Assessment Report Summarizing Geological, Geochemical & Geophysical Surveys In the Miles Ridge Area, Canalask Property

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ASSESSMENT REPORT

Summarizing

GEOLOGICAL, GEOCHEMICAL & GEOPHYSICAL SURVEYS

In the

MILES RIDGE AREA, CANALASK PROPERTY

On Claims

Onion 1 – 13 YA96595 – YA96607
Onion 15, 17, 19, 21 YA97914, YA97916, YA97918, YA97920
Onion 23, 25 YA97922, YA97924
White 1 – 5 YB38234 – YB38238
White 8, 10 YB38241, YB38243
WR 2, 4, 6 YB96869, YB96871, YB96873
WR 8, 10, 12 YB96875, YB96877, YB96879

NTS 115F/15,16 and 115K/1,2

Latitude 61°57'N; Longitude 140°32'W

Whitehorse Mining District
Yukon Territory

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WHITEHORSE, Y.T

Prepared By: Ian Fraser, P.Geo.

for

URAVAN MINERALS INC.

Fieldwork conducted between June 2 and July 27, 2001

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This report has been examined by the Geological Evaluation Unit under Section 53 (4) Yukon Quartz Mining Act and is allowed as representation work in the amount of $ 55,900.00.

M. B.

for Regional Manager, Exploration and Geological Services for Commissioner of Yukon Territory.

Abstract

The Canalask Property covers the White River Mafic-Ultramafic Intrusive Complex (The White River Sill), the northern most and second largest mafic-ultramafic intrusive within the Kluane Mafic-Ultramafic Belt (Kluane Belt) in the Yukon Territory. The intrusive complex is 16 km long and attains an average width of approximately 275 m. The White River Intrusive Complex is very similar to the Quill Creek Intrusive Complex host to the Wellgreen Mine/deposit 90 km to the southeast. The White River and Quill Creek mafic-ultramafic complexes are differentiated Lower Triassic sills consisting of strongly serpentinized dunite, peridotite and lesser marginal facies gabbro (mineralized) and clinopyroxenite. The White River Sill is considered highly prospective to host Ni-Cu + PGE type deposits similar to the Wellgreen deposit and the very large, high grade Ni-Cu + PGE, Lower Triassic deposits at Noril'sk in Russia.

Uravan Minerals Inc. (Uravan) conducted exploration in 2001 on the Canalask Property defined by the area known as the Onion through the Cessna Zones. Exploration consisted of grid establishment, MAG, HLEM (MaxMin) and IP surveys as well as geological mapping, rock geochemical sampling plus detailed prospecting and hand trenching along the White River Sill footwall contact. In all, 324 samples were collected for analysis. The samples were subject to numerous assaying techniques including trace element - whole rock geochemistry, precious metal assay (Pt, Pd + Au) as well as a full PGE NiS fire assay (Pt, Pd, Rh, Os, Ir, Ru + Au) on several samples elevated in platinum and palladium.

Exploration to date on the Canalask Property has identified three styles of mineralization. The Main Zone defines the most significant mineralization discovered thus far. Consisting of 390,235 tonnes of 1.35% Ni with very weak copper and PGE credits, the Main Zone forms a steeply dipping tabular body (130 m x 23 m) that occurs in the footwall of the White River Sill within highly altered sediments intruded by sill-like gabbro. The second style of mineralization, the Discovery Showing, is a disseminated, semi massive to massive sulphide occurrence occurring in mineralized marginal gabbros and is interpreted to be associated with an embayment or topographic depression occurring along the sill footwall contact. Prospecting, trenching and recent detailed mapping and sampling has returned significant Ni-Cu + PGE mineralization; e.g. 4.69% Ni, 0.79% Cu, 0.17% Co and 6.83 g/t PGE's. The third style of mineralization characterized by the Onion SE Showing appears to be hydrothermal and associated with shearing along the sill footwall contact. Semi massive to massive niccolite occurring in sheared marginal gabbro yields grades of up to 27.41% Ni, 0.18% Co and 30.61 g/t Au. This style of mineralization appears to be PGE depleted, perhaps overprinting the Ni-Cu + PGE style of mineralization associated with the Discovery type of occurrence mentioned above.

Exploration efforts this summer has highlighted two specific areas along the footwall contact of the White River Sill that Uravan considers highly prospective to host significant deposits of Ni-Cu-Co + PGE, but also Ni-Co + Au type deposits. Two significant embayments, the Discovery and Sax – Cessna Embayments were defined by detailed mapping, prospecting and sampling and by detailed geophysical surveys MAG, HLEM (MaxMin) and IP. Numerous occurrences of Discovery type and possibly Onion SE type occur within both these embayments. The embayments themselves are characterized by local thickening of the White River Sill and by a very irregular basal floor contact. An irregular basal floor contact characterized by topographic depressions would provide traps or pools for sulphides enriched in Ni-Cu-Co + PGE to segregate from the ultramafic magma during emplacement.

The HLEM-MaxMin and IP performed in 2001 has identified zones of strong conductivity, strong chargeability with associated resistivity anomalies within the Discovery and Sax – Cessna Embayments. The chargeability halos are interpreted to be the result of disseminated sulphide enriched marginal gabbros/pyroxenites(?) that contain zones of semi massive-massive mineralization at depth. Three-dimensional modeling of the IP data suggest the disseminated sulphide halo obtains widths up to 150 m and is continuous from approximately 10 m to 150 m below surface. Within this halo, zones of high chargeability coincident with zones of very low resistivity that suggest increased sulphide content, obtain possible widths of up to 30 m. The semi massive-massive mineralization as defined by the very low resistivity is interpreted to occur at 50-80 m below surface. The strong HLEM conductors associated with the embayments may be the up dip reflection of the top of the resistivity anomalies. Uravan considers the very significant Ni-Cu-Co + PGE grades contained within highly oxidized recessive marginal gabbro along the White River Sill footwall contact at surface, to be an indication of much stronger grades existing at depth once below the extent of oxidation. This is further enhanced by the results of the IP survey.

A unique characteristic of the Discovery Showing and other showings on the Canalask Property, the Wellgreen Mine/deposit, and others in the Kluane Range is the unusually high proportion of the rare PGE's (rhodium, iridium, osmium and ruthenium). At the Wellgreen deposit, a 9.8 m surface chip sample of mineralized gabbro across the East Zone assayed 2.44% Ni, 2.07% Cu, 0.094% Co, 2400 ppb Pt, 2200 ppb Pd and 1020 ppb Au. The "rare" PGE's returned values of *560 ppb rhodium, 550 ppb iridium, 440 ppb osmium, and 650 ppb ruthenium* (7.82 g/t PGE + Au). A 2001 grab sample of heavily mineralized gabbro from the Discovery Showing location assayed 4.69% Ni, 0.79% Cu, 0.17% Co, 28 ppb Pt, 820 ppb Pd, *879 ppb rhodium, 830 ppb iridium, 1260 ppb osmium, and 3010 ppb ruthenium* (6.83 g/t PGE). The underground Wellgreen Mine was in operation from 1971-73 and produced 171,652 tonnes of ore grading 2.23% Ni, 1.39% Cu, 0.073 % Co, and 2.22 g/t Pt + Pd (the other 4 PGE's were not recovered during the mining operation). Mineralization at the Wellgreen Mine/deposit consists of massive sulphide lenses and areas of heavily disseminated sulphide (principally pyrrhotite with lesser chalcopyrite and pentlandite) in gabbro and pyroxenite emplaced along the footwall margins of the ultramafic sill(s). Exploration completed this past field season at the Canalask Property suggest a similar mineralization signature.

Uravan is confident that the exploration performed in 2001 has successfully brought the property (the Onion Zone through Cessna Zone area) to the drilling stage. This report discusses the exploration history, geological setting and summarizes the results of the 2001 exploration program on the Canalask Property and incorporates the results of previous exploration programs. Included with this report are three separate reports summarizing the results of the geophysical surveys; HLEM-MaxMin and IP plus a detailed report that gives a 3-dimensional evaluation of the IP data and a petrographic report detailing the petrography and ore microscopy of several samples collected during the field program.

Exploration expenditures incurred by Uravan to date on the Canalask Property amounts to $268,698. Inclusive in this total are the monies spent to properly compile and evaluate the previous exploration data collected on the property. Evaluation of and interpretation of the data accumulated in 2001 is ongoing. It is anticipated that additional exploration on the property will be performed in 2002. The exploration activities will be dominated by diamond drilling; however, contiguous with the drilling, Uravan anticipates doing additional geophysical and geochemical surveys on the property.

ASSESSMENT REPORT ON 2001 GEOLOGICAL, GEOCHEMICAL AND GEOPHYSICAL EXPLORATION ON THE CANALASK PROPERTY, YUKON TERRITORY

TABLE OF CONTENTS

Abstract i

1.0 Property Location, Access and Introduction 3
Figure 1: Property Location Map 5
Figure 2: Property Disposition Map 6
2.0 Property Status 7
3.0 Exploration History, Canalask Property 8
3.1 A Review of The Main Zone 9
Figure 3: Property Showings Map 10
3.2 Summary of Exploration Prior to 2001, West of The White River 11
4.0 Regional and Property Geology 14
Table II Table of Formations – Kluane Mafic-Ultramafic Belt 15
5.0 Review of 2001 Exploration 16
6.0 2001 Exploration Results 17
6.1 Results of 2001 Mapping Program 17
6.2 Rock Geochemistry, Prospecting and Sampling 19
6.3 The Discovery Embayment 20
Figure 10: Discovery Showing 21
Figure 11: Onion SE Showing 23
6.4 The Sax – Cessna Embayment 24
Figure 12: Sax Showing 25
7.0 Discussion of Geophysical Results 27
8.0 Discussion of Petrographic Study 28
9.0 Discussion, Conclusions and Recommendations for Additional Exploration 30
SELECTED REFERENCES 32

LIST OF TABLES

Table I Property Disposition, Claim name, Grant Number, Expiry Date.....7

Table II Table of Formations – Kluane Mafic-Ultramafic Belt.....15

LIST OF FIGURES

Figure 1: Property Location Map.....4

Figure 2: Property Disposition Map.....5

Figure 3: Property Showings Map.....12

Figure 4: 2001 Grid Geology Map, Scale 1:5,000 Map Pocket

Figure 5: 2001 Rock Geochem Sample Location Map, Scale 1:5.000 Map Pocket

Figure 6: Rock Geochem – Ni, Scale 1:5,000 Map Pocket

Figure 7: Rock Geochem – Cu, Scale 1:5,000 Map Pocket

Figure 8: Rock Geochem – Pt + Pd, Scale 1:5,000 Map Pocket

Figure 9: Discovery – Cessna Compilation Map, Scale 1:5,000 Map Pocket
Figure 10: Discovery Showing 18
Figure 11: Onion SE Showing 20
Figure 12: Sax Showing 22

LIST OF APPENDICES

APPENDIX I Author's Statement of Qualifications
APPENDIX II List of Personnel Involved in Project
APPENDIX A Rock Geochemistry Sample Description, Locations (on floppy disc)
APPENDIX B Rock Geochemistry Complete Assaying Summary / Certificates (on floppy disc)
APPENDIX C Aurora Geosciences Ltd., Canalask – Onion Property 2001 Ground Geophysical Program (separate, complete report)
APPENDIX D Memorandum Detailing Interpretation of IP Data, Onion Property – Geophysical Interpretation
APPENDIX E White River Intrusive Complex, Canalask PGM + Ni + Cu Project Yukon Territory: An Interpretation of Mineral Occurrences based on Petrography, Ore Microscopy and Rock Geochemistry of Selected Samples

1.0 Property Location, Access and Introduction

The Canalask Property is located in southwest Yukon Territory within NTS map sheets 115F/15 and 16 at Latitude 61°57'N, Longitude 140°32'W. The property is 320 km from Whitehorse along the Alaska Highway (Figure 1). The nearest tidewater access is the deep-sea port of Haines Alaska, 500 km to the southeast and Valdez Alaska, which is 580 km to the southwest. Meals, lodging, telephone services and fuel supplies are available in the community of Beaver Creek 30 km northeast of the property along the Alaska Highway. The property is also within walking distance of the highway and a lodge providing meals and telephone service when open. Tree line is at 1000 m ASL and the area dominated by the Onion, Sax and Cessna Zones is at 1220 m. Access onto the property is achievable along a horse trail and few bulldozer trails. Access to the higher elevations along Miles Ridge (max elevation 1850 m ASL) is by foot or by helicopter.

Miles Ridge dominates the northwest part of the property, west of the White River. Miles Ridge is characterized by rugged northeast-facing slopes that progress upwards from mature spruce forest to willow and birch covered slopes and eventually to sub-alpine vegetation at the highest levels. Much of the higher parts of Miles Ridge lie at or above the upper limit of Pleistocene glaciation.

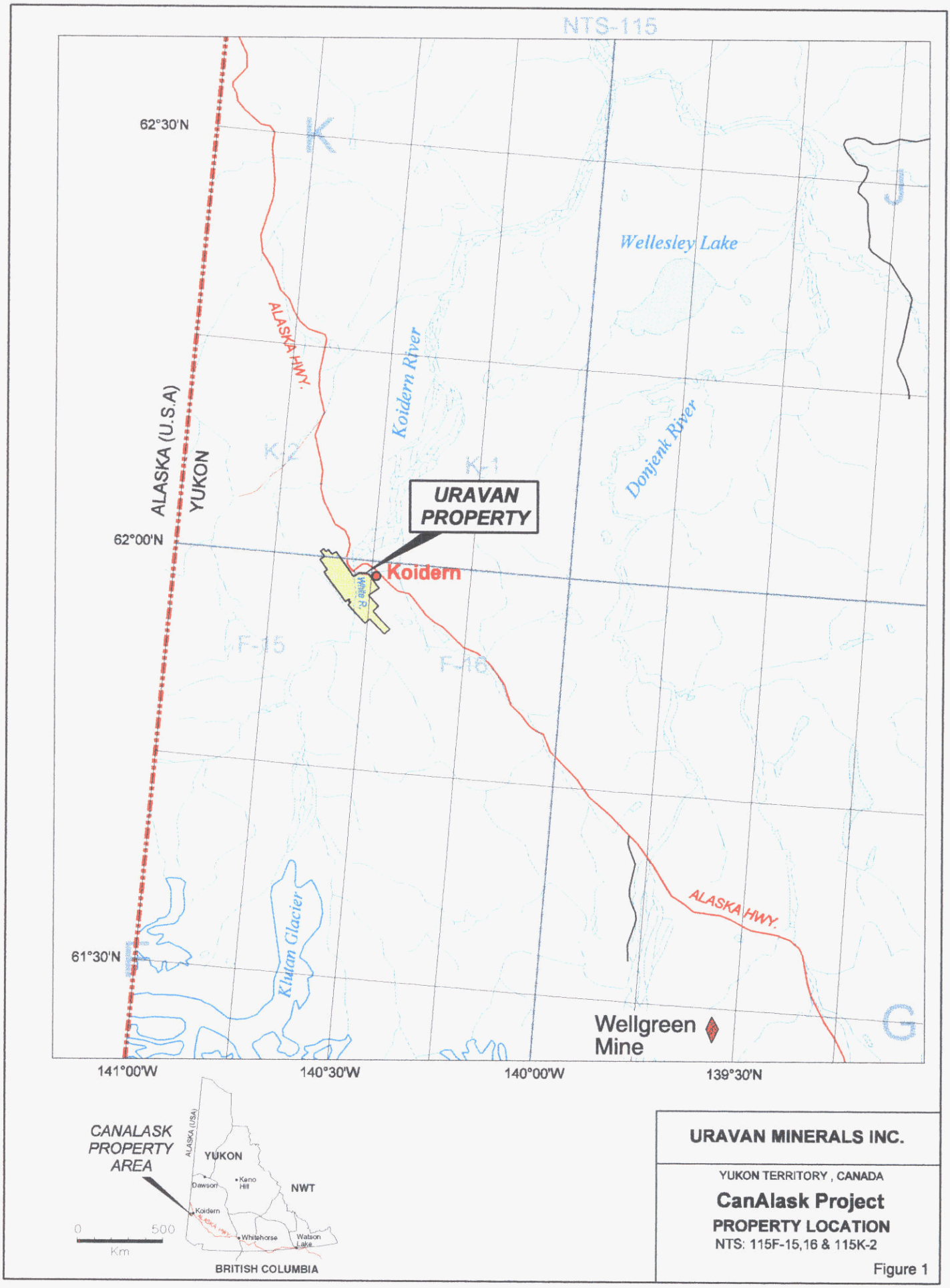
East of the White River (Canalask Main & Footwall Zones) the property is underlain by low, rolling hills separated by low-lying swampy areas. All slopes except south facing have permafrost at shallow depths.

In total the Canalask property consists of 192 contiguous claims covering approximately 4000 hectares (Figure 2) in the Whitehorse Mining District. The area worked in 2001 is highlighted on Figure 2. Exploration on these claims consisted of establishing a grid, geochemical prospecting and sampling, geological mapping and geophysical surveys consisting of HLEM (MaxMin), MAG, and IP. The results of which are summarized in this report. The individual claims worked on are listed below:

Claim Name	*Grant Number*
Onion 1 – 13	YA96595 – YA96607
Onion 15, 17, 19, 21	YA97914, YA97916, YA97918, YA97920
Onion 23, 25	YA97922, YA97924
White 1 – 5	YB38234 – YB38238
White 8, 10	YB38241, YB38243
WR 2, 4, 6	YB96869, YB96871, YB96873
WR 8, 10, 12	YB96875, YB96877, YB96879

In total, $268,697.59 is being filed for assessment on the above listed claims. The following is a description of costs inclusive of all compilation work done prior to the fieldwork:

Description of Costs	***Amount***
Supervisory Geological Personnel	$67,879.65
Geological Support Staff	$21,257.62
Contract Grid Establishment	$20,401.09
Contract Geophysics	$54,060.00
Helicopter Support	$30,934.60
Camp Costs	$5,755.57
Assay Costs	$22,790.02
Field Cost/Freight-Expediting	$3,305.11
Field Supplies	$3,908.57
Computer Drafting/Compilation	$30,583.80
Travel/Food & Lodging	$2,380.45
Travel-Commercial Air	$2,543.97
Insurance	$2,897.14
Total	**$268,697.59**



URAVAN MINERALS INC.

YUKON TERRITORY , CANADA

CanAlask Project

PROPERTY LOCATION

NTS: 115F-15,16 & 115K-2

Figure 1

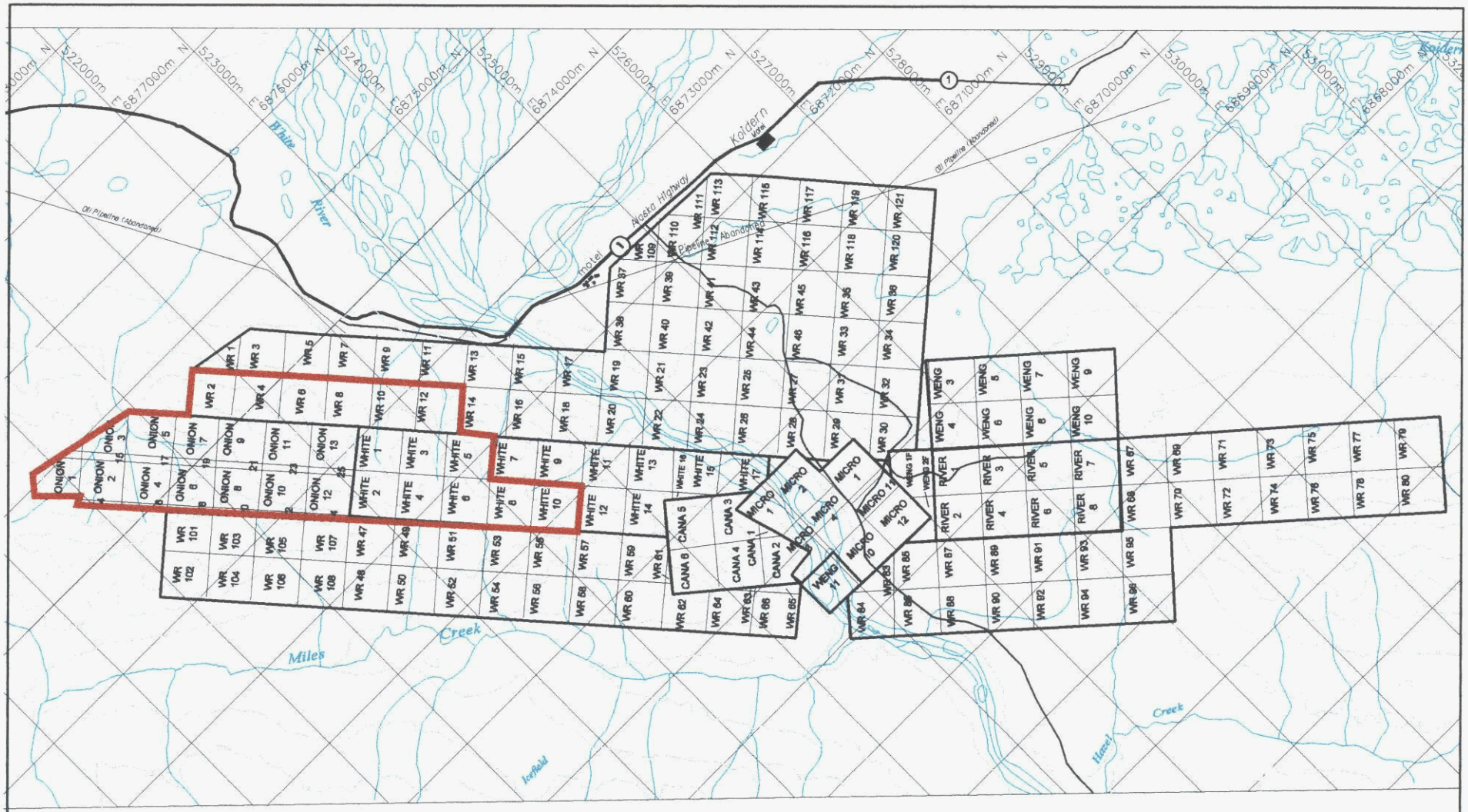


FIGURE 2

LEGEND

Claims worked in 2001

0 500 1000 2000m

URAVAN MINERALS INC.

CANALASK PROPERTY
YUKON TERRITORY

CLAIM COMPILATION

2.0 Property Status

Uravan Minerals Inc. entered into an option agreement dated October 14, 1999 with Expatriate Resources Ltd. in which Uravan can gain a 50% interest in the Canalask Property by incurring $1,200,000 in exploration expenditures by August 1, 2003.

The following **Table 1** lists the individual claims by Name, Grant Number and Expiry Date:

Claim Name	Grant Number	Expiry Date
Cana 1-6	YA97083 – YA97088	4/10/10
Micro 1-2	86108 – 86109	4/10/10
Micro 3-4	86111 – 86112	4/10/10
Micro 6	86115	4/10/10
Micro 10-11	86367 – 86368	4/10/10
Micro 12	86360	4/10/10
Onion 1-3	YA96595 – YA96597	3/19/05
Onion 4-5	YA96598 – YA96599	3/19/08
Onion 6-13	YA96600 – YA96607	3/19/12
Onion 14-15	YA97913 – YA97914	3/19/05
Onion 16-17	YA97915 – YA97916	3/19/08
Onion 18-25	YA97917 – YA97924	3/19/12
River 1-8	YB38253 – YB38260	4/10/11
Weng 1F-2F	YA96585 – YA96586	4/10/10
Weng 3-10	YA96732 – YA96739	4/10/10
Weng 11	YB06099	4/10/11
White 1-18	YB38234 – YB38251	4/10/11
White 20	YB38252	4/10/11
WR 1-20	YB96868 – YB96887	4/10/06
WR 21-28	YB96888 – YB96895	4/10/02
WR 29-30F	YB96896 – YB96897	4/10/02
WR 31	YB96898	4/10/02
WR 32F	YB96899	4/10/02
WR 33	YB96900	4/10/02
WR 34F	YB96901	4/10/02
WR 35-46	YB96902 – YB96913	4/10/02
WR 47-60	YB96914 – YB96927	4/10/06
WR 61F	YB96928	4/10/06
WR 62	YB96929	4/10/06
WR 63F	YB96930	4/10/06
WR 64	YB96931	4/10/06
WR 65F	YB96932	4/10/06
WR 66	YB96933	4/10/06
WR 67-80	YB96934 – YB96947	4/10/02
WR 83F	YB96948	4/10/02
WR 84-96	YB96949 – YB96961	4/10/02
WR 101F	YB97334	4/10/05
WR 102	YB97335	4/10/05
WR 103F	YB97336	4/10/05
WR 104	YB97337	4/10/05
WR 105F	YB97338	4/10/05
WR 106	YB97339	4/10/05
WR 107F	YB97340	4/10/05
WR 108	YB97341	4/10/05
WR 109-118	YB97342 – YB97351	4/10/02
WR 119-121	YB97352 – YB97354	4/10/02

3.0 Exploration History, Canalask Property

Exploration on the Canalask Property has historically been focused on the Main Zone and the area of the White River Sill east of the White River. A few intermittent exploration efforts focused on the western end of the White River Sill (the area of the Discovery Showing); however, the area west of the White River as a whole has never been subject to a concerted, consistent exploration effort. The following summarizes the exploration on the Canalask property to date.

1952 Nickel mineralization was discovered (the Canalask Discovery – Main Zone) in sedimentary rocks within the footwall of the White River ultramafic sill along the east side of the White River.

1952 Prospectors working at the western end of the White River Intrusive Complex 7 km northwest of the Canalask Discovery discovered a nickel-copper occurrence (Discovery Showing – Onion Zone). Prospector Airways Ltd. staked the occurrence in July of that year.

1952-1969 Several individual prospectors and mining companies (Conwest Exploration Co. Ltd., Cominco Ltd.) held the ground covering the Discovery Showing – Onion Zone; however limited work was performed. Exploration consisted of limited trenching and prospecting.

1953 A syndicate consisting of Prospector Airways Ltd., Noranda Mines Ltd. and Kerr Addison Gold Mines Ltd. optioned the property area encompassing the Canalask Discovery from the initial prospectors, drilled 14 holes (1622 m) and dropped the option the following year.

1954-1958 Canalask Nickel Mines Ltd. (a new company with ties to Falconbridge Nickel Mines Ltd.) optioned the property and over the four year period completed 518 m of drifting on two levels, drilled 16 holes from surface (2677 m) and 14 underground (402 m) on the Main Zone. The claims were allowed to lapse.

1964 A new joint venture – syndicate comprised of Discovery Mines Ltd., Rayrock Mines Limited and Consolidated Canadian Faraday Mines Limited optioned the property again from prospectors.

1967-1968 The syndicate performed geophysical surveys (magnetometer, IP and EM-16), bulldozer trenching, surface diamond drilling (999 m, 4 holes) and underground diamond drilling (371 m, 8 holes) again on the Main Zone. The option was dropped.

1971 The property owners performed limited trenching.

1972 The Nickel Syndicate (Canadian Superior Exploration Ltd., Aquitaine Co. Canada Ltd., Home Oil Limited and Getty Mines Limited) optioned the property. Geological mapping, magnetometer and shootback EM surveys were performed.

1973 The Nickel Syndicate drilled 7 holes (643 m) to test the White River Mafic-Ultramafic Complex for magmatic nickel-copper sulphide mineralization in the area of the Main Zone.

1984 Mammoth Resources Limited examined the property's platinum group potential.

1986 All-North Resources Ltd. and Chevron Minerals Ltd. (Kluane Joint Venture) optioned the property and later joint ventured with Rockridge Mining Corporation.

1987 The joint venture mapped the ultramafic complex, performed magnetometer and VLF-EM and geochemical surveys and drilled 5 holes (603 m) in an effort to test the platinum potential of the complex again in the area of the Main Zone.

1987 The area of the Onion Zone showing was restaked as part of the current Onion claims and minor surface geochemical sampling to evaluate the PGE potential was performed.

1988 Rexford Minerals Ltd. under an option agreement conducted systematic grid soil sampling and geophysical surveys consisting of magnetometer and VLF-EM over the Onion Zone area.

1992 After consolidation, All-North Resources Ltd. sold the Canalask property to private interest.

1993 Expatriate Resources Ltd. purchased a 100% interest in claims Micro, Weng and Cana in the White River area (covering the Main Zone) as well as the Onion claims (covering the Discovery – Onion Zone). Expatriate staked additional claims (White and River) and performed linecutting, grid establishment, magnetometer and VLF-EM surveys, geological and geochemical surveys with follow up excavator trenching within the Main Zone area.

1994-1995 Cachet Enterprises entered into an option agreement covering the Micro 1-4 claims and extended the mine grid to the north to perform a VLF-EM survey in an unsurveyed area. Ten drill holes were drilled in this period amounting to 1472 m drilled.

1996 Expatriate Resources Ltd. staked the WR claims to acquire unexplored areas between the Onion and Main Zones as well as areas along strike to the east of the Main Zone. In September a heliborne geophysical survey (magnetometer and EM) amounting to 253 line km was flown over the entire property area.

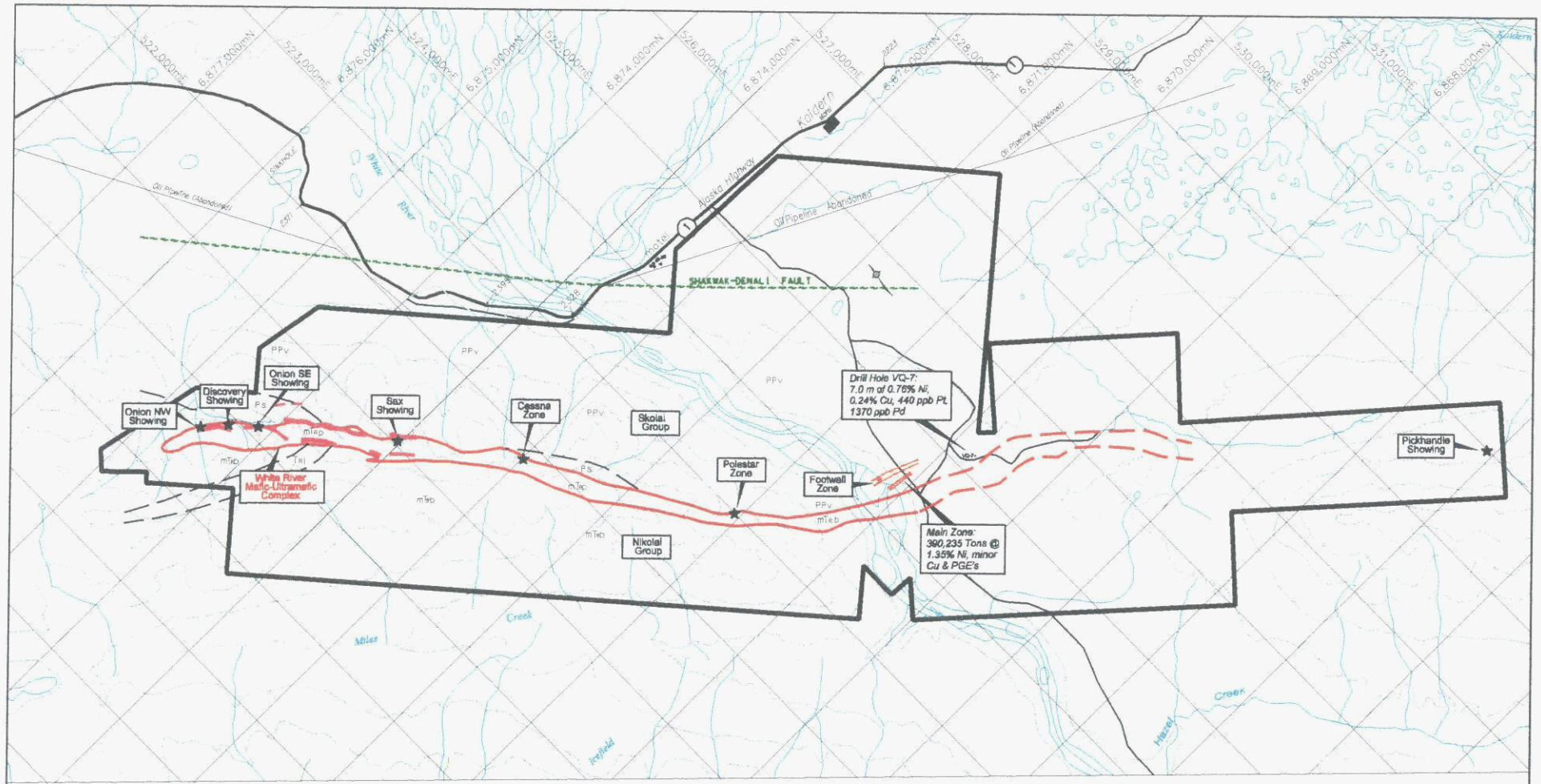
1997 Expatriate Resources Ltd. utilizing Archer Cathro personnel, performed additional linecutting-grid rehabilitation, 33 km of MaxMin II EM, 10 km of MaxMin I EM and 14 km of magnetometer surveys as follow up to the airborne survey. This was followed by 10 drill holes (1227.72 m) all in the area of the Main Zone.

1998 Expatriate Resources Ltd. performed wide-ranging prospecting and silt sampling on Miles Ridge encompassing the Onion Showing and covering a distance of approximately 7 km along the footwall contact of the White River Mafic-Ultramafic Intrusive Complex.

3.1 A Review of The Main Zone

The exploration that has taken place on the Canalask Property to date has been primarily focused on the Main Zone and the area east of the White River (Figure 3). The Main Zone is a nickel rich ore body consisting of 390,235 tonnes of 1.35% Ni, with very weak PGE credits (the author is not aware of the actual PGE grade). The Main Zone occurs in the footwall of the White River Intrusive Complex within highly altered albitized tuffs with intercalated limestone (often hosting calc-silicate skarns) and hornfelsed argillite intruded by sill-like gabbro. Mineralization is structurally controlled and consists of disseminations, fracture fillings, veins, breccia fillings and irregular replacements of pyrrhotite, pyrite, chalcopyrite and pentlandite in up to semi-massive or massive quantities. Diamond drilling results containing sub economic values of nickel, copper and cobalt has substantially delineated a parallel zone north of the Main Zone, the Footwall Zone. A third zone the River Zone, en echelon and parallel to the Main and Footwall Zones also occurs in the footwall of the White River Mafic-Ultramafic Intrusive Complex.

The footwall zones are a significant component to the large-scale geological model that defines the Canalask Property. Both epigenetic and magmatic styles of nickel-copper-cobalt ± PGE mineralization are present on the Canalask property and the overall geological setting compares favorably to the deposits of the Noril'sk-Talnakh region of Siberia Russia. In these deposits, the ore bodies consist of sheet-like masses or lens of massive sulphide that were injected as the last phase of a Triassic mafic-ultramafic magmatic event. The best example of this ore type is the 130 million tonne Oktyabri'sk sulphide body with pre-production grades of 3.65% Ni, 4.70% Cu, 0.13% Co + >10 g/t PGE's. The massive sulphides are always associated with sulphide bearing gabbroic phases but may occur in gabbro or, more commonly, in footwall tuffaceous sedimentary rocks. They are flanked and enveloped by a halo of metasomatic alteration (hornfelsing, albitization and skarnification) with tabular breccia fillings and stockwork-veinlet zones of nickel-copper-PGE sulphide mineralization occurring peripheral to the massive sulphide lenses.



LEGEND

- Known Ni-Cu-PGE Occurrences
- Strong VLF Conductor
- Medium VLF Conductor
- Weak VLF Conductor
- Geological Contact
- Major Strike-Slip Fault

LITHOLOGIES

MIDDLE TRIASSIC
NIKOLAI GROUP
- mTRb amygdaloidal basalt
- mTRl massive limestone

WHITE RIVER MAFIC-ULTRAMAFIC COMPLEX
- mTRp peridotite, dunite, pyroxenite, gabbro

PENNSYLVANIAN TO LOWER PERMIAN
SKOLAI GROUP
- Ps Hasen Creek Fm. - limestone, greywacke, phyllite
- PPv Station Creek Fm. - massive andesite flows, tuff

0 500 1000 2000m

FIGURE 3

URAVAN MINERALS INC.

CANALASK PROPERTY
YUKON TERRITORY

PROPERTY COMPILATION

Similarities between the Canalask Property mineralization and the Noril'sk-Talnakh ore bodies are listed below:

- The most notable similarity is the age (Lower Triassic) of the White River Mafic-Ultramafic Intrusive Complex.
- The gabbroic phase occurring near and forming the footwall contact of the White River Sill, and clastic sedimentary and volcanoclastic rocks that define parts of the footwall.
- The Ni-Cu ± PGE deposits of the Kluane and Noril'sk-Talnakh are associated with hypabyssal mafic-ultramafic intrusions related to Triassic flood basalt volcanism. The Middle Triassic Nikolai basalts compare favorably to the extensive lavas of the Siberian Platform.
- The ore bodies and associated mafic-ultramafic components at Noril'sk-Talnakh were emplaced in Upper Permian clastic sedimentary and tuffaceous rocks. The ultramafic cumulates and associated mineralization within the Kluane occurs at or near the contact of the Permian Hasen Creek Formation (sediments, phyllite, chert, limestone and conglomerates) and Station Creek Formation (volcanics, volcanoclastics with minor limestone).
- The occurrence of a metasomatic alteration front-halo surrounding the mineralization at the Main Zone and the quartz carbonate alteration halo at the Onion through Cessna Zones.
- Known massive sulphide occurrences with significant Ni-Cu + PGE grades occurring in gabbro (Discovery Showing) and zones of massive sulphide (Ni-Cu, Co ± PGE's) mineralization occurring in highly altered sediments within the footwall of the White River Intrusive Complex (Main, Footwall and River Zones).
- Of note; the Triassic Ni-Cu + PGE mineralization associated with the Kluane Mafic-Ultramafic Complex and Noril'sk-Talnakh is considered unique with respect to the Phanerozoic record. Nowhere else in the Triassic record does significant Ni mineralization occur (Hulbert, personal comm.).

3.2 Summary of Exploration Prior to 2001, West of The White River

Nickel – copper mineralization was first discovered west of the White River in 1952. A Cominco Ltd. report (1956) reported very high nickel-copper values from what was termed and remains, the Discovery Showing. After 1956 exploration at the Discovery showing was very limited and not well documented. An undated report for Cominco Ltd. (1966) refers to near-massive pyrrhotite mineralization at the Discovery Showing and at a showing 400 m to the northwest, the Onion NW. The Discovery and Onion NW showings defined the Onion Zone and it was not until 1987 that the area of the Onion Zone underwent serious exploration. Exploration in 1987 and 1988 resulted in further defining the Discovery Showing and resulted in a new discovery the Onion SE thus extending the Onion Zone 300 m to the southeast. Additional prospecting and soil geochemistry in 1988 resulted in the discovery of the Rex, Sax and Polestar Zones. Prospecting in conjunction with stream-sediment sampling in 1998 resulted in the Cessna Zone discovery. All zones mentioned are highly anomalous in Ni-Cu + PGE and Au and all occur at the basal contact of the White River Sill.

The Onion Zone: The Onion Zone defines the most northerly section of the White River Sill and encompasses the Discovery, the Onion NW and Onion SE showings over a strike length of 700 m (Figure 3). At the Discovery Showing, near massive, foliated pyrrhotite bands up to 10 cm thick were first recognized in a trench exposing the basal gabbro contact of the sill. Prospecting and hand trenching in 1956 returned values up to 17.1% Ni and 23.9% Cu; PGE's were not assayed for. In addition to pyrrhotite, pyrite and chalcopyrite, the showing was reported to contain magnetite, pentlandite, heazlewoodite and niccolite. A float sample (collected in 1987) of limonitic gabbro with a thin sulphide seam from the area of the sloughed in trenches at the

Discovery Showing, returned 3.2% Ni, 0.65% Cu, 440 ppb Pt, 1050 ppb Pd, and 35 ppb Au (Main and Davis, 1989). Other samples of peridotite and gabbro containing trace amounts of disseminated pyrrhotite returned values up to 0.25% Ni, 0.06% Cu, 150 ppb Pt, 280 ppb Pd, and 55 ppb Au. Samples of rocky soil taken at 0.5 m intervals from a 2.0 m deep pit at an old trench location assayed up to 0.68% Ni, 0.30% Cu, 820 ppb Pt, 1200 ppb Pd and 160 ppb Au.

In 1988, the Discovery Showing trench was hand excavated exposing 3.0 m of gabbro containing up to 2% disseminated sulphides, at the footwall contact of the sill with quartz-carbonate altered sedimentary rocks. A selected sample returned 2.66% Ni, 1.08% Cu, 1131 ppb Pt, and 1611 ppb Pd. A 2.0 m sample of the rib assayed 0.36% Ni, 0.15% Cu, 926 ppb Pt, and 1989 ppb Pd. Larry Hulbert of the Geological Survey of Canada (Hulbert, 1997) visited the cleaned out trench in 1988 and samples he collected from this location assayed up to 4.5% Ni, 0.91% Cu, 0.15% Co, 2000 ppb Pt, 1700 ppb Pd, 780 ppb rhodium, 840 ppb iridium, 1000 ppb osmium, 2500 ppb ruthenium and 56 ppb gold (8.87 g/t PGE + Au).

The Onion NW showing occurring 400 m northwest of the Discovery trench has been described as near massive pyrrhotite; however, there are no records of assays and the geology of the occurrence is not well documented.

The Onion SE showing discovered in 1987 occurs 300 m southeast of the Discovery Showing. The showing consists of strongly sheared, weathered gabbro containing malachite and minor limonite stains but no visible sulphides. A sample of this mineralization assayed 19.2% Ni, 0.02% Cu and 4100 ppb Au, 50 ppb Pt, and 100 ppb Pd. The anomalous metal content is believed to be due to supergene enrichment of Ni and Au and the leaching of Cu and PGE's. Dr. Hulbert states the high Ni and low Cu is due to the presence of niccolite rather than Ni-Cu sulphides.

Ground geophysical surveys (VLF-EM, MAG) performed in 1988 over the Onion Zone identified an 800 m long strong conductor coincident with a strong magnetic anomaly at the footwall contact encompassing the Discovery and Onion NW/SE showings. The strong magnetic anomaly and strong conductor is suggestive of sulphide accumulation. Results of the soil geochem survey performed in 1988 produced moderate nickel anomalies over the sill and weakly anomalous platinum and palladium values associated with the sill contact. Coincident high copper soil and silt geochem values occur east of the sill in the footwall volcanoclastic rocks, and are possibly coincident with an area of increased magnetic susceptibility as identified by the airborne MAG/EM survey flown in 1996. The zone occurs approximately 300 m down slope of the Discovery Showing, covering an area 400 x 400 m, and has a magnetic signature similar to the Main Zone.

The Rex Zone: The Rex Zone discovered in 1988 is a 400 m long geochemical anomaly that coincides with the sill quartz carbonate footwall contact between the Onion and Sax Zones (Figure 3). The Rex Zone occurs approximately 500 m southeast of the Onion Zone area and is defined by 1988 soil geochem results with values up to 2680 ppm Ni, 17,000 ppm Cu, 190 ppb Pt, 120 ppb Pd and 91 ppb Au. No bedrock mineralization was found to explain the strong geochem anomaly. Stream sediment samples (silt) collected in 1998 from a creek that drains the Rex Zone anomaly area returned highly anomalous values of nickel (up to 1365 ppm) as well as copper (up to 489 ppm). It is important to note that true background values for stream sediment silt samples has either not been established or was not documented in the February 1999 report that summarizes the stream sediment sampling.

Coincident with the geochem anomaly is a strong, elongate VLF-EM conductor and high magnetic signature as defined in the 1988 geophysical survey. The conductor is 1400 m in length

and connects with the Sax Zone to the southeast and ends very near to the Onion Zone to the northwest.

The Sax Zone: The Sax Zone discovered in 1988, is located 1800 m southeast of the Discovery Showing (Figure 3). A sample of fine-grained, limonitic gabbro float with trace disseminated pyrrhotite and chalcopyrite returned a value of 0.44% Ni, 0.22% Cu, 140 ppb Pt, 440 ppb Pd and 35 ppb Au. The 1988 soil geochem survey defined an area anomalous in nickel (up to 2800 ppm), copper (up to 17,020 ppm) platinum and palladium (up to 250 ppb and 150 ppb Pd respectively) and gold (up to 1161 ppb) within the area of the sill footwall contact and in the soils overlying the footwall volcanoclastic rocks.

The 1988 geophysical surveys defined the Sax Zone by a high magnetic signature and by the strong VLF-EM conductor occurring along the footwall contact stretching from the Rex - Sax Zones.

Immediately east of the Sax Zone, two creeks that drain directly below the sill footwall contact, yielded anomalous and consistent nickel copper values (>1000 ppm Ni, >100 ppm Cu) in silt from samples taken within the creeks collected in 1998.

The Cessna Zone: The Cessna Zone was a 1998 discovery (Figure 3). A 4.0 m chip sample of sheared gabbro, assumed to be part of the footwall contact of the mafic-ultramafic sill, assayed 0.21% Ni, 0.18% Cu, 140 ppb Pt and 630 ppb Pd. Stream silt samples from the drainage of the Cessna Zone are anomalous in copper (>200 ppm Cu) approximately 500 m down slope from the sill footwall contact; whereas, the next creek east of the Cessna Zone, is anomalous in nickel (silt) directly below the sill footwall contact and along the entire length of the creek sampled.

The Polestar Zone: An isolated 1988 soil-sampling grid defined the Polestar Zone (Figure 3). A 1.5 m chip sample collected in 1998 of leached and oxidized gabbro in the vicinity of soil geochemistry anomalies returned values of 0.21% Ni, 0.18% Cu, <140 ppb Pt and 420 ppb Pd.

Contiguous with the stream silt sampling performed in 1998, prospecting and sampling of outcrops and float material was performed as well. In all the creeks that drain the Onion – Cessna Zones, sub-economic but anomalous values of copper were returned in several samples of andesite (logged as diorite, summer 2001 program) in the footwall of the White River Sill. Widespread copper in footwall rocks beneath magmatic sulphide mineralization is a common occurrence in other areas throughout the Kluane Mafic–Ultramafic Belt (Carne, personal comm.).

A common characteristic of the Onion – Cessna Zones, is the apparent associated footwall embayments occurring along the floor of the sill at these locations. The airborne geophysics flown in 1996, particularly the calculated vertical gradient of the total magnetic field, defines these possible embayments. At the Wellgreen Mine/deposit, pronounced embayments along the footwall are important controls on localization of massive sulphide-enriched gabbros. Also, the Onion – Cessna Zones are reflected in the airborne EM survey data as resistivity lows, which is suggestive of higher than average sulphide mineral content. The embayments along the footwall of the sill will be discussed in greater detail later in this report.

4.0 Regional and Property Geology

The Canalask property lies along the northwest edge of the Wrangellia Terrane within a steeply dipping package of Late Paleozoic and Early Mesozoic volcanic and sedimentary rocks. These rocks have been subdivided into two groups, the Skolai Group and the Nikolai Group. The mafic-ultramafic White River Intrusive Complex can be considered the third dominant lithology dominating the property area. The Shakwak-Denali Fault system bounds the property to the northeast and the Duke River Fault to the southwest.

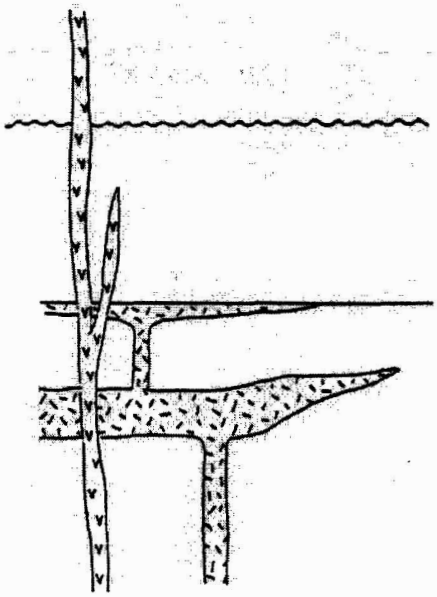
The Skolai Group is comprised of the Pennsylvanian to Permian Station Creek Formation and the Lower Permian Hasen Creek Formation. The Station Creek Formation represents the oldest rocks in the area and forms the lower part of the Skolai Group. Pale green pyroclastic andesites and interbedded phyllites characterize these rocks. Interbedded black phyllite, siltstone, argillaceous limestone and cherty argillites with minor tuff horizons characterize the Upper Station Creek Formation. Total thickness of the formation regionally exceeds 1000 m.

The Lower Permian Hasen Creek Formation forms the upper part of the Skolai Group, attaining a maximum thickness of approximately 800 m. The unit consists of various sedimentary rocks including black phyllite, chert, siltstone, limestone and conglomerate. The basal contact with Station Creek Formation described above is gradational and arbitrarily placed at the uppermost volcanic unit.

The Nikolai Group (Middle to Late Triassic) is a kilometer or more thick sequence of basalt flows with minor interbedded limestone that overlies the Skolai Group rocks along an angular unconformity. Flows are thin (2 to 10 m), vesicular to amygdaloidal and are locally hematite stained, indicating shallow water to sub aerial deposition (Carne, 1999).

The mafic-ultramafic intrusions that form the Kluane Mafic-Ultramafic Belt are generally confined to or near the contact between the Station Creek and Hasen Creek Formations. Within the Kluane Belt these sill-like bodies vary in thickness from less than 10 m to 1000 m and may attain strike lengths up to 20 km. The intrusions generally exhibit good zonation characterized by a marginal gabbro that forms the base of the intrusion. The gabbros are generally fine grained, often mineralized and are overlain by melano-gabbro, clinopyroxenite, peridotite and dunite. Gabbro and pyroxenite-hosted magmatic sulphide concentrations, as massive to net textured pods or lenses of sulphide mineralization characterize several mafic-ultramafic intrusions in the Kluane Belt and carry potential economic levels of nickel-copper + PGE + Au mineralization. Crosscutting relationships within the host rocks indicates a Lower to Middle Triassic age for the intrusions (see Table II).

Table II **Table of Formations – Kluane Mafic-Ultramafic Belt**



Upper Triassic
Nikolai Group – dark green and maroon amygdaloidal basalt, volcanic breccia and conglomerate; minor thin-bedded limestone, chert and argillite

Unconformity

Lower Permian
Hansen Creek Formation – siliceous argillite, sandstone, quartzite, limestone and conglomerate

Pennsylvanian and (?) Permian
Station Creek Formation – tuff, volcanic breccia, siliceous argillite, andesite and basalt flows

Intrusive Rocks

Oligocene
Biotite quartz latite porphyry to trachyte dykes and small stocks

Cretaceous
Biotite-hornblende granodiorite, biotite-nornblende diorite and hornblende-biotite quartz diorite stocks

Upper Triassic
Medium-grained diabasic gabbro dykes and small stocks; probably feeders for Nikolai Group basalts

Lower Triassic
Differentiated ultramafic sills consisting mainly of peridotite with lesser dunite, gabbro and clinopyroxenite

5.0 Review of 2001 Exploration

The 2001 exploration program performed by Uravan was designed to further define the Onion, Rex, Sax and Cessna Zones discussed above and to look for additional similar zones of mineralization along the footwall contact of the White River Sill. The geological model targeted was that of high grade Ni-Cu + PGE mineralization associated with an increased level of sulphides due to a trap or embayment occurring along the floor of the ultramafic sill.

The following summarizes the work completed this field season at the Canalask – Onion Project and discusses the results based on the mapping and prospecting performed.

- **Line Cutting:** Grid establishment commenced on the 2nd of June and was completed on June 15th. The 100 m spaced grid established consists of 5 km of baseline and 34.26 km of cross lines. Wooden lath – pickets were placed every 25 metres along the baseline and every 25 metres along the cross lines. The base line was designed to maintain an azimuth of 140° and was positioned to ensure that cross lines (azimuth 050°) covered the footwall and hanging wall contacts of the White River Sill from the northernmost part of the property, south to the area of the Cessna Zone. Due to extreme magnetism and difficult topography, locally the base line swayed from the desired azimuth (see Figure 4 in map pocket). To ensure grid accuracy GPS readings were taken at the end of each cross line. The base line was slope corrected as were the cross lines. The line cutters utilized 2 different coloured ribbons and lath to illustrate the slope corrected stations and the "straight chained" stations on the cross lines. Slope corrected stations were established for the purpose of the MAG survey and geological control, where as, the HLEM – MaxMin used the "straight chained" stations for control. Extremely dangerous working conditions forced the cancellation of establishing the southernmost portion of the grid (lines 12+00 S – 20+00 South). However, minimal grid, mapping and MAG were performed over the footwall and hanging wall contact in this area.

- **Geophysics:** Uravan and Aurora Geoscience Ltd. personnel mobilized to the property on June 16th. The field crews utilized a fly camp (helicopter supported) established by the line cutters for the duration of the exploration program. The ground MAG survey was performed on every grid line with readings taken every 12.5 m. Following the MAG, some additional line was established on the hanging wall side of the grid near the centre of the grid to secure coverage over the hanging wall contact. Upon completion of the additional MAG, the HLEM – MaxMin survey commenced. Initially a 100 m-coil separation was used and in all 30.95 km of MaxMin was completed. Additional MaxMin was performed over two areas where the 100 m coil established good conductors, notably the area of the Discovery – Onion Zone over a strike length of 600 m and at the Sax Zone covering a strike length of 800 m. The 50 m (3.875 line km) and 150 m-coil (4.80 line km) separations were used in these areas to better define the conductors. MAG and MaxMin surveys were completed on July 15th. An Induced Polarization survey (IP utilizing pole – dipole type array) was initiated on July 18th and completed on July 27th. The IP survey totaled 7.6 line km and was designed to further investigate the two highly anomalous areas associated with the footwall contact as defined by the MaxMin survey between lines 23+00 –15+00 N and 2+00 N – 9+00 S.

- **Geological Mapping, Prospecting and Sampling:** The entire grid was mapped and sampled in detail. As part of the mapping exercise, the footwall contact of the White

River Sill was prospected in detail and where possible hand trenching was performed to better expose the contact. Numerous areas along the footwall contact of the sill were dug out and prepared for sampling. The exercise proved to be effective in exposing the contact and in several instances mineralization associated with the contact. To further define and establish the internal stratigraphy of the sill a strong emphasis was put on sampling as much of the sill as possible. Typically all exposed outcrops within the sill were sampled. Three hundred and ten (310) samples were collected and submitted for assay. Fourteen (14) samples were collected previously on a reconnaissance trip to the property in late May 2001. A 26-element whole rock assay that includes, Ni, Cu, Co, the major oxides plus a precious metal assay Pt, Pd and Au was performed on all samples. Samples were sent from the field to ACME Analytical Laboratories in Vancouver, BC. An extensive check assay program and full PGE analysis (NiS fire assay for Pt, Pd, Rh, Os, Ir, Ru) was performed on several samples by Activation Laboratories Ltd. in Ancaster, Ontario. The assaying technique was designed to determine areas of enrichment and depletion in key elements such as Ni, Cu, Co, MgO, Cr, S, and PGE's + Au within the White River Sill, and to define areas of increased mineralization associated with the footwall contact. Geological mapping, prospecting and sampling consisted of a 4-man crew (2 geologist and 2 assistants) and was completed during the period June 16th – July 15th.

6.0 2001 Exploration Results

The following section reviews the results of the 2001 Exploration program and deals specifically with the area defined by the 2001 grid.

6.1 Results of 2001 Mapping Program

In the area of the Onion – Sax Zones, previous operators have relied on defining the geology by trenching and mapping of talus cover and by the results of the airborne geophysical program flown in 1996. With the exception of the exposed White River Sill along Miles Ridge it is difficult to accurately map the sill and footwall and hanging wall rocks that are largely covered by talus. Uravan put a very strong emphasis on accurately mapping the sill and associated footwall and hanging wall rocks in the Onion – Cessna Zones the results of which are illustrated on Figure 4 in the map pocket.

The oldest rocks in the area, forming the footwall of the White River Sill are the massive bedded, porphyritic andesite flows and crystal tuffs of the Pennsylvanian to Permian Station Creek Formation (Carne, 1999). This unit was mapped as a diorite during the recent field program and is the most dominant rock type forming the footwall to the sill. The unit is fine grained, light in colour green- pale brown, and has a well developed, homogeneous igneous texture. Gossans are prevalent throughout this unit. Locally limestone and basalt blocks occur overlying the volcanic/diorite unit and in combination with an argillite, the Lower Permian Hasen Creek Formation forms the footwall of the White River Sill.

Sandwiched between the limestone, basalt and fine grain sediments is a quartz carbonate alteration halo that forms the immediate footwall contact to the White River Sill. This unit is very distinctive and is in immediate contact with the mafic – ultramafic units that define the White River Sill. The quartz carbonate unit (quartz-carb) is locally mineralized and was observed to contain highly altered breccia fragments of the sill (marginal gabbro). The quartz-carb varies in width from 2.0 – 3.0 metres locally, to up to 80 metres and was observed to be very prolific along

the footwall contact. The quartz-carb also forms the immediate hanging wall contact to the sill; however, outcrop and hence exposure along the hanging wall is not as abundant as along the footwall sill contact. Where observed along the hanging wall, the quartz-carb unit was up to 30 metres thick and parallel to the sill contact.

The hanging wall rocks are made up of predominantly Middle Triassic Nikolai Group amygdaloidal basalts that locally contain lenses of massive limestone. The limestone also occurs as a well-developed unit forming spectacular cliffs within the hanging wall. A volcanic unit consisting of volcanic breccia, lapilli tuffs and agglomerates also forms part of the hanging wall of the White River Sill. Consistently, the basalts, limestone and volcanics form an oblique contact to the White River Sill which is good evidence of the hanging wall contact being that of an angular unconformity (Figure 4).

The White River Sill forms a very well pronounced bench down slope from the crest of Miles Ridge. Topographic features, notably saddles within the slope to the top of Miles Ridge, define the footwall contact (lower saddle) and the hanging wall contact (upper saddle). Outcrop exposure within the sill is good. The author estimates a 40:60 ratio of outcrop to talus cover within the White River Sill itself, west of the White River. Previous operators have relied on talus mapping to define lithology within the sill. The change in lithology is marked by distinctive changes in the colour of the talus cover. Typically the marginal units are lighter in colour; pale grey-blue, locally gossaned, and these colours give way to darker greys to browns toward the more ultramafic lithology within the sill. Within the sill exist several canyon-like features perpendicular to the strike of the sill. These depressions typically form drainages and often expose a good cross-section of the sill. Locally the sill contact is very well exposed along the footwall and hanging wall contacts. Typically the footwall and to a lesser extent the hanging wall quartz-carb unit occur as "spurs" and cliffs along the footwall and hanging wall contacts due to its very resistive nature. The resistive nature and the distinctive orange colour of the quartz-carb unit is a sharp contrast to the very recessive nature of the sill and clearly defines the footwall contact of the White River Sill and where exposed the hanging wall contact. Commonly, immediately adjacent to the footwall rocks (quartz carbonate unit) the mafic – ultramafic rocks of the sill are weathered away over a distance of up to several metres towards the hanging wall of the sill. This weathered away zone persists until the rocks of the mafic – ultramafic sill become more resistive and hence outcrop. What results in several locations along the sill footwall contact is a "notch" or gap in the outcrop (i.e., a gap between resistive quartz-carb and resistive sill rock). This feature was not observed along the hanging wall contact. Several of these "notch's or gaps" were hand excavated. The recessive material present in these locales typically consisted of brown to orange, very broken coarse soils and till (mafic – ultramafic in composition). Solid outcrop was never reached in these trenches and some trenches were dug down 2.0 metres in depth. The recessive material, the author believes, defines the marginal gabbro unit along the footwall contact of the White River Sill and its recessive nature is due to the presence of sulphides within the gabbro that have been reduced to iron oxides.

The White River Sill occurs along an angular unconformity and attains widths up to 300 metres thick and locally narrows to 100 metres. Where observed, the footwall contact has a dip of 65° - 76° to the southwest; however, locally the contact is very irregular and dip determination is difficult. The hanging wall contact of the sill was observed to be dipping at 56° to the southwest. The shallower dipping hanging wall contact is supported by the airborne and ground geophysics, specifically the MAG data. The footwall contact appears very sharp suggestive of a steep contact, whereas the gradual, not as well defined hanging wall contact is indicative of a shallower dip. The true dip of either contact has never been ascertained by drilling.

The White River Sill is comprised of dunite, peridotite, clinopyroxenite and gabbro. The north margin of the complex is the original floor of the sill (footwall) while the south margin defines the upper intrusive contact (hanging wall). The marginal gabbro discussed above, has been exposed in the hand trenching that occurred along the footwall contact; however, locally the marginal gabbro does occur in outcrop and it is believed that the basal, marginal gabbro is present along the entire base of the intrusion and possibly along the upper contact as well. Due to the recessive nature and the lack of good exposure, it is difficult to determine the true width of the marginal gabbro. The gabbro is typically highly weathered, orange-brown in colour often with well-developed nickel and copper blooms (granny smith green – peacock colours) and locally was observed to contain up to 1% disseminated sulphides. Heavily mineralized marginal gabbro, "fly rock" assumed to have derived from the blasting at the Discovery Trench in 1988, consists of semi massive – massive pyrrhotite, pyrite and pentlandite. However, trenching efforts during the past field season were unsuccessful in determining the outcrop source of this heavily mineralized marginal gabbro.

The marginal gabbro grades upward towards the hanging wall into ultramafic rock over a very short distance. Immediately adjacent to the gabbro unit is a clinopyroxene rich peridotite or pyroxenite about 40-60 m thick that forms the base of the ultramafic assemblage. Within this unit abundant carbonate in the form of calcite was observed filling fractures and locally the carbonate was observed, "cementing" - breccia filling large blocks of the peridotite unit. All ultramafic rocks are strongly serpentinized, contain significant magnetite and have a dark brown – green to black groundmass. The serpentinization appears to be greatest in the more olivine rich – dunitic phase of the ultramafic sill. Here a honeycomb like texture is observed where the olivine is completely serpentinized and altered plagioclase forms the rims of the olivine groundmass, resembling a honeycomb.

6.2 Rock Geochemistry, Prospecting and Sampling

During the 2001 program a tremendous emphasis was put on rock geochemistry and collecting enough rock samples to establish a geochemical signature for the White River Sill. In total 324 rock samples were collected and assayed for their base and precious metal content and for their whole rock geochemistry. The soil geochemical sampling performed in 1988 established a good signature for the area of the sill between the Sax and Discovery Zones; however, Uravan questions whether the medium sampled in 1988 was truly soils. The 1988 Summary report does not identify what was sampled. There is no mention of B-horizon soils and Uravan has assumed that the medium sampled over top of the White River Sill was actually unconsolidated outcrop – scree, and that the 1988 material sampled can be considered as relatively in situ and representative of outcrop below the scree cover. Uravan is continuing to work with the 1988 geochemical data in an effort to incorporate the 1988 data with the 2001 rock geochemistry. Figure 5 in the map pocket illustrates the rock geochemistry sample locations. **Appendix A** (see AppendixA – Onion Sample Desc. on floppy disc) lists all the samples collected and defines them by location and lithology. Complete Assay results; Final Assays and complete Assay Certificates are listed on the floppy disc contained in **Appendix B** (see Appendix B–AllAssay File_IF111401).

Statistical analysis was performed on the rock geochemistry database to establish background values for all the elements in the entire database and also for the various lithological units that comprise the database. The units that comprise the White River Sill notably dunite, peridotite, pyroxenite, gabbro, and locally where gabbro and quartz carbonate are intermixed, were combined and statistically analyzed to provide pertinent statistics for the White River Sill. As part of the statistical exercise the 25^{th}, 50^{th}, 70^{th}, 80^{th} 90^{th}, 95^{th} and 98^{th} percentiles for the various elements in the database were established. The 50th percentile defines the background values and

for this report the author is only concerned with background values within the sill for Ni (2050 ppm), Cu (40 ppm), Co (128 ppm), Pt (21 ppb), Pd (32 ppb), and Pt + Pd or total PGE (54.5 ppb). Figures 6, 7 and 8 illustrate the geochem data for Ni, Cu and Pt + Pd respectively.

Another goal of the summer program was to evaluate the existing showings, notably the showings within the Onion – Cessna Zones, by exposing these showings utilizing manpower and shovels. It was hoped that trenches dug perpendicular to the footwall sill contact would reveal the geology plus the mineralization associated with the footwall contact. However it was very quickly realized that digging trenches with the limited manpower would be very difficult and hence the emphasis was just to expose these showings and not necessarily to dig deep trenches at these locales. The shovel excavation was successful in exposing the geology and mineralization associated with the sill footwall contact at the known showings and was successful in exposing new areas as well.

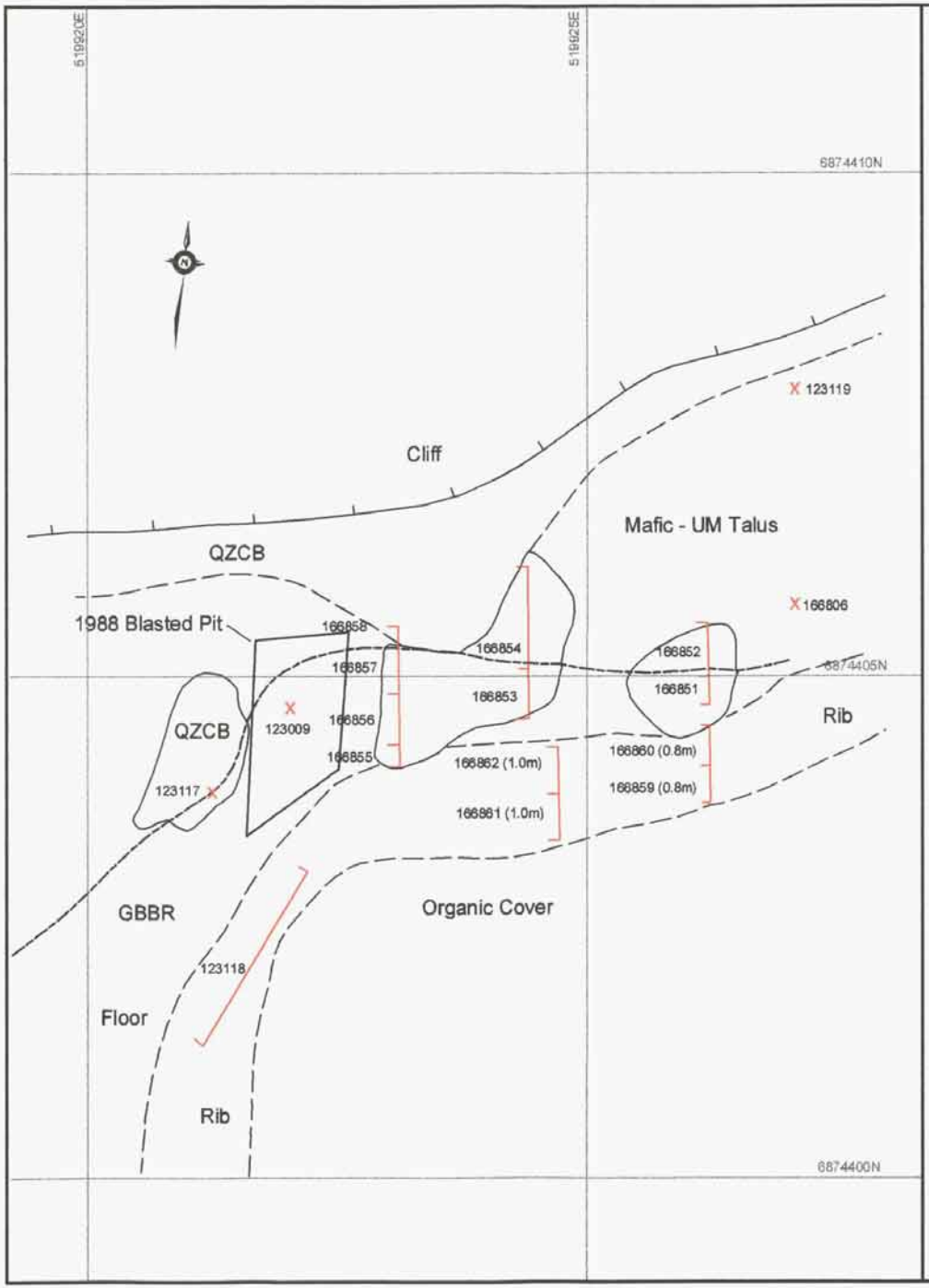
Rock geochemistry results combined with the mapping has established possible embayments along the floor of the sill where the sill is "thickened", the basal contact of the sill is very irregular, and Ni + PGE's are elevated. Two embayments have been identified the Discovery and the Sax-Cessna Embayments, Uravan considers both these embayments as very attractive targets to host significant deposits of Ni-Cu + PGE mineralization. The showings and the footwall contact within the two embayments were sampled and in some cases mapped in detail and are described individually below. The reader is referred to the Compilation Map, Figure 9 in the map pocket. The Compilation Map compiles the 2001 data with results from previous exploration programs.

6.3 The Discovery Embayment

The Discovery Embayment defines an area of "thickening" within the White River Sill. Between grid lines 23+00 N through 9+00 N the sill obtains a thickness of up to 350 m. This embayment within the sill is defined by grid line 23+00 N (Onion NW (?)) to the northwest through to the Rex Zone to the southeast, suggesting a strike length of 1.4 km. The Onion NW showing was not identified in this year's exploration and although the sill appears to maintain its thickness to the northwest of the Discovery showing, the rock geochemistry is not favorable. It should be noted that a grab sample collected this field season in the area of the assumed Onion NW returned 1.16% Zn in what was described as a well mineralized gabbro in contact with sediment.

The **Discovery Showing** was hand excavated during this past field season; previous operators had blasted the showing in 1988. Blasting wire was found in the trench and a sample bag full of rock chips (see sample 123009) was uncovered from a large pile of fill that had slumped into the trench area. Over several days, a large volume of material was removed from the Discovery Showing exposing the quartz-carb marginal gabbro contact. This proved to be a frustrating exercise in that solid outcrop other than the quartz-carb unit was not exposed by shoveling. The marginal gabbro immediately adjacent to the quartz-carb unit is very unconsolidated due to its weathered character and hence it was realized after several days of shoveling that the excavators were actually removing the marginal gabbro, albeit extremely unconsolidated marginal gabbro. The decision was made to stop shoveling and sample what was exposed in the bottom of the trench. The exposed material was brushed off with whiskbrooms to remove possible contamination and was prepared for sampling. After the brushing exercise the exposed material resembled outcrop and with close examination gabbroic textures were recognized as were structural (shears) and mineralization features, notably nickel and copper stains / blooms.

Figure 10 illustrates the detailed sampling at the Discovery Showing. Eight (8.0 m) metres of the marginal gabbro quartz-carb contact was exposed and several chip samples were taken perpendicular to the contact along the trench floor and the ribs of the trench were also



ASSAY RESULTS

Sample No.	Ni ppm	Cu ppm	Co ppm	Pt + Pd ppb (Total PGE ppb)
166806	37060	5980	1400	(6825)
166858	3200	2300	100	(778.1)
166857	4550	2000	150	(823)
166856	6150	1400	250	(980)
166855	9050	1400	400	(976)
166854	254	111	10	12
166853	7500	2150	250	(2422)
166852	1440	650	61	(709)
166851	2980	650	123	(680)
166862	5000	1650	200	(2296)
166861	2550	1650	150	(1061)
166860	2500	1300	100	(651.4)
166859	1119	141	88	66
123009	2050	160	111	185.7
123117	4580	3080	140	(1082)
123118	2860	1490	132	(957)
123119	46920	5980	1400	(6825)

LEGEND

] Chip sample, sample no.

X Grab sample, sample no.

QZCB Quartz carbonate

GBBR Gabbro

0 1 2m

1:50

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DISCOVERY TRENCH

ONION GRID

CANALASK PROJECT

Figure: 10

systematically sampled. Several observations can be made based on the excavating, mapping and sampling exercise performed at the Discovery Showing:

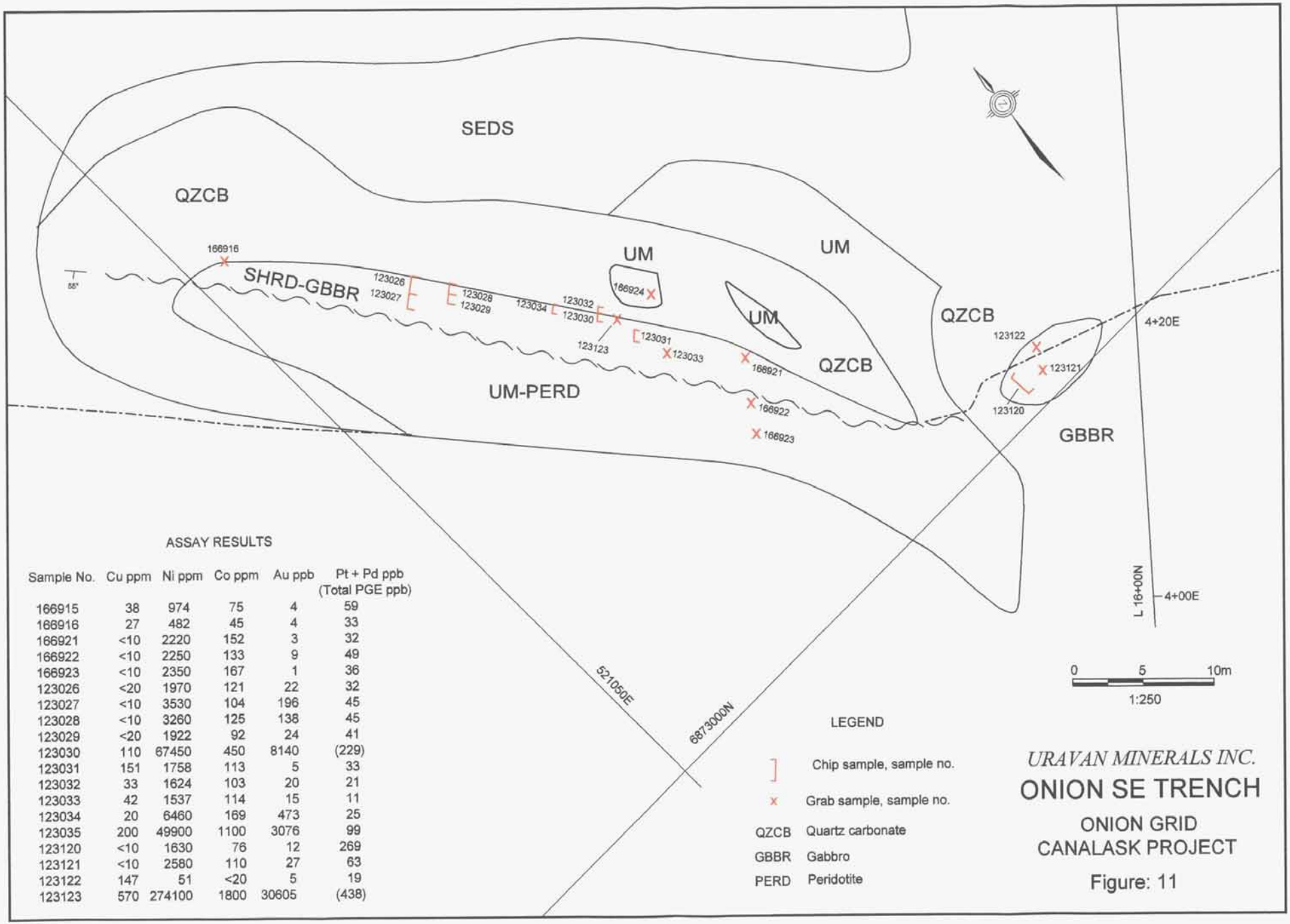
1. As discussed the marginal gabbro at surface is a very recessive unit. The marginal gabbro has been intensely oxidized and hence one can assume "fresh", unexposed marginal gabbro at depth should contain a significant amount of sulphides.

2. The grades obtained from the detailed sampling, for example (sample # 166853, 0.74% Ni, 0.205% Cu, 0.025% Co, 2.42 g/t total PGE) are extremely significant considering the oxidized nature of the marginal gabbro. The total S % (sulphur) for sample # 166853 was assayed at 0.62%. In comparison, samples # 166806 & 123119 are samples of marginal gabbro with semi massive to massive sulphides. These 2 samples were collected at the Discovery Showing, their exact location remains undetermined and similar mineralization was not encountered in the excavating performed this summer. Samples 166806 & 123119 returned assays of 3.71% Ni, 0.59% Cu, 0.14% Co, 6.83 g/t total PGE and 4.69% Ni, 0.79% Cu, 0.17% Co, 6.83 g/t total PGE, and 23% and 25% total sulphur respectively.

3. Clearly the total PGE's within the marginal gabbro is relative to the amount of sulphur in the rock. It remains unclear just how deep, how far down the unconsolidated marginal gabbro becomes "fresh" or consolidated and hence more enriched in sulphur. And it is still unclear where the semi massive to massive sulphide mineralization is located with respect to the gabbro quartz-carb contact. However, the results of the mapping and sampling and the presence of high grade PGE's associated with sulphur suggests the subsurface at the Discovery Showing has tremendous potential to host significant Ni-Cu/Co + PGE mineralization. It is also important to note the extremely high-grade value of the rare PGE's encountered in samples # 166806 & 123119 (824 Rh, 1260 Os, 840 Ir, 3200 Ru and 879 Rh, 1260 Os, 830 Ir, 3010 Ru respectively).

The **Onion SE** showing also occurs within the Discovery Embayment (see Figure 11). The style of mineralization at the Onion SE showing is unique to the property and perhaps the Kluane Belt. A grab sample (# 123123) of semi massive niccolite within strongly sheared gabbro in contact with quartz-carb, assayed up to 27.41% Ni, 0.18% Co and **30.6 g/t Au**. What is unique is the low level of PGE's. This particular sample assayed only 384 ppb total PGE's. The host gabbro unit was similar to the marginal gabbro at the Discovery Showing in colour, texture; however differed in that it was noticeably sheared, more consolidated and assays suggest more depleted in sulphur. The occurrences of niccolite suggest the nickel is associated with arsenic and not sulphur, which explains the lack of PGE's. The PGE's would appear to better assimilate to sulphur than arsenic. For comparison, the samples collected at the Onion SE Showing contain <0.10% S (sample 123123, is the exception @ 0.21% S), whereas at the Discovery Showing the visually unmineralized marginal gabbro contain >0.10% and up to 1.57% S.

The style of mineralization at the Onion SE is suggestive of a hydrothermal, epigenetic origin and not part of the magmatic event that results in the Discovery style of mineralization. The niccolite occurs as disseminations and stringers within the gabbro that on a larger scale form nodules or boudins along the gabbro quartz-carb contact. The mineralization was isolated at the contact, confined to a shear plane (?) and appeared to plunge parallel to, but steeply down the gabbro quartz-carb contact. Seven metres (7.0 m) along the contact from sample 123123, grab sample 123035 described as; strongly sheared and weakly mineralized marginal gabbro, assayed 6.96% Ni, 0.11% Co and 3.07 g/t Au. Note a chip sample at the location of sample 123123 returned 7.01% Ni, 0.045% Co and **8.69 g/t Au** over a 0.3 m sample width.



ASSAY RESULTS

Sample No.	Cu ppm	Ni ppm	Co ppm	Au ppb	Pt + Pd ppb (Total PGE ppb)
166915	38	974	75	4	59
166916	27	482	45	4	33
166921	<10	2220	152	3	32
166922	<10	2250	133	9	49
166923	<10	2350	167	1	36
123026	<20	1970	121	22	32
123027	<10	3530	104	196	45
123028	<10	3260	125	138	45
123029	<20	1922	92	24	41
123030	110	67450	450	8140	(229)
123031	151	1758	113	5	33
123032	33	1624	103	20	21
123033	42	1537	114	15	11
123034	20	6460	169	473	25
123035	200	49900	1100	3076	99
123120	<10	1630	76	12	269
123121	<10	2580	110	27	63
123122	147	51	<20	5	19
123123	570	274100	1800	30605	(438)

LEGEND

] Chip sample, sample no.

x Grab sample, sample no.

QZCB Quartz carbonate

GBBR Gabbro

PERD Peridotite

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ONION SE TRENCH

ONION GRID
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Figure: 11

The southeast boundary of the Discovery Embayment is defined by the 1988 geochemical anomaly the **Rex Zone.** Detailed rock geochem sampling within the Rex Zone did not reveal a source for the highly Pt, Pd anomalous soils collected in 1988. Outcrop excavating and sampling performed in 2001 within the defined Rex Zone at the gabbro quartz-carb contact yielded rock geochem values that fall below background values as defined by statistical analysis for Ni and Pt + Pd. The 1988 soil geochem survey does define a highly anomalous Cu anomaly in the footwall diorites stretching from the Rex through to the Sax Zone. Rock geochem sample collected this summer support the copper soil geochem anomaly. Footwall diorite sample 166946 in the footwall of the Rex Zone assayed 2490 ppm Cu. Three (3) other rock geochem samples of the diorite between the Rex and Sax Zones samples 166970, 166971 and 166972 assayed 6110 ppm, 986 ppm and 912 ppm Cu respectively.

Similar to the Discovery Showing, the excavated area within the Rex Zone consists of limonitic, oxidized marginal gabbro in contact with the very resistive quartz-carb unit. The contact is very well defined, sharp albeit very irregular and resembles a saw blade with the quartz-carb unit (the teeth) jutting into the gabbro. The orientation of the jutting quartz-carb may be indicative of magmatic flow along the gabbro quartz carbonate contact in the southeast direction.

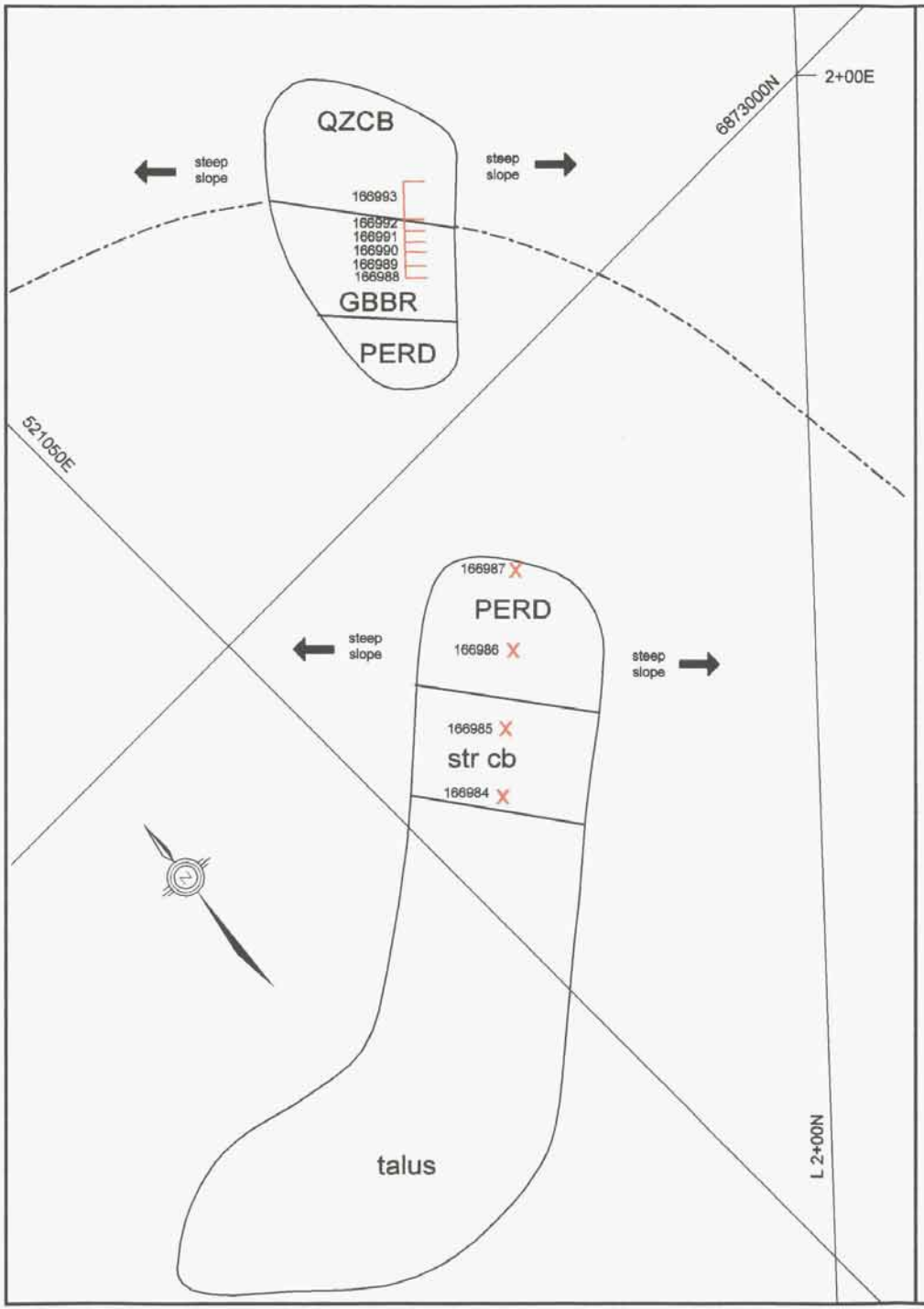
As mentioned the rock geochemistry does not support the 1988 soil geochem results that defined the Rex Zone and hence the author questions if there is a Rex Zone. However, the sill gradually becomes thinner past the boundary of the Rex Zone (?) defining the southeast shoulder of the Discovery Embayment. Within the Discovery Embayment a large zone of nickel enrichment (>2050 ppm) encompassing the entire width of the sill, based on limited rock geochem is defined between grid lines 17+00 N through 11+00 N which includes the Onion SE and the Rex Zone (?).

6.4 The Sax – Cessna Embayment

The Sax-Cessna Embayment (Figure 9) is defined by the footwall contact between lines 5+00 N through 11+00 S encompassing the **Sax, Cessna** showings and the newly discovered **Pix Showing.** Within this embayment the sill is thickened (up to 250 m) and geological mapping suggest that locally the footwall contact is highly irregular indicative of smaller localized embayments. Previous operators defined the Sax and Cessna Zones based on soil, rock geochemistry and stream sediment geochemistry. The results of the 2001 rock geochemistry better defines the Sax and Cessna zones and clearly highlights new zones of Ni, Cu + PGE enrichment, but perhaps equally as important zones of Ni depletion where PGE's are enriched.

The **Sax Showing** was exposed by hand excavating, mapped and sampled in detail (Figure 12). The showing is hosted in marginal gabbro occurring immediately at the gabbro quartz-carb contact. Unlike the marginal gabbro at the Discovery Showing, the Sax Showing marginal gabbro is not as strongly oxidized and limonitic and contains minor disseminated, visible, net textured sulphides (1%). Samples 166988 – 166993 represent a 3.1 m continuous section of the Sax Showing. Assay values within the marginal gabbro are 0.258 – 0.489% Ni, 0.043 – 0.149% Cu, and 435 – 920 ppb total PGE. These values concur with the original values obtained at the showing (0.44% Ni, 0.22% Cu, 140 ppb Pt, 440 ppb Pd from limonite gabbro float) and suggest a higher concentration of overall PGE's. The showing occurs atop a long ridge perpendicular to the sill. At the showing area the exposed marginal gabbro and quartz-carb on the ridge is only 2.0 – 3.0 metres wide and the ridge drops off dramatically either side of the Sax Showing. Due to the lack of exposure it is difficult to speculate as to how much strike the Sax Showing may have. The 1988 soil geochem and geophysical surveys stopped at current grid line 1+00 S.

The 2001 rock geochemistry survey has highlighted a zone within the Sax – Cessna Embayment of above background (>54.5 ppb) Pt + Pd that conforms to the width of the sill from grid lines



ASSAY RESULTS

Sample No.	Cu ppm	Ni ppm	Co ppm	Pt + Pd ppb (Total PGE ppb)
166993	52	302	37	<2
166992	1490	2580	121	(435)
166991	450	4890	187	(920)
166990	1150	3960	177	(770)
166989	1310	3120	168	(518)
166988	148	1681	133	70
166987	30	2320	126	97
166986	20	2890	157	190
166985	<10	2860	155	117.5
166984	<10	2700	149	99

LEGEND

] Chip sample, sample no.

x Grab sample, sample no.

QZCB Quartz carbonate

GBBR Gabbro

PERD Peridotite

str cb Strong carbonate

0 5 10m

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SAX TRENCH

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CANALASK PROJECT

Figure: 12

from 1+00 S to 10+00 S. Within this zone of Pt + Pd enrichment zones defined as >70th percentile (>94.5 ppb Pt + Pd), conform to the gabbro quartz-carb contact and locally to the hanging wall contact. The gabbro quartz-carb contact between lines 1+00 S to 3+00 S is very irregular and complex. As at the Rex Zone the quartz-carb unit juts in and out of the mafic – ultramafic sill rocks in a very irregular and complex nature. The irregular nature of the gabbro quartz-carb contact implies a very irregular floor of the mafic – ultramafic sill and at the time of deposition this floor may have been a very good host/trap for magmatic sulphides. Significant accumulations of sulphide were not observed within this area; however, the area is highly anomalous with several samples collected having >2000 ppm Ni and >100 ppb combined Pt & Pd. It is also very intriguing how little sulphides were detected in the rock samples in this area. All samples with the exception of one (0.17% S) had <0.1% S. The marginal gabbro is typical of the gabbros along the floor of the sill. They are weathered to a brown – orange colour, they appear highly oxidized and limonite rich and occur as unconsolidated rubble. As at the Discovery Showing trench, the loose gabbro was shoveled off to a point where it was semi solid and then cleaned off in preparation for sampling.

Also of significance, detailed sampling of the gabbro quartz-carb contact within the area defined by grid lines 2+50 S to 4+50 S has revealed an area of nickel depletion. Some samples do have values of up to 2100 ppm Ni, however the majority of marginal gabbro samples collected returned values between 1196 – 1968 ppm Ni (below background). What is interesting about this area is, although it appears to be depleted in nickel, several of these samples do have combined >70th percentile Pt + Pd (>94.5 ppb Pt + Pd).

The **Pix Showing** (Figure 9) is a new discovery and occurs within an area of the White River Sill between grid lines 5+00 S and 9+00 S that appears to be nickel and Pt + Pd enriched (2300 – 4460 ppm Ni, >54.5 ppb Pt + Pd). Within this zone outcrop along the gabbro quartz-carb contact is limited. An outcrop occurring at the gabbro quartz-carb contact at 8+60 S / 0+30 W was exposed by shovel excavating and subsequently sampled. This outcrop defines the Pix Showing. One grab sample, two chip samples (0.7 and 0.8 m) of strongly altered gabbro and one sample of the soils (highly oxidized gabbro?), returned 0.115 – 0.446% Ni and 410 – 855 ppb Pt + Pd. Copper values range from 330 – 950 ppm and total S % is elevated compared to other zones discussed at 0.17 – 1.87% S. The outcrop sampled has a limited strike of up to 5.0 m and width of <1.0 m from the contact into the sill and unfortunately the gabbro quartz-carb contact is largely buried under scree. Due to the poor outcrop exposure it is difficult to speculate on the potential size of the Pix Zone; however, it is clear that this zone is defined by elevated Ni, Cu and Pt + Pd values and appears to define a zone of increased S which could be very significant.

The Cessna Zone is now part of the Sax – Cessna Embayment, encompassing the Sax and Pix showings discussed above and the area where prospecting in 1998 resulted in the discovery of the **Cessna Showing** (Figure 9). The Cessna Showing is a 4.0 m chip sample of limonitic gabbro that assayed 0.21% Ni, 0.18% Cu and 770 ppb Pt + Pd. This sample location essentially defines the southeast shoulder of the Sax- Cessna Embayment; that is, grid lines 9+00 through 11+00 S. Although additional prospecting and sampling in the immediate (assumed) area of the 1998 Cessna chip sample did not duplicate the values of the sample, prospecting along the gabbro quartz- carb contact grid north and south of this location did confirm the presence of anomalous nickel and highly anomalous Pt + Pd (marginal gabbro samples 123829, 123830 assayed 2470 ppm, 2100 ppm Ni and 102.1 ppb, 97.8 ppb Pt + Pd respectively). Creeks that drain this area of the sill are very anomalous in copper and nickel suggestive of a copper and nickel-enriched source up stream and most likely within the White River Sill (Figure 9).

The **Cessax Showing** (Figure 9) is a new discovery located 600 m further along strike from the Cessna Showing where a grab sample (123831) of marginal gabbro at the gabbro quartz-carb contact returned values of 0.385% Ni, 0.056% Cu, 161 ppm Co and 934 ppb total PGE's. This sample located at line 17+00 S is directly above a stream sampled in 1998 that is highly anomalous in Ni (anomalous defining stream sediments >1000 ppm Ni). It was very dangerous to work in the area of the Cessax Showing due to difficult topography and hence at this time the author is reluctant to include the Cessax Showing as part of the Sax – Cessna Embayment. Uravan was not able to collect HLEM and geochemical data between grid lines 11+00 and 17+00 S. However, the rock and stream sediment geochemistry presents a favorable argument that the gabbro quartz-carb contact south of the defined Sax – Cessna Embayment is mineralized in Ni + PGE's.

7.0 Discussion of Geophysical Results

Aurora Geosciences Ltd. of Whitehorse YT was contracted to do ground MAG and HLEM surveys over the grid area. The HLEM (MaxMin) survey was successful in defining two prominent conductors associated with the footwall contact of the White River Sill (see Figure 9). The conductors correspond very well with the showings old and new identified in this report. To further define these areas of conductivity Uravan decided to do follow up IP in areas where the conductivity was the strongest and best defined. The IP survey has defined areas of chargeability/resistivity associated with the conductors. The IP survey has also provided a more accurate measure of depth to top of the conductive features.

The results of the geophysical surveys are documented in a separate report that accompanies this report (refer to **Appendix C**). In addition to the Aurora Geosciences Summary Report, Aurora was contracted to perform a full evaluation of the IP data with respect to chargeability and resistivity. The evaluation was aimed at better determining a source for the strong chargeability and resistivity responses and to best integrate this data with the HLEM data. The results of the evaluation occur in this report as a separate document (**Appendix D**). The results of the geophysical surveys compliment and support the results of the rock geochemistry, mapping and prospecting performed this summer. Some key observations are listed below (Belcourt, 2001), (Power, 2002).

- Two areas of strong conductivity were further defined by IP; notably conductor A1 (refer to Figure 9 and maps in **Appendix C**) between grid lines 23+00 N through 15+00 N, and A2 between grid lines 2+00 N through 9+00 S.
- The conductive features and chargeability/resistivity anomalies are interpreted as being the result of disseminated to massive sulphide mineralization. Both areas detailed by additional MaxMin and IP have numerous mineralized showings and occurrences on surface associated with the gabbro quartz-carb contact.
- The surface showings mineralized in Ni, Cu, Co + PGE's discussed in this report, occur for the most part in highly oxidized marginal gabbro with very little sulphide content.
- The chargeability halos as defined by the IP are suggestive of significant disseminated sulphides occurring within the marginal gabbro and pyroxenite units that occur at the base of the White River Sill.
- The depth to tops of the conductive, very chargeable, more resistive bodies as defined by the HLEM and IP is estimated to be 10-30 m below surface. Based on this it can be assumed that oxidation is present within the sill to depths of at least 10 m and that "fresh" unoxidized sulphides are 10-30 m below surface.

- Conductor A1 is strongest between grid lines 19+00N and 17+00N. Associated with the conductor are zones of increased chargeability and very low resistivity. Coincidentally this is the location of the Onion SE showing where very high-grade nickel and gold occur.
- Conductor A2 is strongest on grid line 1+75 S (2+00S) where the footwall contact of the sill is very irregular and where elevated values of Ni and Pt + Pd were obtained from the rock geochemistry survey. IP results, notably zones of increased chargeability and very low resistivity were highlighted on line 2+00S
- The geophysics interprets the dip of the sill footwall contact to be locally very steep to near vertical and in other areas along the contact to be flatter. The irregular, "warped" contact is favorable for the concentration of sulphides.
- The trace of conductors A1 and A2 conform to and parallel the footwall contact of the sill. The location of the A1 and A2 conductor axis's is locally 50 – 100 m northwest of the gabbro quartz carb contact, possibly reflecting the up dip projection of more massive sulphide bodies at depth. Conductor A3 conforms to and parallels the hanging wall contact in an area enriched in Ni and Pt + Pd as defined by the rock geochemistry.
- Exact true widths of the mineralized halos (chargeability anomalies) and the increased sulphide enriched zones (resistivity anomalies) are difficult to interpret from the IP inversion models. However, the chargeability data suggests widths of up >100 m in which the marginal gabbro and adjacent pyroxenites are mineralized with disseminated sulphide. Very low resistivity data within the halos is indicative of possible widths of up to 30 m in which net textured to massive sulphide mineralization occurs along the marginal gabbro quartz-carb footwall contact.

The results of the geophysical survey are very encouraging and interpretation is ongoing. The IP results in particular suggest that the chargeability/resistivity and conductive response may be due to a mineralized body/bodies with some apparent width. The true widths, dimensions and orientations of conductors A1 and A2 and the IP anomalies are not well documented in the geophysical reports accompanying this report; however, it appears these features are significant and remain open to depth. Additional interpretive work and possibly more detailed geophysical work is required before drilling. The reader is referred to the Canalask – Onion Property 2001 Ground Geophysical Program (**Appendix C**) and to Memorandum Detailing Interpretation of IP Data, Onion Property – Geophysical Interpretation (**Appendix D**) by Aurora Geosciences Ltd. for a complete review plus maps of the geophysical results.

8.0 Discussion of Petrographic Study

To further enhance the understanding of the White River Sill lithology, alteration, structure and mineralization several samples (16), representative of the sill lithology and country rock, were submitted to Kishar Research Inc. for petrographic analyses. The purpose of the study was twofold; to develop a consistent rock nomenclature for the various lithologies that comprise the White River Sill for future mapping and drill programs; and to distinguish between the different types of mineralization identified on the property. The entire report, White River Intrusive Complex, Canalask PGM + Ni + Cu Project Yukon Territory: An Interpretation of Mineral Occurrences based on Petrography, Ore Microscopy and Rock Geochemistry of Selected Samples occurs as a separate appendix (**Appendix E**). The results of the petrographic study have greatly enhanced Uravan's understanding of the White River Sill and have added significantly to the overall database. Some of the more pertinent observations are as follows (Miller, 2001):

- The White River Sill is a systematically zoned ultramafic-mafic intrusive with ultramafic rocks occupying the core and periphery of the intrusive (dunite, wehrlite, clinopyroxenite). Mafic rocks are uniformly distributed and restricted along the outer periphery of the intrusive complex (olivine gabbro, gabbro).
- Magmatic sulphide + oxide concentrations are present within the sill and occur dominantly near the basal contact (based on sample population) as droplets, net-textured and massive sulphide. The sulphide occurs as pyrrhotite + pentlandite + chalcopyrite + magnetite.
- In the area of exploration, the White River Sill has been overprinted by two stages of alteration. Initially serpentinization with accompanying sericitization/argillitization, chloritization and sulphurization. Secondly, property-scale deformation introduced carbonitization represented by the quartz-carbonate replacement zones along the upper and lower borders of the White River Sill.
- Penetrative deformation was observed in mineralized samples from the Discovery showing implying that a structure(s), suggested to be acute to the sill has/have displaced mineralization either along strike or down dip.
- Two distinct types of mineralization were recognized from the sample suite submitted. Magmatic disseminated, net-textured to massive sulphide Ni + PGE + Cu mineralization that varies depending on its proximity to the quartz-carbonate alteration halo. The second style of mineralization is epigenetic, skarn-like, niccolite (very high grade nickel) and gold (very high grade) rich. At the Onion SE arsenic-rich, sulphur poor, niccolite, gold, electrum and sphalerite characterize the mineralization. The low PGE associated with the arsenic rich mineralization is attributed to the inability of arsenic-bearing hydrothermal systems to transport PGE's.
- Syngenetic Ni+PGE+Cu magmatic sulphide occurrences have been overprinted by an epigenetic quartz+carbonate hydrothermal episode. The epigenetic event is interpreted to be an arsenic bearing, sulphur poor hydrothermal skarn system. The occurrences of skarn type silicate alteration assemblages within the quartz-carbonate alteration (replacement) zone, plus the occurrence of gold within White River Sill samples is considered to be coeval with the emplacement of the diorite-granodiorite Kluane Range Intrusive Suite. These mineralogical features support their classification into the skarn gold deposit model.
- The high grade nickel (up to 274000 ppm) that characterizes the Onion SE occurrence suggests that arsenic bearing, sulphur poor hydrothermal fluids equilibrated with and leached appreciable nickel from possibly nickel-rich, sulphide poor dunitic rocks of the White River Sill.

In summary, the petrographic study has recognized the Ni+PGE+Cu magmatic mineralization that is being sought at the Canalask – Onion Property. Additionally, a very significant epigenetic (skarn) episode has overprinted the magmatic event and has locally leached nickel from within the White River Sill and has concentrated significant Ni + Au mineralization in deformation zones along the sill / quartz-carb contact. In the limited number of samples submitted for analysis from various locales throughout the area of exploration (2001) both styles of mineralization have been recognized. Based on this observation, the potential for additional Discovery Showing and Onion SE type mineralization within the confines explored thus far on the property is considered very good.

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9.0 Discussion, Conclusions and Recommendations for Additional Exploration

The results of the geological mapping, geophysical surveys and rock geochemistry performed this past field season has reconfigured the Onion, Rex, Sax and Cessna Zones into what Uravan Minerals refers to as the Discovery and Sax – Cessna Embayments. These two embayments are considered highly prospective to host significant deposits of Ni-Cu-Co + PGE and Au. Some key exploration highlights from this past field season are listed below.

- Positive geochemical, geophysical and structural features pertaining to the basal part of the White River Sill highlight the two embayments. Uravan interprets the embayments as zones of thickening within the sill where topographic depressions along the footwall contact occur allowing sulphides equilibrated with PGE's to collected due to gravity segregation during the emplacement of the ultramafic magma. The location of the Discovery and Onion SE showing within the Discovery Embayment and the Sax, Pix and Cessna Showings in the Sax – Cessna Embayment, is good evidence that Ni ± PGE's + Au mineralization occurs along the sill footwall contact throughout the area explored to date.

- The high grade PGE mineralization that occurs at the Discovery Showing is associated with increased levels of sulphur. The two samples collected at the showing that returned 6.8 g/t PGE's were massive sulphide samples assumed to have derived from previous blasting in the area. There appears to be a direct correlation of increased PGE's with increased sulphur.

- Massive sulphide material is very nickel rich 3.0 – 5.0% and very rich in the rare PGE's; notably, rhodium, osmium, iridium and ruthenium (>4.0 g/t combined). Consistent with other known occurrences in the Kluane Belt, the White River Sill hosts significant amounts of the rare PGE's.

- The lower grade Ni + PGE values occurring in extremely oxidized marginal gabbro all along the sill footwall contact is very significant considering the very low levels of associated sulphur and the level of oxidation. Uravan interprets the highly anomalous Ni + PGE's in oxidized rock at surface as being good evidence to suggest that Ni + PGE grades will increase with depth as the sulphur in the marginal gabbros becomes less and less oxidized.

- Geophysical interpretation thus far has recognized two zones of significant conductivity and chargeability hosting zones of very low resistivity within: the Discovery and Sax – Cessna Embayments. The zone of most significant chargeability, resistivity with associated conductivity in the Discovery Embayment measures 400 x 75 m and remains open along strike and to depth. Within the Sax – Cessna Embayment, the zone of best chargeability measures 700 x 100 m and remains open along strike and to depth. Within this halo significant zones of conductivity and resistivity occur; however, as stated in the report, it is very difficult to determine true widths from the existing data.

- The very high-grade nickel + gold mineralization occurring at the Onion SE showing appears to be structurally controlled and a hydrothermal (skarn) event that overprints the magmatic Ni-Cu + PGE style of mineralization that is analogous with the Discovery Showing. This style of mineralization in abundance would greatly enhance the

economics of what is deemed to be potentially a primarily magmatic Ni+PGE+Cu type of exploration target.

- Although not discussed in great detail within the report, the high levels of cobalt associated with the showings and the White River sill is considered significant. Cobalt was a significant component recovered from the Wellgreen Mine during its operation.

- On a property scale, the various styles of mineralization, occurrences and deposits that occur on the Canalask property, and the very significant grades associated with the various styles of mineralization, is geologically unique. This confirms the highly "prospective" nature of the property and enhances the possibility of defining a significant Ni+PGE+Au deposit on the property.

Uravan Minerals Inc. is extremely encouraged by the results of the 2001 exploration program. The next step in evaluating the White River Sill in the area worked during 2001 is to drill. Prior to drilling some infill IP or possibly very target specific TEM surveys would further enhance the existing targets and possibly add significantly to the drill targeting process.

Presently numerous drill targets exist within the two embayments discussed in this report; however, further evaluation and interpretation is required prior to drill targeting. It is anticipated that by the first quarter of 2002 an Exploration Plan and Budget for a summer diamond drill program in 2002 will be finalized.

Respectfully submitted,

Ian Fraser, P.Geo.
Principal Geologist
Uravan Minerals Inc.

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APPENDIX I

Author's Statement of Qualifications

STATEMENT OF QUALIFICATIONS

I, Ian Robert Fraser, P.Geo., hereby certify that:

I am a geologist residing at 176 Sierra Vista Terrace SW, Calgary Alberta.

I am a graduate of the following universities and have the following degrees:
University of Western Ontario, B.A. in geography, 1983. Laurentian University, B.Sc. in geology, 1985.

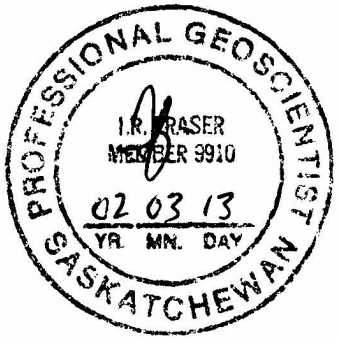
From 1985 to present, I have practiced my profession continuously as a geologist in mineral exploration throughout Canada.

I am a Professional Geoscientist registered with the association of Professional Engineers & Geoscientists of Saskatchewan.

I am the author of this report and I have personally participated in and supervised the fieldwork and compiled and interpreted all the data reported herein.

Dated at Calgary, Alberta on this 13th day of March 2002.

Ian R. Fraser, B.Sc., P.Geo.



APPENDIX II

List of Personnel Involved in Project

PROJECT PERSONNEL

Uravan Minerals Inc.

Name	Position	Period
Ian Fraser	Geologist/Supervisor	June 15-21, July 5-16
Joe Dion	Geologist	June 5-25
Graham March	Geological/Geophysical Assistant	June 15 – July 30
Jim Barr	Geological Geophysical Assistant	June 15 – July 30

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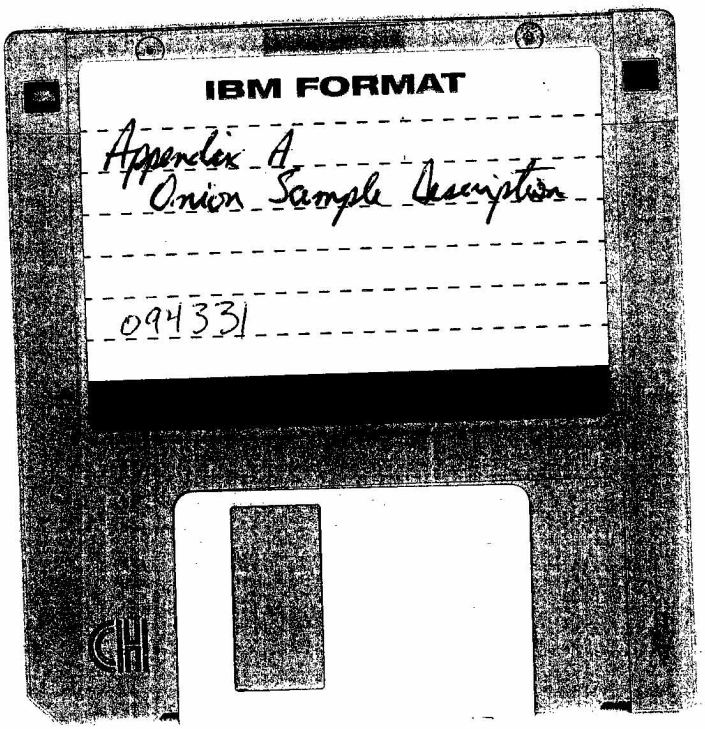
Georges Belcourt	Geophysicist	June 15 – July 16
Scott Casselman	Geotechnician	June 15 – July 16
Kevin Gerlitz	Geophysicist	July 16 – 28
Suzanne Aichele	Geotechnician	July 16 – 28

APPENDIX A

Rock Geochemistry Sample Description, Locations
(refer to floppy disc)



APPENDIX B

Rock Geochemistry – Complete Assaying Summary and Certificates
(refer to floppy disc)

APPENDIX C

Aurora Geosciences Ltd., Canalask – Onion Property 2001 Ground Geophysical Program
(separate, complete report)

APPENDIX D

Aurora Geosciences Ltd., Canalask - Memorandum Detailing Interpretation of IP Data, Onion Property – Geophysical Interpretation

(separate complete report)

APPENDIX E

Kishar Research Inc: White River Intrusive Complex, Canalask PGM + Ni + Cu Project Yukon Territory: An Interpretation of Mineral Occurrences based on Petrography, Ore Microscopy and Rock Geochemistry of Selected Samples

(separate complete report)

SAMPLE #	NORTHING	EASTING	GRID LOCN	SAMPLE TYPE	LITHO	DESCRIPTION	Ni ppm	Cu ppm	Co ppm	Pt ppb	Pd ppb	Au ppb
123001	6874665	519774		GRAB	SEDS / GBBR	SEDS/ARGILLITE/Ultramafic Contact,f.g.,grey-blue,silicified GBBR,qtz-cb veining/fracturing,BXTD TX,3-5% Py	98	342	10	3	5	16
123002	6874672	519789		GRAB	SEDS	SEDS/ARGILLITE,f.g. aphanitic,silicified,grey,gossaned,no apparent sulphides	56	36	10	1	1	111
123003	6874688	519744		GRAB	GBBR	GBBR/H/W Contact,f.g.-m.g.,green-light green,orange weathering,<1% diss Py	36	52	10	1	1	1
123004	6874686	519734		GRAB	BSFL	H/W Volcanics,f.g.,dark grey-maroon,vesicular,qtz-cb,epidote vesicles,no apparent mineralization	117	78	29	7	6	1
123005	6874693	519751		GRAB	GBBR	GBBR,20m down creek,m.g.,pyroxene well developed,orange weathering,olivine rich?,no apparent minz'n	28	30	10	1	1	5
123006	6874696	519760		GRAB	QZCB	Qtz-Cb,khaki,gossaned weathered surface,no apparent, mineralization	24	10	10	1	1	2
123007	6874748	519891		CHIP (0.5m)	DIOR	DIOR, GBBR?, heavily stained (copper),light green,local blebby sulphides py?,cp up to 5%	10	8480	10	1	2	162
123008	6874748	519891		GRAB	DIOR	DIOR,GBBR?, heavily stained (copper),light green, local blebby sulphides py?,cp up to 5%	80	14870	10	1	2	118
123009	6874405	519927			GBBR	DISCOVERY TRENCH,old sample found in bag in trench,middle of trench	2050	160	111	61.7	124	7
123010	6874286	520048		GRAB	SEDS	SEDS,v.f.g., purple/mauve, siliceous, no apparent mineralization	53	26	23	1	1	1
123011	6874286	520048		GRAB	QZCB	Qtz-Cb,2-3m wide in contact with F/W Seds & GBBR Sill,distinctive orange/brown colour with bright green fuchsite	1068	55	95	9	7	4
123012	6874286	520048		GRAB	GBBR	GBBR,f.g.-m.g.,dark green-black, massive, Qtz-Cb fractures throughout,very oxidized/weathered surface, wk mag,<1% sulphides	1737	10	123	7	6	2
123013	6874286	520048		GRAB	GBBR	GBBR,f.g.-m.g.,lighter green in colour,more magnetic than 012,gbbr texture,diss. Mt, more strongly serpentinized, <1% sulphides	1897	50	116	16	14	2
123014	6874239	520095		GRAB	QZCB / GBBR	QTZ-CB,orange weathering,pale khaki green fresh surface,irregular contact with gbbr,sharp F/W contact with seds,no apparent mineralized marginal gbbr,no weathered out section adjacent to Qtz-Cb, at O/C Qtz-Cb is <2m thick	1430	32	104	3	8	1
123015	6874239	520095		GRAB	GBBR	GBBR,f.g.,dark green-black,brown-purple weathered surface,weakly-mod. Magnetic,no apparent sulphides, sample taken adjacent 123014	1768	30	119	9	2	1
123016	6874239	520095		GRAB	GBBR	GBBR,as in 123015,darker groundmass,wkl-mod. magnetic no apparent mineralization,taken 1.5m from 015	1860	29	120	11	10	1
123017	6874239	520095		GRAB	GBBR	GBBR,lighter green,more serpentinized,serp fractures throughout,more magnetic than sample 123016,more olivine rich,pyroxenite?/peridotite?,no apparent mineralization NOTE: samples 015 & 016 from 2m wide zone. 017, adjacent to 2m wide zone	1723	21	117	9	10	1
123018	6874193	520159		GRAB	SEDS	SEDS, v.f.g.,brown-orange weathered surface, light grey fresh surface,very siliceous,massive sediment-phyllite,(Hasen Creek FM.)no apparent mineralization	40	92	23	2	2	2
123019	6874193	520159		GRAB	QZCB	QTZ-CB, alteration zone,< 2m wide at location,orange weathered surface,strongly "crackled"- fractured, with Qtz-Cb veins, pale green fracture surface, no apparent mineralization	1235	50	57	5	29	16
123020	6874193	520159		GRAB	PERD	PERIDOTITE/PYROXENITE?,dark green weathered surface,wkly-mod. Magnetic, no apparent mineralization	1740	5	123	66.2	63.9	4
123021	6873931	520544	1245N / 475E	CHIP (1.0m)	GBBR	REX SHOWING,GBBR, marginal gabbro in contact with Qtz-Cb,gossaned/weathered surface,qtz-cb fractures throughout,weakly magnetic,no apparent sulphides	2190	5	123	14.9	6.7	5
123022	6873931	520544	1245 / 475E	CHIP (1.5m)	GBBR	REX SHOWING, GBBR, marginal gbbr in contact with Qtz-Cb,gossaned/weathered surface, qtz-cb fractures throughout,weakly magnetic,no apparent mineralization	1994	279	113	34	8	3

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SAMPLE #	NORTHING	EASTING	GRID LOCN	SAMPLE TYPE	LITHO	DESCRIPTION	Ni ppm	Cu ppm	Co ppm	Pt ppb	Pd ppb	Au ppb
123023	6873931	520544	1245N / 475E	CHIP (1.4m)	GBBR	REX SHOWING, Ultramafic Lens,in contact with Qtz-Cb,strongly gossaned,weakly magnetic, weakly fractured-sheared?, no apparent sulphides	1922	36	122	14	4	2
123024	6873931	520544	1245N / 475E	CHIP (0.5m)	QZCB	REX SHOWING, QTZ-CB,orange	1297	10	93	22	6	1
123025	6873931	520544	1245N / 475E	CHIP (1.5m)	GBBR	REX SHOWING,GBBR, marginal gbbr., CB fractures, weakly magnetic,well gossaned, wk. Diss magnetite,no apparent sulphides	1961	10	123	10	7	3
123026	6874123	520225		CHIP (1.0m)	GBBR	ONION SE, GBBR,v. orange-brown,gossan,strongly sheared,strongly weathered,in contact with Qtz-Cb, no apparent sulphides	1970	10	121	17	15	22
123027	6874123	520225		CHIP (1.0m)	GBBR	ONION SE,M. GBBR,as in 123026,in contact with 123026,strongly sheared,strongly gossaned,minor copper staining, no apparent mineralization,structural orientatations erratic	3530	5	104	18.6	26.1	212
123028	6874123	520225		CHIP (0.5m)	GBBR	ONION SE, M. GBBR, sheared,good colour, green-orange-brown,in contact with Qtz-Cb unit, no apparent mineralization	3260	5	125	23.8	21.9	161
123029	6874123	520225		CHIP (0.7m)	GBBR	ONION SE, M. GBBR, sheared,good colour, green-orange-brown,in contact with 123028, no apparent mineralization, strong gossan	1922	10	92	22	19	24
123030	6874123	520225		CHIP (0.3m)	GBBR	ONION SE, M. GBBR, f.g.-m.g.,sheared,strongly mineralized,30-35% sulphides,abundant copper staining, predominant sulphide has pinkish hue,strongly magnetic	70100	110	450	89.3	175	8688
123031	6874123	520225		CHIP (1.0m)	GBBR	ONION SE, To compare with sample 123030,brown-green highly weathered material,light green clay material-gouge assoc. with shears oblique to FW Contact	1758	151	113	19	14	5
123032	6874123	520225		CHIP (0.4m)	QZCB	ONION SE, QTZ-CB Alteration Zone, immediately adjacent to massive sulphides in sample 123030, typical Ultramafic brown-orange, green staining, no apparent mineralization	1624	33	103	9	12	20
123033	6874123	520225		SOIL	GBBR	ONION SE, Soil within Marginal GBBR,light brown-light green, very good colour, to compare to 123030	1537	42	114	6	5	15
123034	6874123	520225		CHIP (0.3m)	QZCB / GBBR	ONION SE, QTZ-CB/M. GBBR Contact, sheared, good malachite staining,minor sulphides <2%, sample taken down, slope along contact	6460	20	169	13.2	12.2	473
123035	6874123	520225		GRAB	GBBR	ONION SE, M. GBBR, 7m up slope from 123030, strongly sheared/weathered, good copper stain, minor sulphides as in 123030, < 5%	69600	200	1110	26.5	57	3076
123036	6872224	521487	600S / 050W	GRAB	DUNT	DUNITE, f.g., black-brown weathered surface, massive texture, strongly magnetic, pebbly weathered texture	2320	30	152	29.6	39.8	18
123037	6872288	521528	585S / 015E	GRAB	SEDS	O/C ?,very light green, slippery surface-serpentinite ?, non magnetic, black weathered surface-banded ? Fresh surface is light green, sample of very f.g., green-blue, oxidized weathered surface, sediment within UM? Possibly not O/C, dissem Py @ 1-3%. NOTE 6S-did not see contact in O/C	330	122	56	1	4	17
123038	6872292	521561	600S / 050E	GRAB	QZCB	QTZ-CB Alteration Zone	52	43	10	1	1	1
123039	6872304	521578	600S / 075E	GRAB	QZCB	v.f.g., pale green-fresh orange-brown weathered surface, Qtz-Cb, 1% dissem Py	64	49	10	1	1	5
123040	6872306	521598	600S / 090E	GRAB	ANDS	Volcanics?, f.g., massive texture, homogenous,green minor CB fractures, black infilled fractures-did not streak black, graphite?, < 1% diss. Py	132	32	27	1	1	1
123041	6872301	521608	600S / 090E	GRAB	ANDS	as in 123040, heavily gossaned	110	109	25	1	1	1
123042	6872422	521755	600S / 300E	GRAB	DIOR	DIOR,f.g.-m.g., massive, homogenous, qtz-plag, green-porph. hornblende, 1% diss Py throughout	54	279	10	1	1	6
123043	6872458	521805	600S / 345E	GRAB	ANDS	Volcanic/Andesite?,f.g., massive, light green, ep/cb fractures, < 1% diss Py	65	92	33	1	1	3
123044	6872520	521888	600S / 750E	GRAB	DIOR	DIOR, f.g.-m.g.,light groundmass, green fragments or porphyroblasts-hornblende, some qtz in groundmass blebby Py, 1-2% throughout	57	174	10	1	1	3

SAMPLE #	NORTHING	EASTING	GRID LOCN	SAMPLE TYPE	LITHO	DESCRIPTION	Ni ppm	Cu ppm	Co ppm	Pt ppb	Pd ppb	Au ppb
123045	6872347	521488	515S / 040E	GRAB	PERD	PERIDOTITE, f.g., dark grey-black, massive, no apparent mineralization, in drainage near assumed contact-boulder?	2540	5	140	26.8	12.3	27
123046	6872418	521453		GRAB	PERD	f.g., brown, net textured "honeycomb" magnetite enclosing olivine, diss Py <1%, magnetic, O/C sheared, Carbonate-calcite rich, crisscrossing calcite fractures.	2630	5	146	36.5	8.3	4
123047	6872061	521327	620S / 275W	GRAB	LMST	f.g., grey, carb. rich limestone, carb infilled fractures throughout, no apparent mineralization	38	20	10	1	1	1
123048	6872047	521272	600S / 330W	GRAB	LMST	Limestone as in 123047, strike 004 deg/dip 34 deg W,gossaned locally, brecciated texture, < 1% Py	64	25	22	1	1	7
123049	6872008	521236	600S / 350W	GRAB	VOLC	Lapilli Tuff, f.g., green, no apparent mineralization	153	129	39	7	5	2
123050	6872114	521199	500S / 340W	GRAB	VOLC	Lapilli Tuff, f.g., green, no apparent mineralization	48	207	27	1	4	9
123051	6872134	521235	500S / 300W	GRAB	VOLC	Volcanic Breccia/Lapilli Tuff, f.g. matrix, numerous varying clasts, tectonized surface-slickensided, no apparent mineralization	95	163	48	4	7	4
123052	6872186	521305	500S / 215W	GRAB	BSLT	BSLT, dark green, massive, no apparent mineralization	73	151	42	2	1	2
123053	6872191	521317	510S / 190W	GRAB	LMST	O/C Limestone, within O/C, black bed, v.f.g. argillite?, no apparent mineralization	1764	235	136	18	21	3
123054	6872287	521365	490S / 100W	GRAB	PERD	PERIDOTITE, f.g., dark grey-black, massive,yellow-brown on fresh surface, minor remnant olivine, magnetite stringers throughout, no apparent mineralization	2410	150	154	78	145	2
123055	6872294	521426	510S / 050W	GRAB	DUNT	DUNITE, f.g., dark grey-black, plag phenocrysts obvious, Cb prominent, groundmass x'll has texture unlike previous sample, homeycomb - net textured, magnetite around olivine, < 1% diss Py	2110	5	145	16.3	16.3	1
123056	6872343	521438	495S / 015W	GRAB	DUNT	DUNITE, same as 123055	2150	40	159	16.5	104	1
123057	6872391	521539	510S / 100E	GRAB	ANDS	ANDESITE, f.g., green, locally hem/epidote stained, minor fragments? Tuff? No apparent mineralization	108	41	25	1	2	1
123058	6872430	521570	500S / 150E	GRAB	ANDS	Volcanic-Tuff, f.g., light green, massive with some fragments, sample taken from gossan O/C,<1% diss sulph	10	10	10	9	1	4
123059	6872424	521584	510S / 160E	GRAB	ANDS	Volcanic-Tuff, f.g., light green, massive with some fragments, as in sample 123058, strongly gossaned calcite crystals all over O/C	10	47	20	1	2	7
123060	6872782	521837	390S / 575E	GRAB	DIOR	DIOR, f.g.,porphyritic, homogenous, <1% assoc Py	23	21	10	4	4	1
123061	6872407	521210	300S / 130W	GRAB	PERD	PERIDOTITE, f.g.-m.g., dark green-black, pyroxenes still obvious, moderately magnetic, no visible sulphides	1757	286	127	24	35	1
123062	6872293	521089	300S / 300W	GRAB	VOLC	Volcanic Breccia/Agglomerate, f.g., pale green matrix hosting clasts/fragments of varying comp, no visible sulphides	122	114	49	7	12	1
123063	6872378	521409	440S / 000	GRAB	DUNT	Serpentinite/Dunite?, f.g., white-green, very siliceous bed (20cm wide), 280/45 deg dip, serpentinite within Dunite?,sharp contact, non magnetic, bleb of "graphite" noticed in unit, no apparent mineralization	216	10	29	5	15	1
123064	6872378	521409	440S / 000	GRAB	DUNT	DUNITE, brown weatherded, black fresh surface, strongly magnetic, no apparent mineralization IF-ONION-TS-1	2180	10	156	50.7	71.7	14
123065	6872339	521361		GRAB	DRDK	f.g., pale green-grey, v. sks, black-blue in contact with UM-Serpentinite?, non magnetic, no mineralization ?	205	49	31	2	8	4
123066	6872326	521345		GRAB	DUNT	DUNITE, f.g., massive, magnetic, no apparent mineralization, IF-ONION-TS-2	2190	5	154	44.1	77.4	3
123067	6872283	521284		GRAB	DRDK	f.g., blue-black, massive, abundant calcite, strongly magnetic, no apparent mineralization, IF-ONION-TS-3	2030	5	142	45.7	107	4
123068	6872313	521348		GRAB	DRDK	DIOR, f.g. dyke, non magnetic, no mineralization	343	48	60	1	1	1
123069	6872443	521410	400S / 030E	GRAB	DUNT	DUNITE, f.g., brown, massive, magnetic, altered olivine enclosed by net textured magnetite, no apparent mineralization	2200	5	145	9	10.6	2
123070	6872422	521455		CHIP (2.0m)	PERD	PERIDOTITE, 2m chip across gossaned peridotite @ UM/QTZ-CB contact, unit appears to plunge in NNW direction, very weakly magnetic, no apparent sulphides	2060	90	132	41.9	82.2	6
123071	6872452	521453	415S / 070E	CHIP (1.0m)	QZCB / GBBR	QTZ-CB/PERIDOTITE Contact in creek, magnetic, minor Po/Cp <1%	1884	124	119	20	44	1

SAMPLE #	NORTHING	EASTING	GRID LOCN	SAMPLE TYPE	LITHO	DESCRIPTION	Ni ppm	Cu ppm	Co ppm	Pt ppb	Pd ppb	Au ppb
123072	6872487	521423	390S / 070E	CHIP (0.5m)	QZCB / GBBR	QTZ-CB/M. GBBR Contact, gossaned, strongly sheared, diss Po/Cp @ 1-2%	1790	380	90	39.6	126	7
123073	6872485	521422	390S / 070E	CHIP (1.5m)	PERD	PERIDOTITE, strongly sheared, very minor remnant plag., moderately magnetic, no apparent diss. Sulphides Sample in contact with #123072	1720	40	119	65.2	105	4
123074	6872488	521432	390S / 070E	CHIP (1.5m)	GBBR	M. GBBR/QTZ-CB/SEDS, sample heavily gossaned, Qtz-Cb poorly developed, <10% sulphides Po, minor Cp, rock stained v. bright green	110	210	20	2	2	28
123075	6872478	521429	390S / 070E	GRAB	SEDS	SED?, f.g., green, heavily mineralized, pink sulphide-Po?, non magnetic, prominent @ 10%, <1% diss Cp	5	1660	70	3	2	309
123076	6872478	521434	390S / 070E	GRAB	SEDS	SED?, f.g., green, heavily mineralized, pink sulphide-Po?, non magnetic, prominent @ 10%, <1% diss Cp	5	910	40	5	1	90
123077	6872466	521415	390S / 050E	GRAB	PERD	PERIDOTITE, f.g., blue-green, calcite rich, strongly magnetic, no apparent sulphides, weakly sheared	1940	5	114	9.6	1.8	1
123078	6872463	521429	395S / 055E	GRAB	DUNT	DUNITE, chill margin? Of dunite dyke,f.g., pale green, very silicified, outside contact is magnetic, internal is non magnetic, dyke v.f.g., amygdaloidal, grey, very obvious igneous/intrusive texture, IF-ONION-TS-4	248	57	41	1	1	9
123079	6872492	521435	390S / 070E	GRAB	SEDS	SEDIMENT, f.g., blue-grey, sample taken at base of O/C, diss Po/Cp @ 1-3%, O/C interbedded Qtz/Cb with sediment	5	90	10	1	1	20
123080	6872494	521423	390S / 070E	CHIP (0.8m)	GBBR	O/C, green-yellow soils below Qtz-Cb/and consolidated UM (M. GBBR)	1498	128	107	32	59	1
123081	6872494	521423	390S / 070E	GRAB	GBBR	GBBR, f.g., black-grey, non magnetic, calcite stringers throughout, poorly developed sulphides @ <1% IF-ONION-TS-6	1838	106	126	14	34	7
123082	6872494	521423	390S / 070E	GRAB	GBBR	M. GBBR,O/C, grab sample from within zone chipped # 123080, yellow-green weathered surface, strongly sheared, dark blue metallic mineral diss throughout - sulphide? 1-3%, non magnetic, IF-ONION-TS-5	1630	5	100	53	33	1
123083	6872494	521423	390S / 070E	GRAB	QZCB	QTZ-CB Alteration Zone, v.f.g., pale grey, in contact with #123080,#123082, no apparent sulphides, gossan orange weathered surface	75	45	10	19	20	24
123084	6872513	521361	300S / 060E	GRAB	DUNT	DUNITE, f.g., brown-black, massive, magnetite surrounding olivine, strongly magnetic, no apparent sulphides	2240	5	121	12.5	2.7	1
123085	6872542	521403	300S / 100E	GRAB	PERD	PERIDOTITE, f.g., dark grey-black, strongly magnetic, no apparent sulphides	2190	60	120	26	34	20
123086	6872545	521405	300S / 110E	CHIP (0.5m)	GBBR	M. GBBR, chip across brown-orange weathered surface, strong limonite stain, light green-yellow fresh surface, calcite prominent, non magentic, possible diss sulphides 1-2%	1721	59	119	14	21	10
123087	6872547	521410	300S / 110E	GRAB	QZCB	QTZ-CB, f.g., grey, in contact with #123086, strong gossan, light green malachite? - orange	1233	99	108	23	62	3
123088	6872557	521387	290S / 110E	GRAB (0.8m)	GBBR / QZCB	SOIL? Sample at oxidized Qtz-Cb/M. GBBR contact, minor rock fragments, good colour l.e./green-brown-orange	1291	57	103	18	41	10
123089	6872557	521387	290S / 110E	CHIP (0.8m)	GBBR	M. GBBR, Sample taken below #123088, dug down to more competent rock, strongly oxidized, no apparent mineralization	1196	53	97	17	19	3
123090	6872555	521386	290S / 110E	CHIP (0.5m)	GBBR	M. GBBR, orange-brown, competent, adjacent to #'s 123088/089, f.g., black gabbro-pyroxenite, weakly mag., no apparent sulphides	2070	70	123	42.7	81.6	6
123091	6872555	521386	290S / 110E	CHIP (1.0m)	PYRX	PYROXENITE, f.g., blue-green, adjacent to # 123090, strongly magnetic becoming serpentinized, carbonate fractures throughout, light green serpentinite, no apparent mineralization, IF-ONION-TS-7	1968	43	127	28	38	18
123092	6872552	521383	275S / 100E	CHIP (0.7m)	QZCB	QTZ-CB, f.g., grey-white, orange weathered surface, green stain, no apparent mineralization	144	50	24	1	8	2
123093	6872552	521383	275S / 100E	CHIP (0.6m)	GBBR	M. GBBR, strongly oxidized, very prominent green stain @ contact with # 123092, possible 1% sulphides oxidized	1250	280	104	39.2	87.6	2
123094	6872552	521383	275S / 100E	CHIP (0.1m)	QZCB	QTZ-CB, no apparent mineralization	646	47	50	30	35	12

SAMPLE #	NORTHING	EASTING	GRID LOCN	SAMPLE TYPE	LITHO	DESCRIPTION	Ni ppm	Cu ppm	Co ppm	Pt ppb	Pd ppb	Au ppb
123095	6872552	521383	275S / 100E	CHIP (1.5m)	GBBR	M. GBBR, strongly sheared, oxidized, strong limonite stain, no apparent mineralization	1736	68	113	24	56	13
123096	6872552	521383	275S / 100E	CHIP (0.5m)	GBBR	M. GBBR/PYROXENITE, unit more competent than previous, oxidized, magnetic, no apparent mineralization	1640	20	111	23.6	43.3	3
123097	6872552	521383	275S / 100E	CHIP (0.5m)	PYRX	PYROXENITE/PERIDOTITE, NOT OXIDIZED	1476	31	102	25	30	1
123098	6871921	521617	900S / 170W	GRAB	DIOR	DIOR, f.g., non magnetic,no apparent mineralization	77	46	44	2	7	1
123099	6871859	521545	900S / 280W	GRAB	BSLT	BASALT, f.g., green-red (hematite), dark green amygdules, weakly magnetic, no apparent mineralization	35	141	44	8	16	1
123100	6871863	521691	1000S / 150W	GRAB	DUNT	DUNITE, f.g., black, brown weathered surface, strongly magnetic, magnetite is net textured enclosing olivine crystals	1919	112	140	10	22	3
123101	6871941	521759	990S / 040W	GRAB	PYRX	PYROXENITE, f.g.-m.g., black, weakly limonite stained, pyroxene prominent, weakly magnetic, no apparent mineralization	1990	5	110	5.7	10.7	1
123102	6871949	521755	970S / 035W	GRAB	GBBR	M. GBBR, f.g., weakly magnetic, possible weak sulphide mineralization <1%, very irregular contact with Qtz-Cb	1390	30	120	54.1	40.9	1
123103	6871959	521748	970S / 035W	GRAB	QZCB	QTZ-CB, good gossan,no apparent mineralization, diss manganese oxide throughout, O/C of #'s 123101-103 layered, repeating qtz-cb and pyroxene-gabbro, very flat (apparent) intermixing ?	1484	74	107	8	19	1
123104	6871996	521839	990S / 050E	GRAB	SEDS	SEDIMENT, f.g., strongly gossaned, 1-3% diss Py	10	48	10	1	3	4
123105	6871949	521825	1015S / 010E	GRAB	GBBR	GBBR, f.g.-m.g., light green, non magnetic, <1% diss Py	115	77	48	9	15	3
123106	6871961	521799	990S / 000	GRAB	GBBR	GBBR, f.g., massive, homogenous, not well gossaned or sheared, non magnetic, <1% diss sulphides	149	643	57	13	26	5
123107	6871999	521787	960S / 010E	GRAB	SEDS	SEDS-ARGILLITE, f.g., in contact with Qtz-Cb, disseminated cubic Py @ 1%	59	32	10	1	3	1
123108	6872036	521684		GRAB	GBBR	GBBR, m.g., strongly altered, pyroxene altered to fuchsite, strong iron carbonate stain, qtz veins (cb) fractures throughout, non magnetic, very well mineralized grey metallic mineral 5-10%, very minor f.g. Cp<1% sample of material pulled out of trench, IF-ONION-TS-9	2880	680	140	201	386	11
123109	6872036	521684		SOIL	GBBR	SOIL profile (0.7m), from trench, good colours was careful not to include rock chips	2170	950	126	196	370	19
123110	6872036	521684		CHIP (0.7m)	GBBR	Chip sample of rock material below the soil profile #123109, Marginal Gabbro as #123108 with some qtz-cb	1150	410	50	90	287	9.7
123111	6872036	521684		CHIP (0.8m)	GBBR	M. GBBR, bright green, qtz-cb fractures, 5-10% diss-blebby sulphides, very minor Cp <1%	4460	1020	150	216	627	21
123112	6871973	521676	900S / 090W	GRAB	DUNT	DUNITE, f.g., brown weathered surface, strongly magentic, no apparent mineralization	2160	80	154	43.4	66.2	7
123113	6871953	521650	900S / 125W	GRAB	PERD	PERIDOTITE, f.g., dark green-black, some remnant plag., strongly magnetic, no apparent mineralization	2282	121	155	45	128	4
123114	6871237	522200	1800S / 180W	GRAB	QZCB	QTZ-CB, buffed-orange weathered surface, v.f.g., light grey fresh surface, carbonate infilled fractures, no apparent mineralization,O/C @ 130 deg/48 W	1150	30	118	42	125	2
123115	6871237	522200	1800S / 180W	GRAB	PYRX	PYROXENITE/PERIDOTITE, sheared limonite stained, not the M. GBBR, diss magnetite blebs, no apparent mineralization,O/C @ 130 deg/48 W	1680	5	119	42.7	88	4
123116	6871237	522200	1800S / 180W	GRAB	PYRX	Pyroxenite/GABBRO, sheared, non limonite stained, green-blue, serpentinized, magnetic, no apparent sulphides, O/C @ 130 deg/48 W	2130	5	136	4.6	3.4	1
123117	6874408	519924		GRAB	QZCB / GBBR	DISCOVERY TRENCH, QTZ-CB mixing with Marginal Gabbro, well mineralized diss Cp 1%, Po 1-2%	4580	3080	140	200	720	73
123118	6874408	519924		CHIP (2.0m)	GBBR	DISCOVERY TRENCH, Pulled rocks out of rib/wall from trench across the gabbro unit, good staining (Cu) some net textured mineralization, rock chips predominantly gabbro, minor qtz-cb, true representation of the width?	2860	1490	132	342	542	67

SAMPLE #	NORTHING	EASTING	GRID LOCN	SAMPLE TYPE	LITHO	DESCRIPTION	Ni ppm	Cu ppm	Co ppm	Pt ppb	Pd ppb	Au ppb
123119	6874408	519924		GRAB	GBBR	DISCOVERY TRENCH, Fly rock, massive sulphides (semi-massive) in v.f.g. gabbro, magnetite, appears, foliated, Cp >5%, Po>10%	46920	7900	1670	28	820	81
123120	6874102	520237		CHIP (1.5m)	GBBR	ONION SE SHOWING, Sample through bench of Marginal Gabbro, oblique to strike, good colours, pale green, weak sulphide mineralization <1%	1630	5	76	62.2	105	12
123121	6874102	520237		GRAB	GBBR	ONION SE SHOWING, M. GBBR, m.g., blue to dark-green, very minor diss sulphides cp/po 1%, weakly magnetic	2580	5	110	38.8	56.1	27
123122	6874102	520237		GRAB	GBBR	ONION SE SHOWING, Random grab from rubble pile @contact QTZ-CB, weak sulphides <1%	51	147	10	4	15	5
123123	6874102	520237		GRAB	GBBR	ONION SE SHOWING, SEMI-MASSIVE SULPHIDES-Nicollite?, >20%, very dense, in altered gabbro, sulphide pod-lens in sheared host, sulphide lens has boudinaged appearance as does several less mineralized lenses in the O/C	274100	570	1800	24	174	30605
123124	6874102	520237		GRAB	GBBR	ONION SE SHOWING, GBBR, highly altered, pale green, no apparent mineralization, therefore some malachite staining in vicinity of sample	1688	10	102	2	12	5
123801	6872472	521105	200S / 155W	GRAB	GBBR / QZCB	H/W Contact,GBBR,light to med grey-green,m.g.,weakly to mod mag,qtz-cb,fuchsite,irregular contact, gabbro occurs as irregular pods/blocks within Qtz-Cb, sample taken from pod/block 4m x 1m	1547	10	105	2	2	3
123802	6872498	521082	200S / 126W	GRAB	DUNT	DUNITE?/Peridotite,lime green/black,f.g.,lighter material is non magnetic,black is strongly mag	384	87	61	5	8	1
123803	6872486	521128	200S / 126W	GRAB	PERD	Ultramafic/Peridotite,dark grey-black,f.g.-m.g.,stongly fractured,sheared with white calcite,strongly magnetic	2480	5	144	25.8	13.8	1
123804	6872516	521202	215S / 050W	GRAB	PERD	Ultramafic/Peridotite, dark grey-black,f.g.-m.g.,sheared with calcite coating fractures,strongly magnetic	2390	5	143	17.8	80.3	4
123805	6872559	521232	195S / 000	GRAB	UM	Ultramafic,dark grey-black,f.g.-m.g., strongly magnetic	2420	5	143	31.7	43	3
123806	6872600	521260	175S / 050E	GRAB	UM	Ultramafic,dark grey-black,f.g.-m.g.,strongly magnetic,mt	3420	100	154	104	189	24
123807	6872621	521284	175S / 080E	GRAB	GBBR	GBBR,med grey-green,m.g.,fractured,strongly weathered,calcite fracture fillings,gossan,magnetic	1889	27	100	9	21	4
123808	6873023	521771	175S / 710E	GRAB	DIOR	DIOR,light to med grey-green,m.g.,massive with gossaned/hematized fractures, non mag, Trace diss Py	10	72	10	20	44	9
123809	6872572	521351	250S / 083E	CHIP (0.5m)	PERD	Peridotite,light to med grey,f.g.-m.g.,strongly fractured,sheared,qtz-cb veinlets,mod magnetic	2380	220	141	34.4	54.7	10
123810	6872572	521351	250S / 083E	CHIP (1.0m)	PERD	Peidotite/GBBR,weak to mod gossan at surface,Qtz-Cb veining throughout	1810	220	120	25	48	6
123811	6872572	521351	250S / 083E	CHIP (1.1m)	GBBR	GBBR/peridotite,moderate gossan,grey-green,m.g.,fractured/sheared,mod magnetic	2710	60	139	38.1	70.3	7
123812	6872572	521351	250S / 083E	CHIP (0.8m)	QZCB	QTZ-CB,Buff/tan to light grey-pink,f.g.-m.g.,non magnetic, 2.6m East of 809	1413	67	104	15	45	1
123813	6872572	521351	250S / 083E	CHIP (0.8m)	GBBR	GBBR,med green,m.g.,intense fracturing,qtz-cb veining,mod magnetic,occurs as a pod within the qtz-cb,3.4E	1796	35	104	15	22	6
123814	6872572	521351	250S / 083E	CHIP (1.0m)	QZCB	QTZ-CB,buff to white,f.g.-m.g.,light pinkish hematite stringers, locally weakly magnetic,	1173	47	85	9	30	8
123815	6872568	521365	267S / 085E	CHIP (0.7m)	PERD	Peridotite,F/W Contact,Dips approx. 60 deg W,dark grey-green,m.g.,strongly fractured/sheared,mod mag	2280	140	128	18.6	28.6	3
123816	6872568	521365	267S / 085E	CHIP (0.3m)	QZCB / GBBR	QTZ-CB, buff,light green,f.g.,contains pieces/blocks of mafic/ultramafic,non magnetic	1003	49	79	13	56	2
123817	6872568	521365	267S / 085E	CHIP (1.0m)	PERD	Peridotite,med grey-green,local gossan,f.g.-m.g.,strong fracturing,qtz-cb veining throughout,mod-str mag	2210	30	118	25.9	53.6	2
123818	6872568	521365	267S / 085E	CHIP (1.0m)	PERD	Peridotite,med grey-green,local gossan,f.g.-m.g.,strong fracturing,qtz-cb veining throughout,mod-str mag	2060	70	131	32.1	52	7
123819	6872568	521365	267S / 085E	CHIP (0.9m)	QZCB	QTZ-CB,buff weathered surface,light grey-green,locally magnetic	1766	90	112	8	30	3
123820	6872568	521365	267S / 085E	CHIP (0.7m)	PERD	Peridotite,grey-green,f.g.-m.g.,strongly fractured,locally gossaned, strongly magnetic	2090	270	129	34.2	68	9

SAMPLE #	NORTHING	EASTING	GRID LOCN	SAMPLE TYPE	LITHO	DESCRIPTION	Ni ppm	Cu ppm	Co ppm	Pt ppb	Pd ppb	Au ppb
123821	6872635	521264	150S / 075E	GRAB	PERD	Peridotite,med grey-green,m.g.,strong fracturing,abundant qtz-cb veining ,mod mag	1927	30	133	23	34	4
123822	6872634	521264	150S / 080E	GRAB	PERD	Peridotite/GBBR,light to med grey/purple,f.g.,mushed contact with Qtz-Cb,abundant qtz-cb veining	1990	100	110	20	66	4
123823	6872119	521532	700S / 085W	GRAB	UM	Ultramafic,dark grey-black,f.g.-m.g.,rubble/scree,O/C?, strongly magnetic	2560	80	150	15.7	21.8	3
123824	6872182	521590	700S / 000	GRAB	PERD	Ultramafic/peridotite,dark grey-green-black,f.g.-m.g.,rubble, O/C?, strongly magnetic	2800	5	147	16.4	19.1	1
123825	6872241	521618	675S / 060E	CHIP (1.0m)	PERD	Peridotite/GBBR,light to med grey-green,m.g.,abundant qtz-cb veining,sheared,weakly to mod magnetic	1546	169	109	22	65	7
123826	6872241	521618	675S / 060E	CHIP (1.0m)	GBBR	GBBR, light grey-green,m.g.,intense fracturing,Qtz-Cb veining,weakly magnetic	1568	78	109	19	61	1
123827	6872241	521618	675S / 060E	CHIP (0.5m)	QZCB / GBBR	QTZ-CB,possibly contains gbbr blocks,fuchsite	460	44	43	7	34	6
123828	6871796	521779	1100S / 120W	GRAB	PERD	Ultramafic/peridotite,dark grey-green-black,f.g.-m.g.,possible narrow whispy sulphides,str fracturing/shearing	2420	5	156	9.2	8.3	2
123829	6871831	521853	1125S / 040W	GRAB	GBBR	GBBR,med grey-green,m.g.,fractured,possibly slumped O/C,weakly magnetic	2470	200	143	35.2	66.9	11
123830	6871825	521859	1130S / 040W	GRAB	GBBR	GBBR,gossan,med grey-green,m.g.,fractured,weakly magnetic	2100	100	117	32.7	65.1	9
123831	6871311	522117	1700S / 195W	GRAB	PERD	Ultramafic/peridotite,O/C?,dark grey-green-black,f.g.-m.g.,strongly magnetic,calcite along fractures	3810	800	161	352	414	85
123832	6871345	522152	1700S / 148W	GRAB	PERD	Ultramafic/peridotite/marginal GBBR,gossan,med grey-green,m.g.,strongly fractured,weakly to mod mag	2150	5	129	57.4	42.7	1
123833	6871345	522152	1700S / 148W	GRAB	QZCB	QTZ-CB/Marginal GBBR,buff surface,grey-white,m.g.,mixing zone,non magnetic	1292	43	108	10	25	1
123834	6874406	519920		GRAB	GBBR	DISCOVERY TRENCH,GBBR,m.g.,loose from trench,2% sulphides,cpy,py,weakly magnetic	2830	1380	159	213	383	60
123835	6874250	520082		GRAB	GBBR	GBBR/Peridotite,F/W Contact,light to med grey-green,f.g.,silicified?,Qtz-Cb veining,strongly mag,Tr sulphides	1943	40	130	5	13	1
123836	6873012	521020	275N /150E	GRAB	DRDK	Diorite Dyke,	1345	10	92	6	12	1
166801	6874405	519927	DISC	GRAB	PERD	Discovery showing, NNW of trench, fg, dk green-grey, orange-brown weathering, peridotite, magnetic, wk diss py <1%	2050	100	120	16	10	71
166802	6874256	520087		GRAB	GBBR	Fg, dk green, fine diss sulphides <1%	1890	5	100	7	6	2
166803	6874256	520085		GRAB	GBBR	As above # 166802, very gossaned, wkly fractured - crackled txt, carb infilling fractures, wk mnz'd <1% sulphides	1850	5	90	20	75	3
166804	6873001	521076		GRAB	GBBR	Sax showing, fg, dense green, wklly gossaned, diss to net txt sulphides throughout 1-3%	2290	730	130	73	174	12

094331

SAMPLE #	NORTHING	EASTING	GRID LOCN	SAMPLE TYPE	LITHO	DESCRIPTION	Ni ppm	Cu ppm	Co ppm	Pt ppb	Pd ppb	Au ppb
166805	6873001	521076	SAX	GRAB	QZCB	Footwall alt'n zone at Sax, vfg, white- orange, no apparent minz'n	220					
166806	6874408	519924	DISC	GRAB	GBBR	Discovery Showing - fly rock from trench (?), heavily minz'd, good fol'n fabric, qtz-carb veinlet ppd to fol'n, up to 30% sulphides, py - po.	37060	5980	1400	12	689	130
166807	6874408	519924	DISC	GRAB	GBBR	Discovery Showing, coarser marginal gabbro, lighter green, orange weathered surface, wk sulphided net txtd ? 3-5%	4240	2720	160	386	846	200
166808	6874387	519930	DISC	GRAB	GBBR	Discovery Showing, marginal gabbro further away fron contact, fg assoc sulphides <1%	2110	20	120	58	25	
166809	6874411	519930	DISC	GRAB	QZCB	Discovery Showing, footwall alt'n zone, well gossaned minor sill - alt'd inclusions, no apparent minz'n	397					
166810	6874377	519921	DISC	GRAB	GBBR	Discovery, sample up slope from 166808, gabbro - pyroxenite?, wk diss sulphides	1770	60	110	18	36	2
166811	6874364	519914	DISC	GRAB	PERD	As above further up slope towards hanging wall than 166810, no appar minz'n	2190	10	120	20	40	1
166812	6874129	520205	ONION SE	GRAB	GBBR	Onion SE, gabbro in contact with peridotite?, wk minz'n <1%	1970	20	120	9	10	1
166813	6874098	520218	ONION SE	GRAB	PERD	Onion SE, mx dunite in contact with perd?, stongly serpentinized, magnetic, no appar minz'n	2380	30	130	17	16	1
166814	6873275	520592		GRAB	VOLC	Hanging wall Nicolai volcanics, no apparent mineralization	118					
166851	6874405	519927		CHIP (0.3m)	GBBR	Discovery Trench, GBBR, dark green, rust streaks, loose	2980	650	123	206	403	300
166852	6874405	519927		CHIP (0.5m)	QZCB / GBBR	Discovery Trench, Qtz-Cb, buff, Str fracturing, blocks of GBBR	1440	650	61	230	412	300
166853	6874405	519927		CHIP (0.55m)	GBBR	Discovery Trench, GBBR mush, dark green, rusted, weathered	7500	2150	250	840	1280	57
166854	6874405	519927		CHIP (1.0m)	QZCB	Discovery Trench, Qtz-Cb, white to buff, f.g., possible sulphides Tr sulphides	254	111	10	1	11	16
166855	6874405	519927		CHIP (.25m)	GBBR	Discovery Trench, GBBR, dark green, gossaned,wk magnetic	9050	1400	400	382	512	30
166856	6874405	519927		CHIP (0.5m)	GBBR	Discovery Trench, GBBR, STR gossan, sulphide clots(sporadic), sheared, locally strongly magnetic	6150	1400	250	337	546	31
166857	6874405	519927		CHIP (0.5m)	GBBR	Discovery Trench, GBBR, loose (gravelly), Qtz-CB stringers,malachite	4550	2000	150	340	389	16
166858	6874405	519927		CHIP (0.2m)	QZCB	Discovery Trench, Qtz-Cb, white to buff,fuchsite (green stain colour)	3200	2300	100	277	453	50
166859	6874405	519927		CHIP (0.8m)	GBBR	Discovery Trench, WALL/RIB SAMPLE, GBBR mush, gossaned,loose,easily crumbles,weathered sulphides?	1119	141	88	21	45	3
166860	6874405	519927		CHIP (0.8m)	GBBR	Discovery Trench, WALL/RIB SAMPLE, GBBR mush, gossaned,loose,easily crumbles,weathered sulphides?	2500	1300	100	212	377	60
166861	6874405	519927		CHIP (1.0m)	GBBR	Discovery Trench, WALL/RIB SAMPLE, GBBR mush, gossaned,loose,easily crumbles,weathered sulphides?	2550	1650	150	296	632	75
166862	6874405	519927		CHIP (1.0m)	GBBR	Discovery Trench, WALL/RIB SAMPLE, GBBR mush, gossaned,loose,easily crumbles,weathered sulphides?	5000	1650	200	627	1210	100
166863	6874398	519922		GRAB	GBBR	GBBR/Pyroxenite, strongly serpentinized, weakly magnetic	1710	90	100	31	33	1
166864	6874393	519920		GRAB	PYRX	Ultramafic Pyroxenite/peridotite, dark grey-green, wk-mod. Mag.	1960	100	120	14	15	6
166865	6874386	519913		GRAB	PYRX	Ultramafic Pyroxenite/peridotite, dark grey-green, wk Mag.,fractured/broken	2210	5	124	166	220	3.4
166866	6874375	519900		GRAB	PERD	Peridotite/Dunite, weakly to mod. Magnetic, str. Serpentine	2070	10	130	9	4	1
166867	6874329	519907		GRAB	PERD	Peridotite/Dunite, weakly to mod. Magnetic, str. Serpentine, just below possible drill/heli pad	2350	50	120	33	46	3
166868	6874296	520049	1890N / 455E	GRAB	GBBR	GBBR, dark green-grey, fractured with qtz-cb veinlets,str mag,.2-.3% sulphides, L18+90N, 4+55E	1562	10	105	13	9	2
166869	6874277	520069		GRAB	SEDS	SEDS., contact with Qtz-cb, buff,non-magnetic, minor Qtz-Cb veining	60	32	21	1	4	1
166870	6874269	520069		GRAB	QZCB	Qtz-cb, buff-white, minor green staining (fuchsite), non-magnetic	1221	70	78	9	8	2
166871	6874278	520066		GRAB	GBBR	GBBR/Pyroxenite,approx 1m west of Qtz-Cb contact,dark green-grey,weakly to moderately magnetic	1632	10	113	22	16	27
166872	6874613	520262	2003N / 785E	GRAB	BSFL	BSFL, serpentinized, calcite stringers,non magnetic,L20+03N,7+85E	51	94	36	2	2	5
166873	6874483	520109	2000N / 588E	GRAB	DIOR	DIOR, grey-green, m.g., weakly magnetic, L20N,5+88E	10	156	10	1	1	4
166874	6874423	520008	2000N / 485E	GRAB	DIOR	DIOR, Lt. grey-green, m.g., local gossan, non magnetic, L20N,4+85E,Tr. Malachite	10	1610	10	1	1	227

SAMPLE #	NORTHING	EASTING	GRID LOCN	SAMPLE TYPE	LITHO	DESCRIPTION	Ni ppm	Cu ppm	Co ppm	Pt ppb	Pd ppb	Au ppb
166875	6874345	520087	1900N / 485E	GRAB	DIOR	DIOR, Bleached, strongly fractured, non magnetic, L19N,4+85E,Tr. Py	10	31	10	1	1	4
166876	6874409	520305	1808N / 685E	GRAB	BSFL	BSFL, med. Grey-green, f.g., mass. To mod fractured, slight mag., L18+08N,6+85E	56	83	40	1	1	1
166877	6874699	518966	2910N / 095W	GRAB	BSFL	BSFL, med. Grey-green, f.g., mass. To mod fractured, slight mag.,L29+10N,0+95W	75	79	44	2	12	3
166878	6875188	519388	3000N / 550E	GRAB	BSFL	BSFL, dark grey-green,f.g.,amygdaloidal,non-mag., L30N,5+50E	1462	78	52	2	5	2
166879	6875211	519487		GRAB	DIOR	DIOR, altered,fractured,wk gossan, non magnetic	23	42	27	1	1	2
166880	6874188	520161		GRAB	QZCB / GBBR	Contact zone,qtz-cb/mafic/Ultramafic,2m west of 123019,irr. Solid blocks, non-mag.	267	320	23	4	7	3
166881	6874188	520161		GRAB	GBBR	Next to 166880,exposed in trench, strong serp.,no visible sulphides,non-str mag.	1373	29	96	18	23	2
166882	6874227	520106	1810N / 387E	GRAB	GBBR	Mafic/Ultramafic, 0.5m west of FW contact,med grey-green,f.g.,str serp.,mod-str mag,L18+10N,3+87E	1641	10	109	13	8	2
166883	6874200	520081	1810N / 386E	GRAB	QZCB	Qtz-cb, buff/tan,locally sheared parallel FW contact,non-magnetic	858	10	77	4	5	1
166884	6874197	520078	1810N / 382E	GRAB	SEDS / QZCB	SEDS., contact with Qtz-cb,str fractured, brown,non-magnetic	10	46	10	1	1	1
166885	6874208	520095	1800N / 400E	GRAB	UM	Ultramafic,dark grey-black,f.g.,str serp., str magnetic	1637	10	137	12	35	10
166886	6874119	520009	1800N / 277E	GRAB	UM	Ultramafic,dark grey-black,f.g.,str serp., str magnetic	1778	87	144	6	7	1
166887	6874092	519980	1800N / 237E	GRAB	UM	Ultramafic,sheared,str fracturing, white calcite staining, strongly magnetic	1564	80	146	19	19	1
166888	6874025	519958	1765N / 175E	GRAB	UM	Ultramafic, HW contact zone,rust weathering,qtz-cb veining,non-mag	1757	130	121	19	17	1
166889	6874293	520067	1880N / 420E	GRAB	GBBR	Mafic/Ultramafic, FW contact,qtz-cb,lt to med grey-green,gossan,weakly magnetic	1765	10	120	9	4	1
166890	6874413	520054		GRAB	DIOR	DIOR?,in contact with f.g.BSLT,m.g.,pale green-white,<10 mafics (bleached), massive,gossaned, tr malachite	10	2280	20	1	1	129
166891	6874735	519495	2600N / 325E	GRAB	GBBR	GBBR,med-dark grey-green,str fractured,non-magnetic,serp,L26N/3+25E	219	35	43	5	10	1
166892	6874831	519618	2600N / 480E	GRAB	DIOR	DIOR,white-grey(bleached),fractrued,weakly magnetic, L26N/4+80E,3-4% Py,tr. Mt	10	585	34	1	1	4
166893	6874831	519618	2600N / 480E	GRAB	DIOR	DIOR,white-grey(bleached),fractrued,weakly magnetic,3-4% Py,tr. Mt	10	553	58	1	1	4
166894	6874835	519621	2600N / 485E	GRAB	BSFL	BSFL, (dyke?), f.g., pyrite filled fracture surfaces,5-7% Py	10	28	10	1	1	3
166895	6874516	519415	2500N / 120E	GRAB	UM	Ultramafic, strongly fractured, mod mag, serp.	53	46	40	5	9	1
166896	6874474	519369	2500N / 055E	GRAB	PERD	Ultramafic sill/peridotite, strongly fractured,serp, mod mag.	27	83	27	1	5	2
166897	6874448	519343	2500N / 020E	GRAB	PERD	Ultramafic sill/peridotite, strongly fractured,serp, mod mag.	92	52	40	4	3	1
166898	6874517	519556	2400N / 220E	GRAB	BSFL	BSFL, dark green, purple surface weathering,amygdaloidal,calcite,weakly to mod mag	70	81	40	2	4	1
166899	6874650	519705	2400N / 420E	GRAB	BSFL	BSFL, amygdaloidal, mass., non magnetic	39	104	40	1	5	1
166900	6874750	519822	2400N / 575E	GRAB	DIOR	DIOR/Gbbr,cliff face,serp, non magnetic, massive	77	128	43	5	6	1
166901	6874773	519850	2400N / 615E	GRAB	BSFL	BSFL,(dyke ?) v.f.g.-f.g., grey-green, mass. with calcite veinlets,Tr Py	63	82	46	1	1	1
166902	6874270	519546	2220N / 040E	GRAB	BSLT	BSLT, grey-green,f.g.,amygdaloidal,weakly magnetic,Tr Py	95	71	43	1	7	1
166903	6874562	519929	2180N / 515E	GRAB	DIOR	DIOR,bleached,light green/grey,m.g.,massive,in contact with 904	10	104	10	1	3	1
166904	6874562	519929	2180N / 517E	GRAB	BSFL	BSFL, irregular contact, local gossan	62	62	43	1	1	1
166905	6874615	520098	2100N / 685E	GRAB	DIOR	DIOR, light grey-green,m.g.,massive	10	10	10	4	1	1
166906	6874246	519852	1995N / 245E	GRAB	DIOR	DIOR, light grey-green,m.g.,massive to weakly fractured,non mag,bleached	169	111	40	1	1	2
166907	6874090	519670	2005N / 050E	GRAB	BSLT	BSLT/Ultramafic,dark green,f.g.-m.g.,strongly fractured/brittle,weakly magnetic	172	55	60	7	14	3
166908	6874388	519850	2100N / 350E	GRAB	UM	Ultramafic sill, dark grey/black,strongly fractured/sheared,strongly magnetic, no visible sulphides	2360	5	135	9	6.9	4
166909	6874404	519863	2100N / 370E	GRAB	UM	Ultramafic sill, dark grey/black,strongly fractured/sheared,strongly magnetic	2110	10	130	38	28	1
166910	6874408	519859	2106N / 369E	GRAB	UM	Ultramafic sill, dark grey/black,strongly fractured/sheared,strongly magnetic	2260	5	135	26.7	24.4	6

SAMPLE #	NORTHING	EASTING	GRID LOCN.	SAMPLE TYPE	LITHO	DESCRIPTION	Ni ppm	Cu ppm	Co ppm	Pt ppb	Pd ppb	Au ppb
166911	6874406	519871	2100N / 375E	GRAB	PERD	Ultramafic/peridotite, brown weathering,strongly magnetic,no visible sulphides	2960	290	144	132	155	20
166912	6874414	519896	2100N / 400E	GRAB	QZCB	HW Contact Zone,Qtz-CB with ultramafic wallrock,qtz-cb stringers, trace fuchsite,approx 20-25m N of D trench	1233	263	90	5	4	1
166913	6874337	519944	2000N / 375E	GRAB	UM	Ultramafic sill, dark grey/black, brown surface weathering, strongly magnetic	2280	5	142	13.3	15.8	2
166914	6874108	520131	1700N / 350E	GRAB	PERD	Ultramafic/peridotite, brown weathering,dark grey-black,strongly magnetic	2750	20	148	51.6	26	5
166915	6874148	520200	1675N / 425E	GRAB	GBBR	FW Contact Zone,ultramafic,weakly to mod magnetic	974	38	75	25	34	4
166916	6874148	520200	1675N / 425E	GRAB	GBBR / QZCB	FW Contact Zone,ultramafic/qtz-cb,rubble near contact,	482	27	45	16	17	4
166917	6874120	520143	1700N / 365E	GRAB	PERD	Ultramafic/peridotite, dark grey-black,f.g.-m.g.,mass. to strongly fractured,serp	2510	30	190	32.8	41.7	1
166918	6874002	520025	1705 N / 198E	GRAB	UM	Ultramafic, dark grey-black,f.g.-m.g.,str serp,weak to mod mag	1449	278	160	2	1	1
166919	6873889	520048	1608N / 125E	GRAB	BSLT	BSLT,light green-grey (purple weathering), f.g., locally amygdaloidal, non mag	104	10	44	12	11	3
166920	6873918	520083	1600N / 170E	GRAB	PERD	Ultramafic/peridotite, dark grey-black,f.g.-m.g.,strongly fractured,serp,str mag	1740	180	140	25	46	3
166921	6874123	520218	1635N / 415E	GRAB	GBBR	SOUTHEAST SHOWING,Ultramafic,FW Contact,dark to med grey,gossan,wk mag	2220	5	152	13.3	18.3	7
166922	6874123	520218	1635N / 413E	GRAB	GBBR	SOUTHEAST SHOWING,Ultramafic, 1.5-2.0m west of FW,med grey,f.g.,qtz-cb veinlets,crumbly,wk-mod mag	2250	5	133	25.6	23.6	13
166923	6874123	520218	1635N / 411E	GRAB	GBBR	SOUTHEAST SHOWING,Ultramafic,sheared with white calcite, strongly magnetic,med grey,f.g.-m.g.,mod mag	2350	5	167	18.7	18.6	1
166924	6874123	520218	1631N / 417E	GRAB	GBBR	SOUTHEAST SHOWING,Ultramafic,lens/block within Qtz-Cb,gossan,weakly mag,dark grey-green,serp	1900	10	110	20	16	7
166925	6874119	520332	1510N / 477E	GRAB	QZCB	Qtz-Cb, in contact with FW Ultramafic,exposed in trench	971	10	97	7	4	4
166926	6874119	520332	1510N / 477E	GRAB	GBBR	Ultramafic/GBBR,FW Contact,med grey-green,f.g.-m.g.,weakly magnetic, strongly fractured/sheared,	1420	10	125	9	5	2
166927	6873995	520226	1520N / 315E	GRAB	PERD	Ultramafic/peridotite,dark grey-black,f.g.-m.g.,strongly magnetic, deep brown surficial weathering	1653	134	178	8	8	1
166928	6873916	520146	1535N / 200E	GRAB	PERD	Ultramafic/peridotite,dark grey-black,f.g.-m.g.,strongly fractured, O/C?	1850	250	140	28	46	5
166929	6873748	520186	1400N / 105E	GRAB	VOLC	BSLT, Volcanic Breccia,purple green weathering,amyg,malachite	77	124	55	11	20	14
166930	6873886	520244	1440N / 250E	GRAB	PERD	Ultramafic/peridotite,brown weathering,dark grey-green-black,f.g.-m.g.,str mag	2870	200	217	45.2	92.2	29
166931	6874113	520495	1380N / 580E	GRAB	BSFL	BSFL, light to med green,f.g.,amygdaloidal,minor calcite veining, non mag	149	87	55	14	12	22
166932	6874074	520572	1300N / 603E	GRAB	DIOR	DIOR,light grey-green,m.g.,massive, non mag	10	10	23	3	6	1
166933	6873947	520454	1310N / 430E	GRAB	PERD	Ultramafic/perid.,dark grey-black,f.g.-m.g.,strongly magnetic	2400	5	177	17.7	6.1	18
166934	6873842	520379	1302N / 300E	GRAB	PERD	Ultramafic/perid,med to dark grey-green,f.g.-m.g.,strongly magnetic,O/C ? or rubble	1835	234	181	8	32	7
166935	6873563	520288	1200N / 030E	GRAB	VOLC	Volcanic Breccia/amygdaloidal BSLT, limestone blocks, light grey,malachite	21	201	46	11	19	5
166936	6873720	520414	1205N / 228E	GRAB	UM	Ultramafic,light grey-green,f.g., strong serp	130	63	50	13	8	1
166937	6873752	520447	1200N / 275E	GRAB	PERD	Ultramafic/perid,dark grey-black,f.g.-m.g.,rubble,strongly magnetic	2140	30	190	10.9	24.4	2
166938	6873779	520465	1205N / 306E	GRAB	PERD	Ultramafic/perid,dark grey-black,f.g.-m.g.,rubble,strongly magnetic	2240	140	178	20	32.5	16
166939	6873815	520502	1200N / 360E	GRAB	UM	Ultramafic, dark grey-black,f.g.-m.g.,str mag,sheared/fractured with spotty calcite	2300	5	200	14.9	14.6	225
166940	6873855	520503	1225N / 390E	GRAB	UM	Ultramafic, dark grey-black,f.g.-m.g., similar to 939	2440	10	208	9.3	3.9	6
166941	6873931	520544	1245N / 475E	GRAB	GBBR	REX SHOWING,FW Contact Zone,irregular contact,GBBR/Ultramafic	1870	5	165	15.9	4.6	36
166942	6873931	520544	1246N / 475E	GRAB	GBBR / QZCB	REX SHOWING,Qtz-Cb/Ultramafic/Gbbr,light green-white,f.g.-m.g.,calcite	1662	10	145	28	13	4
166943	6873931	520544	1244N / 475E	GRAB	QZCB	REX SHOWING,Qtz-Cb, cream-white,f.g.,local fuchsite	1507	10	125	42	14	13

SAMPLE #	NORTHING	EASTING	GRID LOCN	SAMPLE TYPE	LITHO	DESCRIPTION	Ni ppm	Cu ppm	Co ppm	Pt ppb	Pd ppb	Au ppb
166944	6873931	520544	1248N / 475E	GRAB	GBBR	REX SHOWING,GBBR/Ultramafic,med grey-green,f.g.-m.g.,gossan,weakly mag,qtz-cb veining	2150	5	183	14	6.1	9
166945	6873898	520568	1203N / 465E	GRAB	QZCB	Qtz-Cb Alteration Zone,white-light green,fuchsite,containing blocks/chunks of GBBR,possible weak copper stain	704	10	72	9	12	14
166946	6873927	520732	1100N / 600E	GRAB	DIOR	DIOR, grey-green, m.g.,massive,local bleaching	35	2490	21	1	3	28
166947	6873780	520609	1100N / 410E	GRAB	PERD	Ultramafic/perid,dark grey-black,f.g.-m.g.,strongly magnetic	2270	5	203	6.5	2.7	4
166948	6873726	520622	1060N / 375E	GRAB	ANDS	Altered Volcanics,HW Contact,Tr cubic Py,med grey-green,f.g.	154	26	50	1	1	13
166949	6873168	520561	710N / 080W	GRAB	BSLT	BSLT,light green-grey, f.g., locally amygdaloidal, non mag	75	43	51	11	15	8
166950	6873278	520410	900N / 100W	GRAB	BSLT	BSLT,purple weathering,light grey-green,massive to fractured, Tr Pyrite	69	79	48	7	7	3
166951	6873540	520648	900N / 253E	GRAB	PERD	Ultramafic/perid, dark grey-black,f.g.-m.g.,strongly magnetic,poor exposure	2410	5	157	15.4	12.5	2
166952	6873698	520668	1000N / 370E	GRAB	QZCB	Qtz-Cb, FW Contact,light grey-green to buff,locally weakly magnetic,Tr. Local Py	90	10	25	1	3	15
166953	6873408	520646	800N / 145E	GRAB	PERD	Ultramafic/peridotite,med-dark grey,f.g-m.g.,strongly fractured,O/C jutting out of Talus	2030	90	158	24.7	46.2	8
166954	6873416	520653	800N / 155E	GRAB	DUNT	Dunite ?,light green,f.g.,strongly fractured,Talus along slope,	250	61	47	9	10	7
166955	6873432	520665	800N / 175E	GRAB	PERD	Ultramafic/peridotite,dark grey-black,f.g.,strongly fractured,strongly magnetic,irregular qtz-cb veining	2220	20	158	24.5	32	1
166956	6873595	520796	800N / 385E	GRAB	DIOR	DIOR, light to med grey-green,m.g.,massive,weak hematite staining, non magnetic	10	22	10	2	2	1
166957	6873466	520815	700N / 305E	GRAB	DIOR	DIOR, gossan,hte fractures,weak to mod fracturing	10	10	10	1	1	2
166958	6873306	520700	700N / 110E	GRAB	DRDK	Ultramafic/Dunite?,cream white-green,f.g.,serp,non magnetic	186	51	35	13	13	14
166959	6873271	520691	685N / 085E	GRAB	ANDS	Altered Volcanics,light to med green,strongly fractured/crumbly,non to weakly magnetic	204	28	44	6	7	1
166960	6873256	520655	705N / 055E	GRAB	ANDS	Volanics proximal to HW Contact, weakly magnetic	1348	223	128	1	1	1
166961	6873398	520715	743N / 193E	GRAB	GBBR	Ultramafic/FW Contact Zone,sheared,med green, m.g.,Qtz-Cb veining,weakly magnetic	1889	37	129	8	9	3
166962	6873398	520715	745N / 195E	GRAB	GBBR	Ultramafic, grey-green,weakly magnetic,at edge of sheared material,hard (silicified?), Qtz-Cb veining	2000	100	135	61.5	19.8	2
166963	6873398	520715	745N / 194E	GRAB	QZCB / GBBR	Qtz-Cb, FW Contact,light grey-green to buff,mixture of ultramafic/qtz-cb, non-magentic	262	58	37	2	15	6
166964	6873398	520715	746N / 195E	GRAB	QZCB / GBBR	Qtz-Cb/Ultramafic, f.g., light grey-green,locally weakly magnetic, no visible sulphides	170	101	32	1	4	1
166965	6873248	520801	600N / 148E	GRAB	DRDK	Ultramafic/Dunite?,cream white-green,f.g.,serp,non magnetic,hard (silicified?)	347	65	56	9	9	3
166966	6873272	520833	595N / 187E	GRAB	PERD	Ultramafic/perid,dark grey-black,f.g.-m.g.,fractured,weakly magnetic	2340	5	160	20.2	12.4	2
166967	6873327	520811	650N / 210E	GRAB	QZCB / GBBR	Trenched,FW Contact Zone,Qtz-Cb,green,f.g.-m.g.,fractured,weakly magnetic	2310	20	161	79.6	103	6
166968	6873327	520811	650N / 210E	GRAB	GBBR	GBBR,next to 967,light purple grey,f.g.-m.g.,fractured with Qtz-Cb veinlets	70	10	22	5	4	1
166969	6873335	520913	585N / 287E	GRAB	ANDS	Altered Volcanics,light to green,f.g.,strongly fractured,non magnetic,proximal to Qtz-Cb Contact	214	10	27	1	6	8
166970	6873390	520877	650N / 300E	GRAB	DIOR	DIOR,Gossan/Shear Zone,approx 3m wide,discontinuous,qtz veining with irregular blebs of Py,5% Py,Tr Cpy	10	6110	31	1	1	20
166971	6873287	520974	500N / 300E	GRAB	DIOR	GOSSAN/DIOR,2m wide,irregular,strongly fractured,non magnetic,2-3% bleb Py,Trace Cpy,malachite	22	986	25	1	2	3
166972	6873283	520970	500N / 298E	GRAB	DIOR	GOSSAN/DIOR,strongly fractured,non magnetic,3-5% diss Py,local malachite	21	912	27	1	2	4
166973	6873047	521039	283N / 175E	GRAB	QZCB	Qtz-Cb,buff,local fuchsite	10	10	10	17	16	17
166974	6873028	521024	280N / 160E	GRAB	PERD	Ultramafic/perid,dark grey-black,f.g.-m.g.,strongly magnetic	2410	5	181	43.8	68.4	6
166975	6873003	520997	278N / 125E	GRAB	UM	Ultramafic,dark grey-black,f.g.,str serp., str magnetic,crumbly/friable,white CB cement	1829	54	133	20	28	3
166976	6872912	520865	300N / 035W	GRAB	QZCB	Qtz-Cb,HW Contact,Buff,possible local fuchsite	337	626	28	24	52	10
166977	6872796	520949	165N / 050W	GRAB	QZCB	Qtz-Cb,buff-brown,local fuchsite,intense fracturing with late qtz-cb veining throughout	1760	10	110	13	13	10

SAMPLE #	NORTHING	EASTING	GRID LOCN	SAMPLE TYPE	LITHO	DESCRIPTION	Ni ppm	Cu ppm	Co ppm	Pt ppb	Pd ppb	Au ppb
166978	6872796	520949	165N / 050W	GRAB	GBBR / QZCB	HW Contact Zone,GBBR/Qtz-CB ,qtz-cb stringers, trace fuchsite,weakly magnetic	894	10	85	10	12	1
166979	6872796	520949	165N / 050W	GRAB	GBBR	GBBR, med-dark green,m.g.,strong fracturing,qtz-cb veining,weakly magnetic	1838	10	145	13	9	1
166980	6872796	520949	165N / 036W	GRAB	GBBR	GBBR, med purple, green,m.g.,qtz-cb veining,weakly magnetic,3m from HW contact	1774	32	131	4	7	4
166981	6872872	520970	200N / 020E	GRAB	PERD	Ultramafic/perid,dark grey-black,f.g.-m.g.,local strong fracturing,strongly magnetic,str serp	2340	5	172	65	105	7
166982	6872880	520977	200N / 032E	GRAB	PERD	Ultramafic/perid,dark grey-black,f.g.-m.g.,local strong fracturing,strongly magnetic,str serp	2320	5	188	98.2	81.2	7
166983	6872894	520991	200N / 052E	GRAB	PERD	Ultramafic/perid.,dark grey-black,f.g.-m.g.,strongly magnetic	2270	20	181	34.9	49.8	3
166984	6872987	521050	220N / 165E	GRAB	PERD	Ultramafic/perid.,dark grey-black,f.g.-m.g.,strongly magnetic,fractured with white calcite veining	2700	5	149	32.9	64.9	2
166985	6872992	521054	219N / 169E	GRAB	UM	Ultramafic,intense fracturing,calcite veining/fracturing coatings, rubbly/crumbly,strongly magnetic,4m E of 984	2860	5	155	41.4	76.1	6
166986	6872996	521058	219N / 173E	GRAB	UM	Ultramafic,8m E of 984,brown/white weathering,intense calcite,strongly magnetic	2890	20	157	69.2	121	13
166987	6872999	521063	217N / 177E	GRAB	UM	Ultramafic rubble,intense calcite,weakly magnetic,light grey-green/white,friable/crumbly	2320	30	126	60.2	37.4	2
166988	6873006	521075		CHIP (0.3m)	PYRX	SAX SHOWING,Ultramafic/pyroxenite, dark grey-black,moderately magnetic	1681	148	133	26	44	8
166989	6873006	521075		CHIP (0.5m)	GBBR	SAX SHOWING,GBBR/Gossan,dark grey-green,m.g.,intense weathering,weakly magnetic	3120	1310	168	125	273	38
166990	6873006	521075		CHIP (0.5m)	GBBR	SAX SHOWING,GBBR, local Gossan,dark grey-green,m.g.,intense weathering,weakly-mod. magnetic	3960	1150	177	194	377	330
166991	6873006	521075		CHIP (0.5m)	GBBR	SAX SHOWING, GBBR, dark green-black, m.g.,possible malachite staining,rusted/weathered sulphides	4890	450	187	268	510	11
166992	6873006	521075		CHIP (0.3m)	GBBR	SAX SHOWING, F/W CONTACT,GBBR, dark green-black, m.g.,rusted/weathered,crumbly/mush,non mag	2580	1490	121	115	264	30
166993	6873006	521075		CHIP (1.0m)	QZCB	SAX SHOWING,QTZ-CB,buff, fractured,local fuchsite,possible malachite	302	52	37	1	1	1
166994	6872928	521208	100N / 223E	GRAB	DIOR	DIOR/GOSSAN,approx 1m wide, narrows,malachite,weathered sulphides	45	893	10	4	1	11
166995	6872793	521186	003N / 128E	GRAB	UM	Ultramafic,dark grey-black,f.g.-m.g.,str serp.,massive, str magnetic,crumbly/friable	2160	5	149	10.1	6.5	2
166996	6872822	521224	000N / 175E	GRAB	UM	Ultramafic,dark grey-black,f.g.-m.g.,massive, str magnetic,crumbly/friable	2110	30	147	24.9	58.5	4
166997	6872974	521399	000N / 405E	GRAB	DIOR	DIOR,Light to med grey-green,m.g.,massive, non mag, Trace diss Py	30	90	10	4	8	8
166998	6872902	521489	100S / 415E	GRAB	DIOR	DIOR/GOSSAN,silicified pod,irregular orientation,approx 1m wide, narrows,2-3% diss Py	100	30	147	1	0.6	35
166999	6872658	521210	100S / 045E	GRAB	GBBR	Ultramafic/GBBR,FW Contact,med grey-green,m.g.,intense fracturing,mod magnetic	2840	10	152	47.2	92.7	5
167000	6872637	521188	100S / 015E	GRAB	PERD	Peridotite,dark grey-black,f.g.-m.g.,strongly fractured,strongly magnetic	22	39	10	3	5	44

094331

Appendix B

Number	Samp. No	Northing	Easting	Grid Loc'n	Sample Type	Litho	Norm. SiO2	Norm. Al2O3	Norm. Fe2O3	Norm. MgO	Norm. CaO	Norm. Na2O	Norm. K2O	Norm. TiO2	Norm. P2O5	Norm. MnO	Norm. Cr2O3	Ba ppm	Cu ppm/Acme	Cu % Acme	Cu % Actlab-1	Cu % Actlab-2	Cu % Actlab/Rej	Final Cu ppm	Zn ppm	Zn % Acme	Final Zn ppm	Ni ppm/Acme	Ni % Acme	Ni % Actlab-1	Ni % Actlab-2	Ni % Actlab/Rej	Final Ni ppm	Co ppm/Acme	Co % Acme	Co % Actlab	Co % Actlab/Rej	Final Co ppm	Sr ppm	Zr ppm	Ce ppm	Y ppm	Nb ppm	Sc ppm	Ta ppm	LOI %	TOT/C %	TOT/S %	TOT/S % Actlab-1	TOT/S % Actlab-2
A102001	123001	6874665	519774		GRAB	SEDS / GBBR	58.62	7.54	16.08	1.76	13.71	0.02	1.53	0.31	0.01	0.01	0.007	180	342					342	11207	1.16	11600	98					98	<20					10	61	26	<20	10	<10	7	<20	5.9	2.73	9.27		
A102002	123002	6874672	519789		GRAB	SEDS	76.15	12.02	6.01	1.12	1.28	0.08	1.84	0.44	0.09	0.05	0.011	258	36					36	85		56						56	<20				10	65	66	22	10	<10	11	<20	6.5	0.85	1.55		
A102003	123003	6874688	519744		GRAB	GBBR	59.29	16.68	7.85	4.54	7.17	1.19	2.18	0.71	0.18	0.21	0.006	302	52					52	314		314	36					36	<20				10	66	113	35	18	<10	15	<20	9.1	1.66	0.07		
A102004	123004	6874686	519734		GRAB	BSFL	46.99	15.73	10.24	4.00	15.07	4.96	1.24	1.46	0.14	0.14	0.033	434	78					78	71		71	117					117	29				29	188	72	29	22	<10	31	<20	9.9	2.31	0.005		
A102005	123005	6874693	519751		GRAB	GBBR	51.29	13.70	5.20	2.02	24.14	0.18	2.43	0.55	0.13	0.35	0.007	305	30					30	64		64	28					28	<20				10	145	71	27	28	<10	10	<20	18	4.45	0.03		
A102006	123006	6874696	519760		GRAB	QZCB	52.35	17.57	1.71	1.70	7.44	7.51	0.82	0.53	0.26	0.11	0.004	1848	<20					10	47		47	24					24	<20				10	557	94	136	21	<10	11	<20	6.8	1.58	0.22		
A102007	123007	6874748	519891		CHIP (0.5m)	DIOR	60.86	17.12	7.45	2.26	5.19	2.35	3.74	0.60	0.30	0.13	0.004	925	5618	0.848				8480	48		48	<20					10	<20				10	588	94	71	17	10	13	<20	3.3	0.08	0.88		
A102008	123008	6874748	519891		GRAB	DIOR	62.13	15.47	7.52	1.60	6.09	1.45	4.71	0.57	0.35	0.10	0.012	1097	10764	1.487				14870	125		125	80					80	<20				10	751	103	65	15	<10	12	<20	2.8	0.06	1.42		
A102009	123009	6874405	519927		1988 SMPL	GBBR	44.75	8.95	11.79	19.32	12.44	0.65	0.52	0.98	0.12	0.21	0.283	158	243			0.016		160	73		73	1770			0.205		1770	111				111	132	51	40	12	<10	23	<20	8.1	1.34	0.45	0.43	
A102010	123010	6874286	520048		GRAB	SEDS	54.66	24.72	8.40	1.71	2.45	1.98	4.55	1.15	0.03	0.14	0.010	904	26					26	71		71	53					53	23				23	165	65	45	26	<10	33	<20	8.5	0.92	0.005		
A102011	123011	6874286	520048		GRAB	QZCB	38.91	4.28	13.62	34.53	7.22	0.06	0.06	0.44	0.06	0.21	0.617	138	55					55	59		59	1068					1068	95				95	124	14	31	<10	<10	10	<20	33.2	9.29	0.005		
A102012	123012	6874286	520048		GRAB	GBBR	41.36	3.14	12.59	39.72	1.79	0.02	0.12	0.31	0.06	0.19	0.691	34	<20					10	60		60	1737					1737	123				123	32	10	32	<10	<10	10	<20	16.6	1.62	0.02		
A102013	123013	6874286	520048		GRAB	GBBR	41.58	2.18	11.60	41.12	2.18	0.02	0.09	0.28	0.09	0.16	0.682	39	50					50	192		192	1897					1897	116				116	16	15	24	<10	<10	9	<20	13.9	0.49	0.005		
A102014	123014	6874239	520095		GRAB	QZCB / GBBR	34.03	2.56	13.55	42.79	5.43	0.10	0.14	0.37	0.10	0.21	0.734	36	32					32	141		141	1430					1430	104				104	73	20	25	<10	<10	8	<20	36.7	9.88	0.005		
A102015	123015	6874239	520095		GRAB	GBBR	41.08	2.34	12.46	39.99	2.60	0.07	0.24	0.28	0.07	0.17	0.686	85	30					30	96		96	1768					1768	119				119	40	13	<20	<10	<10	11	<20	17.9	2.28	0.005		
A102016	123016	6874239	520095		GRAB	GBBR	40.76	2.30	11.83	41.20	2.56	0.04	0.10	0.25	0.08	0.18	0.698	45	29					29	177		177	1860					1860	120				120	16	15	<20	<10	<10	7	<20	17.1	1.8	0.005		
A102017	123017	6874239	520095		GRAB	GBBR	38.80	1.81	10.85	38.24	9.01	0.02	0.10	0.30	0.10	0.16	0.612	97	21					21	146		146	1723					1723	117				117	65	21	28	<10	<10	8	<20	17.5	1.91	0.01		
A102018	123018	6874193	520159		GRAB	SEDS	59.37	21.66	9.11	2.00	1.71	0.65	4.31	1.02	0.03	0.13	0.014	797	92					92	155		155	40					40	23				23	123	75	30	10	<10	21	<20	5.5	0.36	0.1		
A102019	123019	6874193	520159		GRAB	QZCB	53.06	5.44	7.63	15.39	16.99	0.05	0.26	0.65	0.15	0.16	0.204	448	50					50	89		89	1235					1235	57				57	508	25	32	<10	<10	12	<20	26	7.13	0.04		
A102020	123020	6874193	520159		GRAB	PERD	43.31	4.99	11.71	33.04	5.10	0.25	0.25	0.53	0.11	0.18	0.531	117	53		-0.001			5	92		92	1716		0.174			1740	123				123	48	24	32	<10	<10	16	<20	6.1	0.05	0.05	0.09	
A102021	123021	6873931	520544	1245N / 475E	CHIP (1.0m)	GBBR	40.42	1.26	12.45	43.72	0.91	0.09	0.04	0.16	0.08	0.15	0.730	23	25		-0.001			5	106		106	2062		0.219			2190	123				123	56	<10	<20	<10	36	6	<20	20.3	3.18	0.01	0.03	
A102022	123022	6873931	520544	1245N / 475E	CHIP (1.5m)	GBBR	40.37	1.32	11.99	41.86	3.07	0.09	0.04	0.17	0.10	0.16	0.825	28	279					279	109		109	1994					1994	113				113	157	<10	<20	<10	30	6	<20	19.5	2.87	0.02		
A102023	123023	6873931	520544	1245N / 475E	CHIP (1.4m)	GBBR	38.22	1.26	12.44	44.43	2.31	0.08	0.03	0.15	0.08	0.19	0.813	23	36					36	76		76	1922					1922	122				122	119	<10	<20	<10	31	5	<20	21.9	3.72	0.005		
A102024	123024	6873931	520544	1245N / 475E	CHIP (0.5m)	QZCB	43.46	1.08	10.93	41.48	1.53	0.15	0.27	0.13	0.12	0.15	0.698	19	<20					10	93		93	1297					1297	93				93	90	<10	<20	<10	20	3	<20	33	9.17	0.005		
A102025	123025	6873931	520544	1245N / 475E	CHIP (1.5m)	GBBR	39.08	1.24	12.48	43.45	2.43	0.04	0.04	0.15	0.08	0.18	0.802	24	<20					10	89		89	1961					1961	123				123	104	<10	<20	<10	30	6	<20	20.9	3.23	0.005		
A102026	123026	6874123	520225		CHIP (1.0m)	GBBR	40.29	1.83	12.15	41.82	2.57	0.02	0.06	0.24	0.11	0.17	0.733	37	<20					10	70		70	1970					1970	121				121	135	<10	<20	<10	34	7	<20	17.5	2.02	0.03		
A102027	123027	6874123	520225		CHIP (1.0m)	GBBR	40.46	1.82	11.19	39.51	5.74	0.06	0.05	0.23	0.08	0.18	0.675	59	<20		-0.001			5	105		105	2851		0.353			3530	104				104	33	13	<20	<10	35	6	<20	16.4	1.82	0.005	0.03	
A102028	123028	6874123	520225		CHIP (0.5m)	GBBR	41.65	1.81	11.31	39.84	4.10	0.05	0.06	0.23	0.07	0.17	0.712	46	<20		-0.001			5	93		93	2521		0.326			3260	125				125	37	<10	<20	<10	27	8	<20	17	2	0.005	0.02	
A102029	123029	6874123	520225		CHIP (0.7m)	GBBR	40.59	1.72	11.89	40.46	4.23	0.08	0.06	0.20	0.07	0.17	0.722	39	23					10	77		77	1922					1922	92				92	42	13	<20	<10	34	7	<20	16.6	1.76	0.005		
A102030	123030	6874123	520225		CHIP (0.3m)	GBBR	52.23	1.58	10.65	18.25	16.55	0.08	0.02	0.24	0.04	0.07	0.284	30	23	0.011	0.01		0.006	110	326		326	60390	6.505	6.745		7.01	70100	299	0.04	0.045	0.045	450	52	<10	<20	<10	36	7	<20	5.7	1.87	0.06	0.08	0.04
A102031	123031	6874123	520225		CHIP (1.0m)	GBBR	40.31	2.01	13.11	39.78	3.48	0.06	0.05	0.25	0.10	0.17	0.677	39	151					151	65		65	1756					1758	113				113	85	<10	<20	<10	31	6	<20	19.2	2.97	0.005		
A102032	123032	6874123	520225		CHIP (0.4m)	QZCB	35.81	2.24	14.08	42.91	2.94	0.15	0.46	0.29	0.08	0.20	0.847	50	33					33	65		65	1624					1624	103				103	81	<10	<20	<10	24	7	<20	34.3	9.35	0.02		
A102033	123033	6874123	520225		SOIL	GBBR	38.57	1.52	11.99	36.54	7.43	0.10	0.37	0.38	0.12	0.19	0.802	42	42					42	57		57	1537					1537	114				114	190	<10	<20	<10	30	8	<20	26.4	6.01	0.005		
A102034	123034	6874123	520225	CHIP (0.3m)	QZCB / GBBR	37.90	2.25	13.93	39.12	5.46	0.08	0.05	0.26	0.11	0.19	0.648	63	53		0.002			20	206		206	4159		0.646			6460	169				169	348	<10	<20	<10	26	7	<20	25.3	5.46	0.005	0.02	
A102035	123035	6874123	520225		GRAB	GBBR	44.66	2.52	15.08	33.07	3.48	0.09	0.05	0.36	0.08	0.15	0.462	38	81	0.02	-0.001		0.018	200	478		478	21444	4.977	4.99		6.96	69600	565	0.072	0.08	0.11	1110	23	<10	<20	<10	<10	8	<20	14.5	1.89	0.08	0.1	0.04
A102036	123036	6872224	521487	600S / 050W	GRAB	DUNT	40.48	0.44	12.80	44.88	0.19	0.03	0.01	0.06	0.09	0.19	0.837	<5	98		0.003			30	53		53	2387		0.232			2320	152	<10	<10	<20	<10	31	4	<20	13.3	1.2	0.01	0.02	
A102037	123037	6872288	521528	585S / 015E	GRAB	SEDS	41.01	11.92	10.59	14.44	20.77	0.08	0.03	0.62	0.20	0.27	0.701	8	122					122	66		66	330					330	56				56	27	34	<20	<10	11	15	28	<20	4.4	0.03	0.42	
A102038	123038	6872292	521561	600S / 050E	GRAB	QZCB	84.70	16.43	4.22	1.18	6.08	4.84	1.88	0.50	0.08	0.07	0.013	705	43					43	39		39	52					52	<20				10	235	115	29	17	12	9	<20	6.2	1.35	0.21		
A102039	123039	6872304	521578	600S / 075E	GRAB	QZCB	70.87	13.59	5.07	1.98	1.88	5.08	0.87	0.50	0.07	0.08	0.015	248	49					49	97		97	84					84	<20				10	270	127	62	36	14	14	<20	4	0.67	1		
A102040	123040	6872306	521598	600S / 090E	GRAB	ANDS	49.70	17.68	11.54	9.08	5.65	4.83	0.17	1.07	0.30	0.14	0.040	69	32					32	138		138	132					132	27				27	400	56	30	21	30	14	<20	7.9	0.14	0.14		
A102041	123041	6872308	521636	600S / 105E	GRAB	ANDS	47.72	17.06	10.68	8.05	11.73	3.15	0.07	1.05	0.26	0.21	0.040	43	109					109	148		148	110					110	25				25	1165	56	42	20	15	31	<20	6.4	0.85	0.47		
A102042	123042	6872422	521755	600S / 300E	GRAB	DIOR	65.44	16.18	4.64	2.06	4.66	5.50	0.76	0.41	0.26	0.08	0.016	1231	279					279	123		123	54					54	<20				10	626	97	83	15	22	8	<20	2.5	0.12	0.65		
A102043	123043	6872458	521805	600S / 345E	GRAB	ANDS	51.47	16.60	10.77	6.03	8.13	5.04	0.09	1.20	0.48	0.16	0.023	95	92					92	229		229	65					65	33				33	354	65	42	18	24	26	<20	4.3	0.39	0.06		
A102044	123044	6872520	521888	600S / 750E	GRAB	DIOR	65.66	16.26	4.40	2.12	4.08	4.29	2.45	0.40	0.22	0.10	0.016	1511	174					174	102		102	57					57	<20				10	390	60	42	13	6	<20	<20	3.5	0.69	0.4		
A102045	123045	6872347	521468	515S / 040E	GRAB	PERD	39.63	3.44	12.58	45.69	0.42	0.02	0.02	0.06	0.08	0.17	0.615	<5	<20		-0.001			5	214		214	2464		0.254			2540	140	<10	<10	<20	<10	18	4	<20	13.7	0.16	0.04	0.11	
A102046	123046	6872418	521453		GRAB	PERD	39.63	0.35	13.15	45.69	0.13	0.07	0.02	0.05	0.08	0.16	0.669	6	<20		-0.001			5	215		215	2552		0.263			2630	146	<10	<10	<20	<10	14	4	<20	14.3	0.28	0.01	0.06	
A102047	123047	6872061	521327	620S / 275W	GRAB	LMST	9.91	0.57	0.79	1.01	87.08	0.02	0.14	0.05	0.22	0.20	0.008	570	20					20	171		171	38					38	<20				10	354	23	<20	10	<10	2	<20	40.7	11.3	0.03		
A102048	123048	6872047	521272	600S / 330W	GRAB	LMST	96.49	0.23	2.23	0.15	0.56	0.06	0.10	0.03	0.10	0.01	0.029	168160	25					25	412		412	64					64	22				22	2308	33	80	<10	<10	1	<20	23	6.19	3.91		
A102049	123049	6872006	521236	600S / 350W	GRAB	VOLC	54.22	12.88	7.11	7.81	8.99	2.85	0.91	1.06	0.26	0.21	0.040	25	129					129	257		257	153					153	39				39	85	62	28	17	13	25	<20	10.5	1.76	0.03		
A102050	123050	6872114	521199	500S / 340W	GRAB	VOLC	53.36	17.62	10.71	4.17	5.51	5.55	1.52	1.07	0.30	0.18	0.014	739	207					207	337		337	48					48	27				27	387	91	<20	24	<10	25	<20	4.3	0.39	0.05		
A102051	123051	6872134	521235	500S / 300W	GRAB	VOLC	50.56	13.51	11.51	6.82	10.88	4.01	0.72	1.56	0.18	0.22	0.031	758	163					163	260		260	95					95	48				48	188	74	44	23	15	34	<20	5.8	0.85	0.02		
A102052	123052	6872186	521305	500S / 215W	GRAB	BSLT	50.96	13.70	13.90	7.29	8.09	3.03	1.04	1.46	0.27	0.25	0.018	729	151					151	325		325	73					73	42				42	299	82	25	27	36	36	<20	4.5	0.04	0.005		
A102053	123053	6872191	521317	510S / 190W	GRAB	LMST	43.49	2.84	1.38	34.24	2.43	0.13	0.03	0.25	0.09	0.21	0.637	18	235					235	374		374	1764					1764	136				136	140	<10	<10	<20	<10	13	<20	11.3	0.02	0.1		
A102054	123054	6872287	521365	490S / 100W	GRAB	PERD	39.45	0.61	13.39	44.90	0.22	0.07	0.01	0.07	0.07	0.19	1.030	30	68		0.015	0.003		150	242		242	2419		0.241	0.228		2410	154				154	<10	<10	<20	<10	<10	4	<20	13.8	0.24	0.01	0.05	0.02
A102055	123055	6872294	521426	510S / 050W	GRAB	DUNT	38.48	0.33	13.46	46.22	0.18	0.08	0.01	0.05	0.05	0.17	0.976	15	21		-0.001			5	216		216	2255		0.211			2110	145				145	<10	<10	<20	<10	10	2	<20	15.2	0.42	0.005	0.01	
A102056	123056	6872343	521438	495S / 015W	GRAB	DUNT	40.89	0.49	13.28	43.71	0.19	0.06	0.01	0.06	0.09	0.18	1.043	25	<20		0.004			40	95		95	2202		0.215			2150	159				159	<10	12	<20	<10	13	5	<20	13.9	0.24	0.005	0.02	
A102057	123057	6872391	521539	510S / 100E	GRAB	ANDS	47.58	16.44	11.11	5.71	15.42	2.04	0.14	1.05	0.31	0.21	0.043	44	41					41	75		75	108					108	25				25	664	75	99	21	11	31	<20	7.1	1.26	0.005		
A102058	123058	6872430	521570	500S / 150E	GRAB	ANDS	61.79	14.37	6.16	2.91	7.38	5.18	0.71	0.98	0.41	0.10	0.012	133	<20					10	40		40	<20					10	<20				10	358	143	54	26	10	17	<20	6.1	1.24	1.37		
A102059	123059	6872424	521584	510S / 160E	GRAB	ANDS	59.72	17.15	7.97	2.54	6.17	2.16	3.24	0.57	0.31	0.15	0.012	234	47					47	81		81	<20					10	20				20	139	128	113	12	14	11	<20	10.5	0.64	3.17		
A102060	123060	6872782	521837	390S / 575E	GRAB	DIOR	68.25	15.83	3.67	1.34	3.26	4.50	2.54	0.33	0.20	0.06	0.013	519	21					21	39		39	23					23	<20				20	99	80	40	<10	<10	5	<20	3.5	0.49	0.03	0.01	
A102061	123061	6872407	521210	300S / 130W	GRAB	PERD	41.91	0.97	13.18	41.64	1.10	0.05	0.02	0.11	0.08	0.18	0.757	13	286					286	100		100	1757					1757	127				127	17	40	80	<10	16	6	<20	16	1.51	0.05		
A102062	123062	6872293	521089	300S / 300W	GRAB	VOLC	52.53	13.73	10.53	8.17	8.71	5.03	0.36	0.57	0.12	0.21	0.052	218	114					114	84		84	122					122	49				49	245	54	26	14	<10	41	<20	4.6	0.53	0.005		
A102063	123063	6872378	521409	440S / 000	GRAB	DUNT	40.46	8.19	10.55	10.43	27.58	0.02	0.01	2.03	0.41	0.25	0.060	6	<20					10	105		105	216					216	29				29	30	106	142	30	17	23	<20	2.8	0.04	0.01		
A102064	123064	6872378	521409	440S / 000	GRAB	DUNT	42.14	0.67	14.03	41.78	0.18	0.02	0.01	0.06	0.10	0.15	0.945	9	53		0.001			10	68		68	2056		0.218			2180	156				156	<10	19	<20	<10	<10	5	<20	12.3	0.1	0.005	0.02	
A102065	123065	6872339	521361		GRAB	DRDK	43.70	9.77	8.45	9.93	26.92	0.04	0.01	0.49	0.18	0.40	0.108	5	49					49	145		145	205					205	31				31	40	66	91	<10	11	20	<20	1.7	0.04	0.01		
A102066	123066	6872326	521345		GRAB	DUNT	40.38	0.62	12.65	44.66	0.30	0.06	0.01	0.08	0.08	0.16	0.996	6	35		-0.001			5	103		103	2140		0.219			2190	154				154	<10	<10	<20	<10	16	6	<20	14.3	0.24	0.005	-0.01	
A102067	123067	6872283	521284		GRAB	DRDK	39.71	0.66	14.31	42.38	1.48	0.06	0.01	0.08	0.08	0.18	1.057	9	38		-0.001			5	90		90	2007		0.203			2030	142	<10	<10	17	<20	<10	6	<20	14.3	0.47	0.02	0.02	
A102068	123068	6872313	521348		GRAB	DRDK	44.43	12.29	9.48	14.00	7.72	4.50	1.39	0.69	0.28	0.19	0.083	314	48					48	99		99	343					343	60				60	170	83	116	18	24	32	8	32	0.02	0.03		
A102069	123069	6872443	521410	400S / 030E	GRAB	DUNT	40.20	0.45	10.79	47.02	0.21	0.04	0.02	0.06	0.08	0.18	0.951	2	28		-0.001			5	82		82	2170		0.22			2200	145	<10	<10	<20	<10	14	5	<20	14.5	0.23	0.005	0.01	
A102070	123070	6872422	521455		CHIP (2.0m)	PERD	40.62	1.85	13.80	40.98	1.62	0.01	0.02	0.20	0.07	0.18	0.838	26	154		0.009			90	131		131	2161		0.206			2060	132				132	64	30	81	<10	17	7	<20	16.3	1.77	0.06	0.02	
A102071	123071	6872452	521453	415S / 070E	CHIP (1.0m)	QZCB / GBBR	40.15	2.58	11.98	38.69	5.16	0.02	0.04	0.27	0.10	0.18	0.826	79	124					124	113		113	1884					1884	119				119	109	18	<20	<10	13	8	28	16.6	1.66	0.12		
A102072	123072	6872487	521423	390S / 070E	CHIP (0.5m)	QZCB / GBBR	49.05	5.89	12.84	21.38	9.42	0.09	0.08	0.60	0.13	0.13	0.415	22	273	0.038	0.024			380	200		200	1404	0.179	0.162			1790	100	0.009			90	<10	42	39	<10	<10	16	20	7	0.04	0.34	0.17	
A102073	123073	6872485	521422	390S / 070E	CHIP (1.5m)	PERD	42.03	3.42	13.83	35.45	3.91	0.03	0.02	0.35	0.09	0.21	0.660	18	124		0.004			40	214		214	1618		0.172			1720	119				119	<10	27	45	<10	16	11	<20	10.5	0.04	0.11	0.05	
A102074	123074	6872488	521432	390S / 070E	CHIP (1.5m)	GBBR	49.66	12.46	13.66	4.19	17.54	0.60	1.01	0.45	0.07	0.35	0.011	1379	159	0.021				210	104		104	1132					1110	37	0.002			37	20	44	37	22	15	10	12	0.47	0.36	0.98		
A102075	123075	6872478	521429	390S / 070E	GRAB

Appendix B

Analyte Symbol	Final TOT/S	SUM	Os	Ir	Ru	Rh	Au	Au	Au	Final Au	Pt	Pt	Pt	Final Pt	Pd	Pd	Pd	Final Pd	Re
	%	%	ppb	ppb	ppb	ppb	ppb/Acme	ppb/Actlab-1	ppb/Actlab-2	ppb	ppb/Acme	ppb/Actlab-1	ppb/Actlab-2	ppb	ppb/Acme	ppb/Actlab-1	ppb/Actlab-2	ppb	ppb/Actlab
A101-1003	9.27	88.65					16			16	3			3	5			5	
A101-1004	1.55	99.97					111			111	<2			1	<2			1	
A101-1005	0.07	99.97					<2			1	<2			1	<2			1	
A101-1015	0.005	99.81					<2			1	7			7	6			6	
A101-1500	0.03	99.86					5			5	<2			1	<2			1	
A101-1501	0.22	100.02					2			2	<2			1	<2			1	
A101-1502	0.86	99.83					162			162	<2			1	2			2	
A101-1503	1.42	99.96					118			118	<2			1	2			2	
A101-1504	0.45	99.68					7	7		7	62	61.7		61.7	107	124		124	
A101-1505	0.005	99.86					<2			1	<2			1	<2			1	
A101-1506	0.005	100.01					4			4	9			9	7			7	
A101-1507	0.02	100.1					2			2	7			7	6			6	
A101-1508	0.005	99.88					2			2	16			16	14			14	
A101-1509	0.005	99.88					<2			1	3			3	8			8	
A101-1510	0.005	99.81					<2			1	9			9	2			2	
A101-1511	0.005	99.95					<2			1	11			11	10			10	
A101-1512	0.01	99.77					<2			1	9			9	10			10	
A101-1513	0.1	99.93					2			2	2			2	7			7	
A101-1514	0.04	99.8					16			16	5			5	29			29	
A101-1515	0.09	99.87					4	-3		4	58	66.2		66.2	61	63.9		63.9	
A102-1	0.03	100.07					<2	5		5	25	14.9		14.9	9	6.7		6.7	
A102-2	0.02	100.06					3			3	34			34	8			8	
A102-3	0.005	100.07					2			2	14			14	4			4	
A102-4	0.005	100					<2			1	22			22	6			6	
A102-5	0.005	100.1					3			3	10			10	7			7	
A102-6	0.03	99.96					22			22	17			17	15			15	
A102-7	0.03	99.75					212	196		212	23	18.6		18.6	31	26.1		26.1	
A102-8	0.02	100.06					161	138		161	20	23.8		23.8	26	21.9		21.9	
A102-9	0.005	100					24			24	22			22	19			19	
A102-10	0.06	97.68	-2	-1	38	-1	8688	8140	9	8688	20	15	89.3	89.3	180	175	20.3	175	<5
A102-11	0.005	100.13					5			5	19			19	14			14	
A102-12	0.02	99.88					20			20	9			9	12			12	
A102-13	0.005	99.9					15			15	6			6	5			5	
A102-14	0.02	99.86					473	297		473	9	13.2		13.2	13	12.2		12.2	
A102-15	0.1	97.22	-2	1	17	2	3076	2820	2750	3076	29	21	26.5	26.5	71	57	60	57	<5
A102-16	0.02	100.07					18	10		18	31	29.6		29.6	44	39.8		39.8	
A102-17	0.42	100.59					17			17	<2			1	4			4	
A102-18	0.21	100.49					<2			1	<2			1	<2			1	
A102-19	1	100.26					5			5	<2			1	<2			1	
A102-20	0.14	100.73					<2			1	<2			1	<2			1	
A102-21	0.47	100.69					<2			1	<2			1	<2			1	
A102-22	0.65	100.58					6			6	<2			1	<2			1	
A102-23	0.06	100.71					3			3	<2			1	<2			1	
A102-24	0.4	100.83					3			3	<2			1	<2			1	
A102-25	0.11	99.86					27	-2		27	28	26.8		26.8	13	12.3		12.3	
A102-26	0.06	99.86					4	-2		4	16	36.5		36.5	9	8.3		8.3	
A102-27	0.03	100					<2			1	<2			1	<2			1	
A102-28	3.91	88.53					7			7	<2			1	<2			1	
A102-29	0.03	100.42					2			2	7			7	5			5	
A102-30	0.05	100.62					9			9	<2			1	4			4	
A102-31	0.02	100.52					4			4	4			4	7			7	
A102-32	0.005	100.22					2			2	2			2	<2			1	
A102-33	0.1	100.01					3			3	18			18	21			21	
A102-34	0.05	99.92	14	7	26	4	2	1.6	2	2	113	78	77.7	78	196	145	176	145	<5
A102-35	0.01	99.94					<2	-3		1	24	16.3		16.3	18	16.3		16.3	
A102-36	0.02	99.94					<2	-3		1	25	16.5		16.5	99	104		104	
A102-37	0.005	99.85					<2			1	<2			1	2			2	
A102-38	1.37	99.94					4			4	9			9	<2			1	
A102-39	3.17	99.85					7			7	<2			1	2			2	
A102-40	0.01	99.99					<2			1	4			4	4			4	
A102-41	0.05	99.7					<2			1	24			24	35			35	
A102-42	0.005	99.97					<2			1	7			7	12			12	
A102-43	0.01	99.69					<2			1	5			5	15			15	
A102-44	0.02	99.9					7	14		14	28	50.7		50.7	70	71.7		71.7	
A102-45	0.01	99.66					4			4	2			2	8			8	
A102-46	0.005	99.92					1	3		3	45	44.1		44.1	62	77.4		77.4	
A102-47	0.02	99.79					4	-1		4	80	45.7		45.7	138	107		107	
A102-48	0.03	99.8					<2			1	<2			1	<2			1	
A102-49	0.01	99.79					2	-3		2	14	9		9	12	10.6		10.6	
A102-50	0.06	99.92					3	6		6	41	41.9		41.9	91	82.2		82.2	
A102-51	0.12	99.8					<2			1	20			20	44			44	
A102-52	0.34	99.67					6	7		7	53	39.6		39.6	138	126		126	
A102-53	0.11	99.89					<2	4		4	54	65.2		65.2	90	105		105	
A102-54	0.98	100.03					28			28	2			2	2			2	
A102-55	5.95	99.64					309			309	3			3	2			2	
A102-56	4.09	99.91					90			90	5			5	<2			1	
A102-57	0.02	99.71					<2	-1		1	2	9.6		9.6	9	1.8		1.8	
A102-58	0.02	99.76					9			9	<2			1	<2			1	
A102-59	1.02	99.89					20			20	<2			1	<2			1	
A102-60	0.02	99.85					<2			1	32			32	59			59	
A102-61	0.23	100.05					7			7	14			14	34			34	
A102-62	0.13	99.58					<2			1	53			53	33			33	
A102-63	0.01	99.94					24			24	19			19	20			20	
A102-64	0.02	100.01					<2	-3		1	2	12.5		12.5	<2	2.7		2.7	
A102-65	0.01	99.85					20			20	26			26	34			34	
A102-66	0.01	99.69					10			10	14			14	21			21	
A102-67	0.08	99.74					3			3	23			23	62			62	
A102-68	0.05	99.75					10			10	18			18	41			41	
A102-69	0.005	99.67					3			3	17			17	19			19	
A102-70	0.02	99.97					6	4		6	37	42.7		42.7	81	81.6		81.6	
A102-71	0.005	100.02					18			18	28			28	38			38	
A102-72	0.34	99.99					2			2	<2			1	8			8	
A102-73	0.04	99.78					2	1		2	31	39.2		39.2	85	87.6		87.6	
A102-74	0.005	99.82					12			12	30			30	35			35	
A102-75	0.03	99.99					13			13	24			24	56			56	
A102-76	0.02	99.68					3	2		3	43	23.6		23.6	61	43.3		43.3	
A102-77	0.005	99.97					<2			1	25			25	30			30	
A102-78	0.005	100.02					<2			1	2			2	7			7	
A102-79	0.005	99.99					<2			1	8			8	18			18	
A102-80	0.02	99.91					3			3	10			10	22			22	
A102-81	0.005	99.99					<2	-1		1	8	5.7		5.7	19	10.7		10.7	
A102-82	0.01	99.64					<2	2		1	42	54.1		54.1	59	40.9		40.9	
A102-83	0.005	99.82					<2			1	8			8	19			19	
A102-84	0.31	99.72					4			4	<2			1	3			3	
A102-85	0.25	99.89					3			3	9			9	15			15	

Analyte Symbol	SiO2	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO	Cr2O3	Total Majors	100 / Majors
	%	%	%	%	%	%	%	%	%	%	%		
A101-1003													
A101-1004													
A101-1005													
A101-1015													
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P. 16

Appendix B

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Appendix B

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Appendix B

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Appendix B

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Appendix B

A1[illegible]4	0.03	99.98				<2	4		4	28	24.9		24.9	67	58.5		58.5			37.21	1.87	12.06	33.58	2.02	0.02	0.04	0.21	0.10	0.16	0.503	87.773	1.139302519
A1[illegible]4	0.07	100.01				8			8	4			4	8			8			62.88	15.77	4.85	2.03	3.72	3.74	3.80	0.42	0.22	0.10	0.017	97.547	1.025146852
A1[illegible]4	1.2	100				4	35		35	7	-0.1		1	15	0.6		0.6			35.51	0.65	12.72	35.29	0.49	0.01	0.02	0.07	0.07	0.16	0.83	85.615	1.165297442
A1[illegible]4	0.03	100				<2	5		5	44	47.2		47.2	88	92.7		92.7			36.96	0.66	9.80	35.53	0.99	0.03	0.01	0.08	0.05	0.16	0.792	85.062	1.175613082
A1[illegible]4	1.47	99.8				44			44	3			3	5			5			82.72	4.98	3.48	0.50	1.95	1.76	0.61	0.11	0.06	0.05	0.016	96.236	1.039112183

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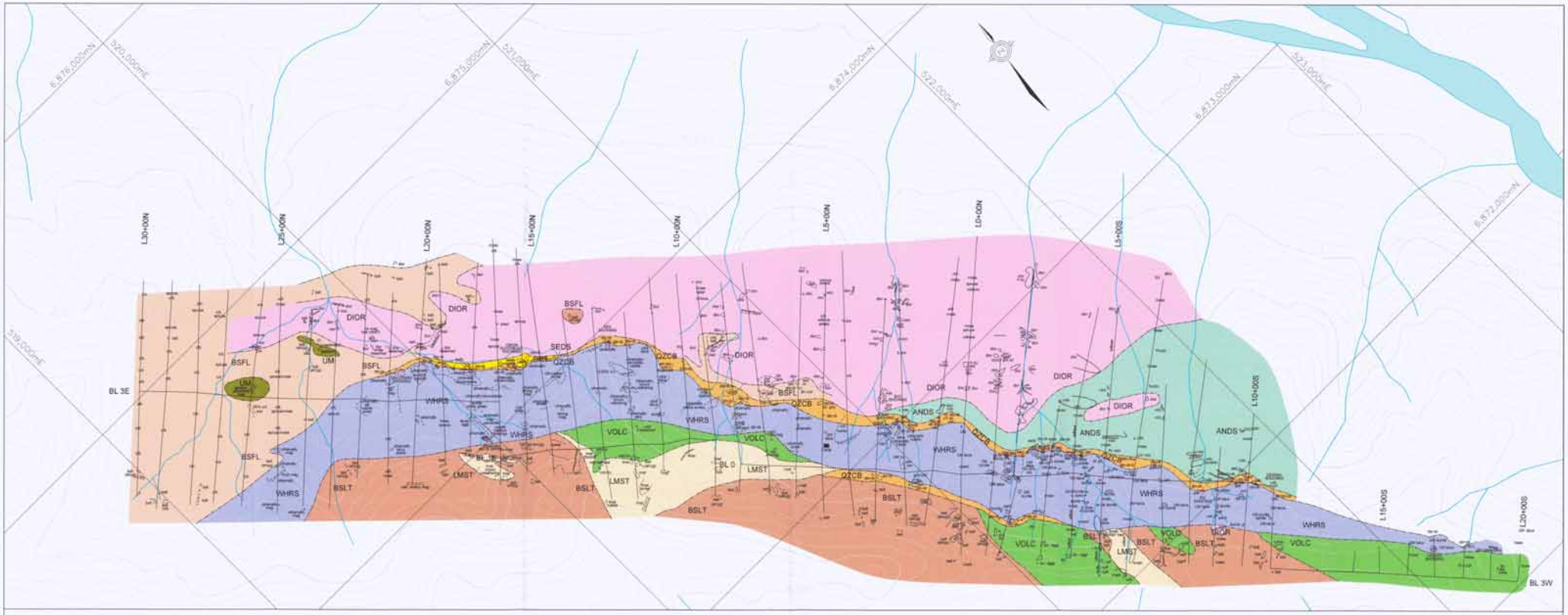


GEOLOGY

MIDDLE TRIASSIC
NIKOLAI GROUP
- BSLT Amygdaloidal basalt
- LMST Massive limestone
- VOLC Lapilli tuff, volcanic breccia

WHITE RIVER MAFIC-ULTRAMAFIC COMPLEX
- WHRS Peridotite, dunite, pyroxenite, gabbro
- UM Peridotite

PENNSYLVANIAN TO LOWER PERMIAN
SKOLAI GROUP
Hasen Creek Formation
- QZCB Quartz carbonate alteration halo
- SEDS Siliceous argillite

Station Creek Formation
- DIOR Diorite
- ANDS Massive andesite flows
- BSFL Massive basalt flows

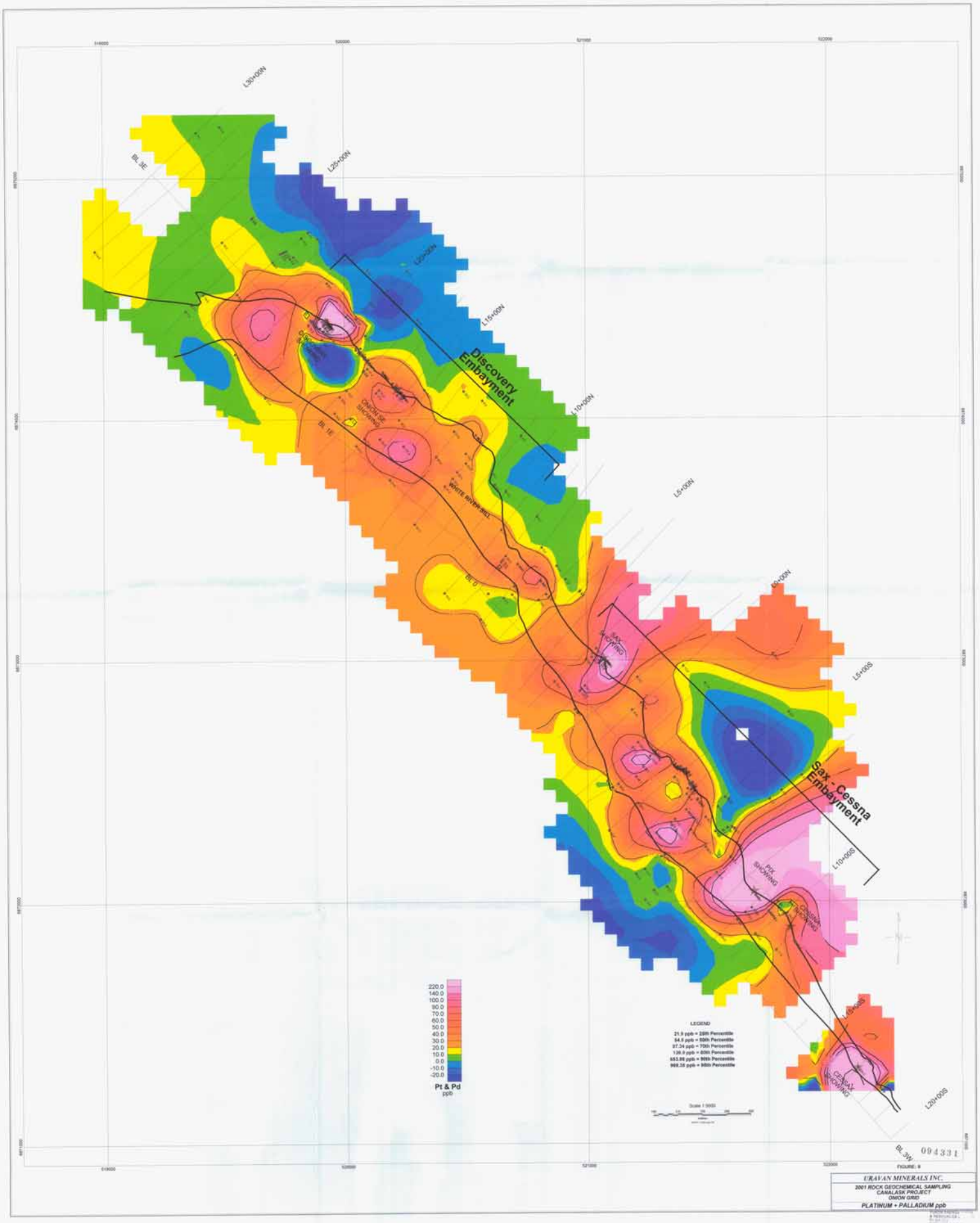
0 500 1000m
1:5000

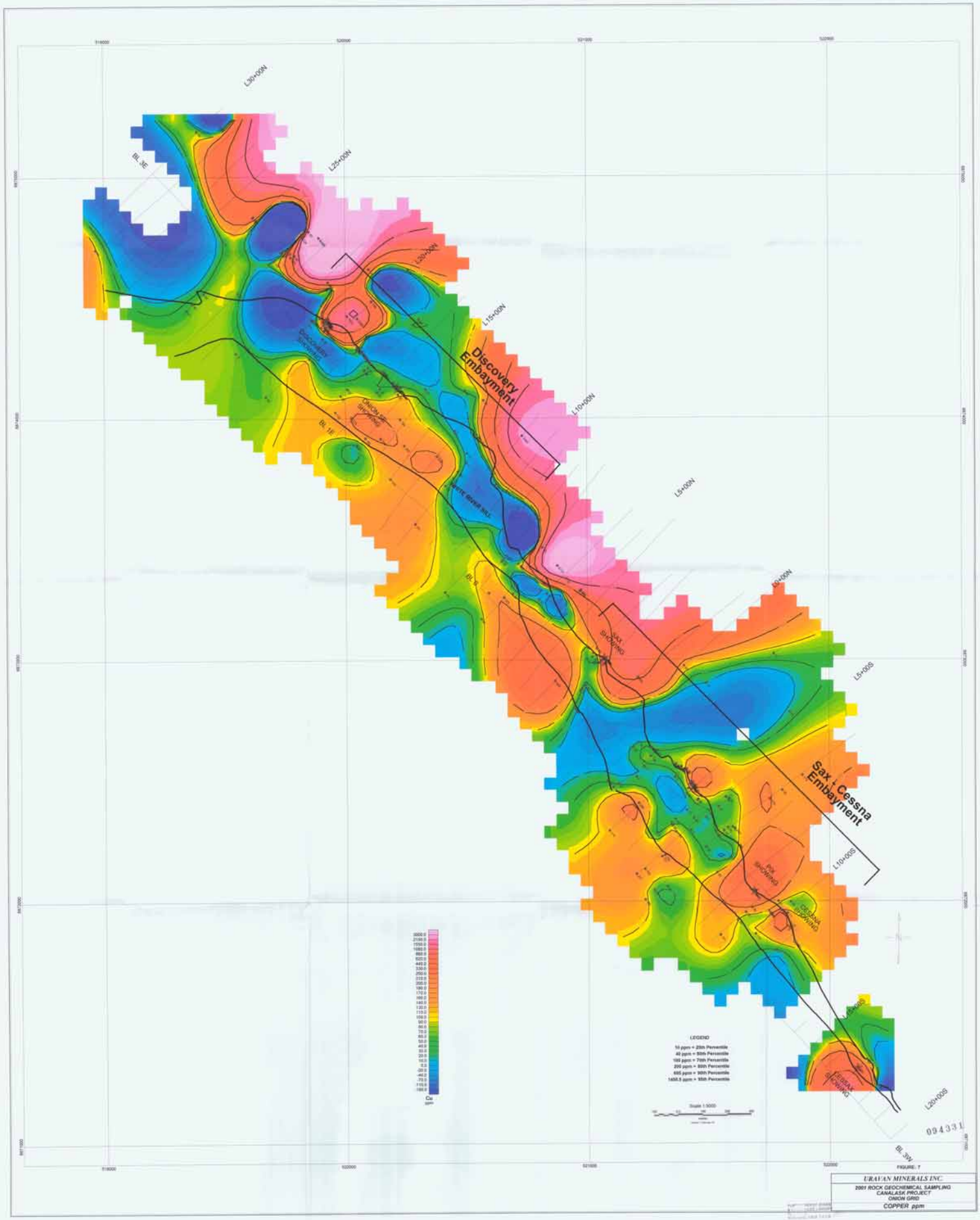
LEGEND

2001 trench location

094331

URAVAN MINERALS INC.
ONION / SAX GRID
CANALASK PROPERTY
YUKON TERRITORY
DETAILED MAPPING
FIGURE 4


L30+00N
L25+00N
L20+00N
L15+00N
L10+00N
L5+00N
L0+00N
L5+00S
L10+00S
L15+00S
L20+00S
BL 3E
BL 1E
BL 3W
Discovery Embayment
Sax - Cessna Embayment
ONDINE SHOWING
WHITE RIVER SHEAR
SAX SHOWING
PIX SHOWING
CESSNA SHOWING
220.0
140.0
100.0
90.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
Pt & Pd
ppb
LEGEND
21.9 ppb = 25th Percentile
54.5 ppb = 50th Percentile
97.34 ppb = 70th Percentile
126.8 ppb = 80th Percentile
553.96 ppb = 90th Percentile
969.35 ppb = 95th Percentile
094331
FIGURE: 9
URAVAN MINERALS INC.
2001 ROCK GEOCHEMICAL SAMPLING
CANALASK PROJECT
ONION GRID
PLATINUM + PALLADIUM ppb


L30+00N
L25+00N
L20+00N
L15+00N
L10+00N
L5+00N
L0+00N
L5+00S
L10+00S
L20+00S
BL 3E
BL 1E
BL 1W
BL 3W
Discovery Embayment
Sax - Cessna Embayment
Discovery Showing
Martin Showing
White Grave Hill
SAX Showing
Pink Showing
CESSNA Showing
LEGEND
10 ppm = 25th Percentile
40 ppm = 50th Percentile
100 ppm = 70th Percentile
200 ppm = 85th Percentile
695 ppm = 90th Percentile
1458.5 ppm = 95th Percentile
Cu
ppm
Scale 1:5000
FIGURE: 7
URAVAN MINERALS INC.
2001 ROCK GEOCHEMICAL SAMPLING
CANALASK PROJECT
ONION GRID
COPPER ppm
094331

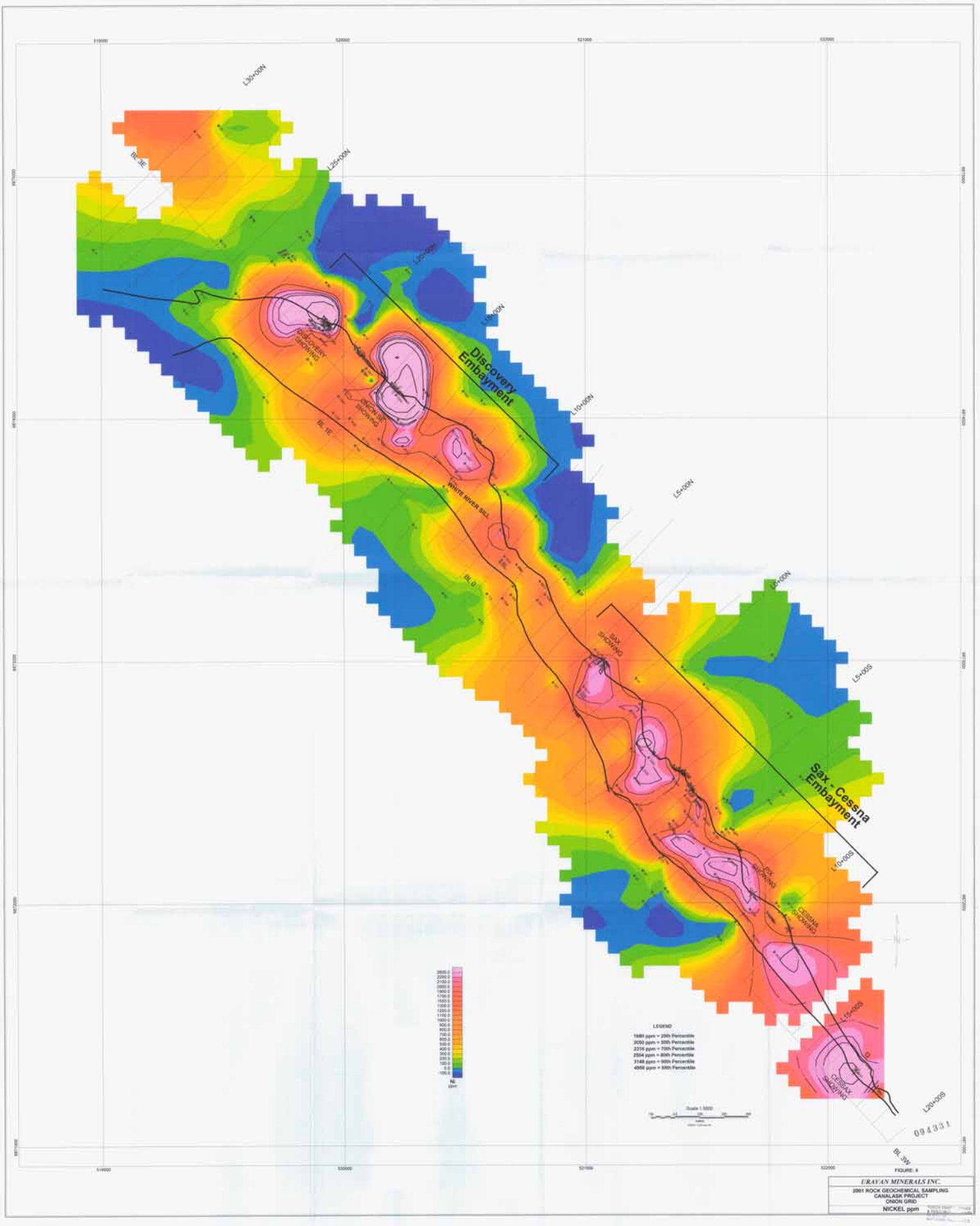
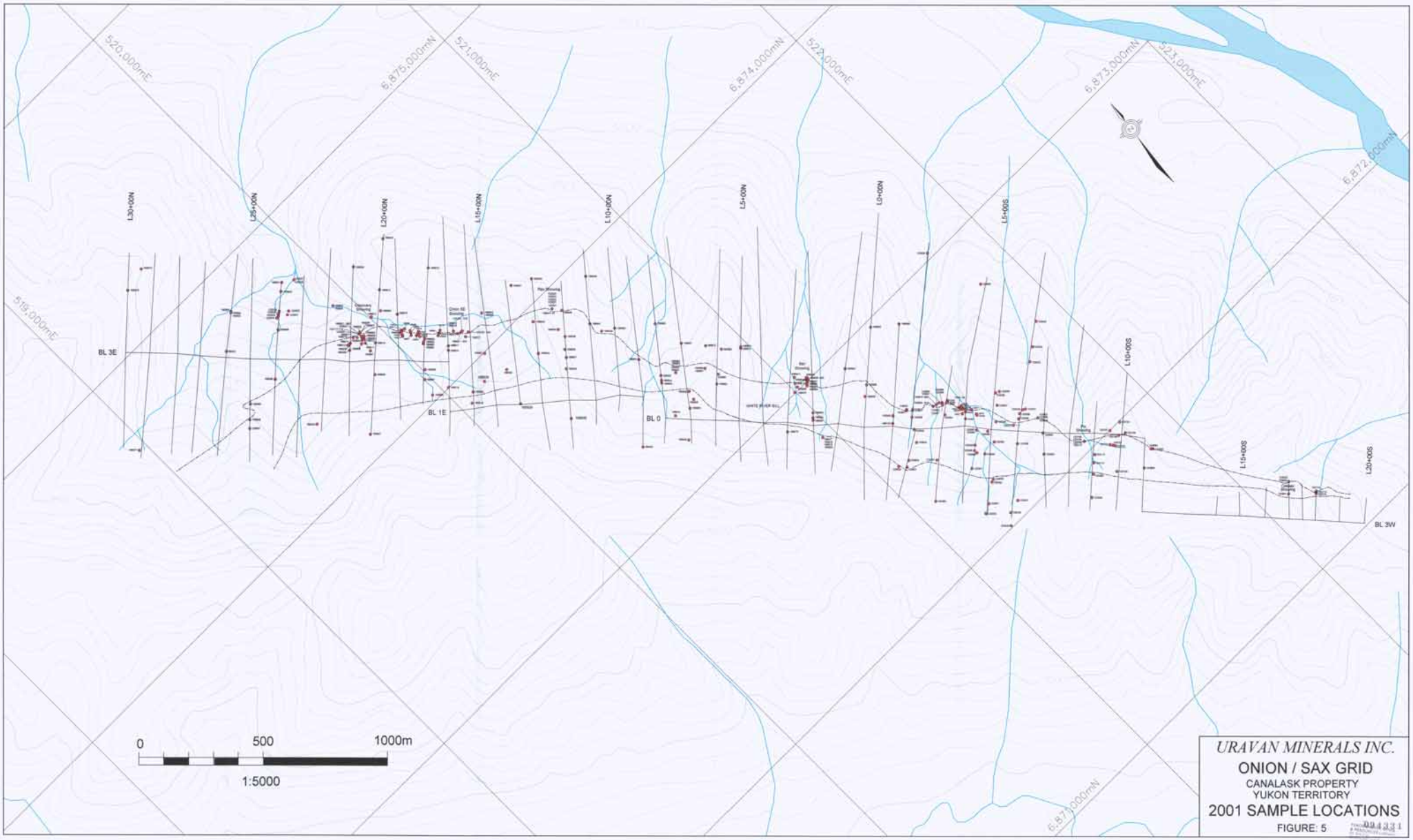


FIGURE: 4

URAVAN MINERALS INC.
2001 ROCK GEOCHEMICAL SAMPLING
CANALASK PROJECT
ONION GRID
NICKEL ppm



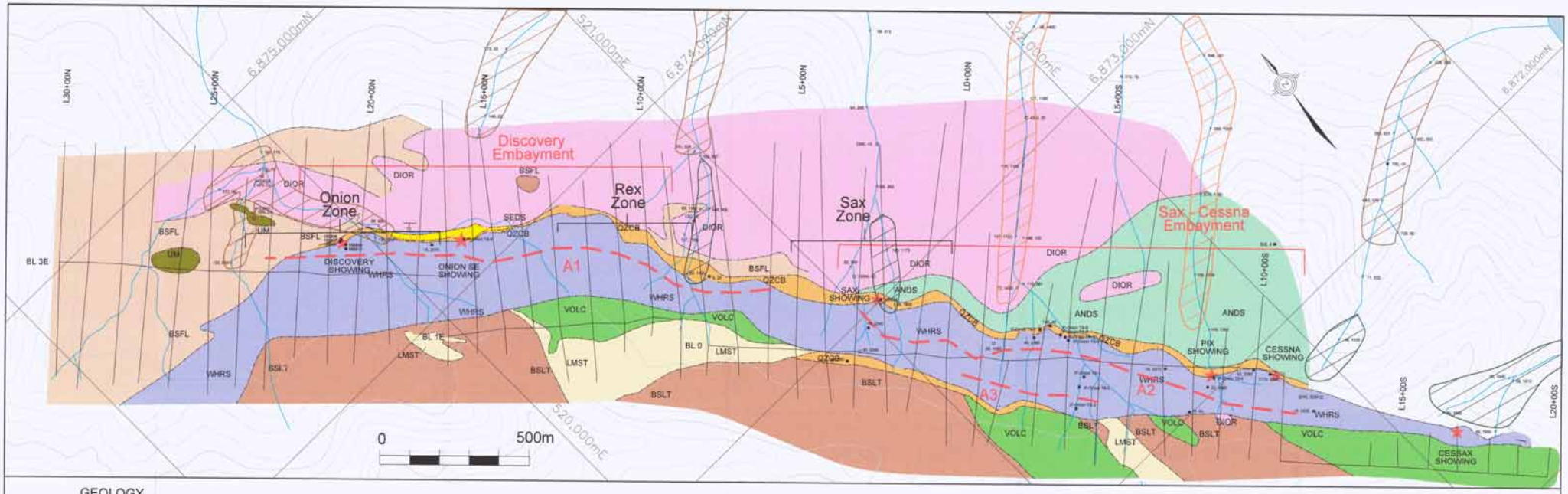
URAVAN MINERALS INC.

ONION / SAX GRID

CANALASK PROPERTY
YUKON TERRITORY

2001 SAMPLE LOCATIONS

FIGURE: 5



GEOLOGY

MIDDLE TRIASSIC
NIKOLAI GROUP
- Amygdaloidal basalt
- Massive limestone
- Lapilli tuff, volcanic breccia

WHITE RIVER MAFIC-ULTRAMAFIC COMPLEX
- Peridotite, dunite, pyroxenite, gabbro
- Peridotite

PENNSYLVANIAN TO LOWER PERMIAN
SKOLAI GROUP
Hasen Creek Formation
- Quartz carbonate alteration halo
- Silicious argillite

Station Creek Formation
- Diorite
- Massive andesite flows
- Massive basalt flows

HISTORICAL SAMPLE RESULTS

Discovery Showing:
1. 1956 Trench Sample: 16.9% Ni, 18.9% Cu
2. 1988 Trench sample: Gabbro 2% sulphides, 2.66% Ni, 1.08% Cu, 1131 ppb Pt, 1611 ppb Pd
3. 1988 GSC Sample: Up to 4.5% Ni, 0.91% Cu, 2000 ppb Pt, 1700 ppb Pd, 780 ppb Rh, 840 ppb Ir, 2500 ppb Ru, 1000 ppb Os

Onion SE Showing:
1. 1988 Grab Sample; Sheared Gabbro: 19.2% Ni, 0.02% Cu, 4100 ppb Au, 50 ppb Pt, 100 ppb Pd

Sax Showing:
1. 1988 Float Sample: 0.44% Ni, 0.22% Cu, 140 ppb Pt, 440 ppb Pd, 35ppb Au

Cessna Showing:
1. 1988 Chip Sample: 0.21% Ni, 0.18% Cu, 140 ppb Pt, 530 ppb Pd /4.0m

2001 TRENCH RESULTS

Sample #	Showing	Ni %	Cu %	Co %	Au g/t	PGE g/t
123117	Discovery	0.46	0.31	0.01	NS	1.08
123118	Discovery	0.29	0.15	0.01	NS	0.96
123119	Discovery	4.69	0.79	0.17	NS	6.83
166806	Discovery	3.71	0.60	0.14	NS	6.83
166807	Discovery	0.42	0.27	0.02	NS	1.29
166853	Discovery	0.75	0.22	0.03	NS	2.42
166855	Discovery	0.91	0.14	0.04	NS	0.98
166861	Discovery	0.26	0.17	0.02	NS	1.06
166862	Discovery	0.50	0.17	0.02	NS	2.30
123030	Onion SE	7.01	NS	0.05	8.69	0.23
123035	Onion SE	6.96	NS	0.11	3.08	0.10
123123	Onion SE	27.41	NS	0.18	30.61	0.38
123111	Pix	0.45	0.10	0.02	NS	1.02
166991	Sax	0.49	0.05	0.02	NS	0.92
123831	Cessax	0.38	0.08	0.02	NS	0.93

LEGEND

- Stream Sediment Silt Anomaly >100 ppm Cu
- Stream Sediment Silt Anomaly >1000 ppm Ni
- Stream Sediment Silt Anomaly >100 ppm Cu and > 1000 ppm Ni
- 2001 HLEM (MaxMin) Conductor Axis
- 1998 Silt Sample with Cu ppm and Ni ppm values
- 1998 Rock (float) Sample with Cu ppm and Ni ppm values
- 1998 Rock (outcrop) Sample with Cu ppm and Ni ppm values
- 2001 Petrographic Sample location
- 2001 Rock Sample location

URAVAN MINERALS INC.
ONION / SAX GRID
CANALASK PROPERTY
YUKON TERRITORY
COMPILATION MAP
FIGURE: 9

094331

APPENDIX C

URAVAN MINERALS INC.

CANALASK-ONION PROPERTY
2001 GROUND GEOPHYSICAL PROGRAM

N.T.S 115 F/15, 115 K/2

61° 58′ 21″N to 62° 0′ 46″N
140° 34′ 21″W to 140° 38′ 23″W

June - July, 2001

AURORA GEOSCIENCES LTD.
GEOLOGICAL AND GEOPHYSICAL CONSULTANTS
YELLOWKNIFE, NT CANADA
WHITEHORSE, YT CANADA

URAVAN MINERALS INC.

CANALASK-ONION PROPERTY
2001 GROUND GEOPHYSICAL PROGRAM

N.T.S 115 F/15, 115 K/2

61° 58′ 21″N to 62° 0′ 46″N
140° 34′ 21″W to 140° 38′ 23″W

June - July, 2001

094331

CANA 1-6
MICRO 1-4, 6, 10-12
WENG 1-11
WR 1-80, 83-96, 101-121

ONION 1-25
RIVER 1-8
WHITE 1-17

Report Prepared By

Georges Belcourt, B.Sc

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Aurora Geosciences Ltd.
Yellowknife, Northwest Territories

SUMMARY

Total magnetic field, horizontal loop electromagnetic field (HLEM) and induced polarization (IP) surveys were conducted on the Onion-Canalask Property for Uravan Minerals Inc. from June 16 to July 28, 2001. The surveys were conducted to locate heavily disseminated to massive sulphides in the White River Ultramafic Sill Complex west of the White River. A total of 34.4 line-km of total field magnetics were surveyed on one grid with an northwest-southeast striking base line. HLEM surveys utilized a 100 m coil separation and frequencies 220 Hz, 880 Hz, and 3520 Hz, with a total of 29.90 line-km recorded. Detail surveys were completed with a 150 m coil at frequencies 220 Hz, 880 Hz, and 3520 Hz, and a 50 m coil at frequencies 440 Hz, 1760 Hz, and 7040 Hz. Totals completed for the detailed surveys were 4.80 and 3.875 line-km respectively. The IP surveys were completed with a pole-dipole array with six dipoles read at a spacing of 25 m. A total of 7.60 line-km were completed on portions of twenty gridlines.

The total magnetics field anomalies follow the trend of the sill and are due to the presence of magnetic minerals in the sill itself. This data indicates a moderate to steep southwestern dipping structure.

The HLEM survey identified three conductive trends associated with the ultramafic sill. The northernmost anomaly, A1, lies within the sill and near the footwall contact. The strongest conductance is on L1800N where the conductor widens and the depth is estimated at 40 - 45 m. Anomaly A2 follows the trend of the sill on the south portion of the grid again near the footwall contact. The strongest conductance is on L175S where the depth is estimated at 55 m. The probability of sulphide mineralization is strongest on the portions of these anomalies where the responses widen and do not plot directly at the surface. Anomaly A3 exists to the southwest of A2 closer to the hanging wall contact of the sill. This anomaly is shallow and narrow, and is unlikely to be caused by sulphides in the sill.

The IP survey provided confirmation of the strongest areas of the anomalous trends. The survey increased the certainty of the location and the depth to top estimations from the HLEM survey.

HLEM and IP responses on the grid are affected by the weak conductance of the ultramafic sill. The net effect is to cause the conductors to appear to be weaker and shallower than they truly are.

Two drill holes are recommended in order to test the strongest portions of these anomalous trends. Upon completion with positive results, additional drill targets are recommended for further testing of the trends.

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 LOCATION AND ACCESS 1

1.2 PHYSIOGRAPHY 4

1.3 CLAIM INFORMATION 4

2.0 GEOLOGICAL SETTING 6

3.0 2001 GROUND GEOPHYSICAL PROGRAM 7

3.1 INTRODUCTION 7

3.2 MAGNETOMETER SURVEY 7

3.3 HORIZONTAL LOOP ELECTROMAGNETIC SURVEY 8

3.4 INDUCED POLARIZATION SURVEY 9

4.0 HLEM INTERPRETATION PROCEDURES 9

5.0 SUMMARY OF GEOPHYSICAL SURVEY RESULTS 11

6.0 CONCLUSIONS AND RECOMMENDATIONS 14

REFERENCES

STATEMENT OF QUALIFICATIONS

APPENDIX I SURVEY LOGS
APPENDIX II GEOPHYSICAL INSTRUMENTATION
APPENDIX III HLEM INTERPRETATION SUMMARY
APPENDIX IV IP INVERSION MODELS

LIST OF TABLES

Table 1.3 Claim Information Summary 4

LIST OF FIGURES

Figure 1.1a Location Map - Canalask-Onion Property 2

Figure 1.1b Camp and Grid Location 3

LIST OF MAPS

Total Field Magnetics Color Contours	1:10,000
Vertical Gradient Magnetics Color Contours	1:10,000
Horizontal Loop EM Profiles 100 m coil - 3520 Hz	1:10,000
Horizontal Loop EM Profiles 100 m coil - 880 Hz	1:10,000
Horizontal Loop EM Profiles 100 m coil - 220 Hz	1:10,000
Horizontal Loop EM Profiles 150 m coil - 3520 Hz	1:10,000
Horizontal Loop EM Profiles 150 m coil - 880 Hz	1:10,000
Horizontal Loop EM Profiles 150 m coil - 220 Hz	1:10,000
Horizontal Loop EM Profiles 50 m coil - 7040 Hz	1:10,000
Horizontal Loop EM Profiles 50 m coil - 1760 Hz	1:10,000
Horizontal Loop EM Profiles 50 m coil - 440 Hz	1:10,000
Induced Polarization Pseudosections - Line 2300N	1:2,500
Induced Polarization Pseudosections - Line 2200N	1:2,500
Induced Polarization Pseudosections - Line 2100N	1:2,500
Induced Polarization Pseudosections - Line 2000N	1:2,500
Induced Polarization Pseudosections - Line 2000N	1:2,500
Induced Polarization Pseudosections - Line 1900N	1:2,500
Induced Polarization Pseudosections - Line 1800N	1:2,500
Induced Polarization Pseudosections - Line 1700N	1:2,500
Induced Polarization Pseudosections - Line 1600N	1:2,500
Induced Polarization Pseudosections - Line 1500N	1:2,500
Induced Polarization Pseudosections - Line 200N	1:2,500
Induced Polarization Pseudosections - Line 100N	1:2,500
Induced Polarization Pseudosections - Line 0N	1:2,500
Induced Polarization Pseudosections - Line 100S	1:2,500
Induced Polarization Pseudosections - Line 200S	1:2,500
Induced Polarization Pseudosections - Line 300S	1:2,500
Induced Polarization Pseudosections - Line 400S	1:2,500
Induced Polarization Pseudosections - Line 500S	1:2,500
Induced Polarization Pseudosections - Line 600S	1:2,500
Induced Polarization Pseudosections - Line 700S	1:2,500
Induced Polarization Pseudosections - Line 800S	1:2,500
Induced Polarization Pseudosections - Line 900S	1:2,500

1.0 INTRODUCTION

This report summarizes the 2001 ground geophysical program completed during the months of June and July, 2001 on the Canalask-Onion Property. The project covers portions of the ONION, WHITE, and WR claim groups.

One large grid totaling 39.4 line km was surveyed in an attempt to locate heavily disseminated to massive sulphides in the White River Ultramafic Complex west of the White River. The targets were located at the base of the sill and offset mineralization in the footwall in correlation with previous geochemistry results and surface showings in the area. The ground geophysical program included total field magnetic surveying, horizontal loop electromagnetic surveying (HLEM), as well as induced polarization surveying over key areas on the grid. Handheld GPS readings were taken in order to properly convert the data collected into Universal Transverse Mercator (UTM) coordinates.

1.1 LOCATION AND ACCESS

The town of Koidern, YT lies on the Alaska Highway nearest to the project area. Koidern is located approximately 320 km Northwest of the City of Whitehorse, YT along the Alaska Highway and approximately 75 km Southeast of the Alaska border (Figure 1.1a). The project area covers parts of NTS map sheets 115 F/15 and 115 K/2 and is directly to the north of the Kluane National Park (Figure 1.1a). All of the work was completed on Miles Ridge (elevation 1,850 m) which has no direct road access but is accessible by helicopter. The fieldwork was completed out of a camp rented by Uravan Minerals Inc. located in the center of the project area at a latitude of 61° 59' 27.64" N, and a longitude of 140° 36' 21.95" W (Figure 1.1b). Access to the grid discussed in this report was by helicopter from the White River Lodge, and the day to day work was completed on foot.

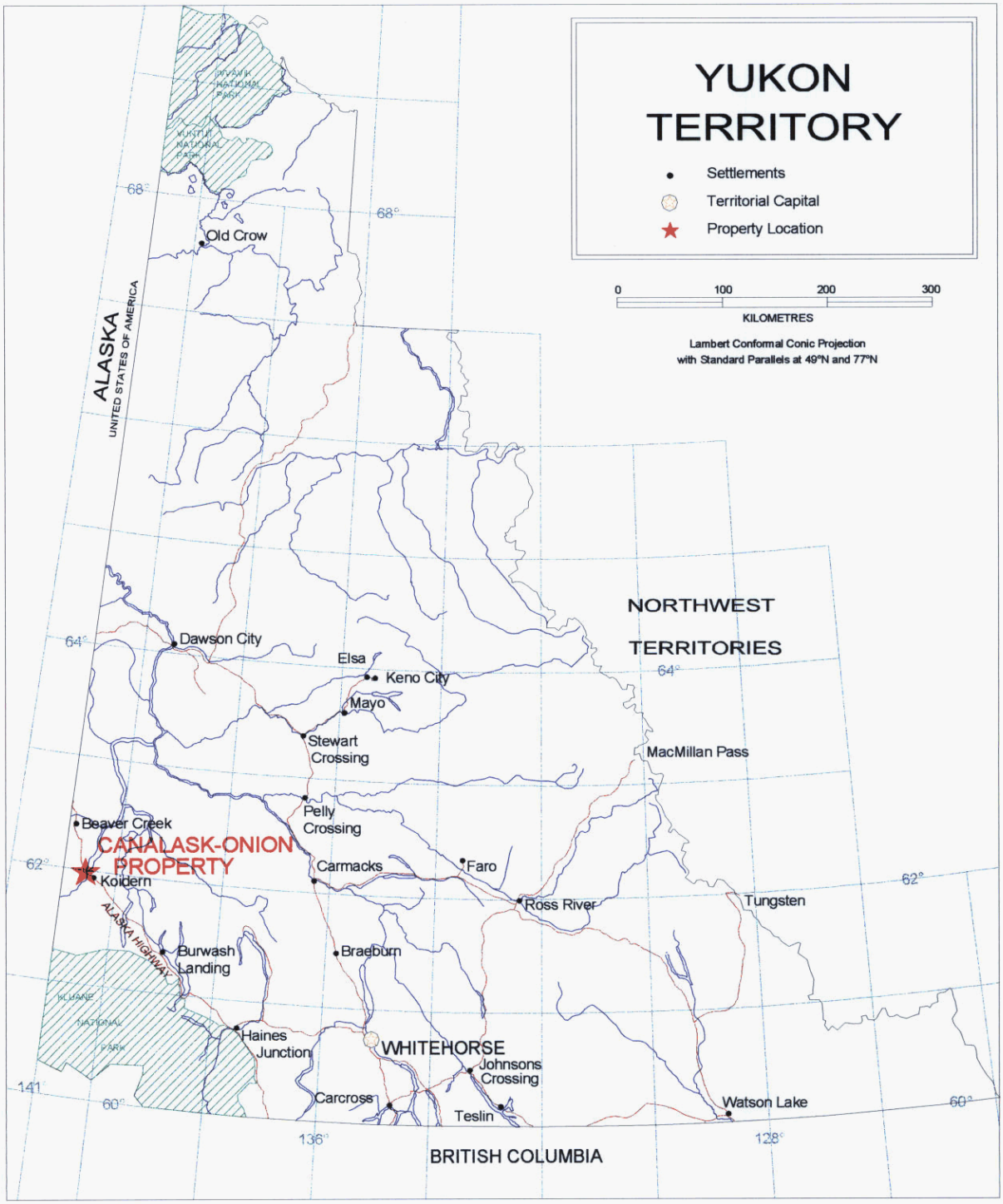

Figure 1.1a Location Map - Canalask-Onion Property

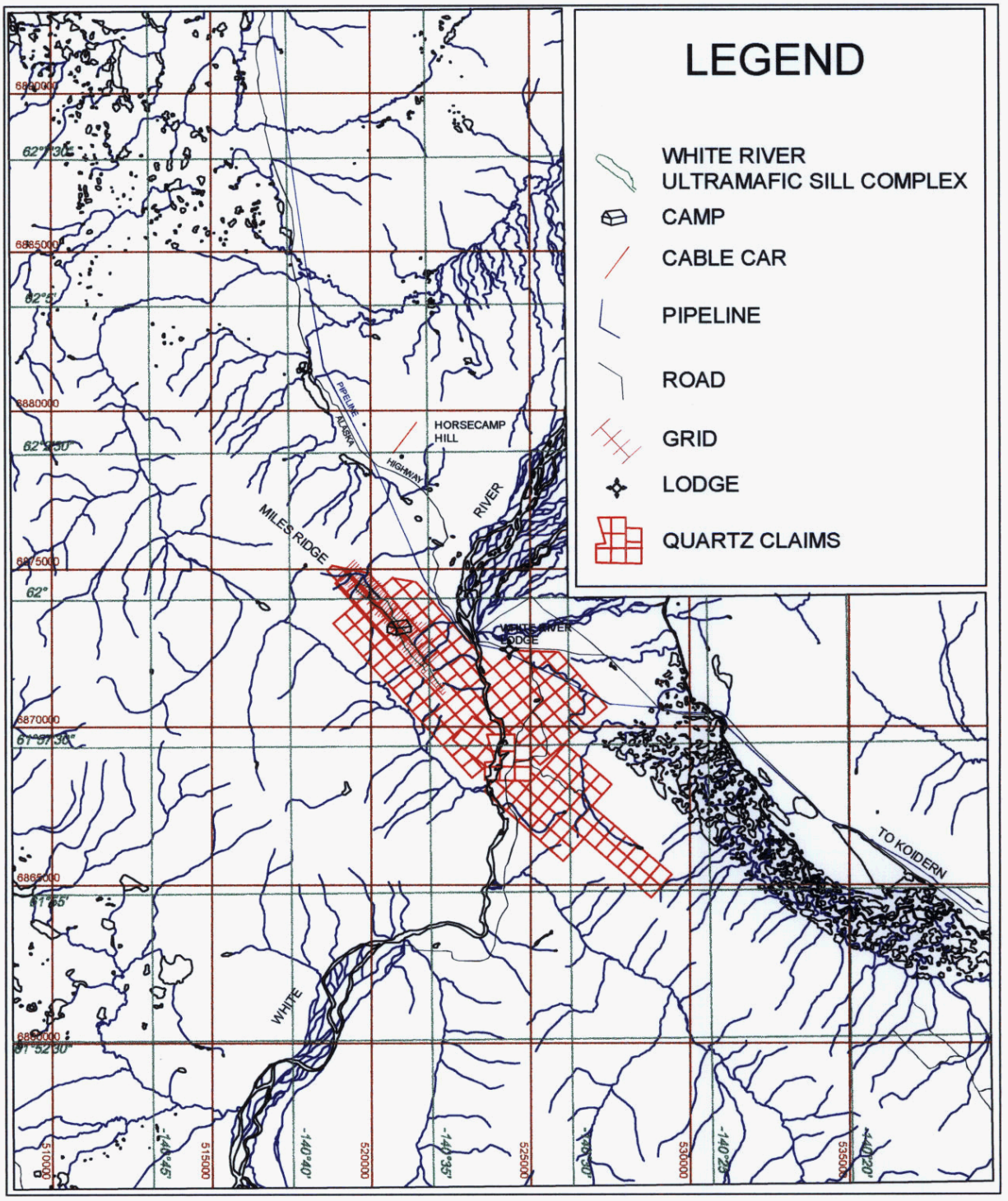

Figure 1.1b Camp and Grid Location

1.2 PHYSIOGRAPHY

The property is located in the Northern Coast Mountains Natural Region. Mountains and glaciers are the essence of this region. The Boundary ranges, and the St. Elias range are the major mountain systems making up this region. Mt. Logan, Canada's highest point at 5951 meters, is located in the St. Elias range.

The vegetation of this region is a composite of flora from the coast, the western mountains, the boreal forest, the northern prairies and the arctic. Most notably black spruce, white spruce, alders and willows in the valleys with sub-alpine grasses present at higher elevations.

The wildlife in this area consist mainly of large populations of grizzly and black bears. The largest sub-species of moose is found here with Dall's sheep, woodland caribou and mountain goats in abundance as well.

1.3 CLAIM INFORMATION

The Canalask Property consists of 192 claims staked in the Whitehorse Mining District, Yukon Territory. The claim information is summarized below in Table 1.3.

Table 1.3 Claim Information Summary

Claims	Record Number	Expiry Date
CANA 1-6	YA97083-YA97088	10th April, 2010
MICRO 1-2	86108-86109	10th April, 2010
MICRO 3-4	86111-86112	10th April, 2010
MICRO 6	86115	10th April, 2010
MICRO 10, 11, 12	86367, 86368, 86360	10th April, 2010
ONION 1-3	YA96595-YA96597	19th March, 2005

ONION 4-5	YA96598-YA96599	19th March, 2008
ONION 6-13	YA96600-YA96607	19th March, 2012
ONION 14-15	YA97913-YA97914	19th March, 2005
ONION 16-17	YA97915-YA97916	19th March, 2008
ONION 18-25	YA97917-YA97924	19th March, 2012
RIVER 1-8	YB38253-YB38260	10th April, 2011
WENG 1F, 2F	YA96585, YA96586	10th April, 2010
WENG 3-10	YA96732-YA96739	10th April, 2010
WENG 11	YB06099	10th April, 2011
WHITE 1-18	YB38234-YB38251	10th April, 2011
WHITE 20	YB38252	10th April, 2011
WR 1-20	YB96868-YB96887	10th April, 2006
WR 21-28	YB96888-YB96895	10th April, 2002
WR 29, 30F	YB96896, YB96897	10th April, 2002
WR 31, 32F, 33, 34F, 35-46	YB96898, 899, 900, 901, 902-913	10th April, 2002
WR 47-60	YB96914-YB96927	10th April, 2006
WR 61F, 62, 63F, 64, 65F, 66, 67-80	YB96928, 29, 30, 31, 32, 33, 34-47	10th April, 2006
WR 67-80	YB96934-YB96947	10th April, 2002
WR 83F, 84-96	YB96948, 949-961	10th April, 2002
WR 101F, 102, 103F, 104, 105F, 106, 107F, 108	YB97334, 35, 36, 37, 38, 39, 40, 41	10th April, 2005
WR 109-121	YB97352-YB97354	10th April, 2001

The registered owner of these claims is Expatriate Resources Ltd. Uravan Minerals Inc. has entered into an agreement with Expatriate Resources Ltd. whereby they can earn a 50% interest in the property by spending $1.2 million in exploration expenditures by August 1, 2003.

2.0 GEOLOGICAL SETTING

The Canalask-Onion property is located in the Kluane Mafic-Ultramafic Belt. The geology of the Kluane Belt is described by Hulbert (1995). The following discussion is based on this source.

The Canalask-Onion property is underlain by a steeply dipping package of Late Paleozoic and Early Mesozoic volcanic and sedimentary rocks. The Nikolai Group, which consists a thick sequence of Triassic Age basalt flows, overlies the Pennsylvanian to Lower Permian Age Skolai Group along an angular unconformity. The White River Mafic-Ultramafic Sill Complex has intruded this angular unconformity and now extends for a length of 20 km in the program area.

In the program area, the White River Sill trends roughly 320°, varies in thickness from 100 m to 275 m and dips steeply to the southwest. The sill itself is comprised of a marginal gabbro at the footwall of the intrusion and is overlain and grades into melano-gabbro, clinopyroxenite, peridotite and dunite. There exists a quartz-carbonate alteration zone on the footwall and hanging wall contacts. The olivine-rich dunite and peridotite have undergone serpentinization as serpentine is visualized in the rocks of the program area. The alteration process will produce serpentine together with brucite, talc and carbonates. Any iron components in the olivines with alter to magnetite.

The Wellgreen Deposit represents the most advanced property within the Kluane Belt and lies approximately 75 km to the southeast of the Canalask-Onion Property. The Wellgreen deposit has a historic production of 171, 652 tonnes grading 2.23% Ni, 1.39% Cu, 0.073% Co, and 2.15 g/t Pt and Pd. More recent exploration by Galactic Resources in the late 1980's outlined a "probable reserve" of 42,326,030 t grading 0.36% Ni, 0.35% Cu, 0.5 g/t Pt and 0.3 g/t Pd.

3.0 2001 GROUND GEOPHYSICAL PROGRAM

3.1 INTRODUCTION

A combination of sampling, geochemistry, airborne geophysics and ground geophysical methods is used for exploration for Platinum Group Minerals, Nickel and Copper (PGM-Ni-Cu) occurrences. Ground geophysics programs are utilized in order to exploit physical characteristics of the PGM occurrences or any other associated rocks/minerals. By combining all information, a drilling decision can be made in order to accurately test local anomalies.

The 2001 geophysical program was designed to locate and delineate magnetic anomalies and conductive responses that could be associated with massive to heavily disseminated sulphides at the base of the White River Ultramafic Complex and offset mineralization in the footwall. One grid was established by Uravan Minerals Inc. on Miles Ridge with a baseline matching the strike of the sill complex and winglines that were designed to cover the footwall and hanging wall contacts.

3.2 MAGNETOMETER SURVEY

Total field magnetometer surveys were completed over the entire grid for a total of 34.40 line-km. Gem Systems Inc. GSM-19 magnetometer consoles were used in the survey as field and base station units. The base station was set up outside the Uravan Minerals camp on Miles Ridge at latitude 61° 59' 28" N and longitude 140° 36' 22" W, taking readings every 10 seconds for the correction of diurnal variations. Operators leveled themselves over a common grid line each day in order to remove the variation between operators and instruments if/when they existed. Field readings were taken every 12.5 m along secant chained grid lines. The corrected magnetometer data was gridding using Geosoft Inc.'s BIGRID gridding algorithm which interpolates data onto grid nodes defined by 25 m cells.

In order to remove noise with a minimum amount of signal distortion, a 3x3 Hanning filter was applied in one pass for final smoothing. The first vertical derivative was applied to the total magnetic field data in order to enhance the most shallow sources in the data and top enhance the discrimination between neighboring anomalies. Lastly, a low pass filter was applied in order to remove high wavenumber noise. Total magnetic field and total field vertical gradient data has been colour gridded with a histogram equalization colour distribution and contoured at a scale of 1:10,000 (see maps in pocket).

3.3 HORIZONTAL LOOP ELECTROMAGNETIC SURVEY

The HLEM surveys were carried out on the entire grid with an Apex Parametrics I-10 Maxmin. Originally a coil separation of 100 m was used with readings taken every 25 m along slope chained grid lines. A total of 30.20 line-km were read using the frequencies 220, 880, and 3520 Hz. A second pass of detailed surveys was undertaken with a 150 m coil separation. A total of 4.8 line-km was surveyed on twelve lines. Readings were taken every 25 m along slope chained grid lines and utilizing frequencies 220, 880, and 3520 Hz. Another detailed survey was completed with a coil separation of 50 m utilizing frequencies 440, 1760, and 7040 Hz. Readings were taken every 12.5 m along slope chained grid lines for a total of 3.875 line-km on eleven separate lines. Slopes from station to station were measured for all Maxmin surveys with a handheld inclinometer, and a tilt correction was calculated and implemented in the field at each station to compensate for the slope chained pickets. A final correction was applied with Apex Parametrics' MMCFIX1 program to correct for any short intercoil spacing due to the difference in the picket chaining. The slope chained grid co-ordinates were converted to secant chained grid co-ordinates using the elevation information recorded in the Maxmin data files. The data is presented as profiles of the in-phase and quadrature measurements of each frequency of each coil separation and plotted at a scale of 1:10,000 (see maps in pocket). The data was converted from secant chained grid co-ordinates to UTM co-ordinates in NAD27 Yukon.

3.4 INDUCED POLARIZATION SURVEY

The induced polarization (IP) survey was completed over portions of twenty gridlines in order to delineate conductors that were observed in the maxmin data. The IP equipment consisted of a GDD Tx II transmitter and an Iris Instruments VIP 3000 transmitter, one Iris Instruments Elrec-10 receiver, and a Honda Generator. A pole-dipole type array was utilized for the entire survey with six dipoles (n=6) recorded at a separation of 25 m (a=25). The pole-dipole array was utilized since the original dipole-dipole array was producing voltages that were too low to successfully record chargeability data for n>3. A total of 7.6 line-km of data was recorded at 25 m stations on twenty lines with line 2000N read with both array types. The apparent resistivity and apparent chargeability data was recorded and plotted in pseudo-section format at a scale of 1:2,500 (see maps in pocket). As well, the raw data was input into the UBC Inversion program in order to create inversion models for both apparent resistivity and apparent conductivity (see Appendix IV).

4.0 HLEM INTERPRETATION PROCEDURES

Interpretation procedures for HLEM data are dependent upon the model to which the data is to be fitted. In most cases, the characteristic shape of the response will dictate the likely overall geometry of the source and thus the model to which the response should be fitted. Flat lying targets can be directly modeled with computerized calculations of target responses. Dipping tabular body responses on the other hand cannot be numerically modeled and must either be approximated through finite-element models or interpreted using characteristic curves. Characteristic curves for tabular dipping conductors incorporate several key features of the responses into simple charts. These responses are derived from model experiments. The ratio of positive shoulders responses and the ratio of in-phase to quadrature peak negative values are the commonly used features of the response.

A dipping tabular conductor can be specified by the dip and dip direction, depth to top, target width and electrical conductance (conductivity thickness product or σt). Asymmetry in the positive shoulders indicates the dip direction and the ratio of the positive shoulder responses can be used to estimate the dip. The strength of the response is largely determined by the depth to the top of the conductor. Increasing the depth to the top of the conductor decreases the amplitude of the response but does not otherwise change the shape of the response. The effective depth of investigation of the HLEM method for steeply dipping targets is approximately one half the coil spacing. If the conductor is wide, the location of the zero crossovers, normally equal to the coil spacing, will increase. If the width reaches approximately one half the coil spacing, the trough of the response for shallow targets will start to deflect slightly to the positive. If the width of the target approaches that of the coil spacing, the positive return in the trough will be apparent at any depth to target. As noted above, the electrical conductance (conductivity-thickness product or σt) controls the ratio of the in-phase to quadrature response. Weak targets show only a quadrature response. As the target conductance increases the strength of the in-phase component will increase. Very high conductance targets are characterized by strong in-phase responses and weak to very weak quadrature responses.

The data contained in this report was interpreted using characteristic curves developed by Ketola and Puranen (1967). The procedure, normally done by hand, has been automated in proprietary software (MMPLOT) developed by Aurora Geosciences Ltd. The characteristics of each response are entered into a computer program which creates a batch plotting file. The data is plotted directly on a CADD diagram with each of the characteristic curves on a different layer. The operator is able to quickly match the data to the curve which best fits the data by selecting different characteristic curves (ie. by changing layers). Where the data falls between two curves, the conductance and depth to top parameters can be interpolated but the dip cannot be reliably interpolated.

5.0 SUMMARY OF GEOPHYSICAL SURVEY RESULTS

In general, the total field magnetics exhibits a zone of high values with associated lows to the northeast. The response is consistent with a moderate southwestern dipping magnetic body. This magnetic anomaly is roughly continuous along the length of the sill and is located nearest to the hanging wall contact. The presence of magnetite would produce these higher values and could be expected in the ultramafic sill nearer the hanging wall contact, due to the alteration of the olivine-rich rocks present in this region. The vertical gradient magnetics produces anomalies which lie within the mapped boundaries of the sill. The vertical gradient anomalies indicate the magnetic sources responsible for the anomalies seen in the total field data that exist close to surface.

Three distinct anomaly trends are apparent in the HLEM data obtained with the 100 m cable. The anomaly trends are summarized below and line-by-line interpretation summaries are in Appendix III. Any responses observed in the detailed surveys will also be discussed and related to the anomalies below.

Anomaly A1

Anomaly A1 extends from L2300N, 330E to L600N, 200E. The response consists of a moderate to strong negative in-phase and stronger quadrature response at 3520 Hz with a much weaker, predominantly quadrature response at 880 Hz. The in phase anomaly is located within the outline of the sill, close to the footwall contact. This entire length of this HLEM anomaly exists directly to the north of the total field magnetic high. The quadrature is producing a negative response over the entire width of the sill. The entire ultramafic sill complex is a weak conductor as compared to the surrounding geology. This is due to the presence of disseminated conductive materials within the ultramafic complex. The response geometry consists of lows with flanking positive peak on either side. In several locations we can see an asymmetry in the flanking peaks with the peaks to grid west of larger amplitude than those to grid east. As well, we observe the negative peaks occurring further to grid east in the 50 m data set and further to grid west in the 150 m data set. These indicate a general dip direction to the southwest. The average dip of 61° was estimated from the characteristic

curves and gives a rough estimation of the actual dip across the anomaly.

In general, the low ratio of in-phase to quadrature response suggests that the source conductor has a low conductance. A moderate conductance target is interpreted between lines 1700N and 1900N and on lines 1300N and 1000N. Interpreted source parameters derived from a dipping plate model suggest an average σt between 1.0 and 2.0 Siemens at 3520 Hz. The best response appears to be that recorded at L1800N, 350E where the 150 m coil data at 3520 Hz suggests a possible target conductance of 7.1 Siemens. The depth to top estimates range from <5 m for the 50 m coil, to 42 m for the 150 m coil. The average depth to top value from the 100 m coil at 3520 Hz is 15 m.

The location of the IP anomalies closely matches those obtained with the HLEM. On most lines we see chargeability highs exist at the 40-45 m depth range. The depth increases to approximately 80 m on Line 2300N, and the chargeability highs are the shallowest on line 1800N, 1900N, and 2000N, roughly 10-15 m. The resistivity models contain anomalous lows in the same locations with the lowest values on lines 1700N through 2100N.

Anomaly A2

Anomaly A2 extends from L300N, 135E to L1100S, 115W. The response consists of a moderate to strong negative in-phase and associated quadrature response at 100 m coil separation and 3520 Hz. The anomaly axis lies roughly in the center of the sill, and the quadrature response entirely fills the area between the sill boundaries. This HLEM anomaly exists directly to the north of the total field magnetic high along it's entire length. Once again we observe the migration of anomaly peaks to the southwest as the coil separation and thus the depth of investigation increases. The negative peaks are flanked with positive anomalies which are asymmetric in some locations. The asymmetry again indicates a dip to the southwest, and the average dip estimated from the characteristic curves was 68°.

The ratio between the negative in-phase and quadrature peaks indicates a moderate to good conductance across the anomaly. Interpreted source parameters derived from a dipping plate model

suggest an average σt of 2.2 Siemens at 3520 Hz. The best response appears at L175S, 25E and L1100S, 115W where the 100 m coil at 3520 Hz suggest a possible conductance of 4.4 Siemens. The depth to top estimates range from 5 m for the 50 m coil, to 55 m for the 100 m coil. The average depth to top value from the 100 m coil at 3520 Hz is 45 m.

Again the IP survey outlines anomalous values which correspond with the HLEM anomaly location. The chargeability highs are shallowest on line 100S and 200S, about 10 m. The depth increases on lines to the north and the south to approximately 25-40 m. The resistivity models contain anomalous lows on lines 100S and 200S, and on lines 400S and 500S.

Anomaly A3

Anomaly A3 extends from L200N, 20E to L500S, 140W. The response consists of a weak to moderate negative in-phase and associated quadrature response at 100 m coil separation and 3520 Hz. The 50 m coil separation was able to discern between anomalies A2 and A3 on line 200N, 100N, and 0N. The anomaly axis runs parallel to anomaly A2 very close to the hanging wall contact of the sill and in the center of the total field magnetic high. Once again we observe a small migration of anomaly peaks to the southwest as the coil separation and thus the depth of investigation increases. With the closeness to anomaly A2 it is difficult to discern a consistent geometry. The anomaly migration indicates a dip to the southwest, and the dip can only be characterized as moderate to steep.

The ratio between the negative in-phase and quadrature peaks indicates a moderate to good conductance across the anomaly. Interpreted source parameters derived from a dipping plate model suggest an average σt of 1.4 Siemens at 3520 Hz. The best response appears at L175S, 25E and L500S, 130W where the 150 m coil at 3520 Hz suggest a possible conductance of 3.0 Siemens. The depth to top estimates were difficult to obtain due to the proximity of anomaly A2 and the complexity of the resultant curves.

The IP survey outlined this anomaly from line 100N through line 500S. The chargeability high

values are all very close to the surface with the majority of the responses at 5 m depth. The resistivity models contain moderate values in these locations.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The results of the total magnetic field, HLEM, and IP surveys support the following conclusions:

a. The magnetic field survey results suggest the presence of disseminated magnetite associated with serpentinization events in the ultramafic sill complex which strikes southeast-northwest and dips moderately to steeply southwest on the grid.

b. The ultramafic sill complex is weakly conductive as seen in the out-of-phase response of the HLEM data. Estimates of source conductance made from the 3520 Hz data are probably too low and estimates of depth to top are probably too shallow.

c. Anomaly A1 follows the strike of the sill complex and is located close to the footwall contact. The anomaly indicates a dip to the southwest and an average dip of 61° was estimated from characteristic curves. The apparent width of the source body increases on Lines 1700N through 1900N suggesting the source conductor is wider in this area. The strongest conductive response is at L1800N, 350E where the conductance was estimated at 7.1 Siemens. Depth estimates in this location are between 40 and 45 m. This conductor may be caused by disseminated sulphide mineralization given the apparent moderate conductance and its location within the sill complex.

d. Anomaly A2 also follows the strike of the sill complex and is located near the center and closer to the footwall contact of the sill. The data indicates a dip to the southwest, with an estimated average dip of 68°. The best response exists on L175S, 25E where the conductance was estimated at 4.4 Siemens and the depth to top estimated at 55 m. This conductor may be caused by disseminated or massive sulphide mineralization given the

apparent moderate to strong conductance and its location within the sill complex.

e. Anomaly A3 follows the strike of the sill complex and is located to the southwest of Anomaly A2. This anomaly is shallow and narrow and with its location higher up in the sill geology it is unlikely to be caused by massive or disseminated sulphides.

The following recommendations are made based on the conclusions of this work:

i. HLEM Anomaly A1 should be drill tested at L1800N, 350E by a hole extending to a depth of at least 75 m. The available geophysical data indicates that strata are dipping to the southwest in this location.

ii. HLEM Anomaly A2 should be drill tested at L175N, 25E by a hole extending to a depth of at least 75 m. The available geophysical data indicates that strata are dipping to the southwest in this location.

iii. If positive results are obtained, additional drill locations at L1900N, 375E; L1700N, 375E; L1200N, 375E; L200N, 50E; and L500S, 25E may be tested.

Respectfully submitted,
AURORA GEOSCIENCES LTD.

Georges Belcourt, B.Sc.
Geophysicist

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STATEMENT OF QUALIFICATIONS

I, Georges Belcourt, of the City of Yellowknife, in the Northwest Territories, Canada,

HEREBY CERTIFY:

That my address is 3502 Raccine Road, Yellowknife, NT X1A 3J2

That I am a graduate of the University of Saskatchewan in Geophysics:

B.Sc. - The University of Saskatchewan, 1996

That I have been a practising Geophysicist since 1996:

September 1996 - March 1997	Delta Geosciences Ltd. Delta, BC Geophysicist
April 1997 - December 2000	Covello, Bryan & Associates Ltd. Yellowknife, NT Geophysicist
January 2001 to present	Aurora Geosciences Ltd. Yellowknife, NT Geophysicist

That I am a Geophysicist in the Northwest Territories, Canada.

Dated this 10th day of October, 2001 at Yellowknife, NT

Georges Belcourt

Georges Belcourt, Geophysicist

APPENDIX I

SURVEY LOGS

SURVEY LOG

JOB UVN-91-YT

June 16 - July 15, 2001

Personnel: Georges Belcourt (GB), Geophysicist, Aurora Geosciences Ltd.
Scott Casselman (SC), Technician, Aurora Geosciences Ltd.
Jim Barr (JB), Labourer/Technician, Uravan Minerals Inc.
Graham Marsh (GM), Labourer/Technician, Uravan Minerals Inc.
Joe Dion (JD), Geologist, Uravan Minerals Inc.
Ian Fraser (IF), Project Geologist, Uravan Minerals Inc.

Sat 16 June 01 — Drove from Whitehorse to White River and awaited chopper to move all of our gear to the camp. Moved in and started to unpack, very steep terrain noted.

Sun 17 June 01 — Good wx, clear in AM, slightly overcast by 10 AM, clear and hot in afternoon. GB & SC performed magnetics starting on either ends of the grid. Large walking distances, steep terrain and a late start contributed to the lower production. JB & GM walked with JD & IF to sample and trench for the day.

Production: Magnetics 6.113 line-km

Mon 18 June 01 — Wx report - broken clouds at camp in AM, dark storm clouds with rain to north, by afternoon clear and hot. SC continues to perform magnetics on southern portion of grid, GB on northern portion. Better production, but slow due to steep terrain. JD, IF, GM and JB continue trenching at Onion Showing.

Production: Magnetics 7.193 line-km

Tues 19 June 01 — Wx report - broken clouds in AM, rain during the night. Storm clouds with thunder and lightning after 4pm. GB & SC continue on magnetics as per yesterday. JD, IF, GM and JB continue trenching and sample at Onion Showing.

Production: Magnetics 7.820 line-km

Wed 20 June 01 — Wx report - scattered clouds, cool breeze. Mag crews stopped early due to thunder and lightning on the grid at 4:10pm. GB & SC magging. JD, IF, GM, and JB continue trenching, sampling and mapping near the discovery showing.

Production: Magnetics 9.100 line-km

Thurs 21 June 01 — Wx report - hot and sunny. Helicopter arrives at 9am with food, generator and leaves with Ian and some samples. GB & SC finish the mag with overlap on line 1000N. Back to camp at 1:30pm. JD, JB & GM continue geology work on the north end of the grid. SC builds shower in the afternoon and GB processes mag data and preps for Maxmin work tomorrow.

Production: Magnetics 2.774 line-km

Fri 22 June 01 — Wx report - smokey today, overcast and rain in the afternoon. GB & SC Maxmin starting on the farthest north gridline. A good day, except for the rain. JD sampling along the north grid lines, JB and GM continue trenching at the onion zone.

Production: Maxmin 2.550 line-km

Sat 23 June 01 — Wx report - overcast, rainy morning, clearing afternoon. GB & SC Maxmin after rain slowed down and the hail stopped. JD, GMm, & JB had a camp day.

Production: Maxmin 2.225 line-km

Sun 24 June 01 — Wx report - clear, sunny very warm with a light breeze. SC & GB Maxmin again today with much success. A good day walking with few problems. JD, GM & JB trenching and sampling along the onion showing.

Production: Maxmin 2.725 line-km

Mon 25 June 01 — Wx report - warm, hazy smoke in the area still. GB & SC Maxmin again today. JD, GM & JB trenching and sampling.

Production: Maxmin 2.350 line-km

Tues 26 June 01 — Wx report - cool, light breeze, with forest fire smoke clearing in afternoon. Two earthquakes this morning between 7-8am. GB & SC Maxmin today. JD, GM & JB continue trenching and sampling. Bear in camp upon return home today. Scared it away, but it made a mess of the food in the kitchen.

Production: Maxmin 2.975 line-km

Wed 27 June 01 — Wx report - sunny, warm. More forest fire smoke. Bear back again in the morning at breakfast. Tried to scare away without success, SC shot and killed bear just outside of camp. GB & SC Maxmin again. Problems with crooked lines, crossing over in the steep valleys and a broken cable slowed production this afternoon. JD, GM & JB continue trenching and sampling.

Production: Maxmin 2.275 line-km

Thurs 28 June 01 — Wx report - smokey, clearing and warm. Mining Inspector arrived this morning at 10am with the food heli flight. Conservation Officer drove from town and was brought up with the heli. Bear was slung out, and inspection went well. The Officer suggested an electric fence. Out to work at 12:30pm, GB & SC Maxmin. JD, JB & GM sample/map Sax showing close to camp.

Production: Maxmin 1.375 line-km

Fri 29 June 01 — Wx report - sunny and hot. Clouds threaten rain but none arrives. SC & GB Maxmin through the camp valley. JB and GM trench, JD maps and samples around 1700 N.

Production: Maxmin 2.975 line-km

Sat 30 June 01 — Wx report - overcast with sunny breaks, light rain in the morning. GB & SC cut and grid lines for extensions. JD map and sample, GM and JB trenching.

Production: Cutting/Gridding 0.750 line-km

Sun 1 July 01 — Wx report - overcast with intermittent rain showers. GB & SC cut and grid for extensions. JD mapping, JB and GM trenching.

Production: Cutting/Gridding 0.450 line-km

Mon 02 July 01 — Wx report - storm through the night, much rain and hail, today sunny, hot and humid. GB & SC cut and grid, GB mag extensions, SC gps south end of grid. JB, JD and GM trench, sample and map.

Production: Cutting/Gridding 0.200 line-km
Magnetics 1.4 line-km

Tues 03 July 01 — Wx report - hot and humid, sunny with few clouds. GB & SC back on the Maxmin, no problems. JD samples and maps, JB and GM trench.

Production: Maxmin 2.575 line-km

Wed 04 July 01 — Wx report - overcast, light rain through the day. SC & GB continue Maxmin. Cable broke at 4pm, fixed and continued until after 5pm. GM and JB trenching, JD mapping and sampling.

Production: Maxmin 2.900 line-km

Thurs 05 July 01 — Wx report - overcast, cool wind, light rain through the day. GB & SC continue Maxmin. Cable broke twice today, fixed in the field. GM and JB trench, JD mapping and sampling. IF into camp today with food flight.

Production: Maxmin 2.575 line-km

Fri 06 July 01	Wx report - overcast, cool wind, light rain through day. GB & SC continue Maxmin in southern area. In am contact Holly to arrange for IP survey to follow Maxmin survey. IF and JD tour northern showings. JB and GM trench in southern area.	
Production:	Maxmin	1.525 line-km
Sat 07 July 01	Wx report - heavy rain and some snow through night and into AM. Too wet to survey - standby day. SC out to town.	
Sun 08 July 01	Wx report - heavy fog/cloud. Rain later in the day with sunny breaks. GB & JB finish Maxmin on the regular grid. Move gear to L500S for detailed surveys beginning tomorrow. IF and JD prospect and map southern part of grid, GM trenching and sampling.	
Production:	Maxmin	1.175 line-km
Mon 09 July 01	Wx report - overcast, rain showers clearing in the late afternoon. GB & GM begin detailed Maxmin survey with 50m coil on the south part of the grid. IF and JD mapping and prospecting in the south while JB continues trenching.	
Production:	Maxmin 50m	2.075 line-km
Tues 10 July 01	Wx report - cloudy with sunny breaks, few rain showers and hail. GB & JB continue detailed Maxmin with 150m cable and 50m cable. IF and JD mapping and prospecting in the south with Graham trenching along the footwall contact. JD saw a brown bear late in the day close to line 175S.	
Production:	Maxmin 50m Maxmin 150m	0.850 line-km 0.775 line-km
Wed 11 July 01	Wx report - sunny and warm, all day! GB & GM continue detailed Maxmin with 150m coil on line 400S and 50 mm coil on line 200N. Then moved all the gear to line 2300N for 150m coil starting tomorrow. JD and IF mapping, JB trenching.	
Production:	Maxmin 50m Maxmin 150m	0.350 line-km 0.375 line-km
Thurs 12 July 01	Wx report - sunny and warm. GB & JB Maxmin starting on L2300N. Broken cable in the morning required the cutting and splicing of the 100m and 50m cable. Started surveying at 1:30pm. JD and IF mapping, GM trenching.	
Production:	Maxmin 150m	1.425 line-km

Fri 13 July 01 — Friday the 13th!! Wx report - sunny and warm, rain at 4:15pm. GB & GM continue 150m cable Maxmin. Broken cable around lunchtime and once after lunch slowed production. JD, IF and JB mapping, JB carried samples.

Production: Maxmin 150m 1.200 line-km

Sat 14 July 01 — Wx report - rain, cloud and rain, all night and all day. Not able to survey, Standby day.

Sun 15 July 01 — Wx report - sunny and warm. GB & JB finish 3 lines 150m cable Maxmin and 2 lines 50m cable Maxmin. Back to camp, pack up. Mobe out at 4:30, heli to White River Lodge, and drive truck to Whitehorse.

Production: Maxmin 150m 1.025 line-km
Maxmin 50 m 0.600 line-km

(Cut/Grid total 1.400 line-km)
(Magnetics total 34.400 line-km)
(50m coil total 3.875 line-km)
(100m coil total 30.200 line-km)
(150m coil total 4.800 line-km)

SURVEY LOG

July 16 - July 28, 2001

PERSONNEL:
Kevin Gerlitz (KG), Geophysicist, SJ Geophysics
Suzanne Aichele (SA), Geotechnician, Aurora Geosciences Ltd.
Graham March(GM), Geotechnician, Uravan Minerals Inc.
Jim Barr (JB), Geotechnician, Uravan Minerals Inc.

July 16, 2001 KG demobes from Smithers to Whitehorse by airplane via Dease Lake to Watson Lake. Plane 3 hours late due to weather in Dease Lake. Drove blue pick up truck to Whitehorse. Arrive Whitehorse 9 pm.

July 17, 2001 KG checks out equipment in Whitehorse including testing out VIP 3000 transmitter.

July 18, 2001 Demobe from Whitehorse to White River Lodge. Meet HeliDynamics helicopter and move gear to camp. Send the IP gear to Line 2000N - in the first section of the grid.

July 19, 2001 Started reading Line 2000N with the VIP 3000 - but it blew up on the first reading. Shows 250V on the meter but will not start up - no display on screen, no buttons light up, etc... Finished reading line 2000N from 450E to 100E with the GDD transmitter. Received voltages were too low for readings greater than n=3 to successfully record the chargeability data. KG decides to switch to pole-dipole for better signal. Crew lays out infinity (located at approx. 2850N, 300E). KG makes a few sat phone calls at night to SJ Geophysics regarding TX. KG phones IF and advises him of the situation - receives full endorsment of decisions made. Also advised that, if a larger TX is required, one may be flown up from Whitehorse.

Daily Production: 0.350 km
Project Production: 0.350 km

July 20, 2001 Reread Line 2000N with the pole-dipole array from 500E to 100E. Values appeared fairly similar but a stronger signal was obtained for the deeper dipoles. Line was extended to ensure that some background values were obtained from the footwall side (as per KG's recommendation to IF). Read Line 2100N from 500E to 100E. Set-up cables on Line 2200N.

Daily Production: 0.800 km
Project Production: 1.150 km

July 21, 2001 Read lines 2200N (from 500E to 150E: 0.35km), line 2300N (from 500E to 150E: 0.35 km) and line 1900N (from 550E to 150E: 0.400 km). Determined that we have 4 more lines in North end of grid - should be finished early Monday. Started raining at 7 pm. Phoned and advised Holly of Aurora that we would need a helicopter on Monday.

Daily Production: 1.100 km
Project Production: 2.250 km

July 22, 2001 Raining in morning - bit of a late start (8:30 am). Read lines 1800N (from 500E to 150E: 0.35 km), 1700N (from 550E to 100E: 0.45 km) and line 1600N (from 550E to 150E: 0.400 km). Phoned Holly and told her that we would be finished the northern grid on the 23rd. Spoke with IF and told him that we would be moving the Tx site on the 23rd.

Daily Production: 1.200 km
Project Production: 3.450 km

July 23, 2001 Read line 1500N from 500E to 150E (0.350 km). Packed up the Tx site for slinging by helicopter to the next grid. Lots of rain and clouds - difficult flying conditions. Helicopter arrives at 5:15 pm. Transfered TX site to ridge on 50N / 0E. Exchanged VIP 3000 transmitters. Sent in data diskettes.

Daily Production: 0.350 km
Project Production: 3.800 km

July 24, 2001 Heavy rain and wind in morning - did not leave camp until 11 am. Set-up the infinity at approx 400N, 100W. Set up new transmitter site. Read lines 200N from 50W to 225E (extended in order to attempt to close high chargeability anomaly) and 100N from 100W to 225E (0.325 km). Set up cables on line 0N.

Daily Production: 0.600 km
Project Production: 4.400 km

July 25, 2001 More heavy rain, wind and hail - left camp at 9 am. Read lines 0N (from 100W to 150E: 0.25 km), 100S (from 200W to 125E: 0.325 km) and 200S (from 200W to 150E: 0.35 km).

Daily Production: 0.925 km
Project Production: 5.325 km

July 26, 2001 Finally: half-decent weather! Still had a bit of rain and a bit of everything else. Read line 300S from 200W to 150E (0.350 km), line 400S from 200W to 150E (0.350 km), line 500S from 250W to 150E (0.400 km) and line 600S from 150W to 150E (0.300 km). Camp was approached by a black bear in the late afternoon - thus we were unable to setup on line 700S. Phoned Holly and told her of our need for the helicopter on Sunday for demobilization. Attempted to call IF but not at home.

Daily Production: 1.400 km
Project Production: 6.725 km

July 27, 2001 Nice weather for surveying. Read lines 700S (from 150W to 150E: 0.300 km), line 800S (from 150W to 100E: 0.250 km) and line 900S (from 200W to 125E: 0.325 km). Arranged for helicopter for the 28th for demobilization. Packed up kitchen tent.

Daily Production: 0.875 km
Project Production: 7.600 km

July 28, 2001 Packed up other tents. Demobed to Whitehorse. Helicopter arrived at 12 noon with Yukon Government geologist. Slung camp and equipment to White River and drove (with 2 pick-up trucks) to Whitehorse. Arrived in Whitehorse at 8 pm and unpacked one truck.

APPENDIX II

GEOPHYSICAL INSTRUMENTATION

GSM-19 MAGNETOMETER

The instrument to be used is the GSM-19 magnetometer system designed and manufactured by GEM Systems Inc.

The GSM-19 system is a portable microprocessor based magnetometer system that is capable of measuring changes or contrasts in the earth's magnetic field. The data is both sensitive and highly repeatable.

The GSM-19 is a multi-purpose instrument designed to operate as either:

1. Total field magnetometer (Mobile Mode)
2. Total field magnetometer (Walkmag Mode)
3. Total field base station magnetometer
4. Gradiometer (Mobile or Walkmag Mode)

In addition, this unit may be used to conduct VLF electromagnetic surveys in conjunction with or separately from any of the magnetic survey modes.

The primary purpose of the gradiometer system is to measure and store the gradient of the earth's magnetic field in the vertical direction. Magnetic measurements are obtained by the use of an Overhauser effect sensor. The Overhauser effect offers a more powerful method of proton polarization than standard DC polarization. Stronger signals are achieved from smaller sensors, and with less power. Readings can therefore be taken at intervals as low as .5 seconds.

The ability to take readings at small intervals allows the GSM-19 to be used in the walkmag mode. In the walkmag mode the instrument is continuously taking readings at one of these intervals (.5 s, 1 s or 2 s) selected by the operator. As the operator walks the grid line he/she records station locations at a fixed interval along the line (i.e. 5, 10 or 20 m). The locations for readings taken between the fixed intervals are interpolated using the time it takes the operator to walk the fixed interval. This method allows the collection of high density data, useful for the evaluation of narrow and more subtle magnetic anomalies.

Readings collected by the field unit require corrections for magnetic diurnal variations. Corrections are performed internally by connecting the field unit with a compatible base station unit. The data is stored with grid lines and coordinate labels, and is then plotted and contoured on the appropriate grid maps.

HORIZONTAL LOOP EM SURVEYS

The instrument used is a Max-Min I-10 EM manufactured by Apex Parametrics Ltd.

It consists of a transmitting coil and a receiving coil spaced 25, 50, 100, 150, 200, 250, 300, or 400 m apart and connected with a reference cable of approximate length. The two coils are used as an in-line system, traversing across geologic strike. The transmitting coil produces a primary electromagnetic field at a frequency of 110, 220, 440, 880, 1760, 3520, 7040, 14080, 28160, or 56320 Hz which will induce a current within any nearby conductive bodies. This current gives rise to a secondary electromagnetic field, the intensity of which is measured along with that of the ambient primary field as the resultant field at the receiving coil. The in-phase and out-of-phase components of the resultant field are measured as a percentage of the primary field as dictated by the reference cable from the transmitter.

The in-phase and out-of-phase values are plotted at a datum point located midway between the two coils. When the coils straddle a conductor the values subtract giving negative readings over the conductor and weak positive shoulders off to either side, depending on factors such as depth to source and conductive overburden. The quality of conductivity is a function of the in-phase to out-of-phase ratio at the conductor axis. The higher the ratio the better the conductivity.

APPENDIX III

HLEM INTERPRETATION SUMMARY

YUKON ENERGY, MINES
& RESOURCES LIBRARY
P.O. BOX 2703
WHITEHORSE, YUKON Y1A 2C6

Anomaly: A1										Excess					Depth
Line	Intersection	Re1	Im1	Re2	Im2	Re3	Im3	Freq	Coil Sep	Width	h/a	dip	W	sigma*t	to top
2300N	330E	16.62	13.68	-8.93	-17.43	3.31	2.17	3520	100	0	0.25	?	1.75	0.6297	25
2200N	340E	26.97	20.33	-8.66	-22.7	18.24	8.96	3520	100	0	0.18	?	1.75	0.6297	18
2100N	355E	26.33	11.01	-15.01	-31.58	10.07	6.23	3520	100	0	0.26	?	1.75	0.6297	26
2000N	355E	23.72	10.07	-7.8	-41.66	19.95	-4.37	3520	100	0	0.12	45?	3	1.0794	12
1900N	375E	18.87	9.99	-45.33	-52.34	10.01	8.06	3520	100	65	0.1	50	5.26	1.8926	10
1800N	360E	28.22	20.58	-36.54	-52.06	28.12	11.22	3520	100	0	0.11	?	5.26	1.8926	11
1700N	380E	28.75	-1.1	-22.54	-45.49	5.73	10.98	3520	100	40	0.22	?	5.26	1.8926	22
1600N	350E	32.13	4.69	-16.77	-43.27	28.64	19.94	3520	100	0	0.1	50	1.75	0.6297	10
1500N	355E	17.06	5.56	-6.75	-41.73	15.45	10.4	3520	100	7	0.1	63	1.75	0.6297	10
1400N	370E	12.38	15.94	5.47	-26.85	-	-	3520	100	0	?	?	1.75	0.6297	?
1300N	390E	8.8	6.87	-6.15	-23.1	9	3.72	3520	100	0	<0.1	70	5.26	1.8926	<10
1200N	375E	31.51	-3	-27.44	-37.69	14.04	7.92	3520	100	0	0.15	?	5.26	1.8926	15
1100N	350E	31.11	-1.35	-21.32	-31.14	15.91	7.13	3520	100	0	0.18	32	1.75	0.6297	18
1000N	300E	-	-	-2.47	-39.47	-	-	3520	100	0	0.18	70	5.26	1.8926	18
900N	225E	-	-	-26.58	-45.18	-	-	3520	100	0	?	?	5.26	1.8926	?
800N	180E	-	-	-20.7	-41.36	-	-	3520	100	0	?	?	1.75	0.6297	?
700N	180E	-	-	-10.57	-36.51	-	-	3520	100	0	?	?	1.75	0.6297	?
600N	200E	22.28	-6.38	-6.43	-26.84	5.92	7.96	3520	100	0	?	?	5.26	1.8926	?
2300N	350E	39.12	12.12	-22.12	-22.85	-	-	3520	150	0	0.22	?	5.26	1.2617	33
2200N	325E	23.05	-4.74	-35.15	-28.12	30.45	5.19	3520	150	0	?	?	5.26	1.2617	?
2100N	325E	29.79	-3.63	-38.14	-37.51	26.2	5.22	3520	150	10	0.28	60	5.26	1.2617	42
2000N	370E	19.87	8.44	-54.69	-38.47	-	-	3520	150	0	0.12	?	7	1.6791	18
1900N	370E	23.13	21.87	-69.29	-39.53	20.76	13.15	3520	150	70	<0.1	80?	10	2.3987	<15
1800N	350E	27.22	20.58	-88.3	-27.92	8.19	-12.01	3520	150	15	<0.1	?	29.7	7.1241	<15
1700N	375E	26.27	-20.39	-76.47	-44.66	20.76	20.68	3520	150	0	<0.1	?	12.3	2.9504	<15
1600N	335E	29.02	23.94	-71.3	-50.73	27.95	3.31	3520	150	10	<0.1	80?	10	2.3987	<15
1500N	320E	21.61	18.45	-54.53	-48.69	18.43	3.83	3520	150	15	<0.1	75?	5.26	1.2617	<15
1600N	335E	29.14	15.82	1.79	-13.40	16.70	14.50	7040	50	25	<0.1	80?	1.00	0.3598	<5
1700N	350E	38.49	20.48	-0.39	-21.07	25.58	10.37	7040	50	10	<0.1	?	1.00	0.3598	<5

Anomaly: A2										Excess						Depth
Line	Intersection	Re1	Im1	Re2	Im2	Re3	Im3	Freq	Coil Sep	Width	h/a	dip	W	sigma*t	to top
300N	135E	19.38	-9.59	-16.24	-24.67	11.76	10.54	3520	100	0	0.13	53	5.26	1.8926	13
200N	50E	15.06	5.74	-36.27	-43.72	11.76	7.98	3520	100	55	<0.1	?	5.26	1.8926	<10
100N	45E	14.38	5.61	-29.23	-48.72	16.86	4.69	3520	100	40	0.55	75	1.75	0.6297	55
0N	50E	26.95	-13.32	-14.08	-28.07	8.48	6.74	3520	100	0	0.21	?	5.26	1.8926	21
100S	10W	-	-	-22.42	-55.15	-	-	3520	100	0	0.45	72	1.75	0.6297	45
175S	25E	-	-	-82.03	-55.12	-	-	3520	100	33+	0.55	78	12.3	4.4256	55
300S	30E	-	-	-25.98	-37.07	-	-	3520	100	0	0.55	70	5.26	1.8926	55
400S	25E	-	-	-32.79	-43.37	-	-	3520	100	0	0.55	72	5.26	1.8926	55
500S	0E	-	-	-54.32	-40.59	-	-	3520	100	0	0.5	?	10	3.5981	50
600S	25W	26.49	0.31	-41.08	-40.68	18.11	9.4	3520	100	0	0.31	40	5.26	1.8926	31
700S	55W	-	-	-29.79	-38.17	-	-	3520	100	45	0.55	72	5.26	1.8926	55
800S	80W	-	-	-25.25	-41.16	-	-	3520	100	50	0.55	72	5.26	1.8926	55
900S	115W	-	-	-22.65	-41.09	-	-	3520	100	25	0.55	72	5.26	1.8926	55
1000S	140W	-	-	-21.65	-36.49	-	-	3520	100	0	0.55	72	5.26	1.8926	55
1100S	115W	-	-	-40.07	-26.05	-	-	3520	100	10+	0.55	72	12.3	4.4256	55
400S	0E	-	-	-76.61	-45.01	-	-	3520	150	0	?	?	12.3	2.9504	?
500S	25W	-	-	-72.94	-49.72	-	-	3520	150	0	?	?	12.3	2.9504	?
600S	50W	-	-	-70.42	-31.19	-	-	3520	150	20	?	?	12.3	2.9504	?
200N	55E	-	-	3.55	-25.02	-	-	7040	50	0	-	-	-	-	-
100N	65E	-	-	11.0800	-25.6500	-	-	7040	50	0	-	-	-	-	-
0N	75E	-	-	2.64	-16.68	-	-	7040	50	0	-	-	-	-	-
100S	0E	-	-	-18.03	-35.43	-	-	7040	50	0	?	?	3	1.0794	?
175S	55E	-	-	-23.7	-39.85	-	-	7040	50	0	?	?	5.26	1.8926	?
300S	75E	-	-	5.02	-19.22	-	-	7040	50	0	-	-	-	-	-
400S	65E	-	-	-5.15	-21.25	-	-	7040	50	0	0.1	80	1.75	0.6297	5
500S	15E	-	-	-13.28	-30.99	-	-	7040	50	0	?	?	1.75	0.6297	?

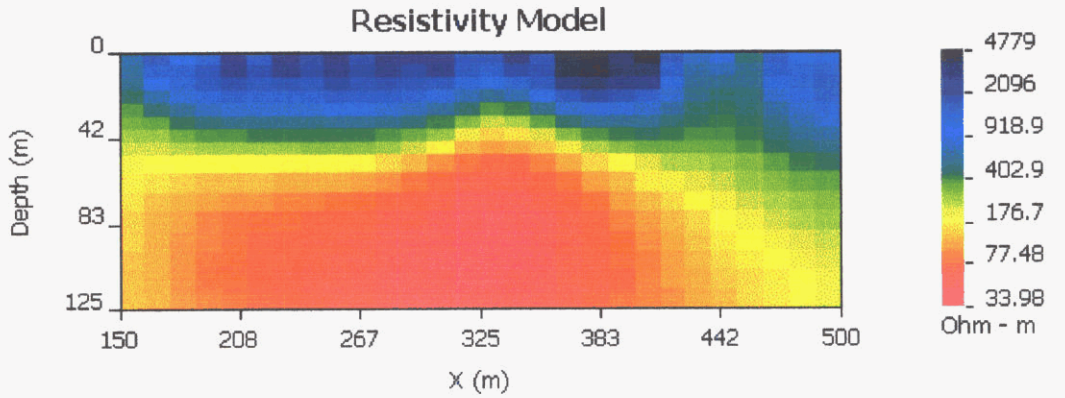
Anomaly: A3										Excess					Depth
Line	Intersection	Re1	Im1	Re2	Im2	Re3	Im3	Freq	Coil Sep	Width	h/a	dip	W	sigma*t	to top
100S	85W	-	-	-34.03	-55.15	-	-	3520	100	0	?	?	3.5	1.2593	?
200S	135W	-	-	-45.58	-40.3	-	-	3520	100	0	?	?	5.26	1.8926	?
300S	120W	-	-	-7.04	-41.22	-	-	3520	100	0	<0.1	75	1.75	0.6297	<10
400S	125W	-	-	-12.5	-38.24	-	-	3520	100	50	?	?	1.75	0.6297	?
500S	140W	-	-	-55.55	-50.64	-	-	3520	100	0	?	?	5.26	1.8926	?
500S	130W	-	-	-88.79	-49.64	-	-	3520	150	0	?	?	12.3	2.9504	?
200N	20E	-	-	-0.9	-23.16	-	-	7040	50	0	?	?	1.75	0.6297	?
100N	10E	-	-	9.3	-26.03	-	-	7040	50	0	-	-	-	-	-
0N	25W	-	-	14.2	-13.05	-	-	7040	50	0	-	-	-	-	-
100S	100W	-	-	0.16	-28.68	-	-	7040	50	0	-	-	-	-	-
200S	140W	-	-	-30.26	-31.47	-	-	7040	50	0	?	?	5.26	1.8926	?
300S	70W	-	-	26.22	-8.04	-	-	7040	50	0	-	-	-	-	-
400S	55W	-	-	2.05	-28.96	-	-	7040	50	0	-	-	-	-	-
500S	150W	-	-	-17.18	-37.98	-	-	7040	50	0	?	?	1.75	0.6297	?

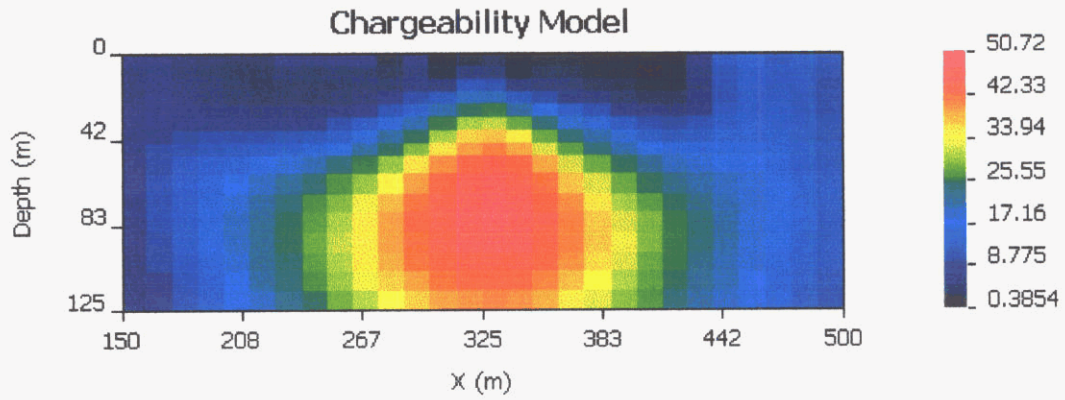
APPENDIX IV

IP INVERSION MODELS

LINE 2300N

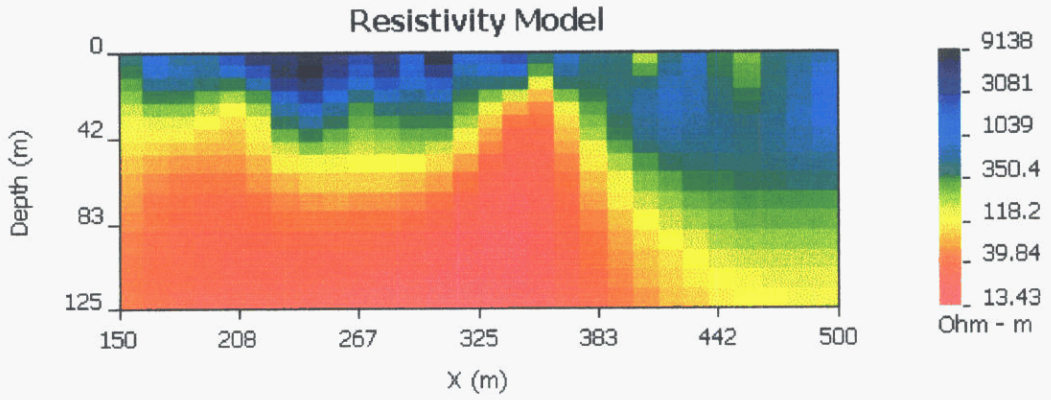
INVERSION MODELS

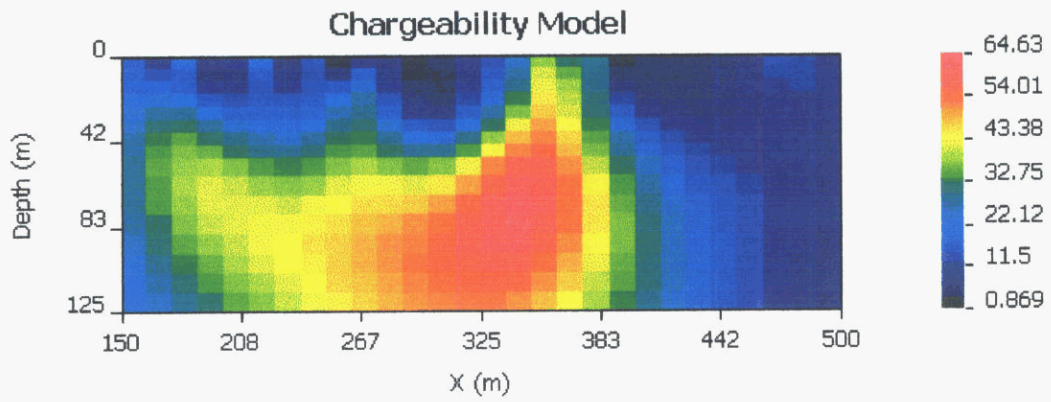




LINE 2200N

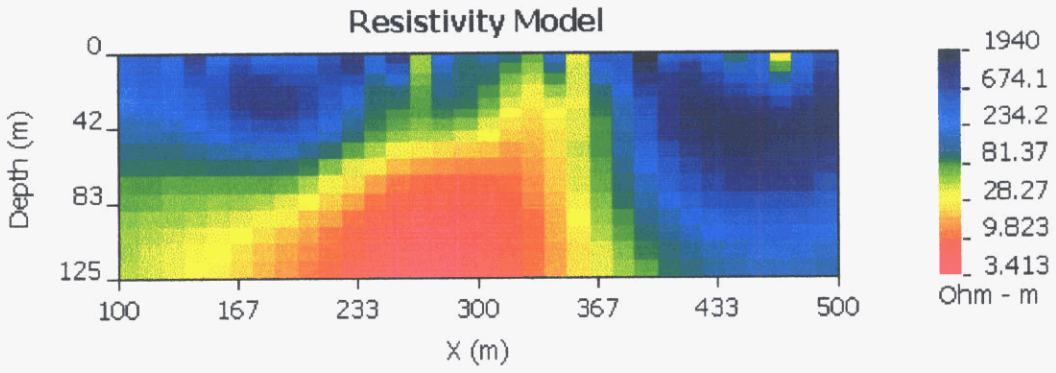
INVERSION MODELS

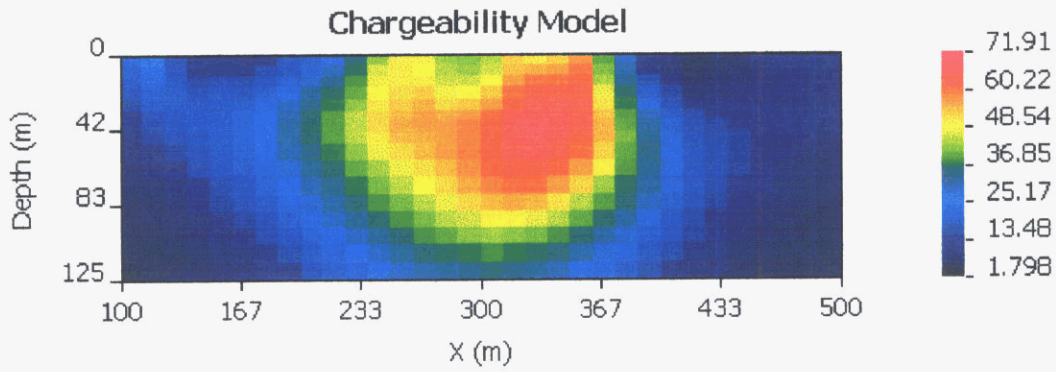




LINE 2100N

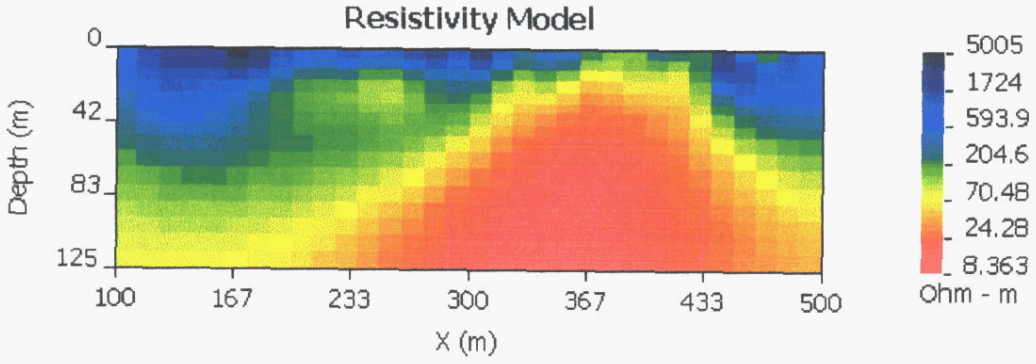
INVERSION MODELS

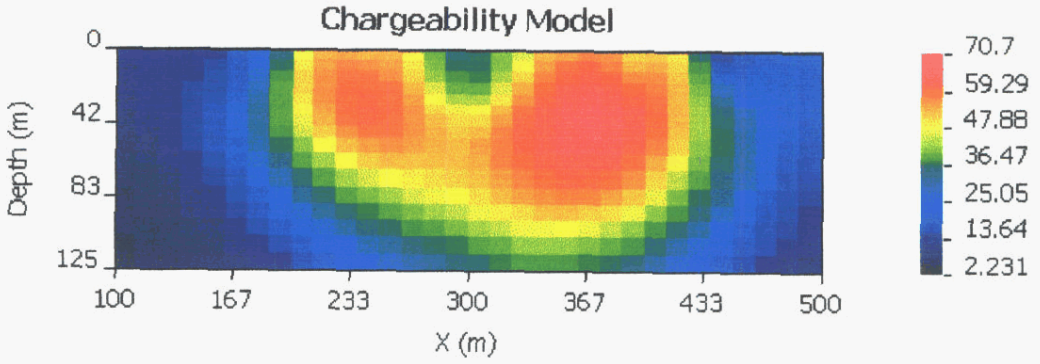




LINE 2000N

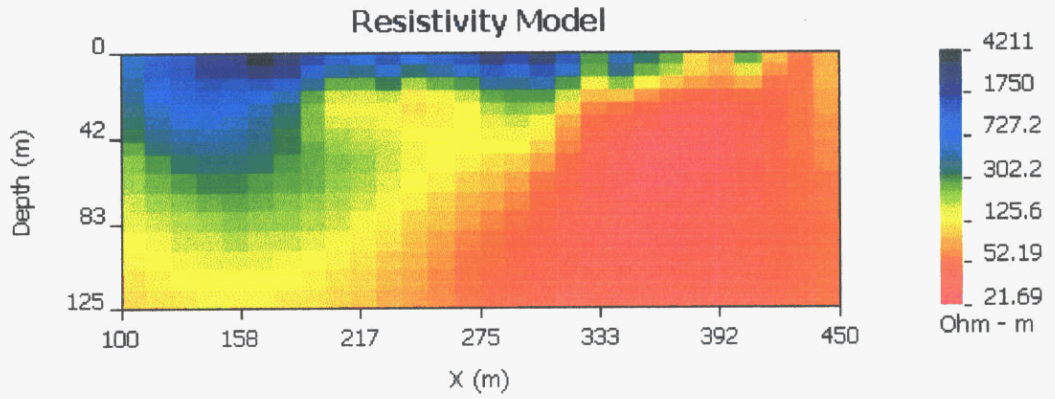
INVERSION MODELS

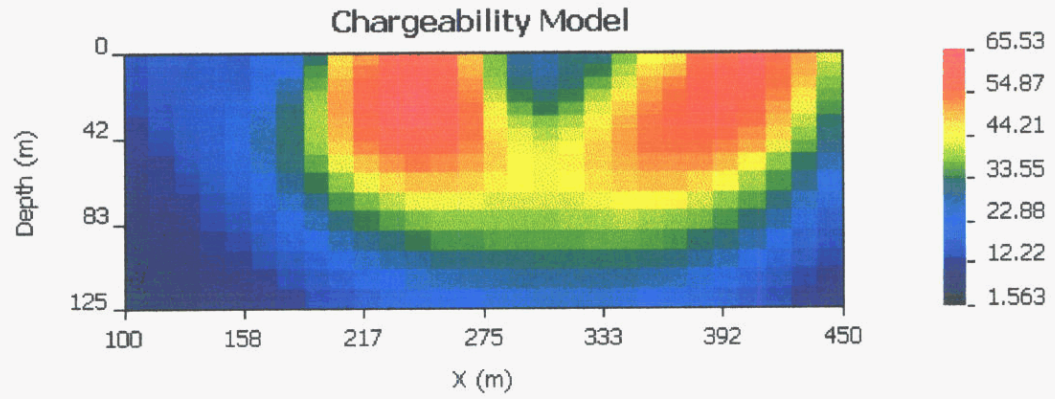




LINE 2000N (DIPOLE-DIPOLE)

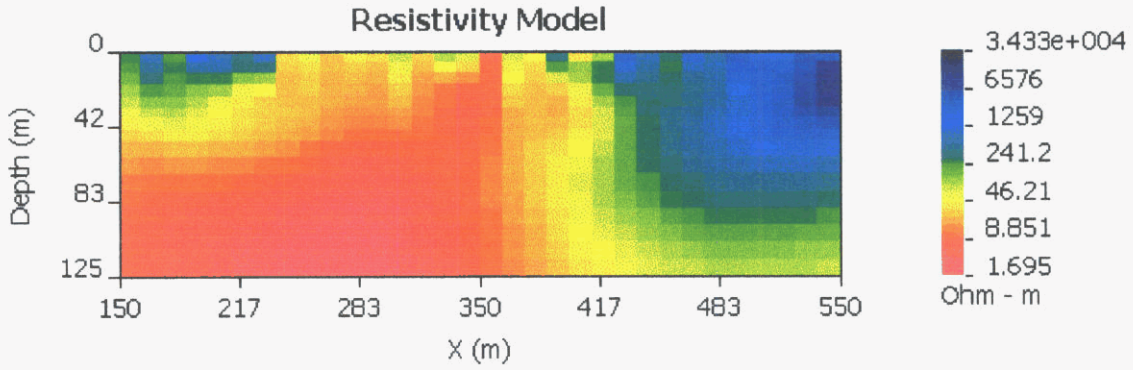
INVERSION MODELS

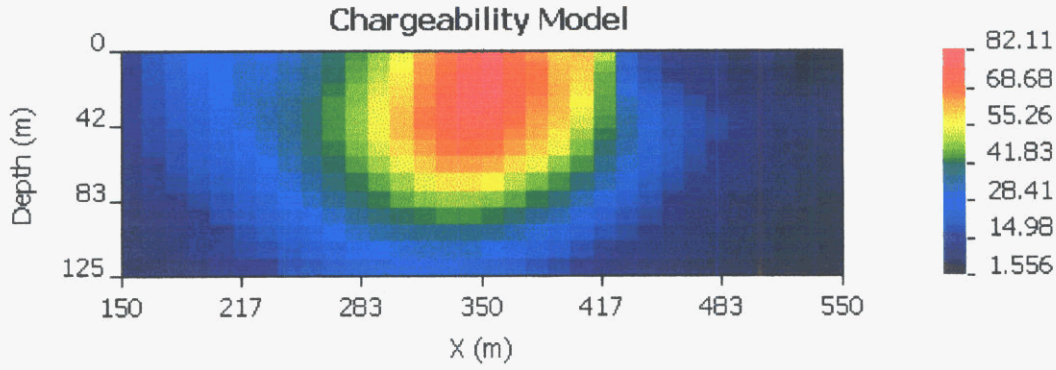




LINE 1900N

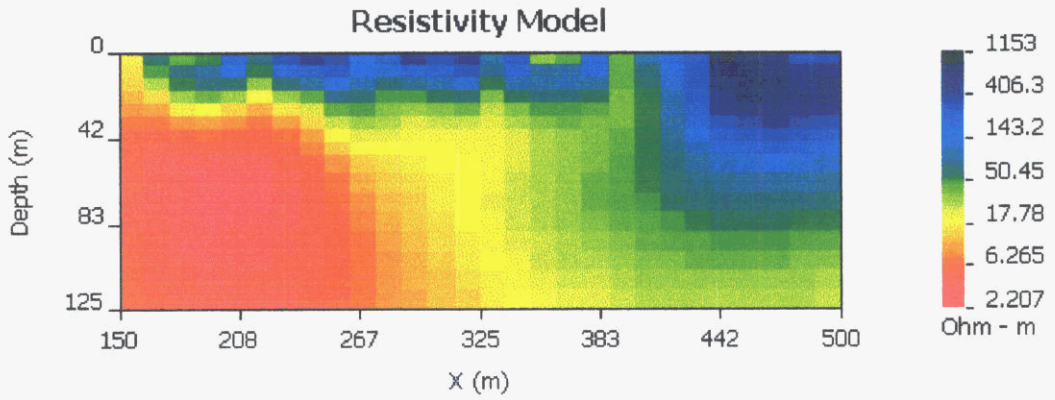
INVERSION MODELS

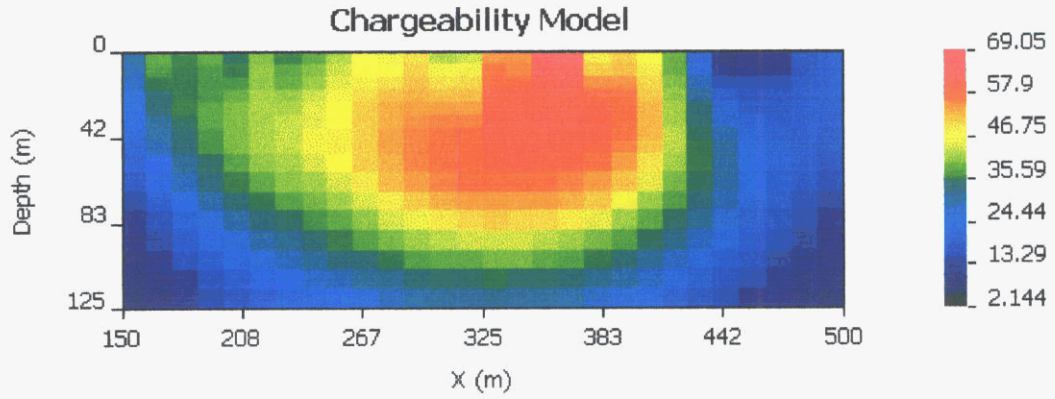




LINE 1800N

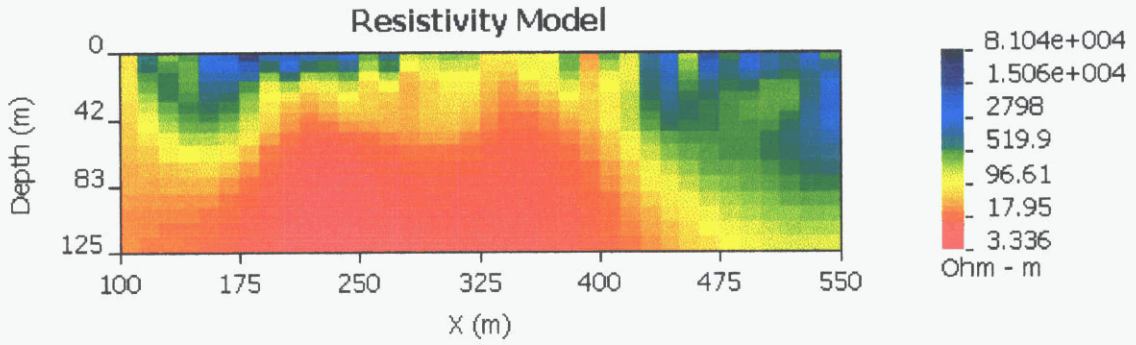
INVERSION MODELS

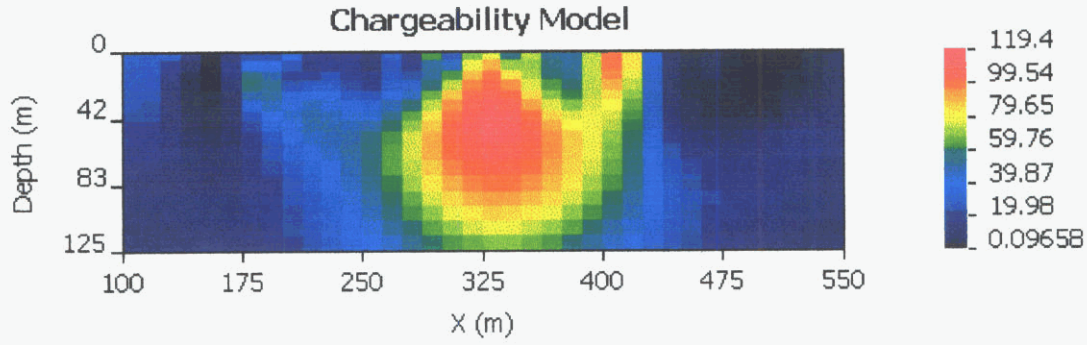




LINE 1700N

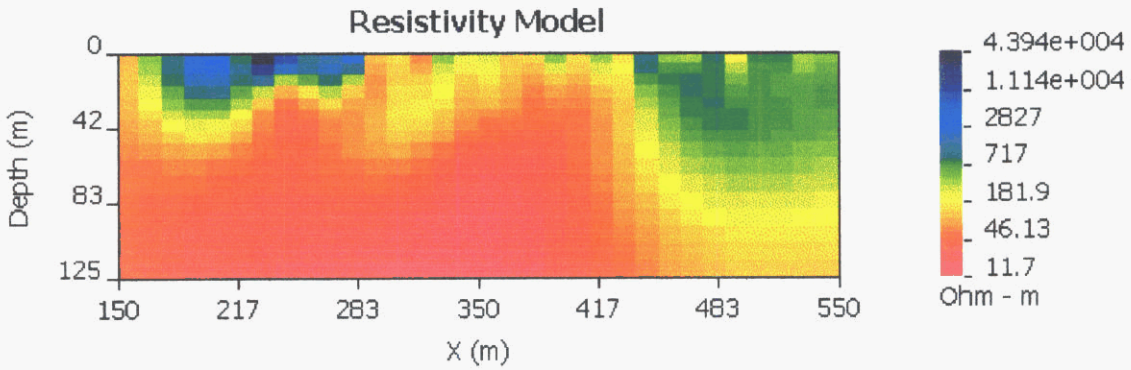
INVERSION MODELS

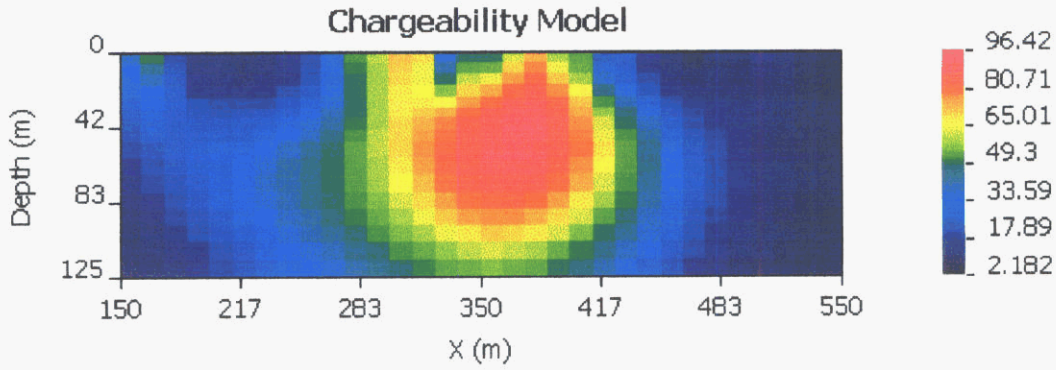




LINE 1600N

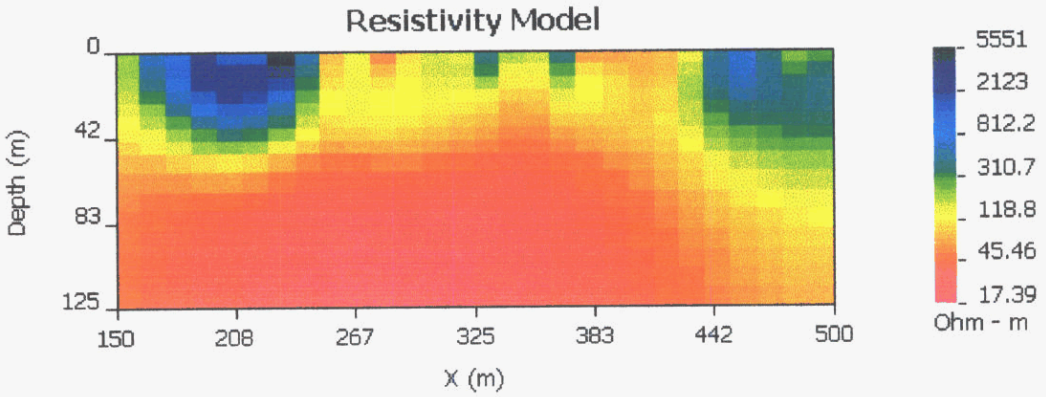
INVERSION MODELS

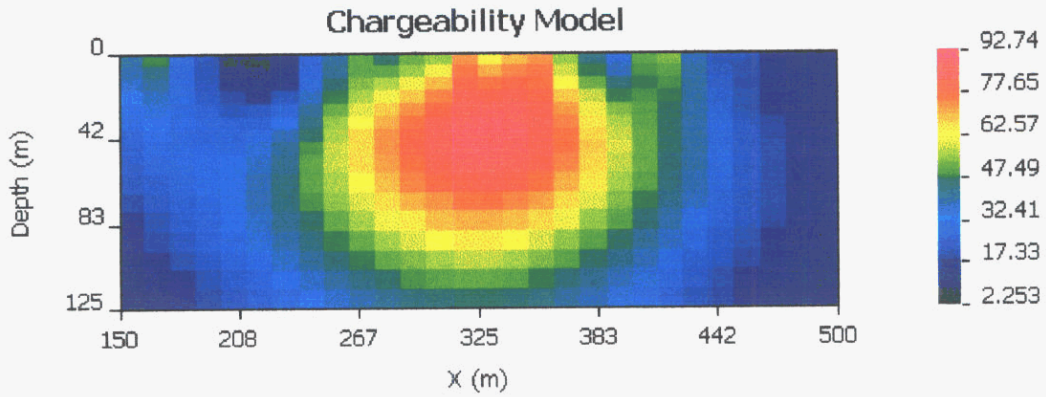




LINE 1500N

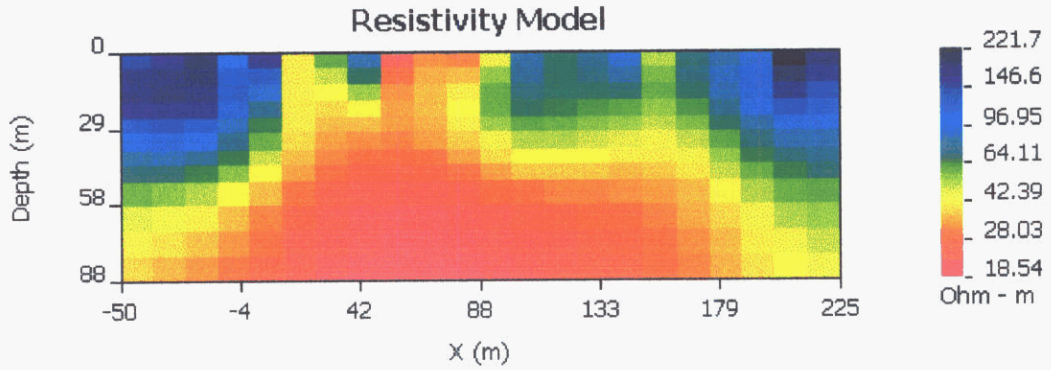
INVERSION MODELS

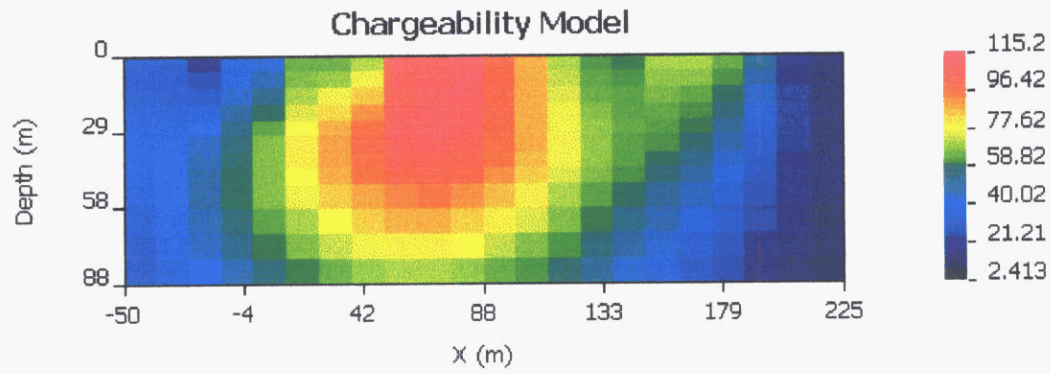




LINE 200N

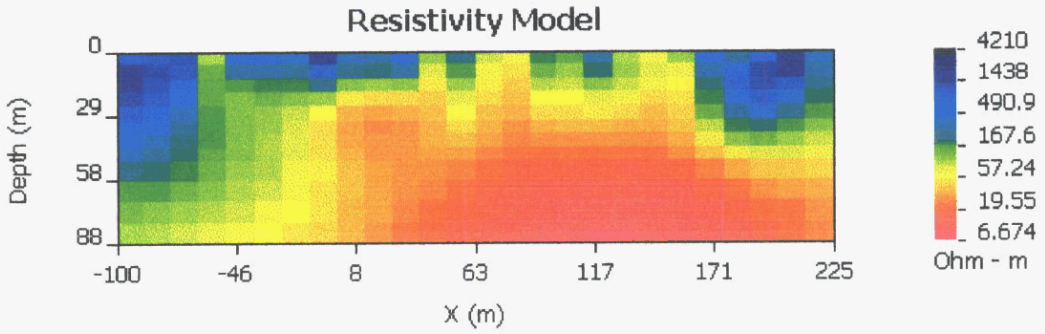
INVERSION MODELS

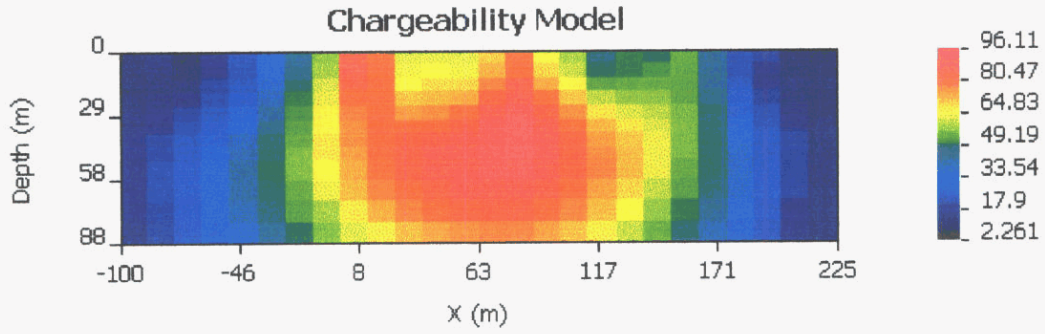




LINE 100N

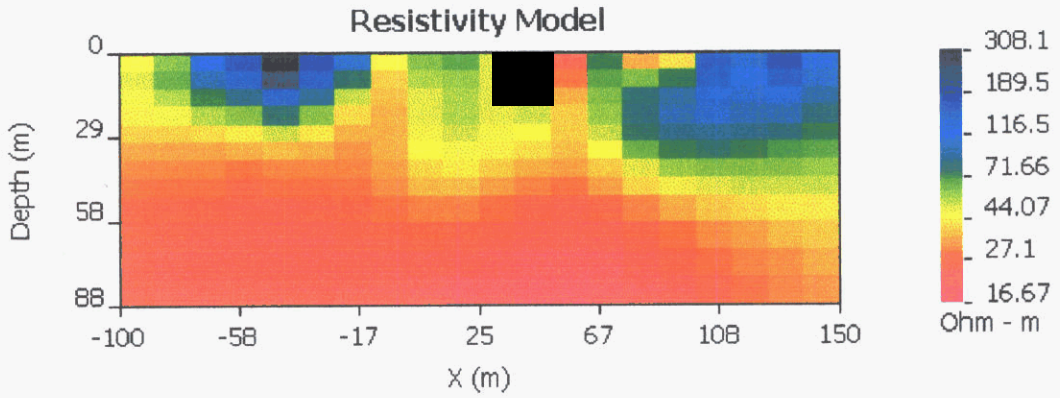
INVERSION MODELS

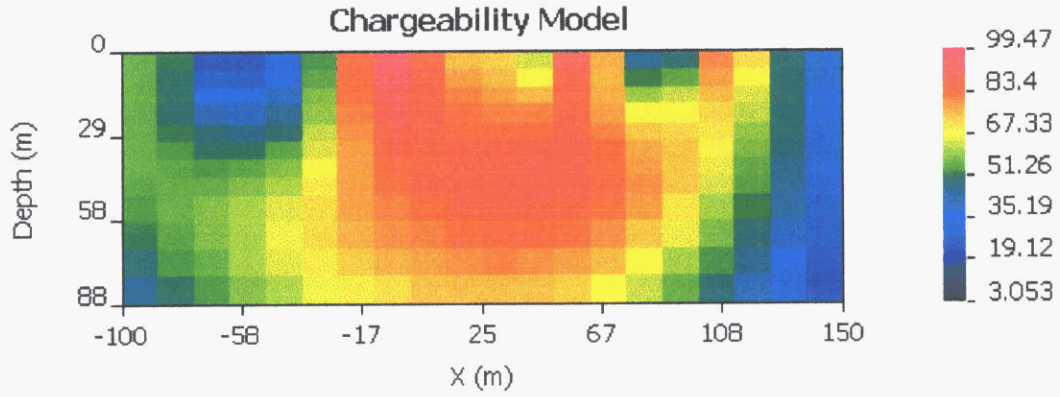




LINE 0N

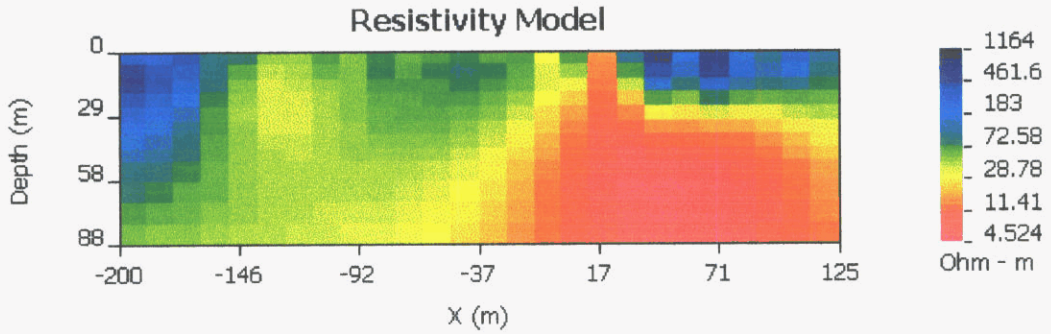
INVERSION MODELS

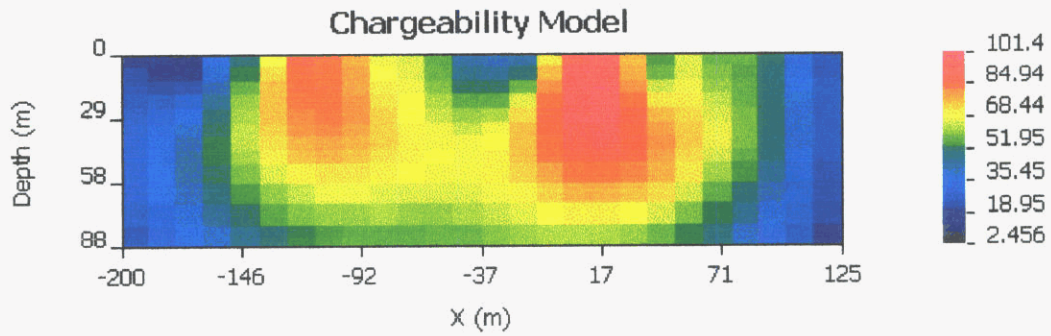




LINE 100S

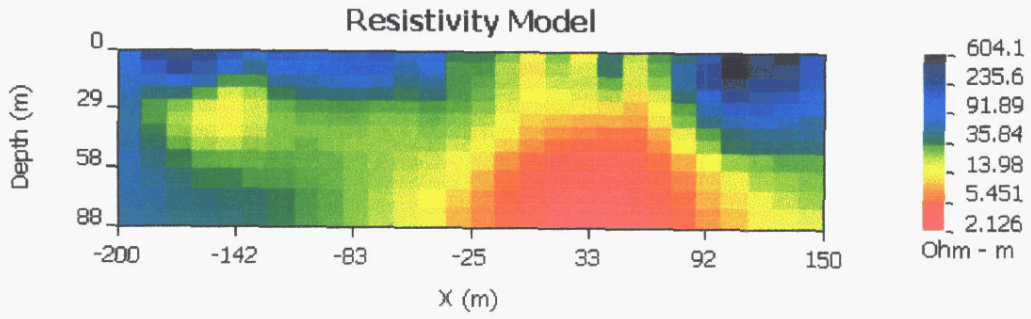
INVERSION MODELS

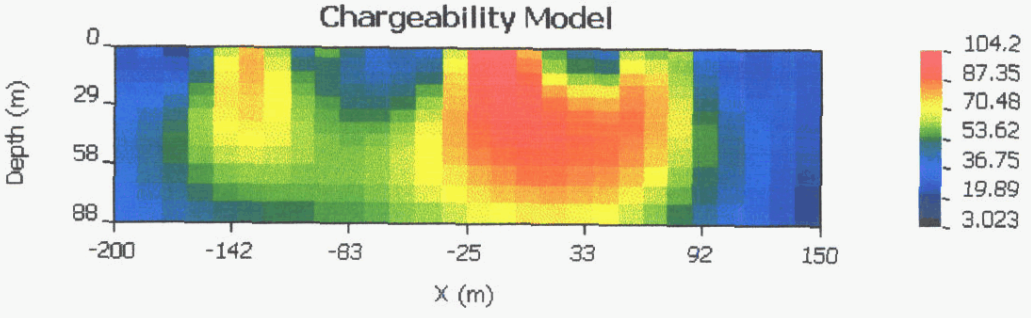




LINE 200S

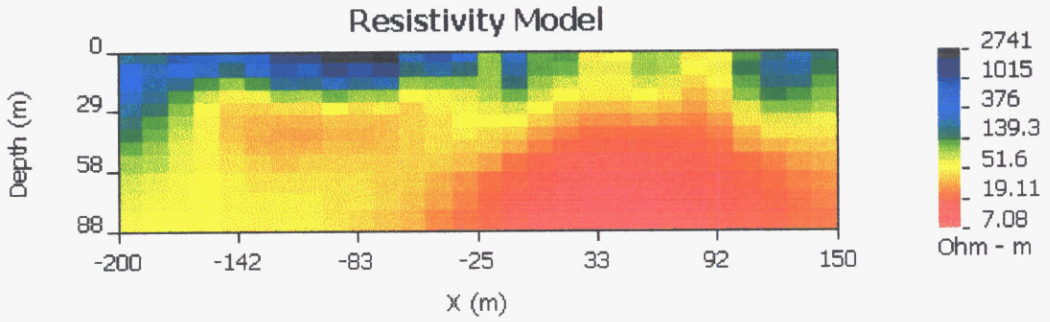
INVERSIONS MODELS

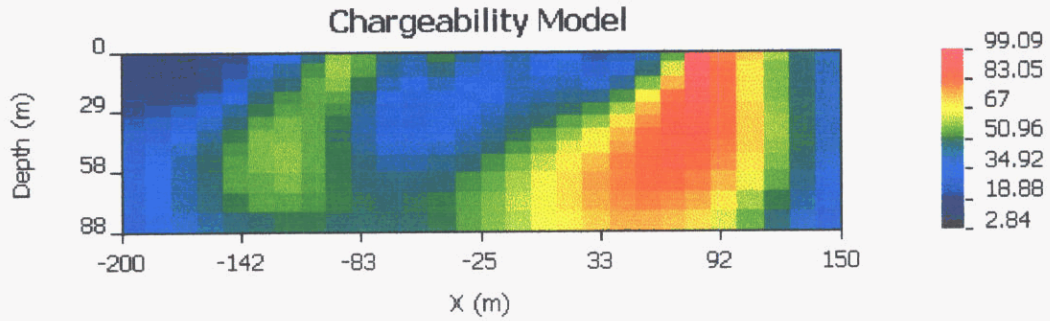




LINE 300S

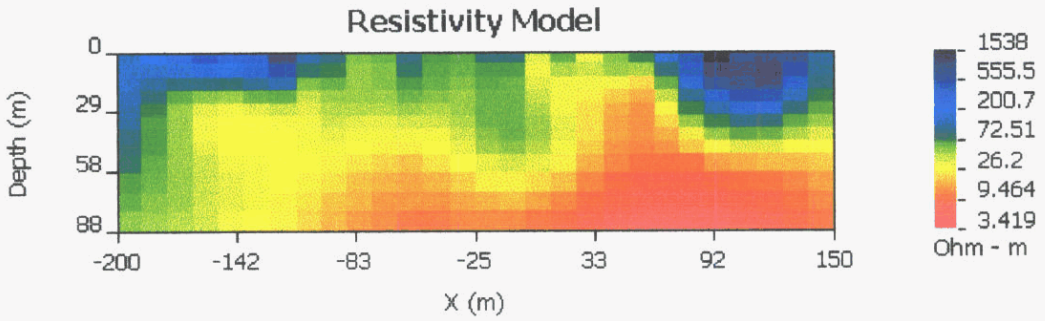
INVERSION MODELS

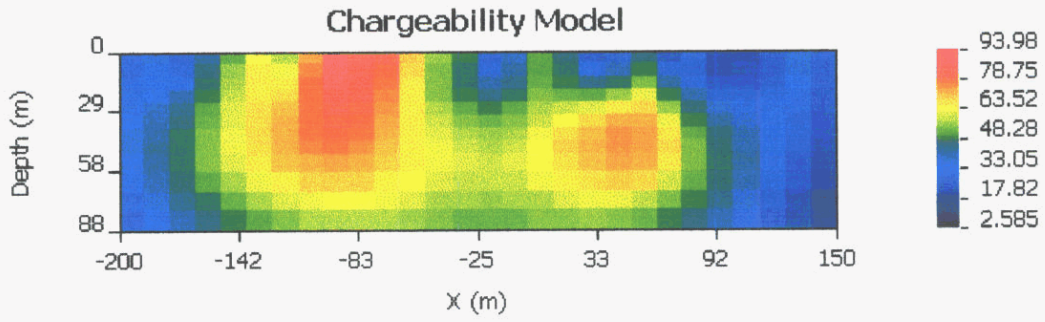




LINE 400S

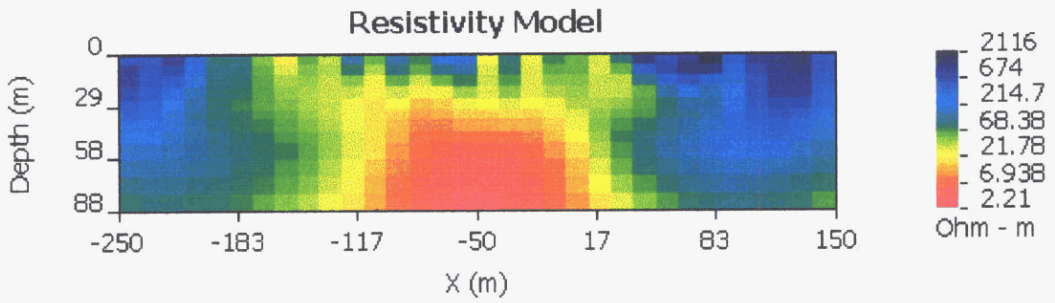
INVERSION MODELS

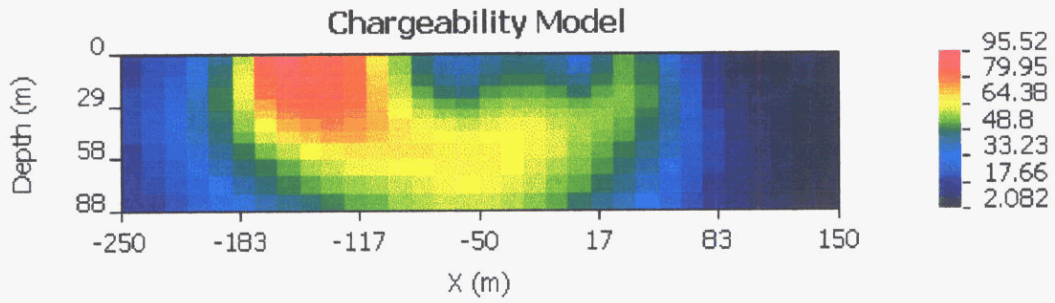




LINE 500S

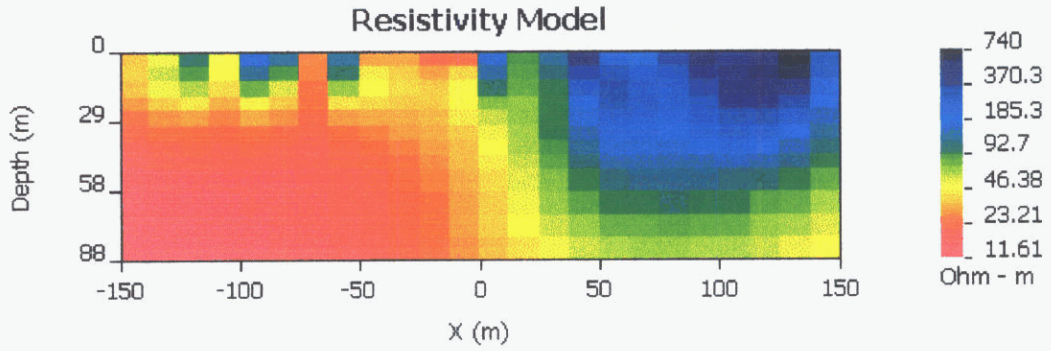
INVERSION MODELS

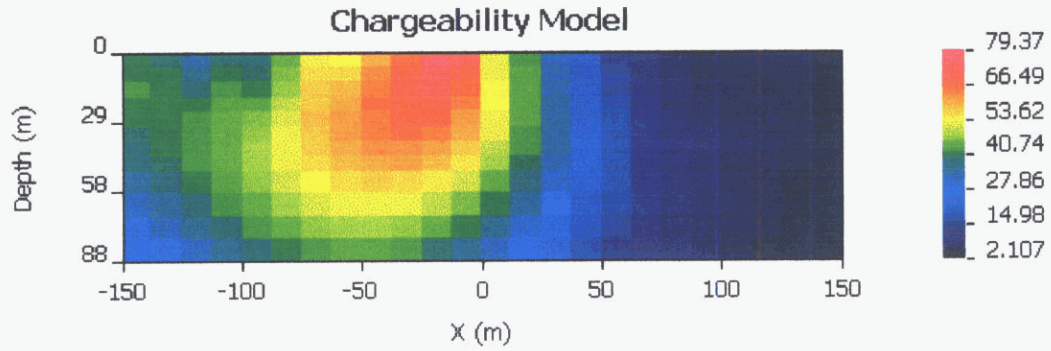




LINE 600S

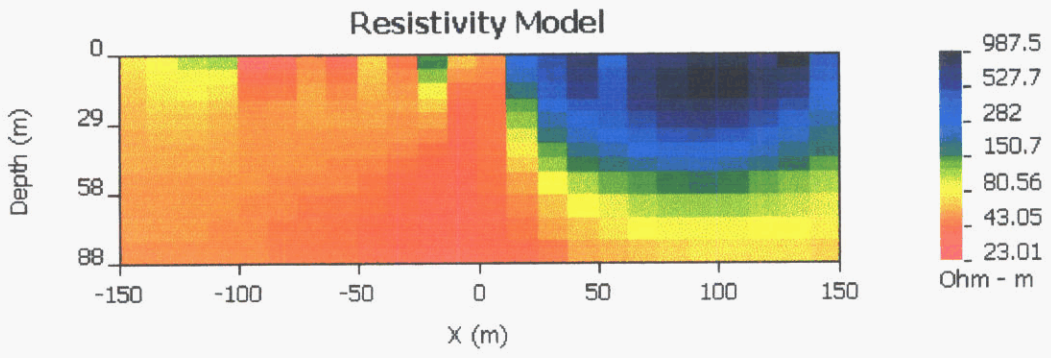
INVERSION MODELS

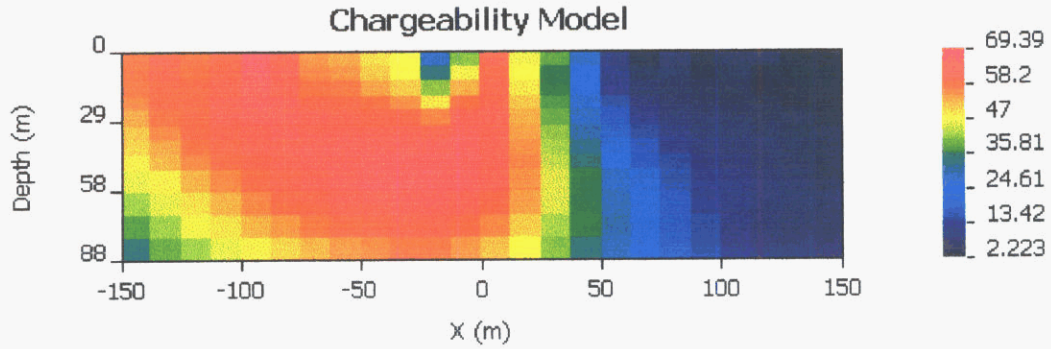




LINE 700S

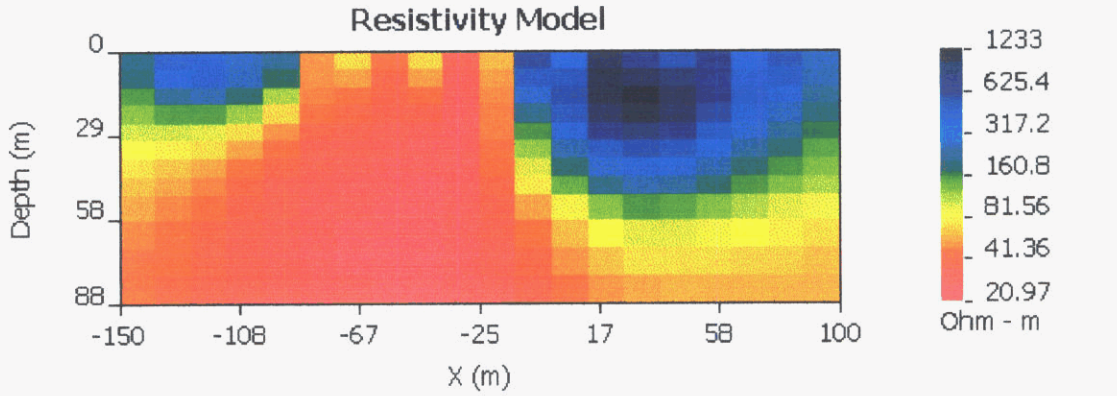
INVERSION MODELS

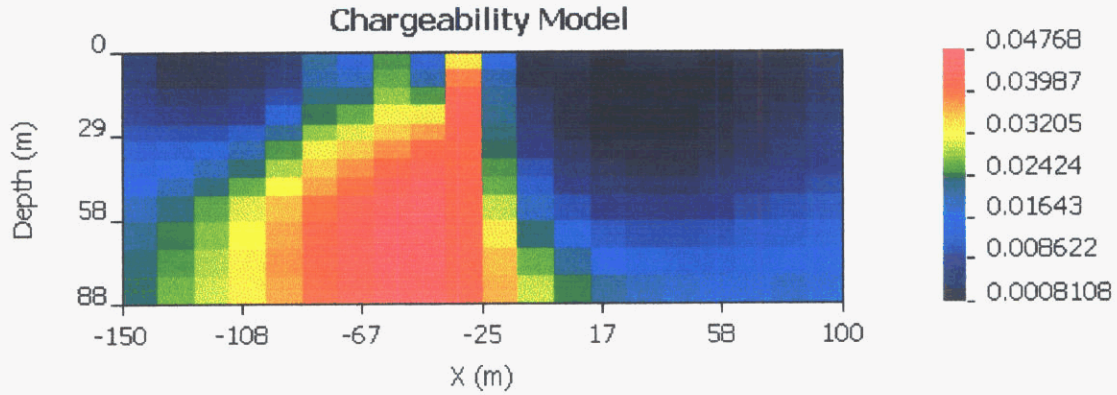




LINE 800S

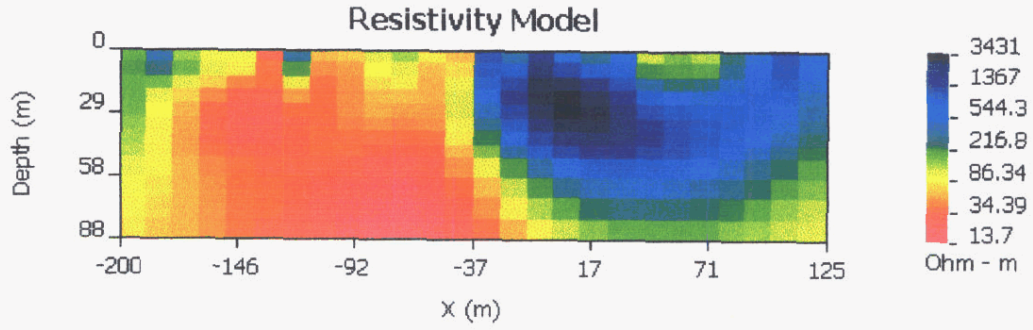
INVERSION MODELS

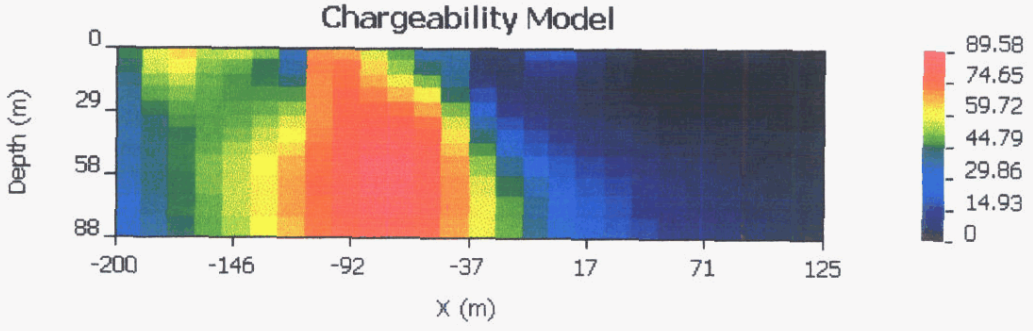




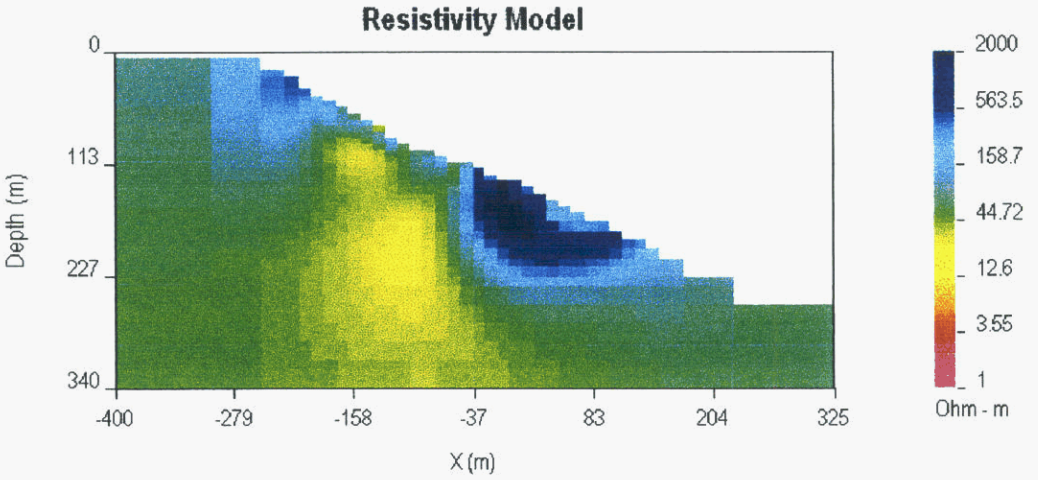
LINE 900S

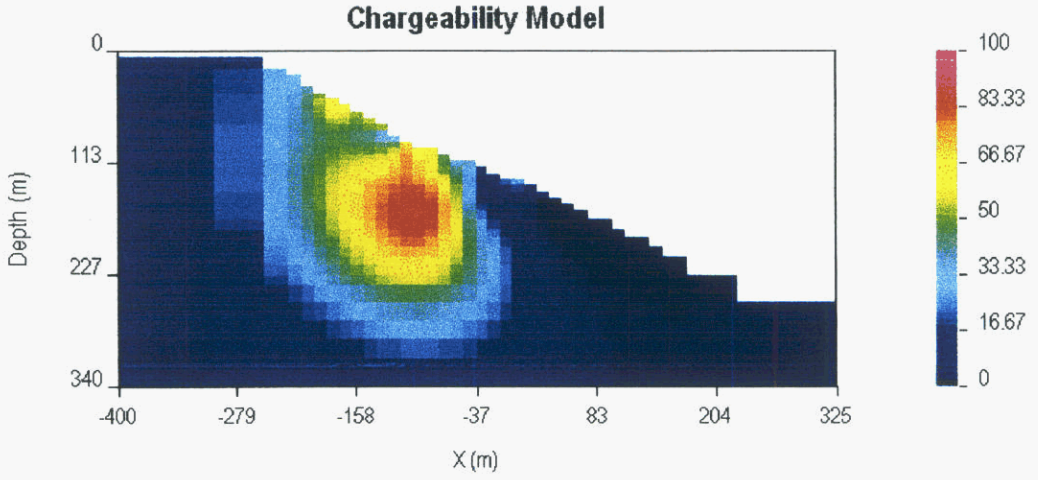
INVERSION MODELS



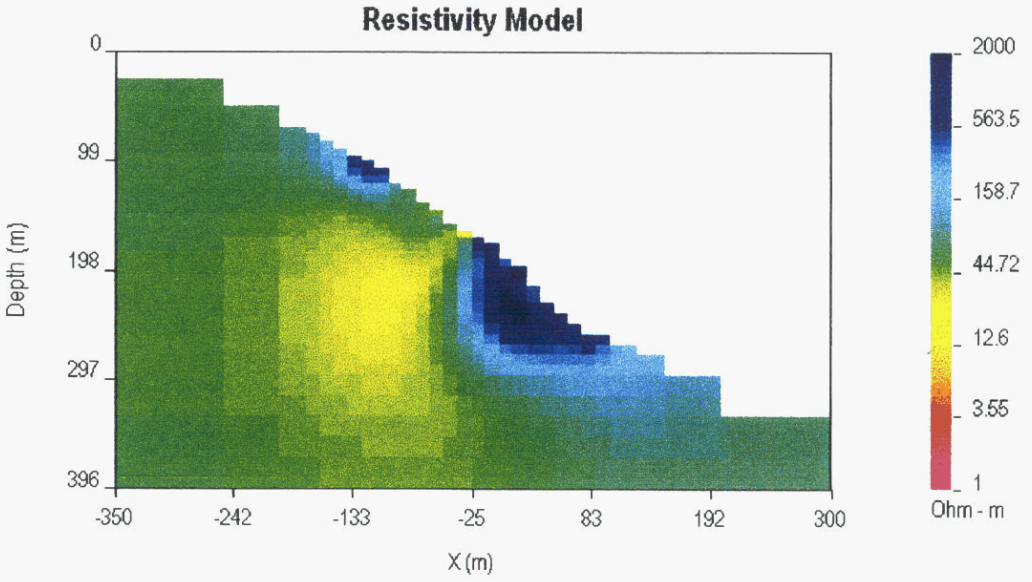


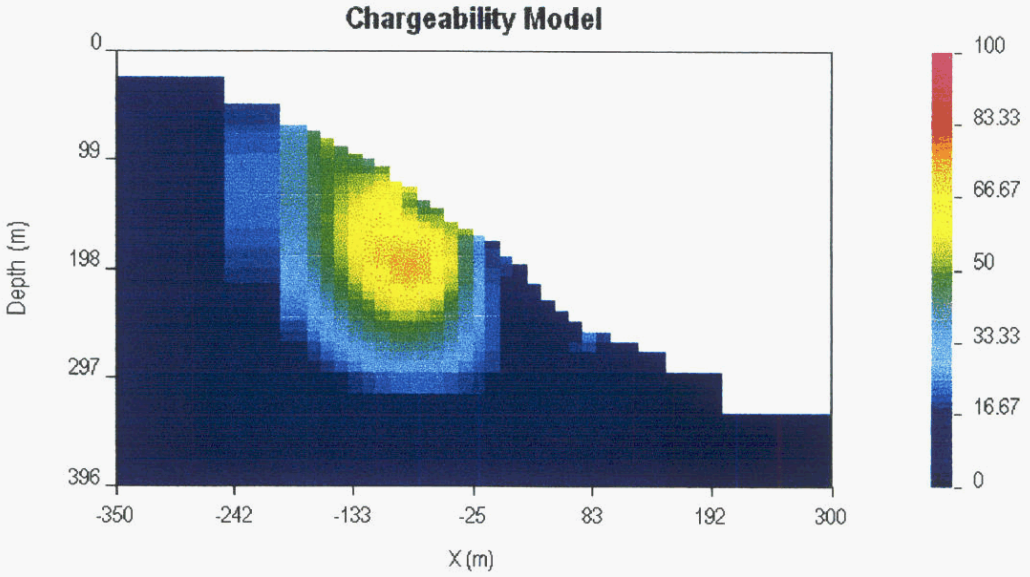
L 900S


Resistivity Model
0
113
227
340
Depth (m)
-400
-279
-158
-37
83
204
325
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m

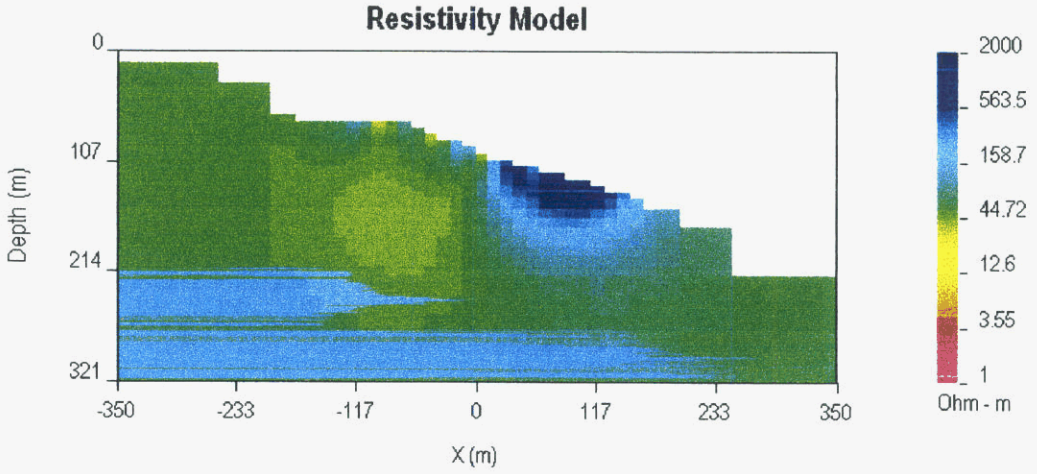

Chargeability Model
0
113
227
340
Depth (m)
-400
-279
-158
-37
83
204
325
X (m)
100
83.33
66.67
50
33.33
16.67
0

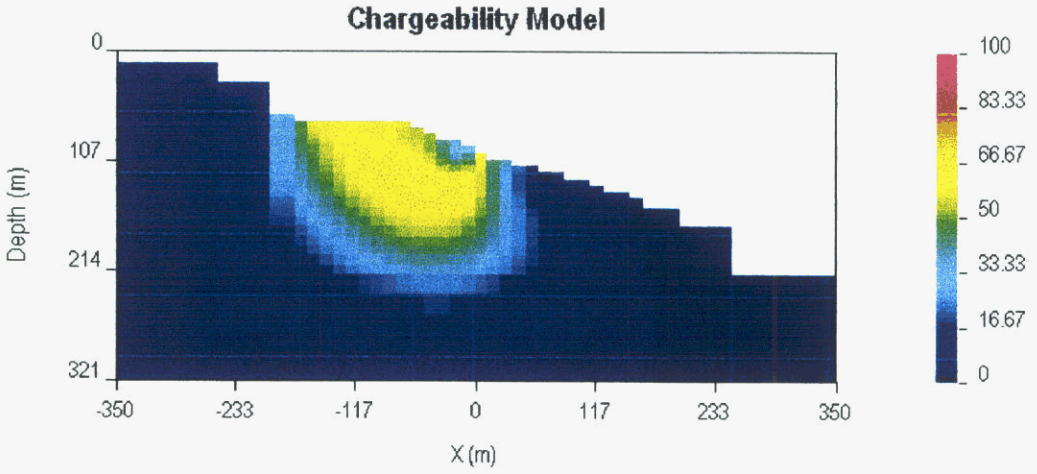
L 800S


Resistivity Model
0
99
198
297
396
Depth (m)
-350
-242
-133
-25
83
192
300
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m

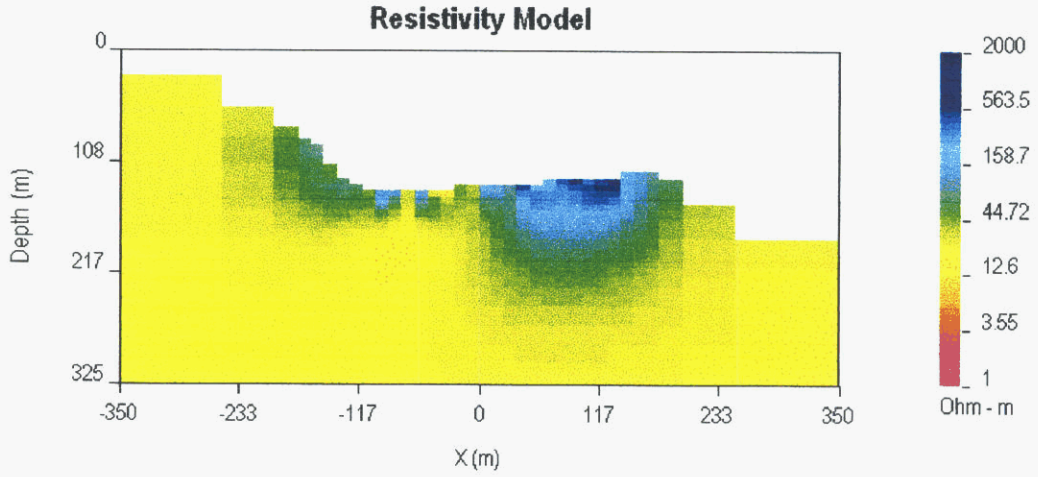

Chargeability Model
0
99
198
297
396
Depth (m)
-350
-242
-133
-25
83
192
300
X (m)
100
83.33
66.67
50
33.33
16.67
0

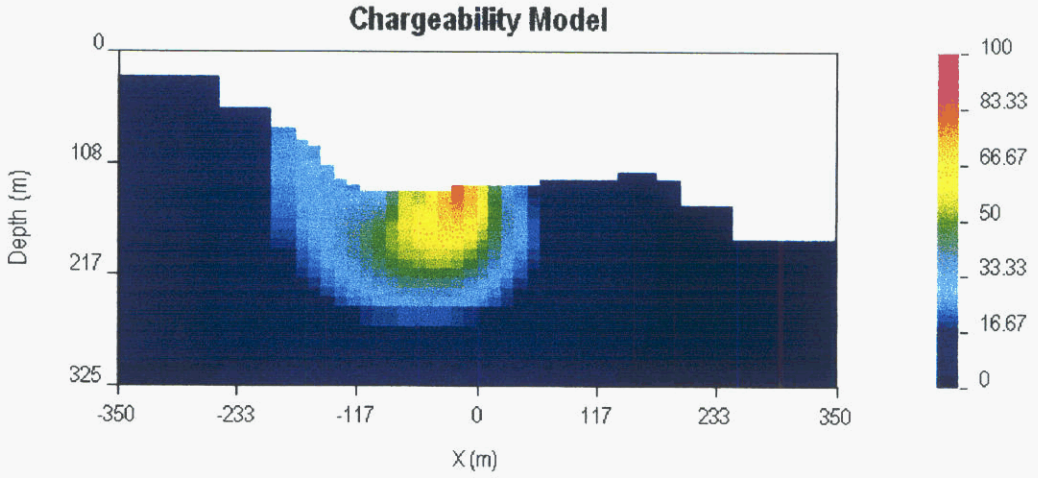
L 700S


Resistivity Model
Depth (m)
0
107
214
321
-350
-233
-117
0
117
233
350
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m

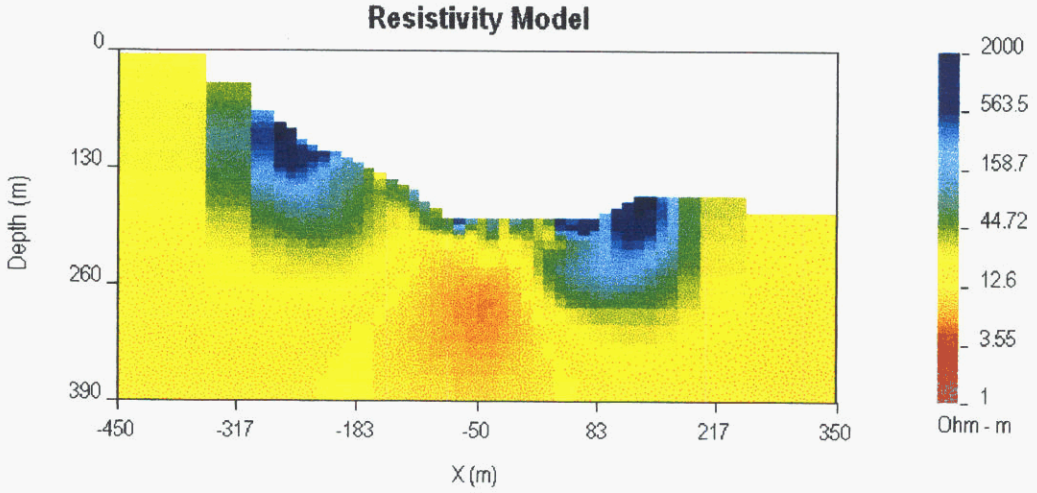

Chargeability Model
Depth (m)
0
107
214
321
-350
-233
-117
0
117
233
350
X (m)
100
83.33
66.67
50
33.33
16.67
0

L600S


Resistivity Model
0
108
217
325
Depth (m)
-350
-233
-117
0
117
233
350
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
0
108
217
325
Depth (m)
-350
-233
-117
0
117
233
350
X (m)
100
83.33
66.67
50
33.33
16.67
0

L500S


Resistivity Model
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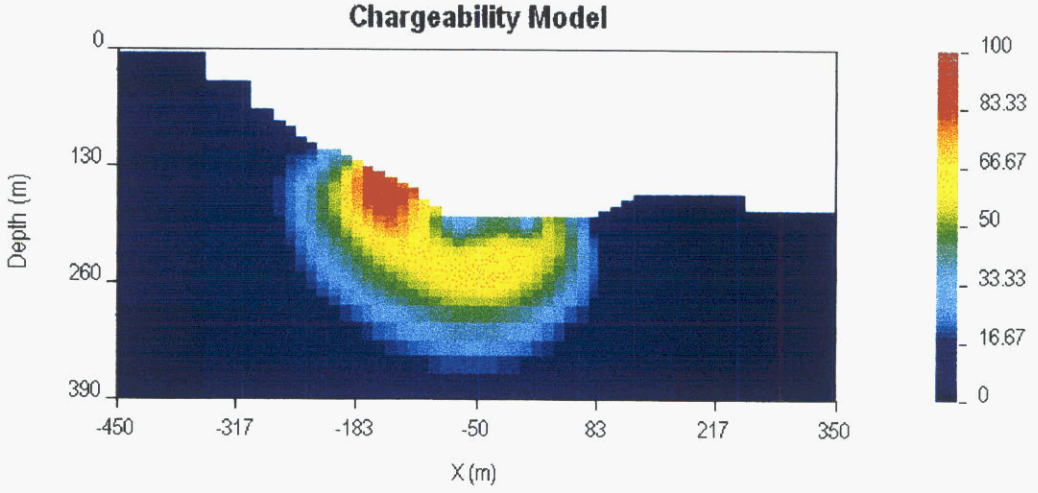
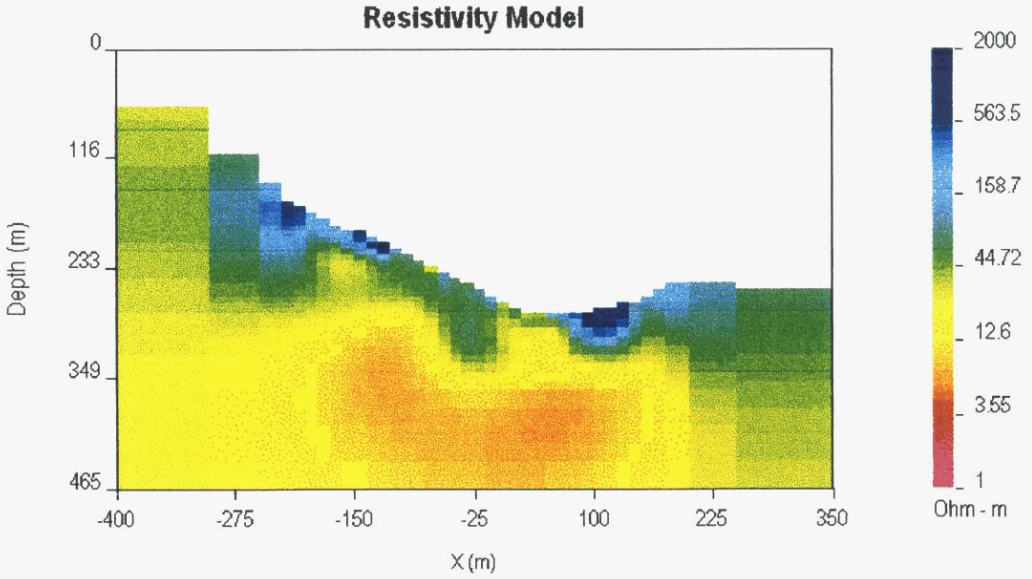
130
260
390
Depth (m)
-450
-317
-183
-50
83
217
350
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
0
130
260
390
Depth (m)
-450
-317
-183
-50
83
217
350
X (m)
100
83.33
66.67
50
33.33
16.67
0

L400S


Resistivity Model
Depth (m)
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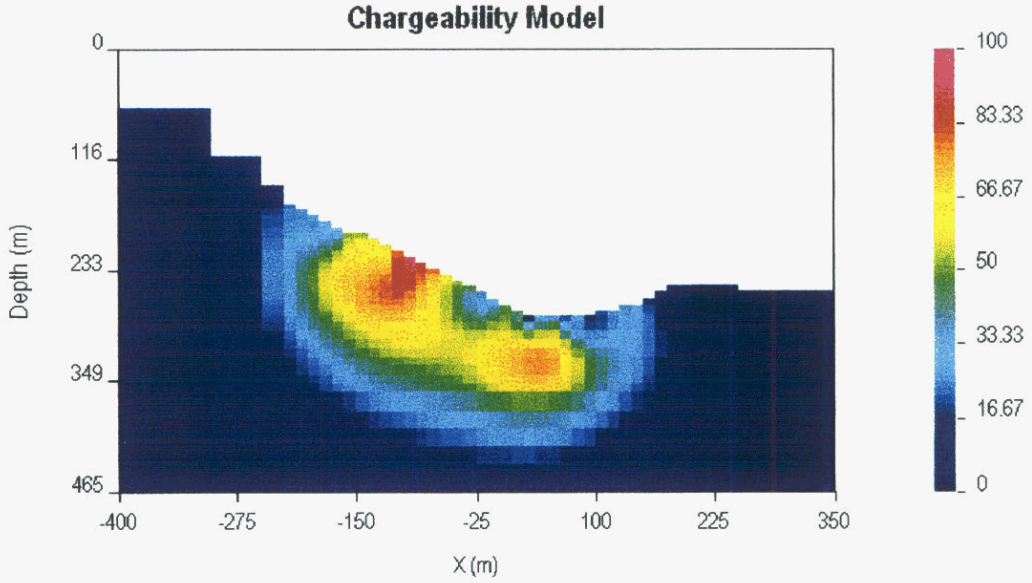
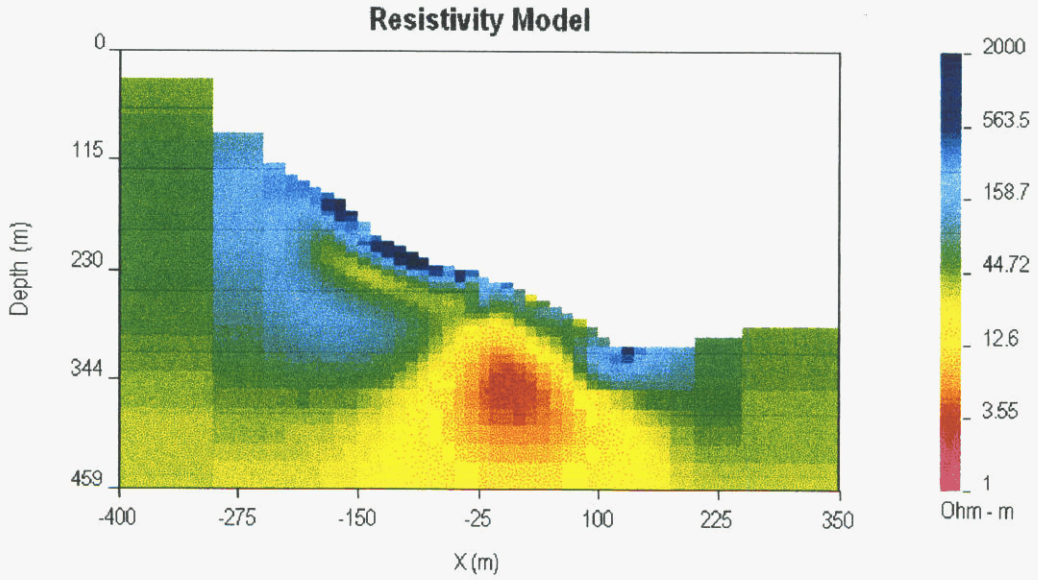
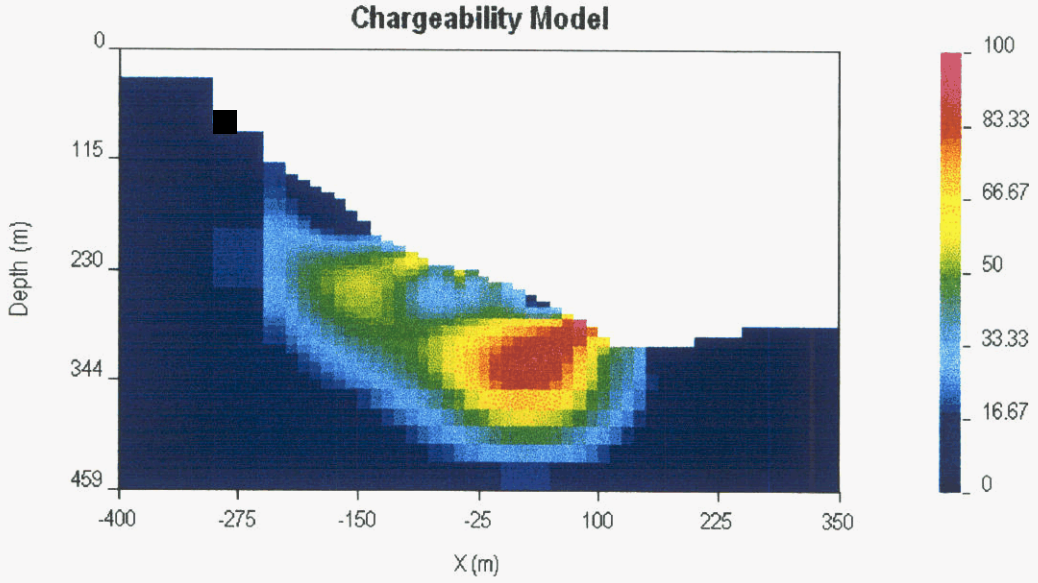
116
233
349
465
-400
-275
-150
-25
100
225
350
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
Depth (m)
0
116
233
349
465
-400
-275
-150
-25
100
225
350
X (m)
100
83.33
66.67
50
33.33
16.67
0

L300S


Resistivity Model
Depth (m)
0
115
230
344
459
-400
-275
-150
-25
100
225
350
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
Depth (m)
0
115
230
344
459
-400
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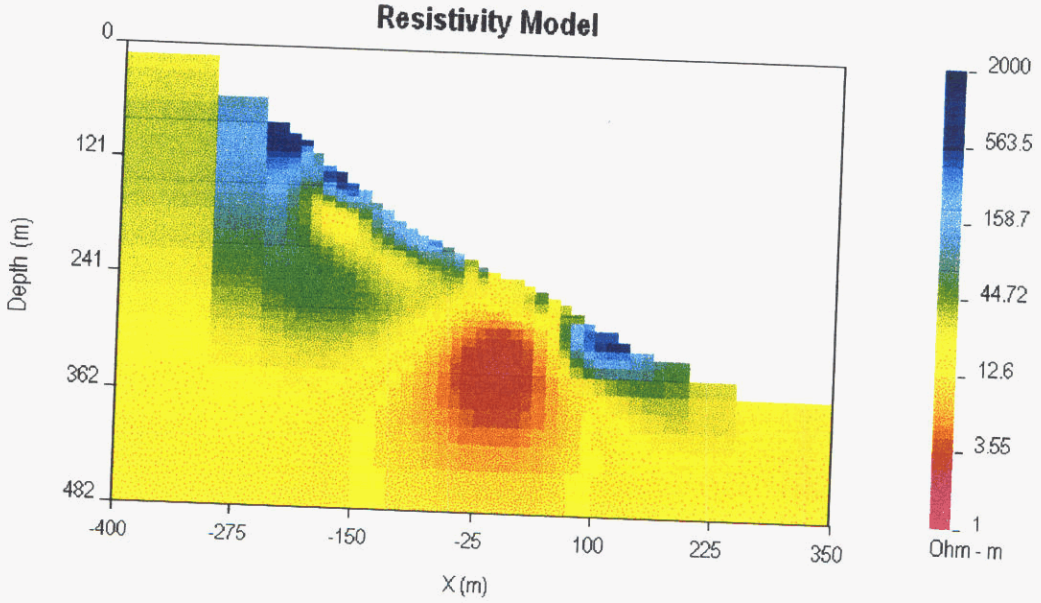
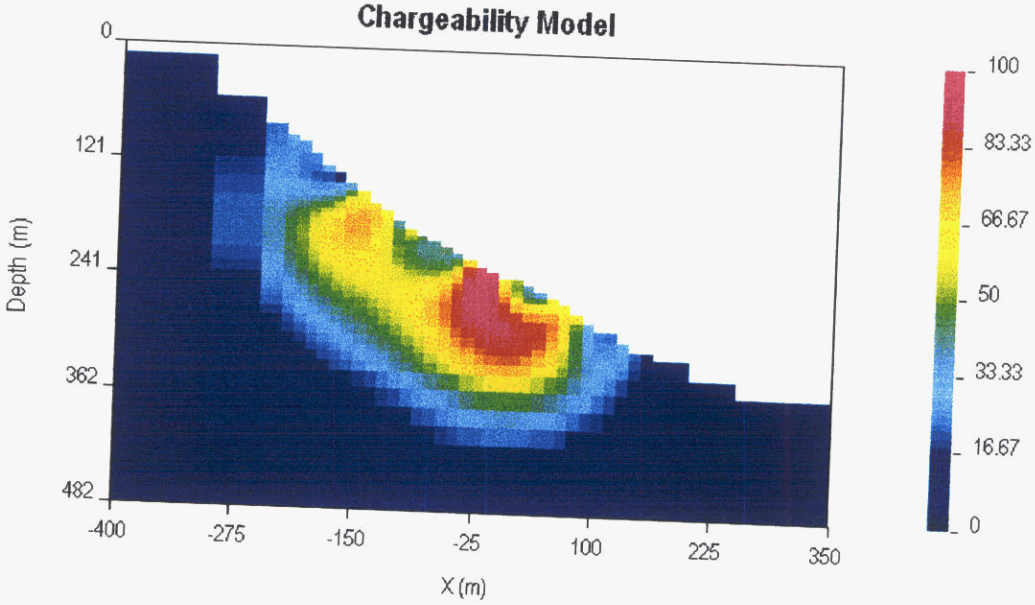
-150
-25
100
225
350
X (m)
100
83.33
66.67
50
33.33
16.67
0

L200S


Resistivity Model
0
121
241
362
482
Depth (m)
-400
-275
-150
-25
100
225
350
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
0
121
241
362
482
Depth (m)
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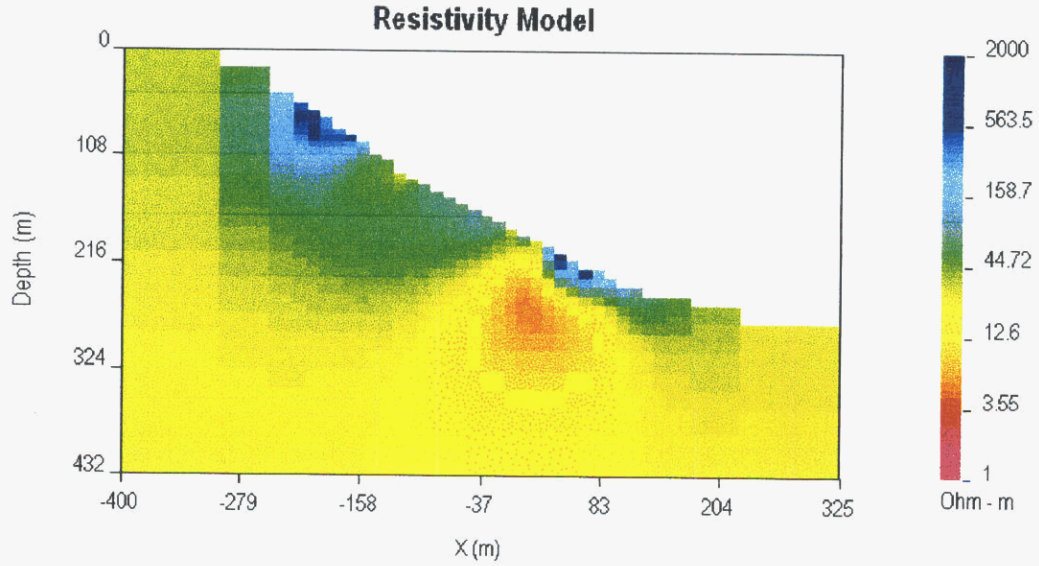
-150
-25
100
225
350
X (m)
100
83.33
66.67
50
33.33
16.67
0

L100S


Resistivity Model
0
108
216
324
432
Depth (m)
-400
-279
-158
-37
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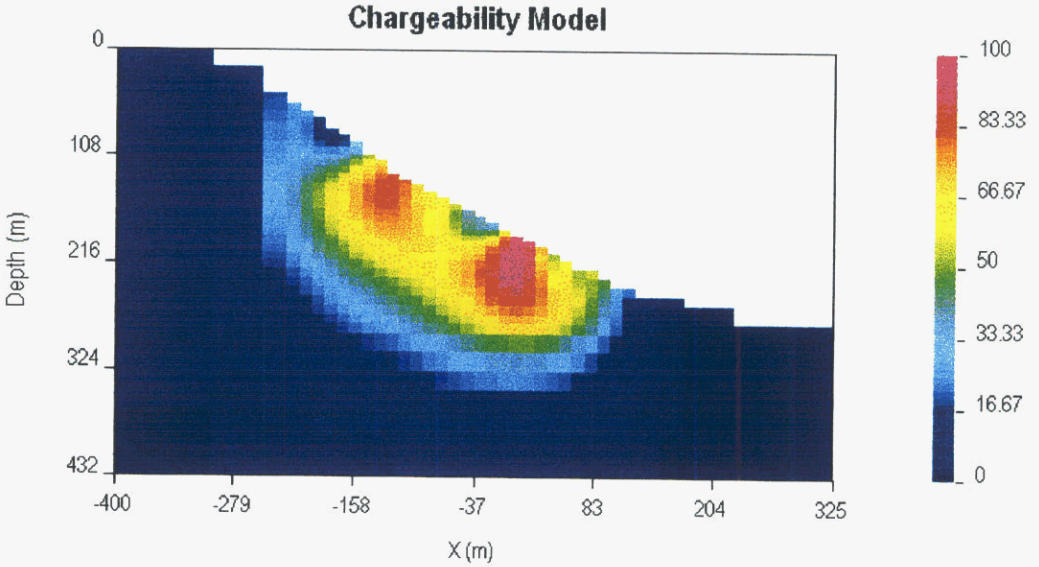
204
325
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
0
108
216
324
432
Depth (m)
-400
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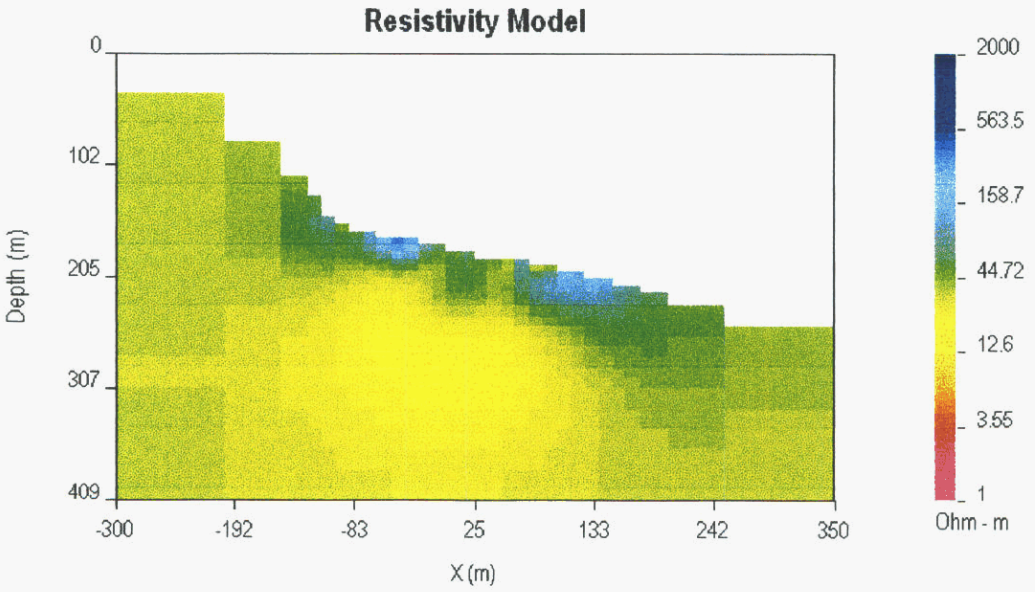
83
204
325
X (m)
100
83.33
66.67
50
33.33
16.67
0

L 0N


Resistivity Model
Depth (m)
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205
307
409
-300
-192
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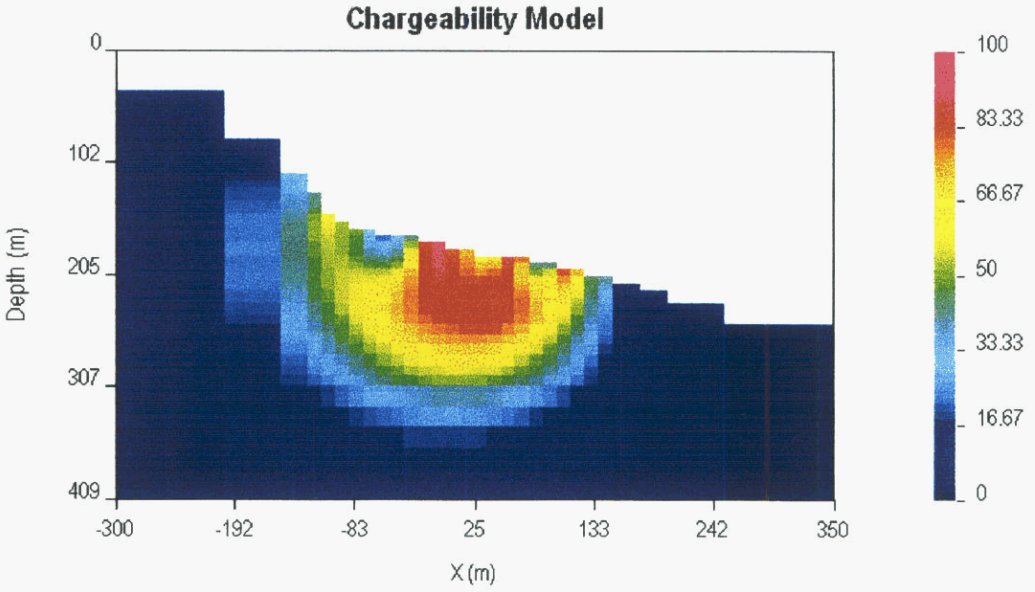
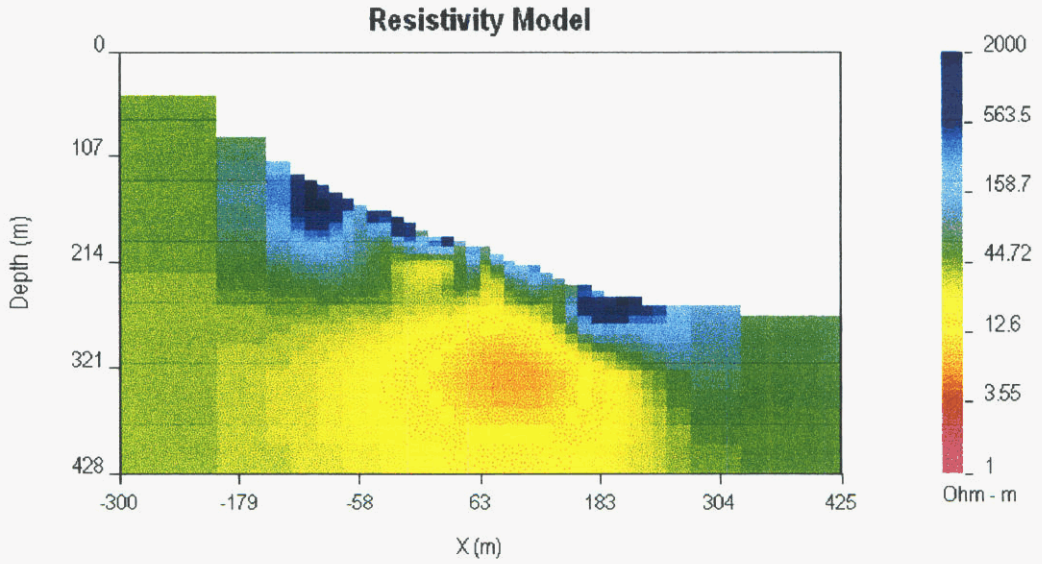
242
350
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
Depth (m)
0
102
205
307
409
-300
-192
-83
25
133
242
350
X (m)
100
83.33
66.67
50
33.33
16.67
0

L 100N


Resistivity Model
Depth (m)
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214
321
428
-300
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-58
63
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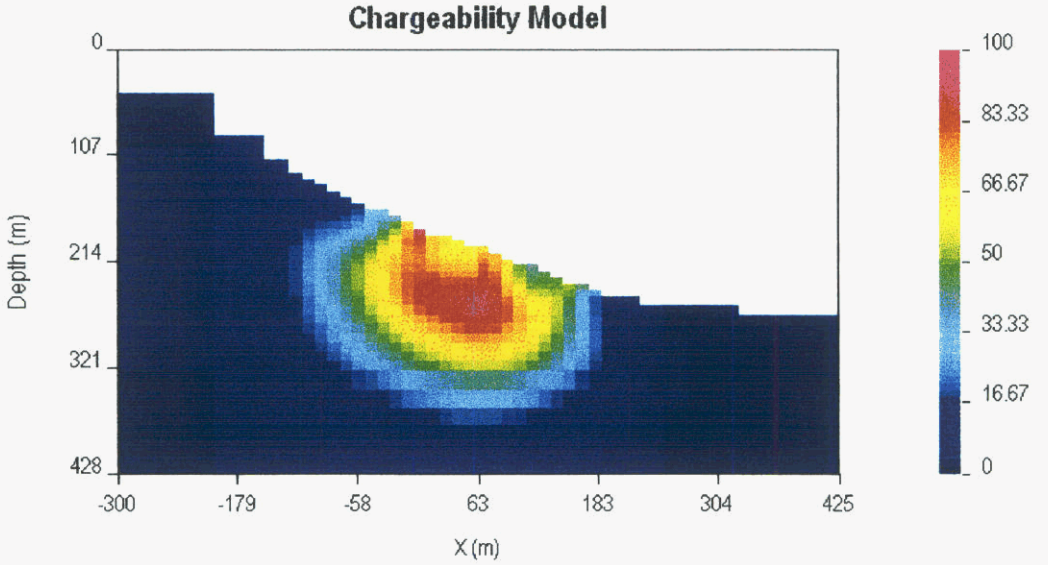
304
425
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
Depth (m)
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107
214
321
428
-300
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-58
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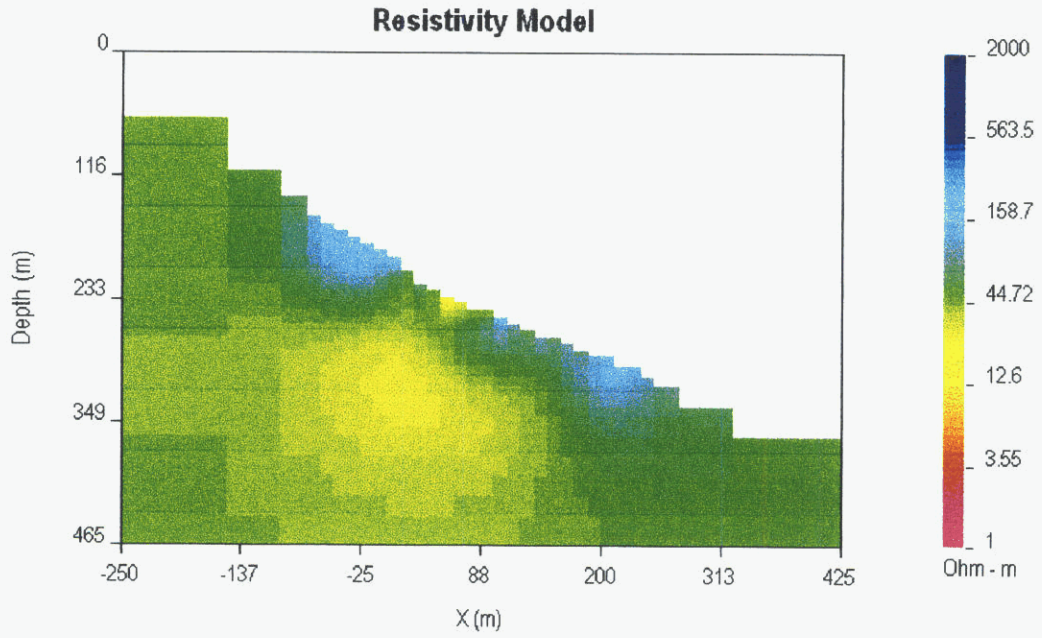
183
304
425
X (m)
100
83.33
66.67
50
33.33
16.67
0

L 200N


Resistivity Model
Depth (m)
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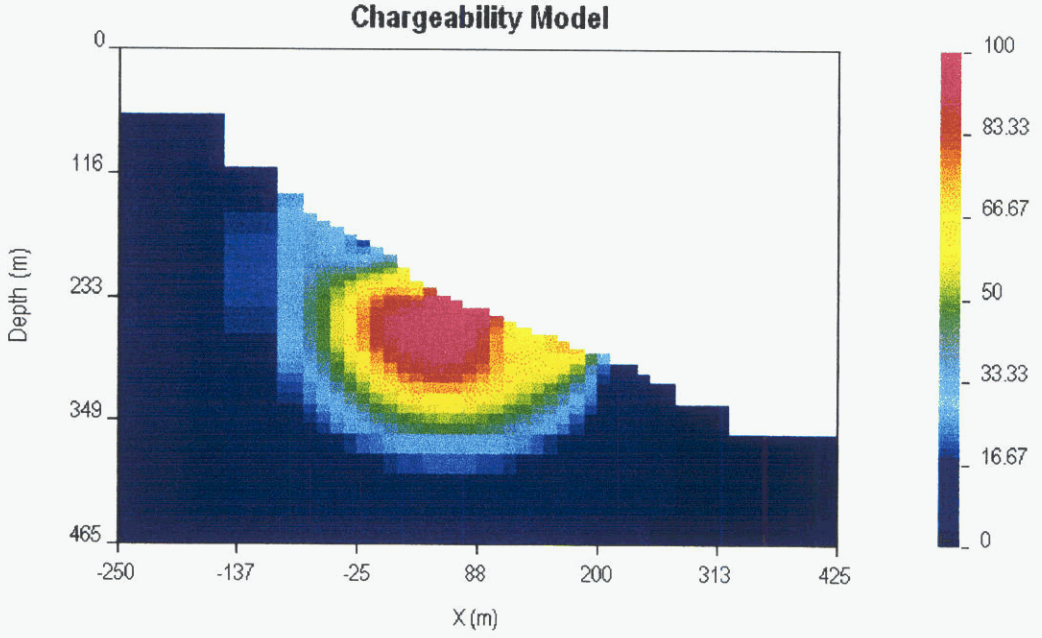
233
349
465
-250
-137
-25
88
200
313
425
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
Depth (m)
0
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233
349
465
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-25
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200
313
425
X (m)
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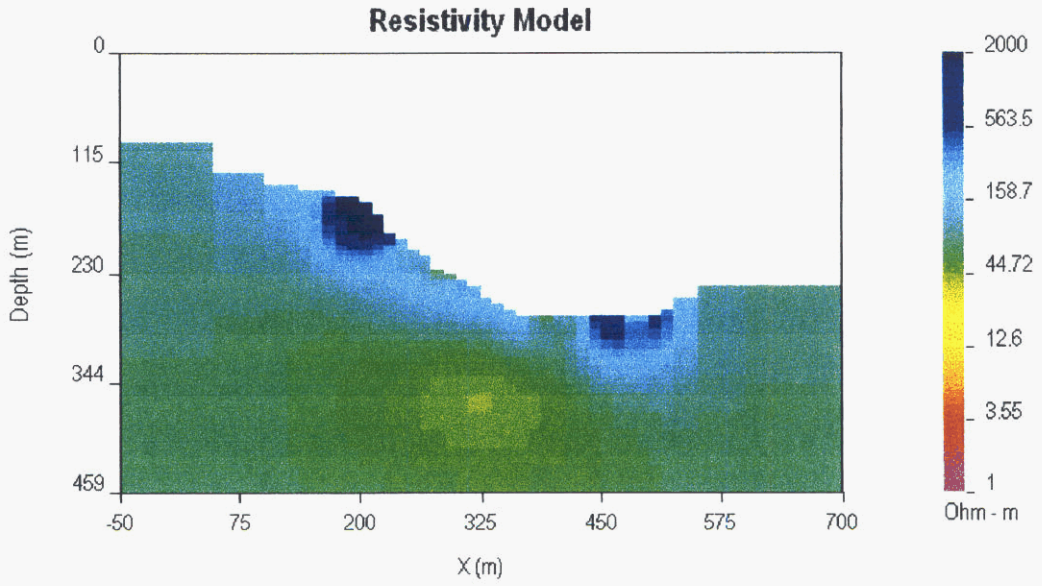
83.33
66.67
50
33.33
16.67
0

L 1500N


Resistivity Model
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230
344
459
Depth (m)
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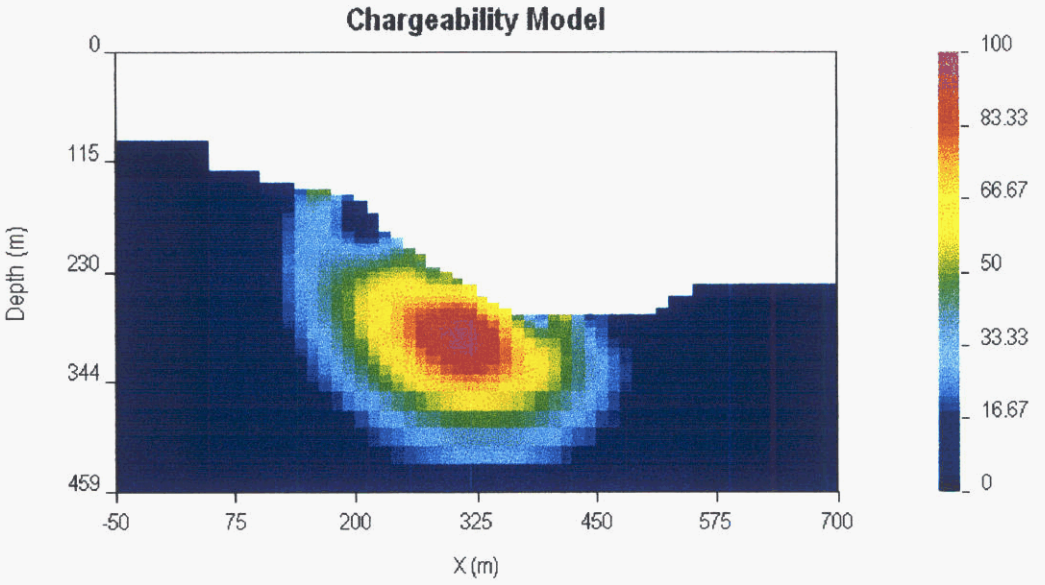
200
325
450
575
700
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
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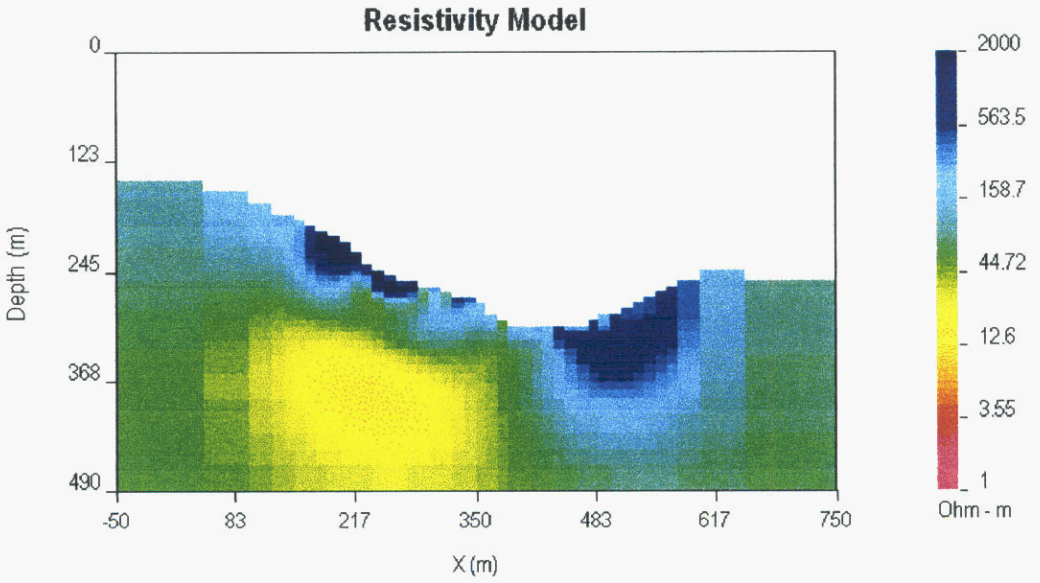
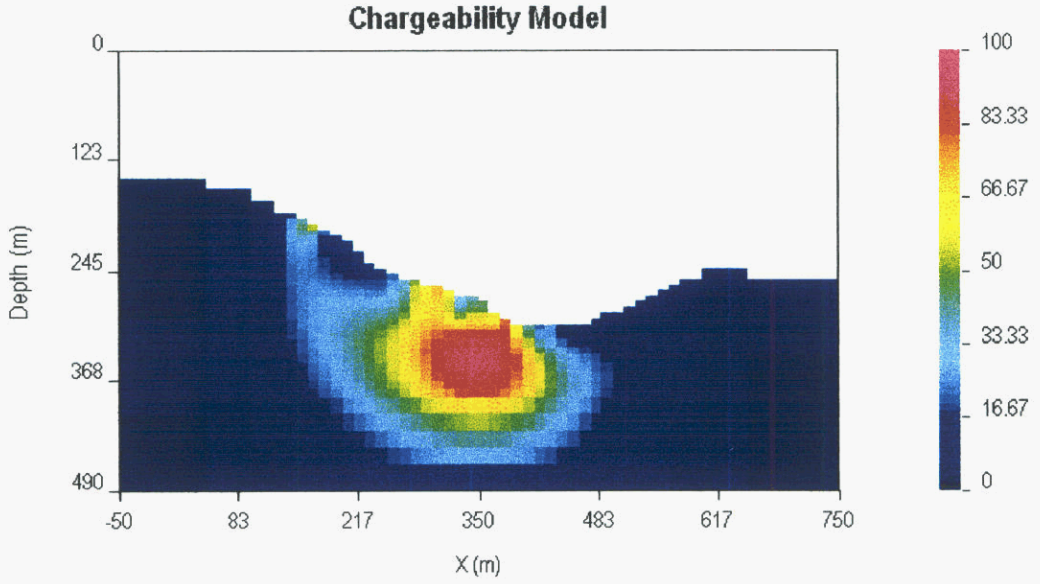
230
344
459
Depth (m)
-50
75
200
325
450
575
700
X (m)
100
83.33
66.67
50
33.33
16.67
0

L 1600N


Resistivity Model
0
123
245
368
490
Depth (m)
-50
83
217
350
483
617
750
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
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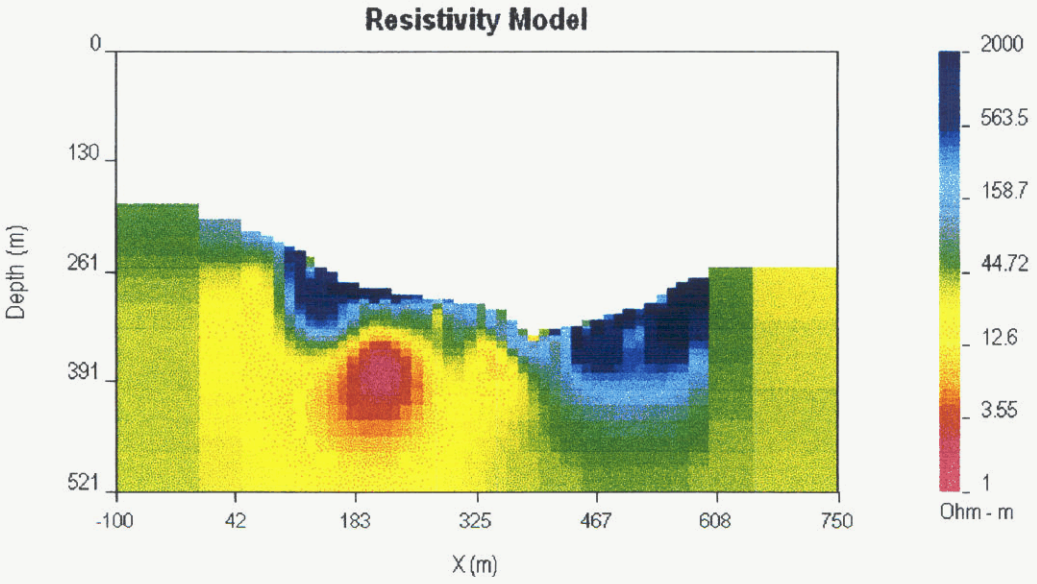
123
245
368
490
Depth (m)
-50
83
217
350
483
617
750
X (m)
100
83.33
66.67
50
33.33
16.67
0

L 1700N


Resistivity Model
Depth (m)
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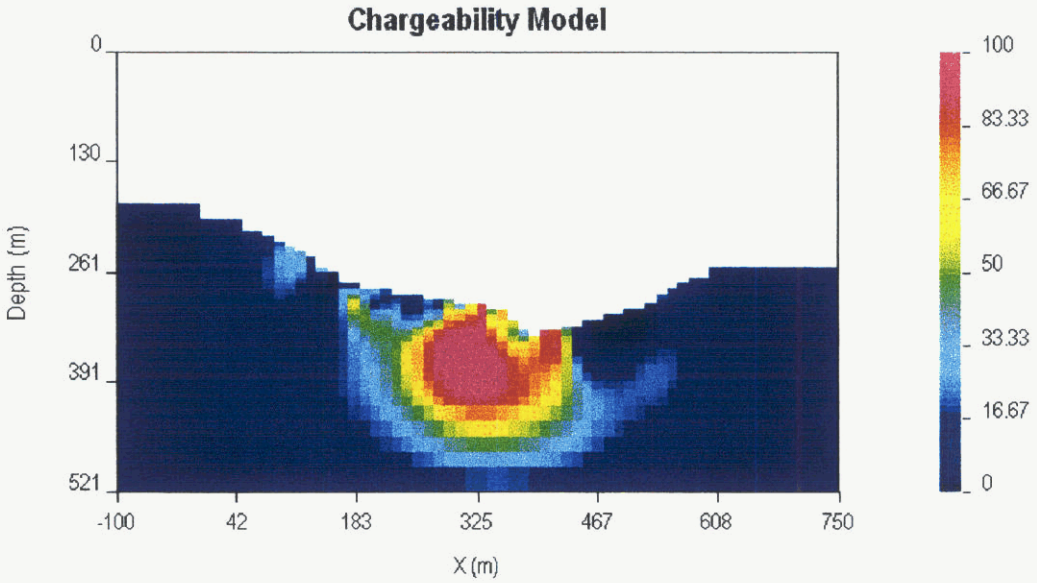
130
261
391
521
-100
42
183
325
467
608
750
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
Depth (m)
0
130
261
391
521
-100
42
183
325
467
608
750
X (m)
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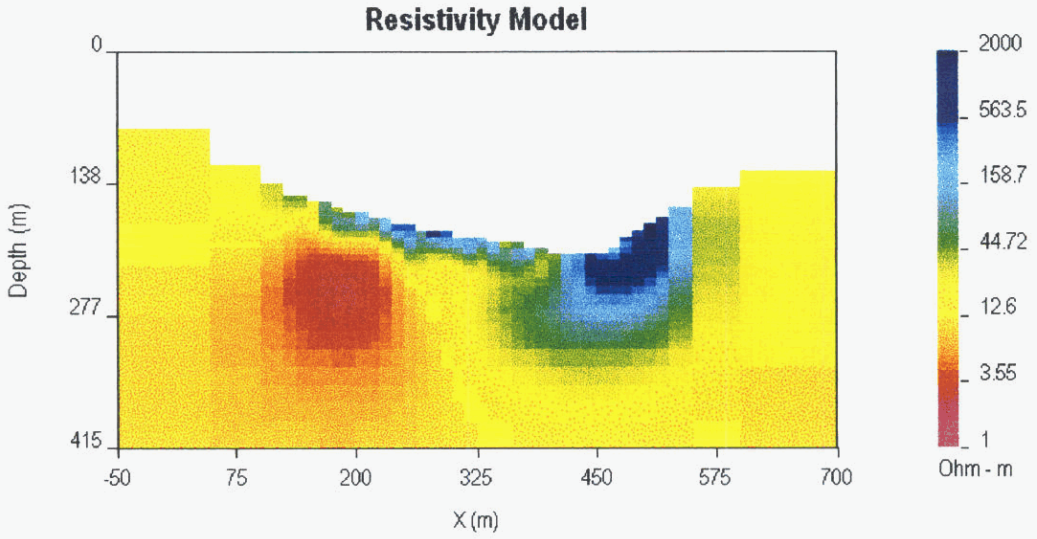
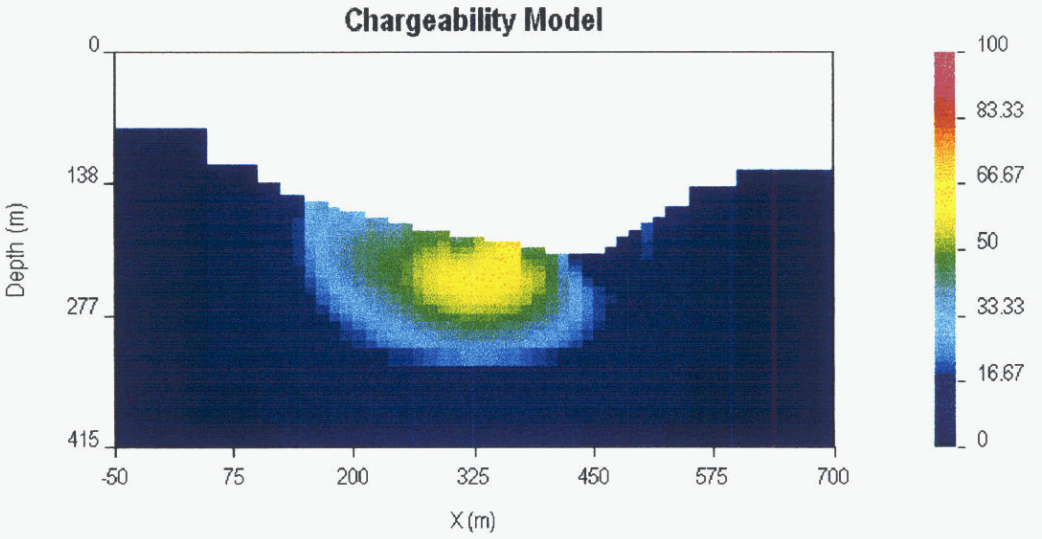
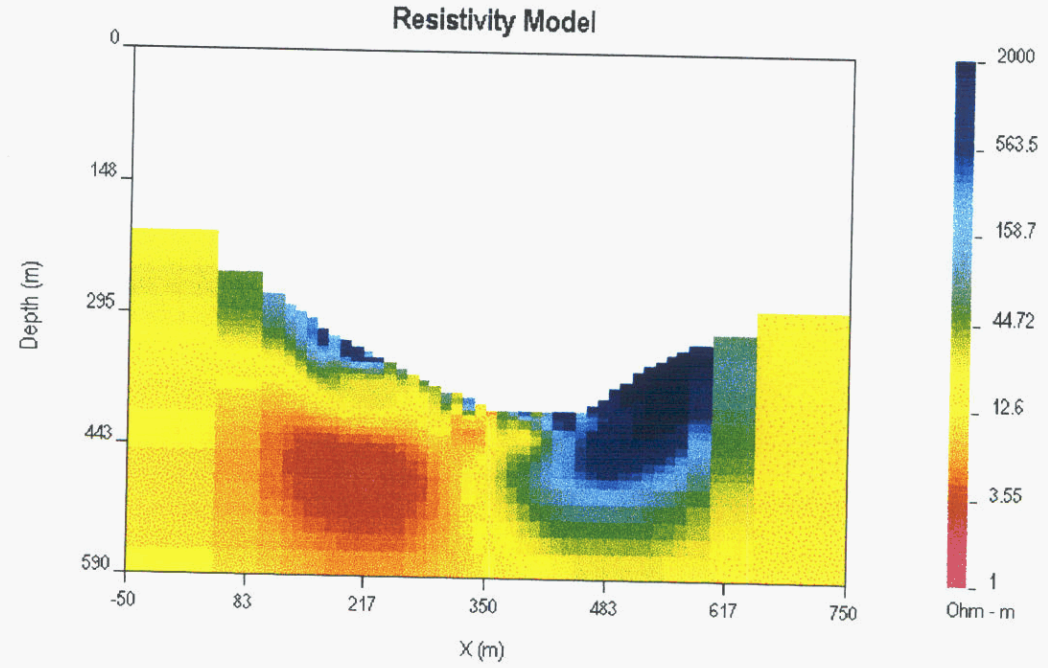
83.33
66.67
50
33.33
16.67
0

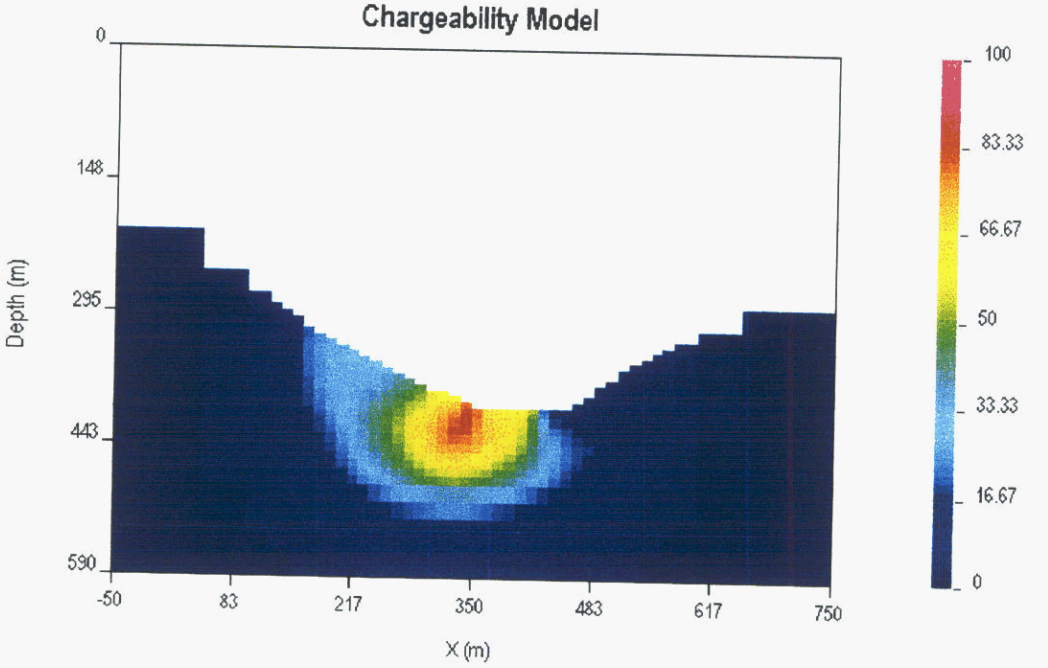
L1800N


Resistivity Model
0
138
277
415
Depth (m)
-50
75
200
325
450
575
700
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m

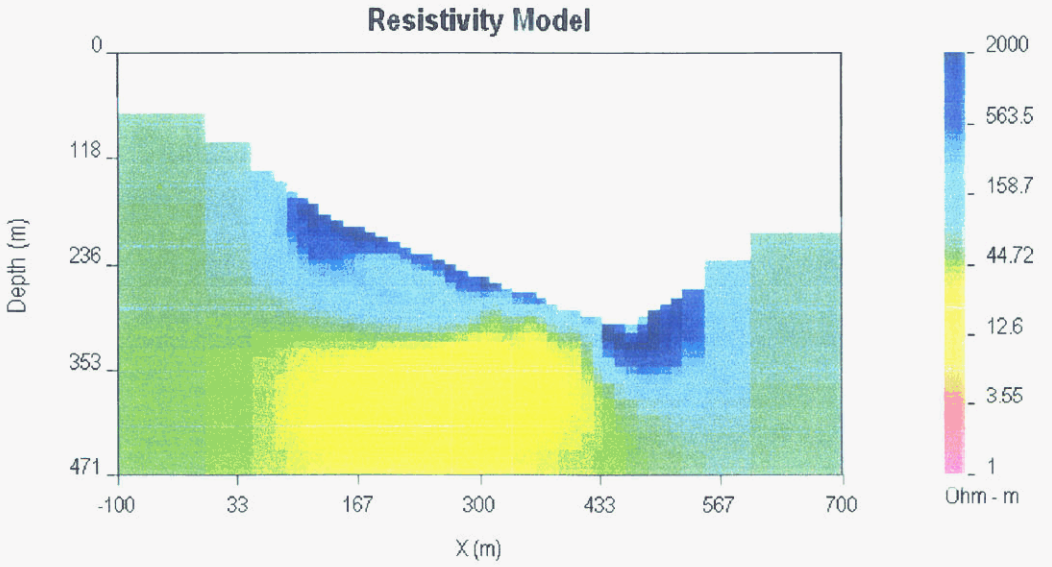

Chargeability Model
0
138
277
415
Depth (m)
-50
75
200
325
450
575
700
X (m)
100
83.33
66.67
50
33.33
16.67
0

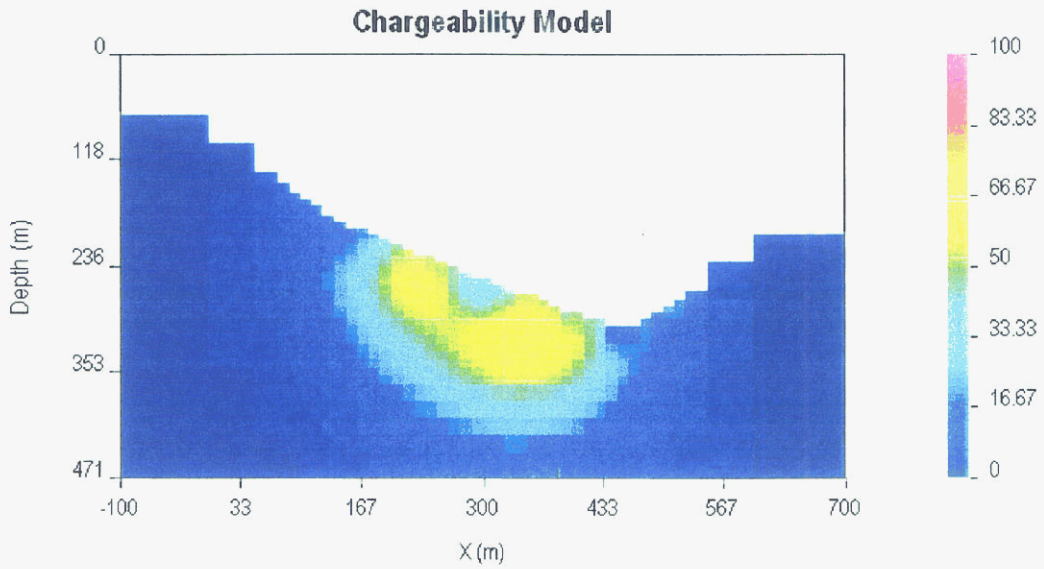
L 1900N


Resistivity Model
0
148
295
443
590
Depth (m)
-50
83
217
350
483
617
750
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m

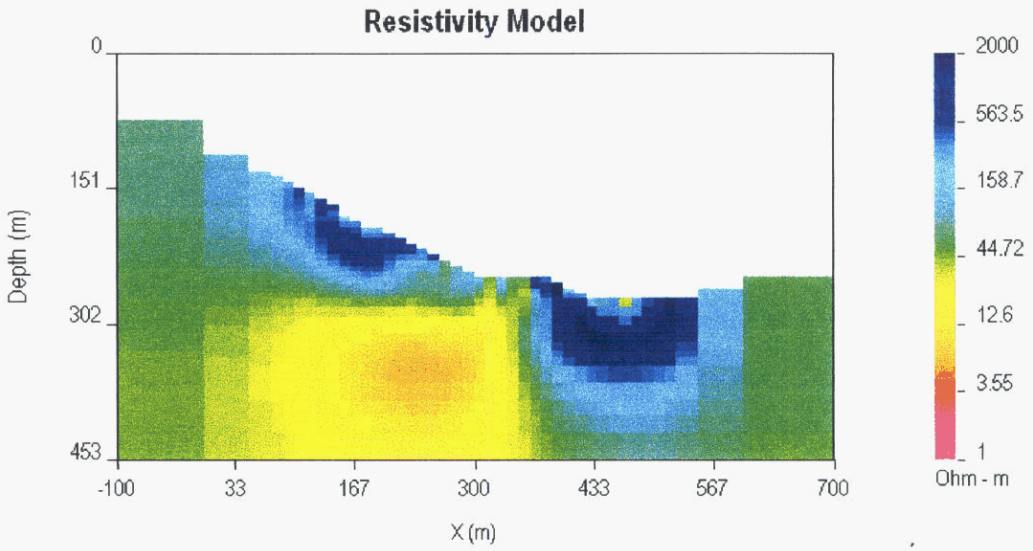

Chargeability Model
0
148
295
443
590
Depth (m)
-50
83
217
350
483
617
750
X (m)
100
83.33
66.67
50
33.33
16.67
0

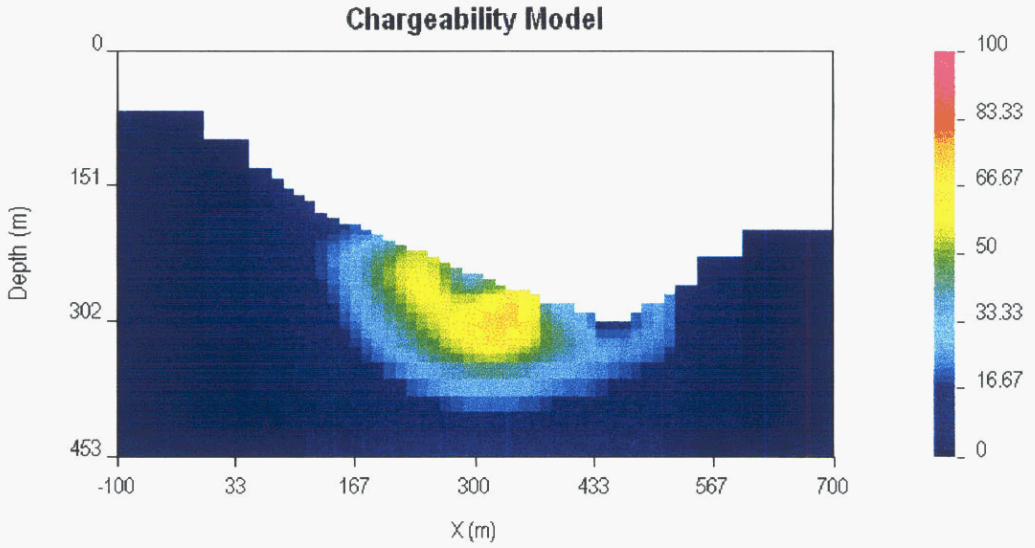
L 2000N


Resistivity Model
0
118
236
353
471
Depth (m)
-100
33
167
300
433
567
700
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m

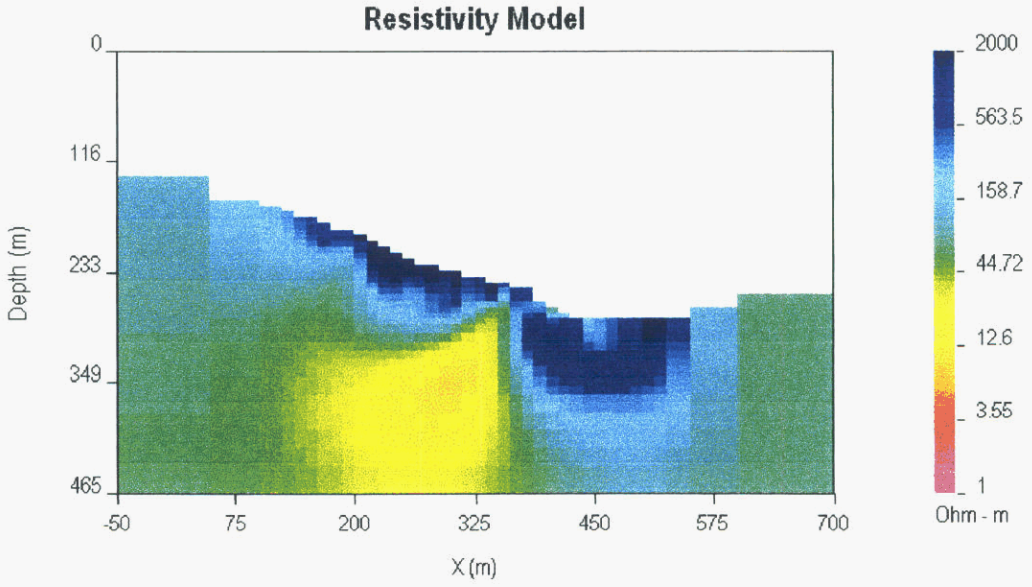

Chargeability Model
0
118
236
353
471
Depth (m)
-100
33
167
300
433
567
700
X (m)
100
83.33
66.67
50
33.33
16.67
0

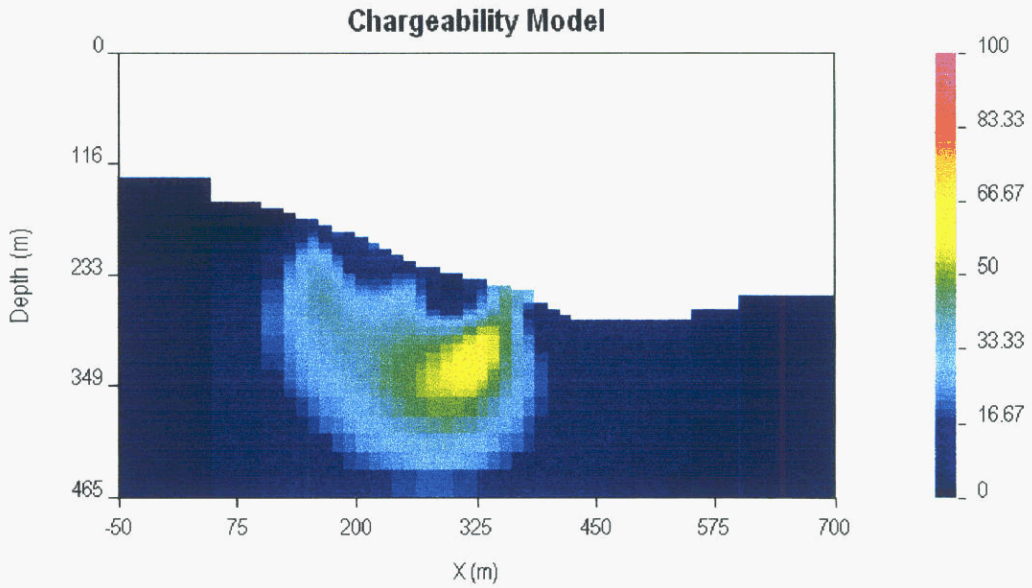
L 2100N


Resistivity Model
0
151
302
453
Depth (m)
-100
33
167
300
433
567
700
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m

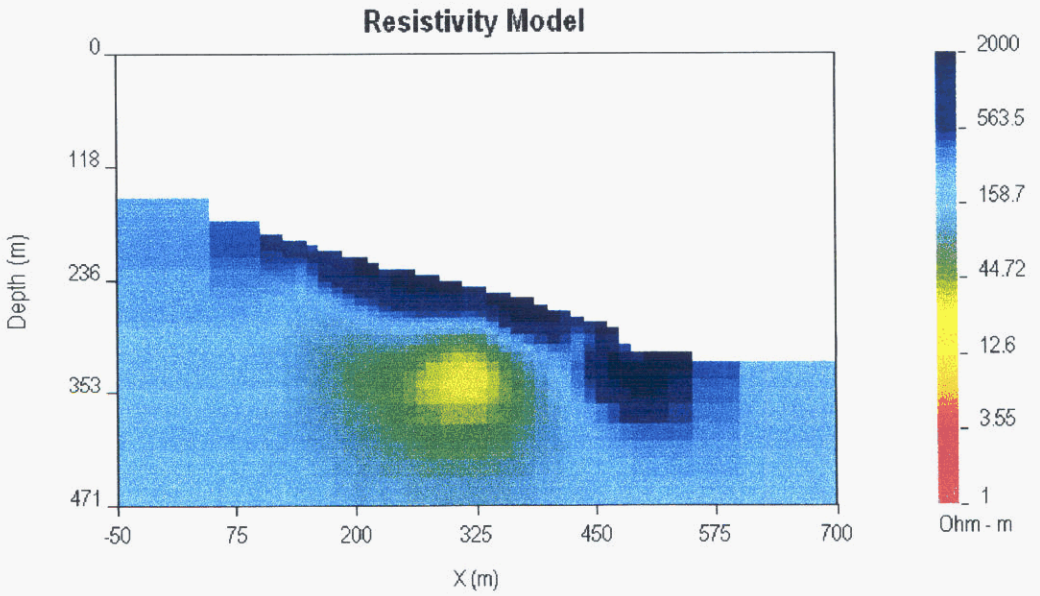

Chargeability Model
0
151
302
453
Depth (m)
-100
33
167
300
433
567
700
X (m)
100
83.33
66.67
50
33.33
16.67
0

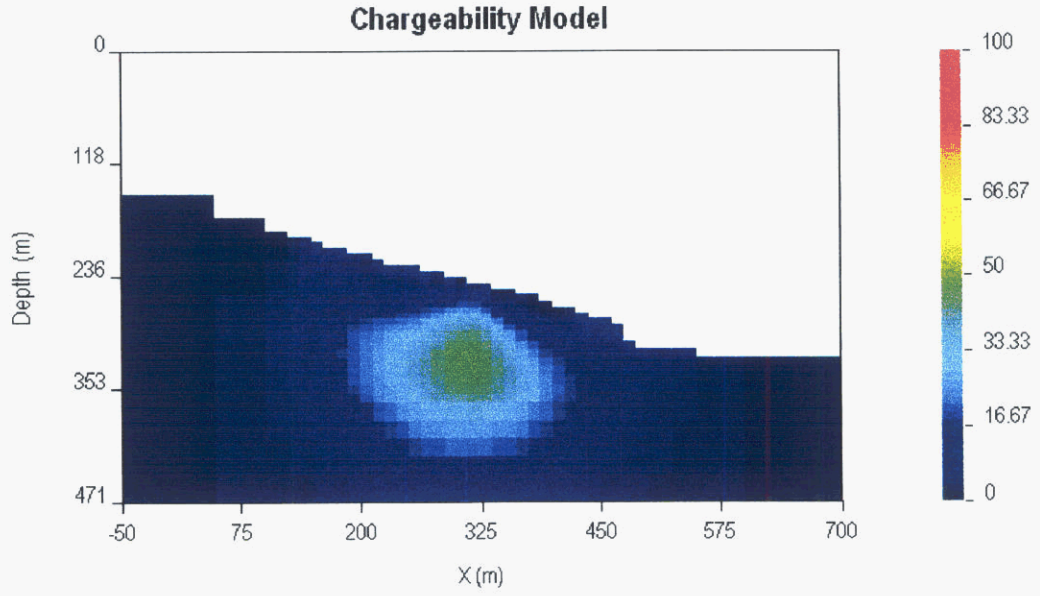
L 2200N

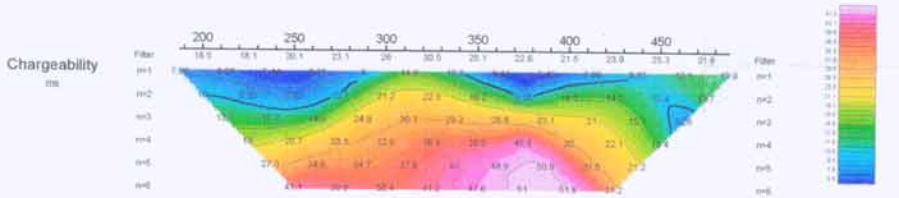

Resistivity Model
0
116
233
349
465
Depth (m)
-50
75
200
325
450
575
700
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m

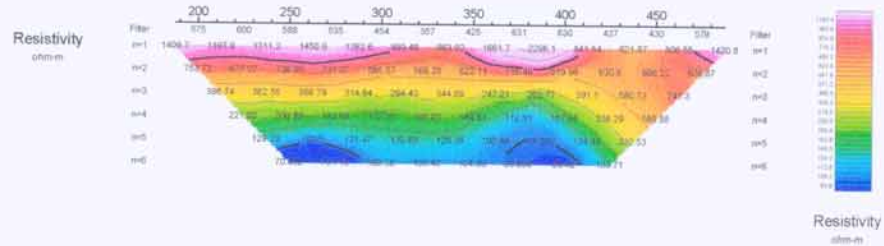

Chargeability Model
0
116
233
349
465
Depth (m)
-50
75
200
325
450
575
700
X (m)
100
83.33
66.67
50
33.33
16.67
0

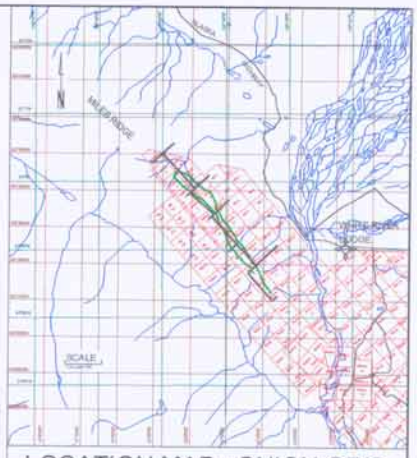
L 2300N


Resistivity Model
0
118
236
353
471
Depth (m)
-50
75
200
325
450
575
700
X (m)
2000
563.5
158.7
44.72
12.6
3.55
1
Ohm - m


Chargeability Model
0
118
236
353
471
Depth (m)
-50
75
200
325
450
575
700
X (m)
100
83.33
66.67
50
33.33
16.67
0





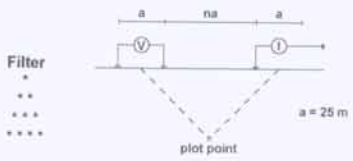


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Dipole-Pole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

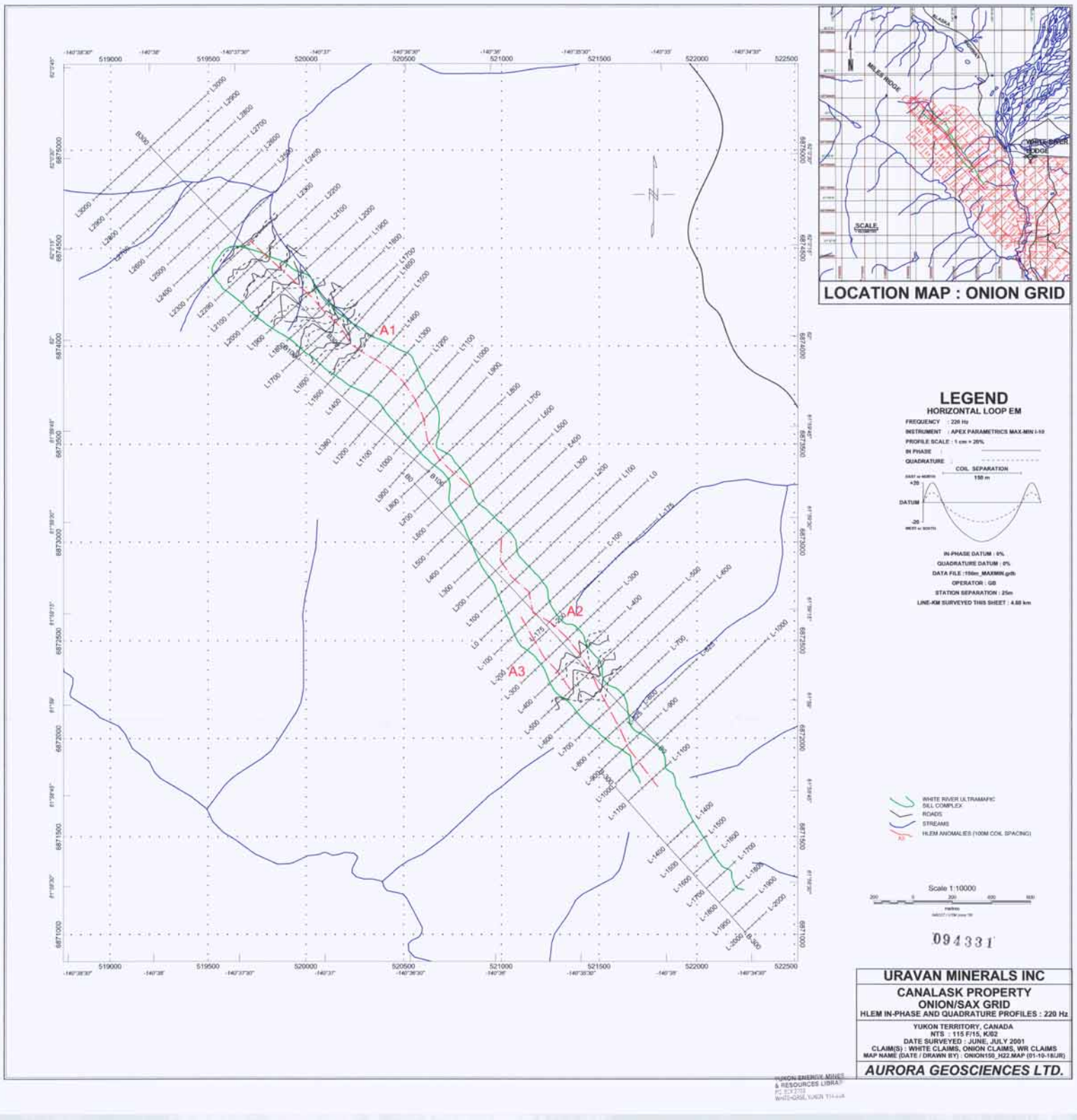
CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 2300N

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L2300.MAP (01-10-18/PJ)

AURORA GEOSCIENCES LTD.

YUKON ENERGY, MINES
& RESOURCES LIBRARY
PO BOX 2703
WHITEHORSE, YUKON Y1A 2C6

094331



LOCATION MAP : ONION GRID

LEGEND

HORIZONTAL LOOP EM

FREQUENCY : 226 Hz
INSTRUMENT : APEX PARAMETRICS MAX-MIN I-10
PROFILE SCALE : 1 cm = 25%
IN PHASE :
QUADRATURE :

IN-PHASE DATUM : 0%
QUADRATURE DATUM : 0%
DATA FILE : 150m_MAXMIN.gdb
OPERATOR : GB
STATION SEPARATION : 25m
LINE-KM SURVEYED THIS SHEET : 4.88 km

WHITE RIVER ULTRAMAFIC SILL COMPLEX
ROADS
STREAMS
HLEM ANOMALIES (100M COIL SPACING)

Scale 1:10000

094331

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
HLEM IN-PHASE AND QUADRATURE PROFILES : 220 Hz

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
CLAIM(S) : WHITE CLAIMS, ONION CLAIMS, WR CLAIMS
MAP NAME (DATE / DRAWN BY) : ONION150_H22.MAP (01-10-18/JR)

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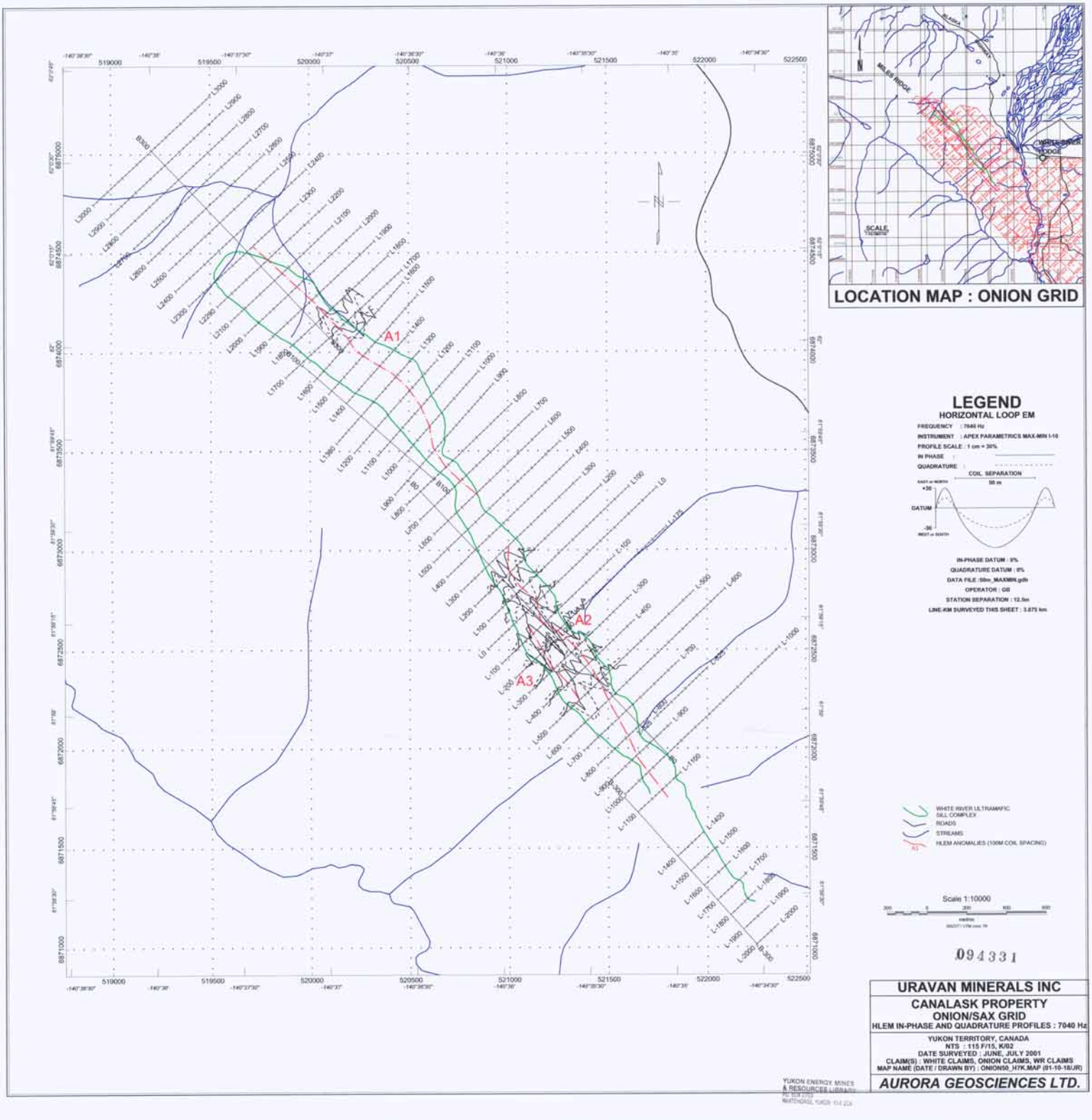

LOCATION MAP : ONION GRID

LEGEND

HORIZONTAL LOOP EM

FREQUENCY : 7040 Hz
INSTRUMENT : APEX PARAMETRICS MAX-MIN I-10
PROFILE SCALE : 1 cm = 20%
IN PHASE :
QUADRATURE :

IN-PHASE DATUM : 0%
QUADRATURE DATUM : 0%
DATA FILE :Sbo_MAXMIN.gdb
OPERATOR : GD
STATION SEPARATION : 12.5m
LINE-KM SURVEYED THIS SHEET : 3.875 km

WHITE RIVER ULTRAMAFIC SILL COMPLEX
ROADS
STREAMS
HLEM ANOMALIES (100M COIL SPACING)

Scale 1:10000

094331

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
HLEM IN-PHASE AND QUADRATURE PROFILES : 7040 Hz

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
CLAIM(S) : WHITE CLAIMS, ONION CLAIMS, WR CLAIMS
MAP NAME (DATE / DRAWN BY) : ONION50_H7K.MAP (01-10-18/JR)

AURORA GEOSCIENCES LTD.

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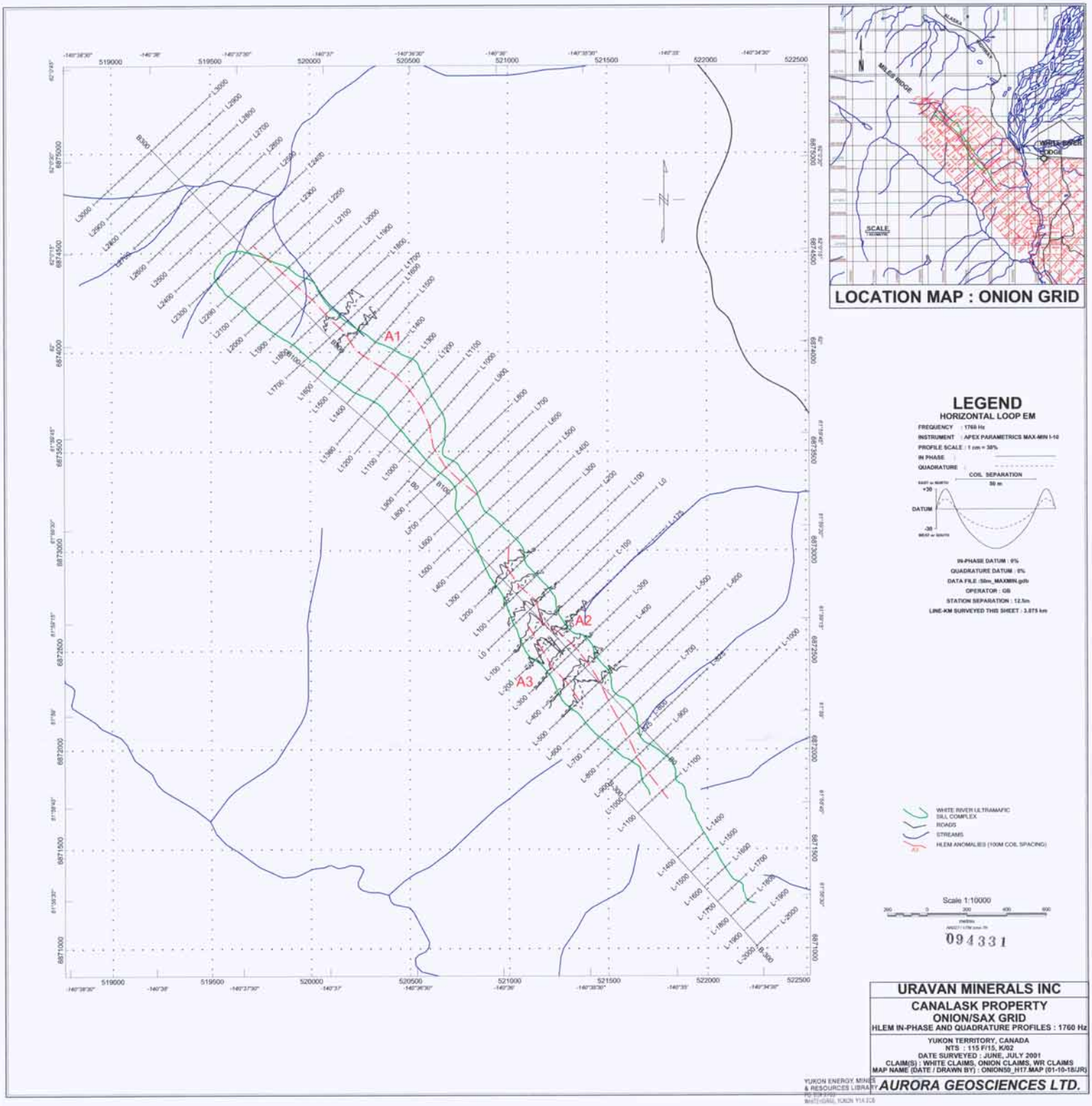

LOCATION MAP : ONION GRID

LEGEND

HORIZONTAL LOOP EM

FREQUENCY : 1760 Hz
INSTRUMENT : APEX PARAMETRICS MAX-MIN I-10
PROFILE SCALE : 1 cm = 38%
IN PHASE
QUADRATURE

IN-PHASE DATUM : 0%
QUADRATURE DATUM : 0%
DATA FILE :50m_MAXMIN.gdb
OPERATOR : GB
STATION SEPARATION : 12.5m
LINE-KM SURVEYED THIS SHEET : 3.875 km

WHITE RIVER ULTRAMAFIC SILL COMPLEX
ROADS
STREAMS
HLEM ANOMALIES (100M COIL SPACING)

Scale 1:10000

094331

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
HLEM IN-PHASE AND QUADRATURE PROFILES : 1760 Hz

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
CLAIM(S) : WHITE CLAIMS, ONION CLAIMS, WR CLAIMS
MAP NAME (DATE / DRAWN BY) : ONION50_H17.MAP (01-10-18/JR)

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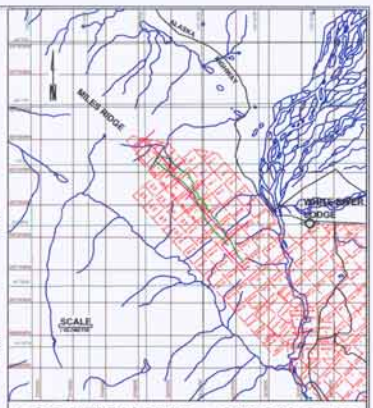
PO BOX 2703
WHITEHORSE, YUKON Y1A 2C6

AURORA GEOSCIENCES LTD.

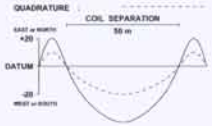


LOCATION MAP : ONION GRID

LEGEND

HORIZONTAL LOOP EM

FREQUENCY : 440 Hz
INSTRUMENT : APEX PARAMETRICS MAX-MIN I-10
PROFILE SCALE : 1 cm = 20%
IN PHASE :
QUADRATURE :



IN-PHASE DATUM : 0%
QUADRATURE DATUM : 0%
DATA FILE :50m_MAXMIN.gdb
OPERATOR : GB
STATION SEPARATION : 12.5m
LINE-KM SURVEYED THIS SHEET : 3.875 km

WHITE RIVER ULTRAMAFIC SILL COMPLEX
ROADS
STREAMS
HLEM ANOMALIES (100M COIL SPACING)

Scale 1:10000

094331

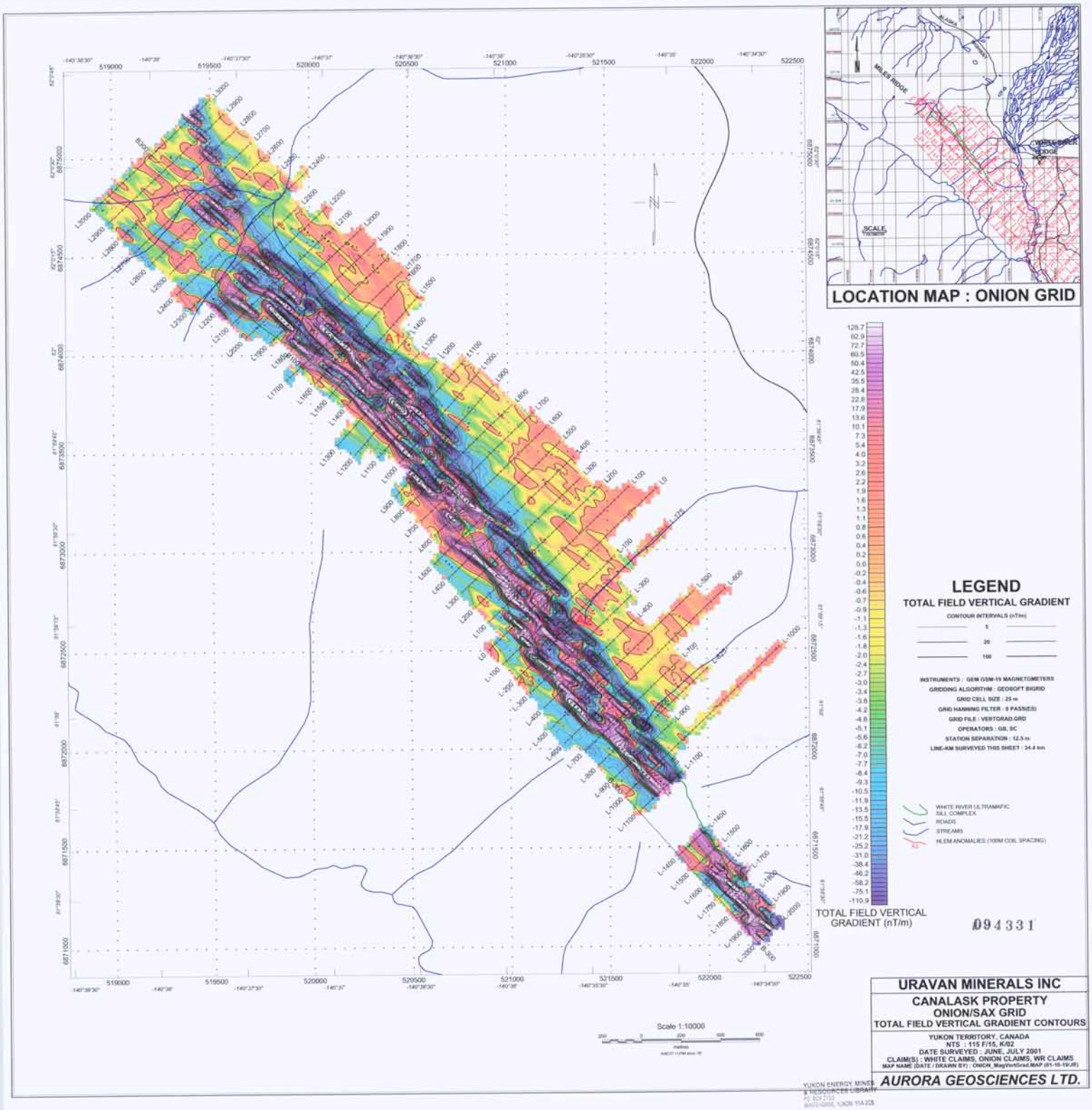
URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
HLEM IN-PHASE AND QUADRATURE PROFILES : 440 Hz

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
CLAIM(S) : WHITE CLAIMS, ONION CLAIMS, WR CLAIMS
MAP NAME (DATE / DRAWN BY) : ONION50_H44.MAP (01-10-18/JR)

AURORA GEOSCIENCES LTD.

YUKON ENERGY MINES & RESOURCES LIBRARY



LOCATION MAP : ONION GRID

LEGEND

TOTAL FIELD VERTICAL GRADIENT

CONTOUR INTERVALS (nTm)

5

20

100

INSTRUMENTS : GEM GSM-19 MAGNETOMETERS
GRIDDING ALGORITHM : GEOSOFT BIGRID
GRID CELL SIZE : 25 m
GRID HANNING FILTER : 0 PASS(ES)
GRID FILE : VERTGRAD.GRD
OPERATORS : GB, SC
STATION SEPARATION : 12.5 m
LINE-KM SURVEYED THIS SHEET : 34.4 km

WHITE RIVER ULTRAMAFIC SILL COMPLEX
ROADS
STREAMS
HLEM ANOMALIES (100M COIL SPACING)

128.7
82.9
72.7
60.5
50.4
42.5
35.5
28.4
22.8
17.9
13.6
10.1
7.3
5.4
4.0
3.2
2.6
2.2
1.9
1.6
1.3
1.1
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.7
-0.9
-1.1
-1.3
-1.6
-1.8
-2.0
-2.4
-2.7
-3.0
-3.4
-3.8
-4.2
-4.8
-5.1
-5.6
-6.2
-7.0
-7.7
-8.4
-9.3
-10.5
-11.9
-13.5
-15.5
-17.9
-21.2
-25.2
-31.0
-38.4
-46.2
-58.2
-75.1
-110.9

TOTAL FIELD VERTICAL GRADIENT (nT/m)

094331

URAVAN MINERALS INC
CANALASK PROPERTY ONION/SAX GRID TOTAL FIELD VERTICAL GRADIENT CONTOURS
YUKON TERRITORY, CANADA NTS : 115 F/15, K/02 DATE SURVEYED : JUNE, JULY 2001 CLAIM(S) : WHITE CLAIMS, ONION CLAIMS, WR CLAIMS MAP NAME (DATE / DRAWN BY) : ONION_MagVertGrad.MAP (01-10-19/JR)
AURORA GEOSCIENCES LTD.

YUKON ENERGY, MINES & RESOURCES LIBRARY
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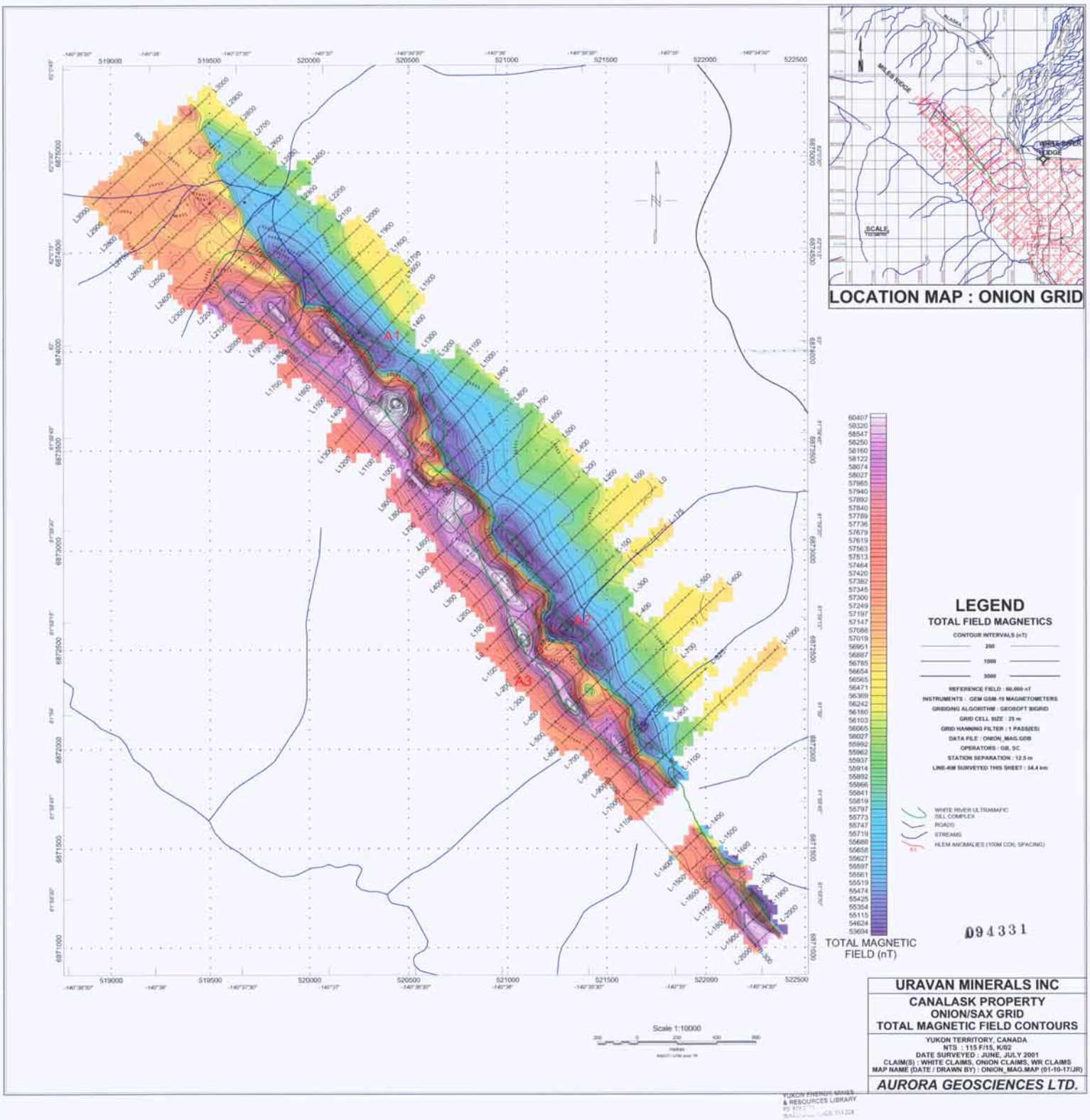
WHITEHORSE, YUKON Y1A 2C6



LOCATION MAP : ONION GRID

LEGEND

TOTAL FIELD MAGNETICS

CONTOUR INTERVALS (nT)

200

1000

5000

REFERENCE FIELD : 60,000 nT

INSTRUMENTS : GEM GSM-19 MAGNETOMETERS

GRIDDING ALGORITHM : GEOSOFT BIGRID

GRID CELL SIZE : 25 m

GRID HANNING FILTER : 1 PASS(ES)

DATA FILE : ONION_MAG.GDB

OPERATORS : GB, SC

STATION SEPARATION : 12.5 m

LINE-KM SURVEYED THIS SHEET : 34.4 km

WHITE RIVER ULTRAMAFIC SILL COMPLEX

ROAD(S)

STREAMS

HLEM ANOMALIES (100M COIL SPACING)

TOTAL MAGNETIC FIELD (nT)

60407
59320
58547
58250
58160
58122
58074
58027
57985
57940
57892
57840
57789
57736
57679
57619
57563
57513
57464
57420
57382
57345
57306
57249
57197
57147
57088
57019
56951
56887
56785
56654
56565
56471
56369
56242
56186
56103
56065
56027
55992
55962
55937
55914
55892
55866
55841
55819
55797
55773
55747
55719
55688
55658
55627
55597
55561
55519
55474
55425
55354
55115
54624
53694

094331

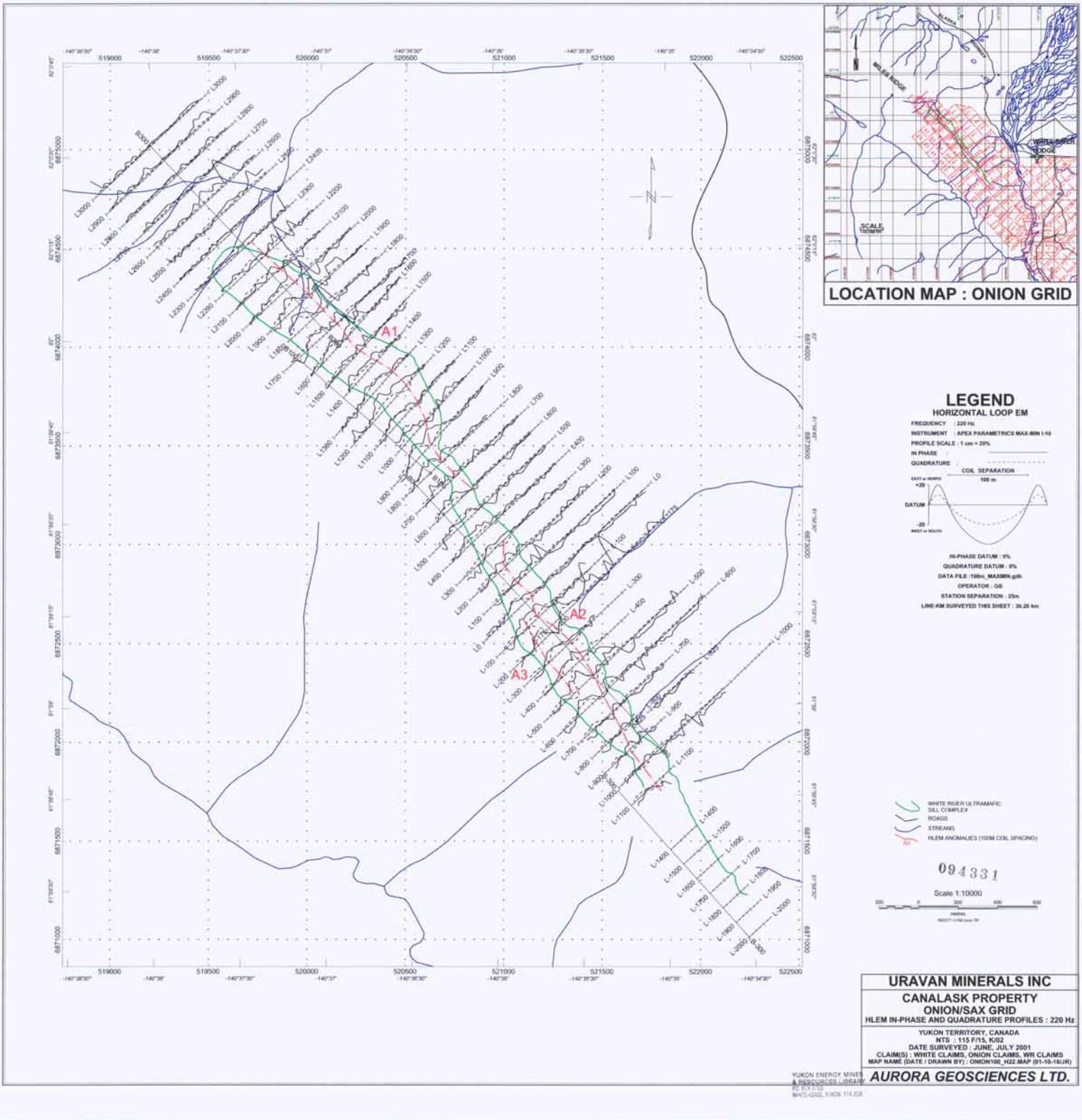
URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
TOTAL MAGNETIC FIELD CONTOURS

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
CLAIM(S) : WHITE CLAIMS, ONION CLAIMS, WR CLAIMS
MAP NAME (DATE / DRAWN BY) : ONION_MAG.MAP (01-10-17/JR)

AURORA GEOSCIENCES LTD.

YUKON ENERGY MINES & RESOURCES LIBRARY



LOCATION MAP : ONION GRID

LEGEND

HORIZONTAL LOOP EM

FREQUENCY : 220 Hz
INSTRUMENT : APEX PARAMETRICS MAX-MIN I-10
PROFILE SCALE : 1 cm = 20%
IN PHASE :
QUADRATURE :

IN-PHASE DATUM : 0%
QUADRATURE DATUM : 0%
DATA FILE :100m_MAXMIN.gdb
OPERATOR : GB
STATION SEPARATION : 25m
LINE-KM SURVEYED THIS SHEET : 30.20 km

WHITE RIVER ULTRAMAFIC SILL COMPLEX
ROADS
STREAMS
HLEM ANOMALIES (100M COIL SPACING)

094331

Scale 1:10000

URAVAN MINERALS INC

CANALASK PROPERTY

ONION/SAX GRID

HLEM IN-PHASE AND QUADRATURE PROFILES : 220 Hz

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
CLAIM(S) : WHITE CLAIMS, ONION CLAIMS, WR CLAIMS
MAP NAME (DATE / DRAWN BY) : ONION100_H22.MAP (01-10-18/JR)

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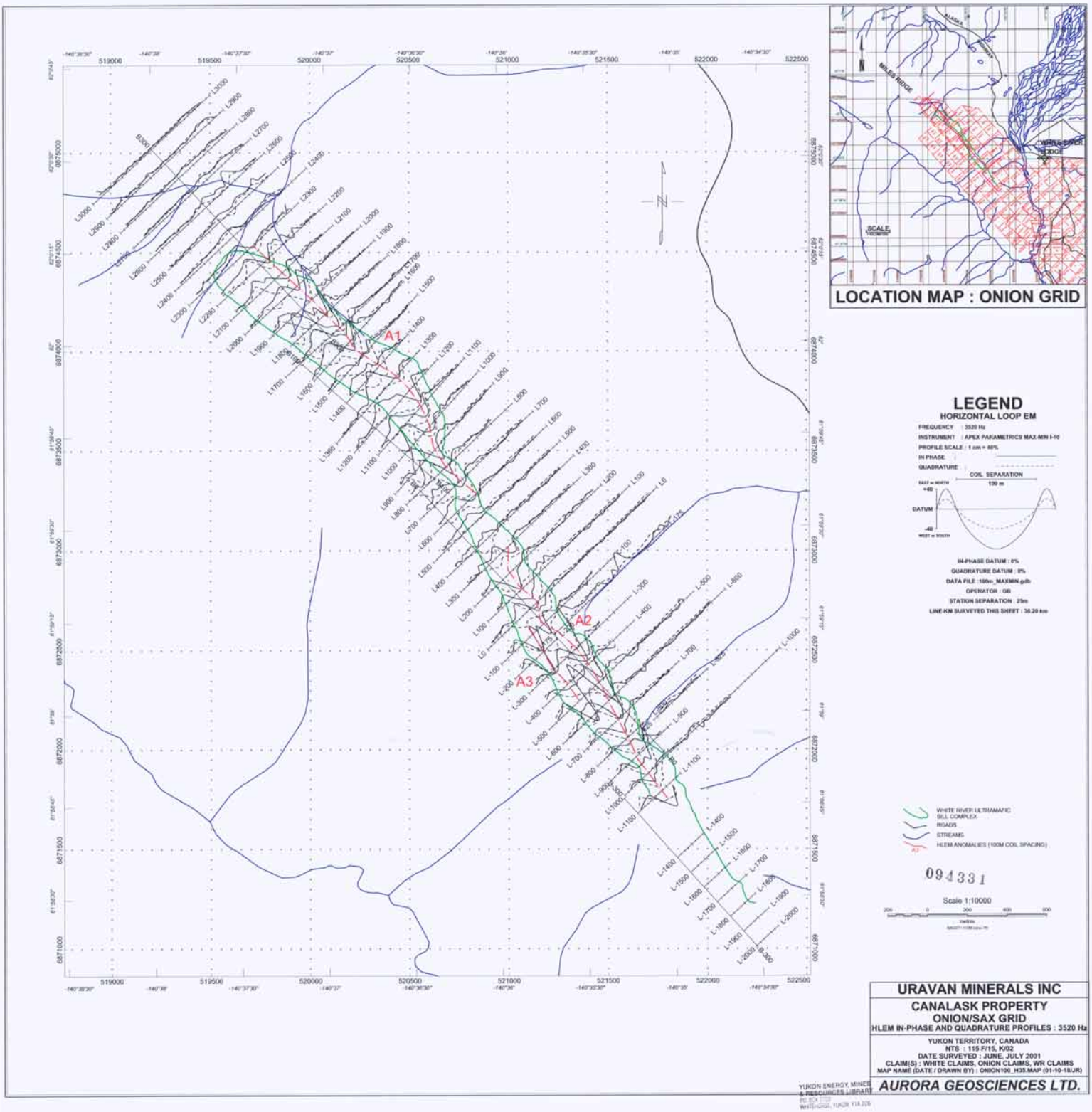

LOCATION MAP : ONION GRID

LEGEND

HORIZONTAL LOOP EM

FREQUENCY : 3520 Hz
INSTRUMENT : APEX PARAMETRICS MAX-MIN I-II
PROFILE SCALE : 1 cm = 40%
IN PHASE :
QUADRATURE :

IN-PHASE DATUM : 0%
QUADRATURE DATUM : 0%
DATA FILE :100m_MAXMIN.gdb
OPERATOR : GB
STATION SEPARATION : 25m
LINE-KM SURVEYED THIS SHEET : 30.20 km

WHITE RIVER ULTRAMAFIC SILL COMPLEX
ROADS
STREAMS
HLEM ANOMALIES (100M COIL SPACING)

094331

Scale 1:10000

URAVAN MINERALS INC
CANALASK PROPERTY ONION/SAX GRID HLEM IN-PHASE AND QUADRATURE PROFILES : 3520 Hz
YUKON TERRITORY, CANADA NTS : 115 F/15, K/02 DATE SURVEYED : JUNE, JULY 2001 CLAIM(S) : WHITE CLAIMS, ONION CLAIMS, WR CLAIMS MAP NAME (DATE / DRAWN BY) : ONION100_H35.MAP (01-10-18/JR)
AURORA GEOSCIENCES LTD.

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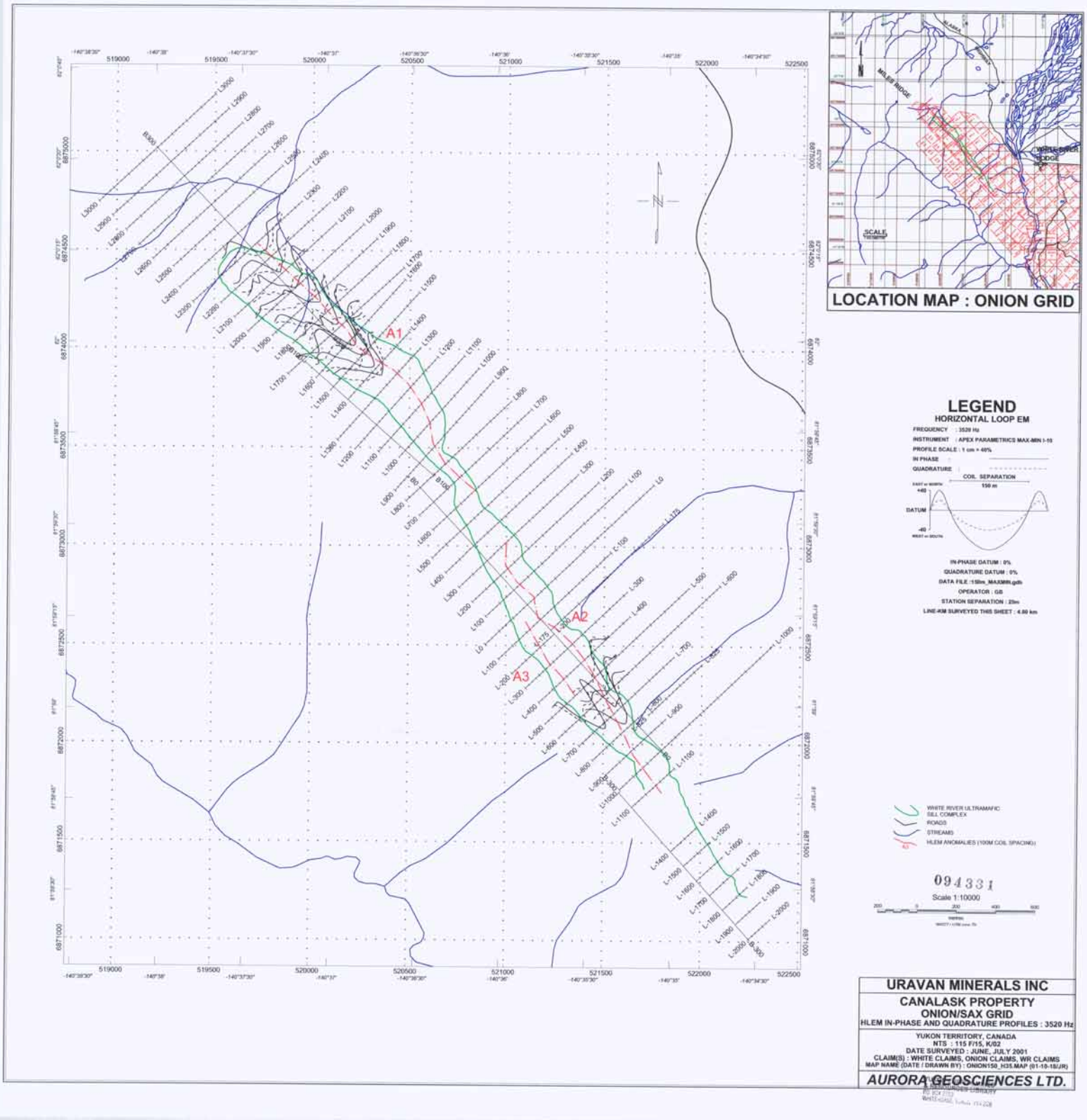
PO BOX 2703
WHITEHORSE, YUKON Y1A 2C6



LOCATION MAP : ONION GRID

LEGEND

HORIZONTAL LOOP EM

FREQUENCY : 3520 Hz
INSTRUMENT : APEX PARAMETRICS MAX-MIN I-10
PROFILE SCALE : 1 cm = 40%
IN PHASE
QUADRATURE

IN-PHASE DATUM : 0%
QUADRATURE DATUM : 0%
DATA FILE :150m_MAXMIN.gdb
OPERATOR : GB
STATION SEPARATION : 25m
LINE-KM SURVEYED THIS SHEET : 4.80 km

WHITE RIVER ULTRAMAFIC SILL COMPLEX
ROADS
STREAMS
HLEM ANOMALIES (100M COIL SPACING)

094331

Scale 1:10000

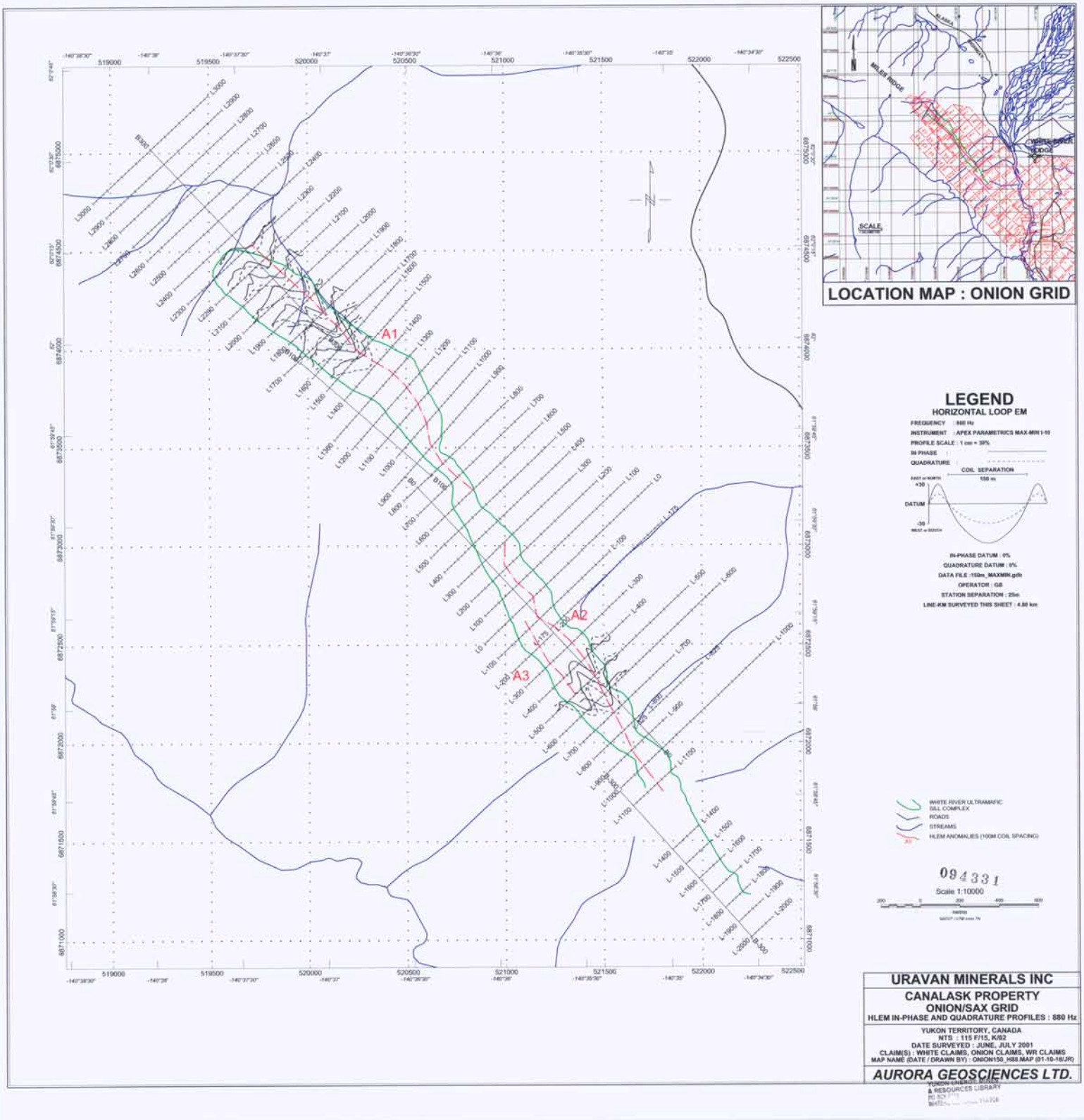
200 0 200 400 600
metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
HLEM IN-PHASE AND QUADRATURE PROFILES : 3520 Hz

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
CLAIM(S) : WHITE CLAIMS, ONION CLAIMS, WR CLAIMS
MAP NAME (DATE / DRAWN BY) : ONION150_H35.MAP (01-10-15/JR)

AURORA GEOSCIENCES LTD.



LOCATION MAP : ONION GRID

LEGEND

HORIZONTAL LOOP EM

FREQUENCY : 880 Hz
INSTRUMENT : APEX PARAMETRICS MAX-MIN I-10
PROFILE SCALE : 1 cm = 20%
IN PHASE :
QUADRATURE :

IN-PHASE DATUM : 0%
QUADRATURE DATUM : 0%
DATA FILE :150m_MAXMIN.gdb
OPERATOR : GB
STATION SEPARATION : 25m
LINE-KM SURVEYED THIS SHEET : 4.80 km

WHITE RIVER ULTRAMAFIC SILL COMPLEX
ROADS
STREAMS
HLEM ANOMALIES (100M COIL SPACING)

094331

Scale 1:10000

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
HLEM IN-PHASE AND QUADRATURE PROFILES : 880 Hz

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
CLAIM(S) : WHITE CLAIMS, ONION CLAIMS, WR CLAIMS
MAP NAME (DATE / DRAWN BY) : ONION150_H88.MAP (01-10-18/JR)

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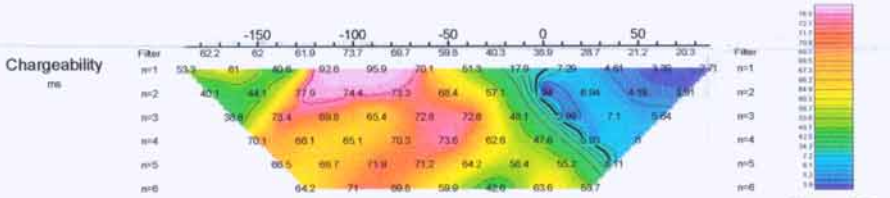
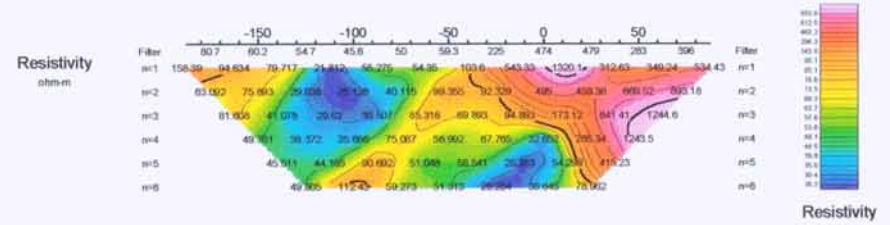
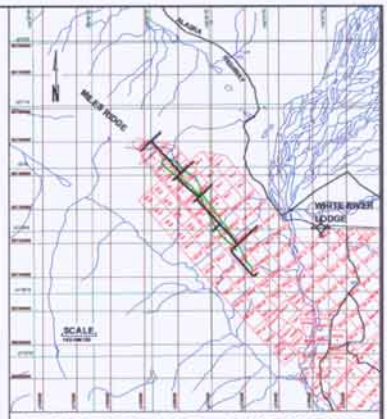
YUKON GEOLOGY SURVEY
& RESOURCES LIBRARY
PO BOX 2703





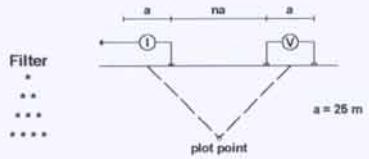


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Pole-Dipole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 900S

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L-900.MAP (01-10-18/PJ)

AURORA GEOSCIENCES LTD.

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PO BOX 2703
WHITEHORSE, YUKON Y1A 2C6

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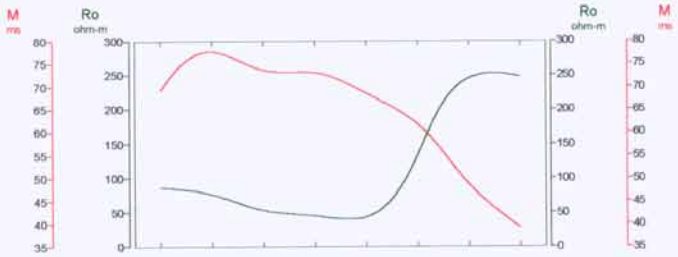
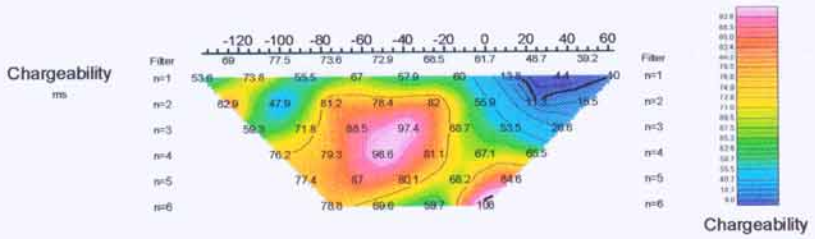
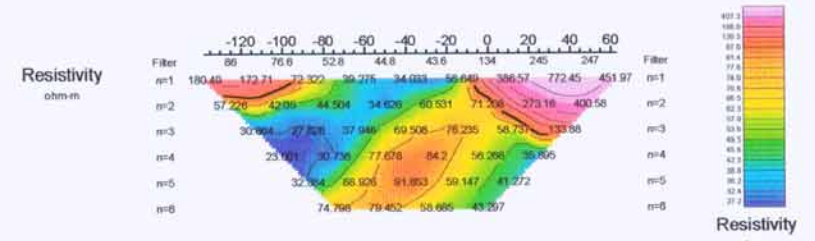
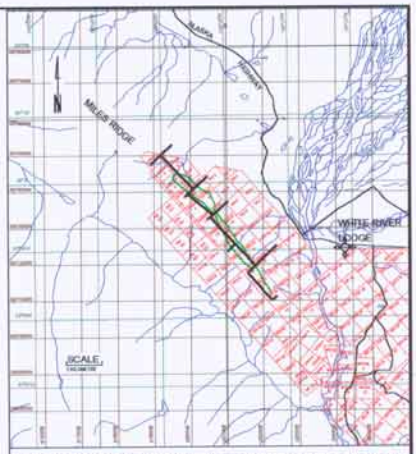






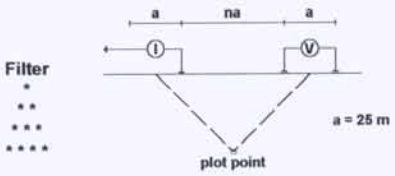


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Pole-Dipole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

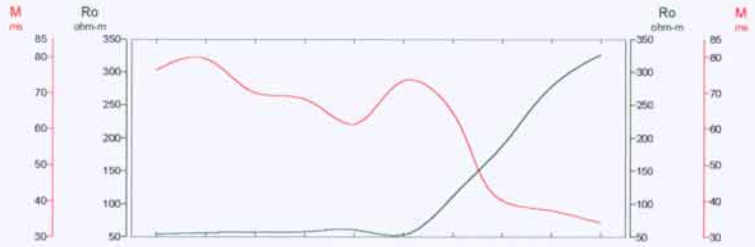
CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 800S

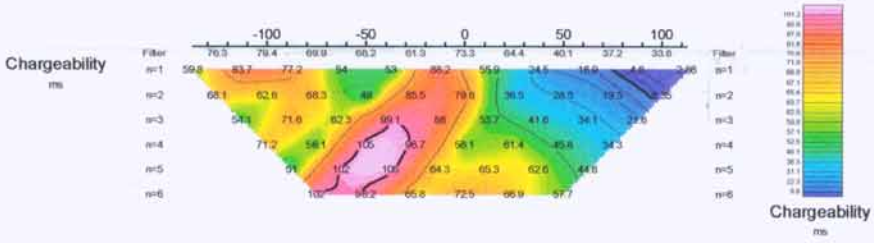
YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L-800.MAP (01-10-18/PJ)

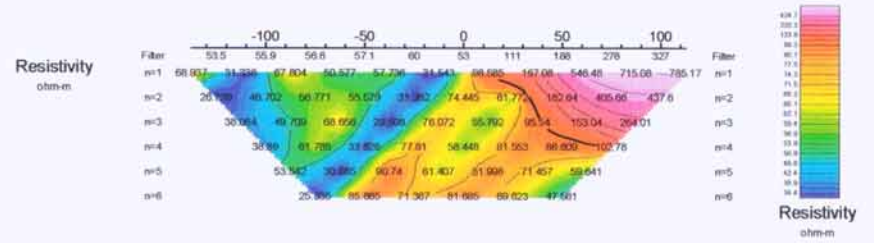
AURORA GEOSCIENCES LTD.

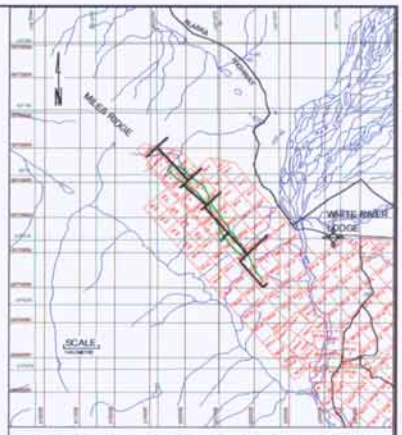
YUKON ENERGY MINES
Whitehorse, Yukon Y1A 2C6

094331







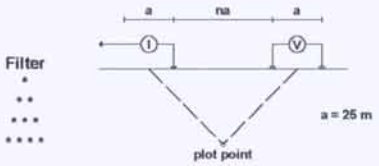


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Pole-Dipole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 700S

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L-700.MAP (01-10-18/PJ)

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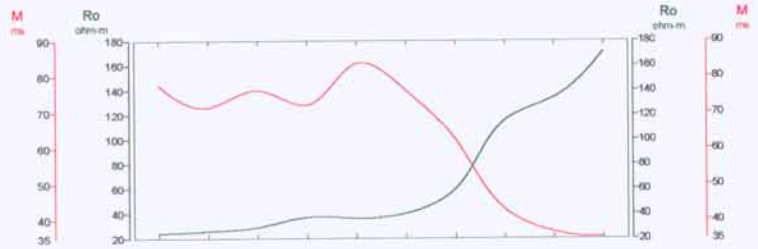
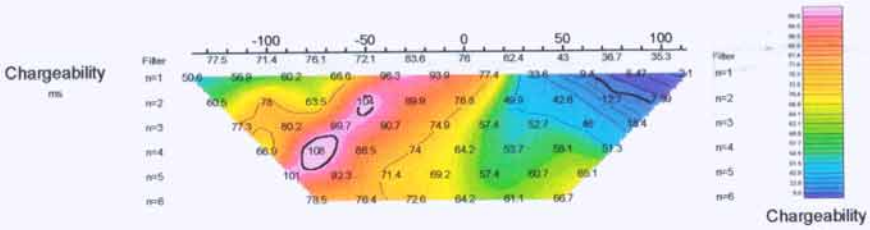
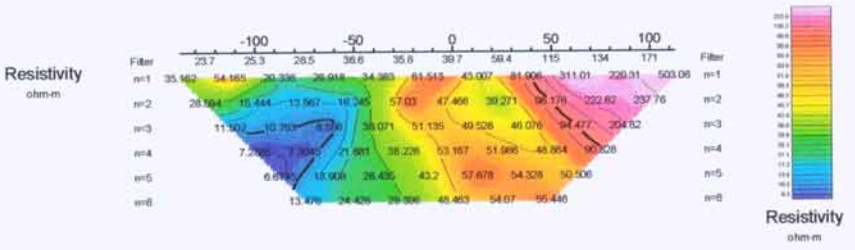
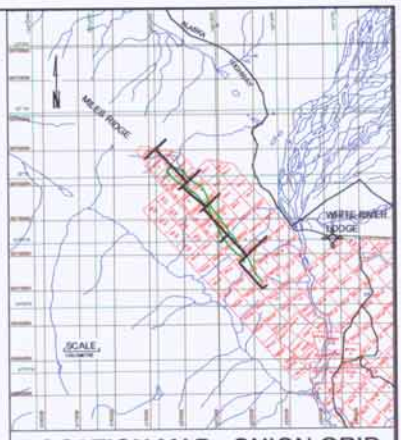






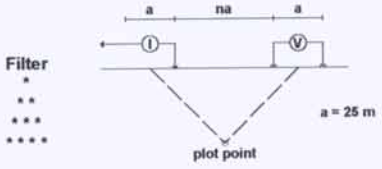


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Pole-Dipole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 600S

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L-600.MAP (01-10-18/PJ)

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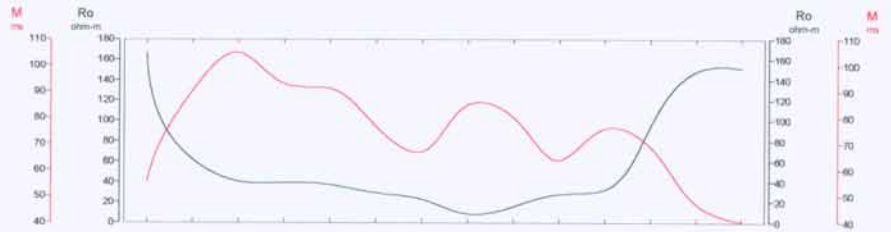

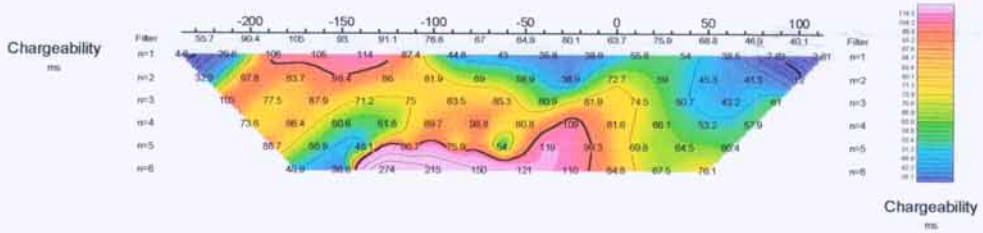

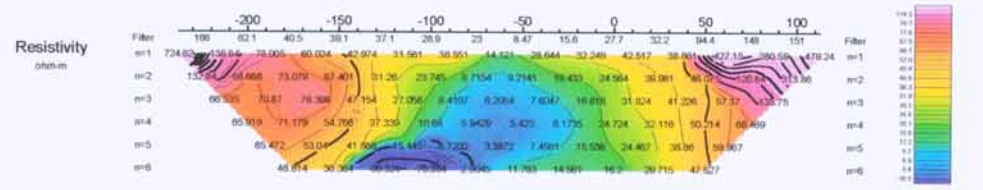

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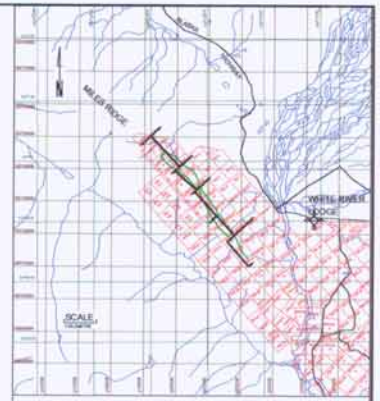
WHITEHORSE, YUKON, Y1A 2C6

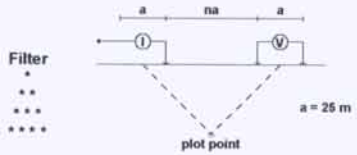


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic
(preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Pole-Dipole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 500S

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L-500.MAP (01-10-18/PJ)

AURORA GEOSCIENCES LTD.

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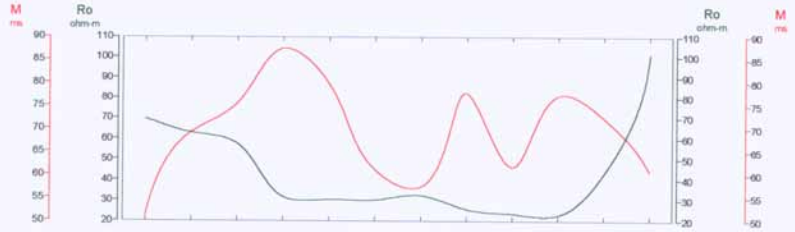
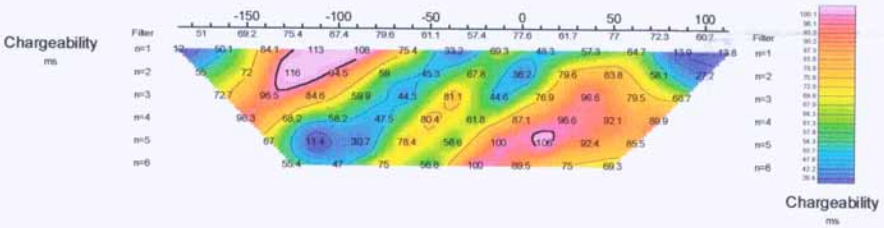
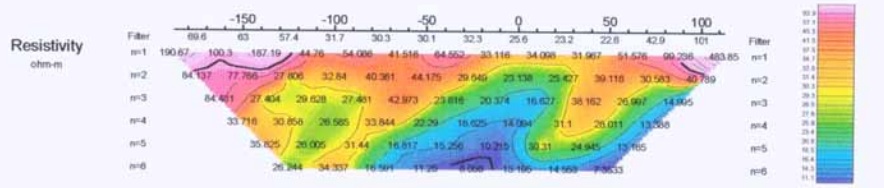
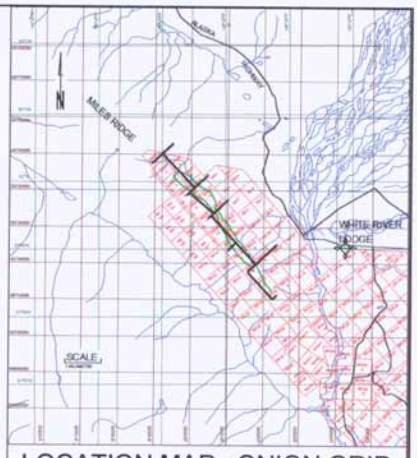






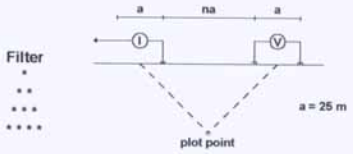


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Pole-Dipole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 400S

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L-400.MAP (01-10-18/PJ)

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WHITEHORSE, YUKON Y1A 2C6

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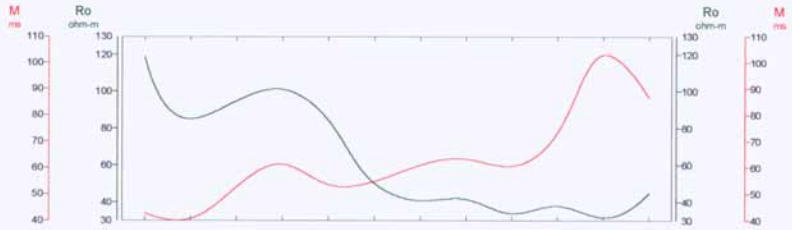
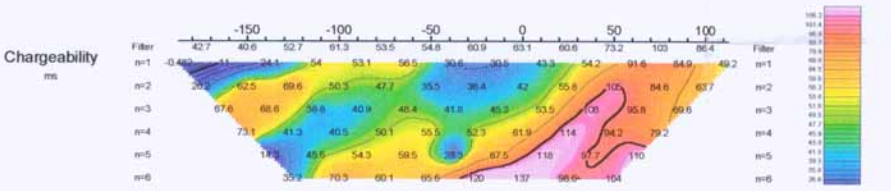
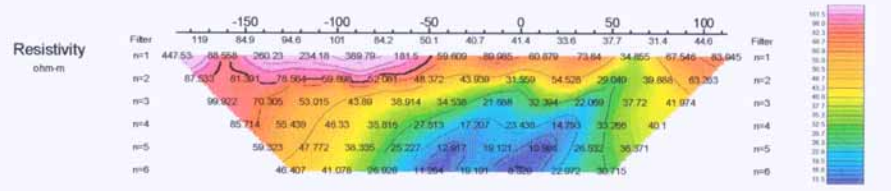
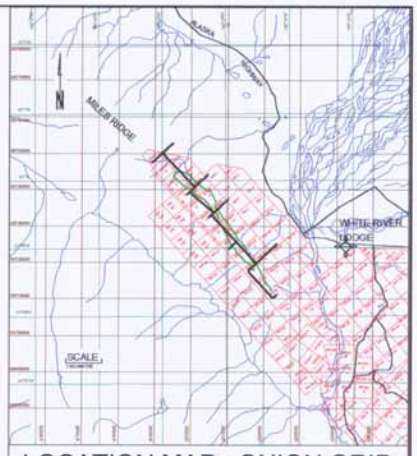






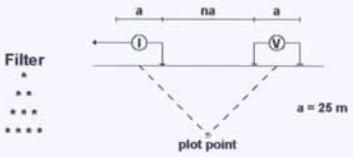


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic
(preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Pole-Dipole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 300S

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L-300.MAP (01-10-18/PJ)

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& RESOURCES LIBRARY
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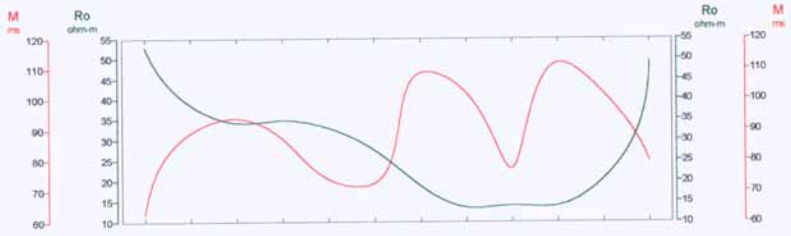
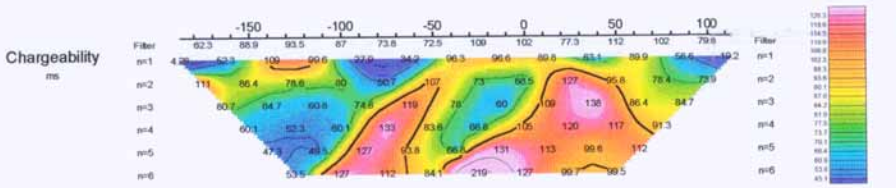
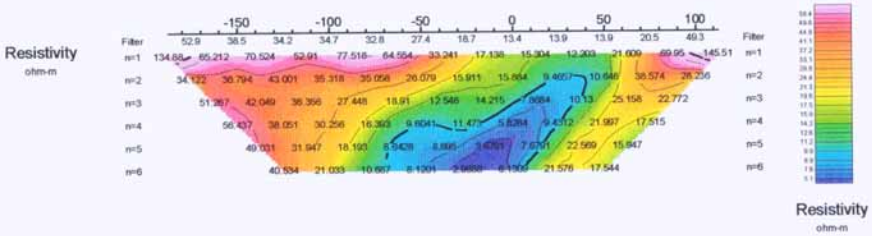
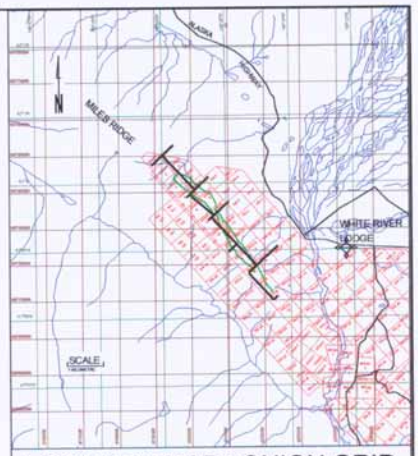






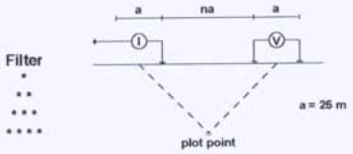


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Pole-Dipole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE -200S

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L-200.MAP (01-10-18/PJ)

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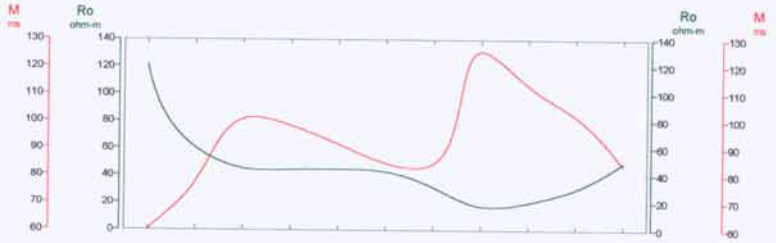
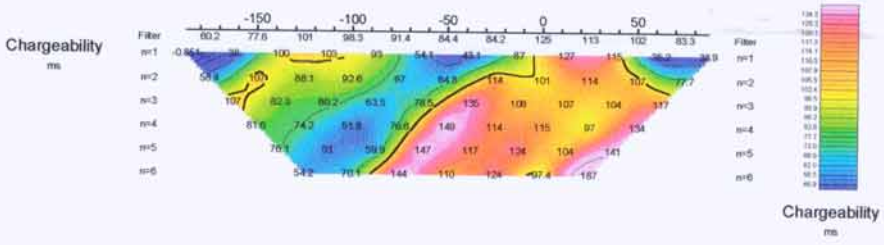
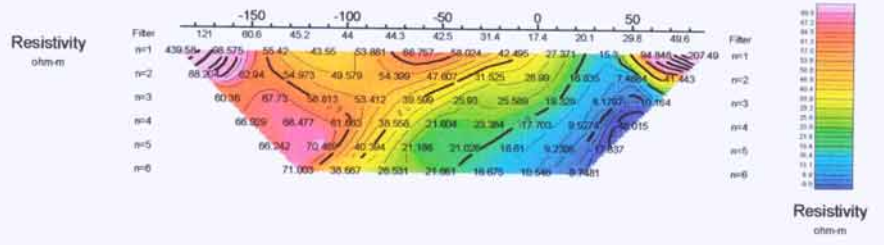
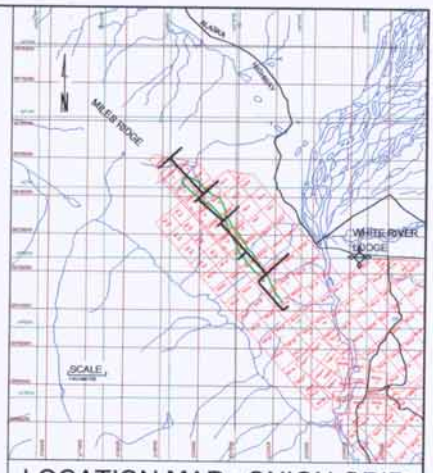






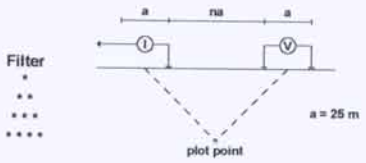


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Pole-Dipole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 100S

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L-100.MAP (01-10-18/PJ)

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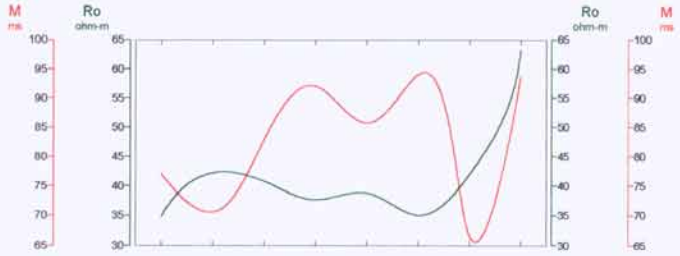
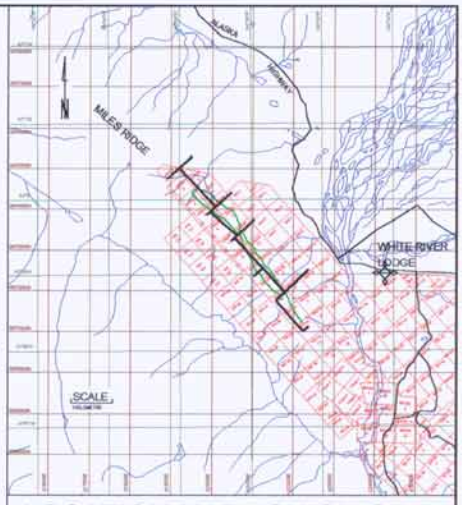
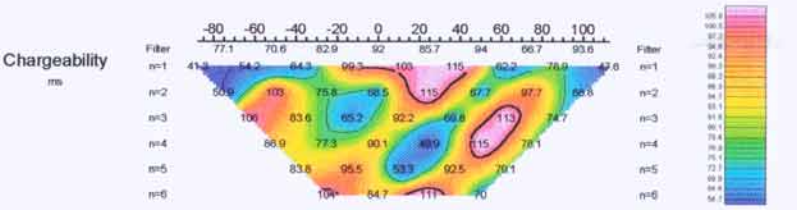
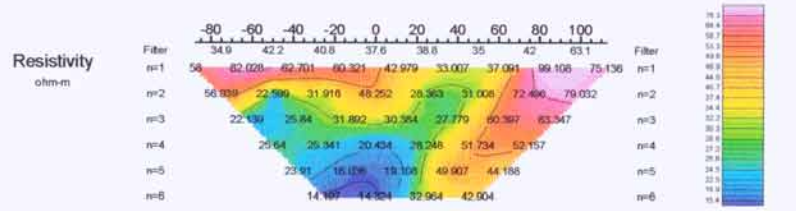




LOCATION MAP : ONION GRID

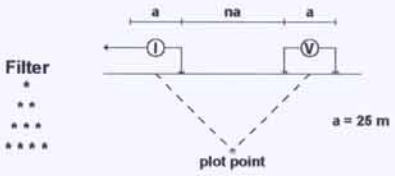




LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Pole-Dipole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 0 N

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L0.MAP (01-10-18/PJ)

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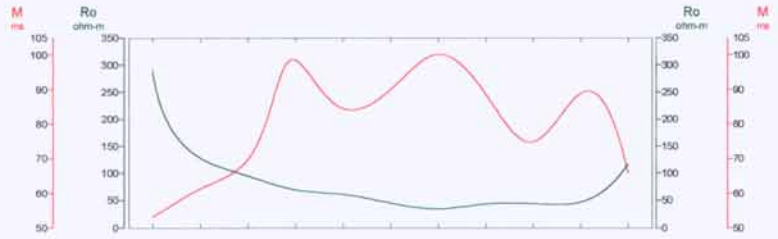
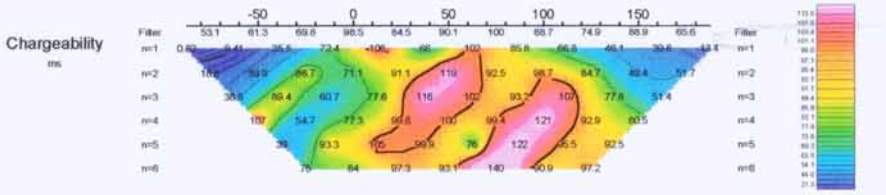
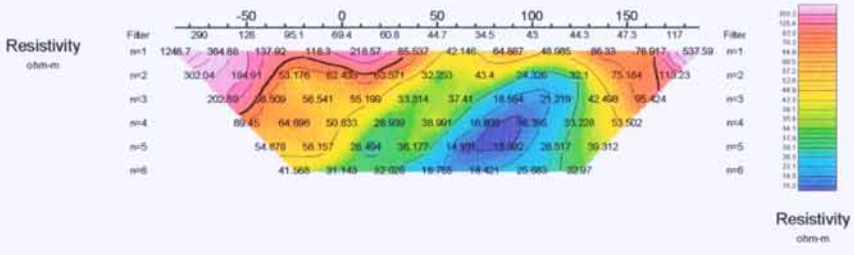
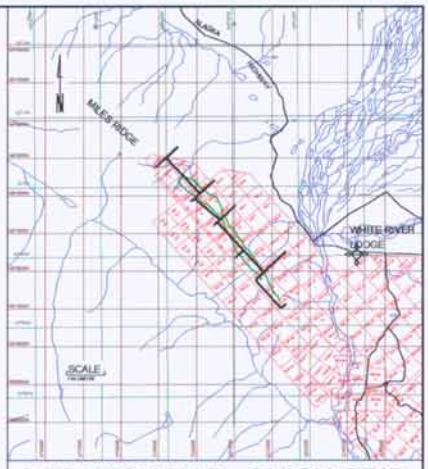






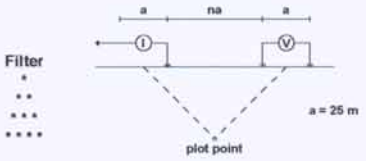


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Pole-Dipole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 100N

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L100.MAP (01-10-18/PJ)

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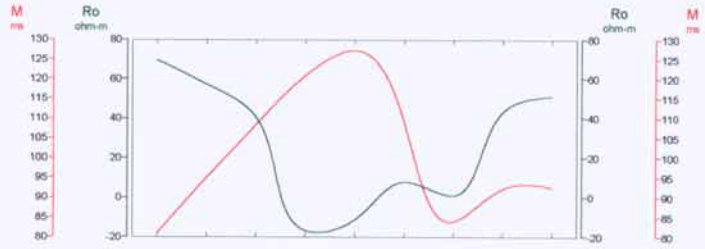
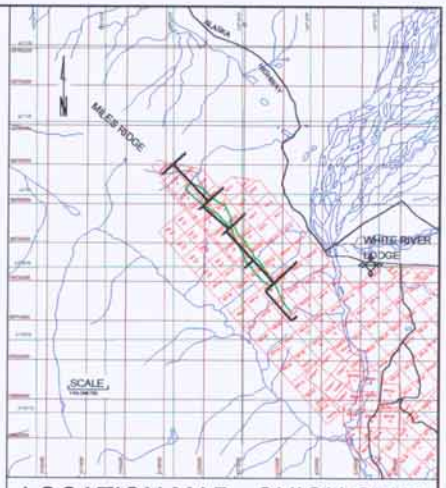
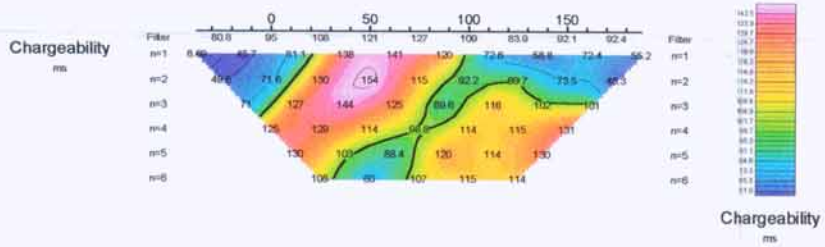
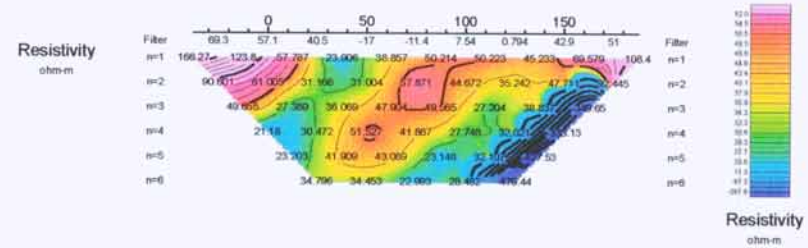




LOCATION MAP : ONION GRID

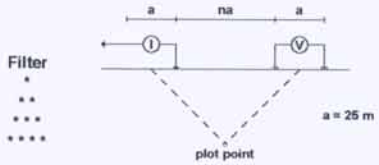




LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic
(preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Pole-Dipole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 200N

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L200.MAP (01-10-18/PJ)

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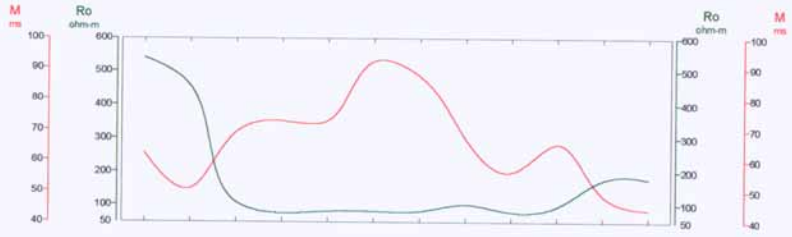
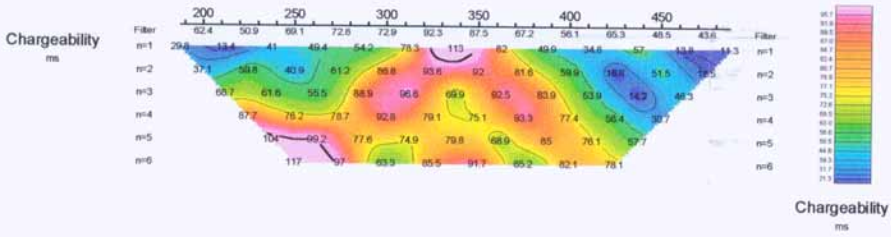
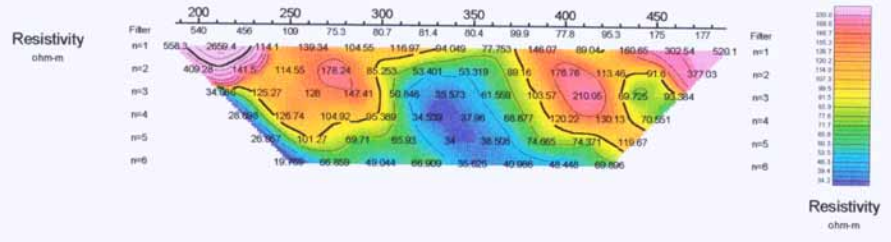
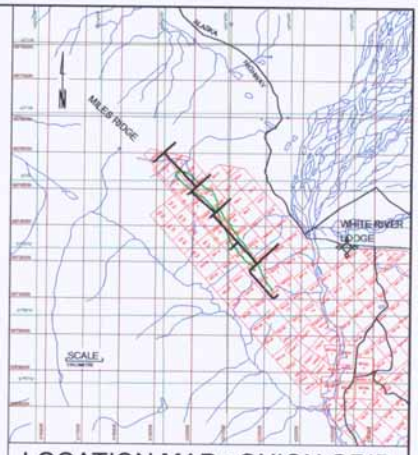






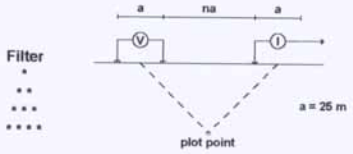


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Dipole-Pole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 1500N

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L1500.MAP (01-10-18/PJ)

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WHITEHORSE, YUKON Y1A 2C6

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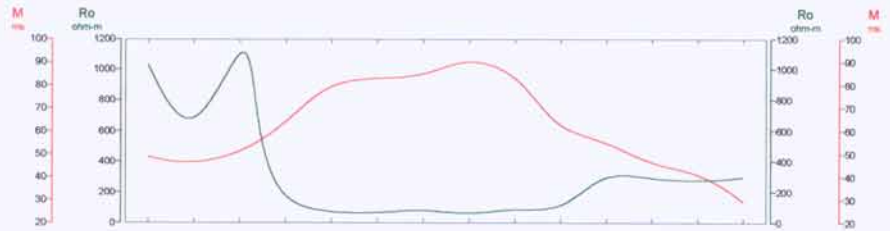
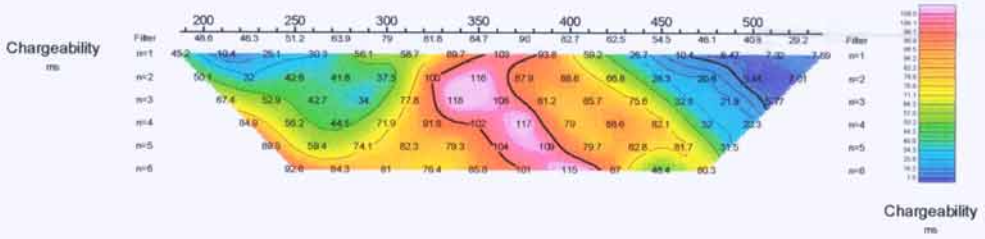
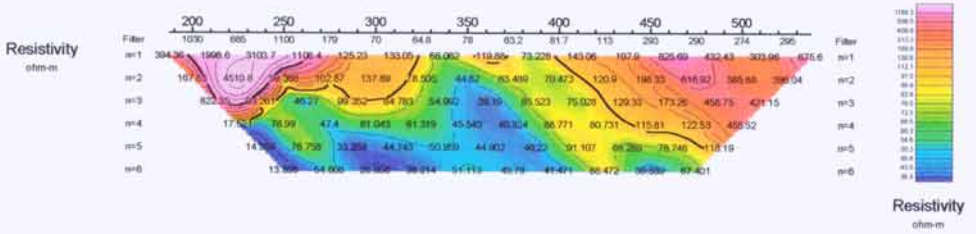
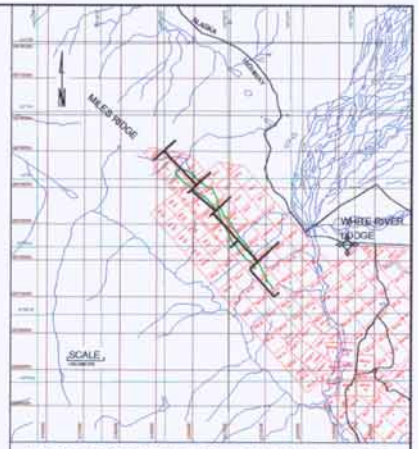






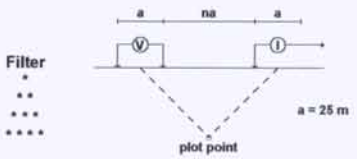


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Dipole-Pole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 1600N

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L1600.MAP (01-10-18/PJ)

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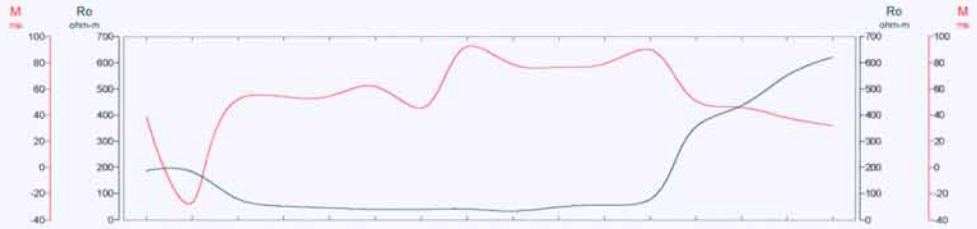
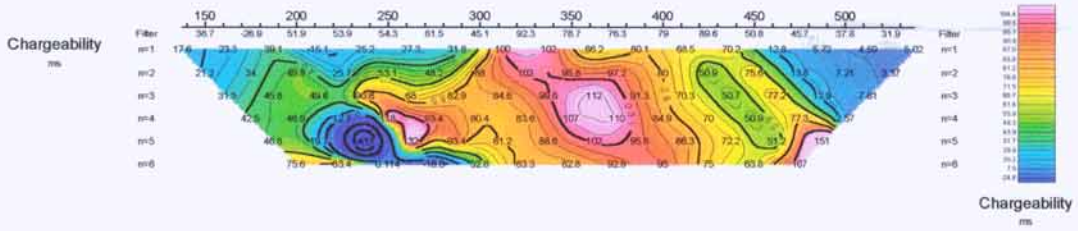
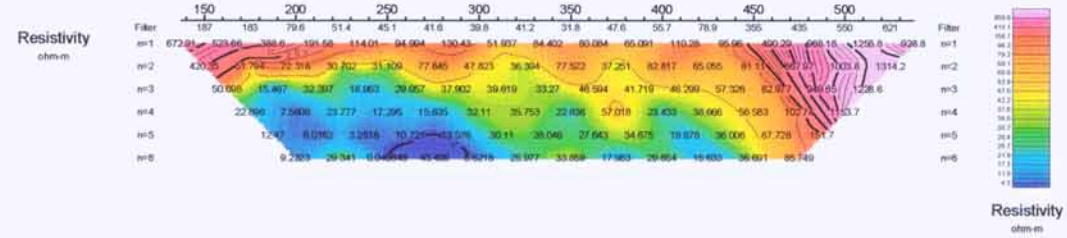
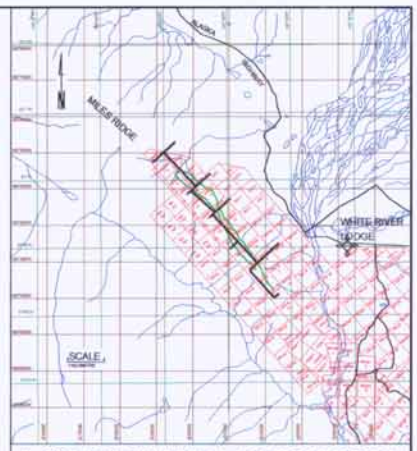






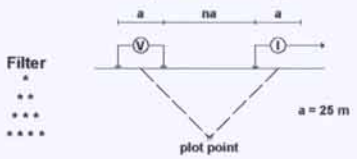


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic
(preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Dipole-Pole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 1700N

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L1700.MAP (01-10-18/PJ)

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WHITEHORSE, YUKON Y1A 2C6

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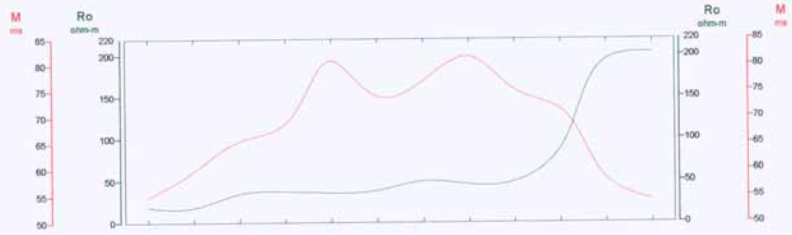
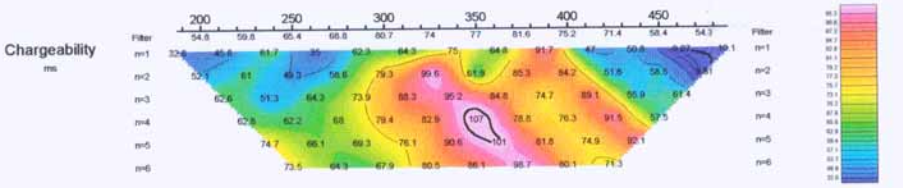
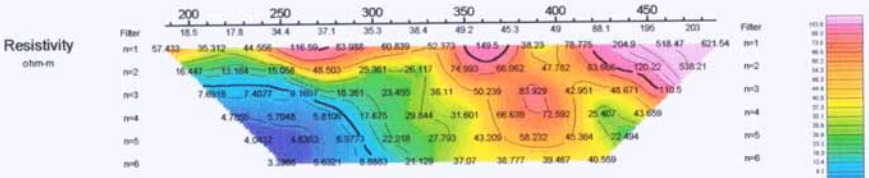
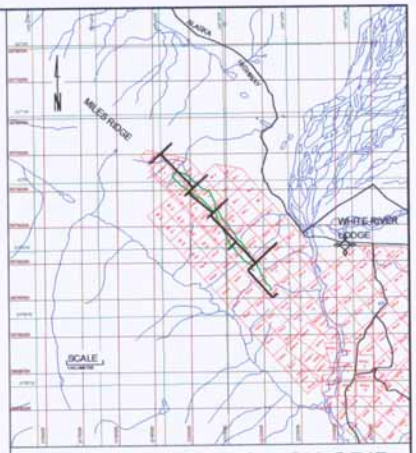




Chargeability
ms



Resistivity
ohm-m

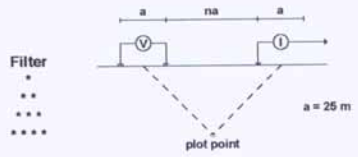


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Dipole-Pole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 1800N

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L1800.MAP (01-10-18/PJ)

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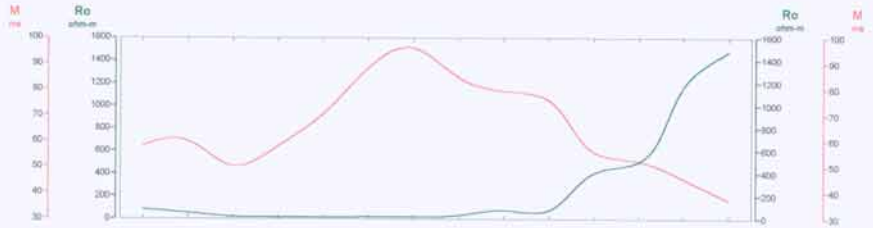
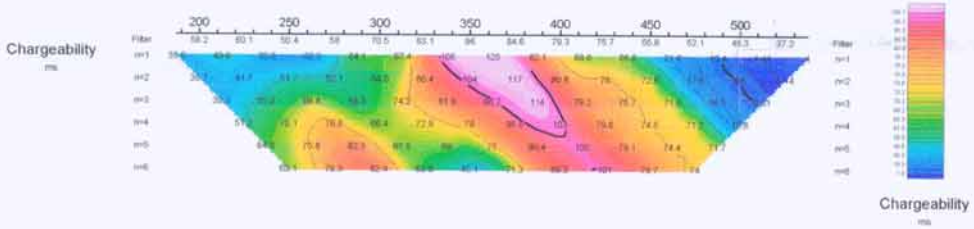
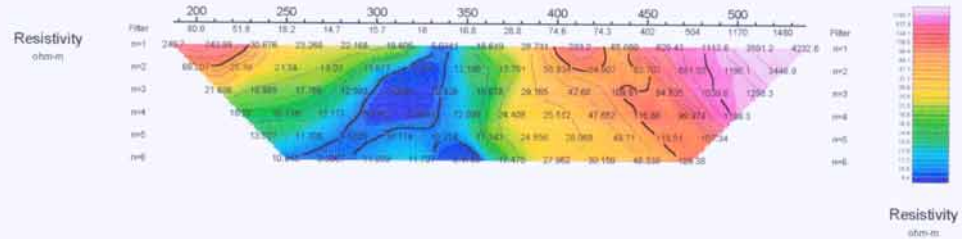
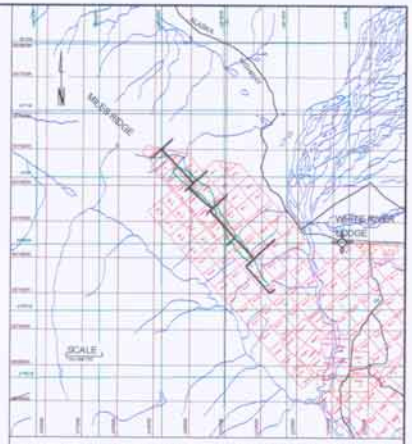






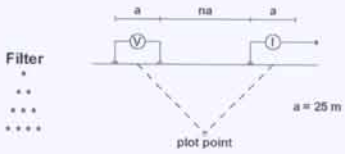


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic
(preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Dipole-Pole Array



Scale 1:2500

25 0 25 50 75 100 125 150
metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 1900N

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L1900.MAP (01-10-18/PJ)

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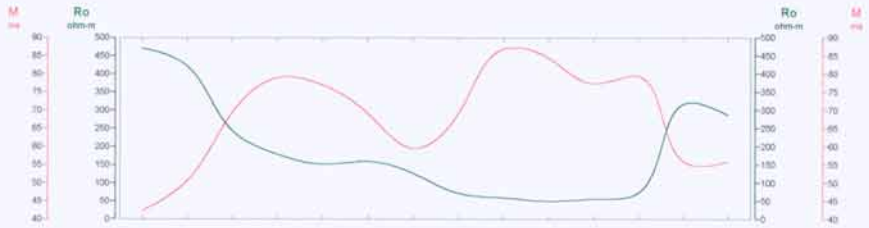
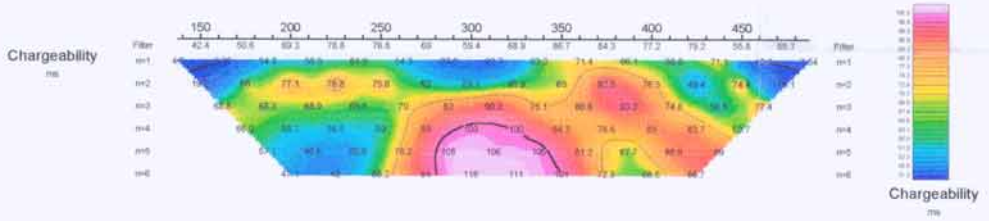
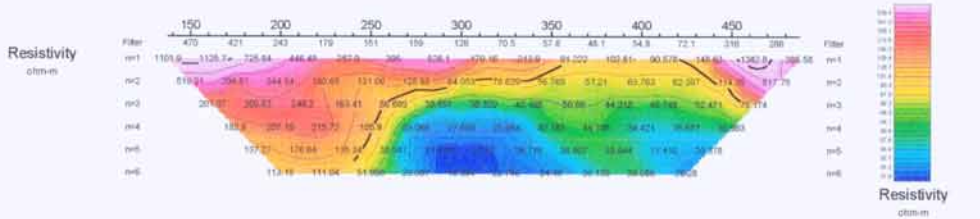




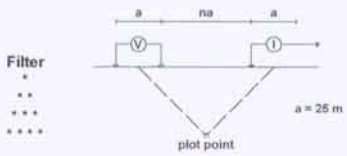


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Dipole-Pole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 2000N

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L2000.MAP (01-10-18/PJ)

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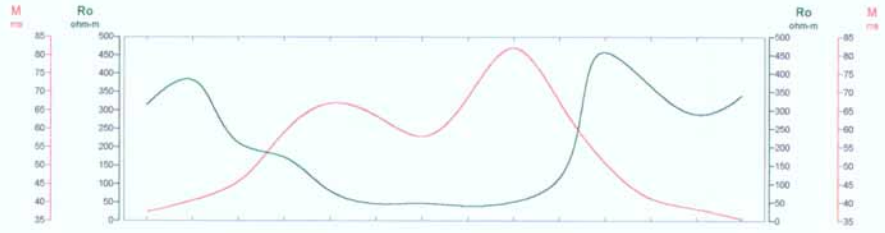
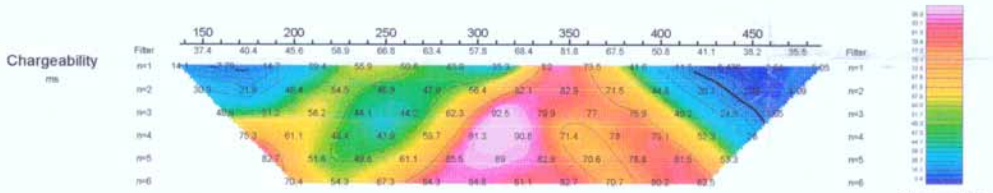
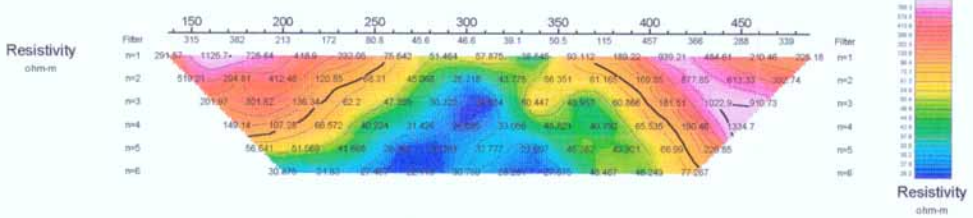
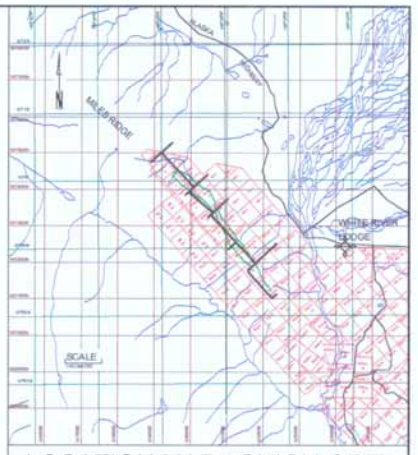






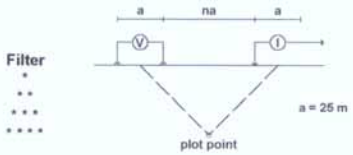


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Dipole-Pole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 2100N

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L2100.MAP (01-10-18/PJ)

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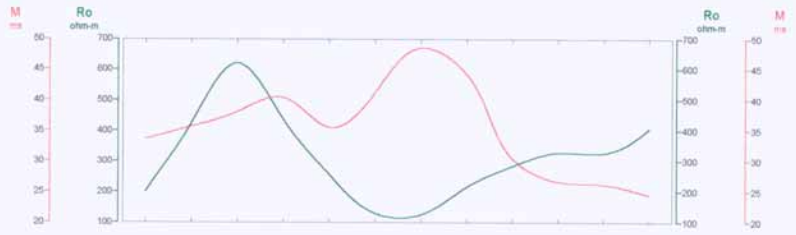
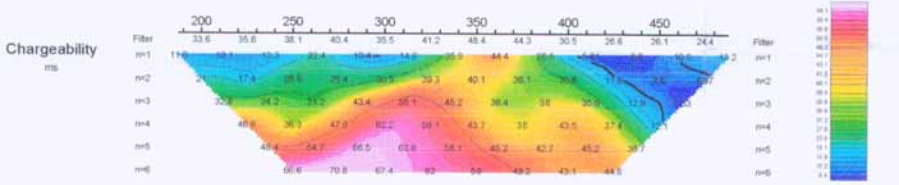
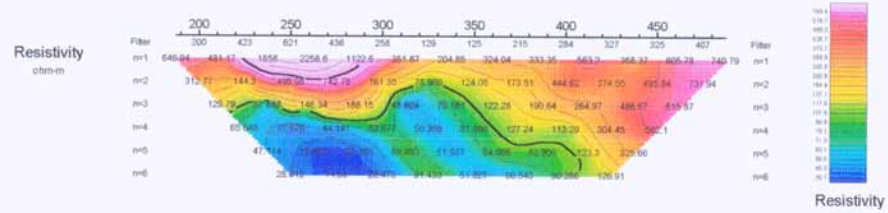
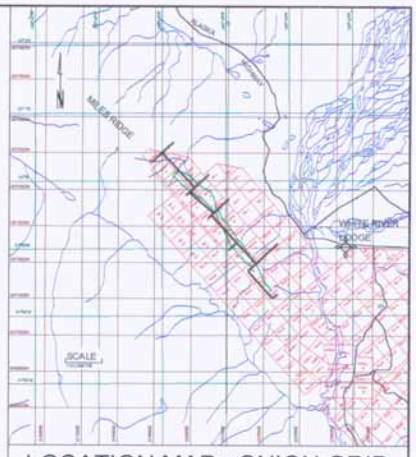
094331







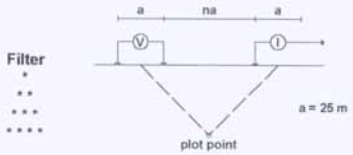


LOCATION MAP : ONION GRID

LEGEND

IP Mode : Time Domain
Electrode Array : Dipole-Pole
Dipole Separation (a) : 25 m
Number of Dipoles (n) : 6
Pseudosections Vertical Scale : 1 cm = 25 m
Receiver : ELREC 10, IRIS INSTRUMENTS
IP Curve Sampling Mode: Semi-Logarithmic (preset windows)
Integration Time : 2 ms
Transmitter : GDD Tx II
Signal Waveform : Symmetrical Time Domain
Pulse Duration : 2 s
Operator : KG

Dipole-Pole Array



Scale 1:2500

25 0 25 50 75 100 125 150

metres

URAVAN MINERALS INC

CANALASK PROPERTY
ONION/SAX GRID
INDUCED POLARIZATION SURVEY - LINE 2200N

YUKON TERRITORY, CANADA
NTS : 115 F/15, K/02
DATE SURVEYED : JUNE, JULY 2001
MAP NAME (DATE / DRAWN BY) : L2200.MAP (01-10-18/PJ)

AURORA GEOSCIENCES LTD.

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WHITEHORSE, YUKON Y1A 2C6

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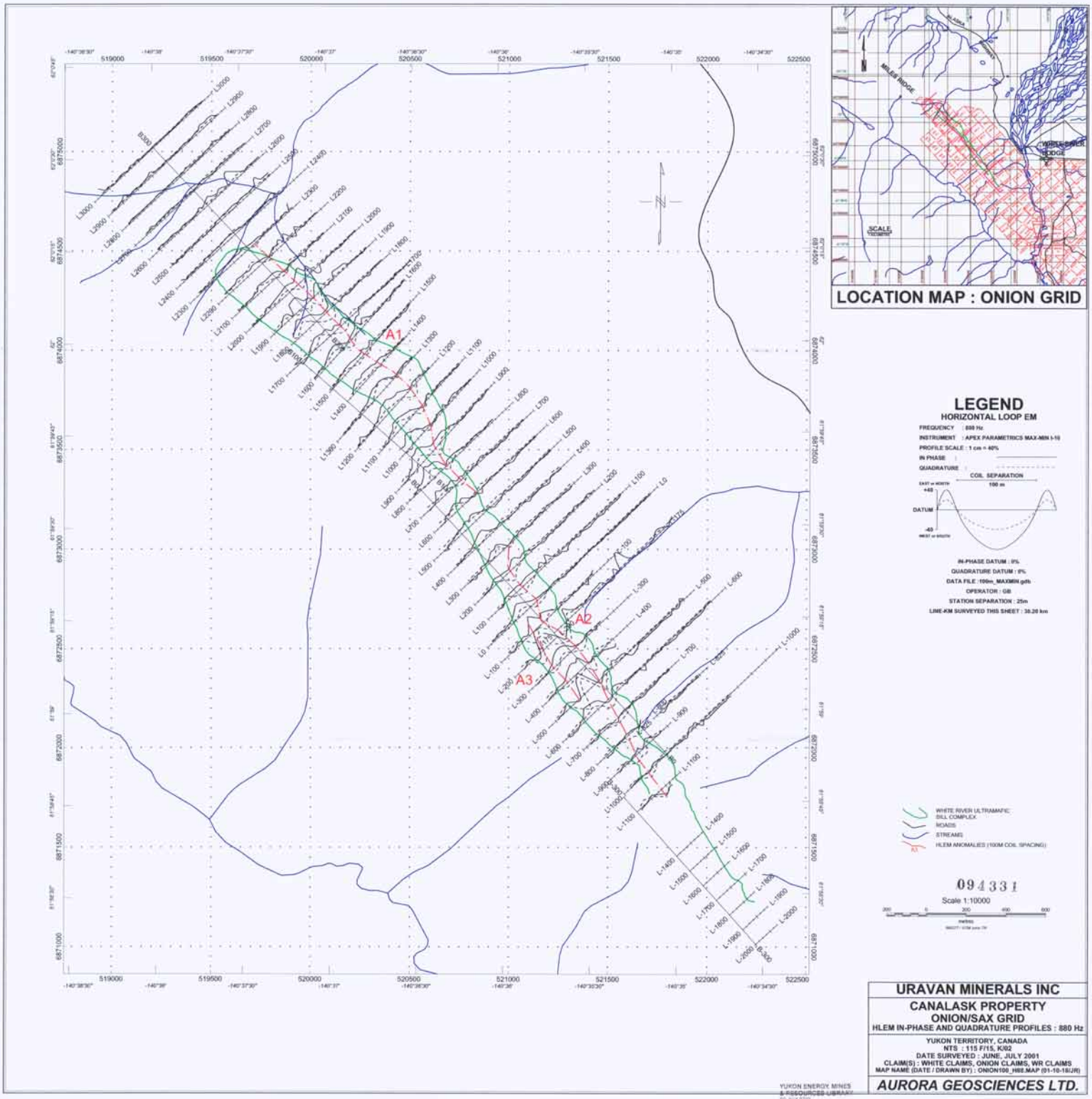

LOCATION MAP : ONION GRID

LEGEND

HORIZONTAL LOOP EM

FREQUENCY : 880 Hz
INSTRUMENT : APEX PARAMETRICS MAX-MIN I-10
PROFILE SCALE : 1 cm = 40%
IN PHASE :
QUADRATURE :

IN-PHASE DATUM : 0%
QUADRATURE DATUM : 0%
DATA FILE : 100m_MAXMIN.gdb
OPERATOR : GB
STATION SEPARATION : 25m
LINE-KM SURVEYED THIS SHEET : 30.20 km

WHITE RIVER ULTRAMAFIC SILL COMPLEX
ROADS
STREAMS
HLEM ANOMALIES (100M COIL SPACING)

094 331

Scale 1:10000

URAVAN MINERALS INC
CANALASK PROPERTY ONION/SAX GRID HLEM IN-PHASE AND QUADRATURE PROFILES : 880 Hz
YUKON TERRITORY, CANADA NTS : 115 F/15, K/02 DATE SURVEYED : JUNE, JULY 2001 CLAIM(S) : WHITE CLAIMS, ONION CLAIMS, WR CLAIMS MAP NAME (DATE / DRAWN BY) : ONION100_H80.MAP (01-10-18/JR)
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APPENDIX E: Volume 1

WHITE RIVER INTRUSIVE COMPLEX, CANALASK PGM+Ni+Cu PROJECT YUKON TERRITORY: AN INTERPRETATION OF MINERAL OCCURRENCES based on PETROGRAPHY, ORE MICROSCOPY and ROCK GEOCHEMISTRY OF SELECTED SAMPLES

Volume 1 of 2

for

Uravan Minerals Inc.
144 - 4th Avenue S.W.
Suite 1250
Calgary, Alberta
T2P 3N4

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December 3, 2001

FRONTISPIECE

Sample #: Onion 166804: Sax Showing
Cu 730 ppm; Ni 2290 ppm; Co 130 ppm
12 ppb Au, 73 Pt, 174 ppb Pd
9.3 ppb Rh, 10 ppb Os, 6 ppb Ir, 33 ppb Ru, 305.3 ppb PGE_T

Northing	Easting
6873001	521076

Photomicrograph, reflected light, shows elongate net-textured sulphide (S) hosted in feldspathic wehrlite. Additional opaque minerals occupying intercumulus volumes include intercumulus subhedral to anhedral titanomagnetite (TM) and very fine-grained cumulus chromite (Cr). FOV (Field of view) = 11 mm, (see also Plates 1 and 7).

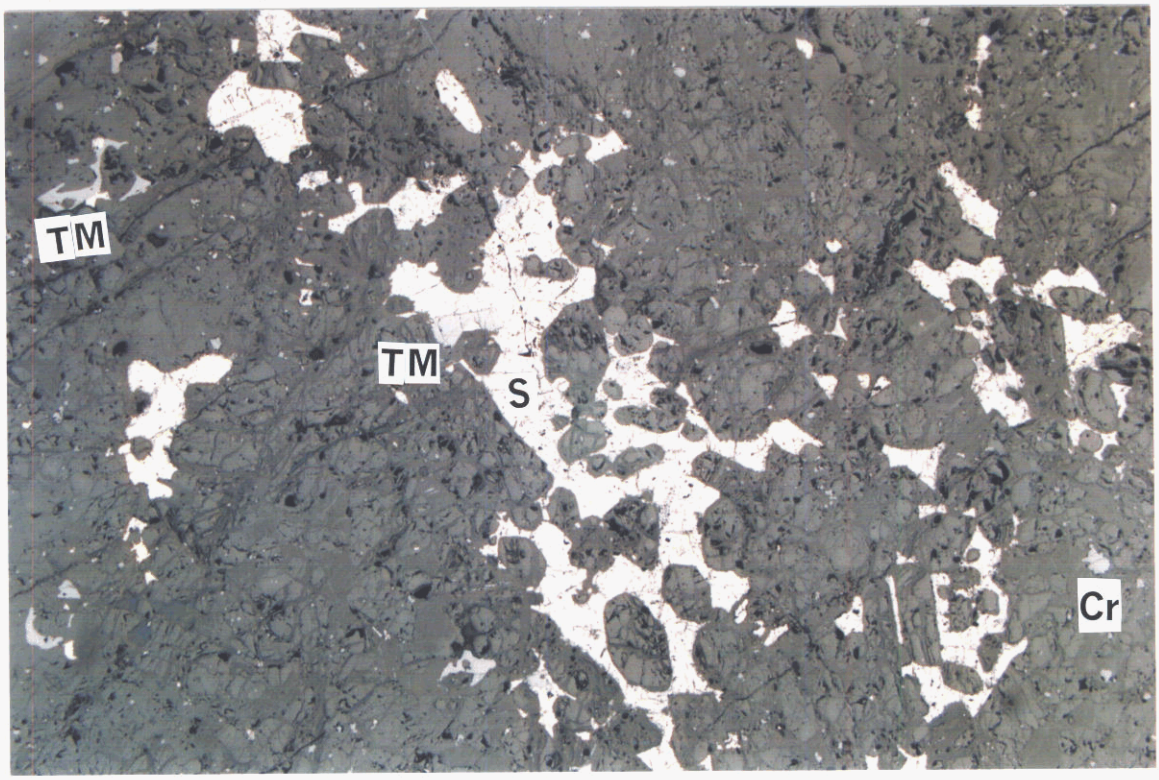

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Table of Contents

	Page
Summary	i
Statement of limitation	1
Scope of the project	1
Part I: Discussion of the Petrography and Ore microscopy	2
Introduction	2
Alteration	2
White River Intrusive Complex	2
White River country rocks	3
White River Intrusive Complex	3
Lithologies	3
Least altered lithologies	6
Dunite	6
Wehrlite to pyroxenite	7
Olivine gabbro	9
Hydrothermally altered lithologies	10
Ultramafic rocks	10
Gabbro	10
Altered nickeliferous massive sulphide	11
White River country rocks	12
Geochemistry – Major and trace element	12
Introduction	12
Discussion	13
PGE minerals: Scanning Electron Microscope Investigation	21
Analytical Procedures	21
Magmatic sulphide+oxide prospects	21
Hydrothermal skarn-type nickeline- sulphide prospects	21
Discussion	23
Recommendations	26
References	27
Part II: Petrography and Ore microscopy	29
Least altered White River Intrusive Complex	29
166804	32
166808	46
166810	60
TS-2	73
TS-3	82
TS-4	92
TS-7	97
Altered White River Intrusive Complex (Volume 2)	106
166806	108
166807	117
TS-5	132
TS-6	141
TS-9	152
Altered White River country rocks	161
166809	163
TS-1	170

TS-8 175
TS-10 185
Certificate of Qualification 191

List of Figures

Figure 1. Sample location map, White River Intrusive Complex. 4
Figure 2. Classification and nomenclature of White River Intrusive Complex. 5
Figure 3. Normative Anorthite-Pyroxene-Olivine, White River Intrusive Complex. 14
Figure 4. AFM plot for White River Intrusive Complex. 15
Figure 5. Jenson cation plot for White River Intrusive Complex. 17
Figure 6. Differentiation index vs Ni and total PGM. 18
Figure 7. Total PGM vs Ni. 19
Figure 8. Normative Px+Ol and Px vs total PGE. 20
Figure 9. Comparison of dioritic rocks to the White River Intrusive Complex. 22
Figure 10. Schematic cross-section of the White River Intrusive Complex. 24

List of Tables

Table 1. Petrographic summary, least altered White River Intrusive Complex. 30
Table 2. Petrographic summary, altered White River Intrusive Complex. 107
Table 2. Petrographic summary, altered White River country rocks. 162

SUMMARY

- The White River Intrusive Complex is a symmetrically zoned ultramafic-mafic intrusion with ultramafic rocks occupying the central and peripheral portions of the complex. Mafic rocks restricted to the outer most portions of the upper and lower border zones. Mafic rocks may not be uniformly distributed along the basal contact.
- The core of the complex is comprised of ultramafic rocks that display orthocumulate to mesocumulate textured formed by varying proportions of cumulus olivine, chromite and rare diopside to intercumulus diopside, phlogopite, hornblende, plagioclase and sulphide. Variations in the amount and types of intercumulus minerals formed a series of ultramafic rocks that range from dunite, wehrlite, clinopyroxenite and feldspathic equivalents of the latter rock types. The mafic border phase, olivine gabbro to gabbro, is characterized by a mesocumulate texture formed by varying amounts of diopside, feldspar, phlogopite, hornblende, sulphide, rare titaniferous magnetite and cumulus olivine.
- Using standard petrological plots to examine major element oxide geochemistry, the intrusive complex underwent little igneous differentiation. The lithological variation from core to margins is interpreted to have formed through dynamic flow. Dynamic flow concentrated xenocrystic olivine, chromite and rare diopside in the core with progressively greater proportions of the liquid component, basaltic to picritic, towards the margins of the intrusion.
- The morphologies and grain size of intercumulus minerals change from the ultramafic into the mafic series. Pyroxene within the ultramafic sequence is commonly intercumulus to olivine and displays an oikocrystic texture. In the mafic rocks diopside is poikilitic. Feldspar in the ultramafic sequence occupies intercumulus volumes whereas in the gabbroic rocks, the feldspar morphology varies from subhedal to anhedal and can form an ophitic texture. Hornblende and phlogopite always occupy intercumulus volumes within the ultramafic series and can rarely display an oikocrystic texture. In contrast, subhedral hornblende and rarely poikilitic textures are present.
- The relationship between rock types within and between the core and border zones is interpreted to be gradational and locally variations between lithologies may occur over short distances.
- Magmatic sulphide+oxide concentrations are present in the complex. The presence of sulphide inclusions in cumulus pyroxene clearly demonstrates that an immiscible sulphide+oxide melt coexisted with the silicate melt that formed the White River Intrusive Complex. Magmatic sulphide+oxide concentrations occur as droplet, net-textured and massive sulphide. Based on the sample population, sulphide-bearing lithologies are present near and at the basal contact. The low percentage of intercumulus volumes in some ultramafic rocks and density contrast between sulphide and silicate melts prevents significant sulphide accumulations within the core of the complex. The sulphide assemblage in least recrystallized samples is comprised of pyrrhotite, pentlandite and chalcopyrite with magnetite.
- The colour of intercumulus hornblende and phlogopite, orange to red orange, clearly indicates that the intercumulus liquid from which these minerals were derived was oxidized. The presence of intercumulus titaniferous magnetite coexisting with the

formed two minerals is further mineralogical evidence for the oxidized state of that interstitial liquid.

- The complex has been overprinted by two alteration stages. The initial alteration episode is recorded primarily by serpentinization with accompanying sericitization /argillitization, chloritization and sulphurization. The overprinting carbonatization episode is associated with deformation and is linked to the property-scale deformation zones that are represented by quartz+carbonate replacement zones along the upper and lower borders of the White River Intrusive complex.
- The serpentinization process is best recorded by complete replacement of olivine in the orthocumulate-textured dunitic rocks whereas olivine is preserved in wehrlitic to clinopyroxenitic rocks. Serpentine+magnetite replaced cumulus olivine and possibly intercumulus orthopyroxene. Intercumulus feldspar is replaced by sericite/clay+iron oxide after feldspar imparting a turbid brown to semi-opaque colour to pseudomorphs. Chlorite with magnetite have replaced intercumulus phlogopite. Trace amounts of ultra fine-grained sulphide, presumably pyrite, are disseminated through serpentine after olivine and associated with secondary magnetite.
- Carbonatization of the White River Intrusive Complex has replaced the border phase of the complex and the adjacent wallrocks and formed a distinct lithological unit. Carbonate-rich, dolomite, shear zones are inferred to be present within the intrusive complex (inferred to be at an acute angle to the property-scale quartz+carbonate replacement zone). Carbonate replacement in ultramafic schist is recorded by carbonate-filled foliation planes and porphyroblastic carbonate after serpentine. Carbonate is accompanied by minor amounts of talc and chlorite, a compatible replacement assemblage under high partial pressure of CO_2. Carbonate replacement is accompanied by sericite in quartzofeldspathic rocks that have been incorporated into the quartz+carbonate replacement zone. Intensely altered mafic rocks are comprised of carbonate, clay/fuchsite, sericite and amphibole. Cumulus chromite is serpentinized and carbonatized rocks has been variably replaced by ferrichromite.
- Carbonatization was synchronous with deformation and the best example of the penetrative deformation is represented by the altered nickeliferous massive sulphide sample 166806. A penetrative shear fabric in this rock is conclusive textural evidence that a fault or faults are present in the area of this sample. The implication is that this mineralized zone may be displaced either along strike or down dip depending on the kinematics of this shear zone.
- Two types of mineralized zones have been recognized on the property: Ni+PGE+Cu and a second having a variable elemental signature.
    - The Ni+PGE+Cu prospects are related to variably recystallized disseminated and massive sulphide associated with basal magmatic sulphide segregations. The texture magmatic sulphide concentrations and its mineralogy vary depending on the proximity of sulphide-bearing samples to the property-scale quartz+carbonate replacement zone. Preliminary PGE-mineral investigation of least altered and altered disseminated and net-textured sulphide-bearing ultramafic rocks identified ultra fine-grained PGE-telluride (kotulskite and merenskyite), PGE-antimonide (sudburyite) and PGE-arsenide (cherepanovite or rhonoarsenide). These minerals are present as inclusions in sulphides forming the assemblage

pyrrhotite+pentlandite+chalcopyrite and subordinately along silicate-sulphide grain boundaries.
    - Syngenetic Ni+PGE+Cu magmatic sulphide prospects have been overprinted by the epigenetic quartz+carbonate hydrothermal episode. The sulphide assemblage has been modified to a high sulphur-bearing assemblage that includes pyrite+pentlandite+chalcopyrite+millerite±pyrrhotite. Trace amounts of texturally late-stage Ni-As-S and Ni-As-S-Co-Fe minerals are associated with the latter recrystallized assemblage. The arsenic component in these recrystallized and remobilized magmatic sulphides is interpreted to be introduced during the overprinting quartz+carbonate hydrothermal episode
- The elemental signature of the second mineralization type is variable (Au-Ag-Sb-Zn-Cu-Ni) but the prospects/occurrences are united by a similar silicate alteration assemblage i.e. samples TS-8 and TS-10. A unifying skarn-type silicate assemblage in these two sampled locations is characterized by garnet+diopside with chlorite ± (serpentine+hematite).
    - The high-grade nickel mineralization at sample site TS-8 (Onion SE Showing) is characterized by an arsenic-rich (sulphur-poor) metallic assemblage dominated by niccolite with a minor amounts of a Ni-Sb mineral identified as breithauptite, gold, electrum and sphalerite. The metallic assemblage is Ni+As+Sb+Au+Ag+Zn.
    - The TS-10 sulphide bearing (pyrrhotite+chalcopyrite) occurrence (Sax-Cessena Embayment area) hosts anomalous gold and copper but negligible nickel.
- This skarn-type silicate alteration assemblage is considered part of the quartz+carbonate replacement zone and this replacement zone is considered coeval with emplacement of the nearby diorite-granodiorite Kluane Range Intrusive Suite. The unifying metallic element in these two prospects/occurrences is gold along with the silicate assemblage. These mineralogical features support their classification into the skarn gold deposit model.
- Different metallic element signatures shown by these two prospects are attributed to the hydrothermal fluid having equilibrated with different host rocks. The mineralogy of skarn gold deposits indicates that arsenic was a diagnostic and common metallic component in their hydrothermal systems but not nickel.
- The very high-grade nickel abundance (70100 ppm Ni) that characterizes the mineralization at the Onion SE Showing suggests that the epigenetic arsenic-bearing, sulphur-poor hydrothermal system equilibrated with the White River Intrusive Complex and leached appreciable nickel, possibly nickel-rich, sulphide-poor dunitic rocks. The low PGE_T abundance (304.3 ppb) is attributed to the inability of arsenic-bearing hydrothermal systems to transport PGE elements because PGE-arsenide and antimonide minerals are more stable than PGE-sulphides. Also the very low sulphide content in this prospect dictates that the hydrothermal systems was deficient in sulphur, i.e. palladium and platinum are efficiently dissolved and transported by bisulphide complexes.
- Trace amounts of late stage arsenic-bearing minerals in sulphide-bearing recrystallized White River Complex rocks is interpreted to be the overprint of the epigentic arsenic-bearing hydrothermal system.

Statement of limitation

Kishar Research Inc. has not conducted onsite geological mapping or previous petrological studies of the Canalask Ni-Cu-PGM property nor has the company ever worked in the area of the prospect. The interpretations presented in this report are based on the observations collected from the petrographic examination of polished thin sections, examination of major element and trace element geochemistry and on the author's experience with magmatic nickel-copper-PGE deposit geology in Saskatchewan, Nunavut and Quebec, Churchill Structural Province, selected areas in the Abitibi Subprovince Superior Province, Yilgarn Block Western Australia, an understanding of the magmatic nickel-copper deposit model and other mineral deposit models.

Scope of the project

This report presents the results of petrographic and ore microscopy analysis of sixteen polished thin sections made from sample collected by Uravan Minerals staff during the summer 2001 exploration program on the Canalask property, Yukon. These sixteen samples were considered to be representative of the different lithologies that comprise the White River Intrusive Complex (WRIC), hydrothermally altered equivalents of the complex and the adjacent hydrothermally altered wallrock lithologies. The primary aim of this project was to develop a rock nomenclature scheme for the various lithologies that comprise the WRIC so that these rock types could be utilized to develop an internally consistent rock nomenclature during future mapping and drill programs. The second objective was to identify the silicate and opaque mineral assemblages associated with the two types of sulphide prospects on the property, advise on how to evaluate these types of prospects and attempt to explain the element partitioning between these two types of sulphide prospects and their genesis. This petrographic and geochemical database with interpretations should be evaluated and integrated into the larger database that Uravan Minerals Inc. has acquired together with their developing understanding of the property in a regional and detailed geological context.

This report is presented in two sections. Part I presents a summary of the descriptive data collected during petrographic, ore microscopy and preliminary scanning electron microscopy investigations used to develop the igneous rock nomenclature, alteration processes, different types of sulphide prospects and their contrasting silicate mineral assemblages. An analysis of the major and trace element geochemistry provides another database layer that supportive of the rock nomenclature proposed for the WRIC and the relationships between these lithologies and magmatic sulphide concentrations.

Part II presents the petrographic, ore microscopy and scanning electron microscope data. This descriptive and interpretative database is presented in three sections. Each section begins with a photograph or photographs of the thin section offcut slabs that illustrate macroscopic hand specimen features. A table that summarizes the petrography and ore microscopy follows these photographs. A detailed petrographic description of each polished thin section follows the introductory photographs and summary table. Each petrographic analysis includes a close-up photograph of hand

specimen, a brief summary highlighting the important features of that petrographic description with interpretations and is followed by sections that describe in detail the mineralogy, texture and fabric and the inferred protolith. Recognition of the macroscopic features in the thin section photographs combined with the petrographic details should be useful as a template for lithological identification during future surface exploration and diamond drill programs. Multiple photomicrographs are presented from each polished thin section in order to document mineralogical and textural elements that were important in identifying the protolith, identify the effect of overprinting deformation and hydrothermal alteration and the impact of these latter processes on the opaque mineral assemblages. These photomicrographs are useful in comparing and contrasting critical mineralogical and textural features between rocks belonging to the WRIC.

Part I: Discussion of the Petrography and Ore Microscopy

Introduction

The sixteen samples were subdivided into three groups based on lithology and alteration. These groups are: 1) least altered rocks of the WRIC – 7 samples, 2) hydrothermally altered rocks of the WRIC – 5 samples and 3) hydrothermally altered White River country rocks – 4 samples taken immediately adjacent to the WRIC. The northwest-striking mafic –ultramafic WRIC is compositionally zoned based on the location of twelve samples shown in Figure 1and their corresponding descriptive petrographic data (Part II). The compositional zoning is in agreement with previous geological-petrological descriptions of the intrusion (Hulbert, 1995). The complex is comprised primarily of ultramafic lithologies with a subordinate gabbroic component that has been identified along the basal northeastern margin of the intrusion. Identification of the different lithologies and the interrelationships between rock types was facilitated by the preservation of some of the primary magmatic minerals but most importantly by the excellent preservation of primary magmatic textures in spite of pervasive post-intrusion alteration. In rocks that record higher states of strain, i.e. ultramafic schists, rock nomenclature was based on primary textures and pseudomorphs preserved only within least deformed altered micro-lithons or micro-domains that are enveloped by the schistocity. It is assumed that these micro-domains are representative of the entire rock.

Alteration

White River Intrusion Complex

Two significant post-intrusion alteration processes partially and completely replaced the WRIC ultramafic-mafic rocks. These processes include an initial hydration followed by carbonatization. The hydration episode is represented by serpentinization of cumulus olivine (Plates 5, 11, 13, 19, 22, 25, 26, 33, 41) and possibly intercumulus orthopyroxene (Plate 42), argillitization/sericitization of intercumulus feldspar (Plates 14, 13, 19, 24) and minor chloritization of intercumulus phlogopite (Plate 41, 43). Secondary iron oxide is present in the three types of ultramafic rocks and is represented by magnetite after olivine (Plates 22, 33, 40) and disseminated micron-sized iron oxide that discolours (turbid, brownish) clay/sericite after feldspar (Plates 13, 21).

Secondary ultra fine-grained sulphide is associated with intensely serpentinized dunitic rocks (Plates 24, 28, 73A). Euhedral cumulus chromite when armoured in olivine or intercumulus minerals is unaltered. However when present in intercumulus volumes, chromite grains have display grain margin modifications that clearly indicate dissolution and replacement during the serpentinization and carbonatization episodes. Partial to complete mantling of chromite by secondary magnetite is common (Plate 24C, 28A, 29C, 30, 31B, 34B, 36) as well as fracturing and filling by secondary magnetite (Plate 30, 35). Subtle variation in reflectivity, gray scales, indicate chromite has undergone replacement to an alteration phase termed ferrichromite (Plate 23B, 43B, 46). Also the development of delicately serrated grain margins in contact with serpentine or carbonate contrasts with the typical euhedralism and indicates that the chromite has undergone etching (Plates 28A, 29C, 30). Conmmonly in carbonatized rocks, the chromite has undergone extensive replacement to form classical atoll-type structures (Plates 23, 73).

Based on textural relationships, the carbonatization episode is inferred to be younger than the hydration episode and is associated with variable strained ultramafic rocks (Plates 63, 64), related nickeliferous massive sulphide (Plate 17) and country rocks. This temporal relationship between hydration and carbonatization is based on the observation that mafic-ultramafic rocks without a penetrative fabric do not contain carbonate. In sheared equivalents, carbonate, dolomite, is vein controlled and wallrock serpentine has been variably replaced by porphyroblastic carbonate (Plates 66, 70) and locally by the conversion of serpentine to talc. Carbonatization without silicification of the WRIC is related to the structural-metasomatic alteration zone (quartz+carbonate) that exists along the upper and lower contacts of the intrusive complex (Figure 1).

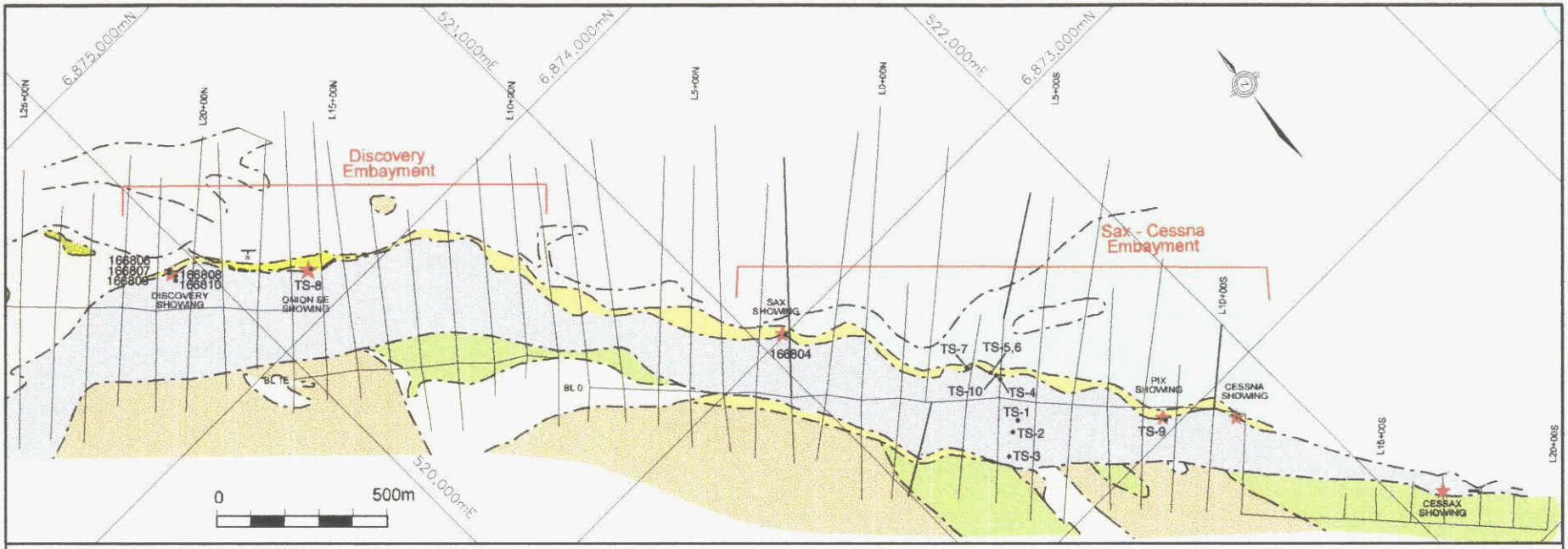
White River country rocks

Four of the five country rock samples were taken within or near the property-scale quartz+carbonate alteration zone that is present along the lower contact of the WRIC. Each of these rocks has been variably overprinted by carbonate with accompanying sericite after feldspar. Sample TS-1 classified as a fine-grained gabbro/diorite or basalt/andesite may belong to either the Station Creek Formation or Nikolai Group depending on the geometric relation between this lithology and the host WRIC. The feldspathic component of this rock has been completely argillitized (Plate 84). This argillitization may be the same event as the hydration of the WRIC, i.e. serpentinization of cumulus olivine and argillitization/sericitization of intercumulus feldspar.

White River Intrusive Complex

Lithologies

The following descriptions of the selected lithologies that comprise the WRIC and country rocks are based on the inferred unaltered protolith. The rock nomenclature utilized in this report is based on the classification and nomenclature for mafic and ultramafic rock proposed by Streckeisen (1976) and is presented in Figure 2. Rock



GEOLOGY

MIDDLE TRIASSIC
NIKOLAI GROUP

- BSLT — Amygdaloidal basalt
- LMST — Massive limestone
- VOLC — Lapilli tuff, volcanic breccia

WHITE RIVER MAFIC-ULTRAMAFIC COMPLEX

- WHRS — Peridotite, dunite, pyroxenite, gabbro
- UM — Peridotite

PENNSYLVANIAN TO LOWER PERMIAN
SKOLAI GROUP
Hasen Creek Formation

- QZCB — Quartz carbonate alteration halo
- SEDS — Silicious argillite

Station Creek Formation

- DIOR — Diorite
- ANDS — Massive andesite flows
- BSFL — Massive basalt flows

•TS-3 Petrographic Sample Location

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CANALASK COMPILATION

Figure 1. Geology of the Canalask property and the location of samples examined in this report.

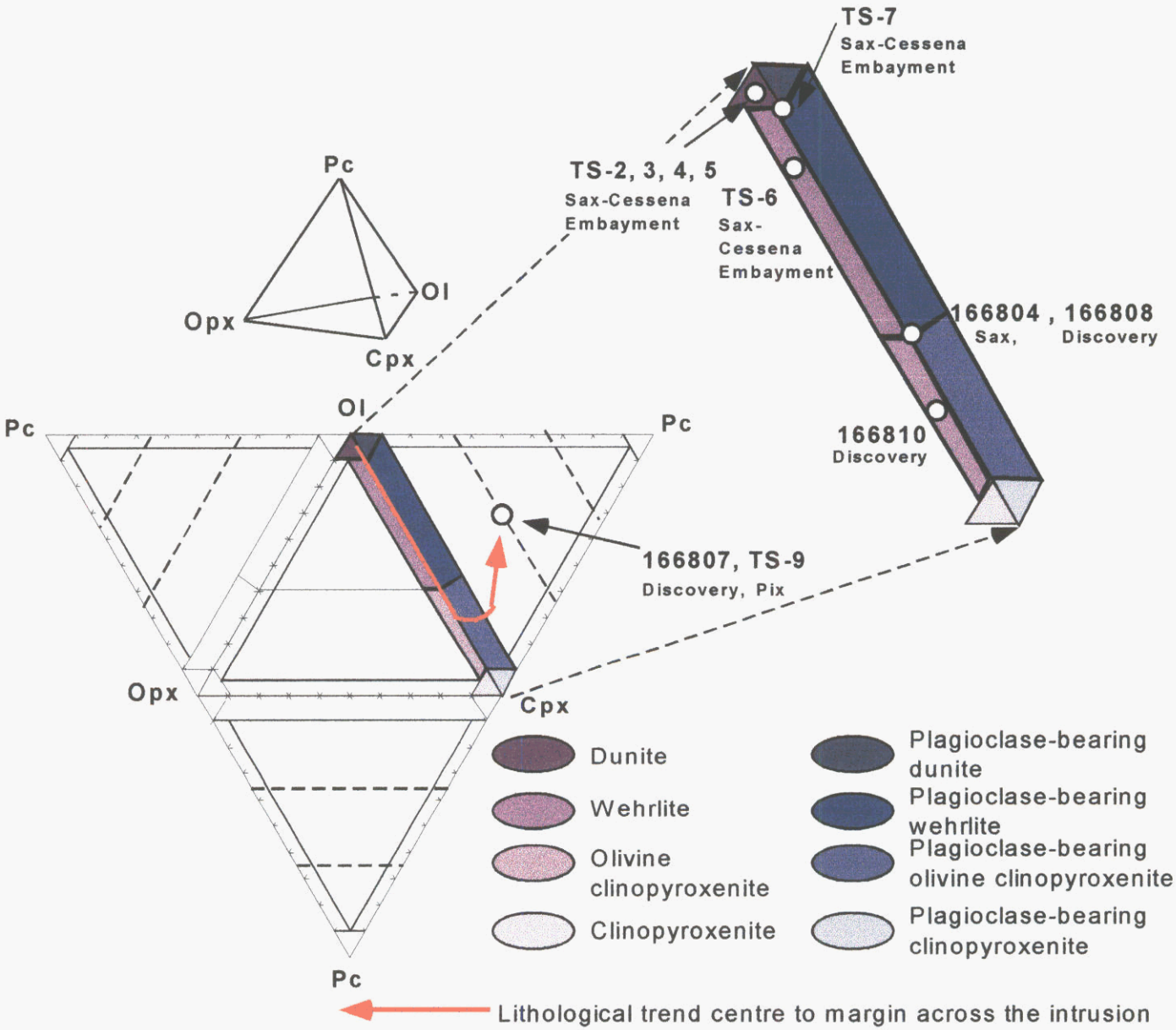

Figure 2. Schematic positioning of the ultramafic and mafic rocks belonging to the White River Intrusion based on the classification and nomenclature for ultramafic and gabbroic rocks after Streckeisen (1976).

nomenclature is based on visual modal estimates of the altered rock but translating the mode into the respective primary mineralogy. The position of the various rock types in Figure 2 is schematic in order to show the lithological variation within the intrusion. Based on the twelve selected samples from the intrusion, dunite appears to occupy the greater portion of the intrusion (Figures 1, 2). An increase in the proportion of feldspar and pyroxene at or near the lower margin of the intrusion has lead to a variety of lithologies that ranges from wehrlite to feldspathic wehrlite, olivine clinopyroxenite into olivine gabbro (Figure 2, trend line). The boundaries between these various lithologies could be gradational and transitions between lithologies may occur over short distances.

Least altered lithologies

Dunite

The least altered specimens are represent by the samples collected on the profile that crossed the Sax-Cessena Embayment area (Figure 1). Dunitic rocks represented by samples TS-2, 3 and 4 have sustained complete serpentinization of olivine and in spite of this thorough serpentinization, the primary texture of this lithology has been superbly preserved. Dunitic rocks display an orthocumulate texture formed by the close packing of fine- to medium grained subhedral to euhedral cumulate olivine (Plates 26, 27, 32, 33, 37). Accessory euhedral very fine-grained cumulate chromite accompanied olivine. Chromite is present as inclusions in serpentinized olivine and interstitial to cumulate olivine (Plates 6, 24, 27B, 28, 29C, 30, 31B, 32C, 33C, 34B, 35, 36, 40B, 42B, 43B, 44, 65C, 71C, 73A). Even though the dunitic rocks as TS-2, 3, 4 preserve a densely packed orthocumulate texture, there was a very minor intercumulus component in this lithology. An intercumulus mineral occupied sparsely distributed irregular-shaped volumes between cumulus olivine and is now represented by very fine-grained mixtures of serpentine+magnetite. The replacement by serpentine suggests that the precursor mineral may have been orthopyroxene (Plates 26, 27, 29A, 32A, 33). The dunitic rock subset do not host intercumulus sulphide. The lack of an intercumulus sulphide component may be due to the diminishing low percentage of intercumulus volumes and the position of some of these samples within the intrusive complex, i.e. within the upper and middle portions of the complex. However sample TS-7 is near the base of the intrusion and hosts a trivial amount of sulphide.

Secondary magnetite, a product of the serpentinization process, is evenly distributed throughout the serpentinized dunite and displays numerous textural relations with the associated serpentine. Secondary magnetite is present as ultra fine-grained disseminations through serpentine pseudomorphs after olivine but the greater proportion of this magnetite is present as discontinuous filaments and bands that accent the boundary between pseudomorphs after olivine and fill intercumulus volumes between pseudomorphs (Plates 27B, 28, 29, 31, 33C, 34, 42). Ultra fine-grained secondary sulphide is inferred to be the product of the serpentinization episode and is present disseminated through serpentine pseudomorphs after olivine and associated with filaments and bands of secondary magnetite (Plates 28, 30, 31, 35, 36). This sulphide is presumed to be pyrite, but the identification has not been confirmed.

Sample TS-7 is interpreted as a transitional rock between the dunitic lithological unit and rocks that grade into wehrlite and clinopyroxenite. Cumulus olivine and chromite in this sample display the same textural features as above (Plate 39). Even though this rock still displays an orthocumulate texture formed by closely packed serpentine pseudomorphs after olivine there is a significant increase in the intercumulus component (Plates 40A). Serpentine, secondary magnetite, chlorite and clay have extensively replaced this intercumulus component. These alteration minerals are interpreted to have replaced pyroxene(?), phlogopite and feldspar respectively. The

increased presence of these intercumulus minerals is conclusive textural evidence to supports the interpretation that there are gradational boundaries between the ultramafic lithologies. Trace amounts of relict phlogopite having a diagnostic orange pleochroism is clearly a primary intercumulus mineral that occupies interstitial volumes between cumulate olivine (Plates 41A). Secondary magnetite+chlorite pseudomorphs are interpreted to be after mica, phlogopite. Secondary magnetite associated with this pseudomorph has concentrated along the cleavage trace of the precursor silicate, a banded-like texture formed by alternating magnetite and silicate (Plates 41, 43). Secondary magnetite after pyroxene or feldspar is unoriented and associated with low birefringent serpentine or clay (Plates 41B, 42). The proportion of intercumulus pyroxene or feldspsr to mica was based on the relative amounts of these two distinctive types of pseudomorphs.

Wehrlite - pyroxenite

Rock belonging to this lithological group are best represented by samples 166804, 166808, 166810 even though the high altered equivalent TS-6 is included in this group. Rocks within this category display both orthocumulate and mesocumulate textures formed by essential cumulus olivine, accessory cumulus chromite and varying amounts of intercumulus clinopyroxene, feldspar and accessory hydrous mica and amphibole. Textural relationships of cumulus chromite to cumulus olivine and intercumulus minerals are similar to texture described in the dunitic rock. Chromite is present as inclusions in and interstitial to olivine and intercumulus minerals (Plates 3B, C, 5C, 6D, 13C, 23A, B, 24C).

There are several mineralogical and textural features that characterize these two lithologies. The most diagnostic feature is the presence of diopside as an essential intercumulus mineral and less commonly is present as a cumulus phase. Secondly, intercumulus feldspar is an essential mineral and is accompanied by accessory intercumulus hornblende and phlogopite. These minerals are uniformly distributed through these lithologies. The third feature is the presence of intercumulus titaniferous magnetite. Even though serpentinization of olivine is of moderate to weak intensity and argillitization/sericitization of feldspar is intense, the preservation and recognition of the igneous textures is excellent.

The texture of medium-grained oikocrystic diopside is common texture to rocks of the wehrlitic to pyroxenitic subgroup. Oikocrystic pyroxene can host very fine-grained cumulus olivine and chromite (Plates 3B, 5B, 11A, 19B, 21B, 24B). Cumulus diopside is subhedral to anhedral and is present as isolated grains in the cumulate olivine+chromite or can form glomeroporphyritic aggregates (Plates 1A, B, 2A, 10A, 19B).

Hydration of the cumulus olivine was accompanied by complete argillitization/sericitization of intercumulus feldspar. Altered intercumulus feldspar is characterized by a turbid appearance in plane light, the result of micron-sized iron oxide disseminated through clay/sericite after feldspar (Plates 1B, 3A, 4, 13A, 14, 19C, 20, 21C, 24, 25). The quantity of intercumulus feldspar is variable within and between rocks

and clearly an increased feldspathic component would mark the transition into gabbroic rocks.

The most significant textural and mineralogical feature of this lithological subset is the coexistence of accessory hydrous primary hornblende and phlogopite with the olivine and diopside (Plates 1B, 4, 10A, 11A, 13A, 15A, 19, 20, 22). These two hydrous minerals are commonly fine to very fine-grained and are clearly intercumulus with respect to cumulus olivine, chromite and diopside. Slightly coarser grained hornblende and phlogopite can display an oikocrystic texture but this texture is not common (Plates 4, 10A, 15A, 19C). An orange to red orange pleochroism is diagnostic of the intercumulus hornblende and phlogopite, a feature that indicates these phases were derived from an interstitial liquid that was oxidized, hydrous and K-bearing.

Primary and secondary magnetite, are present in some of these rocks. Primary magnetite has two mineralogical associations. Fine-grained primary magnetite is associated with intercumulus disseminated and net-textured sulphide (Plates 6, 18). Secondary magnetite is present as discontinuous bands that crosscut net-textured sulphide and concentrate along the interface between altered olivine and sulphide (Plates 6A, C, E). This magnetite does not contain titanium, a consequences of having been derived from a titanium-deficient immiscible sulphide melt. The second type of primary magnetite, titanomagnetite, was identified in the wehrlitic and pyroxenitic rocks. This intercumulus magnetite is characterized by an anhedral amoeboid-like grains, exsolved ilmenite lamellae and the association with intercumulus hornblende and phlogopite (Plates 3C, 15, 16, 22, 23). The presence of titaniferous intercumulus primary magnetite clearly demonstrates the interstitial liquid of the WRIC was significantly evolved and oxidized to precipitate this mineral along with the co-existing oxidized hornblende and phlogopite. Subhedral titanomagnetite was identified with intercumulus sulphide, a textural relation that simply identifies the coexistence of minerals derived from two different liquids, the fractionated interstitial liquid of the WRIC and the immiscible sulphide+oxide melt (Plate 7).

Two generations of sulphide are present in these rocks. Primary immiscible sulphide+oxide aggregates occupy intercumulus volumes along with intercumulus feldspar, diopside and hydrous silicates. The long dimension of these net-textured sulphide+magnetite aggregates can be aligned with the long dimension of intercumulus feldspar (Plates 1A, 5A, 13A). These types of textures preserved in intercumulus silicates and sulphide suggest a derivation through dynamic flow or compaction. The sulphide assemblage in net-textured aggregates includes pyrrhotite+chalcopyrite +pentlandite (Plate 6). The presence of net-textured sulphide implies an immiscible sulphide+oxide melt. However the presence of sulphide blebs or inclusions in cumulus diopside is conclusive evidence that an early sulphide melt was formed and coexisted with the silicate melt that precipitated the various cumulus and intercumulus minerals (Plates 5A, 10A).

Remobilized sulphide, pyrite and chalcopyrite, is present as minute grains associated with secondary magnetite and disseminated through serpentine after olivine

(Plates 23B, 24C). Chalcopyrite in intercumulus net-textured sulphide has been weakly remobilized into irregular shaped clots and along the cleavage planes in pentlandite (Plate 6).

Olivine gabbro

The gabbroic phase of the WRIC is represented by sample 166807 however this sample has sustained intense alteration of its cumulate component with some destruction of primary textures. The alteration present in this rock could belong to the same hydration episode that serpentinized the ultramafic portion of the WRIC. However this sample is located near the basal contact of the intrusion and this contact was the loci for property-scale quartz+carbonate alteration zone. However this gabbro has not been overprinted by the quartz+carbonate alteration even though it is positioned between samples 166806 and 166809, both of which have sustained extensive hydrothermal overprinting. There are two interpretations for the presence of altered gabbro within a zone of intense hydrothermal alteration. First this gabbro may represent a relict domain within the larger quartz+carbonate alteration zone but has not been overprinted by that alteration system. Secondly this altered gabbro without quartz+carbonate alteration may be in fault contact with the adjacent intensely altered rocks. If the latter interpretation is valid, then the lateral and down dip continuity of the Discovery Showing massive sulphide zone, represent by sample 166806, could be faulted and this possibility should be re-evaluated using existing data from geophysical surveys.

Cumulus fine- to medium-grained poikilitic diopside is the most diagnostic textural features of this rock (Plate 52, 53, 54, 56) and this texture clearly distinguishes the gabbroic facies from the intercumulus to oikocrystic diopside in the ultramafic portion of the complex. Olivine, present as inclusions in diopside, has been totally replaced by serpentine and minute acicular amphibole, presumably tremolite (Plate 52, 53, 54, 56). Modally the proportion of olivine is significantly reduced compared to the ultramafic rock series whereas the feldspathic component represented by ultra fine-grained sericite is significant higher than the ultramafic series. The rare preservation of an ophitic texture clearly demonstrates a change in feldspar habit and rock type compared to the intercumulus texture of feldspar in the ultramafic rock series (Plate 56). Fine-grained subhedral to anhedral interstitial hornblende and phlogopite are texturally similar to these minerals in the wehrlitic to pyroxenitic rocks (Plates 52, 53, 55) and display the same red orange to orange pleochroism indicative of derivation from as oxidized magma.

Disseminated and clotted sulphide is present in this altered gabbro. The sulphide clots comprised of pyrrhotite+chalcopyrite+pentlandite with magnetite are interpreted as slightly modified immiscible droplets that have been slightly modified due to the recrystallization (Plates 52, 55, 57, 58). The presence of a droplet-type sulphide-bearing lithology near to the massive sulphide, sample 166804, suggests that this sample may represent the periperal droplet-type sulphide that is commonly present near basal accumulations of magmatically segregated massive sulphide. These sparsely distributed clotted sulphide blebs are the loci for several ultra fine-grained, <5 microns, palladium-

bearing minerals, see section below). Trace amounts of marcasite after pyrrhotite and violarite after pentlandite are interpreted to be the product of Recent oxidation (Plate 58)

Hydrothermally altered lithologies

Ultramafic rocks

Significant recrystallization and replacement has occurred along the northeastern margin of the complex. This zone is the loci of pervasive property-scale quartz +carbonate alteration, local high strain in the WRIC and probably within the adjacent country rocks (Figure 1; hand specimen photographs of TS-5 and –6). Two textural types of carbonate are recognized in the serpentinized and argillitized ultramafic rocks. The most obvious textural type is represented by very fine-grained carbonate that has filled the first-, second- and third-order anastomosing foliation planes (Plates 63, 64, 65, 67). Accessory talc and chlorite are present in the wallrock adjacent to carbonate-lined foliae. Talc is interpreted as the product of serpentine destruction under high CO_2 conditions. Carbonate porphyroblasts represent the second textural variety (Plates 65A, 66A, C, 70, 71B) and are distributed through the least deformed lozenge-shaped micro-domains where relict igneous textures have been preserved.

Gabbro

The protolith to the intensely altered emerald green fuchsitic(?)-bearing, quartz veined and carbonatized offcut slab TS-9 is presumed to have been a gabbro based on pseudomorphs and major oxide and trace element geochemistry. Even though there has been complete replacement of all primary minerals by carbonate, clay, quartz and recrystallization of sulphide, a few relict mineral textures have been preserved that provide a textural link to the protolith. Carbonate, dolomite, is present as an ultra fine-grained mats that has locally obliterated the primary igneous texture and as veins (Plates 74, 75, 76). Primary textures are inferred by the presence of carbonate porphyroblasts. These porphyroblasts may have been pyroxene based on a similar grain size to diopside in unaltered gabbro and clustering of these porphyroblasts similar to aggregates of pyroxene in unaltered gabbro. Some carbonate porphyroblasts host equant inclusions of clay/serpentine, a texture diagnostic of poikilitic pyroxene in gabbroic rocks. Interstitial phlogopite was present but has been represented by easily identifiable pseudomorphs of carbonate+clay+ ultra fine-grained iron oxide (Plate 75).

Opaque mineral aggregates are unevenly distributed through the replaced groundmass (Plate 76). These ragged knots are associated with bleached envelopes comprised of quartz with clay (Plate 76). The opaque mineral assemblage with magnetite has been significantly recrystallized and modified by the overprinting quartz+carbonate hydrothermal event. These recrystallized opaque mineral knots may have been either disseminated or droplet-type magmatic Ni-Cu-Fe sulphide. The knots are comprised primarily of recrystallized pentlandite and chalcopyrite, two minerals interpreted to be relict magmatic minerals common in disseminated, net-textured and massive pentlandite+chalcopyrite+pyrrhotite assemblages (Plate 6). Importantly these two

minerals coexist with pyrite and millerite, the latter mineral commonly formed in recrystallized sulphide assemblages that have re-equilibrated under a higher partial pressure of sulphur. Trace amounts of gersdorffite (Ni-As-S) belonging to the cobaltite group of minerals and an unknown mineral comprised of Ni-Co-Fe-As-S, possibly belonging to the linnaeite group of minerals are intergrown with the above mineral assemblage (Plate 78). The texture of these Ni-As-bearing minerals is texturally late. The mineralogy and texture of this altered gabbro contrasts with the mineralogy of the least altered intercumulus net-textured and droplet-texture sulphide-bearing ultramafic and mafic rocks, i.e. 166804 and 166807 respectively. The critical element in this recrystallized sulphide-bearing rock is arsenic and the conclusion is that arsenic was introduced by the overprinting hydrothermal system. This conclusion is furthered in the discussion on the niccolite+gold-rich prospects.

The impact of hydrothermal alteration on PGE mobility appears to be minor when using sulphide-bearing gabbro, sample 166804, as a baseline. The Pd/Pt ration is 2.19 compared to 1.92 in the altered equivalent, sample TS-9. Similarly the abundances in ppb of Os, Ir, Ru and Rh are similar between unaltered (Os/Ir/Ru/Rh = 16/14/5/23) and altered (Os/Ir/Ru/Rh = 22/13/21/17) equivalents.

Altered nickeliferous massive sulphide

This lithology is represented by sample 166806. One of the important textural features of this rock is that it has been penetratively deformed and deformation was coeval with carbonatization. The penetrative fabric is conclusive documentation that there is faulting associated with the property-scale alteration zone along the lower contact of the complex and that the massive sulphide in the Discovery Showing is sheared and possibly faulted. The banded massive sulphide hosts three carbonate-filled vein sets, two vein sets are oriented at an acute angle to each other and are interpreted as a S-C shear fabric. The third set is oriented at a high angle to the former and is interpreted as extensional veins (Plate 46). Carbonate is the principle mineral filling veins and veinlets but trace amounts of quartz and clay were identified occupying the central portions of some symmetrically banded veins.

Alternating carbonate-rich and sulphide-rich domains forms the banding in the massive sulphide (Plate 46). The sulphide-rich bands are compositionally zoned with pyrite+pentlandite salvages along the interface between carbonate and pyrrhotite (Plates 48, 49). Trace amounts of millerite are associated with pyrite+pentlandite (Plate 51). Chalcopyrite is present but it represents a very minor percentage of the sulphide assemblage. Chalcopyrite is present as irregular-shaped very fine-grained knots, as filaments aligned in the foliation and as knots in extensional veins (Plate 50A). The replacement of pyrrhotite by pyrite and the association of these two sulphides with pemntlandite+millerite indicate that this sulphide has been recrystallized and re-equilibrated under a high partial pressure of sulphur. Importantly this high-sulphur assemblage from the Discovery Showing is strikingly similar to the Pix Showing recrystallized sulphides in the carbonatized sample TS-9 except no arsenide-bearing minerals were identified. Pyrrhotite has been replaced by marcasite, a replacement texture attributed to Recent weathering (Plate 50B).

White River country rocks

Five of the sixteen samples were classified as belonging to stratigraphic formations that lie above and below the WRIC. Sample TS-1 was classified as a fine-grained intrusive rock, gabbro/diorite or its extrusive equivalent of basalt/andesite and equated to either the Nikolai Group basalt or Station Creek Formation. This rock is comprised of an unoriented interlocking mat of very fine-grained plagioclase laths with intergranular pyroxene (Plate 84). If this rock belongs to the Nikolai Group, this sample may have been taken from a younger dyke that cuts the WRIC and is a feeder dyke to the volcanic rocks of the Nikolai Group. Alternatively if this rock belongs to the Station Creek formation, then this rock unit must represent a xenolith within the WRIC. Importantly the feldspathic component of this rock has been completely argillitized (Plate 84). If this rock belongs to the Station Creek Formation, then the hydrothermal alteration could be coeval with the hydration episode that serpentinized the adjacent dunitic rocks in the WRIC.

Sample TS-4 shows the intrusive relationship between a dunite of the WRIC and an intermediate plagioclase porphyritic intrusive rock (Plate 37). This intrusive rock is equated to the Cretaceous Kluane Range diorite-granodiorite intrusive suite. The relative timing relationship between these two lithologies is represented by a devitrified glassy chilled margin of the intermediate intrusive rock in contact with the dunite clearly demonstrates that the this intermediate intrusive rock is younger (Plate 37). The replacement of feldspar by clay+chlorite indicates that there is a low temperature hydrous alteration event that is either syn or post-intrusion. Could this alteration be related to the Kluane intrusive episode?

Geochemistry – Major and trace element

Introduction

The original geochemical database submitted to Kishar Research Inc. was comprised of 324 analyses of rocks collected during the 2001 exploration program. This database included all lithologies represented in the geological record on the property and of potential economic interest. One of the objectives of this report focused on the petrography of the WRIC and the lithological variations between rock units that comprise the complex. Consequently, this database was reduced in size, N = 187, to include only the least altered analyses of the WRIC, i.e. all analyses were excluded if the descriptive notes indicated hydrothermal overprinting or there were exceptionally low totals. Analyses were classified according to the rock nomenclature present in the original database (rock type were not reassigned based on major element chemistry). The final distribution of lithologies is gabbro = 92, pyroxenite = 8, peridotite = 52, dunite = 14 and undifferentiated ultramafic = 21.

In the original database, total iron was reported as Fe_2O_3 and these major oxides were normalized to 100%. Since iron in igneous rocks is present as Fe^{+2} and Fe^{+3} and the normalized total iron in the WRIC rocks was reported as Fe_2O_3, the normalized total iron

was recalculated into FeO and Fe_2O_3 based on an average ratio of Fe^{+2}/Fe^{+3} = 5:1 for mafic-ultramafic rocks. This revised database of 187 WRIC samples with calculated normalized ferric and ferrous oxides were utilized to analyze the geochemistry from the WRIC. This revised normalized major element database was utilized to calculate the CIPW norms using the petrological program Igpet 2001. In order to analyzed the WRIC geochemical database, a series of ternary plots used in the analysis of igneous rocks were constructed as well as ternary and X-Y plots using the calculated normative mineralogy and calculated indices based on the normative mineralogy.

Discussion

The ternary plot utilizing the normative minerals, anorthite-pyroxene (diopside+hypersthene)-olivine, was plotted to examine the degree of fractionation within the WRIC (Figure 3). The compositional trend of the ultramafic rocks clearly illustrate that these rocks are comprised primarily of olivine and pyroxene with minor variations in the plagioclase content, a feature that was identified petrographically by the varying amounts of intercumulus diopside and feldspar (Figure 2). The distribution of gabbroic rocks overlaps with the ultramafic distribution and some of the rocks described as gabbroic belong to the ultramafic suite. However the population of data gabbroic points in the area between the two red asterisks (~$An_{20}Ol_{50}Px_{30}$ to ~$An_{25}Ol_{25}Px_{50}$) shows that there is considerable variation in the composition of the gabbroic rocks within the complex. However overall the WRIC has not undergone significant fractionation.

The standard igneous AFM plot, (FeO+Fe2O3)-(Na2O+K2O)-MgO, was used to graphically portray the chemical variation in the WRIC suite (Figure 4). In Figure 4, the ultramafic rocks are confined primarily to a narrow compositional domain along the along (FeO+Fe2O3)-MgO boundary, i.e. >Mg/Fe_T = 7/3. In contrast the gabbroic rocks display a wide compositional range along the entire length of the (FeO+Fe2O3)-MgO boundary. The fact that the compositional trend of the gabbroic rocks does not extend off the (FeO+Fe2O3)-MgO boundary towards increased concentrations of alkali elements indicates that there has been essentially no fractionation within the complex. The gabbroic data points extend along the entire (FeO+Fe2O3)-MgO boundary but appear to cluster into three groups. The majority of the data points extends up to Mg/Fe_T = 1:1 and are interpreted to represent ultramafic rocks with varying proportions of olivine and pyroxene. The other two groups plot near and at the iron apex. These samples are clearly iron-enriched and that iron is inferred to reflect sulphide. Sulphide-enriched gabbroic rocks may lie peripheral to magmatic sulphide segregations near the basal contact i.e. sample 166807. Thus it is suggested that these iron-enriched gabbroic rocks represent domains along the basal contact that are more prospective for sulphide mineralization, if not recognized by significant mineralization at surface then possibly along the contact at depth. These areas of iron enrichment should be reviewed to see if there are coincident geophysical anomalies in the area, in particular IP anomalies. As a cautionary note, based on petrographic identifications, enhanced concentrations of primary intercumulus titanomagnetite would produce anomalous total iron concentrations. However magnetic and IP surveys should be able to differentiate magnetite and sulphide-bearing rocks.

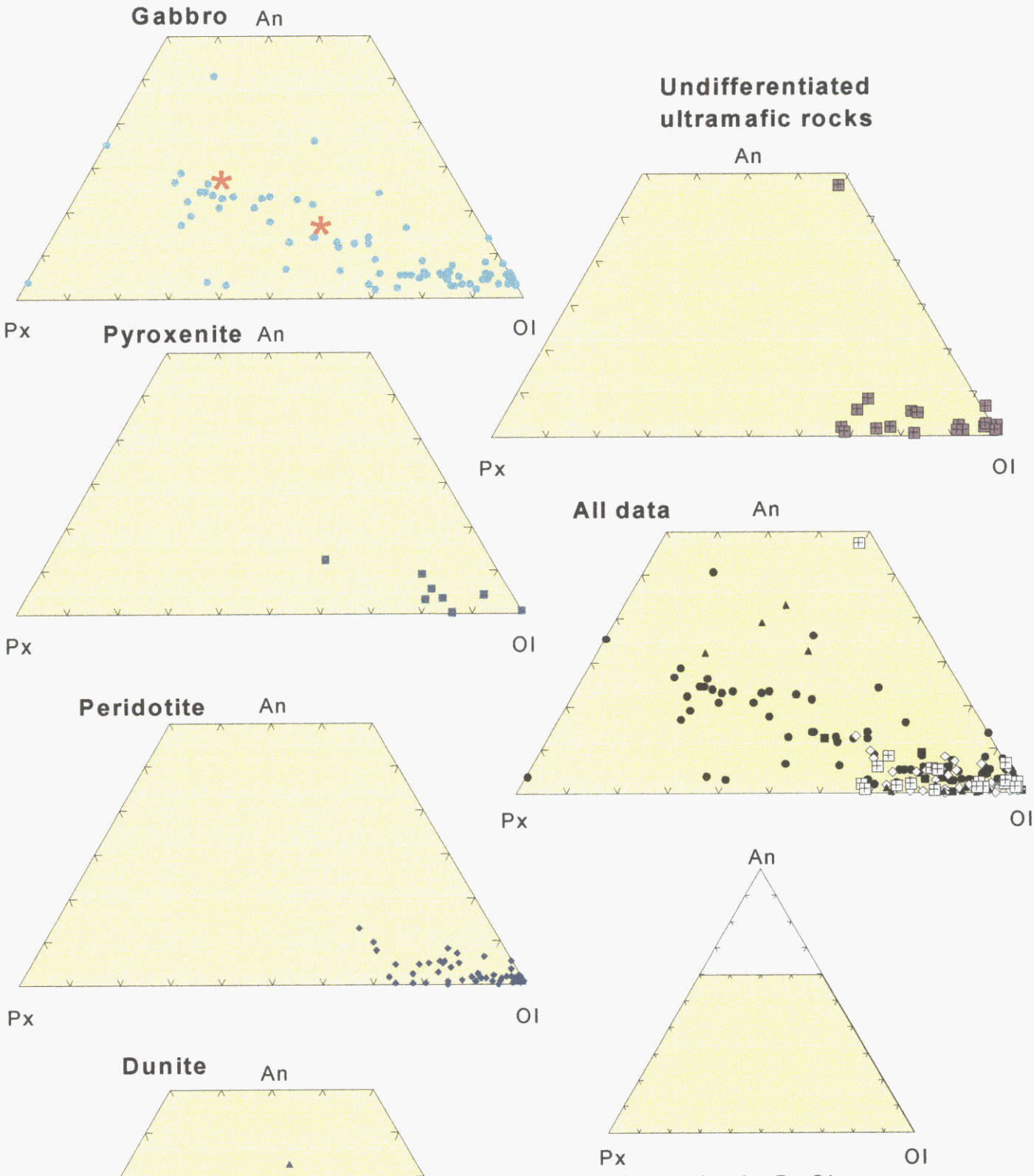

Figure 3. Normative An-Px-Ol (anorthite - pyroxene - olivine) plots for rocks from the White River Intrusive Complex.

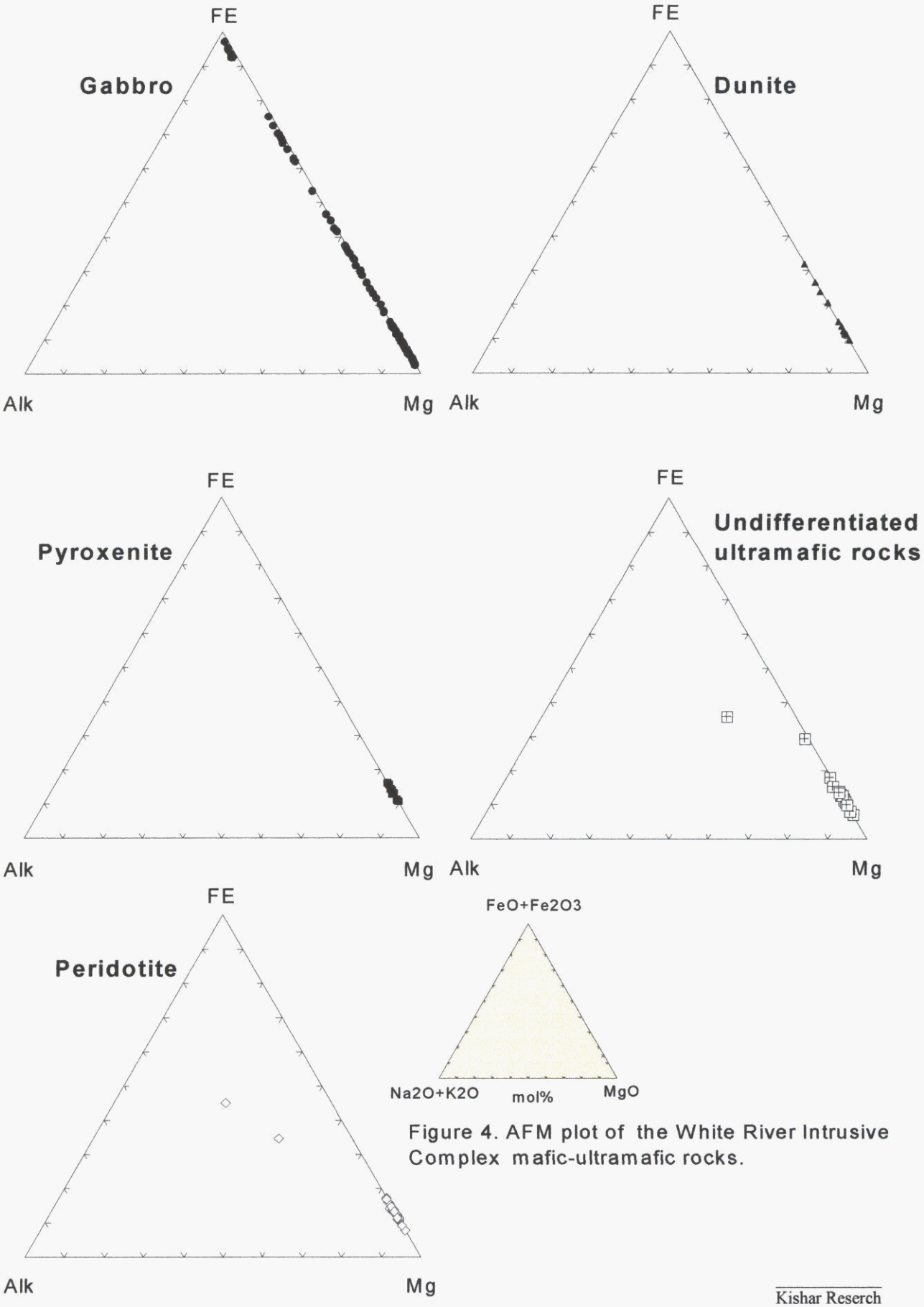

Figure 4. AFM plot of the White River Intrusive Complex mafic-ultramafic rocks.

The Jenson cation plot, (FeO+ Fe_2O_3+TiO_2)-Al_2O_3-MgO, was used to graphically portray the chemical variation in the WRIC suite (Figure 5). Even though the Jenson plot was designed for volcanic rocks, this plot is useful to display the chemical variations because the three apices reflect the three essential minerals, olivine, pyroxene and feldspar, that comprise the principle lithologies of the WRIC. All ultramafic rocks plot on and near to the (FeO+Fe_2O_3+TiO_2)-MgO boundary. The departure of some data points having slightly enhanced Al_2O_3 concentrations is attributed to intercumulus feldspar, a feature that is described in Petrography and Ore microscopy section Part II and shown in Figure 2. The gabbroic rocks display a marked range in composition that overlaps with the compositional range of the ultramafic rocks and extends towards less mafic compositions. The majority of the gabbroic data points combined with the clustered ultramafic data point define a trend line that confirms the above interpretation that there has been little fractionation on the WRIC. The scatter of data points to the left of the vertical line from the Fe apex do not represent highly fractionated equivalents of the gabbroic phase but most probably carbonate-altered gabbroic rocks that are located along the altered northeastern margin of the complex.

To examine the distribution of PGE with respect to rock type in the WRIC, a series of X-Y plots were constructed utilizing normative mineralogy and total PGE assay data, where the total PGE value is the sum of either Pt+Pd or the sum of all platinum group elements. In Figure 6, differentiation index, which is the sum of normative quartz+albite+orthoclase, was plotted against nickel and total PGE. The major proportion of data points cluster between 100 – 500 ppm Ni at a differentiation index <2.5. A small subset extends to DI=5. This distribution demonstrates that there has been negligible igneous fractionation within the WRIC, similar to the conclusion stated above. The small group of gabbro-designated data points that range from ~DI = 6 – 15 contain the same relative amount of nickel as the majority of data points that cluster at DI <2.5. Examination of the geochemical data set for these samples with DI >6 shows that these samples are comparatively sulphur-rich, >0.3 wt% S, compared to the sulphur contents of rocks in the remaining database, i.e. <0.1 wt% S. Some of this these sulphur-rich gabbroic rocks have also undergone carbonatization. This association indicated that carbonatization did not remobilize nickel. This conclusion is supported by the recrystallized and weakly remobilized nickel-bearing assemblage documented in the carbonatized sample TS-9.

A third subset of four data points positioned between 50000 and >100000 ppm Ni is formed from two different two lithologies (Figure 6A). Based on the major element geochemical database, the data point at ~50000 ppm Ni is interpreted to be a silicified nickeliferous massive sulphide. The remaining data points represent high nickel but low sulphur-bearing rocks, which are interpreted to represent high-grade nickel occurrences related to niccolite and not nickeliferous massive magmatic sulphide.

In Figure 6B, the greater majority of the WRIC lithologies have PGE_T concentrations below 100. However there is a subset with high concentrations between

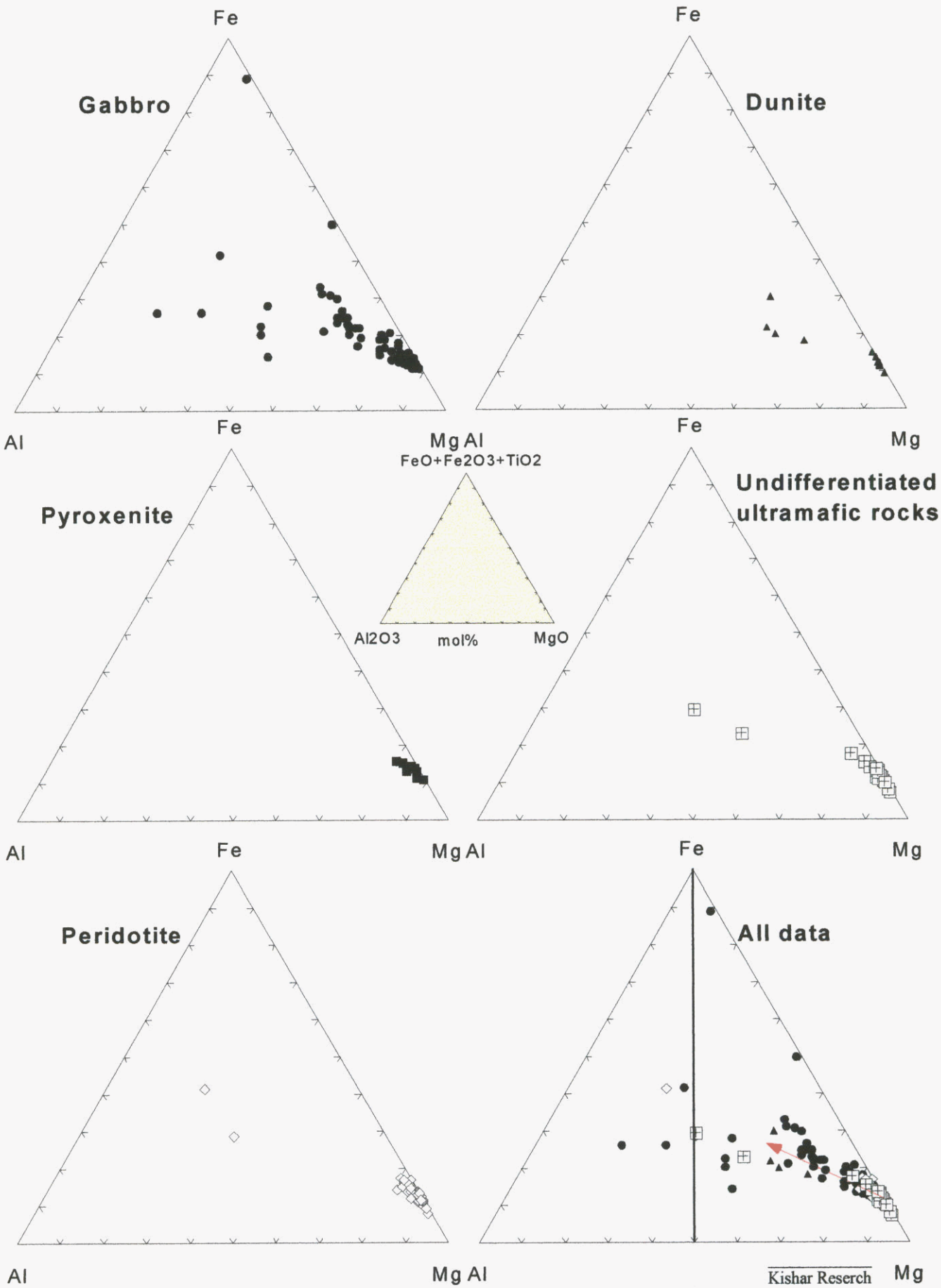

Figure 5. Jenson cation plot of the White River Intrusive Complex

100 – 3000 ppb PGE. These data points are represented by the sulphur-rich gabbroic rocks. The high-grade PGE population is comprised of one sample, the 6827 ppb PGE-bearing nickeliferous nickeliferous massive sulphide. Similarly the plot of Ni versus PGE_T clearly illustrates that nickel and PGE have undergone partitioning or nickel has been preferentially remobilized during the hydrothermal event that formed the niccolite-rich mineralization (Figure 7).

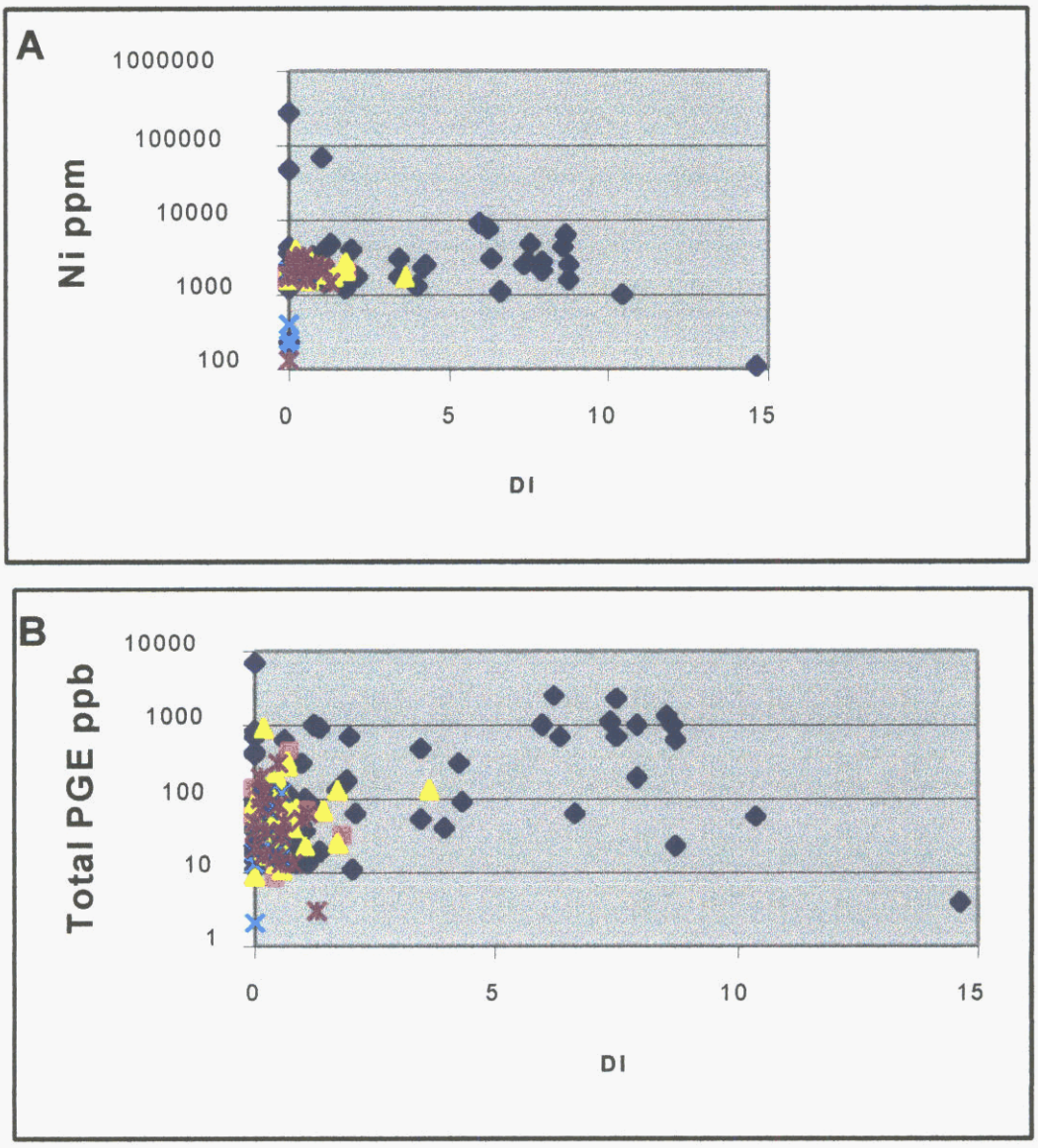

Figure 6. Differentiation index (DI) versus log Ni and total PGM. (DI = sum of normative quartz+albite+orthoclase)

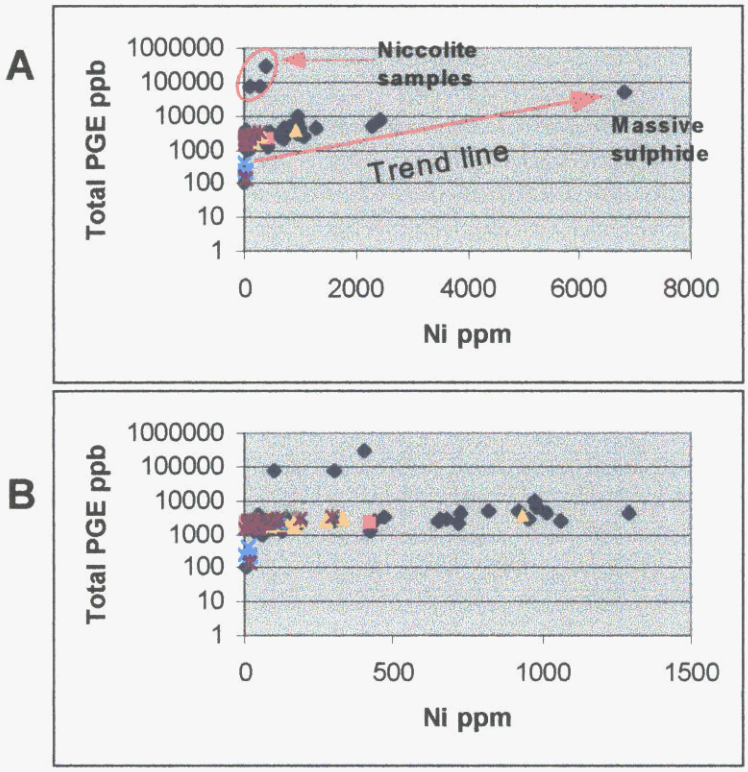

Figure 7. Total PGM versus Ni. (In **B**, three data points >2000 ppb PGE have been removed in order to expand the distribution of data points)

Plotting the distribution of total PGE against normative pyroxene and pyroxene +olivine shows that there is a subset of pyroxenitic, peridotitic and gabbroic data points are that > 100 PGE_{Total} (Figure 8). These samples represent lithologies that formed near the margin of the complex and potentially peripheral to basal concentration of magmatic sulphide segregations. The enhanced PGE concentrations in this subset may identify additional domains within the complex where magmatic sulphide have not be recognized due to exposure or lie peripheral, at depth, within the complex.

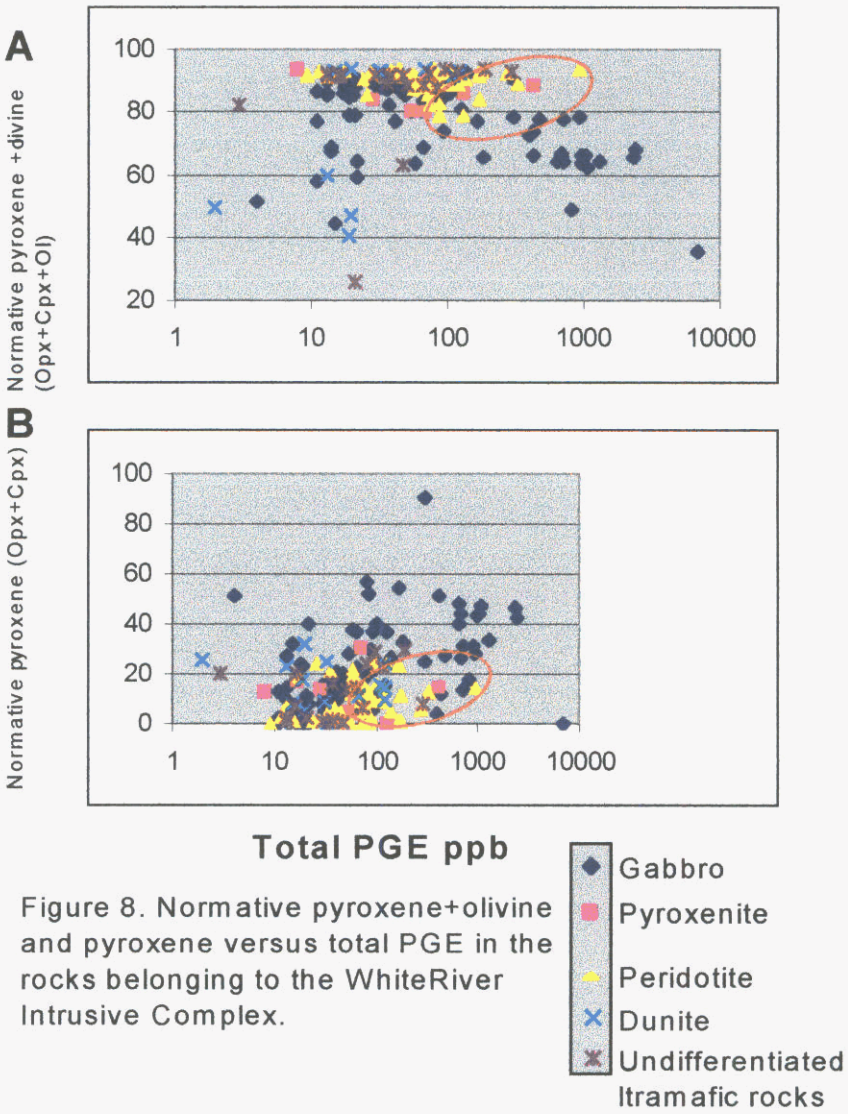

Figure 8. Normative pyroxene+olivine and pyroxene versus total PGE in the rocks belonging to the WhiteRiver Intrusive Complex.

A dioritic dyke swarm was recognized to have intruded the WRIC (I. Fraser, pers. comm. Nov/01). The intermediate intrusive rock described as part of sample TS-4 is inferred to belong to this dyke swarms and is equated with the Cretaceous dioritic to granodioritic Kluane Range Intrusions. A series of ternary plots illustrate that the dioritic dyke swarm is chemically distinct compared to the gabbroic rocks of the WRIC and can not be considered a fractionated equivalent of the WRIC. (Figure 9).

PGE minerals: Scanning Electron Microscope Investigation

Analytical Procedures

A set of six polished thin sections were selected for a preliminary study using a scanning electron microscope equipped with an energy dispersive x-ray spectrometer. The purpose of this investigation was to identify very fine-grained opaque mineral assemblages, confirm the composition of opaque minerals, identify PGE-bearing minerals and identify and confirm the composition of silicate alteration minerals. Mineral names used in this report are based on the energy dispersive spectral image and should be considered as a first approximation until quantitative analyses have been completed. Back scattered electron images of silicate and opaque mineral textures and accompanying energy dispersive spectral images of a mineral or texture are integrated into the petrographic data for that specific polished thin section.

Magmatic sulphide+oxide prospects

PGE-bearing minerals were identified in samples 166804 and 166807. These samples represent two different type of disseminated sulphide and are located in the northwestern and central area of the property and at the base of the WRIC. The feldspathic wehrlite, sample 166804, hosts centimeter-sized net-textured sulphide domains and the olivine gabbro, sample 166807, hosts ragged sulphide blebs. All PGE minerals identified are extremely fine-grained, <5 microns and occur as inclusions in sulphide and along sulphide-silicate grain boundaries. The identified PGE minerals include merenskyite (Pd+Te, Plate 59), kotulskite (Pd+Te, Plate 8), sudburyite (Pd+Sb, Plate 60, 61, 62) and either cherepanovite or rhodoarsenide (Rh+As, Plate 62). Tellurium, antimony and arsenic are considered the diagnostic elemental fingerprint for this magmatic PGE mineralization.

Hydrothermally altered skarn-type nickeline-sulphide prospects

Two samples TS-8 and TS-10 located along the lower hydrothermally altered border of the WRIC were classified as an epigenetic mineralization style. A similar silicate alteration assemblage and the manner in which opaque minerals are distributed through the silicate alteration assemblage suggest similar hydrothermal processes. However the base and precious metal contents are not similar, i.e. Cu, Zn, Ni, Co, Au, Pt, and Pd.

Sample TS-8 hosts high-grade nickel and gold mineralization (70100 ppm Ni and 8688 ppb Au) but the silicate alteration assemblage is clearly diagnostic and indicative of

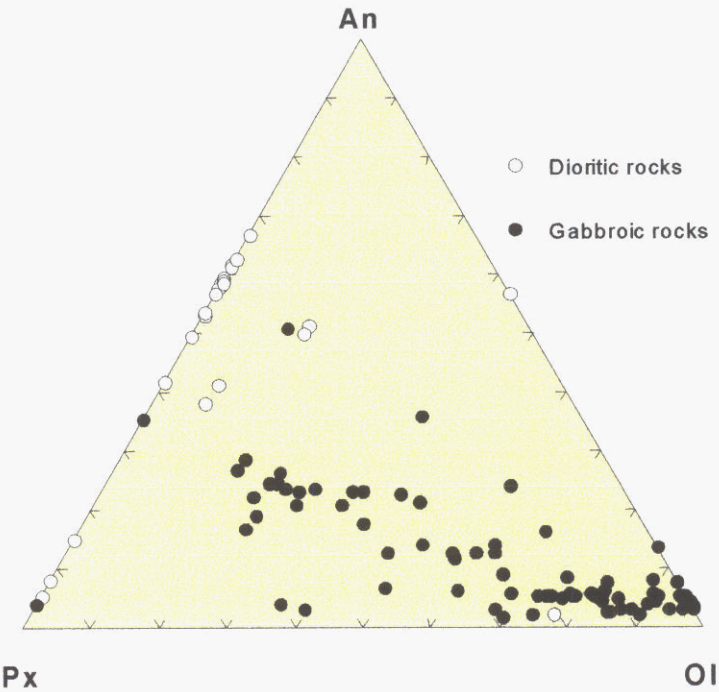

Figure 9**A**. Normative anorthite-pyroxene-olivine (An-Px-Ol) comparison of Cretaceous Kluane Range Intrusive diorite dykes and WRIC gabbroic rocks using Normative anorthite-pyroxene-olivine (An-Px-Ol) .

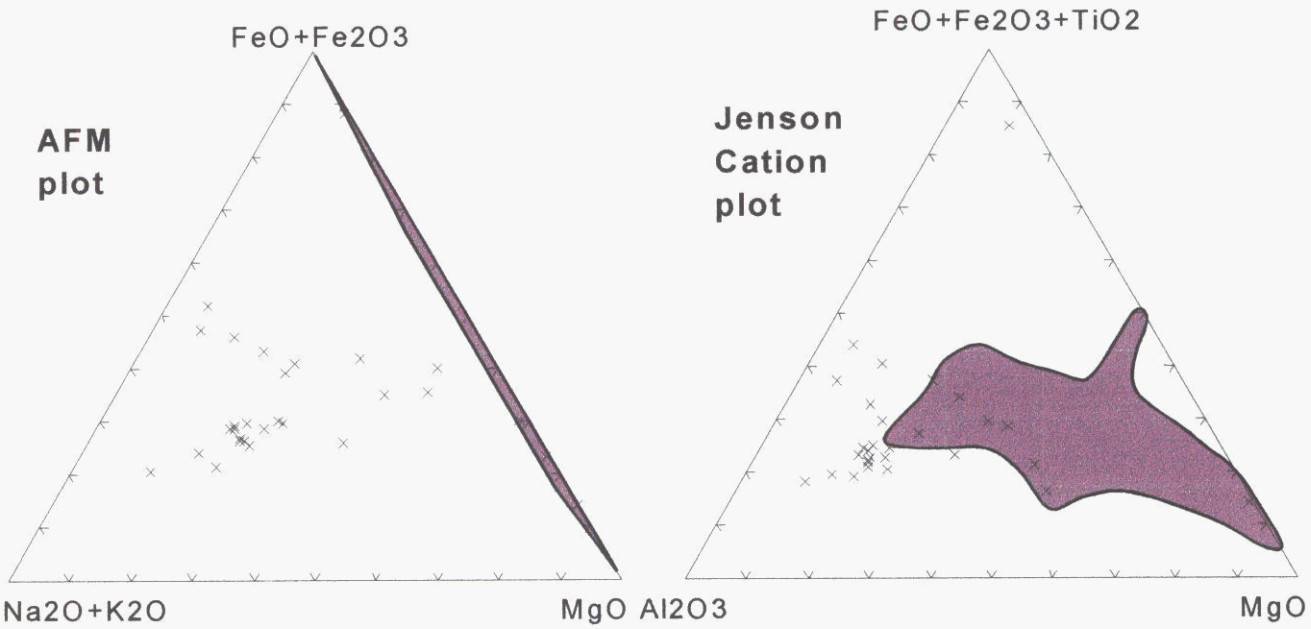

Figure 9**B**. AFM and Jenson cation ternary plots of the major oxide geochemistry for the diorite dykes related to the Cretaceous Kluane Range Intrusive suite and Triassic WRIC gabbroic rocks.

Coloured areas represent the data point distribution for WRIC rocks based on the normalized whole rock major element chemistry for rocks of the mafic-ultramafic White River Intrusive Complex.

Kishar Reserch

a hydrothermal overprint associated with the Ni-As-Sb and Au-Ag minerals. The silicate+oxide assemblage is represented by diopside+andradite+serpentine+chlorite +hematite and is indicative of skarn-type hydrothermal processes (Meinert, 1993). Anhedral to subhedral medium to fine-grained diopside and euhedral to subhedral andradite are hosted in a very fine-grained mat of serpentine (Plates 85, 86, 87, 90). Contorted intergrowths of chlorite+hematite are sparsely distributed through the former assemblage (Plates 85C, 86C, 87). In hand specimen, niccolite is present as medium- to coarse-grained crisscrossing blades. Scanning electron microscope imaging of the niccolite revealed that the niccolite has a poikiloblastic texture due to minute silicate inclusions (plate 88, 89). Niccolite also hosts minute, < 20 micron, irregular shaped bleb- to worm-like inclusions. Based on the energy dispersive spectrum this phase comprised of Ni-Sb is identified as breithauptite (Plates 88, 89). The texture of these inclusions suggests that breithaupite exsolved from the host niccolite. Ultra fine grained, <40 micron, gold and electrum are associated with niccolite-breithaupite-sphalerite and account for the high-grade gold assay (Plates 88, 89). The mineral species termed electrum is characterized by appreciable silver compared to gold phase that hosts negligible silver. Both of these precious metal minerals are present along the boundary between silicate and sphalerite-niccolite and filling fractures in sphalerite-niccolite (Plates 88, 89). This latter texture suggests late stage precipitation or remobilization. The elemental signature of this mineralized sample is Ni+As+Sb+Au+Ag+Zn. Importantly the magmatic sulphide can be characterized by the elemental signature Ni+Cu+Co+Te+Sb+As+Pd+Pt±Au. The overlap in elements between these two types of mineralization strongly suggests remobilization. Four samples with variable gold tenor, ore grade to anomalous, are located in the silificied and carbonatized envelope that borders the lower contact of the complex. Gold is easy complexed and transported as a bisulphide or bicarbonate in a hydrothermal fluid. Consequently the property-scale zone of carbonatization-silicification with deformation that is present along the contacts of the WRIC is prospective for gold.

Discussion

Based on the petrographic and supporting analysis of the major element geochemistry, the WRIC has not undergone significant, if any, fractionation. The distribution of lithologies is inferred to be symmetrical. The symmetrical lithological distribution may have formed through dynamic processes that focused xenocrystic olivine and chromite within the central and middle portions of the magma conduit while the basaltic liquid fluxed to the outer edges of the conduit. This dynamic separation of crystal and liquid formed cumulate-textured dunite in the central and middle portions of the complex. With progressively greater amounts of intercumulus liquid nearer the edges, there would be gradual transitions into wehrlitic and pyroxenitic rocks. It is entirely possible that there are narrow discontinuous domains of wehrlitic and pyroxenitic rocks within the main dunitic core. These domains would represent local focal points for dynamic flow within the chamber. With a progressively higher component of basaltic liquid near the margins of the conduit varying amounts of xenocrystic olivine, the border phase of the intrusion would grade from ultramafic lithologies into olivine gabbro and

gabbro (Figure 10). Dynamical flow would accentuate density contrasts and separation of the immiscible sulphide melt towards the base of the complex.

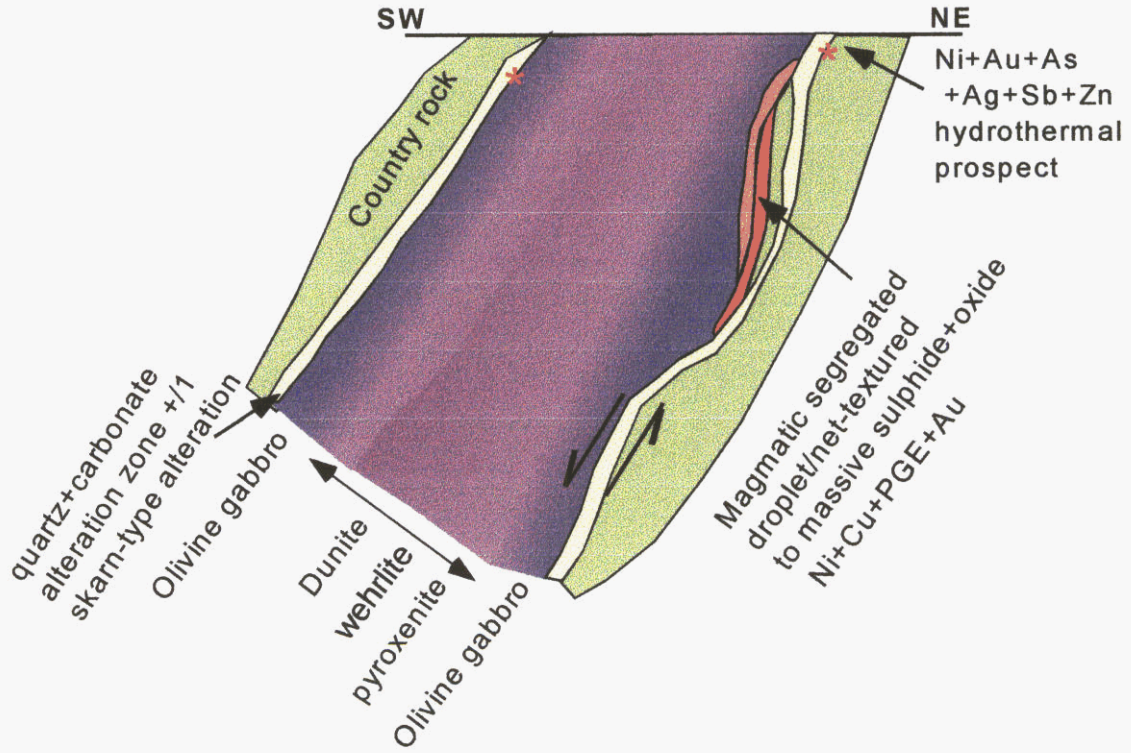

Figure 10. Schematic cross-section through the WRIC showing the inferred symmetrical distribution of rock types across the complex and the different mineralization types.

The second objective of this report was to reconcile the two types of mineralization on the property and attempt to explain the lack of PGE in the epigenetic hydrothermal niccolite+gold prospects, which are interpreted to be the product of partial remobilization of basal magmatic Ni+Cu+PGE segregations. It is recognized that PGM deposits have formed in diverse geological environments and that hydrothermal fluids played a role in the formation. These concepts stimulated research into evaluating the ability of hydrothermal fluids to dissolve, transport and deposit platinum-group metals, in particular Pt and Pd in hydrothermal solutions up to 300°C. The solubility and transport of PGE in hydrothermal solutions suggests that PGE may be mobilized in geological fluids as chloride, hydroxide, bisulphide, polysulphide, thiosulphate, or ammonia complexes depending on pH, $fO2$ and temperature. A few of the important physiochemical factors pertinent to PGE mobility are summarized in light of known and inferred features of the PGE-poor niccolite prospects on the property (Wood et al., 1989; Mountain and Wood, 1988a, b; Gammons et al., 1992, 1993; Sassani and Shock, 1990).

The mineral assemblages provide critically important evidence about the hydrothermal system that formed the mineralization. The high-grade nickel+gold-bearing sample, TS-8, is characterized by the silicate assemblage garnet+diopside+chlorite +serpentine. Similarly the sample TS-10 hosts a garnet+chlorite alteration assemblage but negligible nickel and anomalous gold. In the case of sample TS-8, this mineralization is

essentially monomineralic comprised of approximately 40-45% niccolite. The high arsenic content of this hydrothermal fluid may have been the main deterrent to PGE solubility and remobilization because As, Se, Te act primarily to reduce the solubility of PGE. Many of the PGE minerals are formed by bonding with Se, Te, As, Sb, and Bi. The former metals have a strong capacity to immobilize the PGE because PGE-bearing arsenide, selenide and telluride minerals are more stable than PGE-bearing sulphides.

Significant solubility of Pt and Pd as chlorite complexes can occur only in an acidic, oxidizing solution. The product of a highly acidic hydrothermal solution would convert wall rock assemblages to sericite/clay with hematite. Sericitic alteration is not present in the above samples and consequently chloride complexing is not a viable transporting agent with regards to alteration assemblages seen on this property.

Hydroxide complexing is capable of transporting Pt and Pd in fairly basic (pH>8) and fairly oxidizing conditions, within the hematite stability field. Since hematite is present in the alteration assemblage of TS-8 one of these physiochemical conditions appears to be meet. There is also solubility data that suggests Pt and Pd hydroxides may be stable under oxidizing basic conditions, which would limit the solubility of PGE hydroxide complexes. Thus hydroxide complexes probably do not contribute significantly to hydrothermal PGE transport.

Bisulphide complexing is considered an important complexing agent at near neutral to basic pH, high total sulphur and intermediate temperature (250-400°C). Pt and Pd are several orders of magnitude more mobile as bisulphide complexes than as chloride complexes in hydrothermal solutions having the normal pH range, fO_2 and low sulphur concentrations. The almost total absence of sulphide minerals, trace amounts of sphalerite, indicates that the hydrothermal system responsible for the Ni+Au mineralization at the Onion SE showing (TS-8) contained very little or no dissolved sulphur species. Thus the capacity of the hydrothermal system to complex and transport Pt and Pd would be negligible. Thus the high arsenic-bearing hydrothermal system is interpreted to have been the main impediment to PGE transport.

What is the source of a hydrothermal system that bears the signature of Ni+As+Au+Ag+Sb+Zn in associated with a skarn alteration assemblage? Clearly the mass balance relationships between the amount of arsenic in the magmatic Ni+Cu+PGE disseminated and massive sulphide as indicated by the trivial amount of an arsenic-bearing PGE mineral is not consistent with the arsenic-rich Onion SE showing (dimensions of this mineralization unknown by the author). Thus a skarn gold deposit model is suggeted by the metallic signature, As+Au+Ag+Sb+Zn of the Onion SE Showing and the regional association with the Cretaceous Kluane Range dioritic to granodioritic intrusive suite (Dawson, 1996). The characteristics of this deposit type are arsenic-rich as well as Bi and Te, deficient in base metals and associated with a diopside+garnet gangue assemblage. Nickel is not a characteristic element of this deposit model. The presence of nickel-rich, TS-8, and nickel-poor, TS-10, showings on the property may be a function of the lithologies through which the hydrothermal fluid was channeled. If an arsenic-bearing hydrothermal fluid was focused through dunite, average

>2000 ppm Ni with negligible sulphur (data from the geochemical database) and that ultramafic rock equilibrated with the hydrothermal fluid nickel would be dissolved and transported in that hydrothermal fluid. However this epigenetic hydrothermal fluid was channeled through different lithologies as the hydrothermal system has property-scale dimension. The consequence of these different pathways is that there are gold showing with and without nickel, i.e. samples TS-8 (Onion SE Showing) and TS-10 (Sax-Cessena Embayment) respectively. An intermediate stage in this hydrothermal overprinting may be represented by the recrystallized magmatic sulphide sample, i.e. TS-9 (Pic Showing). This showing is comprised of recrystallized primary sulphide with a minor component of late stage epigenetic Ni+As+S+(Fe+Co) minerals.

The macroscopic texture of the metallic mineralization at localities TS-8 and TS-10 resembles fine-grained crackling associated with faulting or hydrothermal hydraulic fracturing. This texture and its coeval alteration indicate that mineralization has a structural component and that structure may be synchronous with emplacement of the intrusive complex to the northeast of the WRIC. The results of geophysical surveys in these two showing areas should be examined to identify the existence of linears that may control mineralization.

Recommendations

The showings with ore grade and perhaps anomalous gold values warrant several diamond drill holes to test the down-dip continuity of this gold mineralization. If the structure is subvertical, assume ~70°, two or three drill holes should test the continuity of mineralization at vertical depths of 25 and 50 metres below surface. If successful, one or possibly two step out holes should be drilled perhaps 100 meters along strike to text for lateral continuity and be drilled to vertical depths of 25 and 50 metres below surface. If both drill fences intersect mineralization, the drill program should not continue until all assay data and geology have been compiled and interpreted.

It is understood that outcrop on the property is low. In order to map and evaluate mineral prospects, heavy mineral concentrates were made from samples taken from the basal of mechanically broken little-moved rubble crops (L. Lahusen pers. comm. Nov/01). Based on the above discussion the two types of mineralization are present on the property. The lack of PGE-abundances in the epigenetic type of mineralization downgrade their importance even though exceptionally high-grade nickel and gold assays have been obtained by grab and chip samples. A greater understanding of poorly exposed sulphide prospects can be gained by examining the heavy mineral concentrated with an energy dispersive wavelength spectrometer (EDS) attached to either a electron microprobe or scanning electron microscope. The rational for a EDS investigation lies in the contrasting mineralogy that uniquely identifies the two types of mineralization. Magmatic sulphide concentrations are comprised of a typical magmatic assemblage characterized by pyrrhotite+pentlandite +chalcopyrite with a variety of PGE-bearing minerals, silicates typical of magmatic mafic-ultramafic rocks and spinels. In contrast garnet, pyroxene, nickel-bearing arsenide and antimonide minerals and Au-Ag alloys characterize the epigenetic mineralization. Assuming minimal or no transport of the

regolithic material, the heavy mineral concentrate silicate should be a direct reflection of the bedrock mineralization.

Preliminary scanning electron microscope investigation of droplet and net-textured sulphide-bearing wehrlitc and gabbroic rocks of the complex identified several PGE-bearing minerals. Two noteworthy features of the identified PGE-bearing minerals were the grain size, < 5 microns and most of the identified grains were hosted in sulphide. PGE-minerals are harder than the hosting sulphide minerals and as a consequence PGE-minerals are commonly plucked during the preparation of polished thin sections. Plucking of the coarser grained PGE-minerals from silicate-sulphide or sulphide-sulphide grain boundaries may be the explanation for the minute grain size of the identified phases and their textural association. If future PGE mineral identification is planned on rock specimens, it is suggested that moderately polished rock offcut slabs be used. The use of rock slabs with a moderate polish reduces the potential for mineral loss due to plucking.

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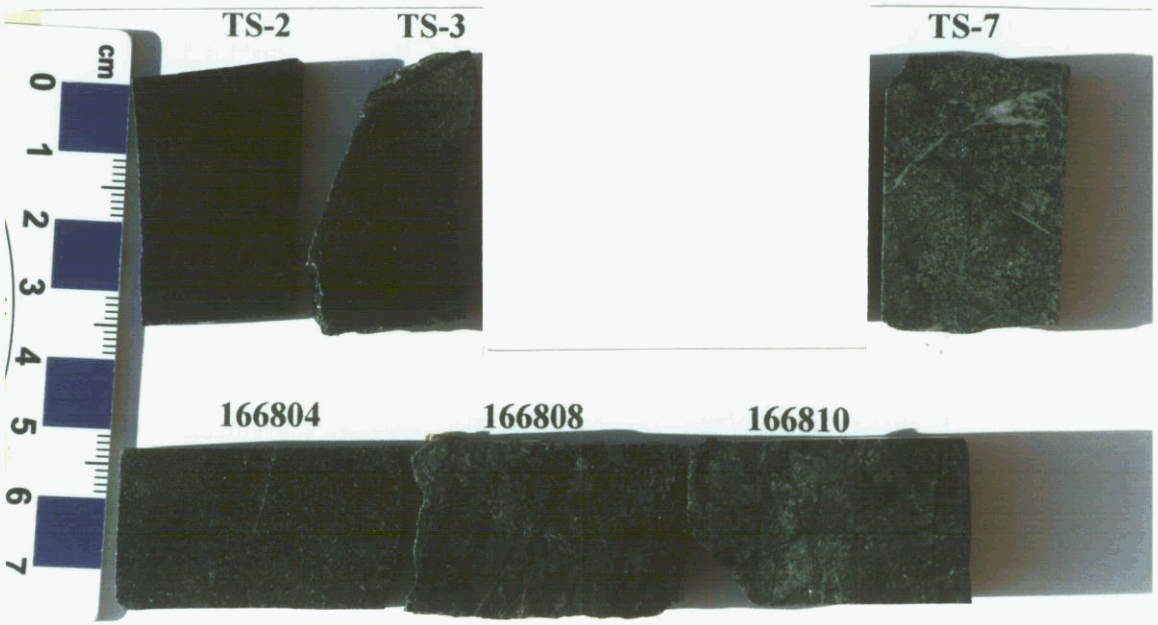
Part II: Petrography and Ore microscopy

Offcut slabs of White River Intrusive Complex



White River Intrusive Complex - country rocks

Intrusive contact: dunite – intermediate porphyry

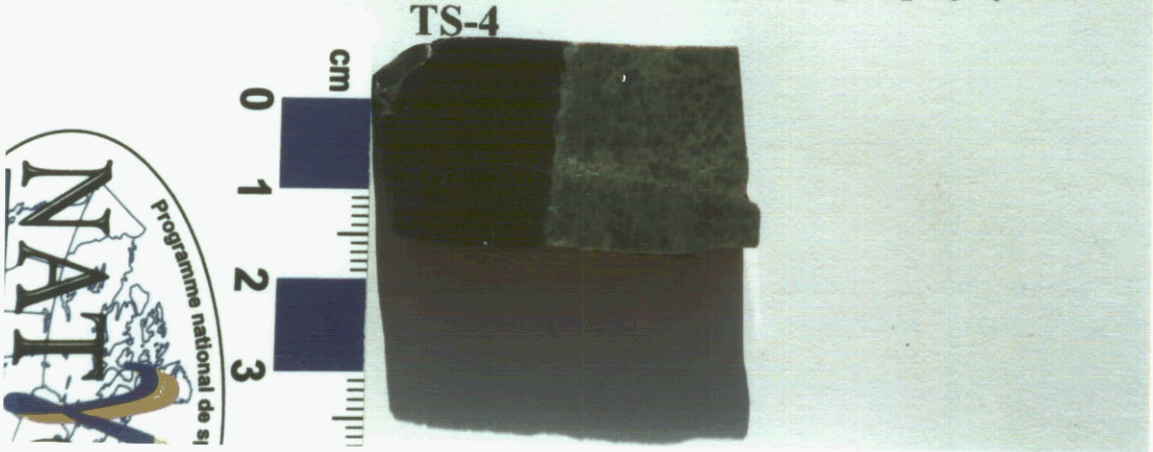


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Table 1. Petrographic summary: least altered White River Intrusive Complex.

Prospect	Section #	Rock name	Cumulate Nomen-clature	Type of cumulate	Essential mineralogy/ Accessory mineralogy	Cumulus minerals	Cumulus mineral morphology	Intercumulus minerals	Intercumulus mineral morphology	Alteration	Similar samples	Correlation with lithological formations
Sax Showing	166804	weakly altered phlogopite-bearing feldspathic wehrlite	cpoC	orthocumulate	----------	olivine, chromite, rare subhedral diopside/augite	equant subhedral - anhedral to oblong subhedral - anhedral olivine 0.4 – 1.6 mm; euhedral chromite to 0.1 mm; rare subhedral diopside/augite to 2 mm.	oikocrystic diopside/augite with subordinate feldspar, minor phlogopite and sulphide+magnetite	oikocrystic diopside/augite to 4.5 mm; phlogopite to 0.8 mm and rare oikocrysts to 1.2 mm; Sulphide predominantly intercumulus but there are rare sulphide inclusions in cumulus pyroxene. Sulphide: pentlandite, chalcopyrite, pyrrhotite, magnetite, kotulskite (Pd-Te).	Serpentine+magnetite after olivine is the principal alteration. Intercumulus feldspar has a brown colour inferred to be clay +sericite+iron oxide.		White River Intrusive Complex – ultramafic phase
Discovery Showing	166808	hornblende+ phlogopite-bearing olivine clinopyroxenite to hornblende+ phlogopite-bearing feldspathic wehrlite	cpoC	Mesocumulate	----------	olivine, diopside, chromite	0.2 – 2.0 mm equant round to oblong olivine; subhedral poikilitic grains to 3 – 4 mm; euhedral chromite to 0.1 mm	oikocrystic diopside, hornblende, phlogopite, feldspar and trace sulphide	oikocrystic diopside up to 5 mm; hornblende to 0.8 mm and phlogopite to 1.3 mm. Sulphide: pentlandite and pyrrhotite	serpentine +magnetite after olivine is the principal alteration. Intercumulus feldspar has a brown colour inferred to be clay+iron oxide.	TS-10	White River Intrusive Complex – ultramafic phase
Discovery Showing	166810	hornblende+ phlogopite+ magnetite-bearing olivine clinopyroxenite	copC	orthocumulate	----------	diopside, olivine, chromite	poikilitic diopside varies from 1 – 3 mm; 0.2 – 1 mm equant subhedral and anhedral to elongated subhedral to anhedral olivine; euhedral chromite to 0.5 mm.	diopside, altered plagioclase, phlogopite, hornblende, magnetite with exsolved ilmenite lamellae and sulphide	oikocrystic diopside and feldspar; subhedral hornblende to 2 mm and can replace pyroxene; phlogopite to 1 mm; anhedral magnetite grains (to 0.3 mm0 with exsolved ilmenite lamellae.	serpentine + magnetite after olivine; trace chlorite in the centre of some micro-fractures.	TS-8	White River Intrusive Complex – ultramafic phase
Sax-Cessena Embayment area	TS-2	serpentinized chromite-bearing dunite	coC	orthocumulate, insignificant intercumulus minerals, very tightly packed cumulate minerals	----------	olivine, chromite	serpentine pseudomorphs after olivine vary from equant round, equant subhedral, oblong subhedral to rounded; grains 0.4 – 1.5 mm; subhedral to euhedral chromite to 0.5 mm	rare pseudomorphs inferred to be after pyroxene	irregular-shaped grains to 1.5 mm in longest dimension	Complete serpentinization of olivine with associated secondary magnetite and sulphide (presumably pyrite)	TS-3	White River Intrusive Complex – ultramafic phase
Sax-Cessena Embayment area	TS-3	serpentinized chromite-bearing dunite	coC	orthocumulate, insignificant intercumulus minerals, very tightly packed cumulate minerals	----------	olivine, chromite	serpentine pseudomorphs after olivine vary from equant round, equant subhedral, oblong subhedral to rounded; grains 0.4 – 2.0 mm; subhedral to euhedral chromite to 0.4 mm	Rare pyroxene	Irregular-shaped grains to 2 mm in longest dimension	Complete serpentinization of olivine and intercumulus pyroxene with associated secondary magnetite and sulphide	TS-2	White River Intrusive Complex – ultramafic phase

Table 1. Petrographic summary: least altered White River Intrusive Complex.

Prospect	Section #	Rock name	Cumulate Nomen-clature	Type of cumulate	Essential mineralogy/ Accessory mineralogy	Cumulus minerals	Cumulus mineral morphology	Intercumulus minerals	Intercumulus mineral morphology	Alteration	Similar samples	Correlation with lithological formations
Sax-Cessena Embayment area	TS-4	serpentinized dunite in contact with an intermediate intrusive rock (See Table 3 for the intermediate intrusive rock description)	coC	orthocumulate	----------	olivine, chromite	equant round serpentine+magnetite pseudomorphs to 0.5 mm after olivine; euhedral chromite to 0.1 mm	none	----------	serpentinization of olivine	TS-2 and TS-3	White River Intrusive Complex – ultramafic phase
Sax-Cessena Embayment area	TS-7	chloritized, serpentinized and weakly carbonatized feldspar+ phlogopite-bearing wehrlitic dunite	coC	orthocumulate	----------	olivine, chromite	0.4 – 2.0 mm equant round to subhedral-euhedral serpentine+magnetite pseudomorphs after olivine; euhedral chromite to 0.8 mm	partial and complete pseudomorphs of intercumulus feldspar, phlogopite and pyroxene(?)	pseudomorphs vary from 0.2 – 1.2 mm (long dimension of the intercumulus volume)	serpentinization with accompanying chloritization followed by carbonatization	similar to TS-2 and TS-3 but a higher intercumulus component in particular mica; possibly transitional into rocks like 166808 and 166810.	White River Intrusive Complex – ultramafic phase

Cumulate terminology: c – chromite, o – olivine, p – diopside, C - cumulate

Sample #: Onion 166804: Sax Showing

Cu 730 ppm; Ni 2290 ppm; Co 130 ppm

12 ppb Au, 73 Pt, 174 ppb Pd

9.3 ppb Rh, 10 ppb Os, 6 ppb Ir, 33 ppb Ru, 305.3 ppb PGE_T

Northing	Easting
6873001	521076

Altered intercumulus feldspar is easily recognized on the cut surface as the very fine-grained gray-white flecks.

Kishar Reserch

SUMMARY: ***weakly altered phlogopite-bearing feldspathic wehrlite***. Alteration is ranked as weakly moderate and represented by serpentine after cumulate olivine and clay+sericite+iron oxide after intercumulus feldspar. The orthocumulate igneous texture is superbly preserved in spite of these alteration processes. The lack of a penetrative fabric has also aided significantly in textural preservation. This ultramafic rock is comprised of the following cumulus minerals: fine- to medium grains olivine, very fine-grained chromite and rare subhedral diopside/augite. Cumulus chromite is interstitial to cumulus olivine and rare pyroxene and is also present as inclusions in intercumulus minerals. The intercumulus component is represented primarily by oikocrystic diopside/augite with subordinate feldspar, minor phlogopite and sulphide+magnetite. The presence of orange to orange red pleochroic intercumulus phlogopite and feldspar suggests that this ultramafic rock may be transitional into gabbroic rocks. Intercumulus volumes between silicates can be occupied by primary sulphide+oxide aggregates and locally there are macro-domains with well-interconnected net-textured sulphide+oxide. Primary exsolution textures are preserved in the intercumulus sulphide, which include pentlandite+chalcopyrite+pyrrhotite with magnetite. There are two generations of magnetite in this rock. There are two textural types of primary magnetite. The most abundant is present as very fine-grained euhedra that are intimately associated with intercumulus net-textured sulphide. The second type, a titaniferous magnetite is rare and is represented as a fine-grained subhedral grain associated with intercumulus sulphide. This magnetite type draws a linkage to the primary titanomagnetite in samples TS-7, 166809 and 166810. Importantly, sulphide blebs are present in cumulus pyroxene, a conclusive feature that there was early segregation of a sulphide melt. Magmatic sulphide has been very weakly remobilized during the serpentinization episode and is represented by pyrite+chalcopyrite.

TYPE: PTS
ASSEMBLAGE: olivine, sericitized feldspar, chromite, diopside/augite, phlogopite, serpentine, sulphide, chlorite, magnetite, fuchsite(?)
ESTIMATED MODE (visual): 45% (olivine, serpentine), 15% sericitized feldspar (clay+sericite+iron oxide), 30% diopside/augite, 5% phlogopite, 3% sulphide, 2% (chromite, magnetite), trace (chlorite, fuchsite(?))

MINERALOGY:
Essential:

Olivine: as partially serpentinized grains that vary from equant subhedral to anhedral to oblong subhedral to anhedral and a grain size that varies from 0.4 – 1.6 mm respectively. Excellent preservation of igneous textures between cumulate olivine and intercumulus pyroxene and altered feldspar.

Sericitized feldspar: feldspar occupies irregular-shaped intercumulus volumes. The feldspar has been replaced by ultra fine-grained hematite(?)-stained clay+sericite. Because of this alteration, it is impossible to determine if this feldspar had an oikocrystic texture. However based the relict texture of the sericite+hematite pseudomorphs after feldspar, it is suspected that the feldspar was oikocrystic.

Diopside/augite: Two generations of pyroxene: 1) Intercumulus: two textural types of intercumulus pyroxene: most common textural type as oikocrysts to 2 - 4.5 mm in widest

dimension but there are finer grained intercumulus pyroxene that are irregular-shaped grains, 0.4 – 0.8 mm. Commonly host cumulus chromite. 2) Cumulus: rare are subhedral cumulus grains to 2 mm with inclusions of chromite and sulphide blebs.

Accessory:

Chromite: as subhedral to euhedral grains to 0.1 mm, average 0.05 mm, present as inclusions in cumulus olivine and in rare cumulus pyroxene and present as inclusions in intercumulus feldspar, pyroxene and phlogopite.

Phlogopite: intercumulus anhedral grains to 0.8 mm; some grains display an oikocrystic texture with olivine. Oikocrystic grains to 1.2 mm. Phlogopite has a characteristic pleochroism of red orange- orange to pale yellow. Locally there are bands of secondary magnetite in phlogopite but overall there is negligible alteration of phlogopite.

Serpentine: partial and locally complete replacement of olivine. Some grains have a pale yellow hue in plane light and are inferred to be iddingsite.

Sulphide: Primary sulphide as intercumulus sulphide aggregates and less commonly as inclusions in pyroxene phenocrysts. And trace amount of remobilized sulphide in serpentine-rich bands. Net-textured intercumulus sulphide+oxide aggregates has a continuity up to 6 mm in longest dimension. Intercumulus aggregates are comprised of varying proportions of pentlandite, chalcopyrite, pyrrhotite with magnetite. Chalcopyrite is present as irregular anhedral micro-domains in the intercumulus aggregates and is present as rectangular bands that are inferred to have formed by exsolution from the Ni-rich sulphide. Secondary sulphide remobilized, pyrite, chalcopyrite, is ultra fine to very fine-grained, <0.02 mm and hosted in serpentine bands that replace olivine.

Chlorite: fill micro-fractures that transect the host rock.

Magnetite: Two generations of magnetite: 1) primary – abundant very fine-grained anhedra associated with intercumulus sulphide and rare euhedral titanomagnetite grains to 0.15 mm that is comparable texturally to titaniferous magnetite in samples TS-7, 166809 and 166810 and 2) secondary - associated with serpentinization of olivine.

Fuchsite(?): possibly associated with serpentine after olivine and in chlorite-filled micro-fractures.

TEXTURE & FABRIC:

Weak alignment of serpentine bands that replace olivine however there is no penetrative fabric of the primary cumulate and intercumulus minerals. In spite of this replacement of cumulus and intercumulus minerals the igneous cumulate texture is superbly preserved. Cumulus minerals include olivine, chromite and minor subhedral clinopyroxene and the proportion of intercumulus oikocrystic clinopyroxene, feldspar, phlogopite and sulphide has formed a mesocumulate-texture ultramafic rock. Sulphide display the intercumulus net-texture even though there has been trace sulphide remobilization associated with serpentinization. That assemblage is recorded by pyrite+chalcopyrite.

ALTERATION:

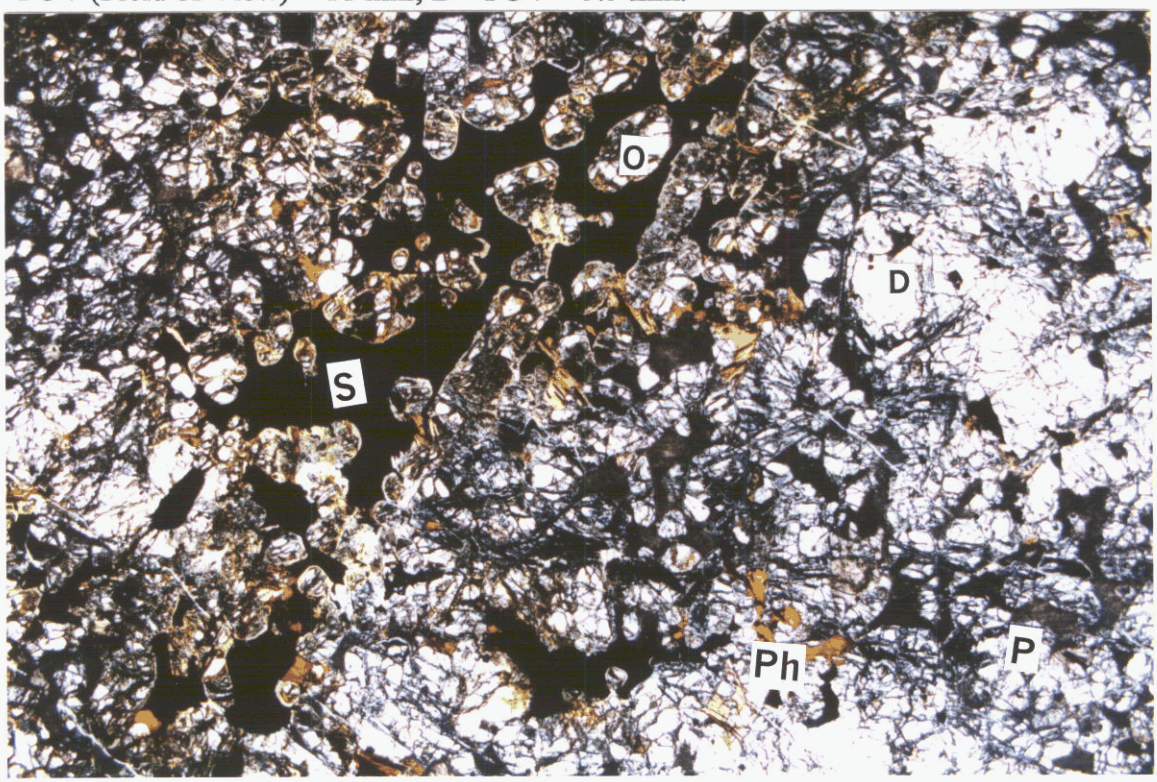
Serpentinization of olivine with associated secondary magnetite and very weak sulphide remobilization is the most prominent alteration type. All intercumulus feldspar has been

replaced by clay+sericite+iron oxide. Overall these two alteration processes are ranked as weakly moderate in intensity but the alteration intensity has obliterated the primary magmatic textures between cumulus and intercumulus minerals.

ROCK TYPE: phlogopite-bearing feldspathic wehrlite.

Plate 1. Photomicrographs, A & B – plane light, show the orthocumulate texture formed by variably serpentinized cumulate olivine (O), cumulate diopside (D) with intercumulus phlogopite (Ph), sulphide (S) and altered plagioclase (P).
A – FOV (Field of View) = 11 mm; **B** – FOV = 5.5 mm.

A



B

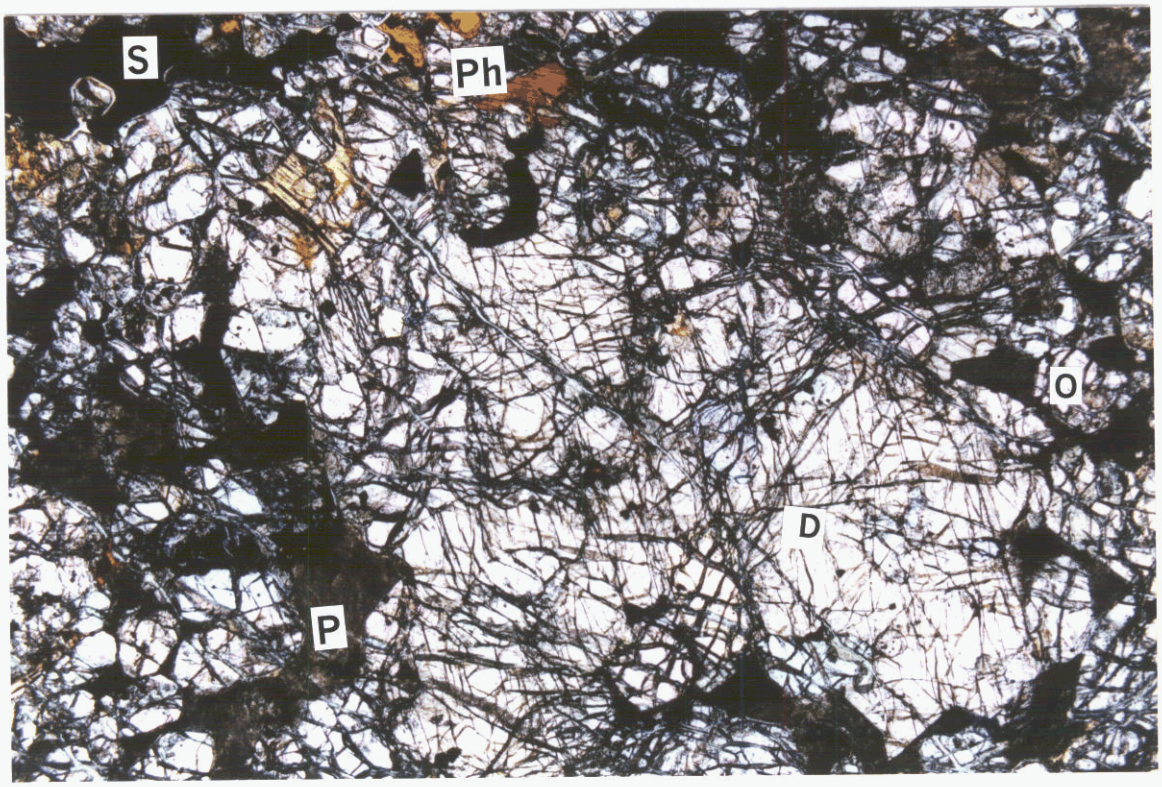


Plate 2. Photomicrographs, **A** – plane light, **B** – reflected light, show the orthocumulate texture formed by abundant cumulate variably serpentinized cumulate subhedral to euhedral olivine (O), rare cumulate subhedral diopside (D) and very fine-grained disseminated chromite (Cr). The intercumulus assemblage is dominated by altered (brown) plagioclase (P) with minor sulphide (S) and phlogopite (Ph).
A & B – FOV = 11 mm.

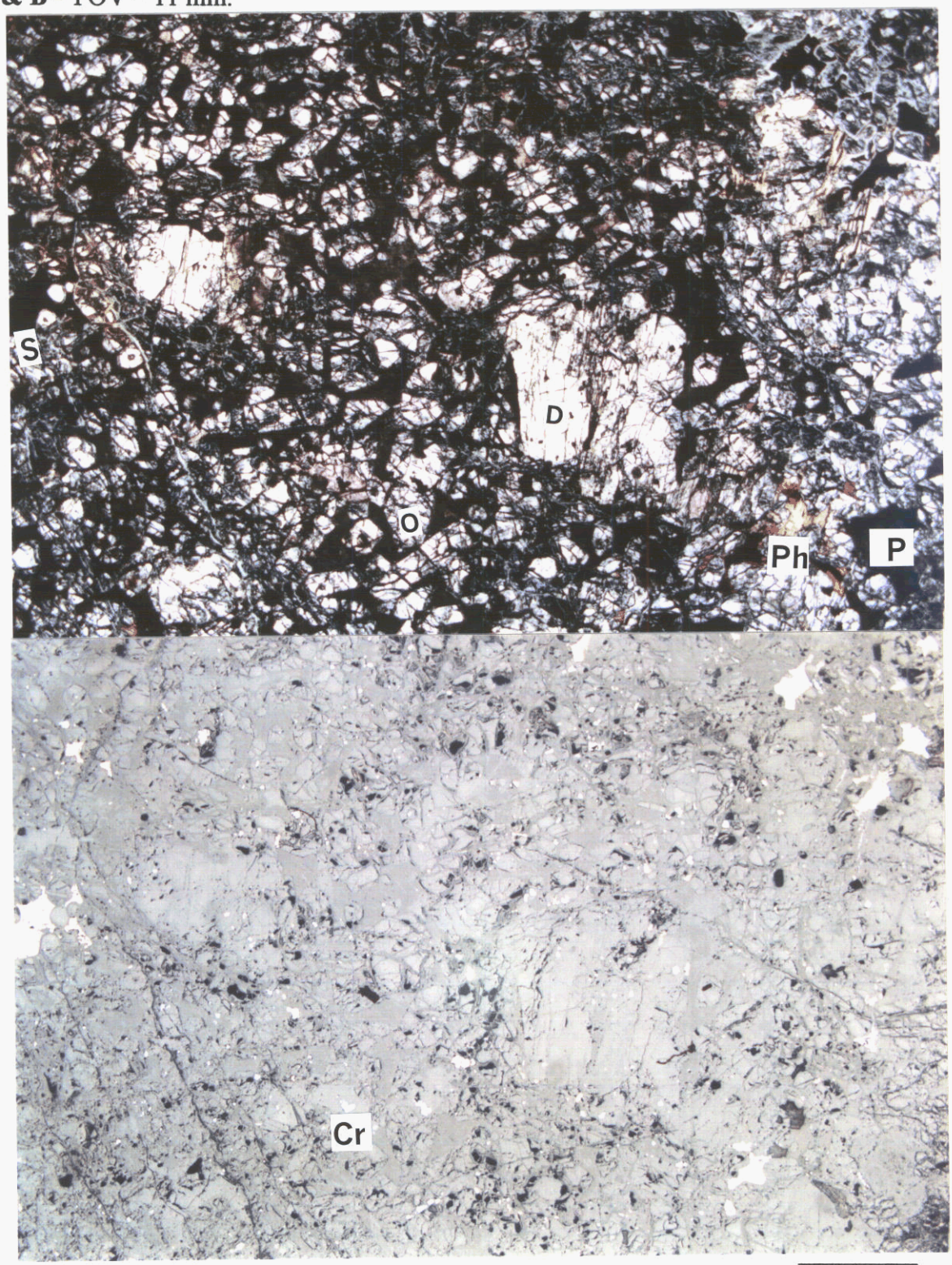


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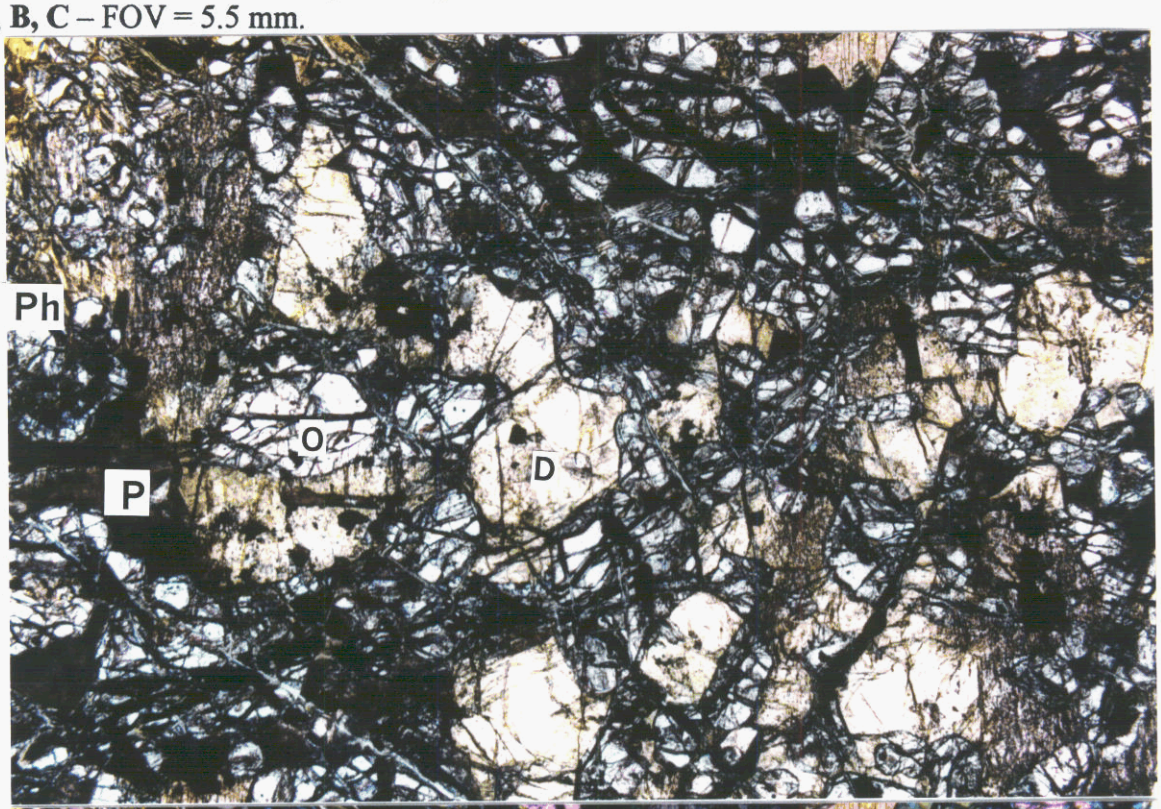
Plate 3. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, show variably serpentinized cumulus olivine (O) with intercumulus oikocrystic diopside (D) with subordinate altered (brown) plagioclase (P) and phlogopite (Ph). Very fine-grained euhedral cumulus chromite (Cr) associated with intercumulus sulphide (S) is present as inclusions in olivine, oikocrystic diopside and interstitial to the latter to minerals.
A, B, C – FOV = 5.5 mm.

A



B

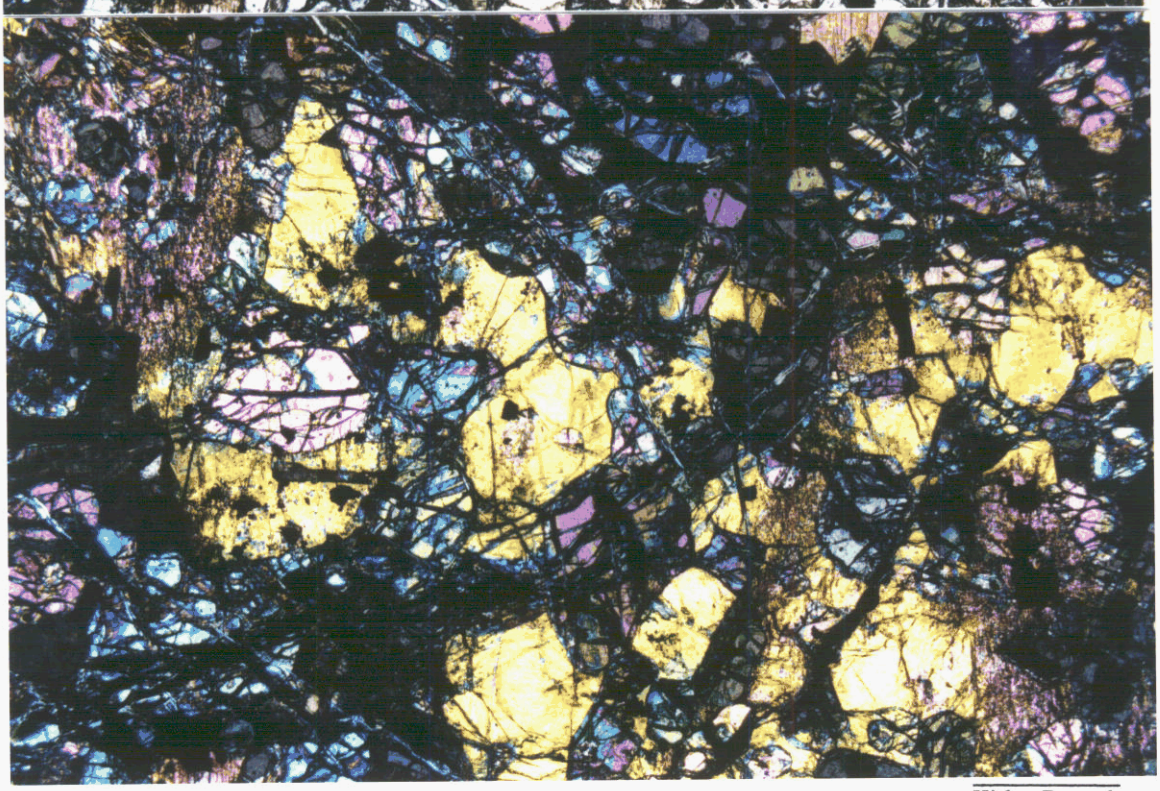


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Plate C.

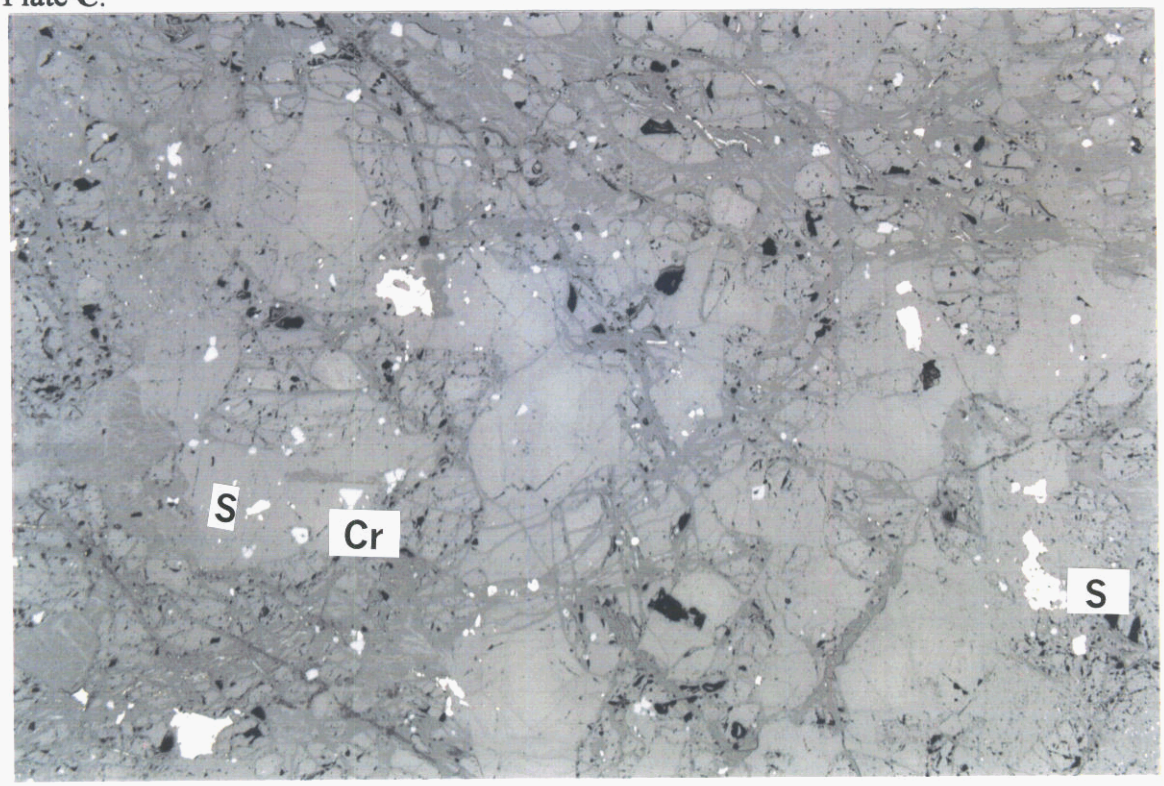

Plate 4. Photomicrograph, plane light, shows cumulate partially serpentinized olivine (O) and euhedral chromite (Cr) associated with intercumulus altered (brown) plagioclase (P) and phlogopite. Some phlogopite grains display an oikocrystic texture (pale yellow grain in the centre of the photomicrograph). FOV = 5.5 mm.

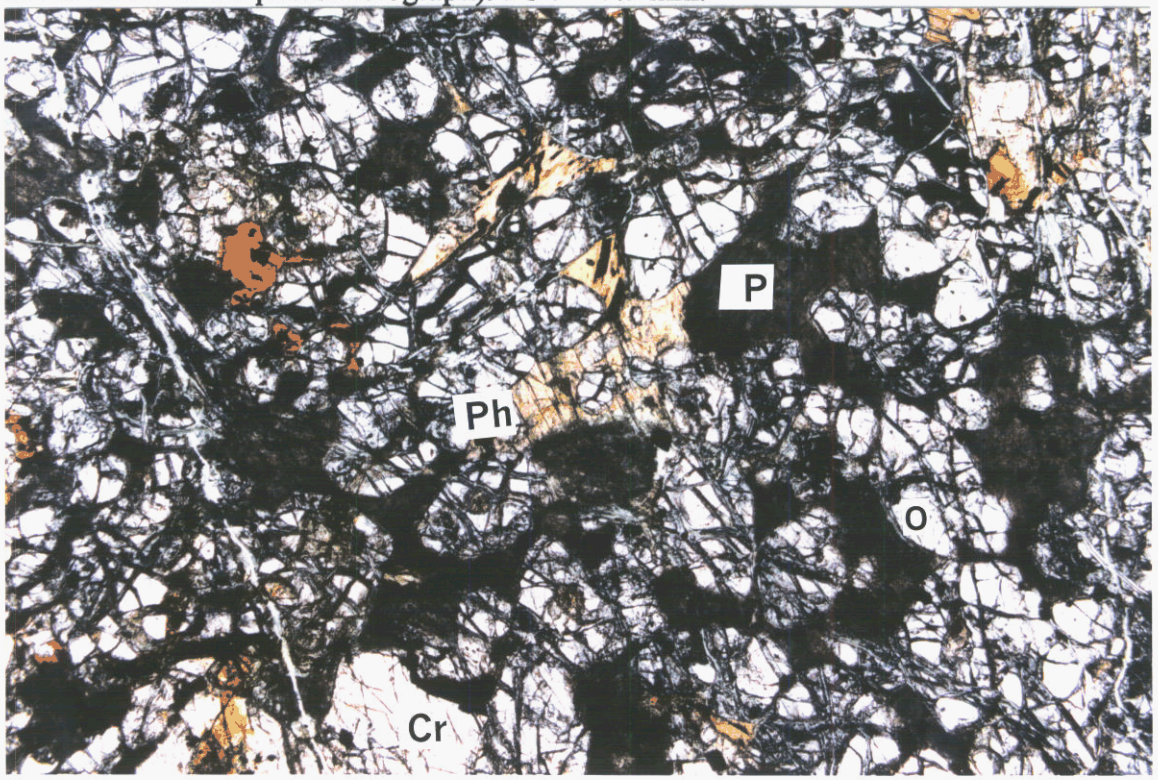

Plate 5. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, show two textural sulphide relationships: #1) cumulus diopside (D) hosts a sulphide (S) bleb, a conclusive textural feature that indicates an early immiscible sulphide melt. 2) The greater portion of the sulphide (S) occupies intercumulus volumes and is accompanied by altered (brown) plagioclase (P). Cumulus chromite (Cr) is distributed through cumulus and intercumulus minerals. **A**, **B, C** – FOV = 5.5 mm.

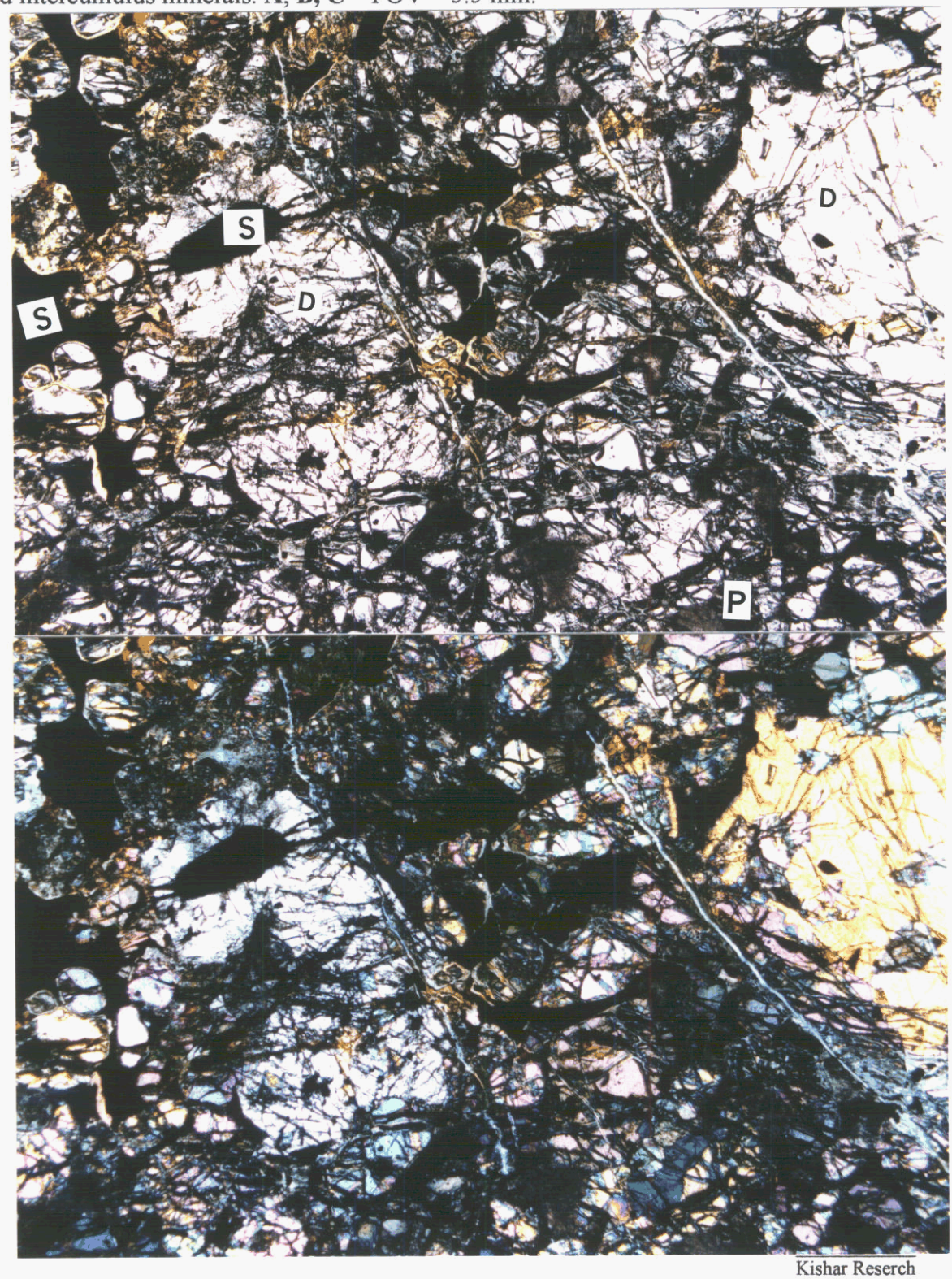

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Plate **C**.

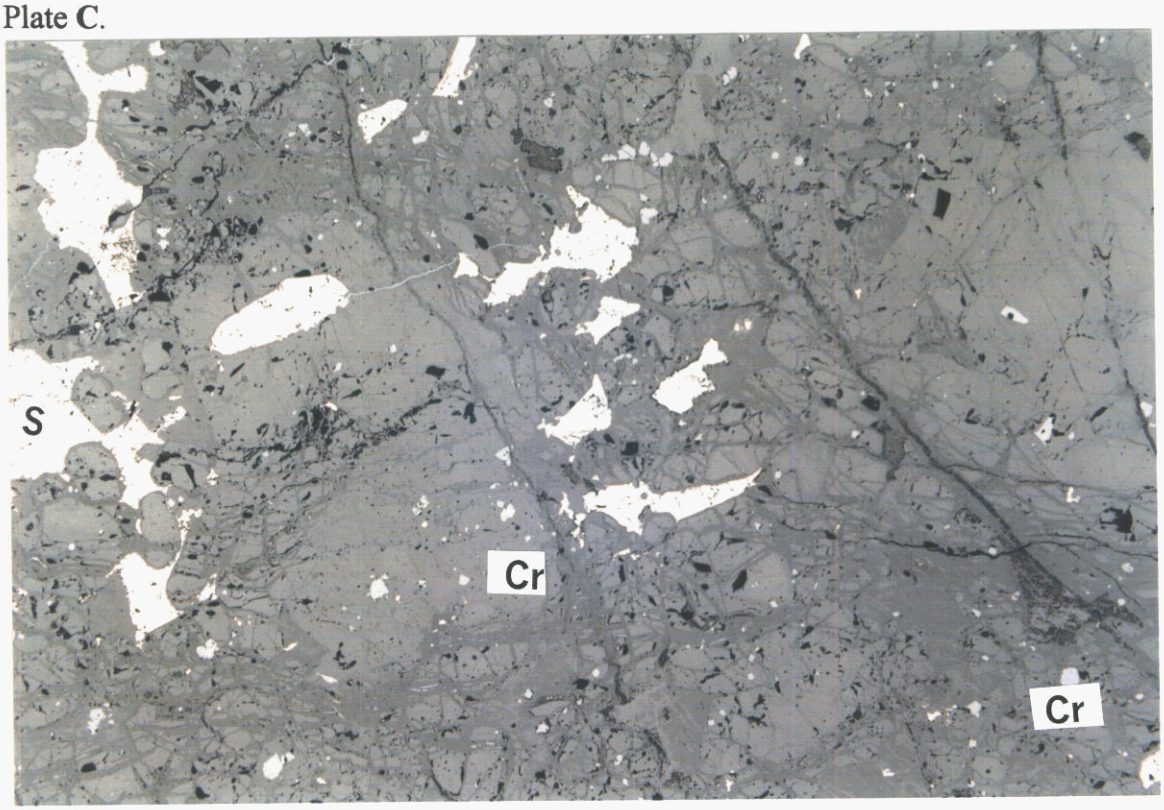


Plate 6. Photomicrographs, **A**, **B**, **C**, **D**, **E** – reflected light, show the mineral assemblage and weak remobilization in intercumulus net-textured sulphide. Intercumulus sulphide is comprised of pyrrhotite (Po), pentlandite (Pn) and chalcopyrite (Cp) with fine-grained magnetite (M). **A**, **B**, **C** – FOV = 1.35 mm; **D**, **E** – FOV = 0.67 mm.

A

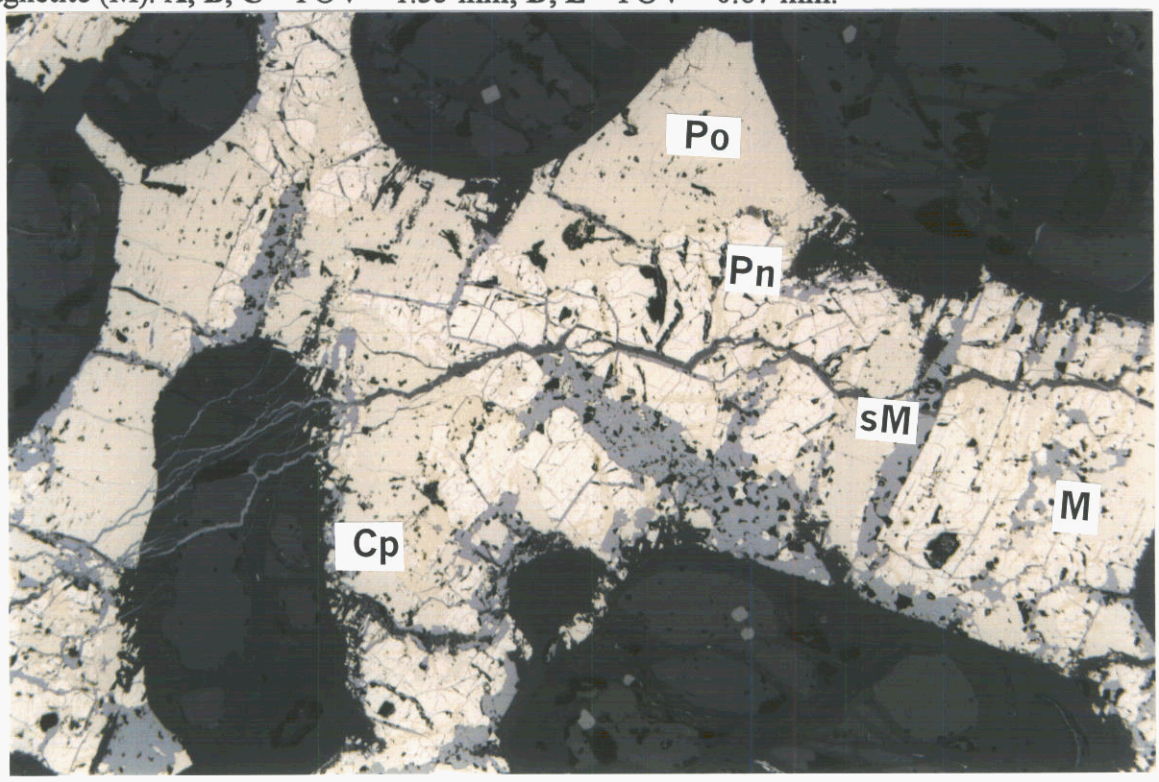
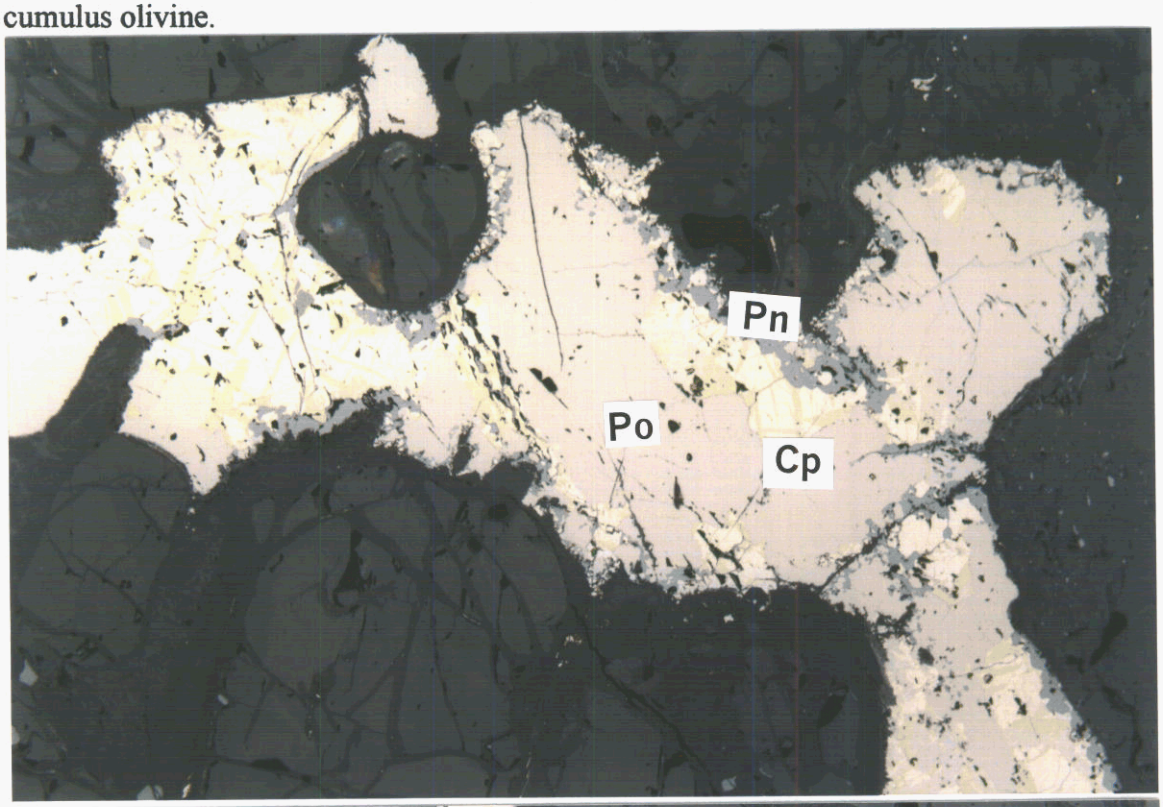


Plate 6 cont'd. Secondary magnetite (sM) is present as bands in the sulphide, along the olivine-sulphide interface and filling micro-veinlets are inferred to be the product of serpentinization. Chalcopyrite has been remobilized along pentlandite cleavage planes. Euhedral and subhedral cumulus chromite (Cr) is present as inclusions in and interstitial to cumulus olivine.

B



C

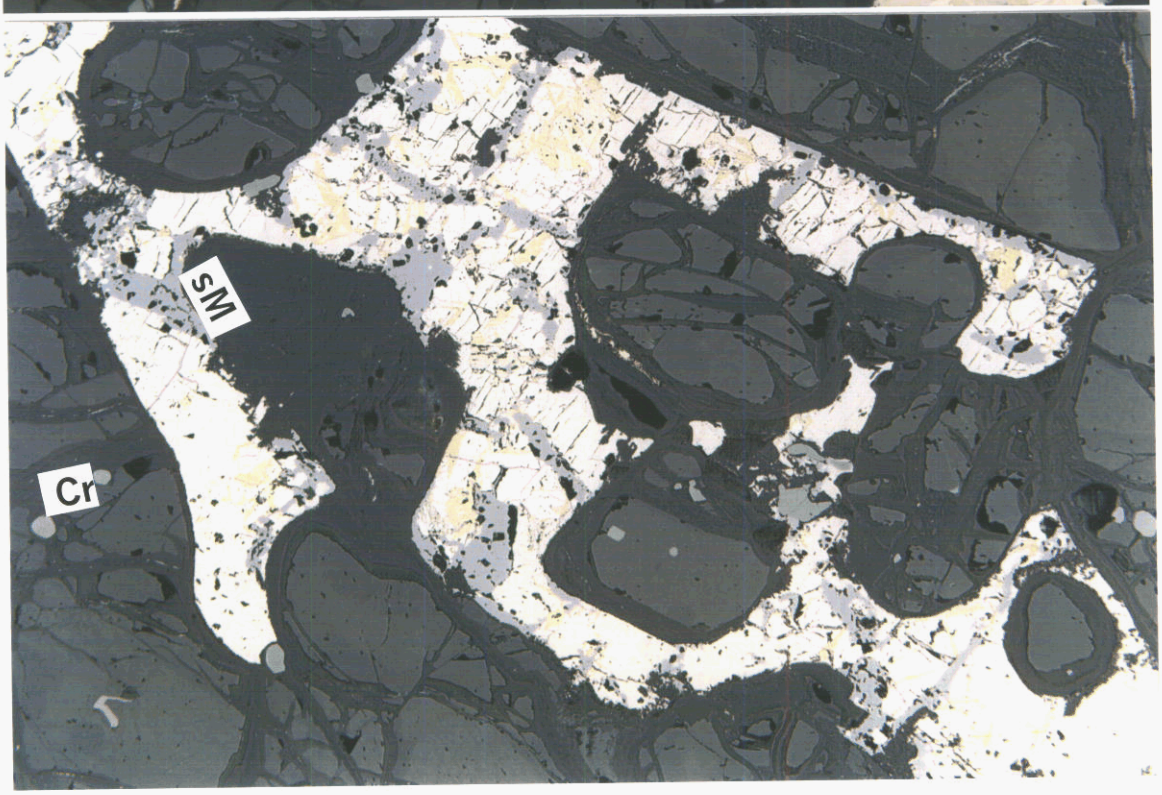


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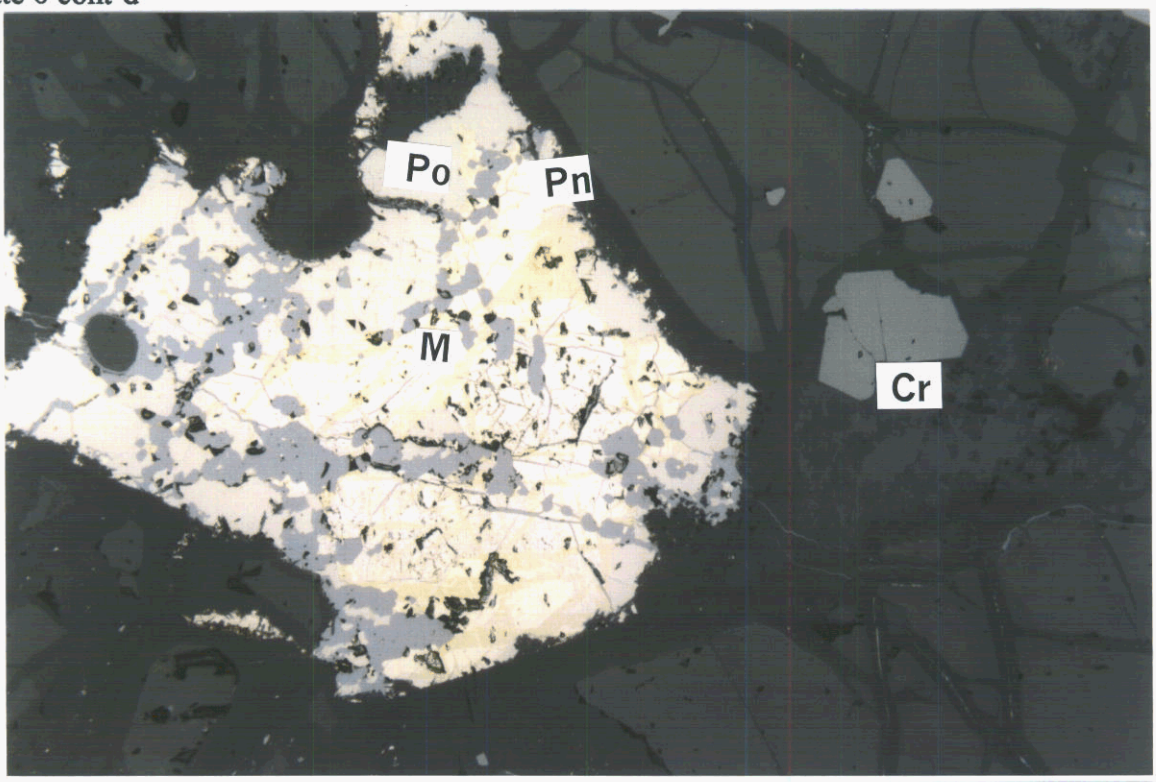
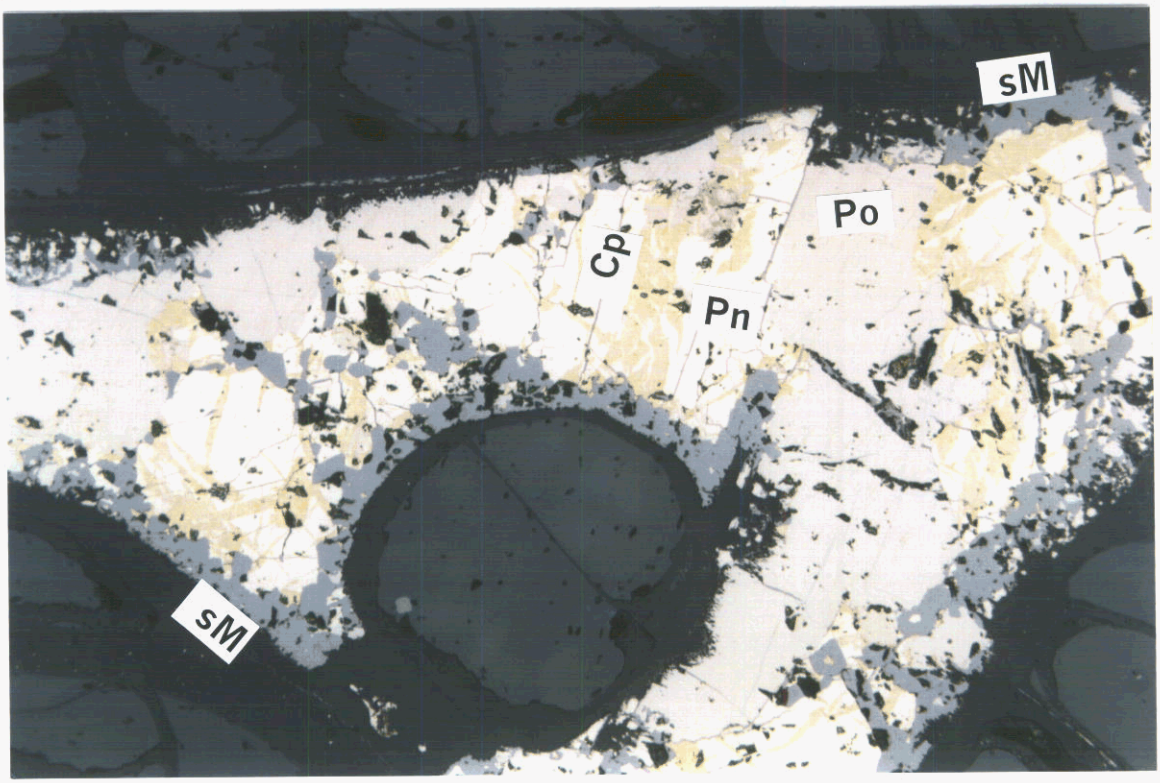
Plate 6 cont'd

D.



E



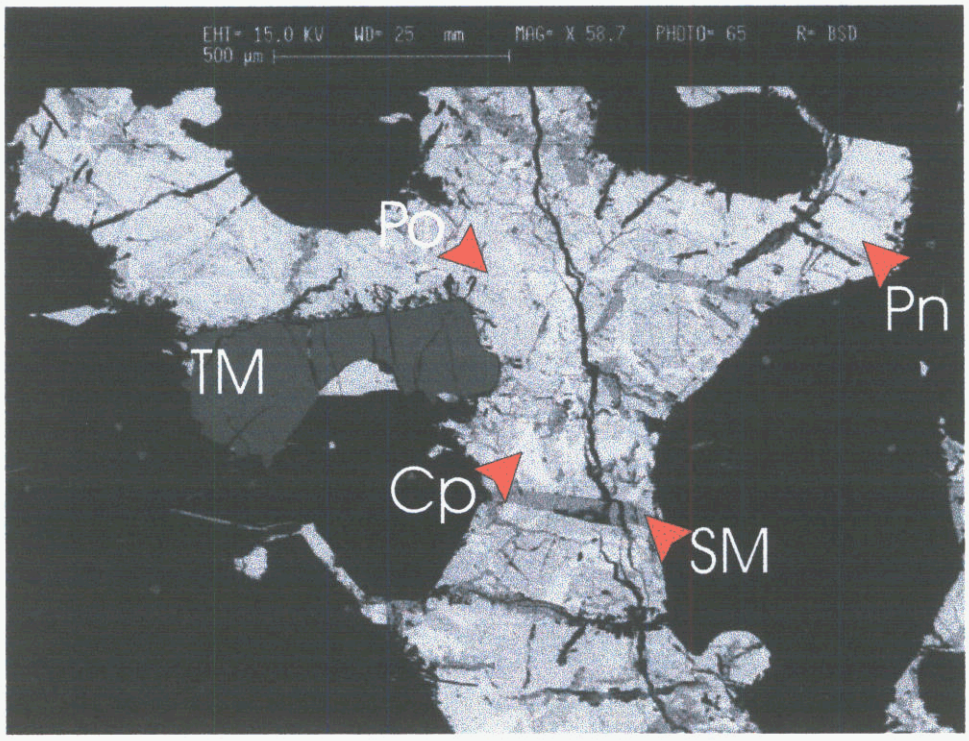


Plate 7. Electron backscattered image of a weakly recrystallized net-textured sulphide comprised of pyrrhotite (Po), pentlandite (Pn) and chalcopyrite (Cp) with rare titanomagnetite (tM). Veinlets of secondary magnetite (sM) formed during serpentinization process crosscut the primary sulphide-oxide assemblage.

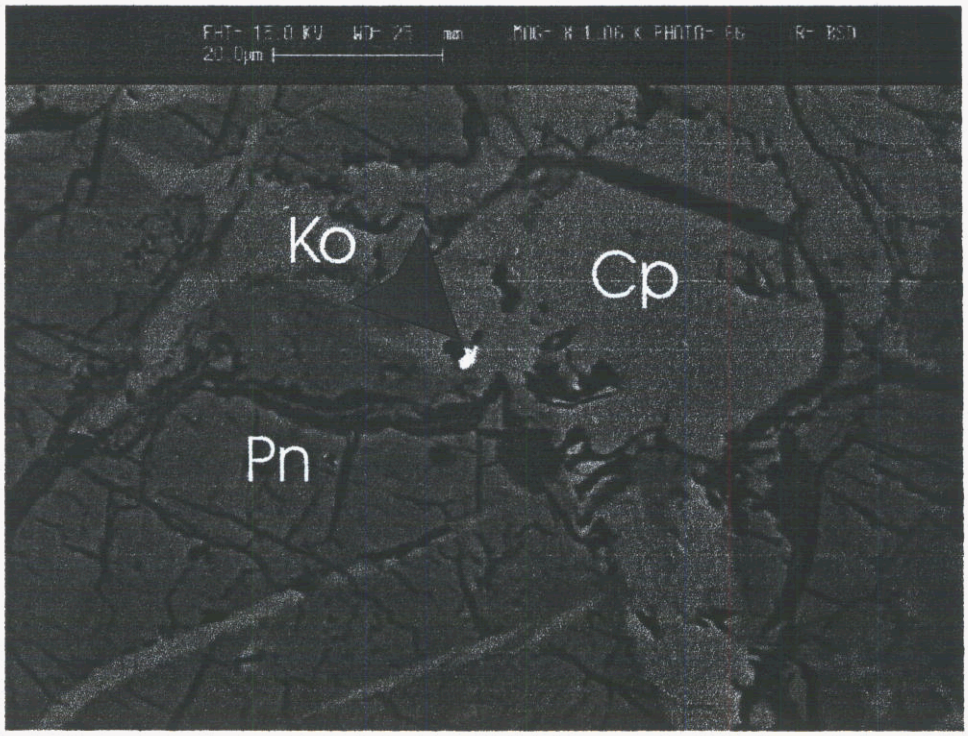
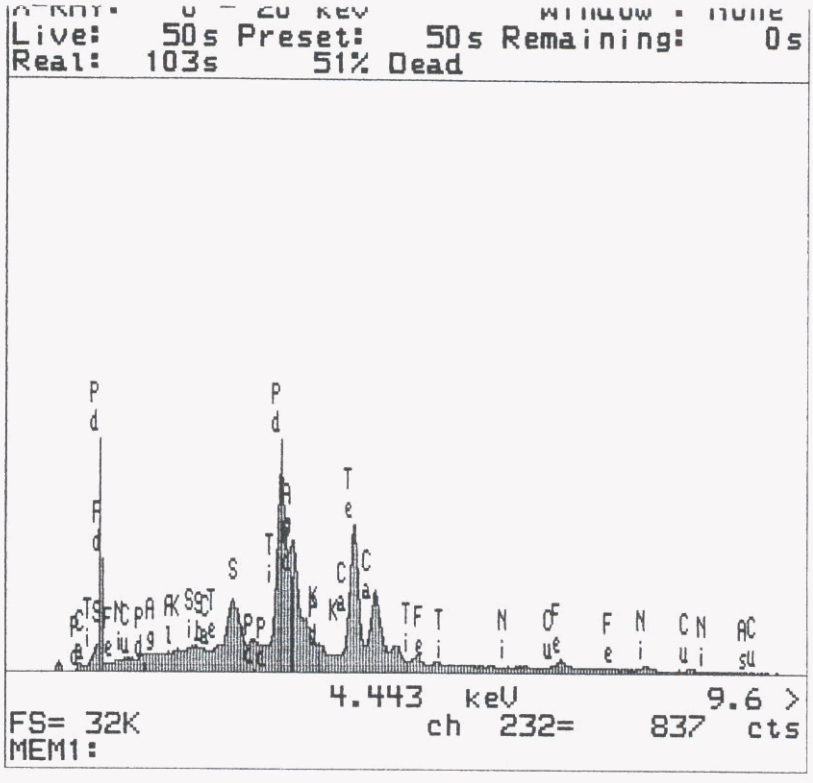


Plate 8. Electron backscattered image of an ultra fine-grained Pd – telluride and based on the energy dispersive spectra the mineral is inferred to be kotulskite (Ko). This Pd-phase is hosted in chalcopyrite (Cp) with associated pentlandite (Pn).



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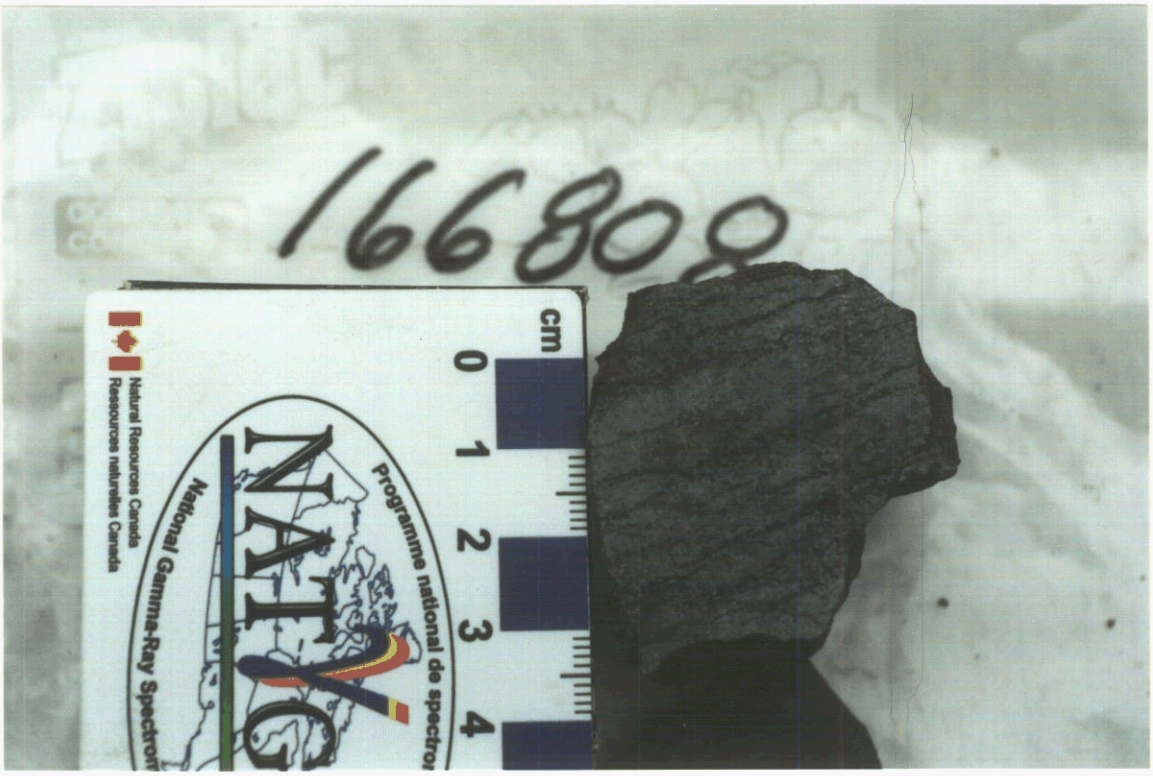
Sample #: 166808: Discovery Showing
Cu 0.002%; Ni 0.21%; Co 0.01%
58 Pt, 25 ppb Pd, 83 ppb PGE_T

Northing	Easting
6874387	519930



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SUMMARY: ***weakly serpentinized composite ultramafic rock with gradation boundary: hornblende+phlogopite-bearing olivine clinopyroxenite to hornblende+phlogopite-bearing feldspathic wehrlite***. Primary cumulus and intercumulus minerals and textures are well preserved due to the lack of a penetrative fabric and weak alteration, serpentine after olivine. This rock is classified as a mesocumulate and the cumulus minerals include olivine, diopside, chromite and a minor component of phlogopite. The intercumulus component includes oikocrystic diopside, hornblende, phlogopite, feldspar and trace sulphide. Variation in the modal proportions of feldspar and pyroxene components result in the above subtle lithological variation. Pyroxene displays two textural morphologies that conclusively show it was both a cumulate, i.e. subhedral poikilitic grains with olivine inclusions. Poikilitic grains can form aggregates up to 3 – 4 mm and as oikocrysts that are part of the intercumulus assemblage comprised of feldspar, hornblende and phlogopite. Cumulus chromite is present in olivine, both textural types of pyroxene and in hornblende and phlogopite. There are several important mineralogical – textural features that indicate this rock was derived from a hydrous, oxidized and more evolved portion of the intrusive complex. The presence of primary red orange hornblende as a primary component and present as a replacement of diopside clearly indicates that the magma was crystallizing two K-bearing minerals, i.e. hornblende along with phlogopite. In addition the presence of only trace amounts of intercumulus sulphide knots, pentlandite-rich, and locally abundant amoeboid-like magnetite with exsolved ilmenite lamellae clearly establish the highly oxidizing conditions associated with crystallization of this rock. Thus the mineralogy of this rock indicates that this rock has undergone a higher degree of fractionation compared to olivine+pyroxene+chromite+phlogopite±feldspar and the latter rock types commonly has a significantly higher sulphide content.
Hydration represented by serpentine after cumulus olivine is the principal type of alteration and is accompanied by the formation of secondary magnetite with trace amounts of pyrite. Hydration was controlled by a set of micro-fractures that is sub-parallel to lithological layering. Intercumulus feldspar has been replaced by ultra fine-grained clay+iron oxide.

TYPE: PTS
ASSEMBLAGE: diopside, hornblende, phlogopite, olivine, serpentine, magnetite-ilmenite, secondary magnetite, sulphide, chromite, ferrichromite, altered plagioclase, chlorite
ESTIMATED MODE (visual); 40% diopside, 4% hornblende, 4% phlogopite, 35% (olivine, serpentine, secondary magnetite), 15% altered plagioclase, 1% magnetite-ilmenite, 1% chromite, trace (sulphide, ferrichromite)

MINERALOGY:
Essential:

Diopside: two textural types: 1) as cumulus grains to 1.5 mm that can occur as individual grains or as clusters/aggregates and 2) as oikocryts to 4-5 mm in widest dimension. Some grains are mantled by red brown hornblende, a conclusive textural features that along with intercumulus phlogopite, that this ultramafic rocks was hydrous and crystallized primary amphibole that mantled/armoured cumulus pyroxene.

Olivine: partially serpentinized. Grains vary from equant round to oblong and the grain size varies from 0.2 – 2.0 mm. Hosted in cumulus and by oikocrystic pyroxene and can be surrounded by intercumulus feldspar.

Altered plagioclase: present only as intercumulus mineral to olivine and pyroxene. Displays a brownish hue in plane light similar to other sections. Feldspar is inferred to have been replaced by clay + iron oxide. The proportion of intercumulus feldspar varies across the section i.e. minor amount in one portion through to none in the opposite portion.

Accessory:

Hornblende: as primary anhedral overgrowths that armour some cumulus pyroxene and appear to have replaced other pyroxene. There are anhedral grains to 0.8 mm that display a well-formed amphibole cleavage and these coexist with hornblende mantling pyroxene. Olivine inclusions are present in some hornblende after pyroxene and consequently could some of the serpentinization be related to late phase deuteric alteration.

Phlogopite: as fine-grained plates to 1.3 mm long that are interstitial/intercumulus to olivine, pyroxene and hornblende on pyroxene and rarely but importantly as inclusions in pyroxene. This texture clearly indicates early co-crystallization of pyroxene-mica. Displays a red orange- orange to pale yellow pleochroism.

Serpentine: after olivine and filling serpentine±chlorite-filled fractures.

Magnetite-ilmenite: two generations of magnetite: 1) as primary magnetite associated with intercumulus primary hornblende. Importantly, this magnetite hosts ultra narrow exsolution lamellae of ilmenite. The presence of primary magnetite is consistent with the red orange oxidized state of the associated phlogopite and hornblende. 2) Also present as minute grains and aggregates which are associated with serpentine after olivine.

Sulphide: present as disseminated minute, 0.005 mm, grains and rare polymineralic fine-grained clots. The ultra fine-grained sparsely distributed sulphide, presumed to be pyrite, is associated with secondary magnetite after serpentinized olivine. Sulphide clots vary in size from 0.05 – 0.7 mm and occupy intercumulus volumes. Sulphide clots are commonly mantled by magnetite, inferred to be of secondary derivation. Sulphides include pentlandite and pyrrhotite.

Chromite: as inclusions within pyroxene and phlogopite and also as inclusions within phlogopite that is an inclusion in pyroxene. Euhedral grains to 0.1 mm.

Ferrichromite: some cumulus chromite has been variably replaced.

Chlorite: ultra fine-grained chlorite fill veinlets and this chlorite can be associated with serpentine in these veinlets/fractures.

TEXTURE & FABRIC:

No penetrative fabric but there is a set of serpentine±chlorite-filled fractures that traverse the rock and the associated vein filling assemblage, particularly serpentine is responsible for local micro-zones of higher intensity serpentinization. The orthocumulate texture is well preserved by cumulus olivine, diopside, chromite with subordinate phlogopite and an intercumulus assemblage of oikocrystic diopside, feldspar, hornblende and phlogopite. The most important textural aspect of this rock is the presence of primary hornblende, a

feature that conclusively indicates that the White River intrusive complex was hydrous. This is congruent with the presence of primary phlogopite. Hornblende, having a characteristic red orange pleochroism, is present as mantles on and replacement of cumulate diopside and as fine-grained subhedral intercumulus grains. The distribution of intercumulus feldspar varies across the section, clearly indicative of variations in the amount of intercumulus liquid and representative of a primary igneous layering. The intercumulus feldspar has an elongated habit that suggests a flow layering/lamination or elongation due to compaction.

ALTERATION:
Alteration is ranked as weak to weakly moderate and is represented primarily by serpentine after cumulate olivine. The one set of serpentine-filled fractures is interpreted to be the loci for hydration and also the loci for fluid fluxing to alter olivine that has is not crosscut by fractures. Intercumulus feldspar has a brown hue in plane light, an alteration inferred to be clay with iron oxide. Cumulus chromite has been variably replaced by ferrichromite-magnetite and is associated with the serpentinization process.

ROCK TYPE: layered ultramafic rock with gradation boundary: hornblende+phlogopite-bearing olivine clinopyroxenite to hornblende+phlogopite-bearing feldspathic wehrlite.

Plate 9. Photomicrograph, crossed nicols, shows the transition from plagioclase (P)-bearing wehrlite (left half of the photomicrograph) into the olivine clinopyroxenite. FOV = 11 mm.

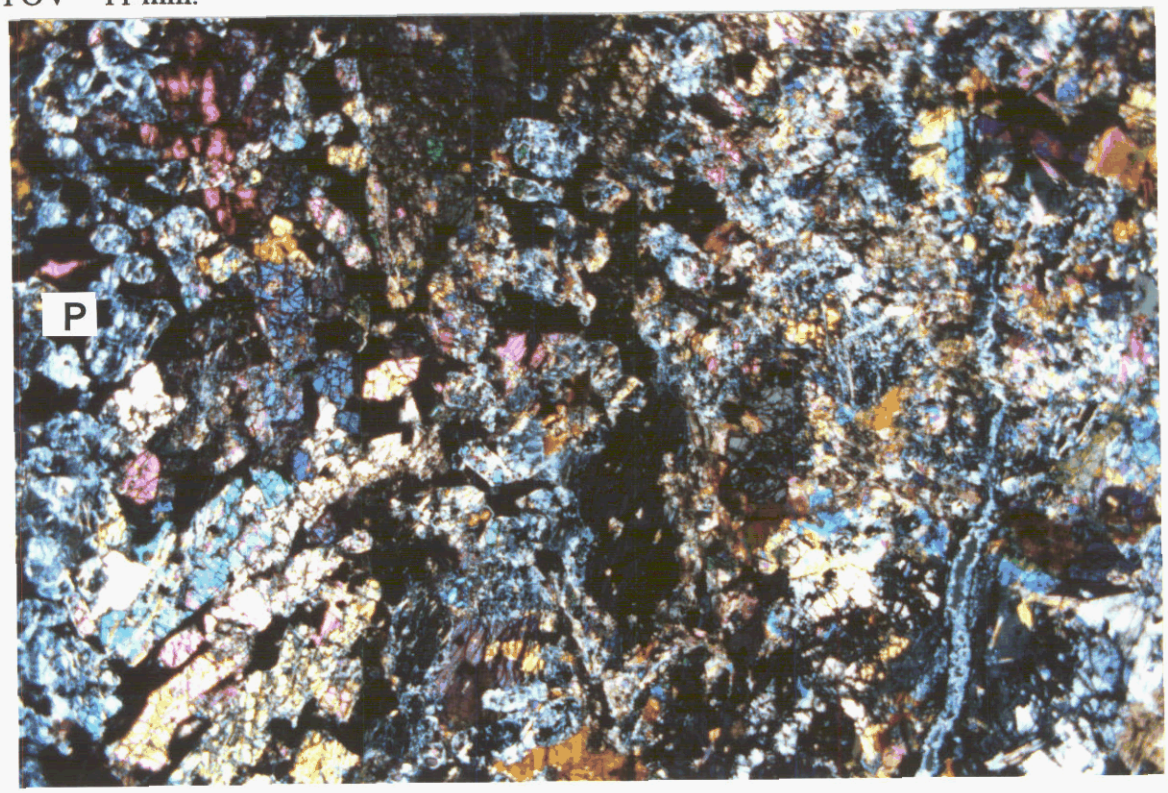
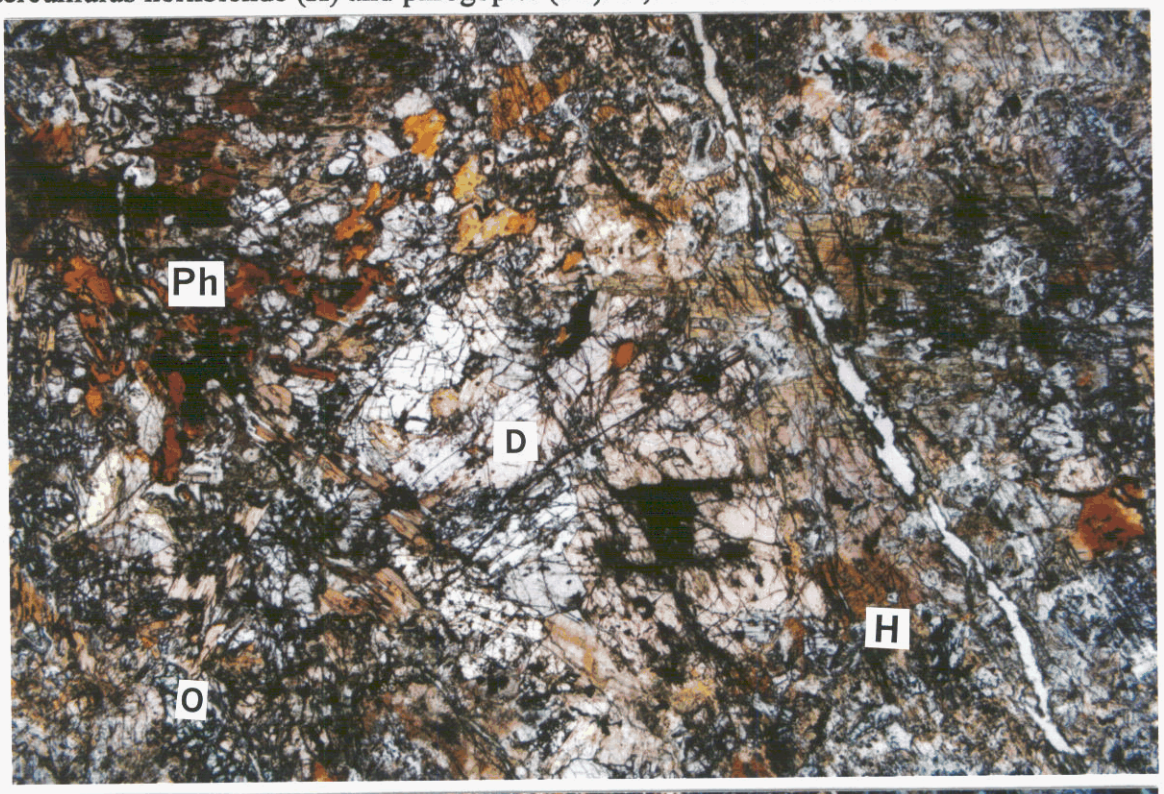


Plate 10. Photomicrographs, **A** – plane light, **B** – crossed nicols, show the texture of the olivine clinopyroxenite. Cumulus diopside (D) and olivine (O) are associated with intercumulus hornblende (H) and phlogopite (Ph). **A, B** – FOV = 11 mm.

A



B

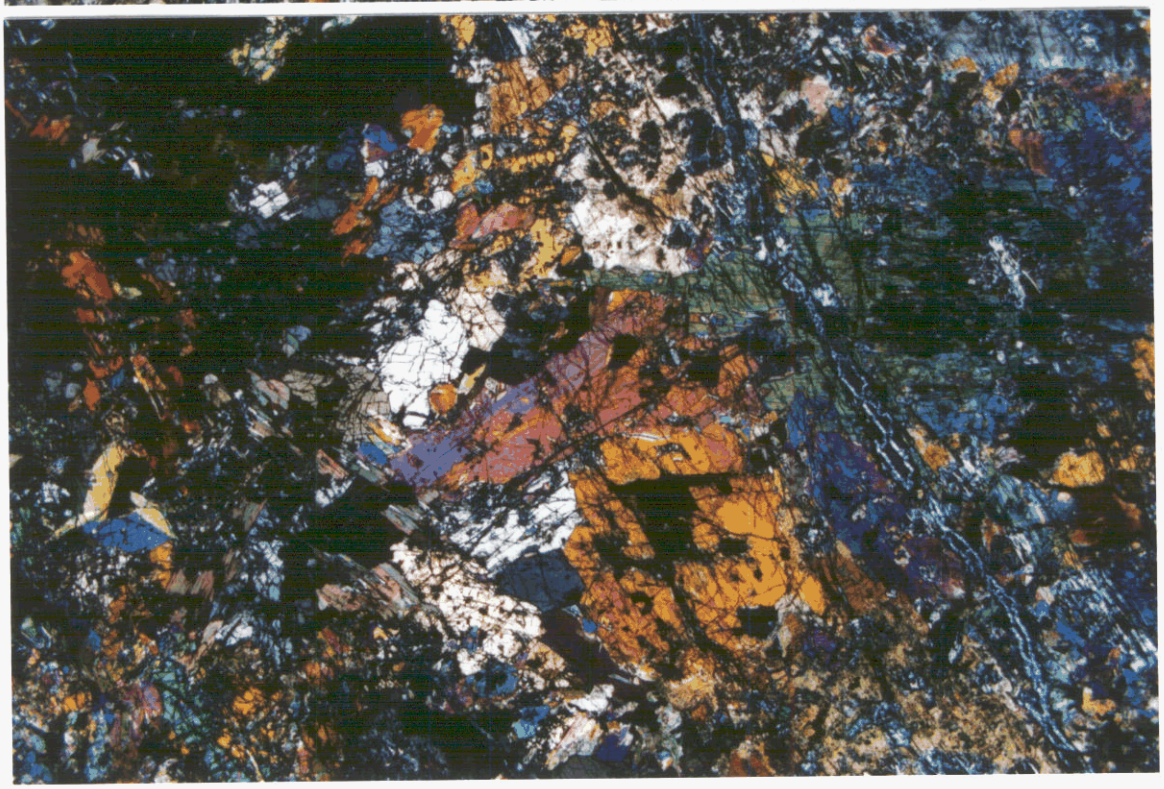


Plate 11. Photomicrographs, **A** – plane light, **B** – crossed nicols, show the texture of the feldspathic wehrlite portion. Cumulus partially serpentinized olivine (O) is associated with intercumulus oikocrystic diopside (D), altered (brown) plagioclase (P) and hornblende (H) and phlogopite (Ph). The presence of a sulphide (S) bleb within the cumulus diopside indicates the existence of an early immiscible sulphide melt.
A, B – FOV = 11 mm.

A

B

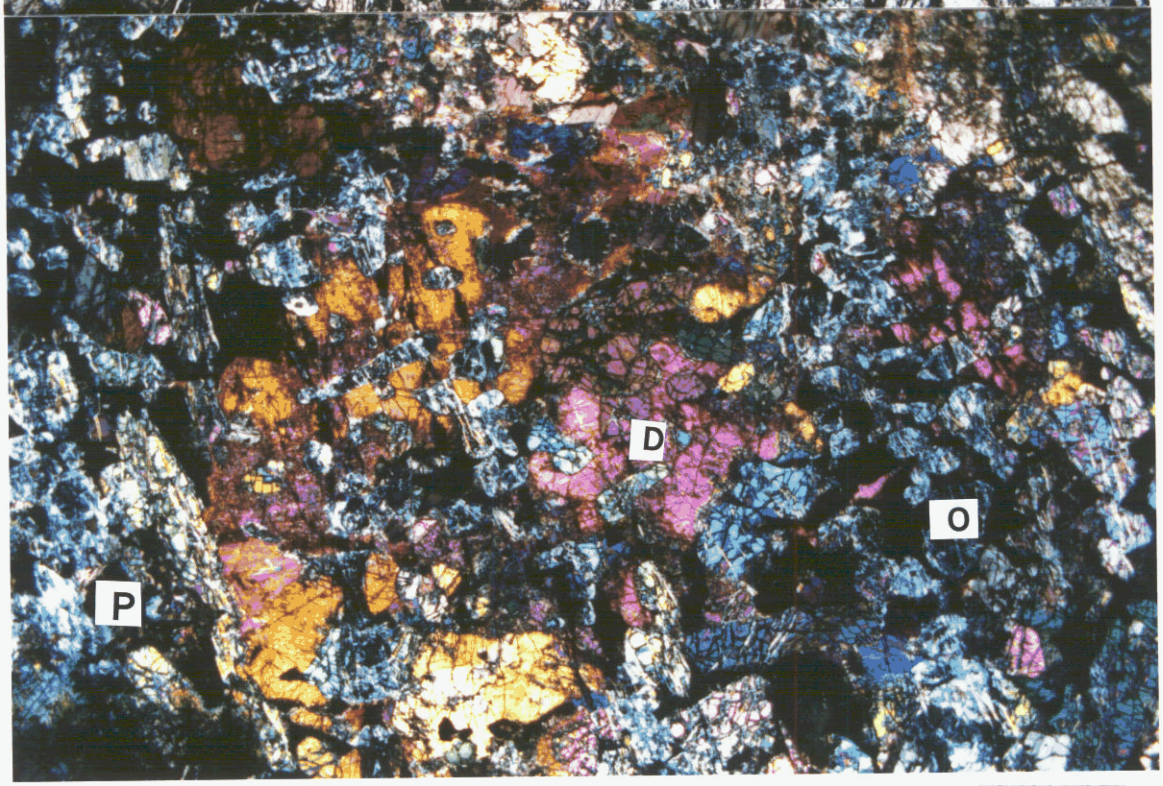


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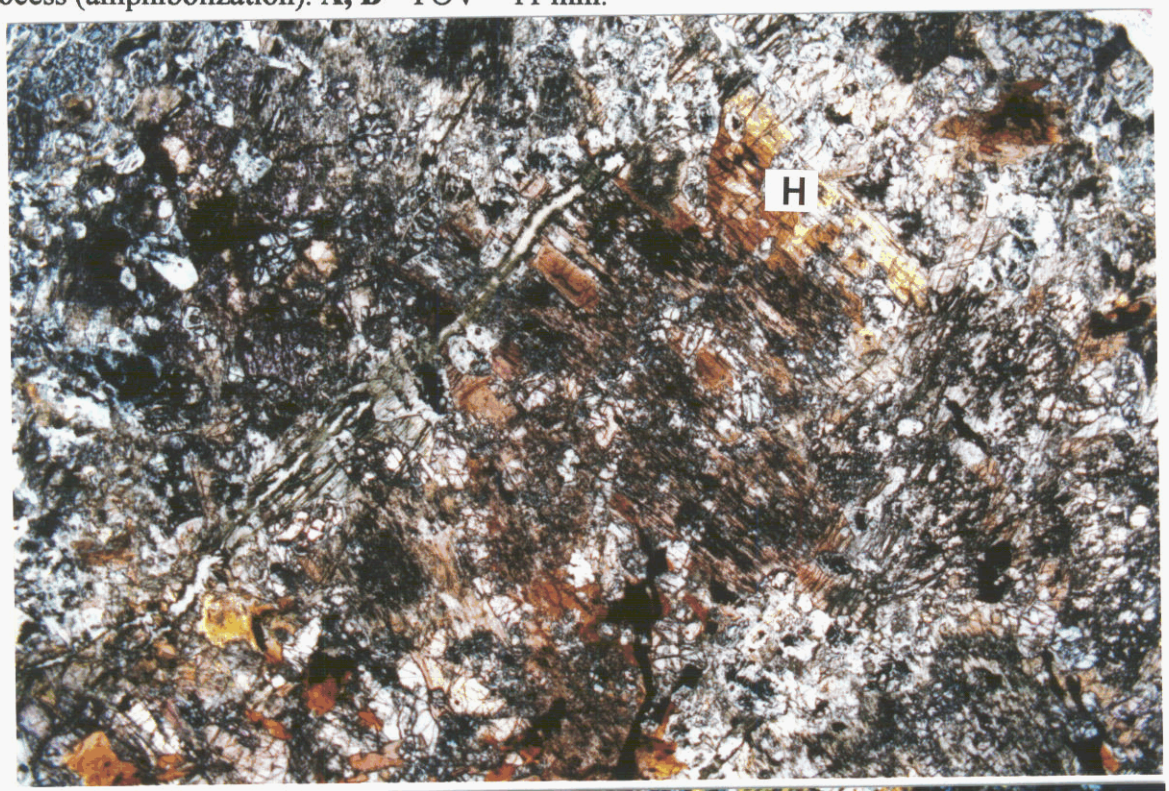
Plate 12. Photomicrographs, **A** – plane light, **B** – crossed nicols, show cumulus diopside partially mantled by and replaced by primary hornblende (H). The abundant very fine-grained oxide in the hornblende-diopside mixture may be a product of this late magmatic process (amphibolization). **A, B** – FOV = 11 mm.

A



B

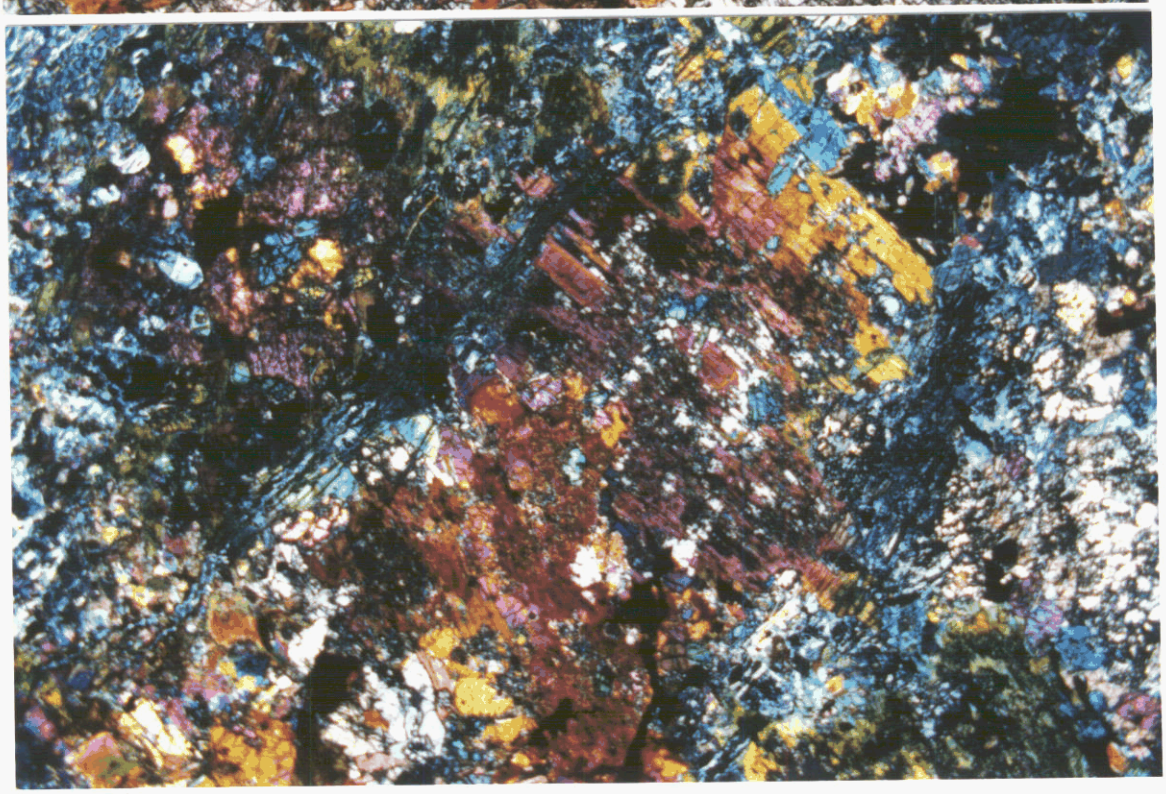
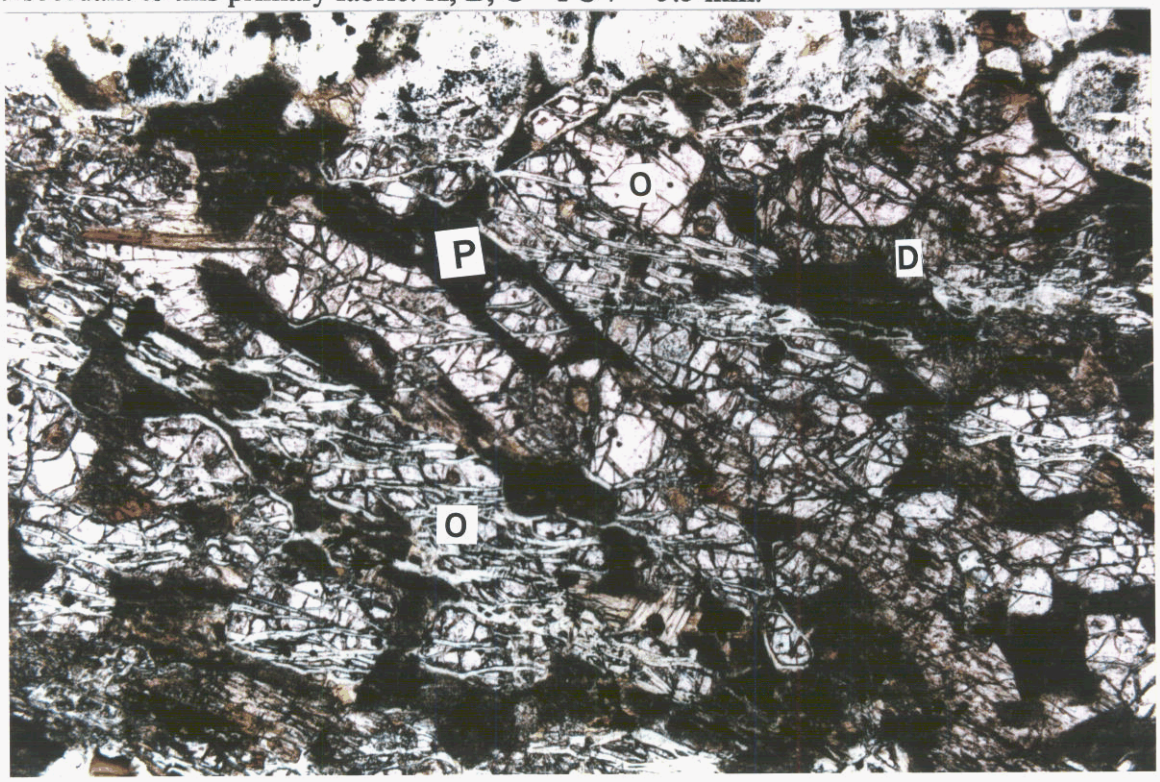


Plate 13. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, show a primary mineral lamination/layering formed by the long dimension of cumulate olivine (O), intercumulus altered plagioclase (P) and diopside (D). The trend of serpentine veins is discordant to this primary fabric. **A**, **B**, **C** – FOV = 5.5 mm.

A



B

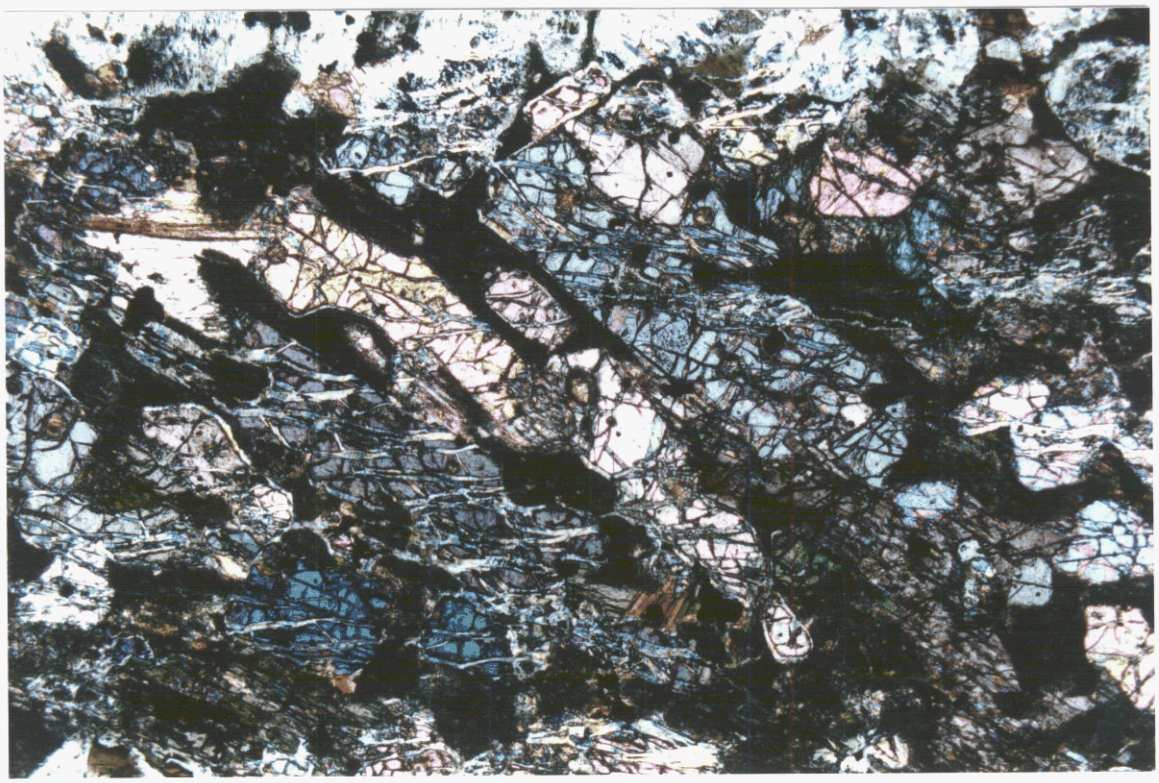


Plate 13 cont'd. **C**. Very fine-grained euhedral cumulus chromite (Cr) is present as inclusions in olivine and as inclusions within intercumulus minerals. Discontinuous bands of secondary magnetite (sM) and very finely disseminated magnetite are present in serpentine-filled veinlets.

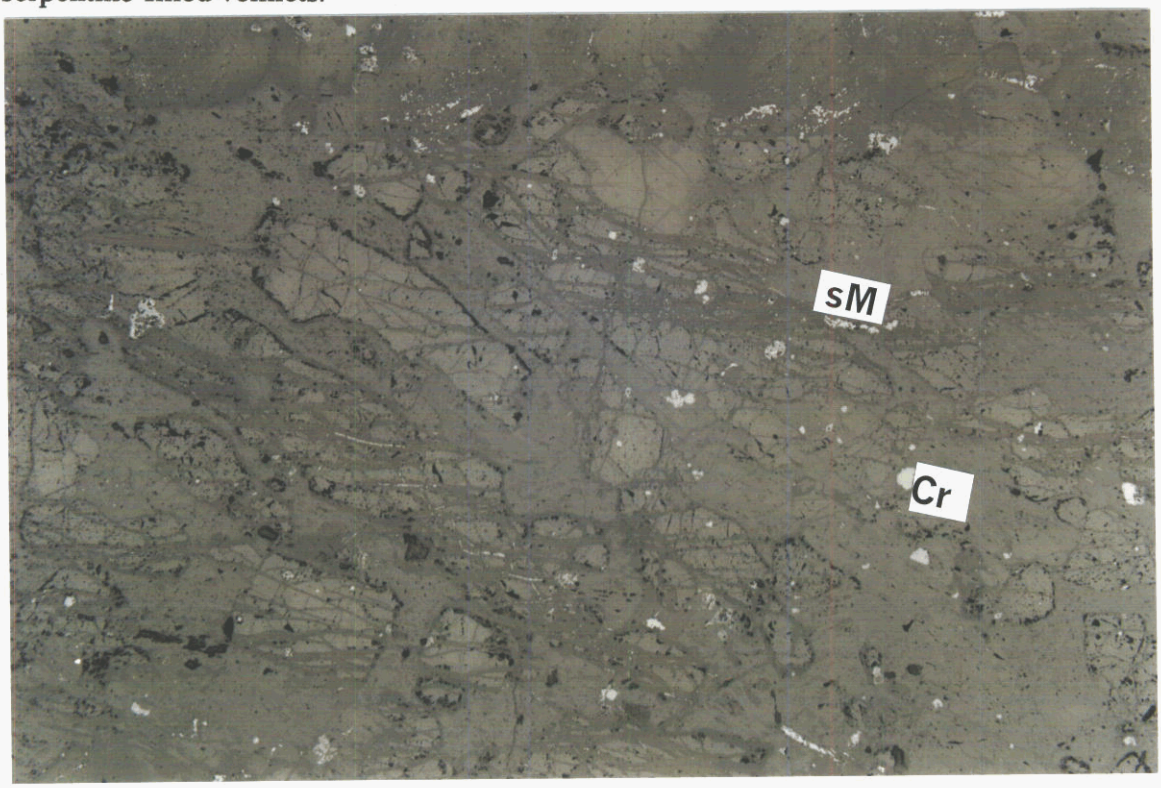
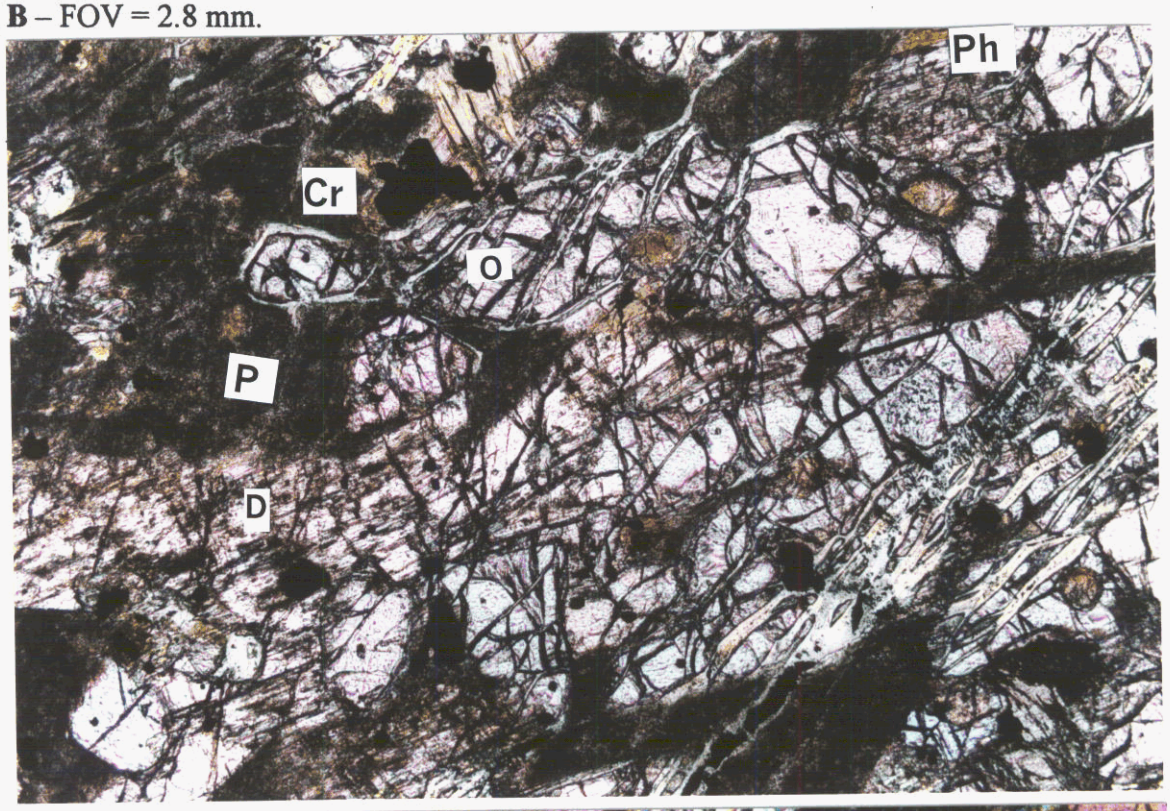


Plate 14. Photomicrographs, **A** – plane light, **B** – crossed nicols, show euhedral cumulus chromite present as inclusions in cumulus olivine and as inclusions in intercumulus oikocrystic diopside (D), altered (brown) plagioclase (P) and phlogopite (Ph).
A, B – FOV = 2.8 mm.

A



B

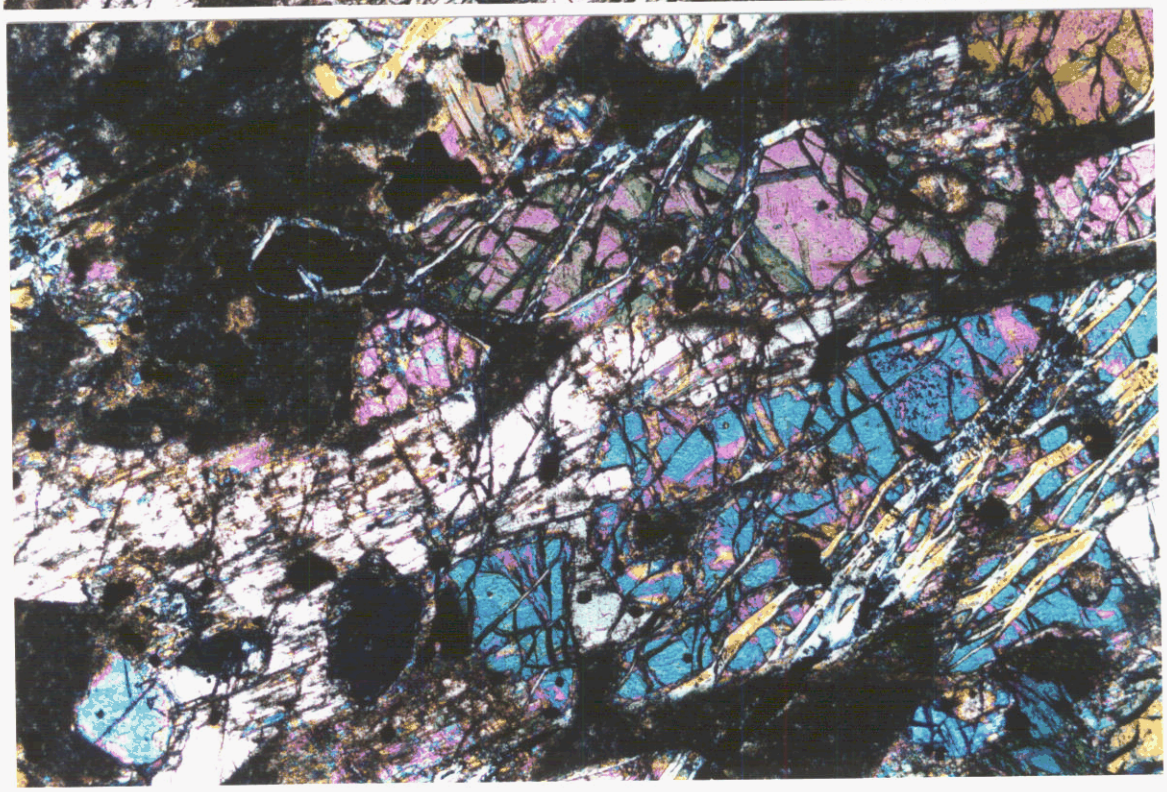
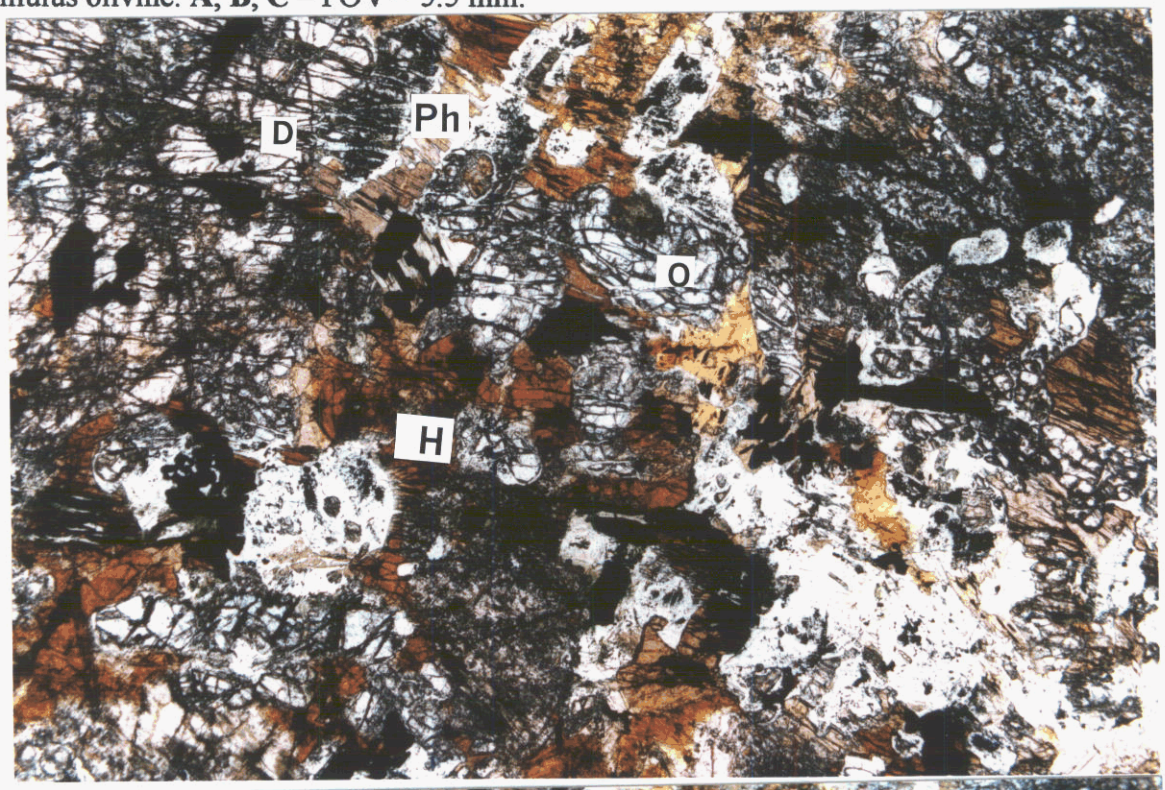


Plate 15. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, show abundant anhedral intercumulus titanomagnetite (tM) with exsolved ilmenite lamellae associated with oikocrystic intercumulus hornblende (H) and phlogopite (Ph). These hydrous primary silicates are intercumulus to poikilitic cumulus diopside (D) and cumulus olivine. **A, B, C** – FOV = 5.5 mm.

A



B

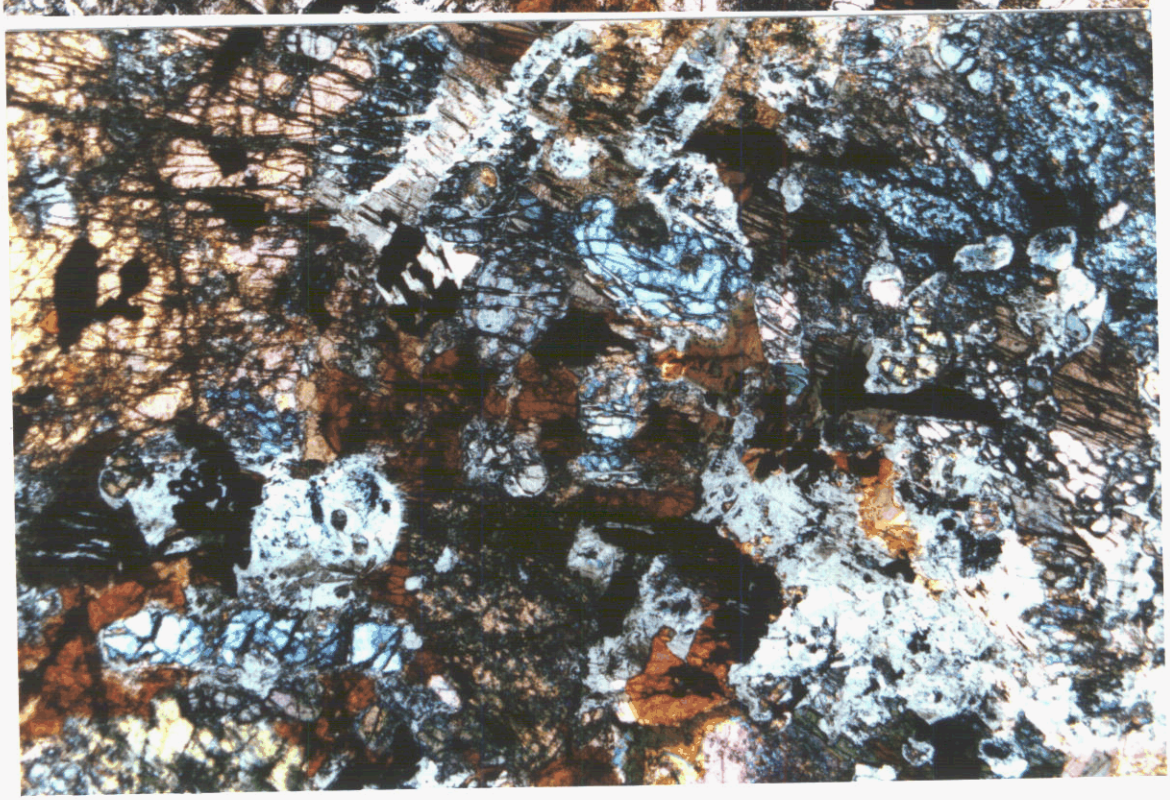


Plate 15 cont'd. C. Two generations of magnetite are present: 1) primary anhedral intercumulus titanomagnetite (tM - see next Plate) and 2) secondary magnetite (sM) associated with serpentinized olivine.

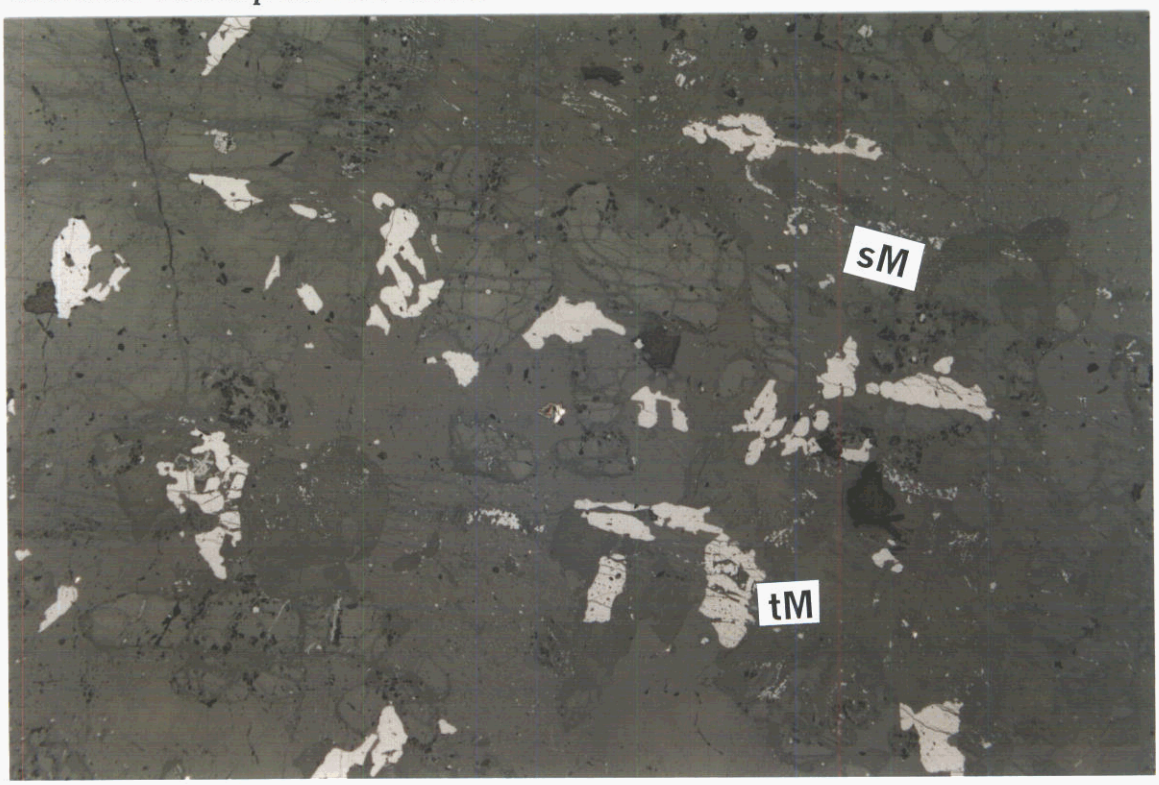
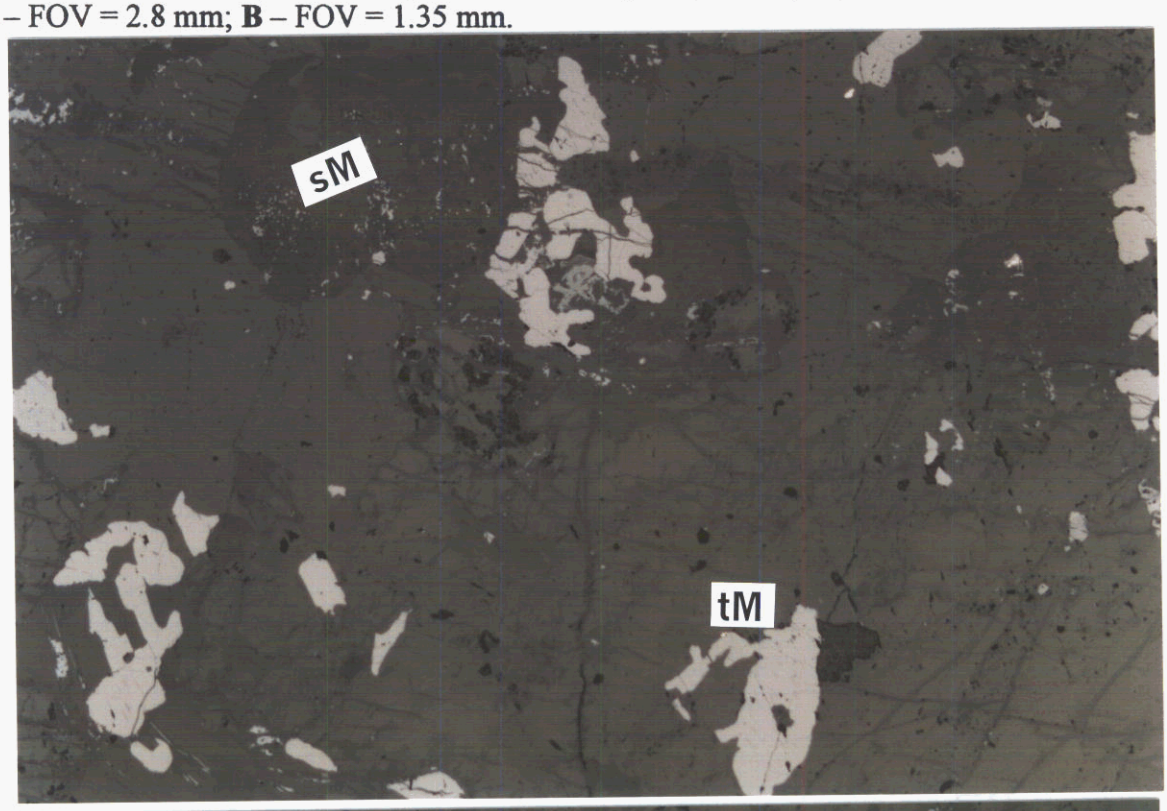


Plate 16. Photomicrographs, **A**, **B** – reflected light, are higher magnification of magnetite in Plate 15**C**. Two generations of magnetite are present: 1) intercumulus primary magnetite (M) hosts minute ilmenite lamellae (arrows), a feature present in sulphide-poor ultramafic rocks and 2) ultra fine-grained secondary magnetite (sM) after olivine.
A – FOV = 2.8 mm; **B** – FOV = 1.35 mm.

A



B

Plate 17. Photomicrograph, reflected light, shows the effect of serpentinization process on cumulus chromite (Cr). Chromite armoured in cumulate and intercumulus silicates is unaltered. Chromite that has been enveloped in serpentine has been converted to ferrichromite (fCr). Secondary magnetite (sM) is present as bands and minute grains in serpentine and is associated with ultra fine-grained sulphide, presumably pyrite (arrow). FOV = 1.35 mm.

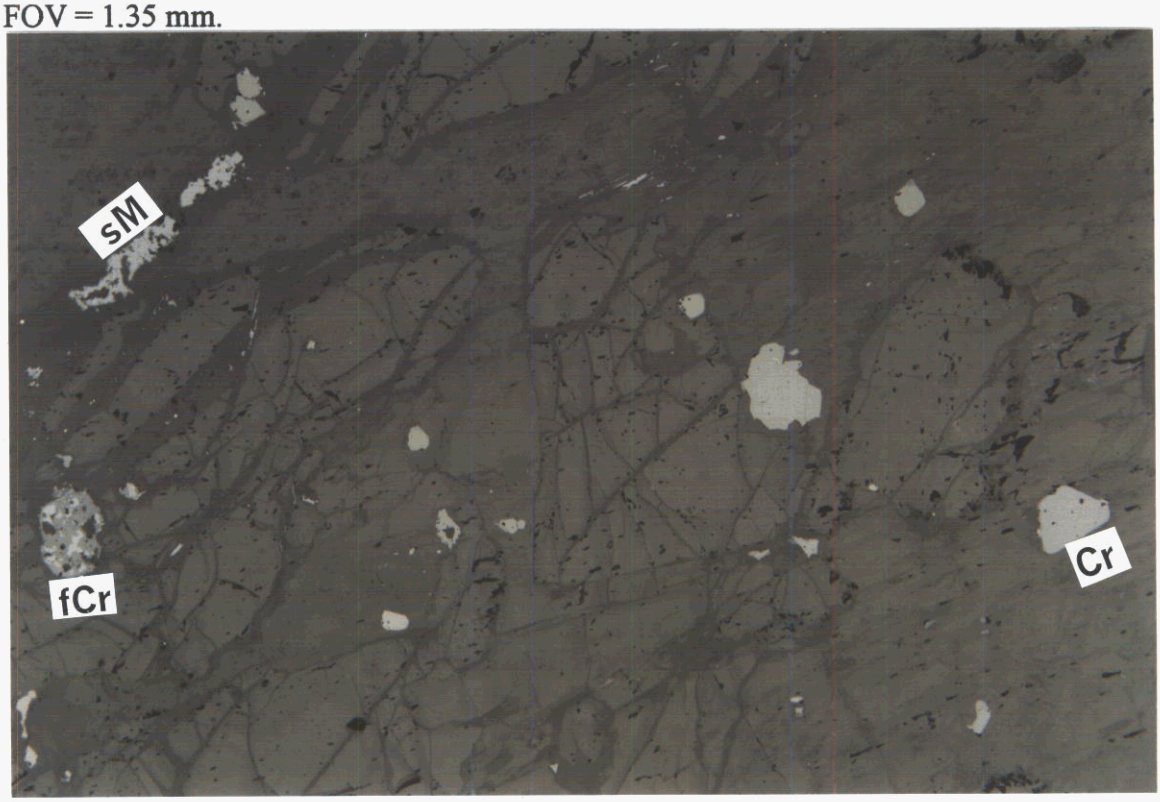
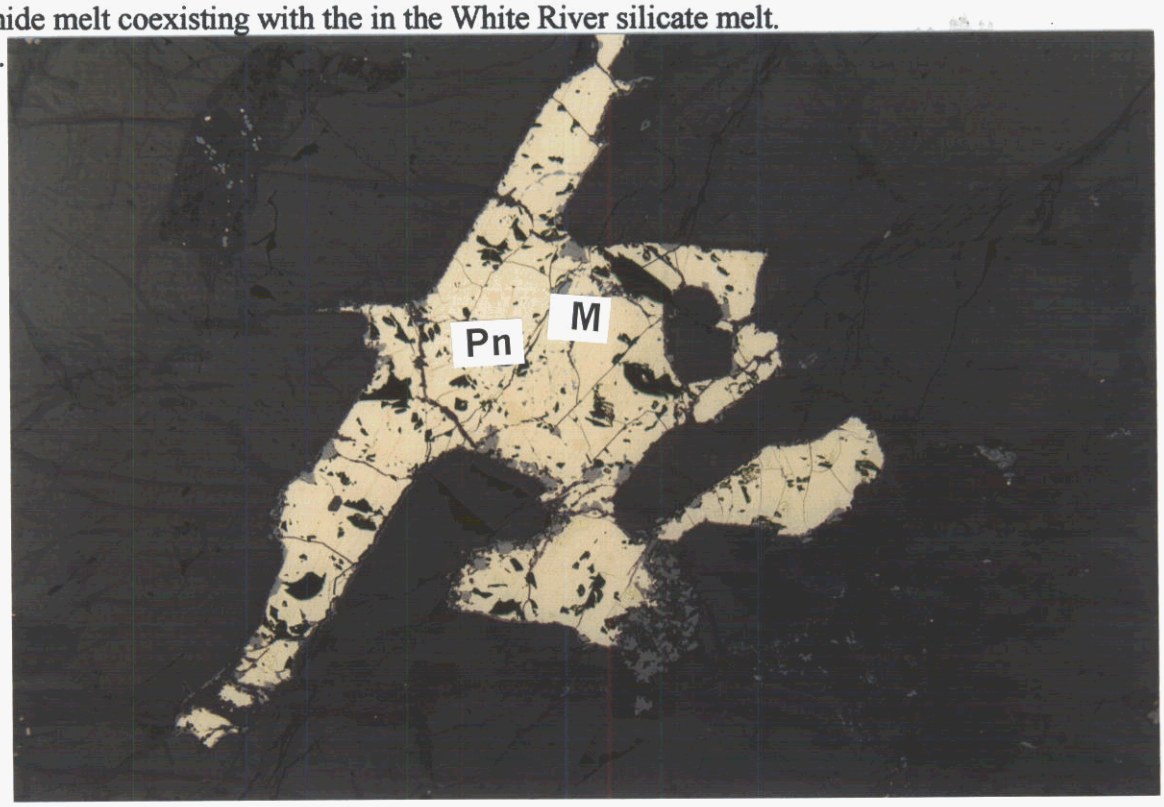


Plate 18. Photomicrograph, reflected light, shows a sulphide inclusion, pentlandite (Pn) with magnetite (M), in cumulus diopside (see 10**A**). Sulphide occurs primarily in early cumulus minerals and this textural association is conclusive evidence for an early immiscible sulphide melt coexisting with the in the White River silicate melt. FOV = 1.35 mm.



Sample #: Onion 166810: Discovery Showing
Cu 60 ppm; Ni 1770 ppm Co 110 ppm
2 ppb Au, 18 Pt, 36 ppb Pd, 54 ppb PGE_T

Northing	Easting
6874377	519921

SUMMARY: ***hornblende+phlogopite+ilmenite-magnetite-bearing olivine clinopyroxenite***. The texture and cumulate and intercumulus mineralogy of this sample is identical to sample 166808. The important aspect of this rock is the highly oxidized state of the intercumulus mafic minerals, hornblende, phlogopite, and their association with intercumulus ilmenite-bearing magnetite. The Ti-bearing magnetite ultramafic rocks also contain very little cumulus sulphide. Ilmenite-bearing magnetite is not present in the net-textured wehrlitic rocks even though magnetite is an accessory minerals associated with sulphide. Thus intercumulus Ti-magnetite ultramafic rocks are inferred to have a low potential for magmatic sulphide concentrations.

TYPE: PTS
ASSEMBLAGE: diopside, olivine, altered plagioclase (sericite+iron oxide), phlogopite, hornblende, serpentine, chlorite, chromite, sericite, secondary magnetite, magnetite-ilmenite (primary), sulphide.
ESTIMATED MODE (visual): 45% diopside, 35% olivine, 10% altered plagioclase, 4% phlogopite, 5% hornblende, 1% magnetite-ilmenite, trace (chromite, sulphide)

MINERALOGY:
Essential:

Diopside: as a cumulate mineral and the most abundant cumulate mineral. Cumulate grains are poikilitic with olivine inclusions. Poikilitic diopside varies from 1 – 3 mm and the long dimension of coarser poikilitic grains define in part a primary mineral layering/lineation. Oikocrystic diopside is also present in portions of the section that have intercumulus altered plagioclase.

Olivine: as a cumulate mineral that varies from equant subhedral and anhedral to elongated subhedral to anhedral. The alignment of oblong grains in part defines a primary mineral layering. Grain size varies from 0.2 – 1 mm and the replacement of olivine by serpentine is variable, relict olivine remains in the core of some grains.

Accessory:

Altered plagioclase: is intercumulus to cumulus olivine and pyroxene and has the characteristic brownish colour inferred to be due to replacement by sericite + iron oxide

Phlogopite: red orange to orange – pale yellow pleochroism. Present as intercumulus grains to 1 mm. Phlogopite is intergrown with intercumulus hornblende.

Hornblende: similar red orange pleochroism as coexisting phlogopite. Present as intercumulus grains to 2 mm and as a replacement of cumulus pyroxene

Serpentine: as a replacement of olivine and filling serpentine-filled veins and veinlets. The fracture set is the main structural element that controlled hydration. Serpentinization of olivine was also controlled by fluid migration along intergranular boundaries. The product of this replacement are minute islands of olivine in serpentine in areas where there is a lack of fractures

Chlorite: trace amount; present only in the central portions of some serpentine-filled veins and veinlets. This chlorite displays a similar textural relationship as chlorite in sample 166808.

Chromite: as subhedral to euhedral cumulus grains to 0.05 mm. Present as inclusions in olivine and diopside, interstitial to the former minerals and hosted in intercumulus minerals.

Ferrichromite: alteration of chromite grains that are hosted in serpentine-filled veins and veinlets.

Magnetite: associated and related to the serpentinization of olivine. Present as anhedral to subhedral minute grains, <0.005 mm, that form aggregates in altered olivine and form discontinuous filaments in serpentine, partially mantle and can replace chromite to ferrichromite.

Magnetite-ilmenite: as primary intercumulus grains to 0.3 mm. Grains are subhedral to anhedral (elongate to amoeboid in shape). Some grains host exsolved ilmenite lamellae, identical to magnetite in sample 166808.

Sulphide: trace amount; two generations of sulphide: 1) minute sulphide, presumed to be pyrite is associated with secondary magnetite after olivine and 2) as inclusions in cumulus diopside; sulphides are predominantly pyrrhotite with rare pentlandite.

TEXTURE & FABRIC:

No penetrative fabric and consequently there is excellent preservation of primary mineralogy and textures even though the rock ahs sustained minor serpentinization related to one set of fractures.

This rock has an orthocumulate texture formed by abundant cumulus olivine and diopside with an estimated intercumulus content of ~20% comprised of intercumulus diopside, feldspar with hornblende and phlogopite. The alignment of oblong shaped olivine and the long dimension of cumulate diopside define a primary flow lamination or crystal layering.

The association of ilmenite-bearing intercumulus magnetite with oxidized intercumulus hornblende and phlogopite conclusively indicates that this portion of the intrusion is highly oxidizing and this portion of the intrusion has a very low intercumulus sulphide content. Trace amounts of primary sulphide are present as inclusions in cumulus pyroxene and there is a trace amount of secondary sulphide associated with secondary magnetite after olivine. These mineral associations are identical to sample 166808.

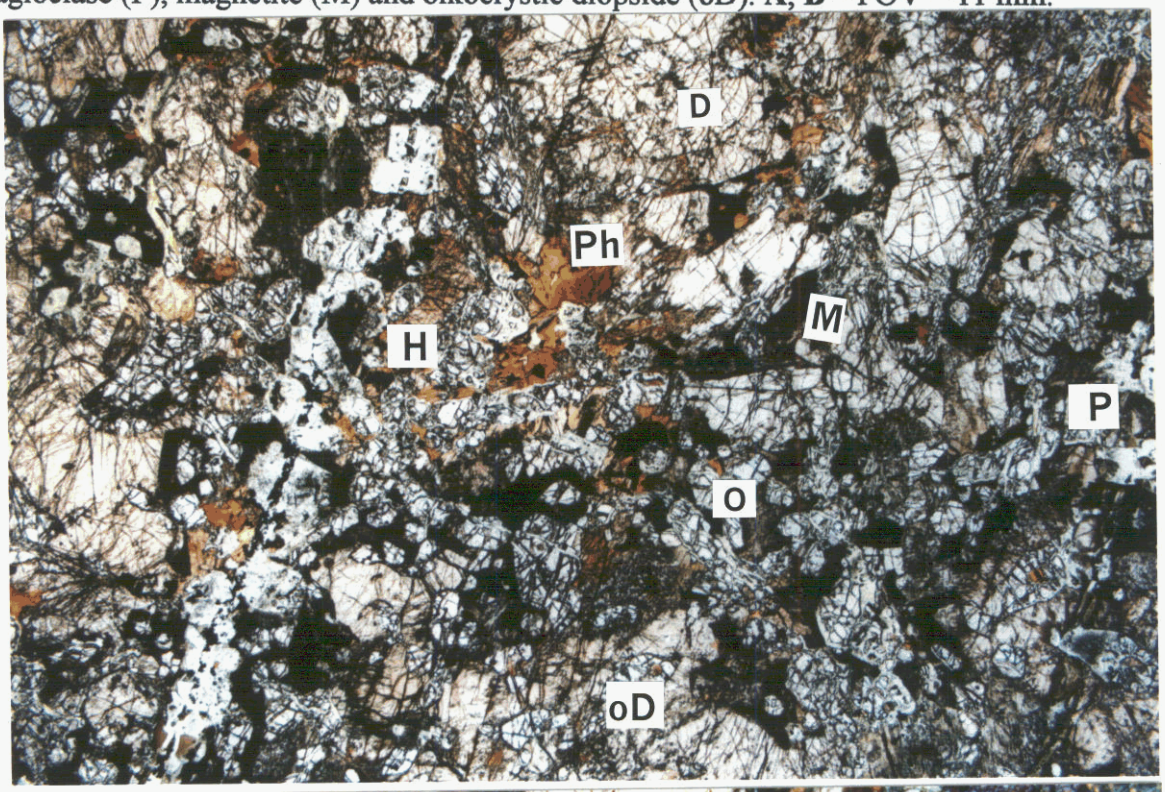
ALTERATION:

Serpentinization is ranked as weakly moderate and associated with fluid migration along a well-developed set of fractures and consequently along grain boundaries.

ROCK TYPE: hornblende+phlogopite+magnetite-bearing olivine clinopyroxenite.

Plate 19. Photomicrographs, **A** – plane light, **B** – crossed nicols, present an overview texture of the clinopyroxenite. Cumulate subhedral diopside (D) and euhedral-anhedral olivine (O) are associated with intercumulus hornblende (H), phlogopite (Ph), altered plagioclase (P), magnetite (M) and oikocrystic diopside (oD). **A**, **B** – FOV = 11 mm.

A



B

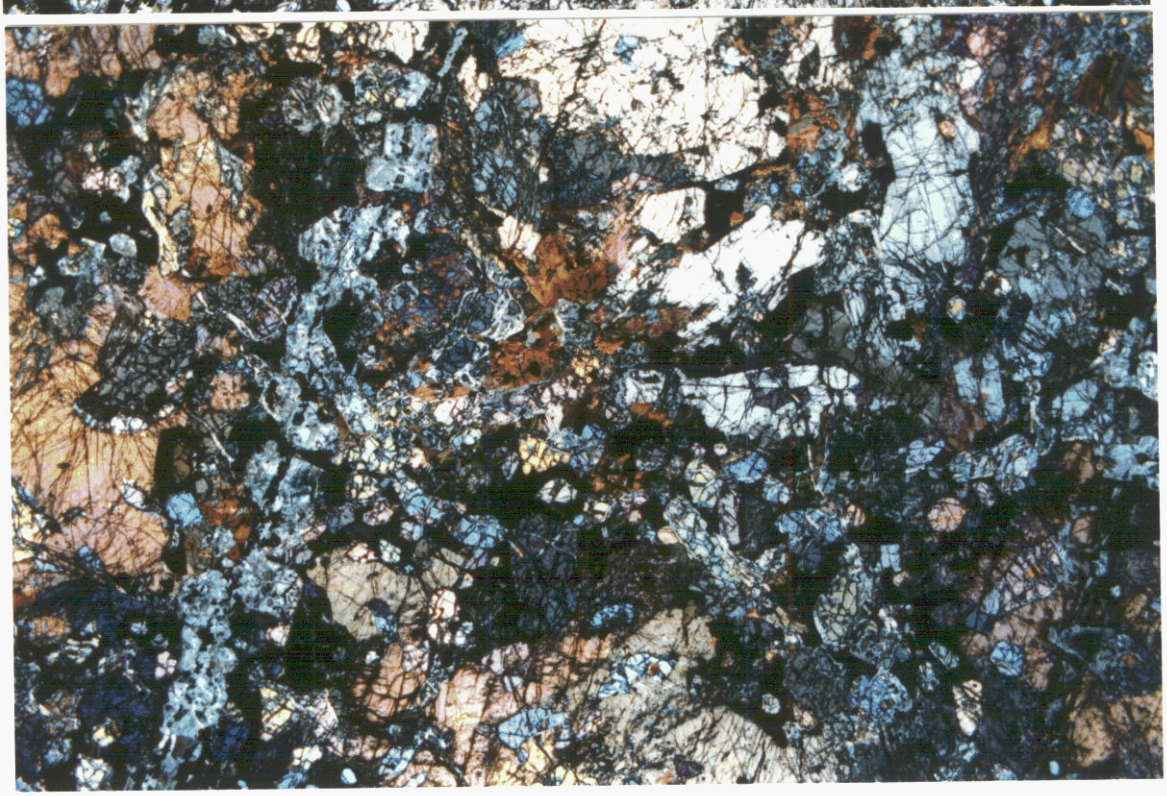


Plate 19**C**. Photomicrograph, plane light, a higher magnification of Plate 19**A** shows the intercumulus texture of hornblende (H), phlogopite (Ph), altered plagioclase (P), and magnetite (M) between the cumulus diopside (D) and olivine (O). **C** – FOV = 5.5 mm.

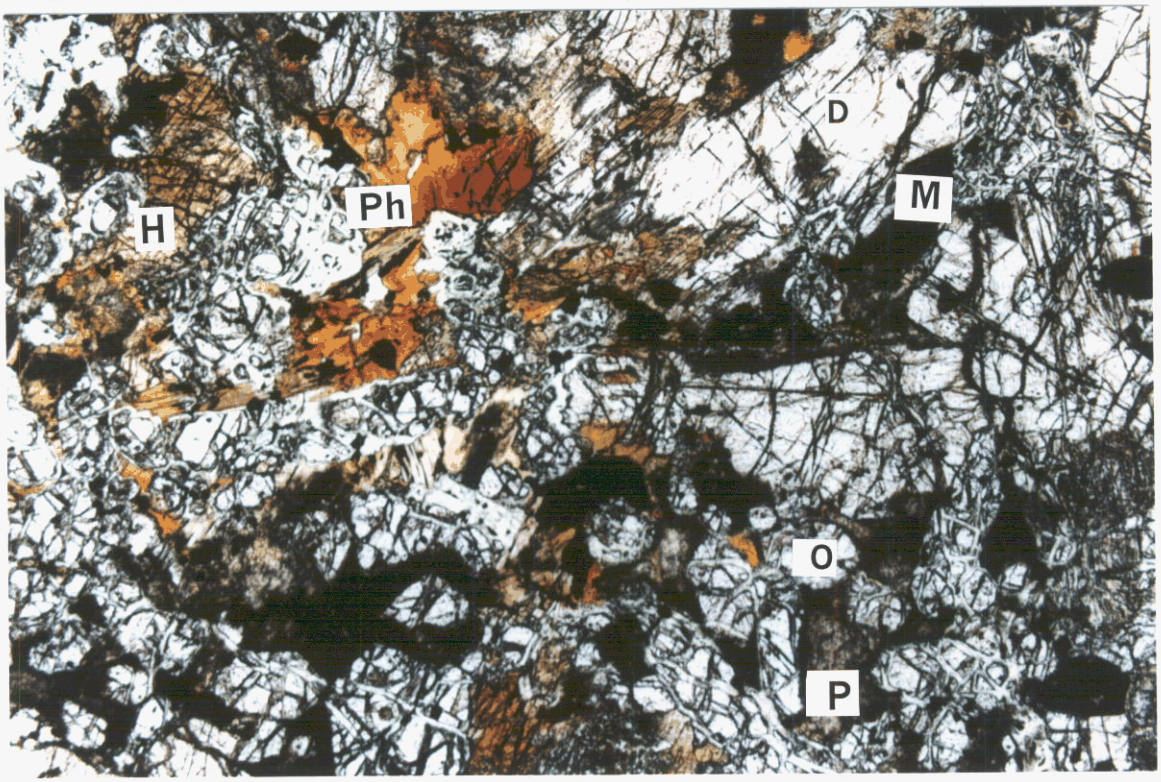


Plate 20. Photomicrograph, plane light, shows variably serpentinized cumulus olivine (O) with intercumulus hornblende (H), phlogopite (Ph) and altered plagioclase (P) and magnetite (M). FOV = 5.5 mm.

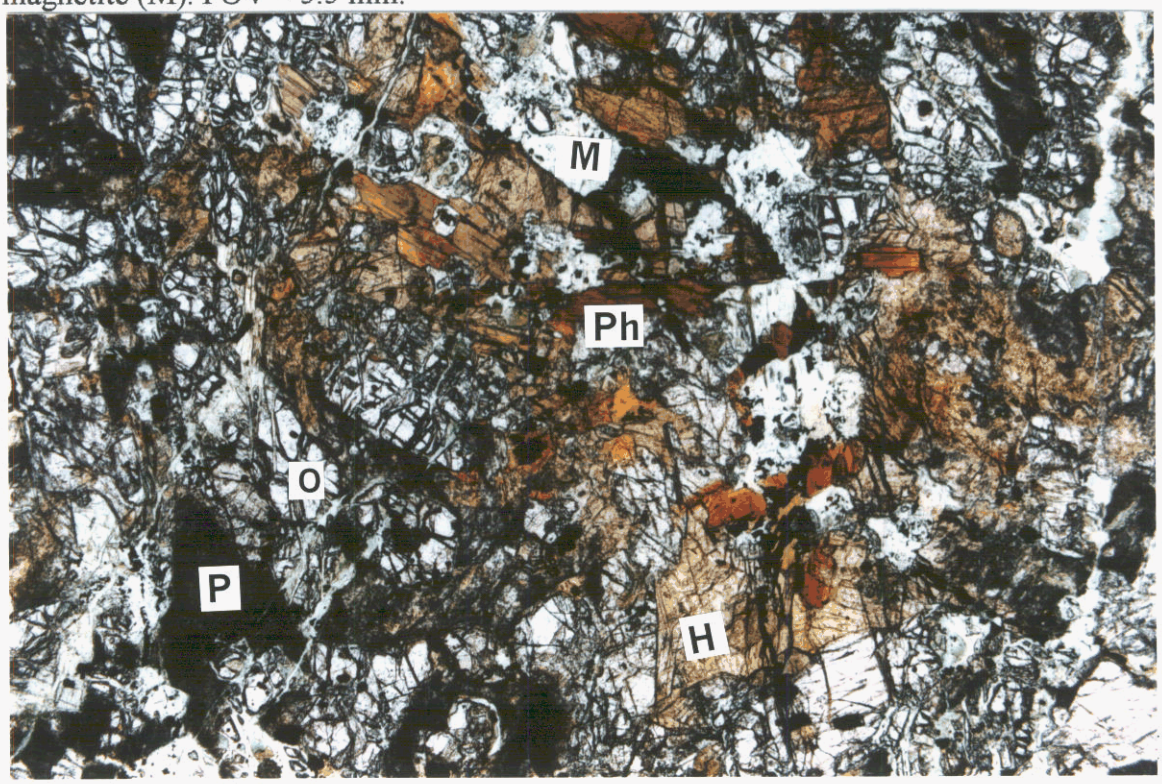
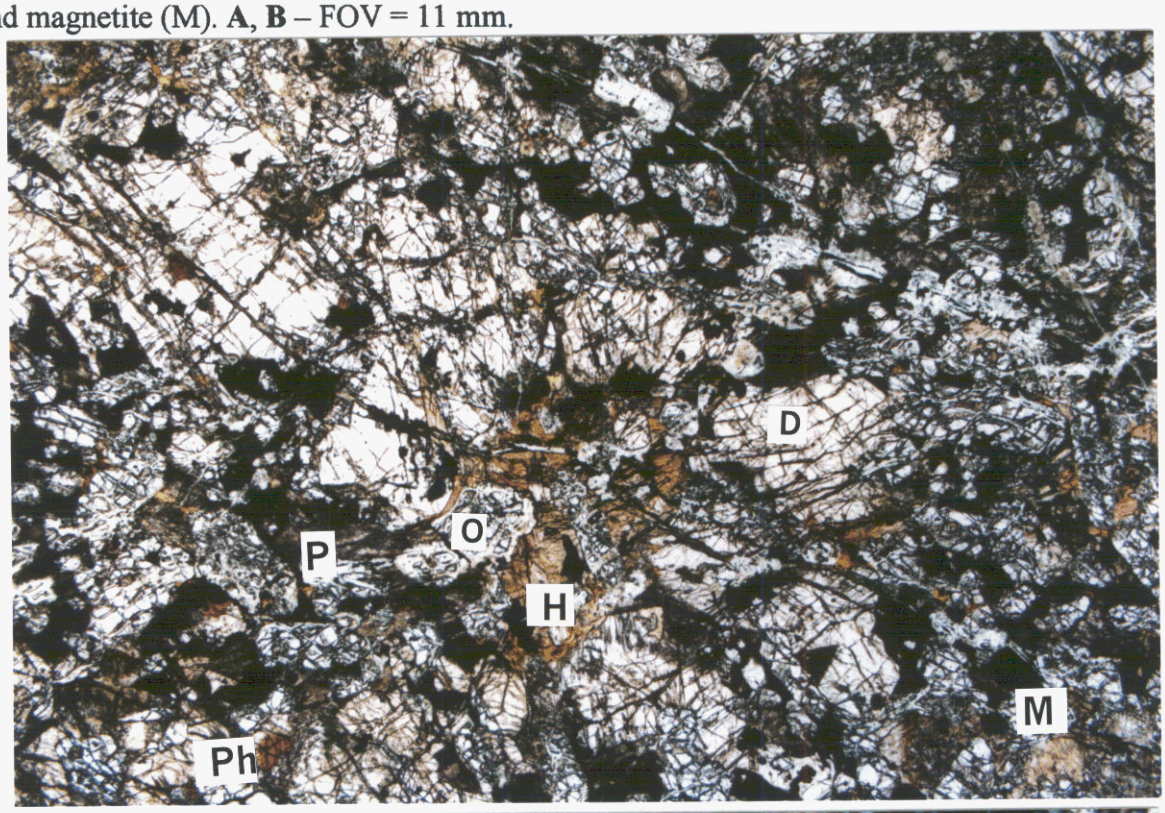


Plate 21. Photomicrographs, **A** – plane light, **B** – crossed nicols, show cumulate subhedral to anhedral diopside (D) and variably serpentinized olivine (O) associated with an intercumulus assemblage of hornblende (H), phlogopite (Ph), altered plagioclase (P) and magnetite (M). **A**, **B** – FOV = 11 mm.

A



B

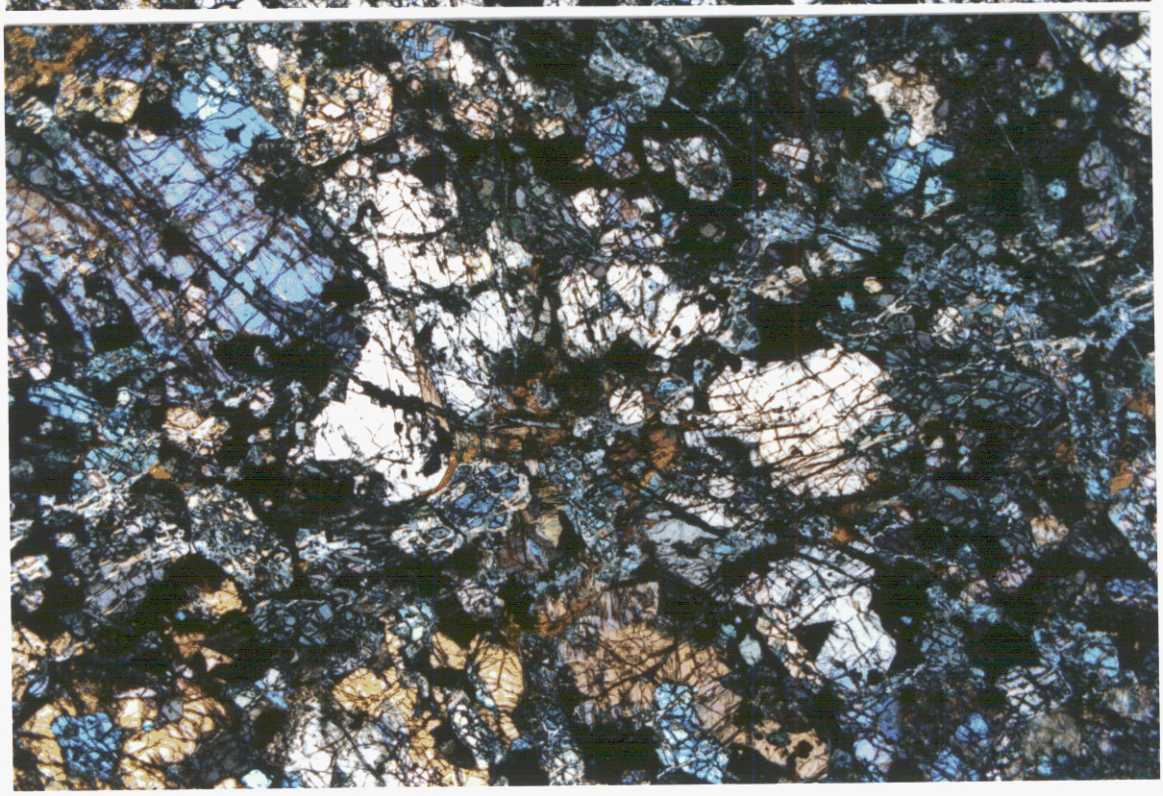
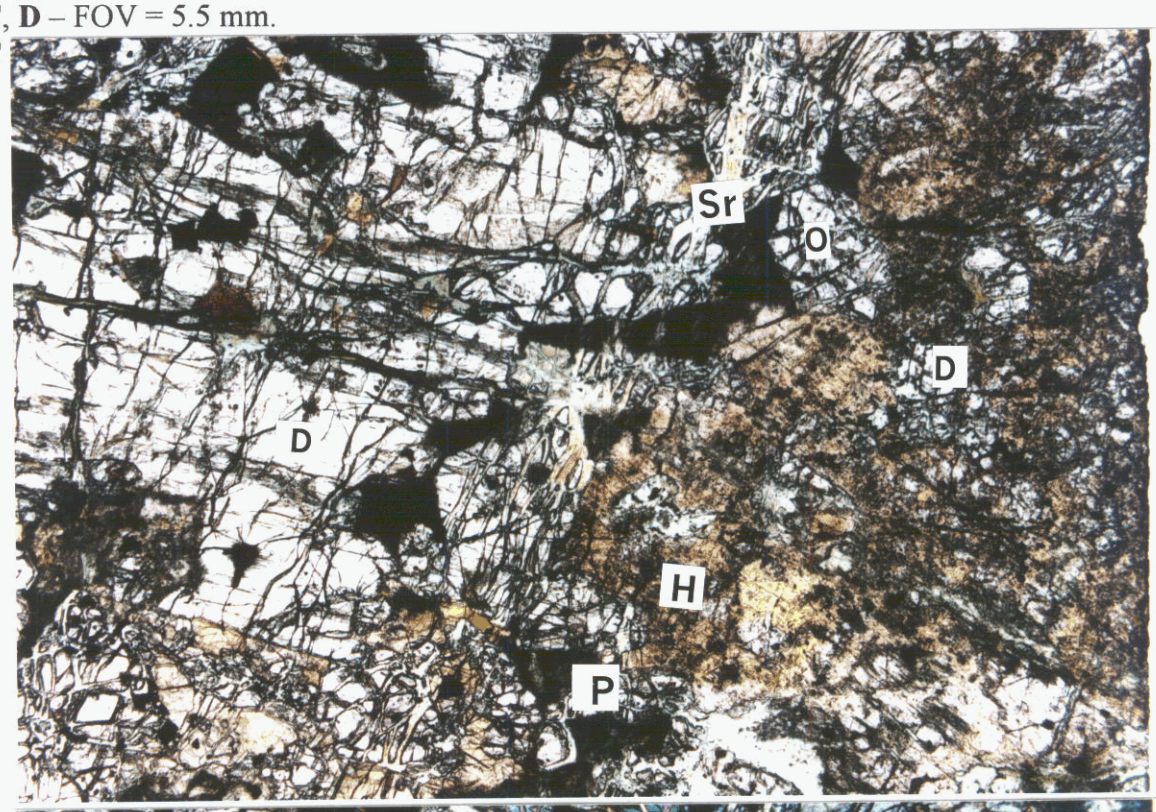


Plate 21cont'd. Photomicrographs, **C** – plane light, **D** – crossed nicols, a higher magnification of the upper left hand corner of Plate 21**A**, show several textural features. These include 1) the typical - relationship between cumulus diopside (D)+olivine (O) and intercumulus plagioclase (P); 2) late magmatic hornblende replacement of diopside (D-relict diopside in hornblende) and 3) serpentine (Sr) after olivine and filling veinlets. **C**, **D** – FOV = 5.5 mm.

C



D

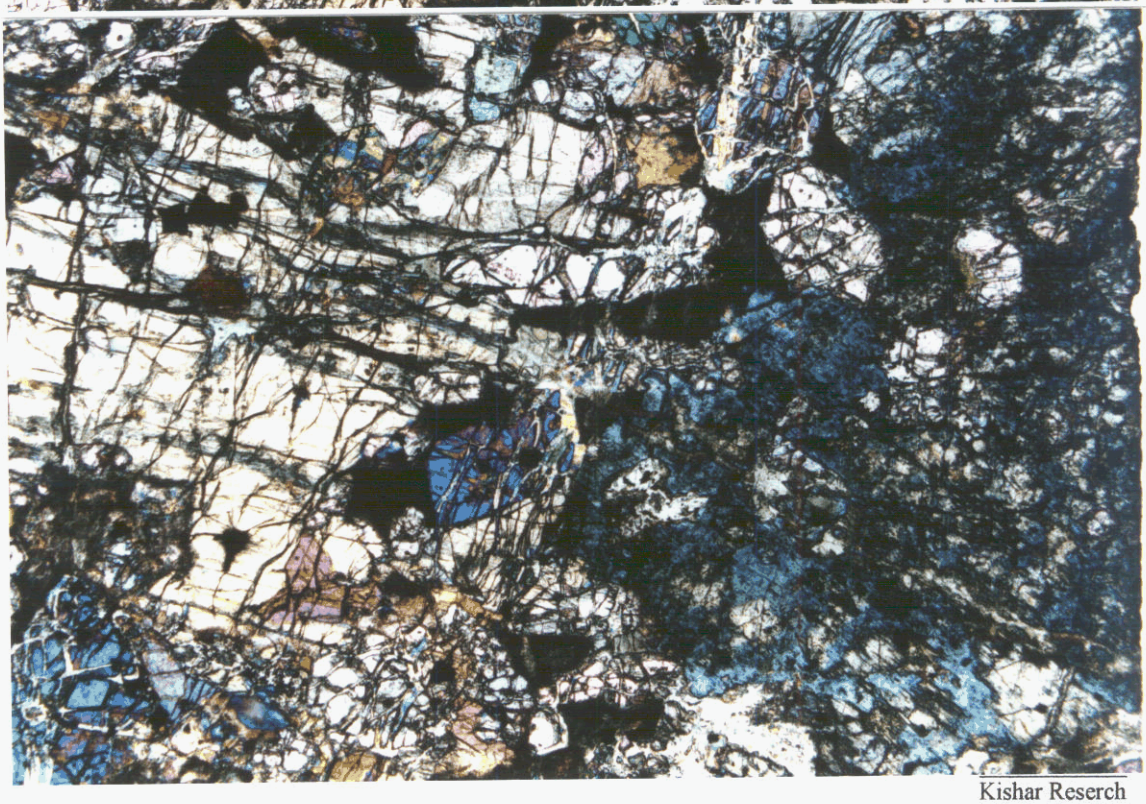


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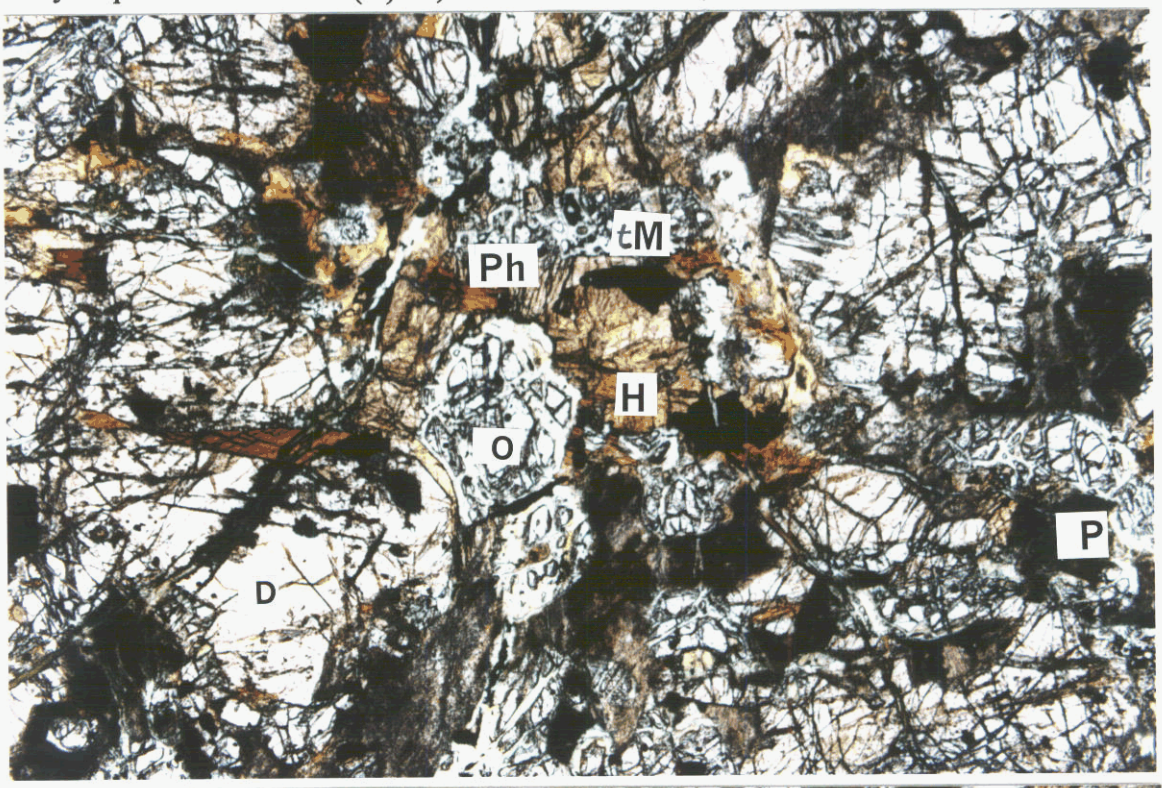
Plate 22. Photomicrographs, **A** – plane light, **B** – crossed nicols, show the intercumulus texture of titanomagnetite (tM) with accompanying intercumulus plagioclase (P), hornblende (H) and phlogopite (Ph). The cumulus minerals include diopside (D) and partially serpentinized olivine (O). **A, B** – FOV = 5.5 mm.

A



B

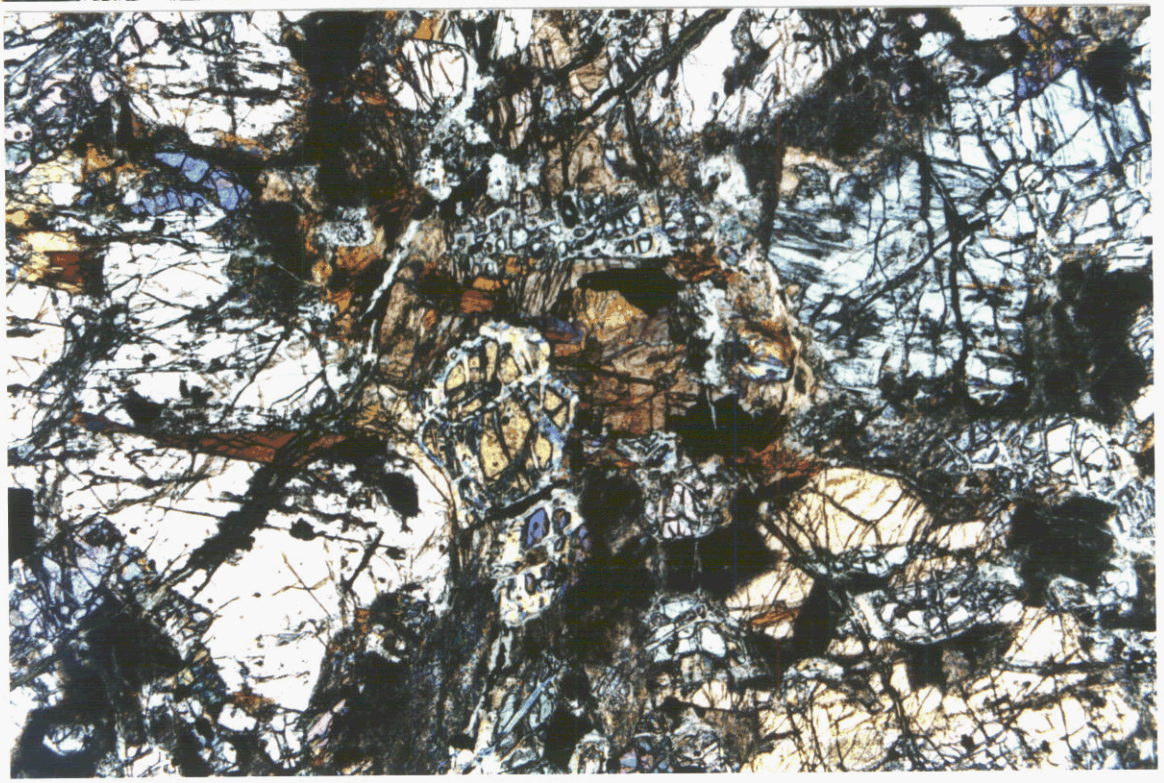
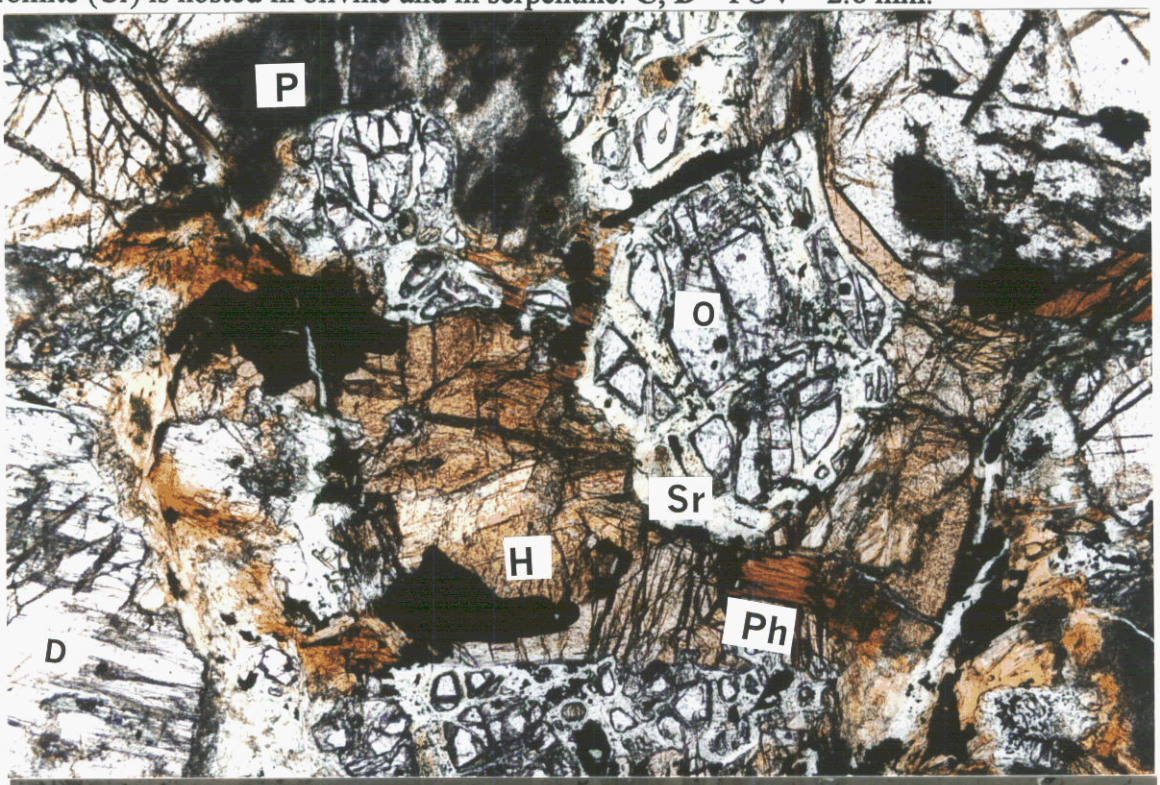


Plate 22 cont'd. Photomicrographs, **C** –, **D** – reflected light, a higher magnification of the central area of Plate 22**A**, show intercumulus anhedral titanomagnetite (tM) associated with intercumulus plagioclase (P), hornblende (H) and phlogopite (Ph). The cumulus minerals include diopside (D) and partially serpentinized olivine (O). Trace amounts of secondary magnetite (sM) is hosted in serpentine (Sr) after olivine (O). Euhedral chromite (Cr) is hosted in olivine and in serpentine. **C**, **D** – FOV = 2.8 mm.

C



D

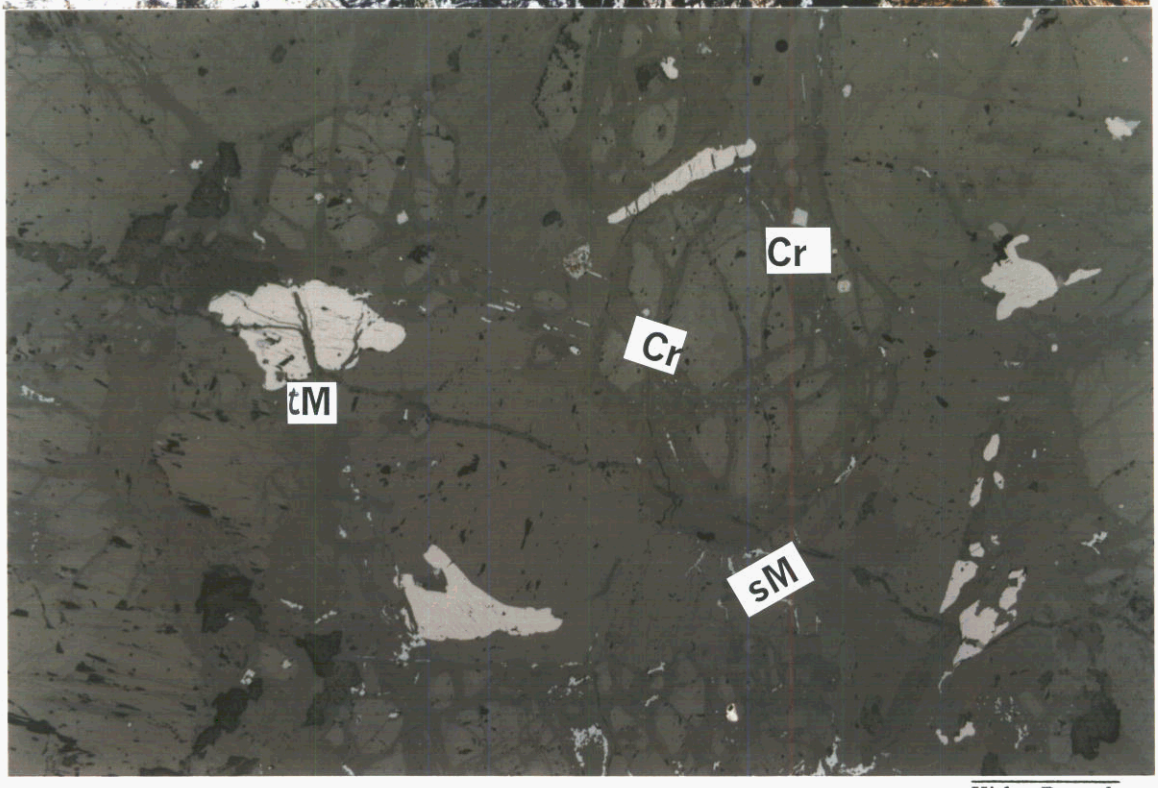


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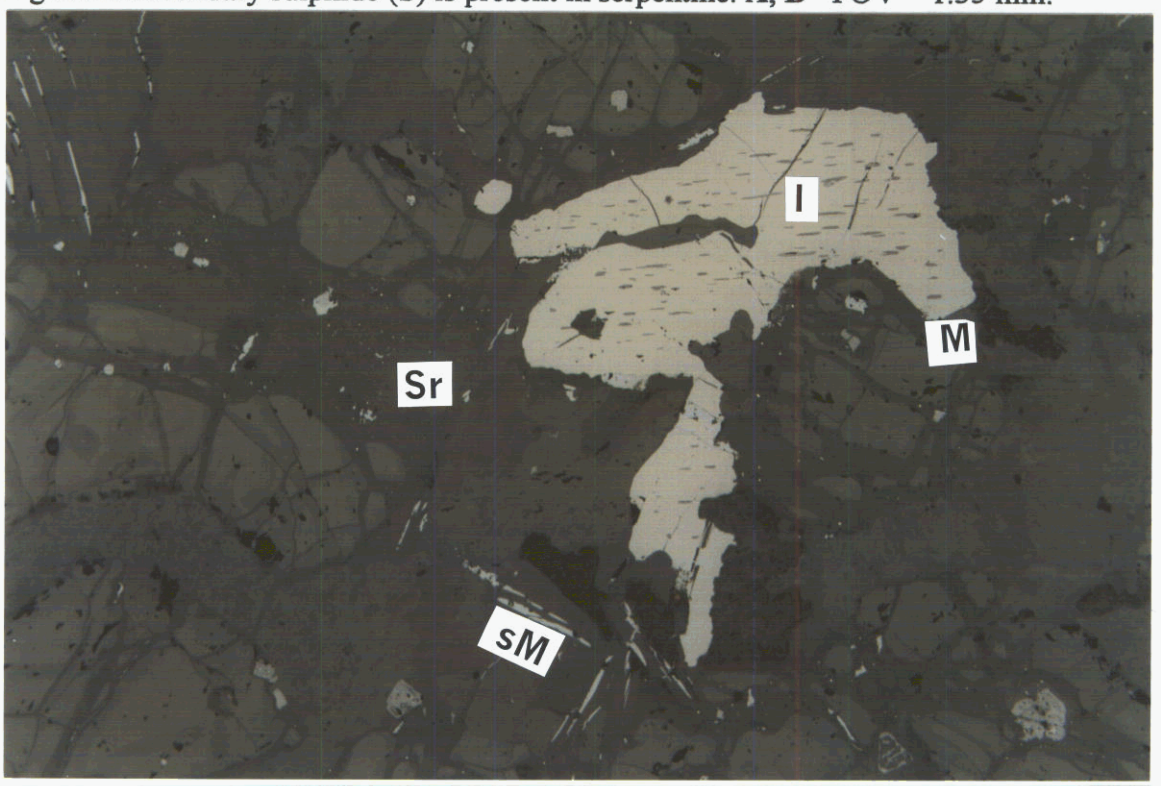
Plate 23. Photomicrograph, **A**, **B** - reflected light, shows the exsolution lamellae of ilmenite (I) in magnetite (M), referred to in the text as intercumulus titanomagnetite. Secondary magnetite (sM) is associated with serpentine (Sr) and euhedral chromite hosted in serpentine has been replaced by ferrichromite (fCr), atoll-like structures. Ultra fine-grained secondary sulphide (S) is present in serpentine. **A**, **B** - FOV = 1.35 mm.

A



B

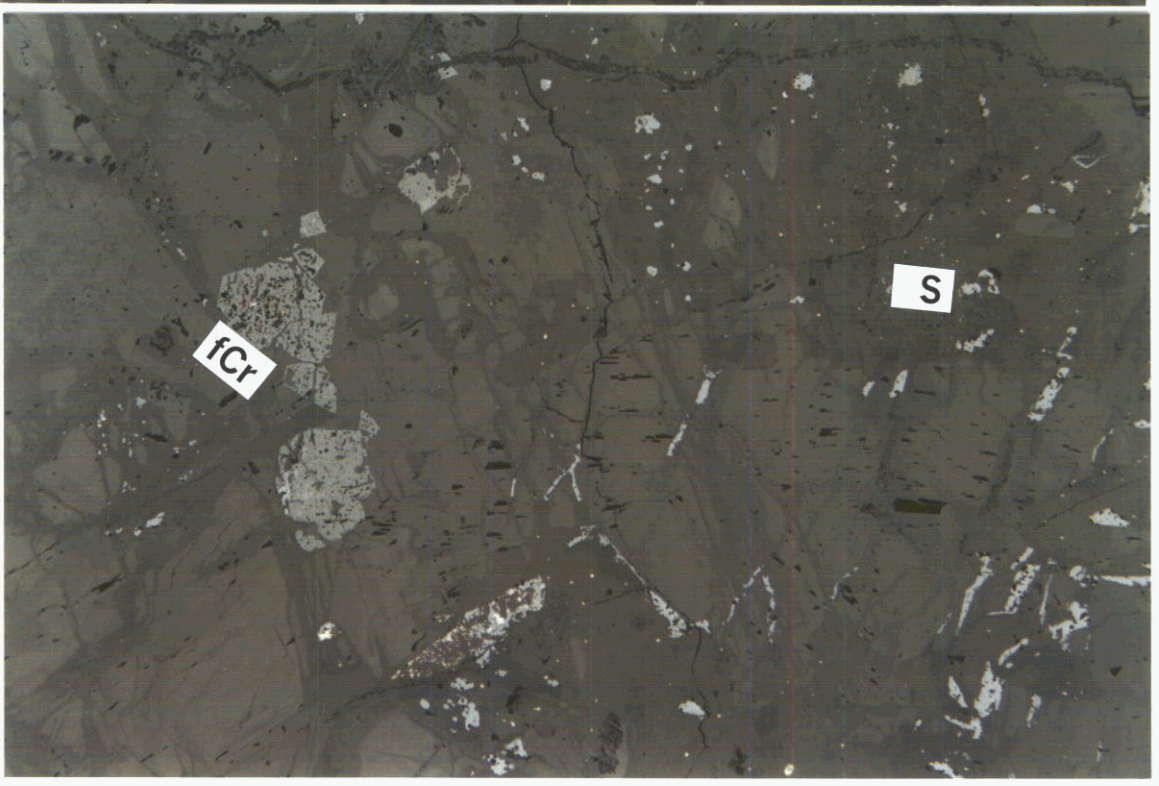
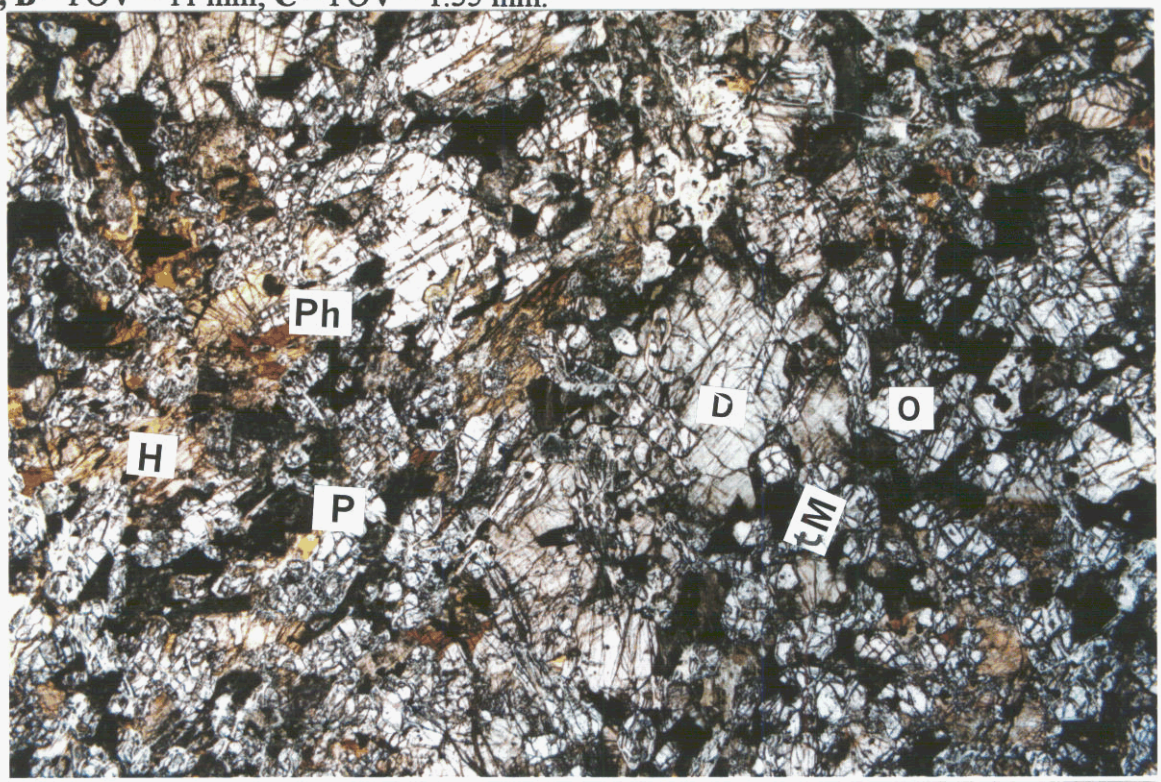


Plate 24. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C**– reflected light, show medium-grained poikilitic cumulus subhedral diopside (D) and fine-grained cumulus variably serpentinized olivine (O) with intercumulus hornblende (H), phlogopite (Ph), titanomagnetite (tM) and altered plagioclase (P).
A, B – FOV = 11 mm; **C** – FOV = 1.35 mm.

A



B

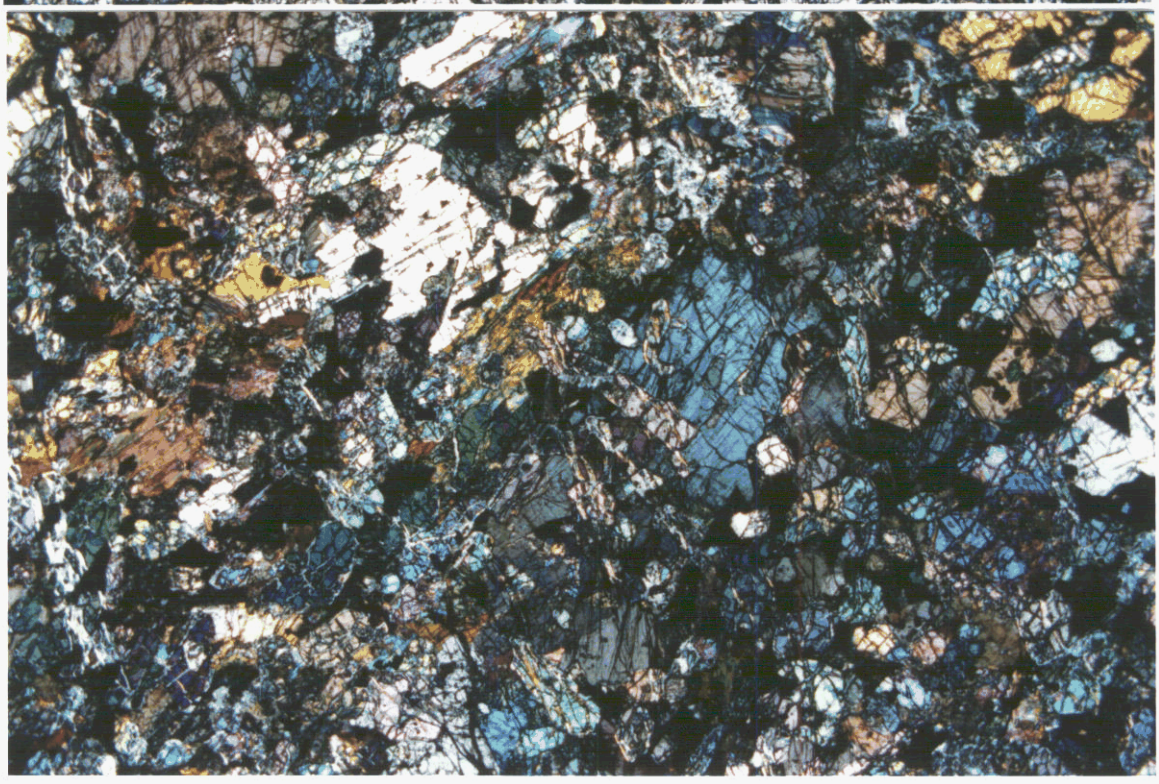


Plate 24C. Photomicrograph, reflected light, a higher magnification of Plate XX, shows very fine-grained euhedral cumulus chromite (Cr) as inclusions in relict olivine (O) as well as partially and completely enclosed in serpentine (Sr). Secondary magnetite (sM) is present as filaments and minute disseminated grains in serpentine. Ultra fine-grained sulphide (S) is sparsely disseminated through serpentine. **C** – FOV = 1.35 mm.

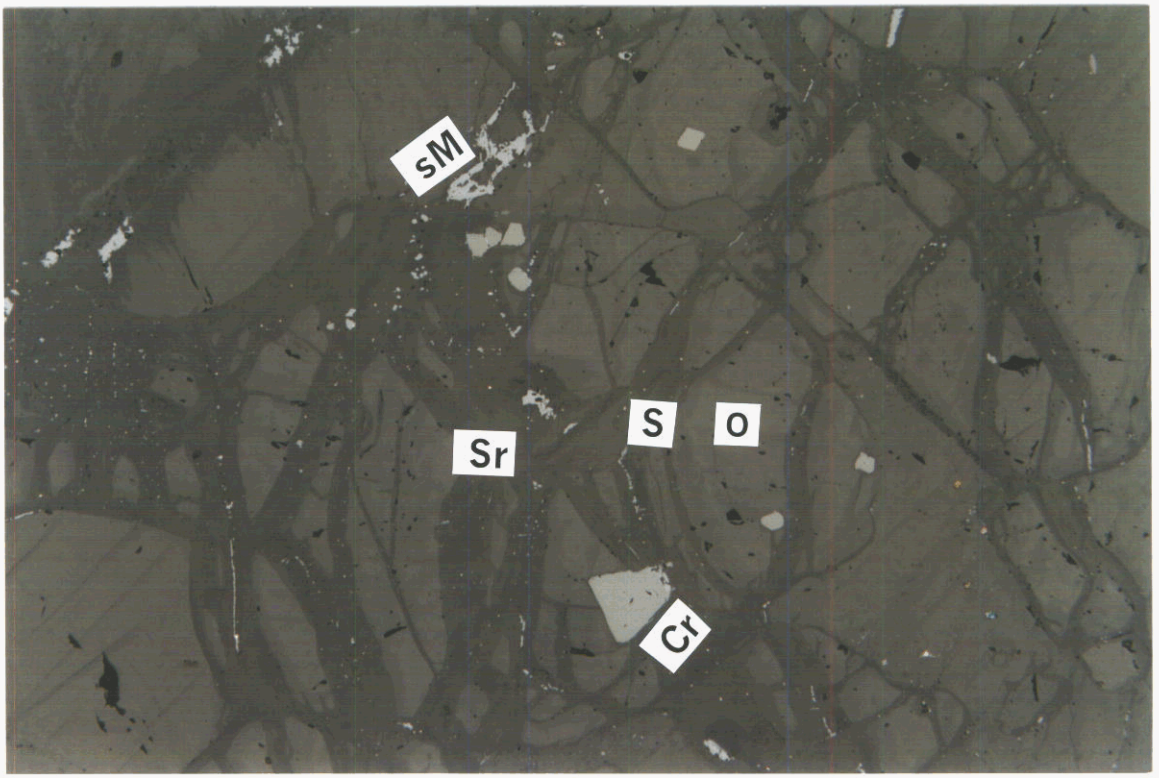
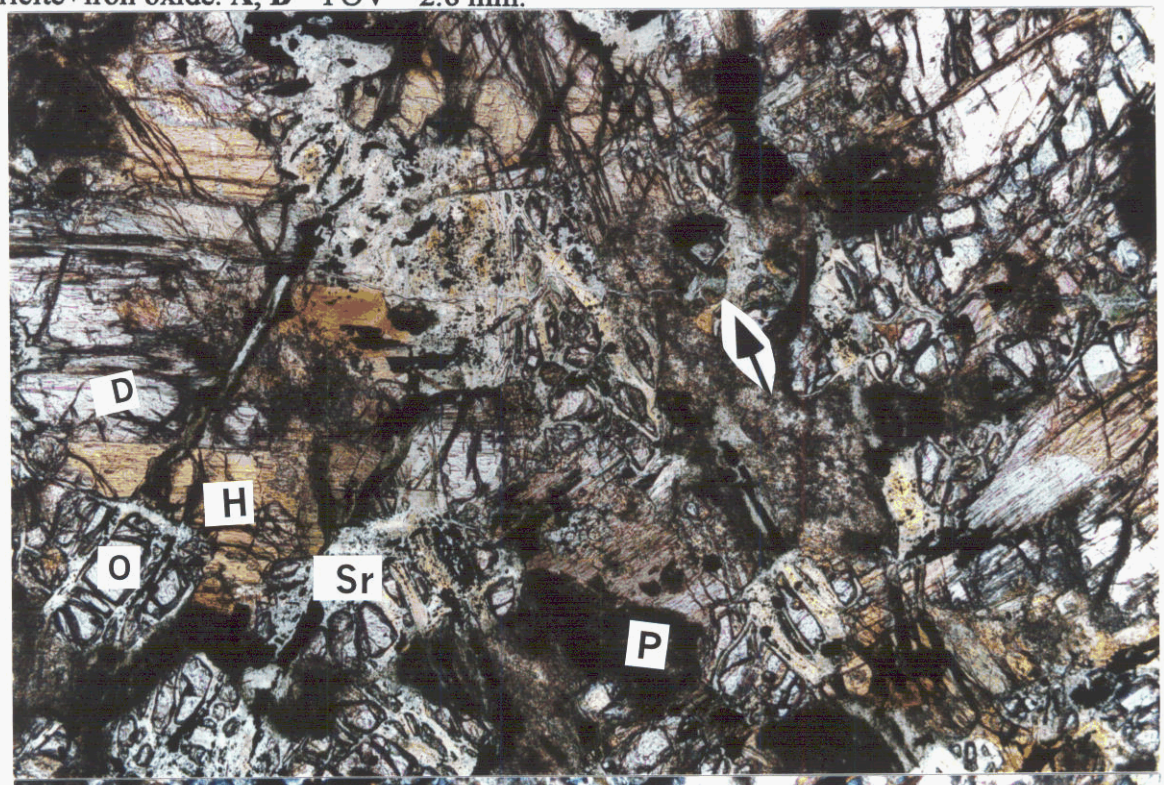
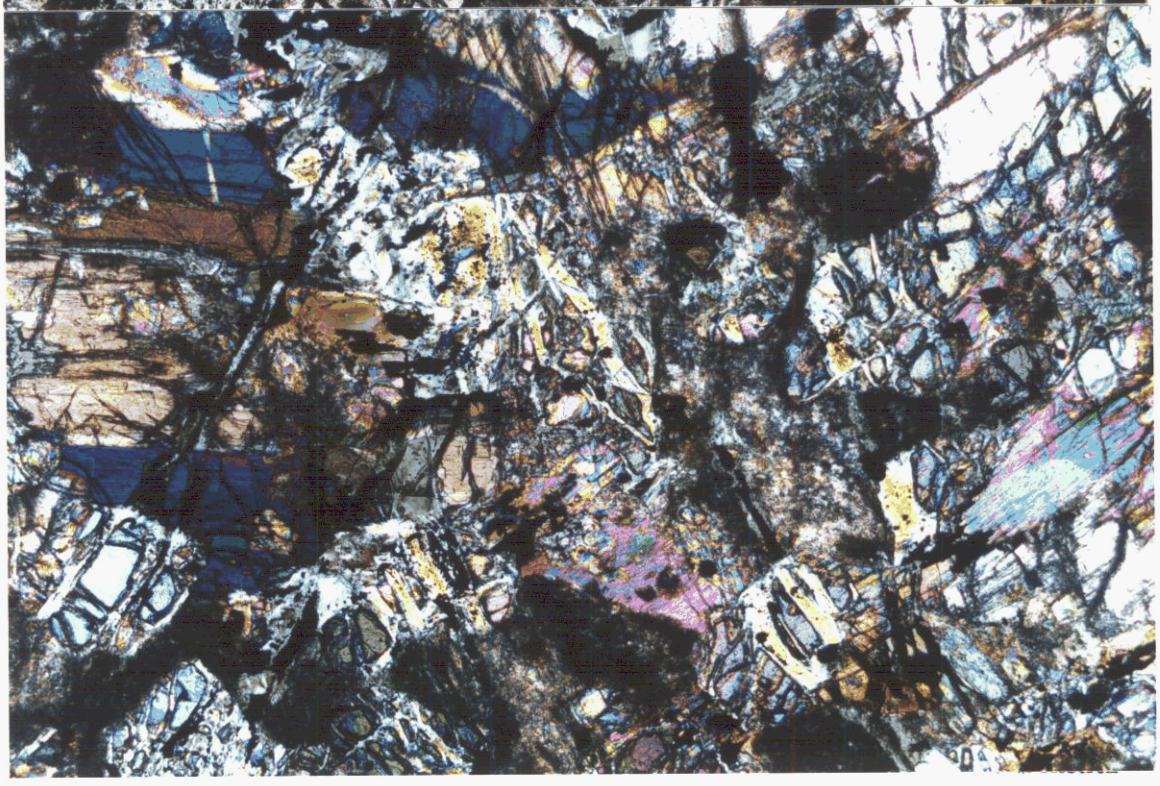


Plate 25. Photomicrographs, **A** – plane light, **B** – crossed nicols, show several textures related to primary stability of igneous mineral and to later replacement alteration. Primary: intercumulus hornblende (H) is stable with diopside (D) and can host inclusions of olivine (O). Olivine is replaced by serpentine (Sr) and locally the serpentine has a green hue, possibly due to chromium remobilization (arrow). Altered plagioclase (P) has that typical mottled opaque to semi-opaque appearance, inferred to be due to a mixture of sericite+iron oxide. **A**, **B** – FOV = 2.8 mm.

A



B



Sample #: Onion TS-2: Sax-Cessena Embayment area

Cu 5 ppm; Ni 2190 ppm; Co 154 ppm

3 ppb Au, 44.1ppb Pt, 77.4 ppb Pd, 121.5 ppb PGE_T

Location	Northing	Easting
521345 E / 6872326 N	6872326	521345

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SUMMARY: ***serpentinized chromite-bearing dunite***. The orthocumulate igneous texture of this monomineralic ultramafic rock has been superbly preserved due to the absence of a penetrative fabric even though there has been complete serpentinization of the silicate minerals. This rock was comprised of two cumulate minerals, 99% olivine with 1% chromite. Chromite is present predominantly occupying intercumulus positions to coarser grained olivine even though chromite is present as inclusions in cumulus olivine. The serpentine pseudomorphs display a tightly packed texture, a texture inferred to be primary and formed through compaction of the cumulate olivine. This very closely packed texture of the pseudomorphs reflects the primary orthocumulate texture. Serpentine pseudomorphs after cumulate olivine vary from equant rounded, equant subhedral to oblong subhedral to rounded and vary from 0.4 – 1.5 mm in longest dimension. This rock did contain an insignificant intercumulus component and like the cumulus silicate component, the intercumulus mineral has been replaced during the hydration episode. The intercumulus mineral has been replaced by serpentine and this replacement suggests that the protomineral was pyroxene, probably orthopyroxene. Disseminated magnetite as filaments and bands is present along the boundaries of pseudomorphs and within pseudomorphs. A trace amount of ultra fine-grained sulphide, presumably pyrite, is present in secondary magnetite bands and filaments and disseminated through the serpentine pseudomorphs after olivine. This sulphide is inferred to be secondary and associated with the serpentinization process. Cumulate chromite is mantled by and veined by secondary magnetite but does not display any optical variations that indicate alteration associated with the complete serpentinization of this dunite.

TYPE: PTS
ASSEMBLAGE: serpentine-iddingsite, magnetite, chromite, sulphide (pyrite)
ESTIMATED MODE (visual): 99% serpentine-iddingsite after olivine+magnetite, 1% chromite, trace sulphide (pyrite)

MINERALOGY:

Essential:

Serpentine-iddingsite: as variably coloured composite aggregates after cumulus olivine. Colour in plane light varies from colourless to very pale yellow and the pale yellow variety is termed iddingsite due to trace amounts of inferred iron oxide, limonite. Serpentine is also as a replacement of rare intercumulus mineral to serpentine pseudomorphs after olivine. Also present as a replacement of intercumulus pyroxene.

Accessory:

Magnetite: secondary mineral formed during the serpentinization processes. Present as ultra fine-grained filaments and bands lining the interface between serpentine pseudomorphs after olivine, filaments and bands that subdivide domains within serpentine pseudomorphs after olivine and as partial to complete mantles on and filling fractures in intercumulus chromite. Also present as minute grains and irregular-shaped clusters within serpentine pseudomorphs.

Chromite: as subhedral to euhedral grains to 0.5 mm that most commonly occupy intercumulus volumes between closely packed serpentine pseudomorphs after olivine and less commonly as inclusions in serpentine pseudomorphs after olivine. Some grains have

scalloped margins, a texture inferred to represent minor replacement of chromite during the serpentinization processes. Other than the secondary magnetite mantles on chromite, there are no visible/optical colour variations in chromite that indicate that the chromite has undergone any alteration during the serpentinization process.

Sulphide: sparsely disseminated ultra fine-grained sulphide, grains up to 0.005 mm, distributed through serpentine pseudomorphs after olivine and in the magnetite-rich bands and filaments that are interstitial to pseudomorphs. These textural relationships indicate that the sulphide is secondary. This sulphide has a white yellow colour and is presumed to be pyrite.

TEXTURE & FABRIC:
No penetrative fabric but there is a well-developed fracture cleavage that is represented by a set of discontinuous micro-veinlets that are filled by serpentine+magnetite.
The igneous texture has been superbly preserved because of the absence of a penetrative fabric. Serpentine pseudomorphs vary from equant rounded, equant subhedral to oblong subhedral to anhedral and vary in size from 0.4 mm to 1.5 mm. Importantly, the pseudomorphs display a tightly packed texture with an insignificant proportion of intercumulus material. This closest packed texture has produced a very well developed triple point texture between adjacent grains and is inferred to have formed by compaction of cumulus olivine and chromite. Chromite is the commonest intercumulus mineral along with rare serpentine pseudomorphs after pyroxene, probably orthopyroxene.

ALTERATION:
Serpentinization of olivine is complete and associated with the formation of secondary magnetite and an ultra fine-grained secondary sulphide, presumably pyrite. Serpentine after trace amounts of intercumulus pyroxene

ROCK TYPE: chromite-bearing dunite.

Plate 26. Photomicrographs, **A** – plane light, **B** – crossed nicols, show the closely packed texture of the serpentinized dunite. Cumulus subhedral to euhedral olivine (O) has been completely replaced by serpentine. Secondary magnetite (sM) is localized along the boundary of pseudomorphs and in triple point junctions between pseudomorphs. Colourless serpentine is associated with a pale yellow serpentine, inferred to be the variety iddingsite. **A**, **B** – FOV = 11 mm.

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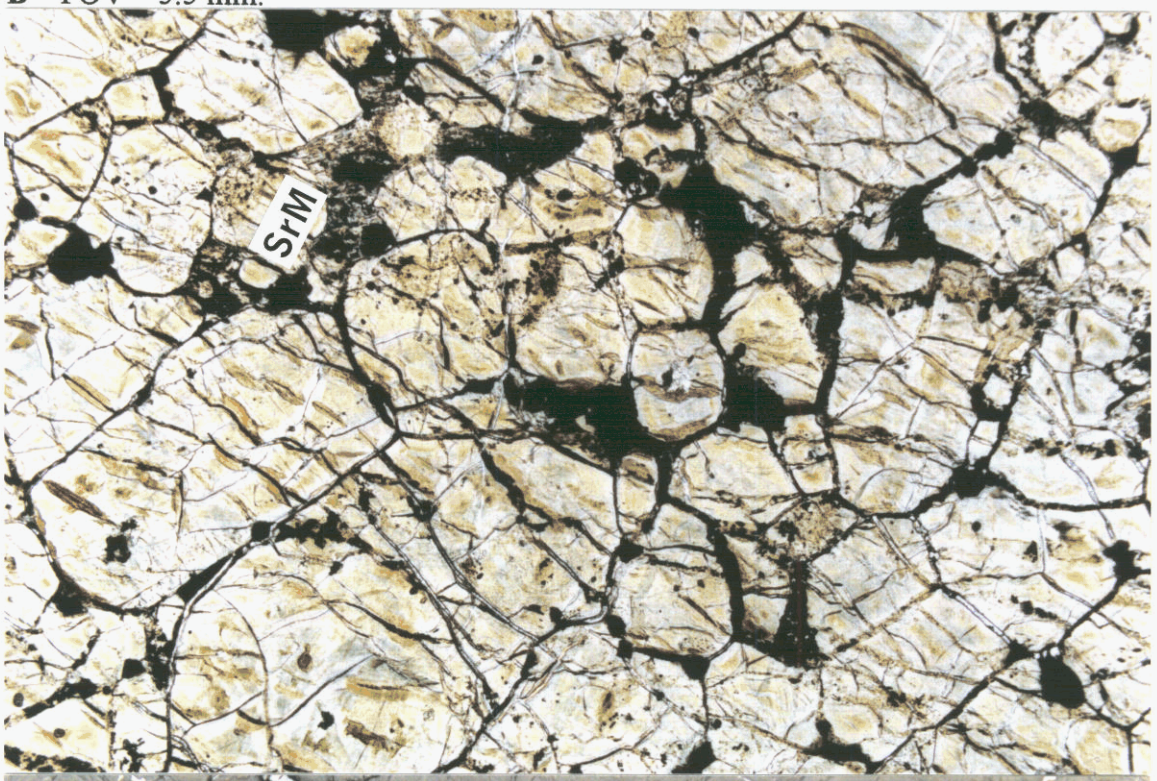
Plate 27. Photomicrographs, **A** – plane light, **B** – reflected light, are a higher magnification of the closely packed triple point textured serpentinized dunite and show the distribution of secondary magnetite (sM) filling intercumulus volumes, along the margins, as filaments in and disseminated through serpentine pseudomorphs after olivine (O). Chromite (Cr) was a cumulus mineral along with olivine. Some intercumulus volumes are comprised of serpentine+magnetite (SrM). Based on the replacement assemblage, the intercumulus mineral is inferred to have been orthopyroxene.
A, **B** – FOV = 5.5 mm.

A



B

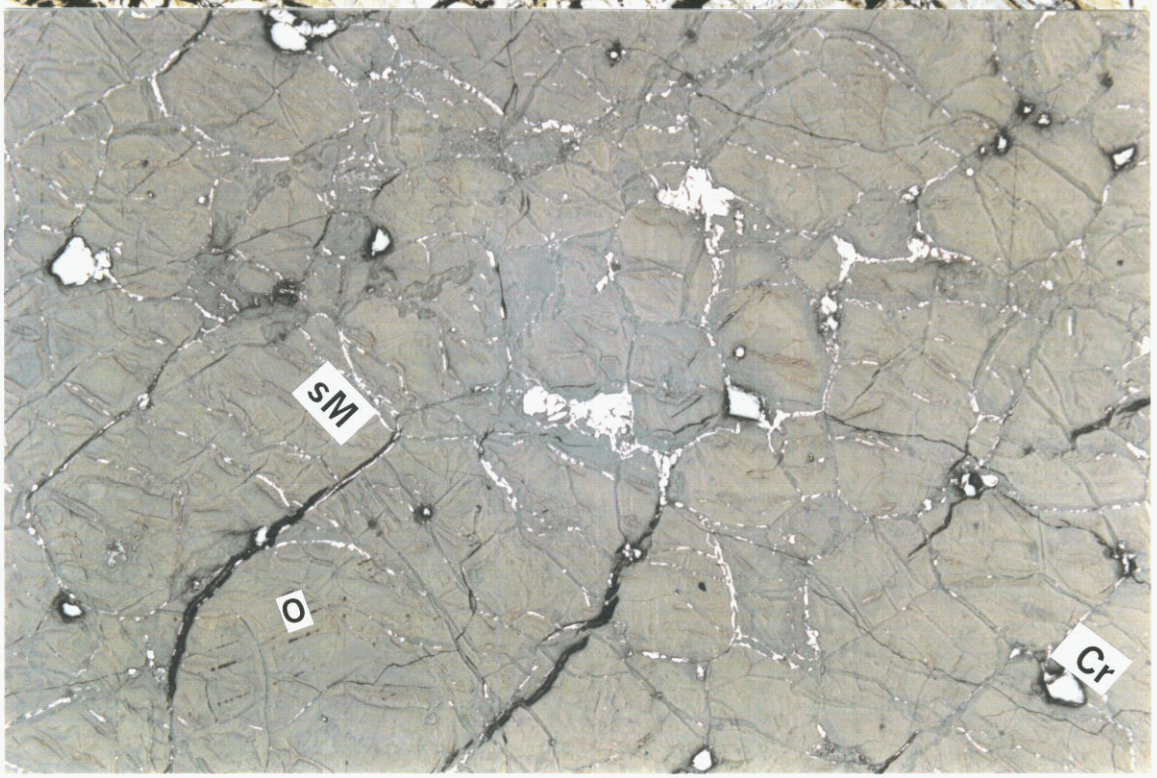
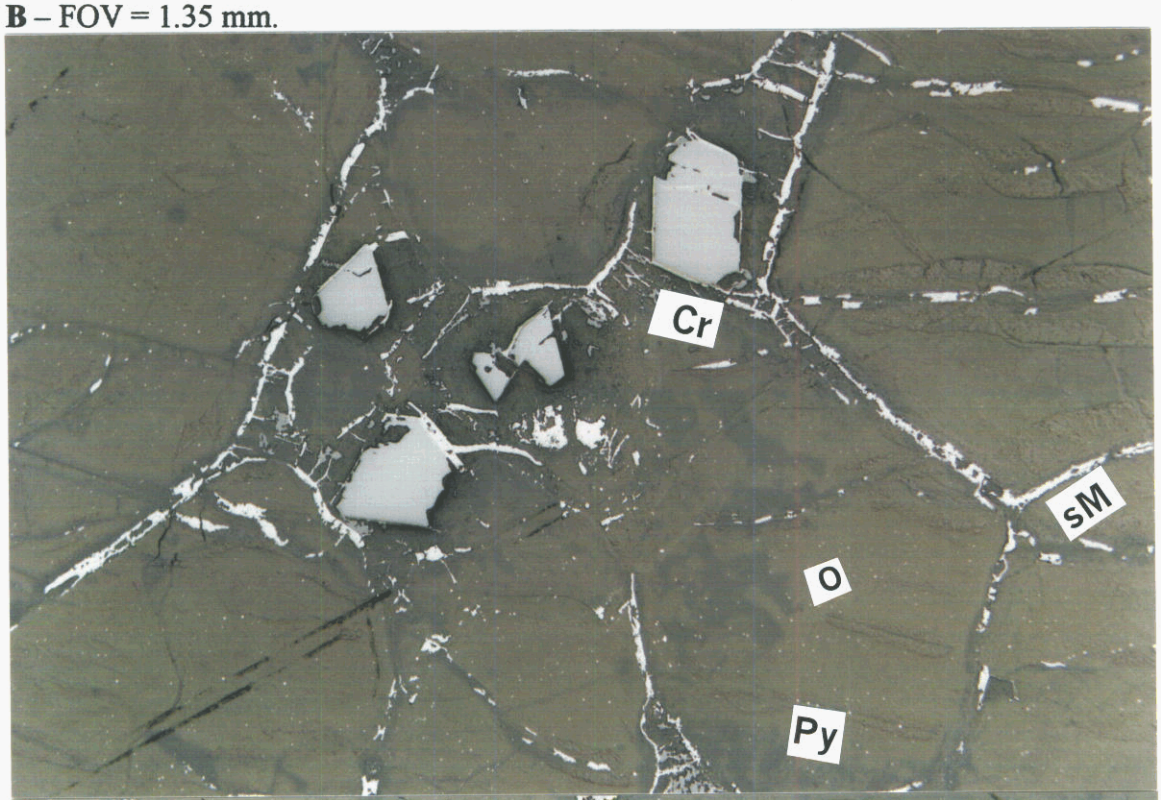


Plate 28. Photomicrographs, **A**, **B** – reflected light, show the two textural associations of cumulus chromite (Cr) to serpentine pseudomorphs after cumulus olivine (O): in **A**, between olivine and in **B**, as inclusions in olivine. Cumulus chromite is mantled by and micro-veins are filled with secondary magnetite (sM). Ultra fine-grained secondary sulphide, presumably pyrite (Py), is disseminated through serpentine after olivine and associated with magnetite bands between serpentine pseudomorphs after olivine.
A, **B** – FOV = 1.35 mm.

A



B

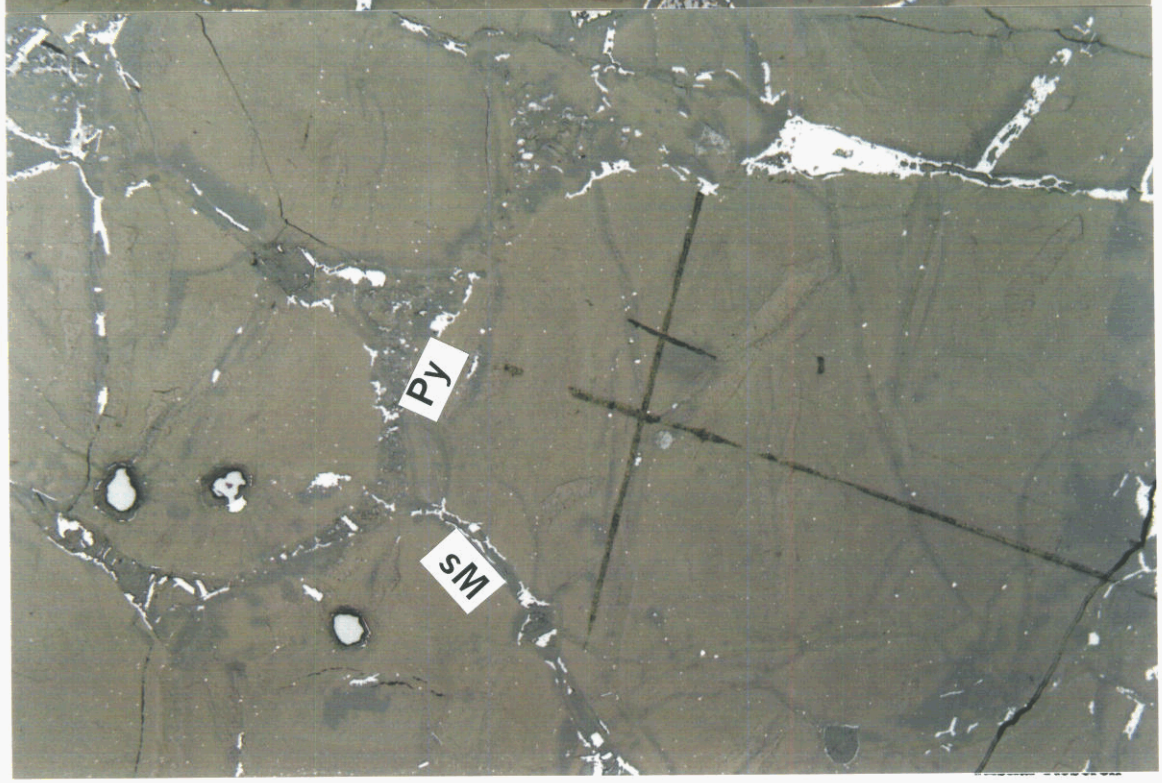


Plate 29. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, show the closely packed texture of serpentinized cumulus olivine (O) with cumulus chromite (Cr) and intercumulus volumes occupied by serpentine+magnetite (SrM). These serpentine+magnetite pseudomorphs suggest that there was a trace intercumulus orthopyroxene component in this dunite. The concentration of secondary magnetite along the margins of serpentine pseudomorphs after olivine accents the size and habit of cumulus olivine. **A, B, C** – FOV = 2.8 mm.

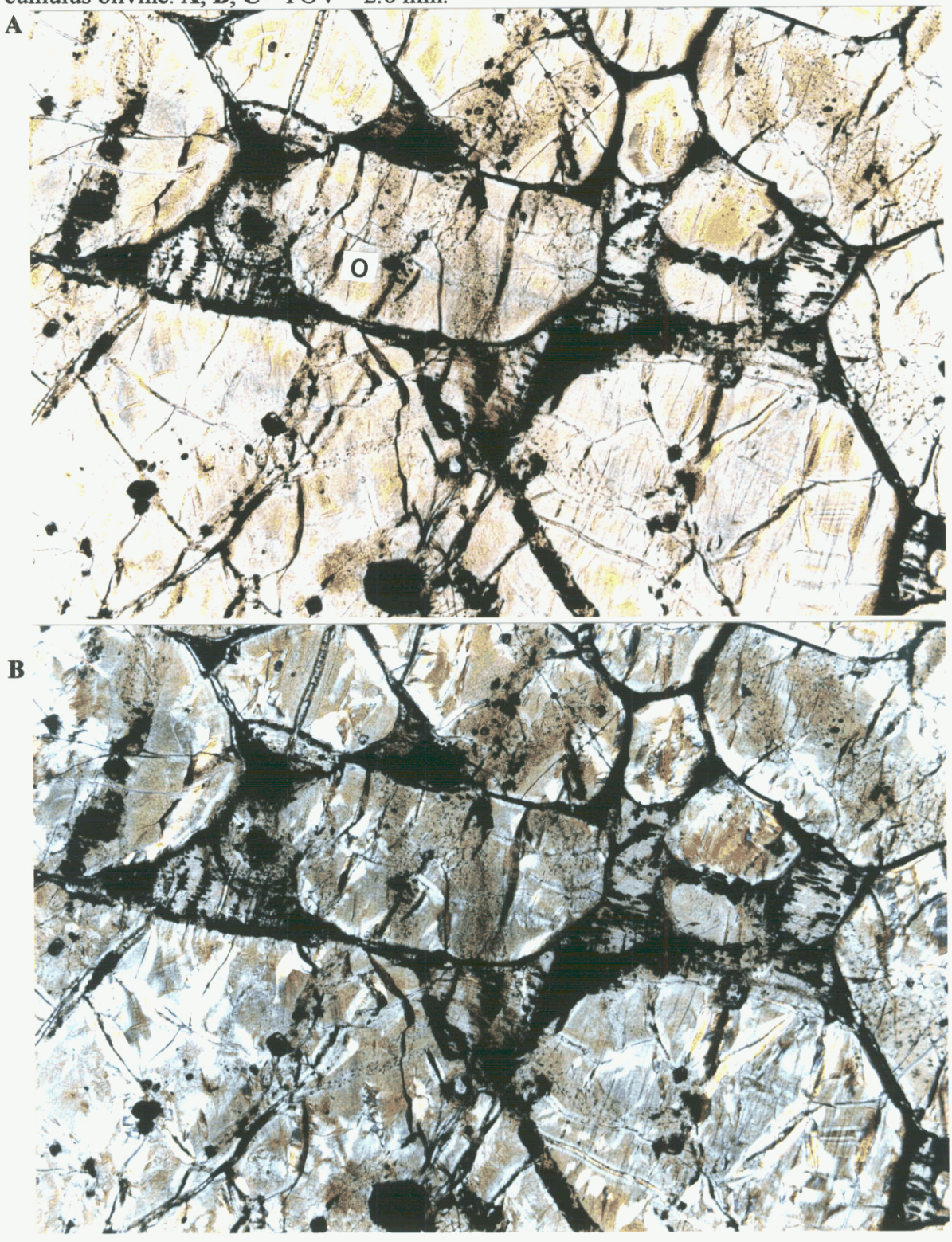


Plate. 29C.

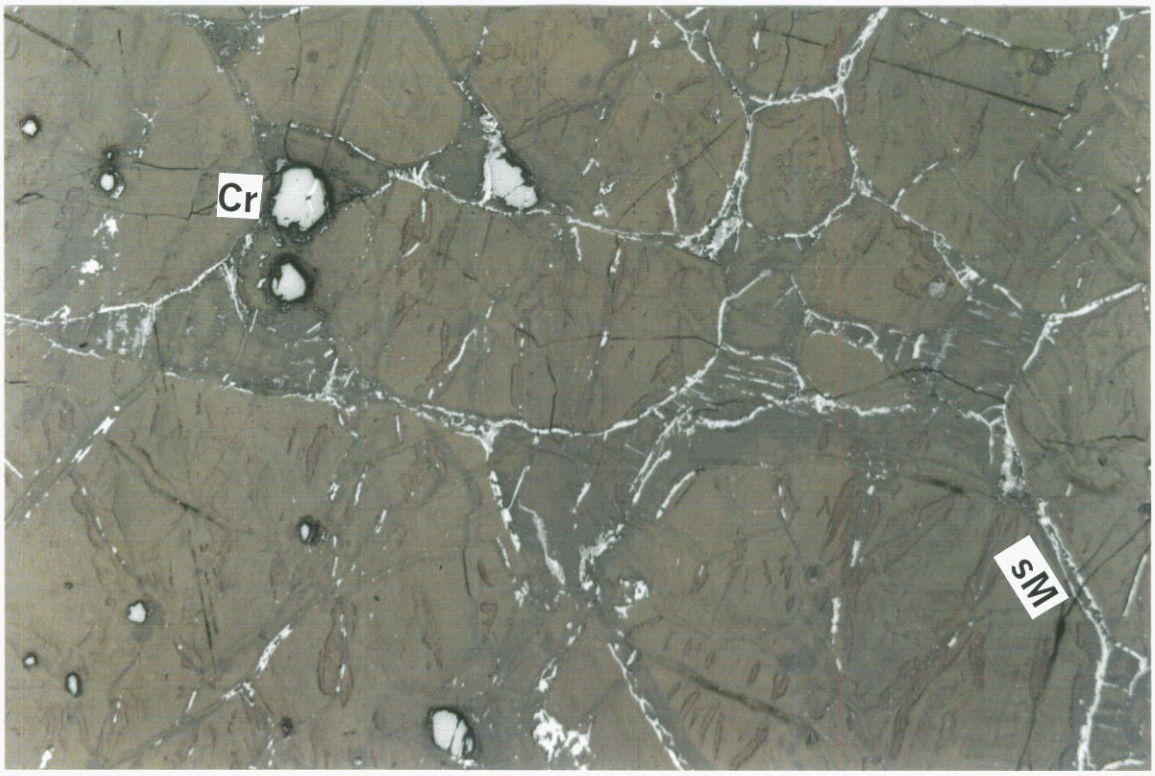


Plate 30.Photomicrograph, reflected light, shows a weakly altered cumulus chromite. The original habit of the euhedral chromite is outlined by the discontinuous mantle of secondary magnetite (sM). The edge of the chromite has been corroded and replaced by silicate, serpentine. Secondary magnetite-filled veinlets crosscut the chromite. FOV = 0.67 mm.

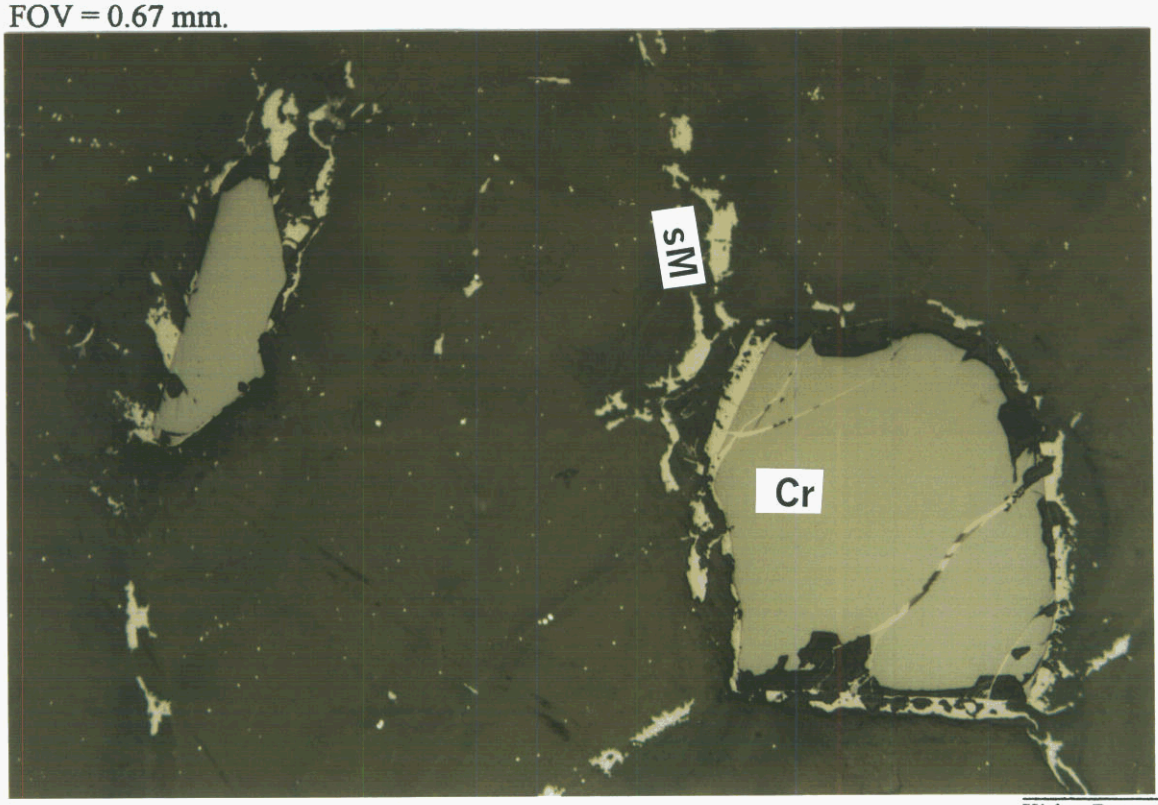
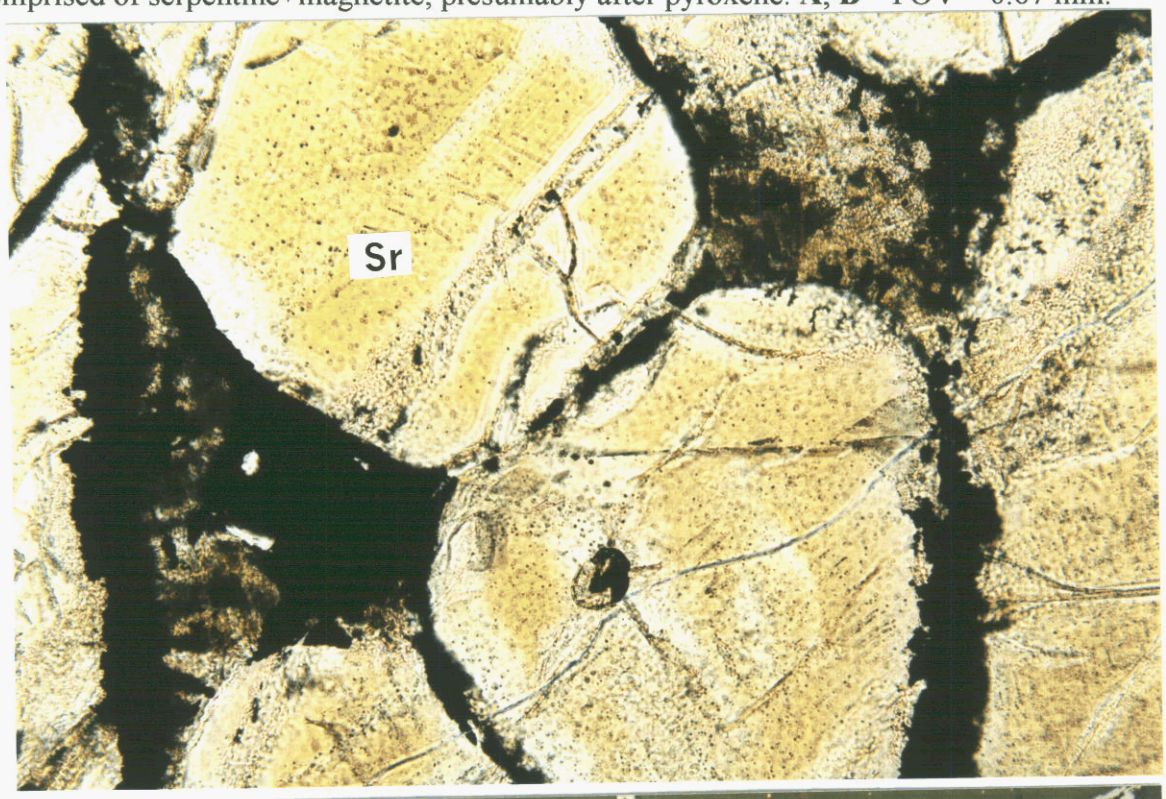
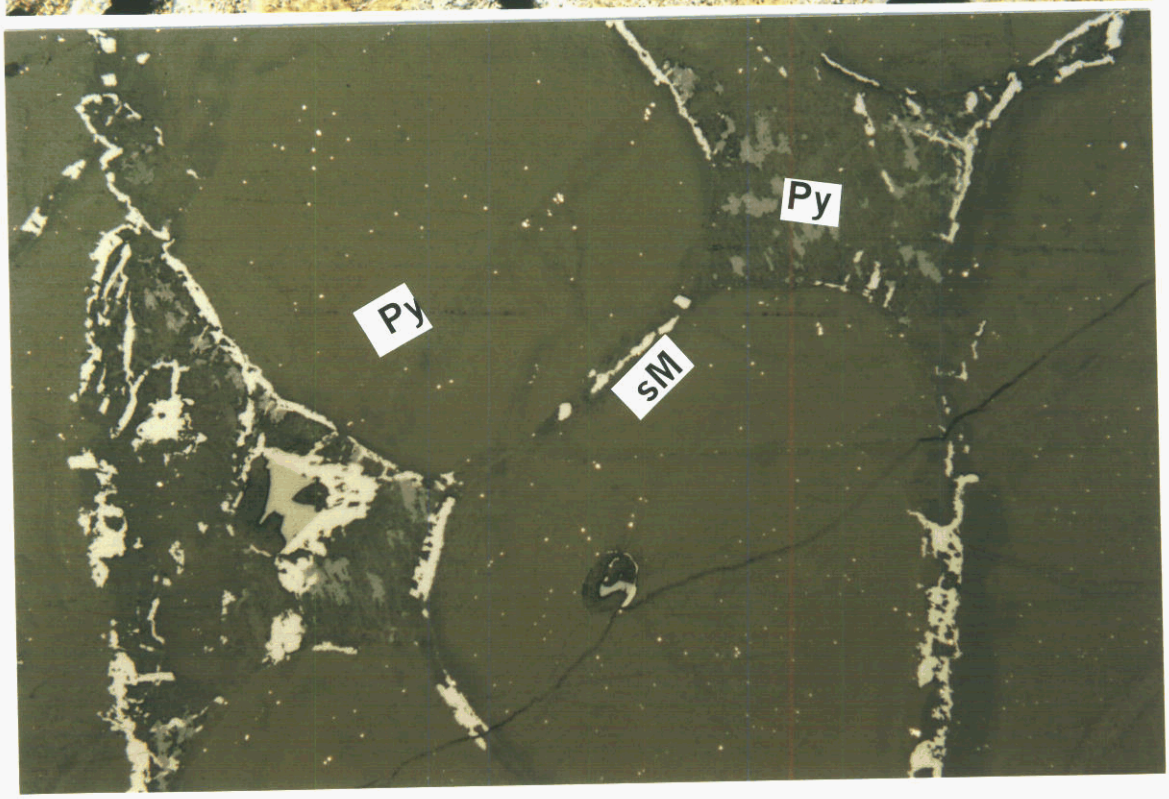


Plate 31. Photomicrographs, **A** – plane light, **B** – reflected light, show the distribution of secondary magnetite (sM) and ultra fine-grained sulphide, presumably pyrite (Py) through serpentine (Sr) after olivine and through the intercumulus volume which is comprised of serpentine+magnetite, presumably after pyroxene. **A**, **B** – FOV = 0.67 mm.

A



B

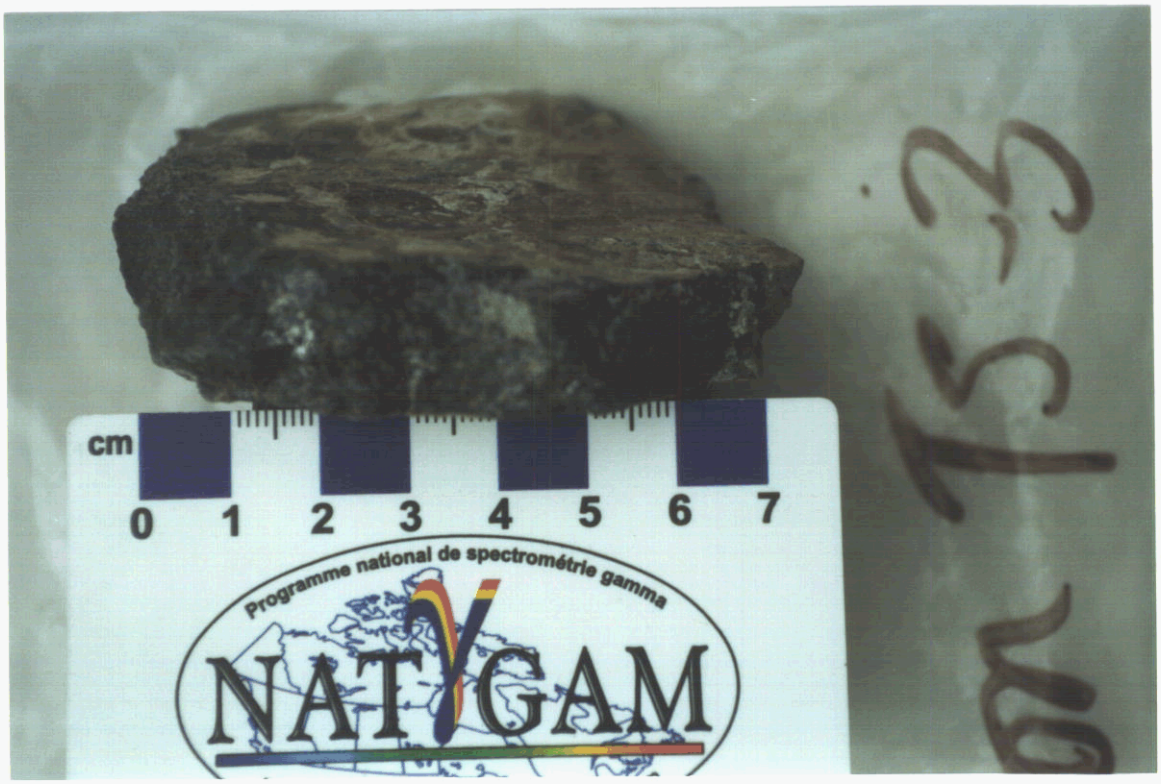


Sample #: Onion TS-3: Sax-Cessena Embayment area

Cu 5 ppm; Ni 2030 ppm; Co 142 ppm

4 ppb Au, 45.7 ppb Pt, 107 ppb Pd, 152.7 ppb PGE_T

Location	Northing	Easting
521284 E / 6872283 N	6872283	521284



Kishar Reserch

SUMMARY: ***serpentinized chromite-bearing dunite***. This rock is identical to sample Onion TS-2 with respect to the complete serpentinization of the silicate minerals, modal abundance of cumulate olivine and chromite to rare intercumulus pyroxene. Fine- to medium-grained, <1 – 2 mm, cumulus olivine (serpentine-iddingsite pseudomorphs after olivine) formed a very closely packed orthocumulate texture i.e. well developed triple point texture between adjacent grains. Either cumulus chromite or very rare serpentine+magnetite pseudomorphs after pyroxene occupied the intercumulus volumes. The pyroxene is inferred to have been an orthopyroxene based on the replacement by serpentine+magnetite. Secondary ultra fine-grained, <0.005 mm, sulphide, presumably pyrite is present in secondary magnetite-filled bands and filaments that are interstitial to serpentine pseudomorphs after olivine and sparsely disseminated through serpentine pseudomorphs after olivine.

TYPE: PTS
ASSEMBLAGE: serpentine-iddingsite, magnetite, chromite, sulphide (pyrite)
ESTIMATED MODE (visual): 99% serpentine-iddingsite after olivine+ magnetite+serpentine after pyroxene, 1% chromite, 1% sulphide (pyrite)

MINERALOGY:

Essential:

Serpentine-iddingsite: Serpentine-iddingsite pseudomorphs after olivine constitutes ~98% of this rock. Also trace amounts of serpentine after an intercumulus mineral assumed to be pyroxene.

Accessory:

Magnetite: secondary magnetite formed during the serpentinization of olivine. Present as discontinuous filaments and bands interstitial to and crosscutting pseudomorphs. Also sparsely disseminated through pseudomorphs. Commonly form partial to complete mantles around and fill fractures in cumulus chromite.

Chromite: as subhedral to euhedral grains interstitial to serpentine pseudomorphs after olivine and as inclusions in serpentinized olivine. Under high magnification, the margins of some chromite grains are scalloped, a texture that suggests there has been minor dissolution of chromite during the serpentinization process. Chromite grains vary from <0.05 – 0.4 mm.

Sulphide (pyrite): trace amount as minute grains, <0.005 mm, in secondary magnetite and sparsely disseminated through serpentine pseudomorphs after olivine. Based on the white yellow colour this sulphide is inferred to be pyrite.

TEXTURE & FABRIC:

The alignment of narrow discontinuous serpentine-magnetite bands that cut across the serpentine pseudomorphs after olivine define a weakly developed fracture cleavage associated with the serpentinization episode.

The igneous texture is superbly preserved even though this rock has sustained complete serpentinization. An orthocumulate texture was present in the protolith and was formed by two cumulus minerals and a trace amount of an intercumulus mineral. The cumulus

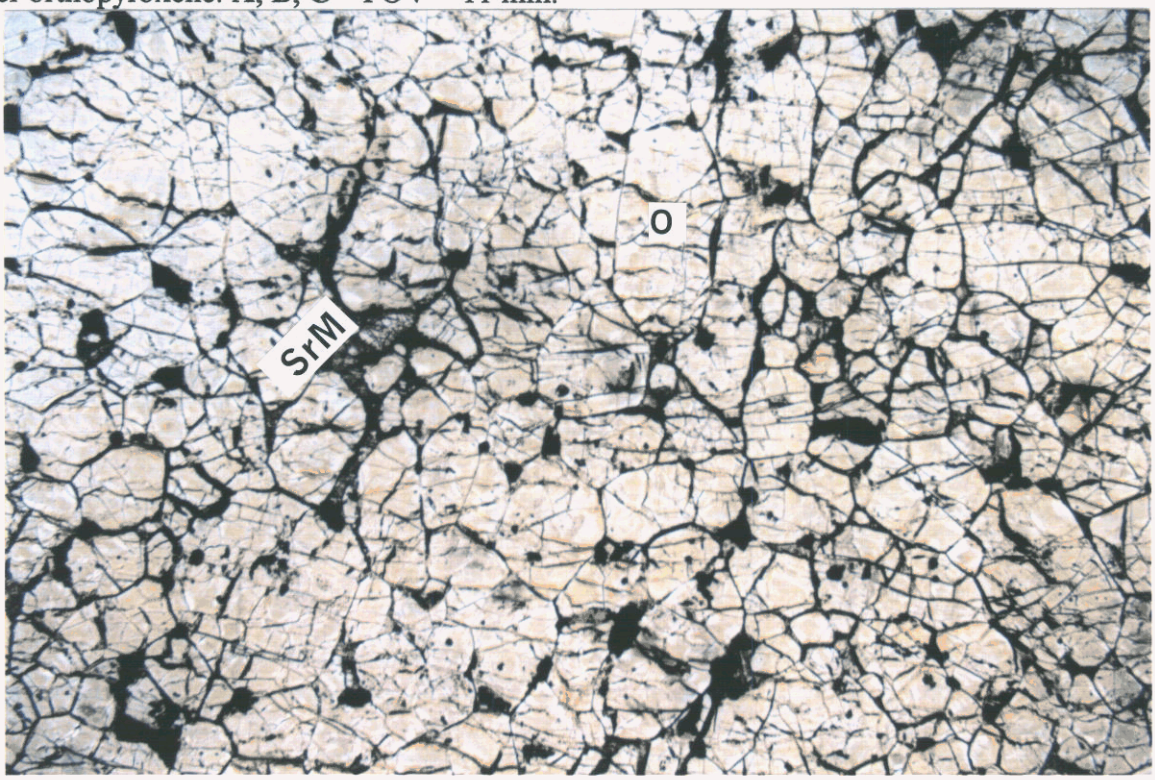
minerals were olivine and chromite and the intercumulus mineral is inferred to have been an orthopyroxene since it has been replaced by serpentine+magnetite.
Serpentine pseudomorphs after olivine Serpentine pseudomorphs after olivine vary from 0.4 – 2.0 mm and the pseudomorphs display a very tightly close-packed texture and a very small intercumulus volume, <1%. This intercumulus volume is filled by cumulus chromite and rarely by an anhedral pseudomorphs of serpentine+magnetite after pyroxene.

ALTERATION:
Complete serpentinization of cumulus olivine and rare intercumulus pyroxene.

ROCK TYPE: chromite-bearing dunite.

Plate 32. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, show a closely packed texture of a serpentinized dunite that is identical to sample TS-2. Cumulus olivine (O) replaced by serpentine is associated with cumulus chromite (Cr) and rare intercumulus volumes comprised of serpentine+magnetite (SrM), the latter possibly after orthopyroxene. **A**, **B**, **C** – FOV = 11 mm.

A



B

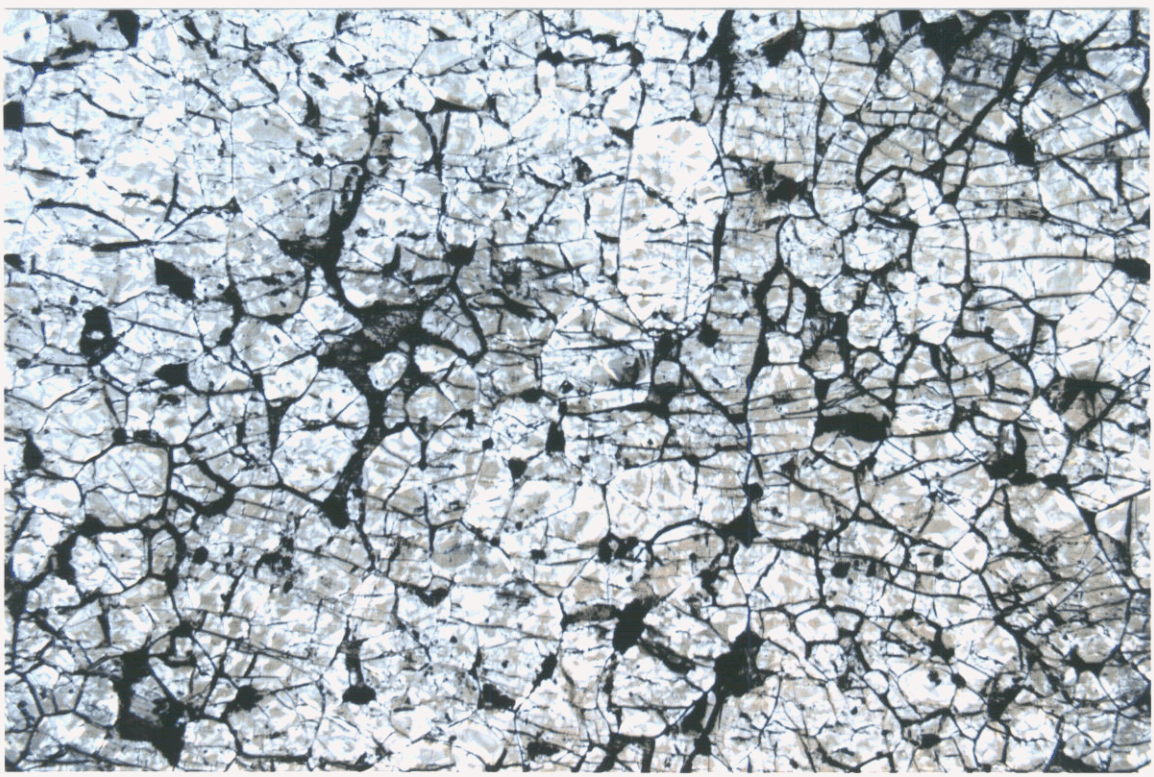


Plate. 32C cont'd.

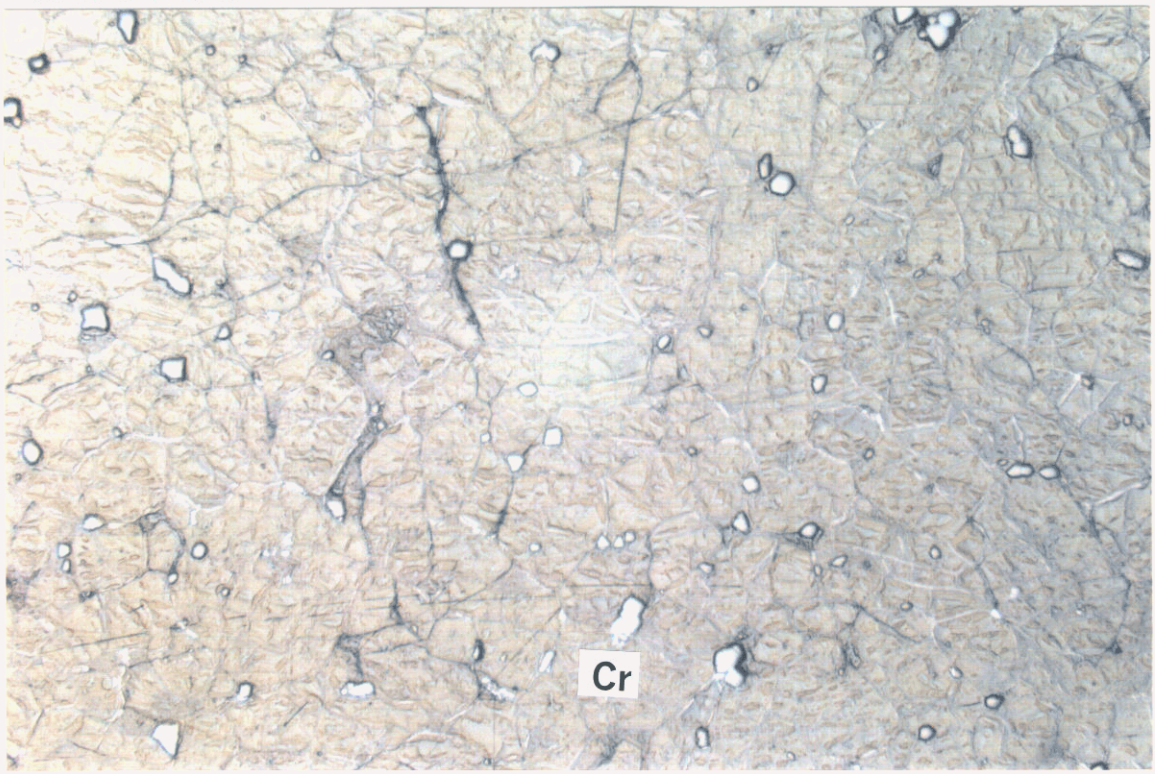
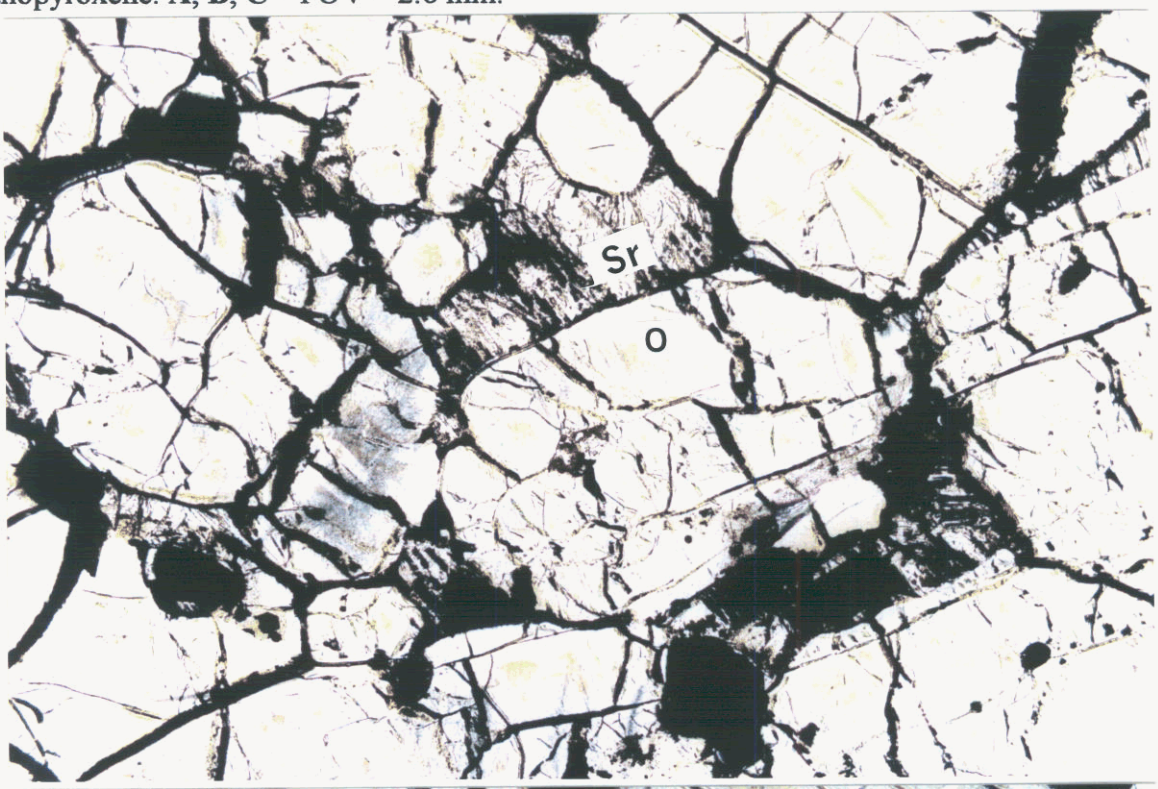


Plate 33. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, a higher magnification of the texture shown in Plate 32, show the orthocumulate texture formed by the cumulus minerals, subhedral olivine (O- now present as serpentine pseudomorphs after olivine) and euhedral chromite (Cr), and a minor intercumulus component now represented by serpentine, presumably after orthopyroxene. Cumulus chromite is present interstitial to olivine and as inclusions in olivine and the intercumulus orthopyroxene. **A**, **B**, **C** – FOV = 2.8 mm.

A



B

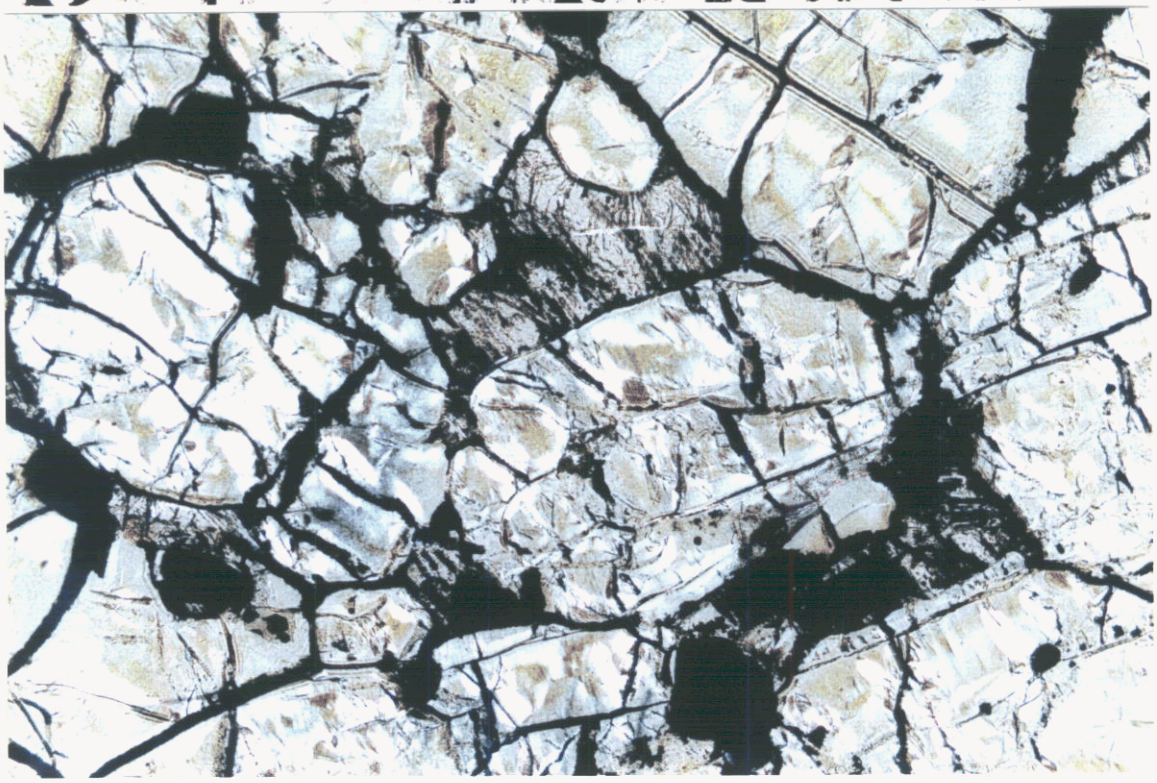


Plate. 33C. Secondary magnetite (sM) is present as discontinuous filaments within and along the grain boundaries of serpentine pseudomorphs after olivine.

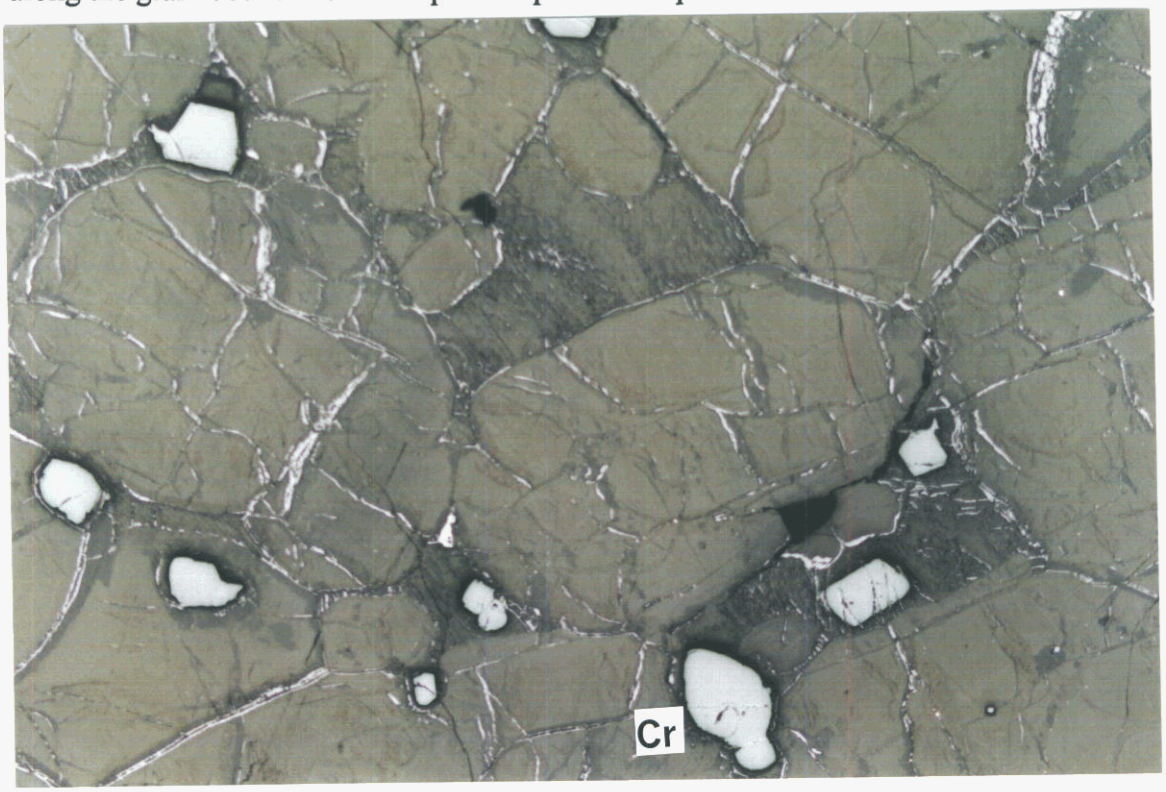


Plate 34. Photomicrographs, **A** – plane light, **B** – reflected light, show the texture of secondary magnetite (sM) within some of the intercumulus volumes. Secondary magnetite has a blade-like habit that suggests that it has nucleated along a cleavage plane. This texture suggests that the precursor mineral could have been mica, possibly phlogopite. Trace amounts of ultra fine-grained sulphide, presumably pyrite (Py), is hosted in secondary magnetite bands, clots and disseminated through serpentine pseudomorphs. **A**, **B** – FOV = 2.8 mm.

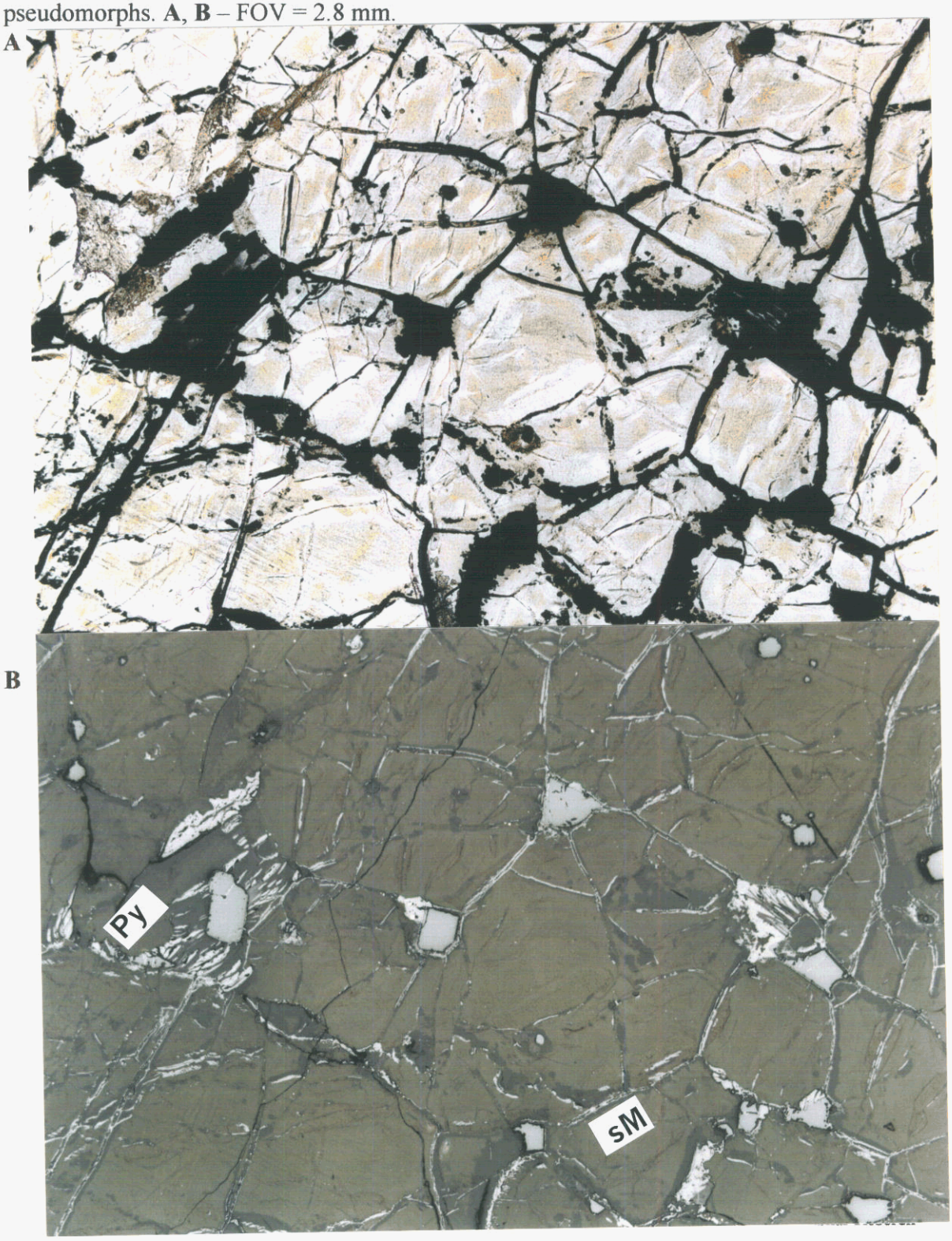
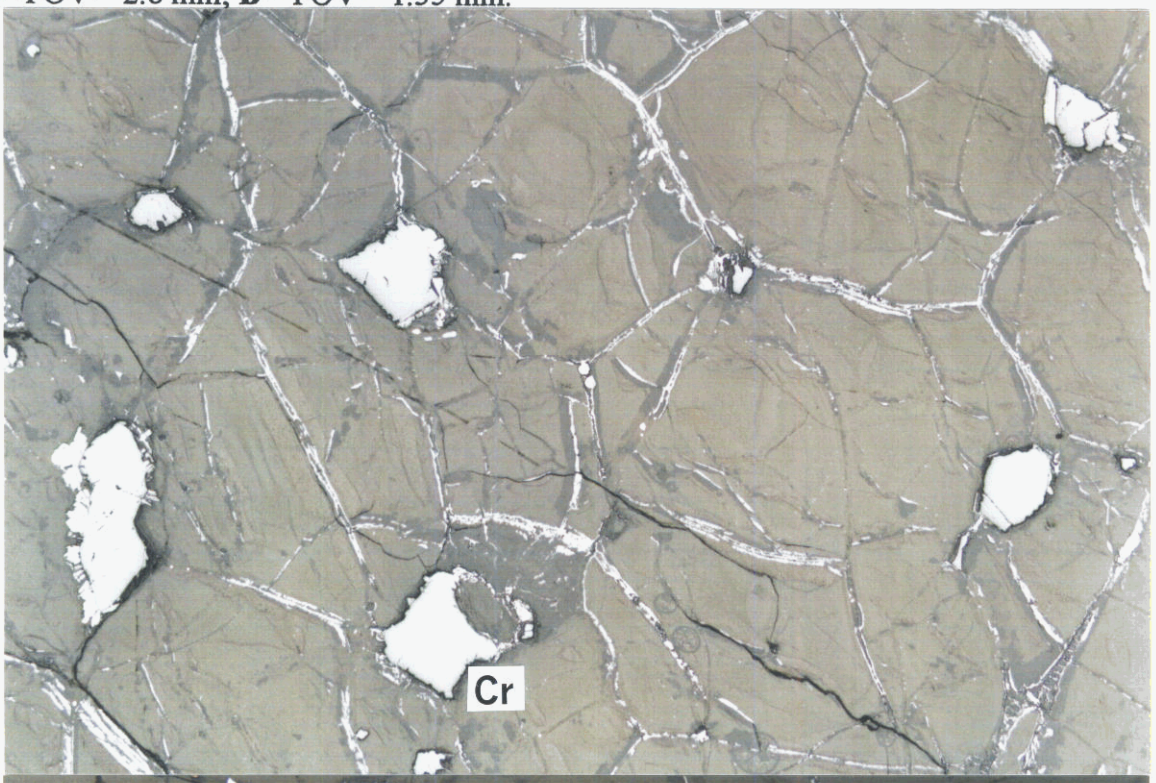


Plate 35. Photomicrographs, **A**, **B** – reflected light, show incipient alteration textures that are present in cumulus chromite when enveloped by serpentine+magnetite. The outer edges of chromite (Cr) grains in contact with serpentine can be serrated or delicately scalloped, a feature that indicates corrosion of chromite during the serpentinization process. Fractures in chromite are filled with secondary magnetite. Intercumulus sulphide is not present and the minute secondary sulphide is related to the serpentinization process. **A** – FOV = 2.8 mm; **B** – FOV = 1.35 mm.

A



B

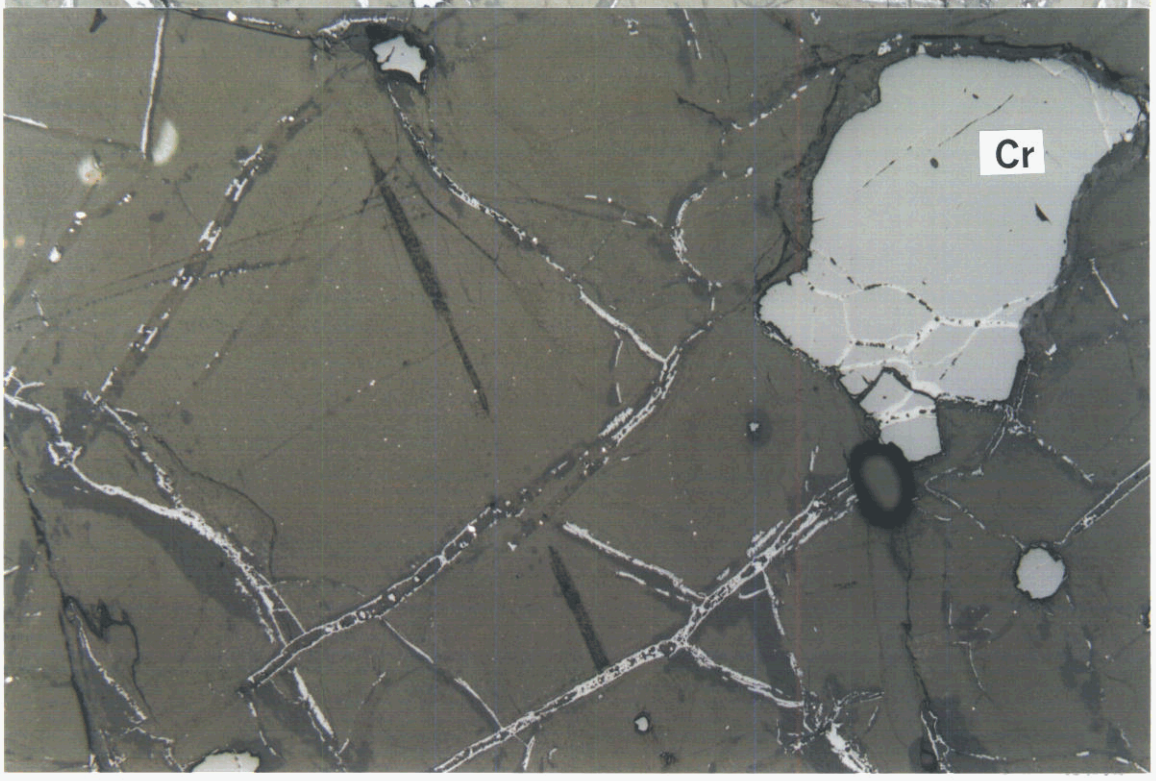
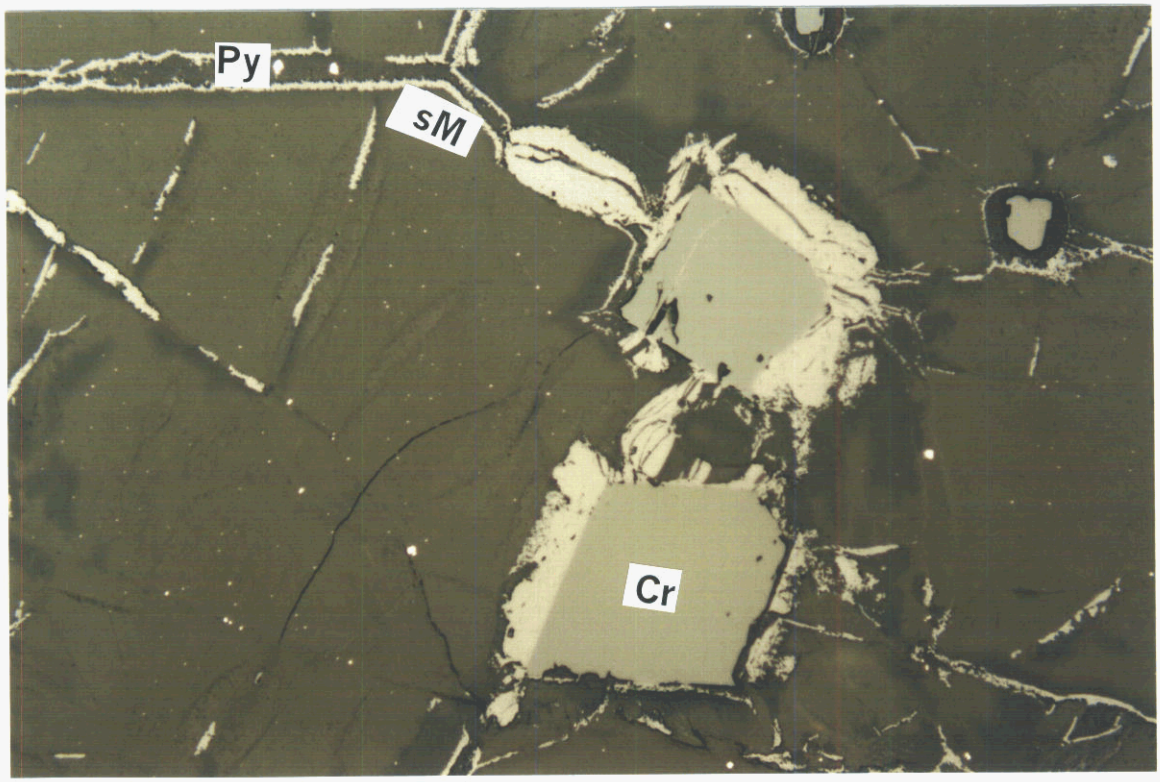


Plate 36. Photomicrograph, reflected light, shows cumulus euhedral chromite mantled by secondary magnetite (sM) and incipient corrosion of the chromite where it has not been armoured by magnetite. Ultra fine-grained sulphide is disseminated through the serpentine after olivine. FOV = 0.67 mm.



Sample #: Onion TS-4: Sax-Cessena Embayment area

Cu 57 ppm; Ni 248 ppm; Co 41 ppm

9 ppb Au, 1 ppb Pt, 1 ppb Pd, 2 ppb PGE_T

Location	Northing	Easting
3+95 S / 0+55 E	6872463	521429

Kishar Reserch

SUMMARY: ***contact between serpentinized dunite and an intermediate intrusive rock.*** The serpentinized dunite is similar to TS-2 and TS-3, closely packed cumulate olivine and chromite and complete serpentinization of the cumulate olivine. The intermediate rock chilled against the ultramafic rock, indicated by a 10-cm glassy porphyritic contact zone. The proportion of micro-phenocrysts increases away from the contact. At greater than 10 cm, the phenocrysts population in the intermediate intrusive rock is comprised of plagioclase micro-phenocrysts and microlites and diopside micro-phenocrysts, both hosted in an ultra fine-grained hematite-stained possibly devitrified glassy groundmass. This intermediate intrusive could be equivalent to TS-1?

TYPE: PTS
ASSEMBLAGE: ultramafic lithology: serpentine, magnetite, chromite;
intermediate lithology: clay/chlorite, diopside, plagioclase, glass and glassy groundmass, iron oxide, magnetite, sulphide, sericite.

MINERALOGY:

Ultramafic lithology

Essential:

Serpentine: pseudomorphs after olivine. Pseudomorphs to 0.6 mm.

Accessory:

Magnetite: present as disseminations through serpentine pseudomorphs, concentrated as bands between pseudomorphs and concentrated in the interstitial domains between pseudomorphs.

Chromite: as euhedral cumulate grains to 0.2 mm interstitial to and as inclusions in serpentine pseudomorphs after olivine.

Intermediate lithology:

Essential:

Glass and hematite-stained very fine-grained glassy groundmass: gradational zone having a width of about 10 cm that grades from glass with few bi-pyramidal phenocrysts into glass with a greater abundance of phenocrysts then into an hematite-stained very fine-grained glassy groundmass with two phenocrysts.

Diopside: stubby anhedral to subhedral phenocrysts to 0.3 mm.

Sericite: as minute platelets inferred to be after feldspar and this mineral is best observed in the clear domains that have not been overprinted by iron oxide.

Iron oxide: staining through the very fine-grained glassy groundmass.

Accessory:

Clay/chlorite: two textural associations: 1) replacement of bi-pyramidal phenocrysts in the glassy portion and of feldspar microlites in the hematite-stained very fine-grained glassy groundmass. 2) irregular shaped, subequant to oblong, micro-domains up to 0.5 mm. These could have been gas cavities

Plagioclase: microlites in the hematite-stained very fine-grained glassy groundmass.

Magnetite: euhedral grains to 0.03 mm sparsely distributed through the hematite-stained very fine-grained glassy groundmass.

Sulphide: trace amount; grains to 0.005 mm sparsely distributed through the hematite-stained very fine-grained glassy groundmass. Inferred to be pyrite.

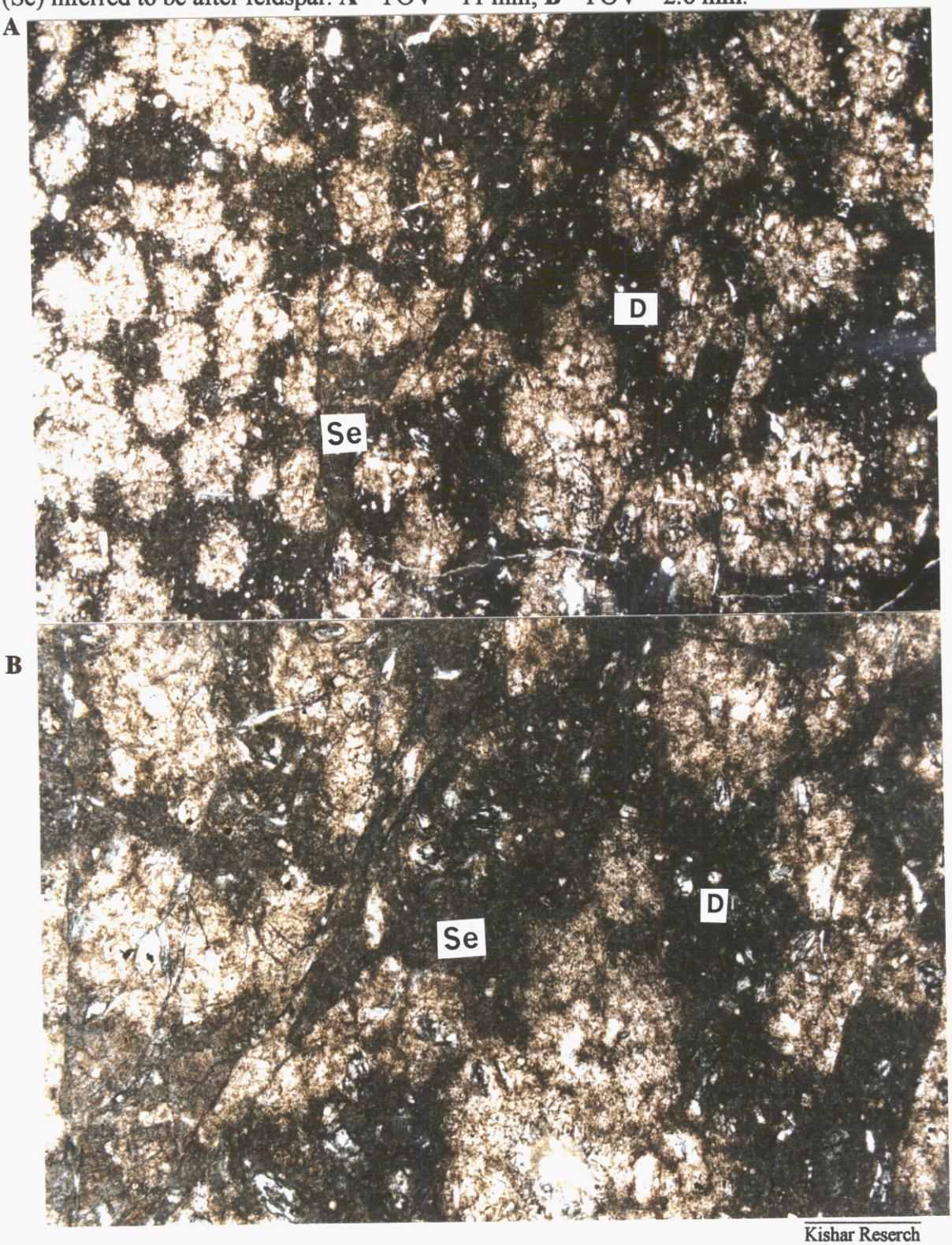
TEXTURE & FABRIC:
This section is cut across the chilled contact between a rock of intermediate composition and an ultramafic rock. The intermediate composition rock chilled against the ultramafic rock as indicated by the glassy contact zone, approximately 10 cm in width. The remainder of the intermediate rock is comprised of micro-phenocrysts of diopside, altered plagioclase phenocrysts and altered microlites of feldspar hosted in a ultra fine-grained to glassy groundmass.

ALTERATION: Both rock types have sustained hydration. The dunite appears similar to TS-2 and TS-3 and has sustained complete serpentinization of the cumulate olivine. The intermediate rock has been overprinted by a clay/chlorite episode that is represented by clay/chlorite filling of micro-domains inferred to have been gas cavities and the replacement of feldspar phenocrysts and microlites.

ROCK TYPE: dunite intruded by an intermediate rock comprised of feldspar+diopside. Could this intermediate rock be equivalent to TS-1?

Plate 37. Composite photomicrograph, plane light, shows the intrusive contact between a dunite (on the left) and an intermediate intrusive rock that is chilled contact against the dunite. The light green band (marked by the two arrows) represents the devitrified glassy chilled margin of the intermediate intrusive. Note the minute altered euhedral plagioclase phenocrysts in the glassy chilled margin. FOV = 11 mm (for one plate).

Plate 38. Photomicrographs, **A, B** – plane light, show the texture of the altered intermediate intrusive rock. The black portions of the section have been overprinted and obliterated by cryptocrystalline black iron oxide-stained devitrified very fine-grained groundmass. Minute anhedral diopside (D) is present in both the black and light portions of the section the light portions are comprised of diopside and very fine-grained sericite (Se) inferred to be after feldspar. **A** – FOV = 11 mm; **B** – FOV = 2.8 mm.



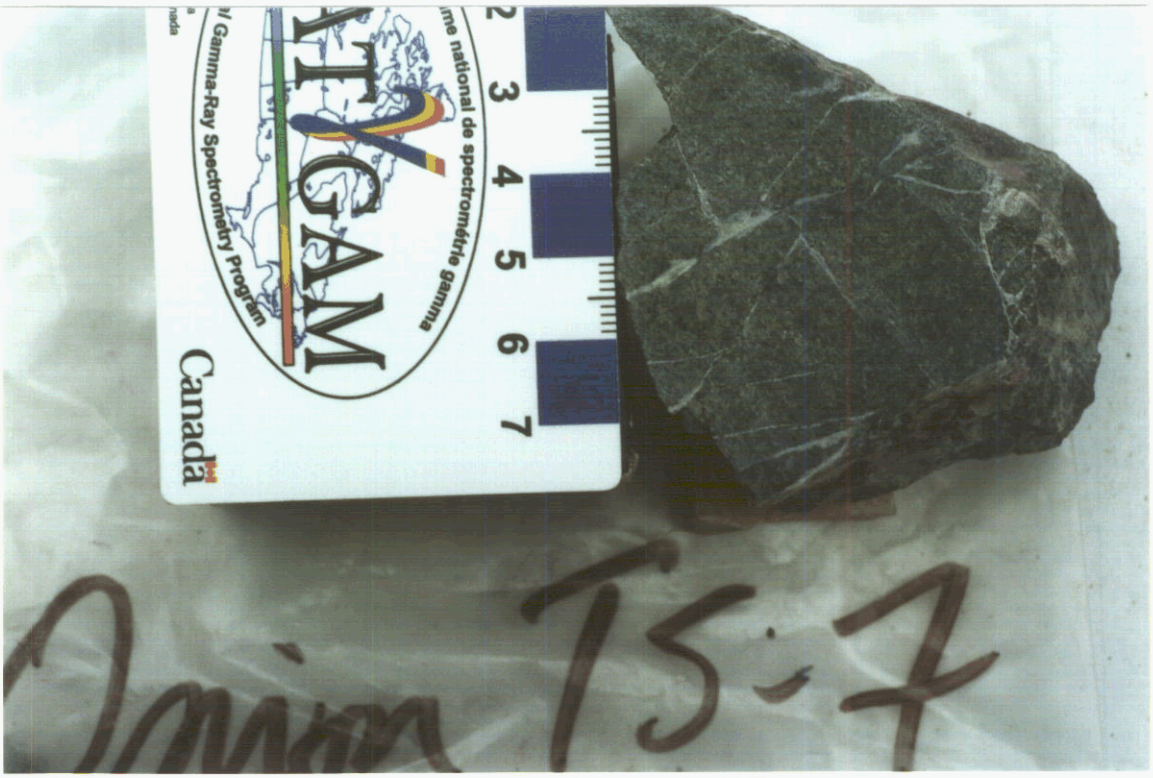
Kishar Reserch

Sample #: Onion TS-7: Sax-Cessena Embayment area

Cu 43 ppm; Ni 1968 ppm; Co 127 ppm

18 ppb Au, 28 ppb Pt, 38 ppb Pd, 66 ppb PGE_T

Location	Northing	Easting
2+90 S / 1+10 E	6872555	521386



Kishar Reserch

SUMMARY: ***chloritized, serpentinized and weakly carbonatized feldspar+phlogopite-bearing wehrlitic dunite***. Except for carbonate±serpentine-filled veins and shears, this altered ultramafic rock does not possess a penetrative foliation. Even though there has been almost total replacement of all primary igneous minerals, the primary igneous orthocumulate texture has been perfectly preserved. The cumulate minerals include olivine and opaque chromite and the intercumulus volumes are occupied by altered feldspar, phlogopite, pyroxene(?) and opaque cumulus chromite. This rock has undergone complete serpentinization (hydration and oxidation) with accompanying chloritization and a weak overprinting carbonatization. Consequently the primary mineralogy and rock type is based primarily on pseudomorphs. A closely packed orthocumulate texture is formed by fine- to medium-grained serpentine+magnetite pseudomorphs after olivine. Cumulate opaque chromite is present as inclusions in and interstitial to serpentine pseudomorphs after cumulate olivine. Feldspar, phlogopite and possibly pyroxene filled intercumulus volumes however these minerals have been almost totally replaced by secondary magnetite+serpentine+chlorite. Minor amounts of intercumulus phlogopite remain whereas the pseudomorphs inferred to have been feldspar and possibly pyroxene have been completely replaced. Secondary magnetite+chlorite replace phlogopite. Intercumulus feldspar and possibly pyroxene have been replaced by clay/serpentine+magnetite. Secondary magnetite displays two morphological habits depending on the intercumulus mineral that it has replaced. Ultra to very fine-grained magnetite with clay/serpentine has replaced intercumulus feldspar and possibly pyroxene. Magnetite with chlorite after phlogopite has a bladed habit because magnetite has been preferentially replaced the mica along the mica cleavage planes. Cumulus chromite has been variably altered and converted to ferrichromite with surrounding magnetite+serpentine. Trace amounts of sulphide are associated with secondary magnetite and this sulphide formed during the serpentinization episode.

Petrological significance of this rock: The intercumulus assemblage inferred to have been feldspar, phlogopite with possibly pyroxene clearly indicates that the intercumulus liquid was hydrous, alkali-bearing and most probably had an alkali ultramafic to basaltic composition. With higher degrees of fractionation, the ultramafic rocks could grade gradually or rapidly into feldspathic ultramafic or gabbroic lithologies.

TYPE: PTS
ASSEMBLAGE: serpentine, carbonate, phlogopite, chlorite, clay, magnetite, chromite-ferrichromite, sulphide.
ESTIMATED MODE (visual): 75% serpentine, 4% carbonate, 3% phlogopite, 2% chlorite, 5% clay, 10% magnetite, 1% chromite-ferrichromite, trace sulphide

MINERALOGY:
Essential:

Serpentine: present as pseudomorphs after olivine and is the most abundant silicate mineral in the section.

Magnetite: most abundant spinel in this rock. Several textural associations: secondary magnetite partially to completely fills the interstitial volumes between serpentine pseudomorphs after olivine, is present as micro-filaments within serpentine

pseudomorphs, as minute inclusions disseminated through serpentine pseudomorphs after olivine and as partial replacement of, fills micro-fracture in and partially mantles cumulus chromite, as partial replacement of intercumulus phlogopite/chlorite and after intercumulus feldspar. Ultra fine-grained sulphide, presumably pyrite, is present in secondary magnetite

Accessory:

Carbonate: two textural types: 1) associated with serpentine and fills veins and shear bands that crisscross the undeformed altered host rock and 2) occupying the intercumulus volumes with secondary magnetite.

Phlogopite: minor to trace amount remain in the section. An orange to very pale orange/colourless pleochroism characterizes the relict grains, clearly indicative of the Mg-rich composition. Magnetite and chlorite have extensively replaced phlogopite.

Chlorite: partial to complete replacement of phlogopite. Commonly accompanied by magnetite.

Clay: very low birefringence and occupies intercumulus volumes with secondary magnetite. These clay+magnetite intercumulus volumes are interpreted to have been feldspar.

Chromite: as subhedral to euhedral grains to 0.8 mm, interstitial to serpentine pseudomorphs to olivine and as inclusions in these pseudomorphs.

Ferrichromite: as replacement of cumulus chromite and these grains commonly host irregular-shaped relict micro-domains of the precursor chromite. Commonly associated with rims of magnetite.

Sulphide: rare; as minute grains to 0.01 mm present in secondary magnetite

TEXTURE & FABRIC:

Except for several directions of serpentine+carbonate-filled vein and shears, the host rock does not possess a penetrative fabric. Consequently primary igneous texture is superbly preserved even though alteration is extensive, represented primarily by serpentinization with subordinate chloritization and a later carbonatization episode. Equant round to subhedral-euhedral serpentine+magnetite pseudomorphs after olivine, 0.4 – 2.0 mm with an average 1 mm display a closely packed orthocumulate texture. Intercumulus pyroxene, phlogopite and chromite occupied the interstitial volumes. Relict phlogopite and chromite are present but these intercumulus minerals have been extensively replaced, predominantly by secondary magnetite.

Magnetite has two textural habits. Blade-like magnetite fills cleavage planes in chlorite pseudomorphs after phlogopite and relict grains comprised of phlogopite-chlorite-magnetite. The second textural type is represented by very fine-grained magnetite that is disseminated through interstitial serpentine. This interstitial clay with magnetite is inferred to have been intercumulus feldspar. Ferrichromite and magnetite have variably replaced cumulus chromite. This ferrichromite-type replacement is particularly well developed in chromite that is present in intercumulus volumes where the greater percentage of secondary magnetite is concentrated.

ALTERATION:
Only a minor component of the primary cumulus and intercumulus minerals have survived conversion during hydration and minor carbonation of this ultramafic rock. Serpentinization is the principal alteration process and is accompanied by chloritization, sulphidization, iron oxide formation and weak overprinting carbonation. Serpentine and magnetite replace cumulus olivine and intercumulus plagioclase by magnetite+clay, partial conversion of cumulus chromite to a ferrichromite type spinel along with replacement by magnetite and intercumulus phlogopite has been replaced by chlorite+magnetite. Carbonatization is primarily confined to veins and shears however there is a minor proportion of carbonate that has infiltrated the host rock and replaced serpentine along the interface between serpentine pseudomorphs after olivine. Trace amounts of sulphide were formed during the serpentinization, i.e. sulphide inclusions in secondary magnetite.

ROCK TYPE: feldspar+phlogopite-bearing wehrlitic dunite.

Plate 39. Photomicrograph, plane light, shows an overview of the orthocumulate texture formed by closely packed cumulus olivine which has been replaced by serpentine + magnetite. Secondary magnetite has been localized between serpentine pseudomorphs after olivine and has replaced intercumulus minerals. Rare relict phlogopite (Ph) remains in some of the magnetite-rich intercumulus volumes. FOV = 11 mm.

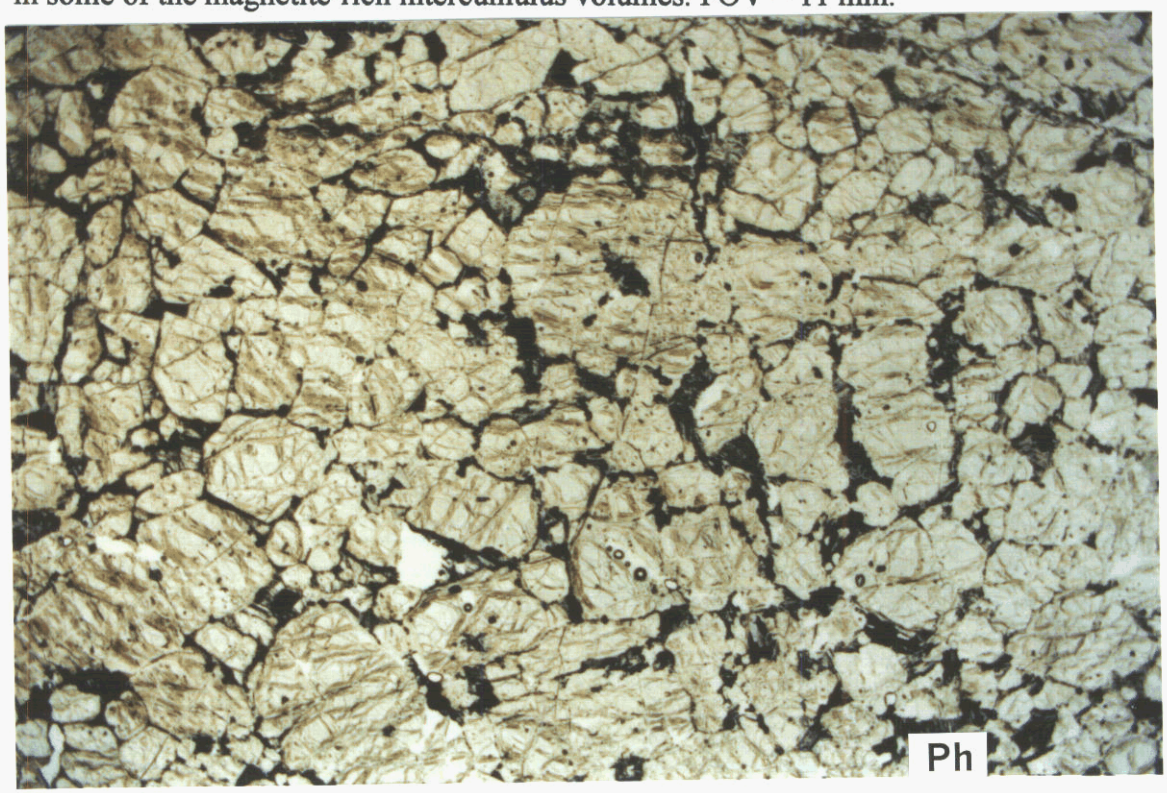


Plate 40. Photomicrographs, **A** – plane light, **B** – crossed nicols, a higher magnification of Plate 39, show the different magnetite replacement textures associated with different intercumulus minerals. Magnetite after phlogopite (Ph) has a bladed texture due to replacement along mica cleavage planes. Other intercumulus volumes are comprised of magnetite + clay and these are inferred to have been feldspar. The cumulus minerals included olivine (O), serpentine pseudomorphs after olivine and cumulus chromite (Cr). **A, B** – FOV = 5.5 mm.

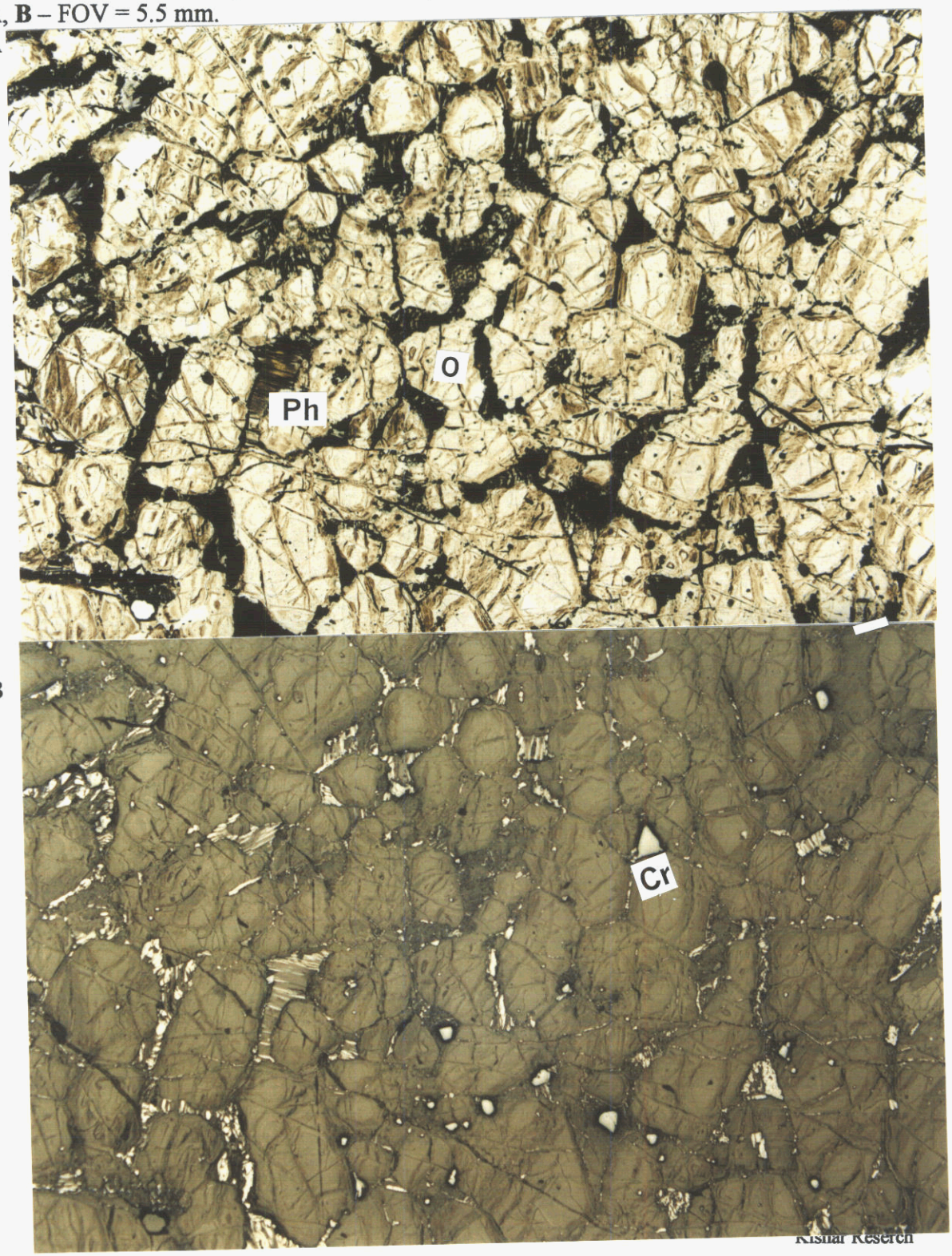
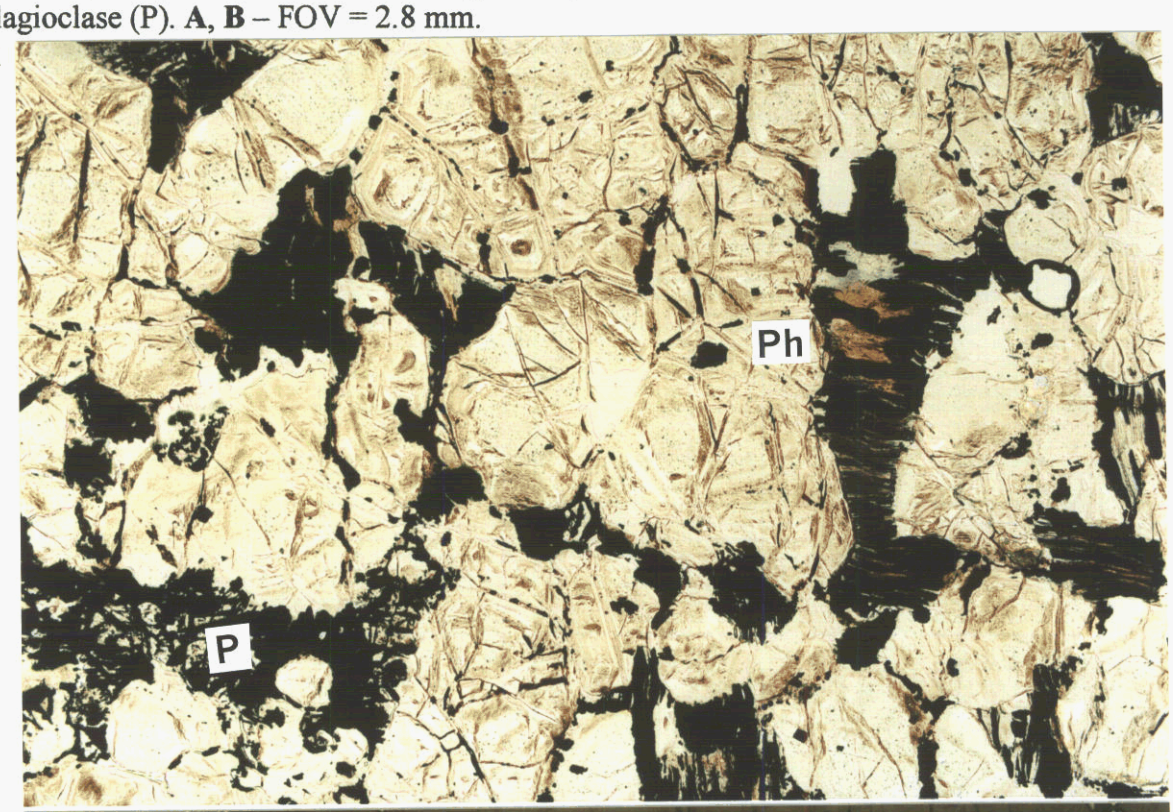


Plate 41. Photomicrographs, **A** – plane light, **B** – reflected light, a higher magnification of Plates 39 and 40, show the different secondary magnetite-silicate replacement textures after mica and feldspar. Intercumulus phlogopite (Ph) is replaced by chlorite and secondary magnetite (sM), the latter is aligned along cleavage traces. Sparsely distributed secondary magnetite with low birefringent clay is inferred to be after intercumulus plagioclase (P). **A, B** – FOV = 2.8 mm.

A



B

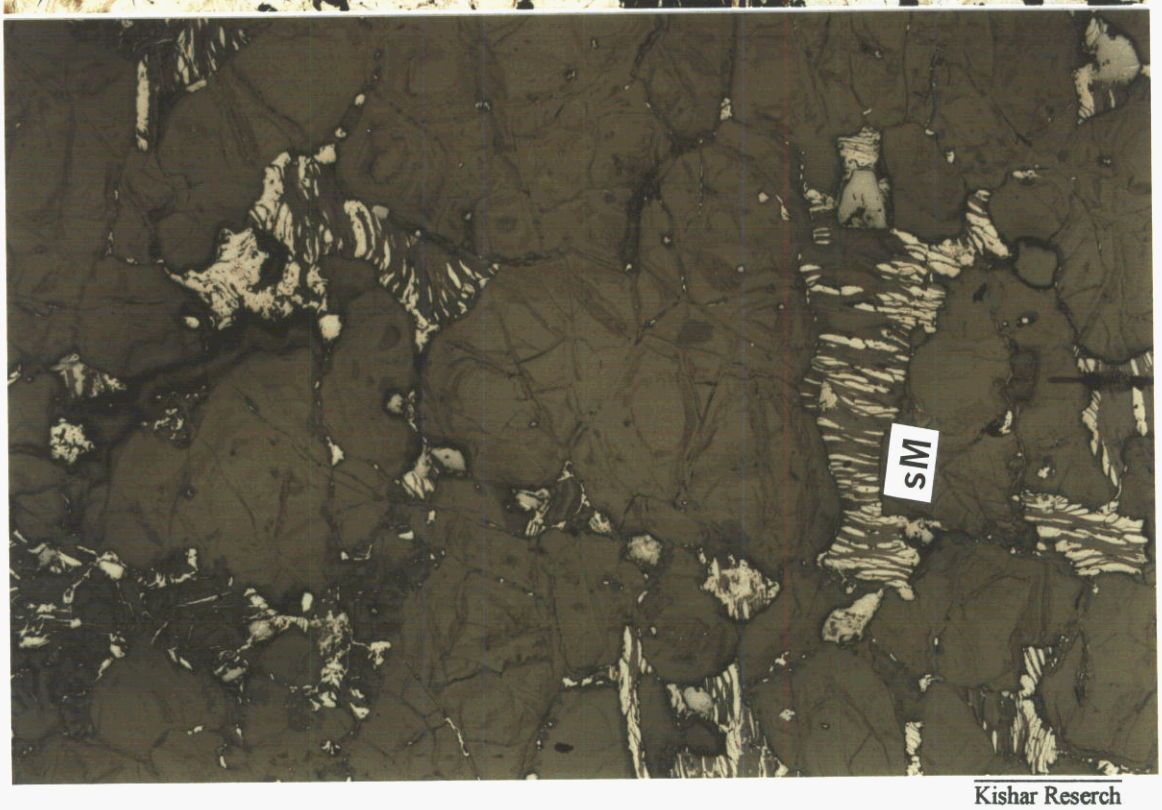


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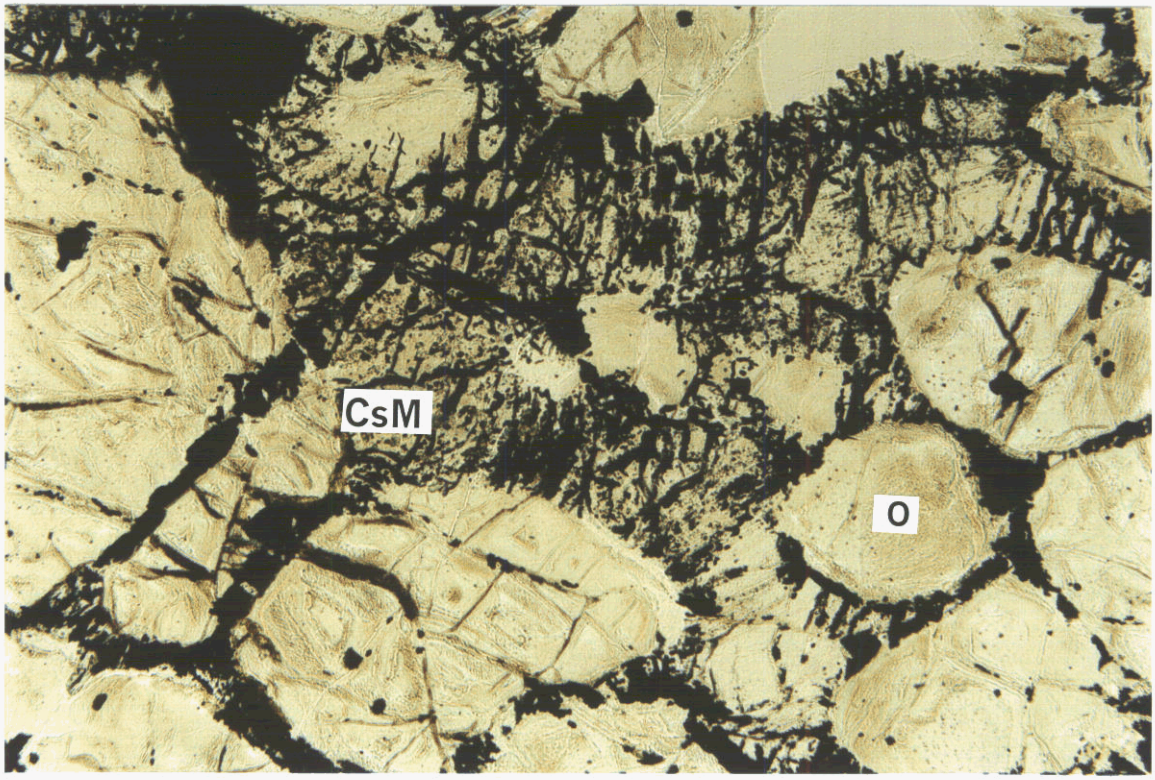
Plate 42. Photomicrographs, **A** – plane light, **B** – reflected light, show the replacement texture of clay + secondary magnetite (CsM) inferred to be after intercumulus feldspar. This intercumulus feldspar was associated with cumulus chromite (Cr) and cumulus olivine (O), the latter replaced by serpentine. **A**, **B** – FOV = 1.35 mm.

A



B

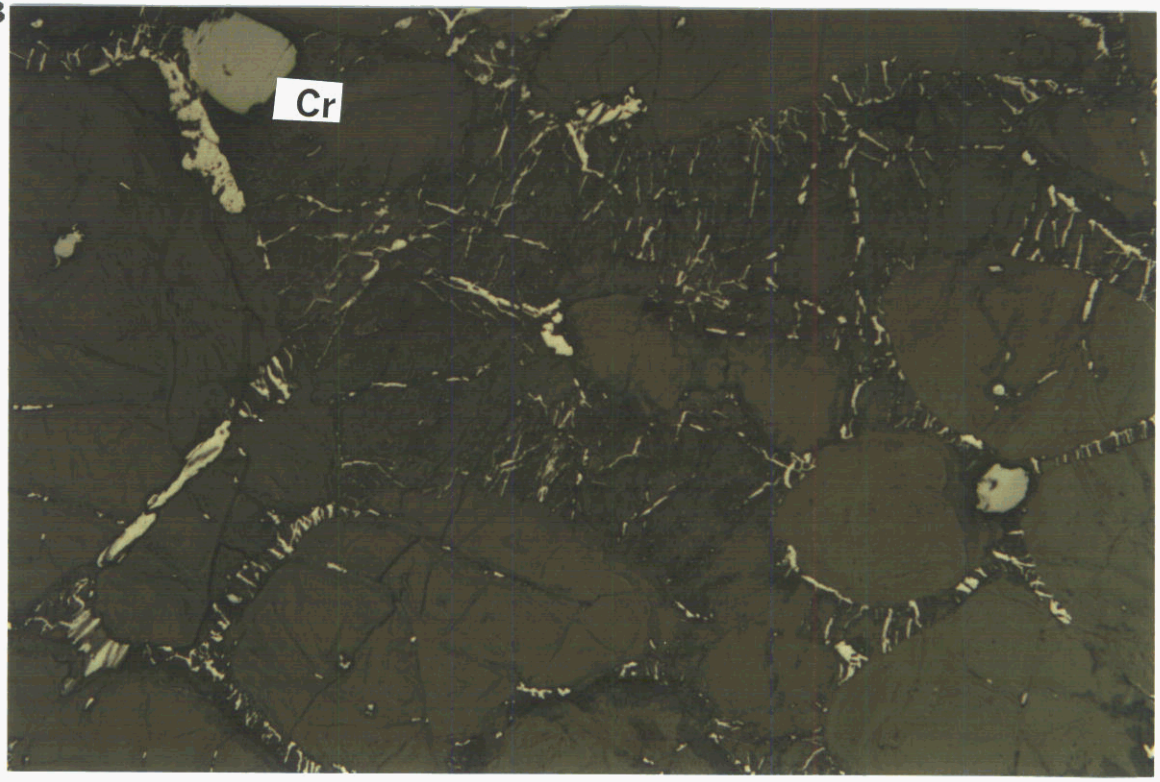
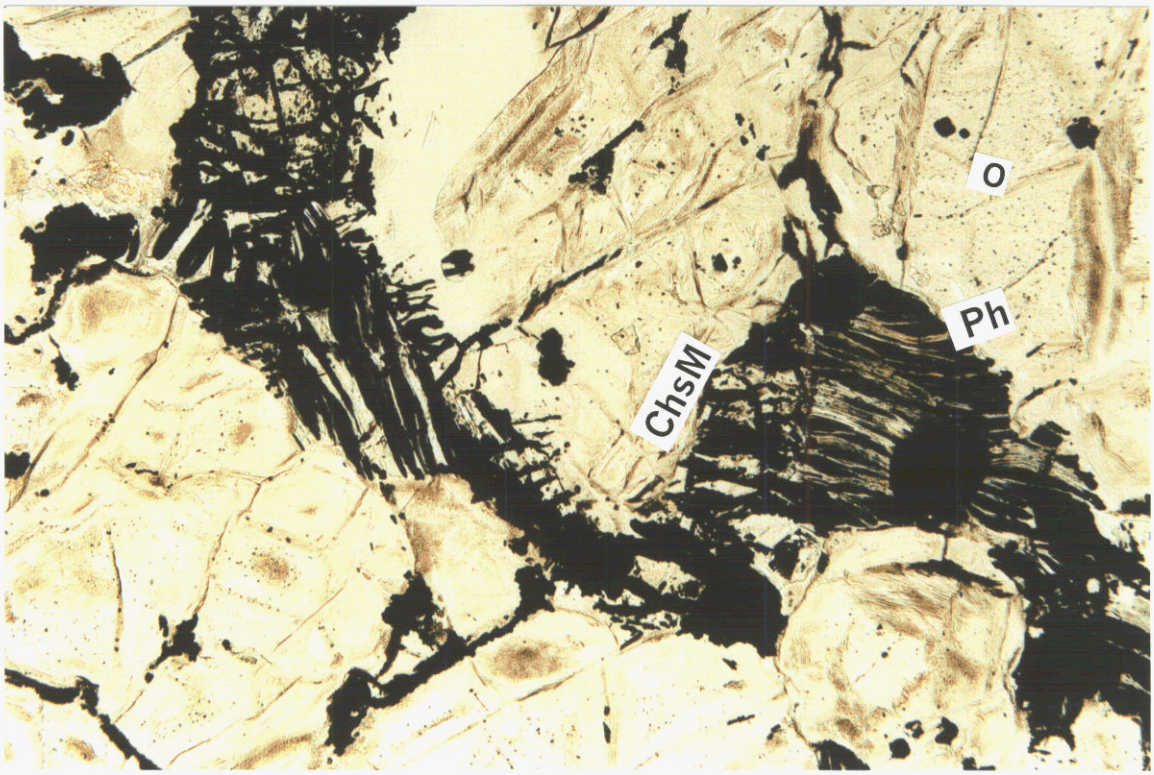


Plate 43. Photomicrographs, **A** – plane light, **B** – reflected light, show the replacement texture of chlorite + secondary magnetite (ChsM) after intercumulus phlogopite (Ph). This intercumulus phlogopite was associated with cumulus chromite (Cr) and cumulus olivine (O), the latter replaced by serpentine. **A**, **B** – FOV = 1.35 mm.

A



B

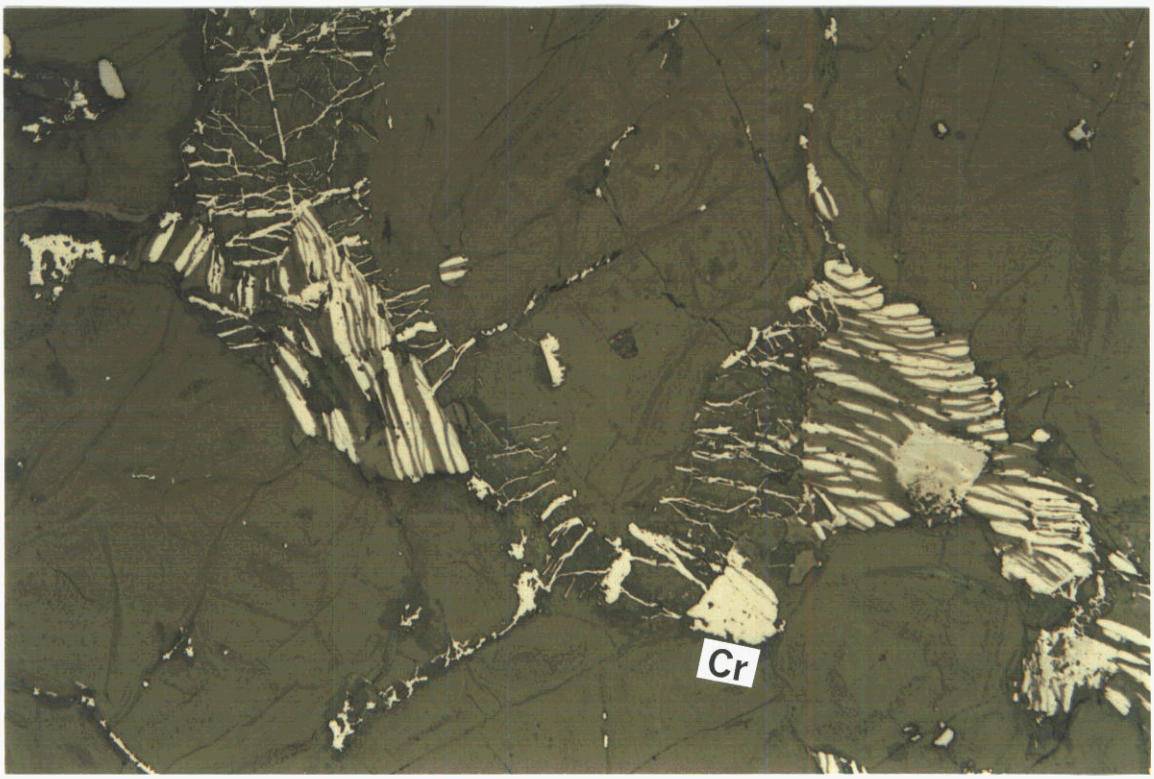


Plate 44. Photomicrograph, reflected light, a higher magnification of a portion of Plate 43, shows the replacement/conversion of cumulus chromite to ferrichromite and magnetite-filled micro-veinlets. Blade-like magnetite is aligned along and has replaced intercumulus phlogopite. FOV = 0.67 mm.

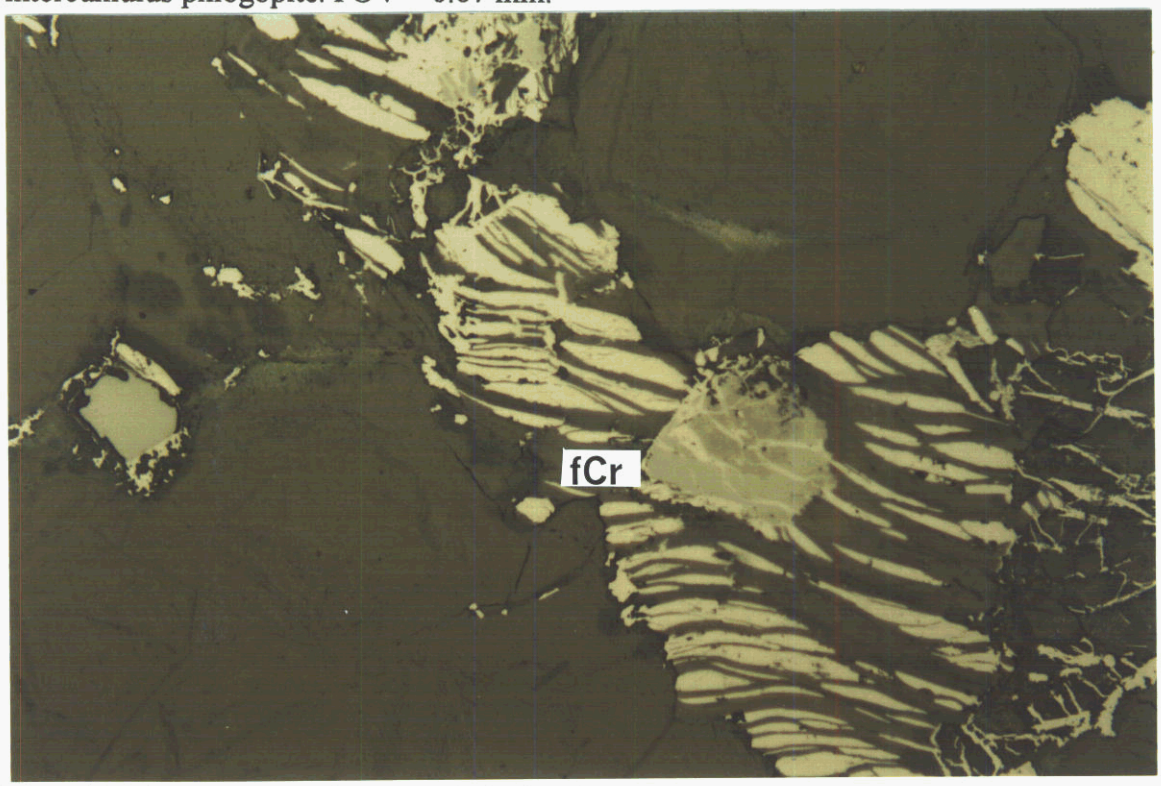
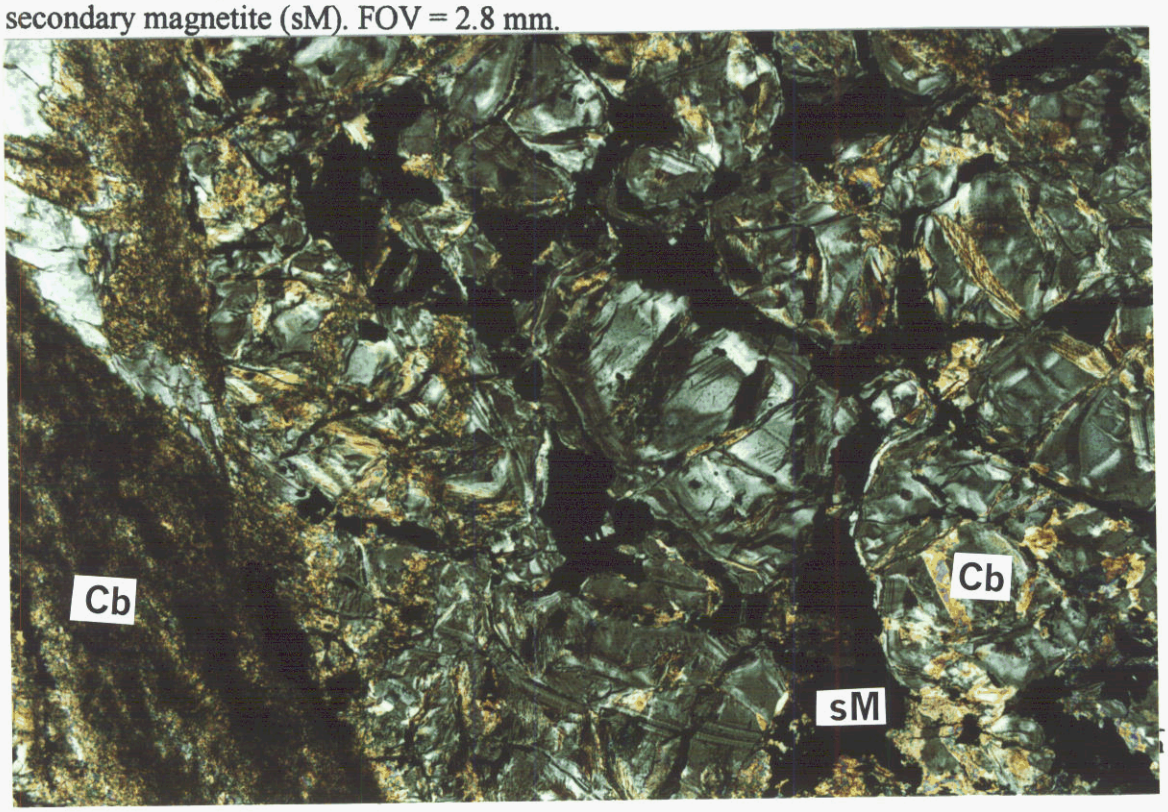


Plate 45. Photomicrograph, crossed nicols, shows a carbonate (Cb)-rich veinlet and the impregnation of carbonate into the wall rock. Carbonate has infiltrated into the wall rock and replaced serpentine after olivine. The intercumulus volumes have been filled with secondary magnetite (sM). FOV = 2.8 mm.



APPENDIX E: Volume 2

WHITE RIVER INTRUSIVE COMPLEX, CANALASK PGM+Ni+Cu PROJECT YUKON TERRITORY: AN INTERPRETATION OF MINERAL OCCURRENCES based on PETROGRAPHY, ORE MICROSCOPY and ROCK GEOCHEMISTRY OF SELECTED SAMPLES

Volume 2 of 2

for

Uravan Minerals Inc.
144 - 4th Avenue S.W.
Suite 1250
Calgary, Alberta
T2P 3N4

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Kishar Research Inc.
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Canada K1S 2V1

December 3, 2001

Table of Contents

	Page
Summary	i
Statement of limitation	1
Scope of the project	1
Part I: Discussion of the Petrography and Ore microscopy	2
Introduction	2
Alteration	2
White River Intrusive Complex	2
White River country rocks	3
White River Intrusive Complex	3
Lithologies	3
Least altered lithologies	6
Dunite	6
Wehrlite to pyroxenite	7
Olivine gabbro	9
Hydrothermally altered lithologies	10
Ultramafic rocks	10
Gabbro	10
Altered nickeliferous massive sulphide	11
White River country rocks	12
Geochemistry – Major and trace element	12
Introduction	12
Discussion	13
PGE minerals: Scanning Electron Microscope Investigation	21
Analytical Procedures	21
Magmatic sulphide+oxide prospects	21
Hydrothermal skarn-type nickeline- sulphide prospects	21
Discussion	23
Recommendations	26
References	27
Part II: Petrography and Ore microscopy	29
Least altered White River Intrusive Complex	29
166804	32
166808	46
166810	60
TS-2	73
TS-3	82
TS-4	92
TS-7	97
Altered White River Intrusive Complex (Volume 2)	106
166806	108
166807	117
TS-5	132
TS-6	141
TS-9	152
Altered White River country rocks	161
166809	163
TS-1	170

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TS-8 175
TS-10 185
Certificate of Qualification 191

List of Figures

Figure 1. Sample location map, White River Intrusive Complex. 4
Figure 2. Classification and nomenclature of White River Intrusive Complex. 5
Figure 3. Normative Anorthite-Pyroxene-Olivine, White River Intrusive Complex. 14
Figure 4. AFM plot for White River Intrusive Complex. 15
Figure 5. Jenson cation plot for White River Intrusive Complex. 17
Figure 6. Differentiation index vs Ni and total PGM. 18
Figure 7. Total PGM vs Ni. 19
Figure 8. Normative Px+Ol and Px vs total PGE. 20
Figure 9. Comparison of dioritic rocks to the White River Intrusive Complex. 22
Figure 10. Schematic cross-section of the White River Intrusive Complex. 24

List of Tables

Table 1. Petrographic summary, least altered White River Intrusive Complex. 30
Table 2. Petrographic summary, altered White River Intrusive Complex. 107
Table 2. Petrographic summary, altered White River country rocks. 162

Offcut slabs of altered White River Intrusive Complex.

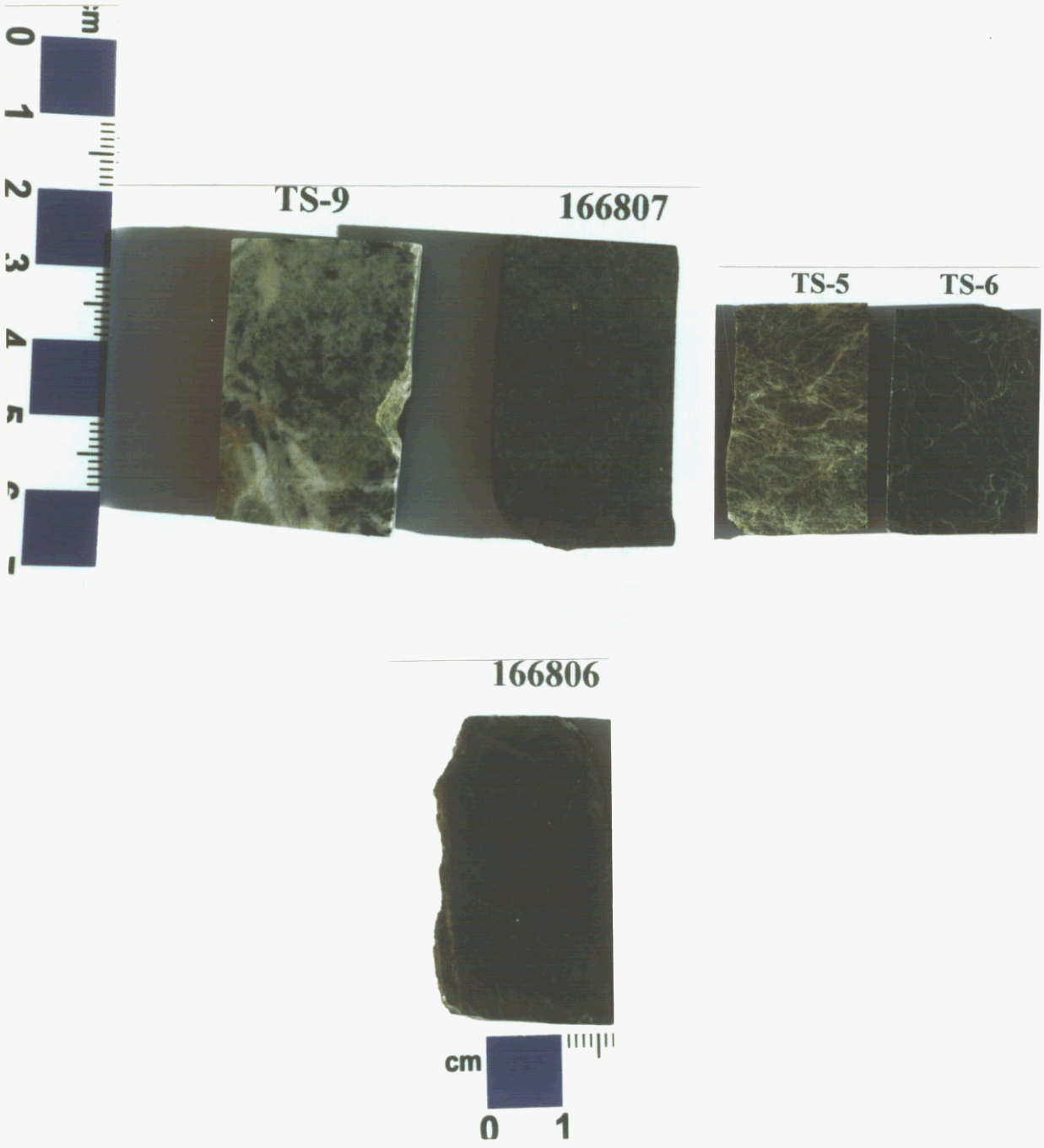

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Table 2. Petrographic summary: Altered White River Intrusive Complex.

Prospect	Section #	Rock name	Cumulate Nomen-clature	Type of cumulate	Essential mineralogy/ Accessory mineralogy	Cumulus minerals	Cumulus mineral morphology	Intercumulus minerals	Intercumulus mineral morphology	Alteration	Similar samples	Correlation with lithological formations
Discovery Showing	166806	Sheared and hydrothermally altered (carbonatized) massive sulphide	----------	Massive sulphide	----------	Pyrrhotite, pyrite, pentlandite, chalcopyrite, millerite	----------	----------	----------	Fe-Mg carbonate, trace quartz and clay(?)		
Discovery Showing	166807	intensely hydrothermally altered phlogopite-bearing ophitic olivine gabbro with clotted sulphide	opC	mesocumulate	----------	diopside, olivine, chromite	poikilitic diopside with inclusions of olivine	hornblende, phlogopite, plagioclase, zircon, magnetite, sulphide (pentlandite, pyrrhotite, chalcopyrite, cherepanovite or rhodoarsenide and sudburyite, merenskyite, violarite (secondary)	subhedral hornblende to 1.0 mm; phlogopite plates to 1.5 mm. disseminated and clotted sulphide: pyrrhotite, pentlandite, chalcopyrite with magnetite. Violarite after pentlandite.	tremolite after diopside and olivine; clay+sericite+acicular amphibole after feldspar		White River Intrusive Complex – gabbroic phase
Sax-Cessena Embayment area	TS-5	chlorite+talc+ serpentine+ carbonate schist	coC	orthocumulate	----------	olivine, chromite	subequant serpentine pseudomorphs after olivine to 0.5 mm; euhedral chromite to 0.1 mm	pseudomorphs after either pyroxene of feldspar	irregular-shaped grains to 1 mm	serpentinization (serpentine+magnetite) followed by carbonatization (carbonate, talc, chlorite)	Portions of this section are similar to TS-2 and TS-3	White River Intrusive Complex – ultramafic phase
Sax-Cessena Embayment area	TS-6	foliated intensely serpentinized and carbonatized wehrlite	coC	orthocumulate	----------	olivine, chromite	subequant serpentine pseudomorphs after olivine to 0.8 mm; euhedral chromite to 0.15 mm.	pseudomorphs of intercumulus feldspar or pyroxene	irregular-shaped intercumulus pseudomorphs to 0.4 – 1.0 mm	serpentinization followed by carbonatization	Possibly 166804, 166808	White River Intrusive Complex – ultramafic phase
Pix Showing	TS-9	intensely hydrothermally altered gabbroic rock	----------	textural recognition not possible due to the intense alteration	carbonate, clay/fuchsite, sericite, sulphide/ quartz, chromite-ferrichromite, magnetite	----------	----------	----------	----------	Intense carbonate replacement of the groundmass and essential minerals, inferred based on pseudomorphs	----------	White River Intrusive Complex – gabbroic phase

Cumulate terminology: c – chromite, o – olivine, p – diopside, C - cumulate

Sample #: 166806: Discovery Showing
Cu 0.60%; Ni 3.71%; Co 0.14%
130 ppb Au, 12 Pt, 689 ppb Pd
824 ppb Rh, 1260 ppb Os, 840 ppb Ir, 3200 ppb Ru, 6825 ppb PGE_T

Northing	Easting
6874408	519924

The shear fabric is defined by carbonate-filled foliation planes in massive sulphide.

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SUMMARY: ***sheared and carbonatized magmatic massive sulphide.*** Deformation of the massive sulphide was accompanied by carbonatization. A series of orthogonal and oblique banded carbonate-rich veins and veinlets are interpreted as complimentary shear and extension veins respectively. These veins and veinlets are banded as well as fibrous indicative of the polyphased incremental deformation and influx of fluids. Trace amounts of quartz and clay(?) are associated with the carbonatization episode. The presence of a minor amount of argillitization in this rock draws a comparison to argillic alteration in many of the other rocks described in this report. Could this imply that the lithologies in this intrusive-volcanic-sedimentary sequence have been variably overprinted by the same hydrothermal episode?
The deformation episode with coeval carbonatization extensively modified the massive sulphide and formed a compositionally banded and altered massive sulphide. The compositionally banding is defined by alternating bands of pyrrhotite- and pyrite+pentlandite-rich sulphide. Pyrite is present as reaction salvages bordering carbonate-filled veins and veinlets. Chalcopyrite, a minor component in this massive sulphide was remobilized into streaky discontinuous micro-filaments, elongated micro-aggregates and disseminated in carbonate-filled veins and veinlets. Pentlandite is present as elongate aggregates in the banded sulphide and is associated with trace amounts of very fine-grained millerite. Primary magnetite is usually present in a magmatic sulphide however this sample is lacking in magnetite. Could magnetite have been destroyed during carbonatization? Pyrrhotite has been partially replaced by marcasite and this replacement process is inferred to be due to Recent oxidation of the massive sulphide.

TYPE: PTS
ASSEMBLAGE: sulphide, carbonate, clay, quartz

MINERALOGY:
Essential:

Sulphide: comprises >98% of the specimen.

Chalcopyrite: minor amount present as: 1) irregular-shaped knots to 0.15 mm in pentlandite+pyrrhotite±marcasite; 2) commonly as streaky bands and local concentrations up to 0.3 mm and 3) as very fine-grained inclusions in carbonate-rich veins and veinlets.

Pyrrhotite: most abundant primary sulphide. Present in comparatively monomineralic bands that alternate with pentlandite-rich bands. Also replaced by the marcasite related to Recent oxidation.

Pyrite: present as a replacement of pyrrhotite. Present as subhedral to euhedral grains, grains to 0.05 mm, that form aggregates that in part define the compositional banding. Present as salvage between pyrrhotite and the carbonate-rich veins and veinlets.

Pentlandite: present as elongate aggregates aligned in the compositional banding. Cleavage planes distinguish this mineral and it commonly hosts remobilized chalcopyrite stingers.

Marcasite: replacement of pyrrhotite/niccolite. Interface between host pyrrhotite and marcasite is highly serrated, a feature indicative of replacement and attributed to Recent oxidation.

Millerite: minute grains identified during scanning electron microscope investigation.

Accessory:

Carbonate: present as three sets of symmetrically banded veins and veinlets. Two sets are at acute angles and may be shear related. The other set is almost orthogonal to the former and may represent extension veins and veinlets. Based on energy dispersive spectral analysis on the scanning electron microprobe, this carbonate is comprised of Fe+Mg, i.e. in the magnesite-siderite compositional solid solution.

Clay(?): trace amount; present in the centre of banded carbonate-rich veins and veinlets. This material looks similar to the ultra fine-grained clay that replaced intercumulus feldspar in section 166804.

Quartz: trace amount present in the central portion of some veins.

TEXTURE & FABRIC:

This massive sulphide has a penetrative fabric formed by a compositional banding formed by alternating pyrite+pentlandite-rich and pyrrhotite-rich bands. The compositional banding formed by differing amounts of pyrite-pyrrhotite and these bands alternate with carbonate-rich domains. Extensional carbonate-rich veins and veinlets crosscut this compositional banding.

Pyrite is inferred to be a reaction product because it is commonly along the interface between pyrrhotite – concordant and discordant carbonate veins-veinlets. Pyrite-pyrrhotite interface is delicately serrated, a texture that indicates pyrite after pyrrhotite. The replacement of pyrrhotite by marcasite, the latter a woody textured grayish white replacement of pyrrhotite, is interpreted to be the product of Recent oxidation of the massive sulphide.

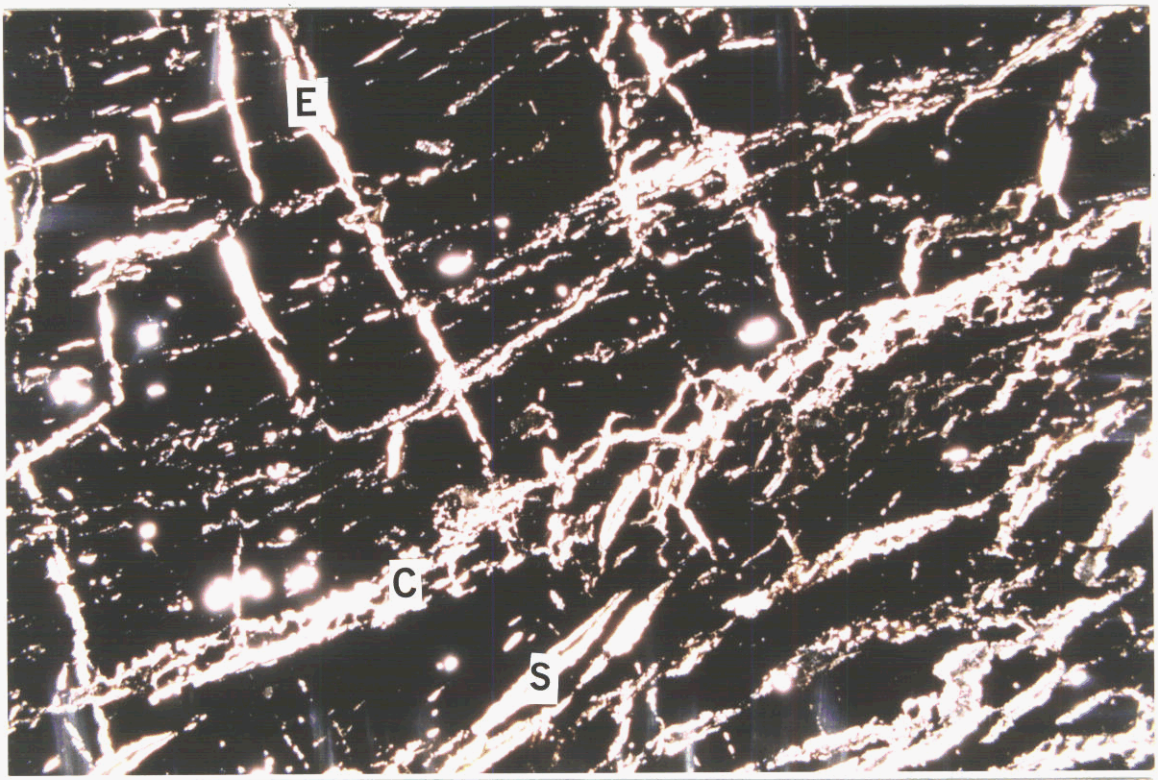
ALTERATION:

This massive sulphide has sustained considerable carbonatization as displayed by banded carbonate-filled shears and extension veins. Pyritization of the massive sulphide is associated with carbonatization. Trace amounts of quartz and clay are present in the central portions of carbonate-rich banded and fiber veins.

ROCK TYPE: remobilized magmatic massive sulphide.

Plate 46. Photomicrographs, **A** – plane light, **B** – reflected light, show the three sets of carbonate-filled veins and veinlets and the banded texture of the massive sulphide formed by deformation with synchronous hydrothermal alteration. The veins are labeled according to shear terminology: S, C and E, an orthogonal extensional set.
A, B – FOV = 11 mm.

A



B

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Plate 47. Photomicrograph, reflected light, shows the banded texture of the massive sulphide formed pyrrhotite (Po)-rich and pyrite (Py)-rich bands and in part by carbonate (Cb)-rich bands that parallel the former banding. FOV = 5.5 mm.

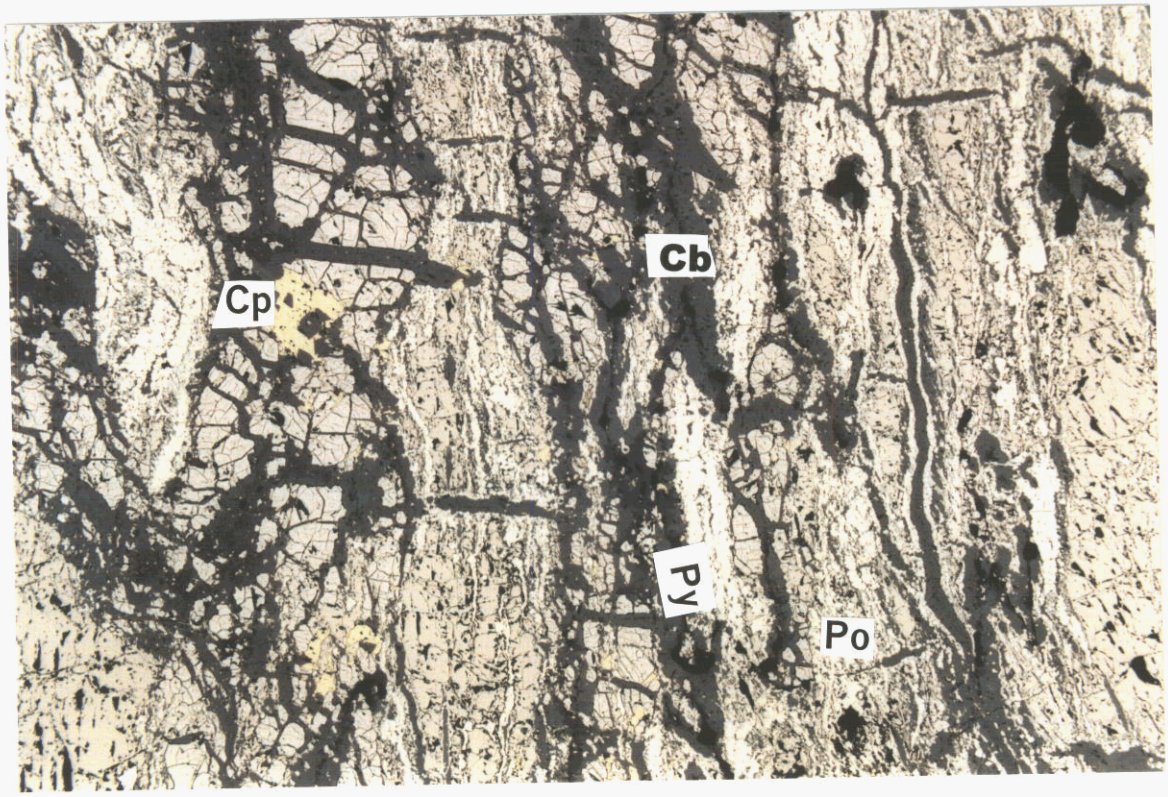
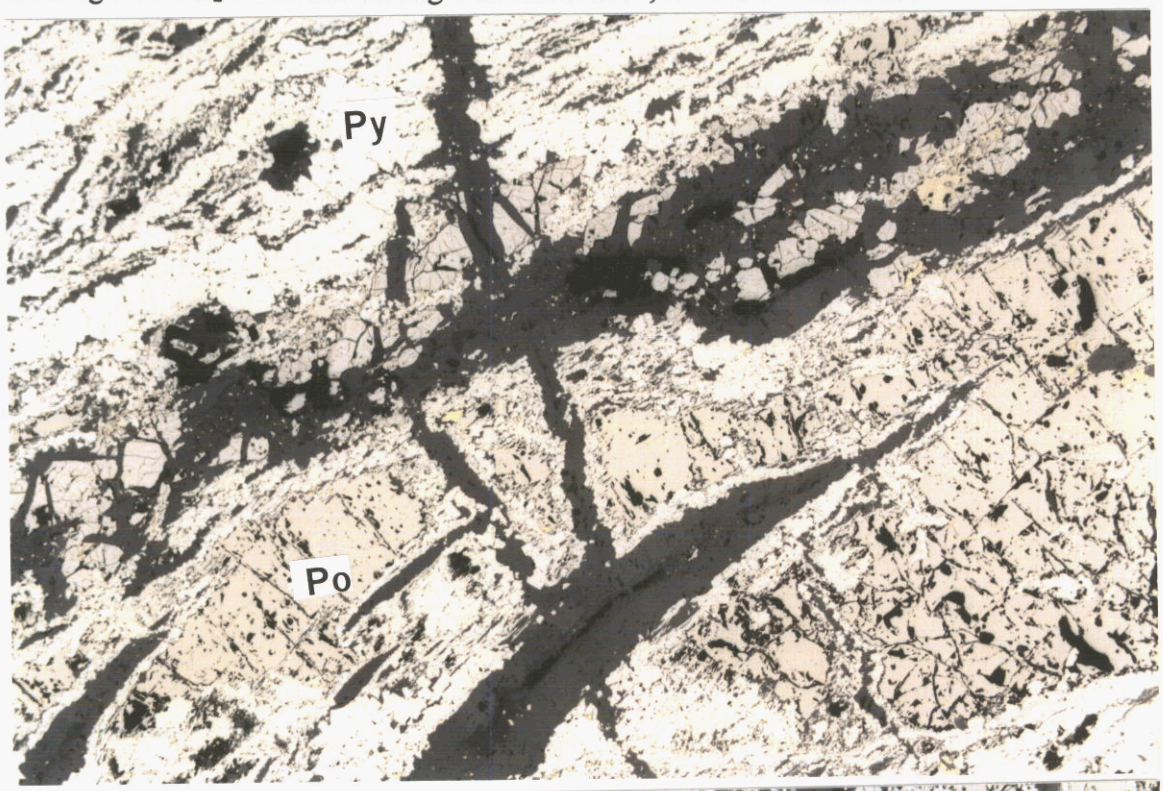


Plate 48. Photomicrographs, **A**, **B** - reflected light, show the pyrite (Py) reaction salvages between the carbonate-filled shear and extensional veins and host pyrrhotite (Po). The banded texture of the ore was formed by varying degrees of pyritization associated with the fluxing of a CO_2-rich fluid during deformation. **A**, **B** - FOV = 2.8 mm.

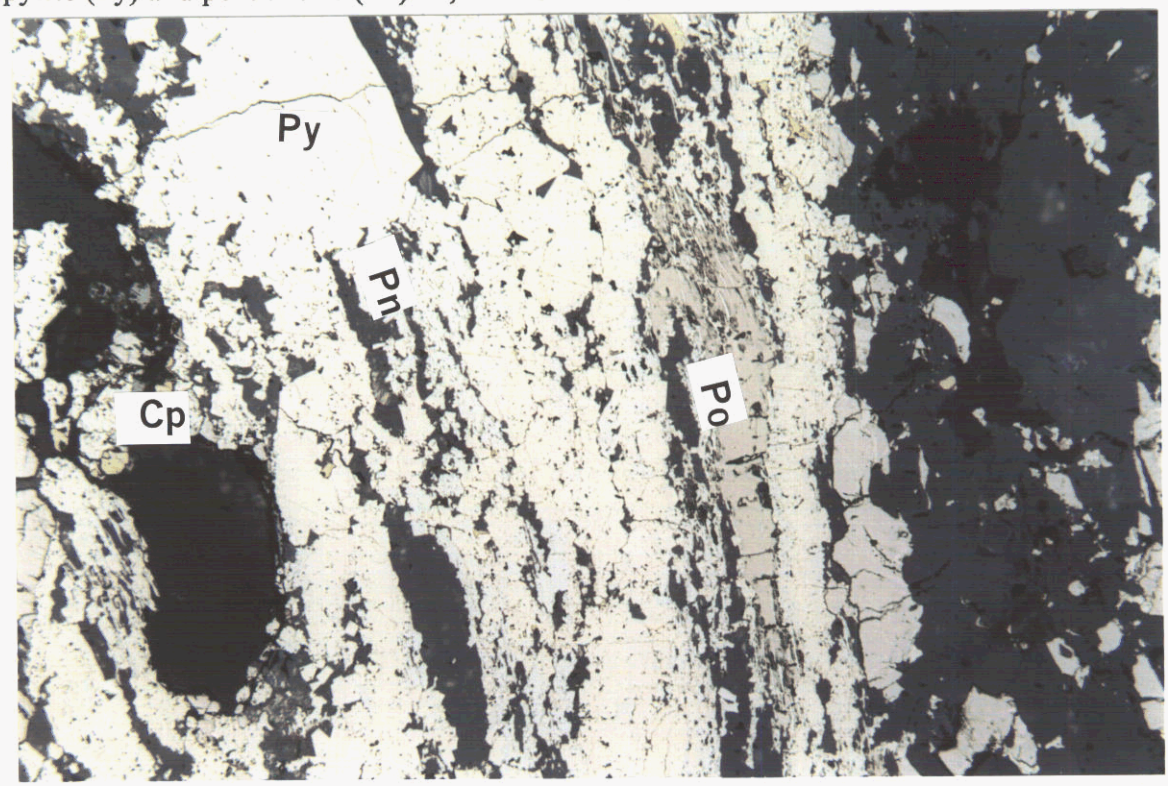
A



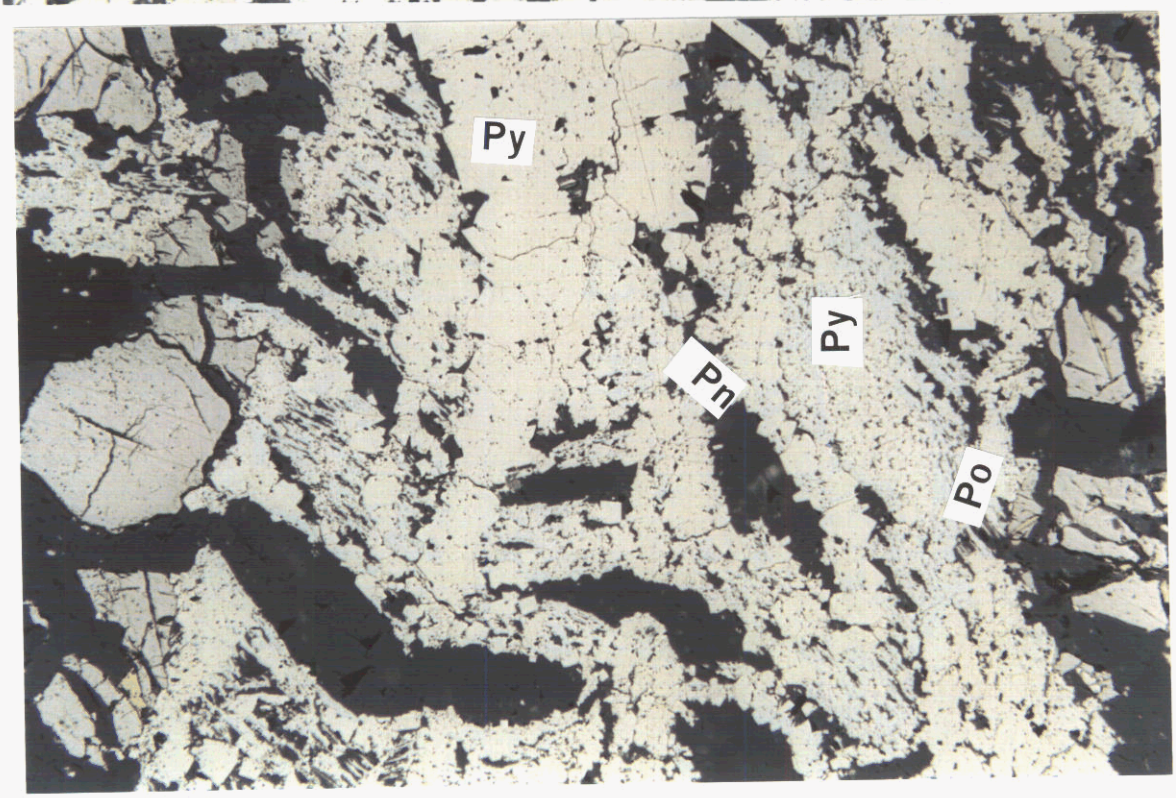
B

Plate 49. Photomicrographs, **A, B** - reflected light, show a replacement band comprised predominantly of pyrite (Py), pentlandite (Pn), minor amounts of relict pyrrhotite (Po) and trace chalcopyrite (Cp). The subtle variations in the yellow colour represent mixtures of pyrite (Py) and pentlandite (Pn). **A, B** - FOV = 0.67 mm.

A



B



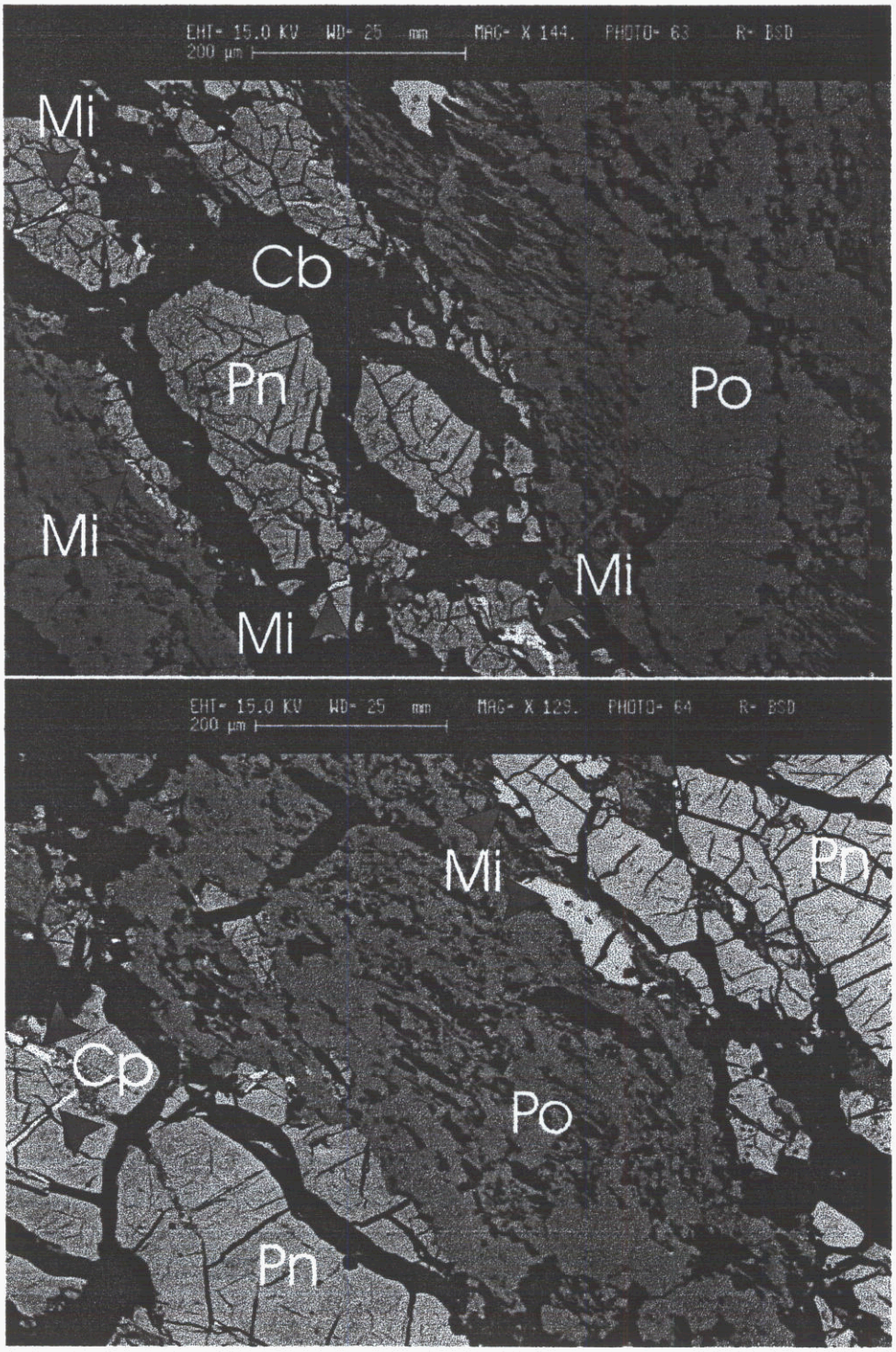


Plate 51. Electron backscattered image of the sheared and carbonate (Cb) -veined massive sulphide comprised of pyrrhotite (Po), pentlandite (Pn), millerite (Mi) and chalcopyrite (Cp).

Sample #: 166807: Discovery Showing
Cu 0.27%; Ni 0.41%; Co 0.02%
200 ppb Au, 386 Pt, 846 ppb Pd
23 ppb Rh, 16 ppb Os, 14 ppb Ir, 5 ppb Ru, 1290 ppb PGE_T

Northing	Easting
6874408	519924

Kishar Reserch

SUMMARY: ***intensely hydrothermally altered phlogopite-bearing ophitic olivine gabbro with clotted sulphide***. This gabbroic rock does not possess a penetrative fabric however extensively hydrothermal recrystallization has significantly modified the primary mineralogy and texture even though relict primary minerals and igneous textures are inferred through pseudomorphs. The principal alteration process was the partial to complete replacement of cumulus diopside by tremolite and the growth of fibrous tremolite throughout the groundmass. The feldspathic component has been replaced by clay+sericite±fibrous amphibole. Sulphide was moderately recrystallized and remobilized during this hydrothermal recrystallization. Two igneous textures are recognizable: 1) ophitic texture and the presence of equant to oblong-shaped tremolite pseudomorphs in altered pyroxene. The latter is inferred to have been olivine inclusions in cumulus pyroxene, a textural feature that links this gabbroic rock with ultramafic rocks in this intrusive complex. Locally fine- to medium-grained partially altered diopside and tremolite pseudomorphs after pyroxene form aggregates up to 6 mm. Mafic mineral aggregates are common in gabbroic rocks. Sulphide is present as ultra fine-grained disseminations through the tremolite-rich recrystallized groundmass and as clots. The sulphide assemblage is comprised predominantly of pyrrhotite with subordinate pentlandite and chalcopyrite. Pentlandite has two textural forms: 1) a minor component as exsolved flame-type pentlandite in pyrrhotite but most commonly as individual grains associated with the polymineralic sulphide clots. Pentlandite in the sulphide clots has locally been replaced by violarite. Violarite is interpreted to be the product of Recent oxidation/supergene weathering. Is the alteration/replacement present in this rock related to the carbonatization episode even though this alteration is not characterized by carbonate replacement i.e. TS-9. The following <5 micron-sized PGE-bearing minerals associated with clotted sulphide were identified an energy dispersive analysis using a scanning electron microscope: Pd-Te - merenskyite (Me) or a Pd+Ag telluride tarkianite, sudburyite – Pd-Sb and a Rh-As inferred to be either cherepanovite or rhodoarsenide (Rh),

TYPE: PTS
ASSEMBLAGE: diopside, tremolite, uralitic amphibole, olivine, phlogopite, sericite, clay, chlorite(?), sulphide, zircon, magnetite, chromite, plagioclase, hornblende, sulphide, PGE-bearing minerals
ESTIMATED MODE (visual): 55% (diopside, tremolite, uralitic amphibole), 10% olivine, 7% phlogopite, 25% (sericite, clay, plagioclase), 2% sulphide, 1% magnetite, trace (zircon, chromite, plagioclase, hornblende)

MINERALOGY:
Essential:

Diopside: as relict grains that have been replaced by and overgrown by tremolite. Grains have a distinctive brownish hue around the altered margins, possibly due to hematite. Primary grain size varies from 1 – 3 mm and can form clusters of grains to 6 mm in longest dimension. Some grains host ultra fine-grained clay+sericite+acicular amphibole inferred to be after feldspar, a clear indication of an ophitic texture.

Tremolite: most abundant amphibole. Present as fibrous overgrowths on and a replacement diopside.

Uralitic amphibole: micro-domains of the section are comprised of acicular fibrous amphibole. These domains are inferred to have been pyroxene

Phlogopite: plates to 1.5 mm and have a characteristic orange red – orange to pale yellow pleochroism. Occur as individual plates interstitial to altered feldspar-altered pyroxene and as clusters of plates either interstitial to essential altered silicates or associated with recrystallized and weakly remobilized sulphide.

Olivine: equant grains to 0.4 mm as inclusions in poikilitic diopside.

Accessory:

Sulphide: minor amount evenly disseminated through the recrystallized host rock. Present as disseminated ultra fine-grained, 0.05 mm and less, sulphide in the recrystallized host rock and irregular-shaped clots up to 3 mm.

Pyrrhotite: present as the dominant sulphide in the disseminated and clotted textural types. Pyrrhotite can host exsolved flame type pentlandite but it is not that common.

Pentlandite: two textural types: predominantly as individual anhedral grains in the sulphide clots and 2) rare as exsolved flame-type pentlandite in pyrrhotite.

Chalcopyrite: minor to trace amount; present in the sulphide clots and also disseminated.

Violarite: as ultra narrow rims on pentlandite in portions of the section. This replacement of pentlandite by violarite is attributed to Recent oxidation/supergene processes.

Hornblende: trace amount; red brown pleochroism with well-formed amphibole cleavage. Hornblende is present as subhedral to anhedral grains that have an intercumulus texture similar to hornblende in the ultramafic series. It is also present as overgrowths on pyroxene, a replacement texture similar to pyroxene-amphibole in the ultramafic rocks. These textures indicate co-precipitation and replacement of pyroxene-amphibole in a hydrous intercumulus liquid. Hornblende is associated with ubiquitous phlogopite.

Sericite: as ultra fine-grained platelets associated with clay after feldspar.

Clay: irregular shaped domains comprised of a very fine-grained phyllosilicate mineral that has a very low first-order birefringence. These are inferred to be clay, kandite group, after feldspar.

Feldspar: trace amount remaining as relict grains within clay+sericite pseudomorphs. Some pseudomorphs have an intercumulus textures and other grains are subhedral to 2 mm and have an ophitic texture with respect to pyroxene and interstitial to pyroxene.

Zircon: rare anhedral grains commonly adjacent to phlogopite

Magnetite: trace amount distributed through the recrystallized tremolite+diopside+phlogopite host rock. Some grains of magnetite as inclusions in intercumulus phlogopite. This texture implies that the magnetite is primary and is supporting mineralogical evidence for the oxidation state of intercumulus mica and amphibole, i.e. pleochroic colours.

Chromite: rare grains to 0.1 mm distributed through recrystallized host rock.

Chlorite(?): low birefringent variety, Mg-rich, associated with very fine-grained clay-fuchsite mats that replace the feldspathic component.

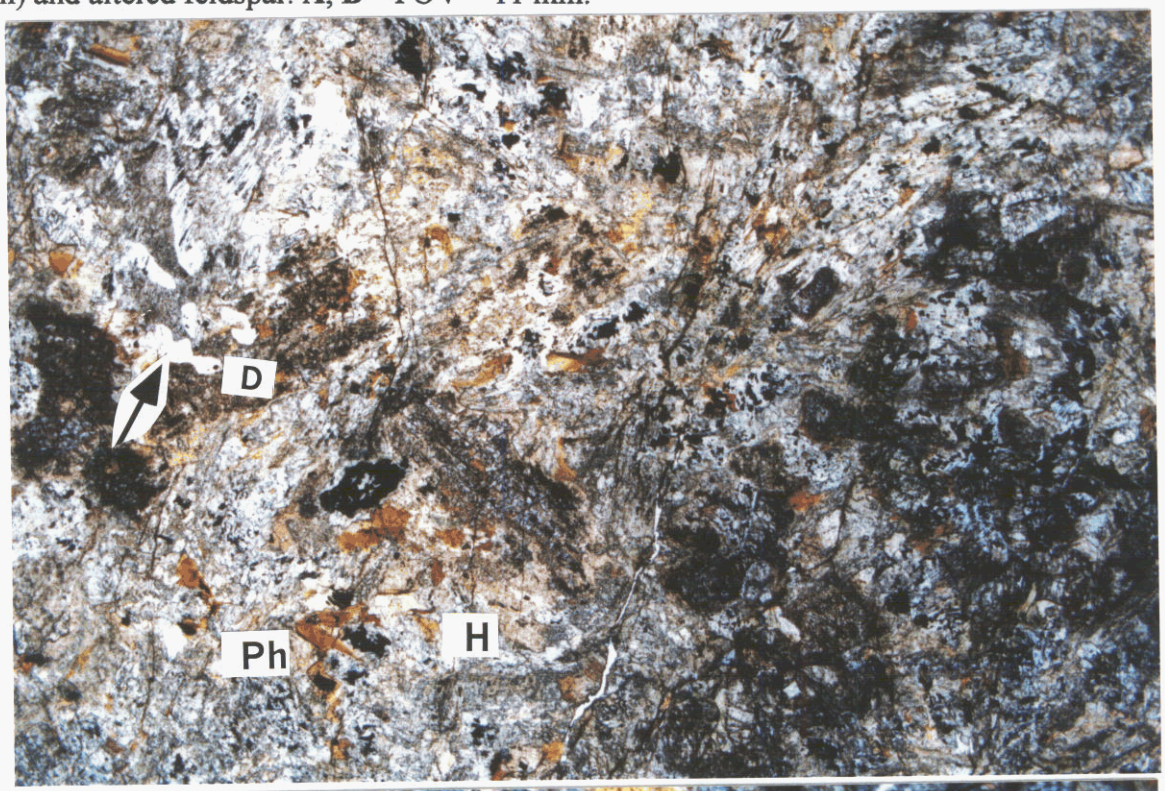
TEXTURE & FABRIC:
This rock does not have a penetrative fabric but has been extensively recrystallized. Even with this extensive replacement, predominantly by amphibole, there are distinctive relict textures that conclusively indicated that the protolith was a gabbro.
An ophitic texture is preserved by the partial enclosure of altered feldspar (clay+sericite) in tremolite pseudomorphs after pyroxene. In addition some tremolite pseudomorphs after pyroxene host elongate to equant tremolite pseudomorphs inferred to have been olivine. These poikilitic olivine-bearing pyroxene are similar to cumulate olivine-bearing pyroxene in the ultramafic rocks described in this report and these similarities support primary differentiation between the ultramafic and gabbroic phases of this complex. The presence of rare hornblende rims on pyroxene suggests that the parental gabbroic magma may have crystallized late stage amphibole. The gabbroic magma was hydrous as indicated by the presence of phlogopite/biotite. Thus the presence of late stage amphibole crystallization on cumulate pyroxene is consistent with a hydrous magma.

ALTERATION:
This rock has sustained intensive recrystallization without the formation of a penetrative fabric and consequently there is some preservation of the primary igneous textures. Tremolite is the dominant alteration mineral and is presence as a replacement of cumulus pyroxene, olivine inclusion in pyroxene and very fine-grained acicular amphibole replacing the leucocratic portion of the host rock. The feldspathic component has been replaced by clay+sericite+ultra fine-grained amphibole.

ROCK TYPE: phlogopite and sulphide-bearing ophitic gabbro

Plate 52. Photomicrographs, **A** – plane light, **B** – crossed nicols, show intensely hydrothermally altered gabbroic rock. Poikilitic diopside (D) and its inclusions of olivine (arrow) have been variable replaced by tremolite. Clots and ragged grains of sulphide are distributed through the matrix that is comprised of primary hornblende (H), phlogopite (Ph) and altered feldspar. **A**, **B** – FOV = 11 mm.

A



B

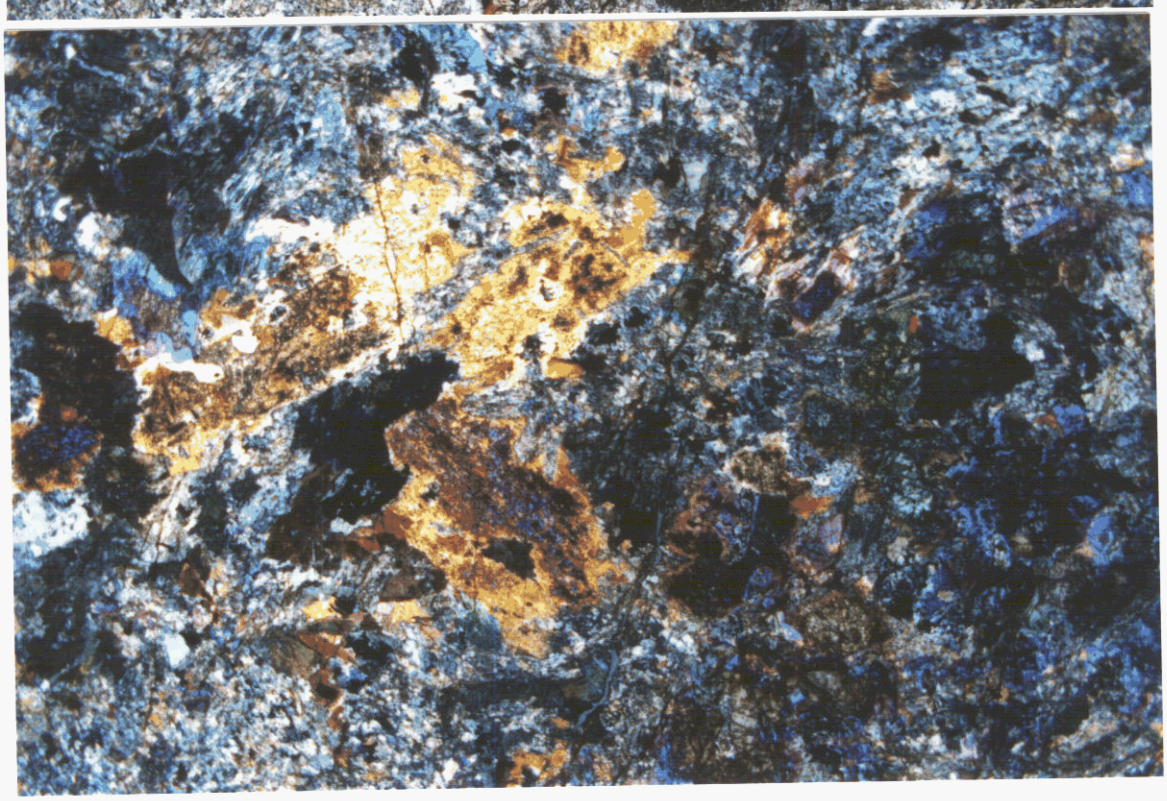


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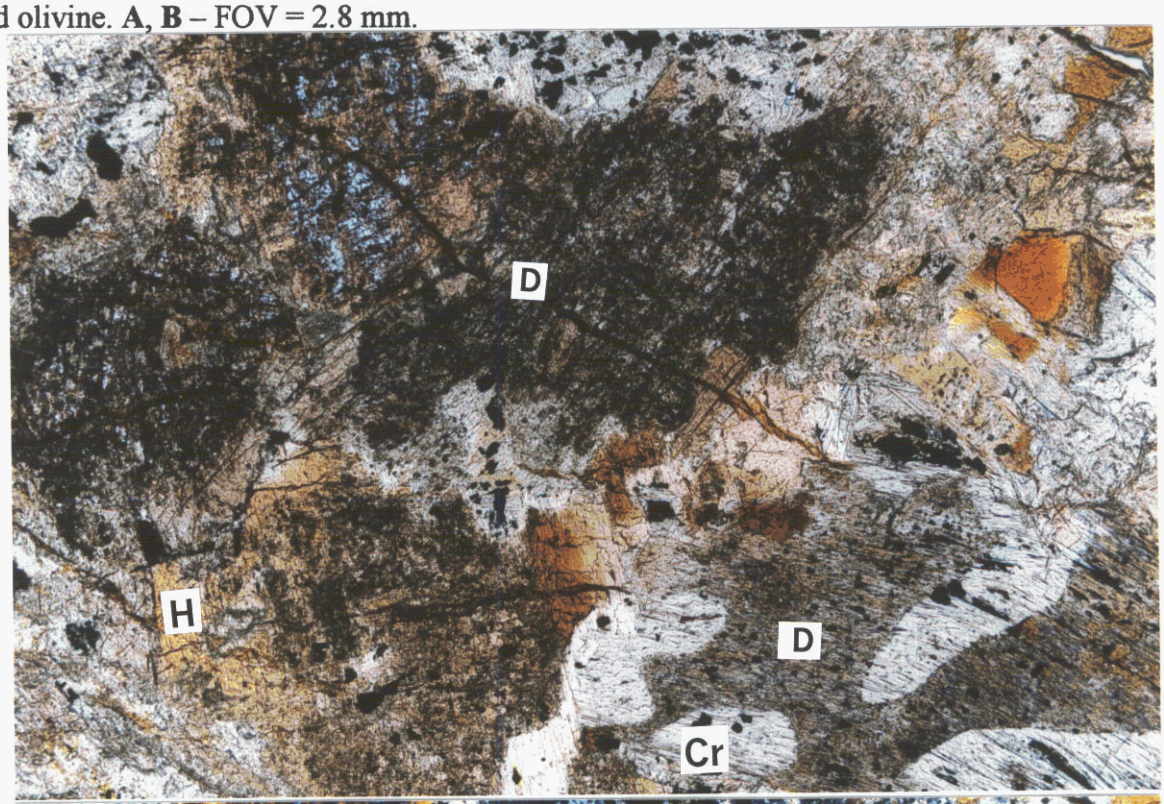
Plate 53. Photomicrographs, **A** – plane light, **B** – crossed nicols, show the clotted texture of variably altered poikilitic diopside and the associated primary intercumulus hydrous minerals. Poikilitic diopside (D) hosts inclusions of equant to oblong olivine (O), both have been replaced by tremolite (T). Primary hornblende (H) mantle some cumulate diopside (D) and relict cores of diopside remain in some tremolitized pyroxene grains. Fine-grained euhedral chromite (Cr) is present as inclusions in altered cumulus diopside and olivine. **A**, **B** – FOV = 2.8 mm.

A



B

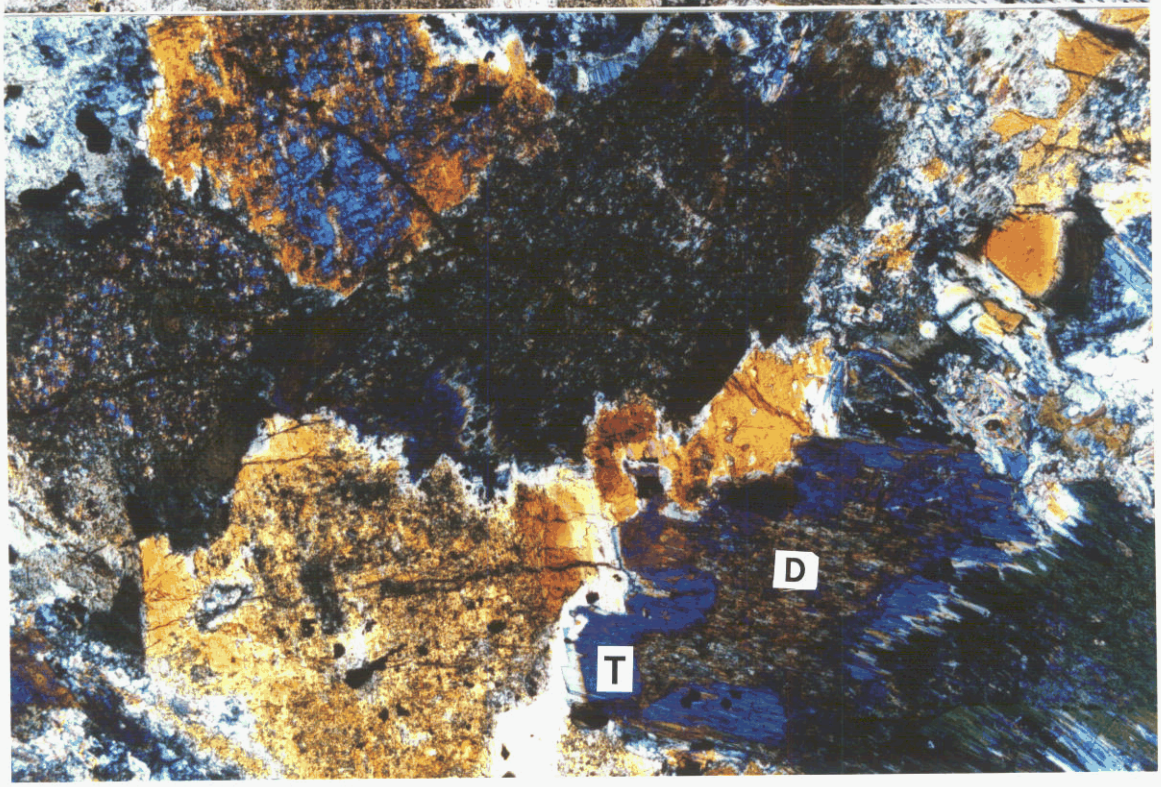
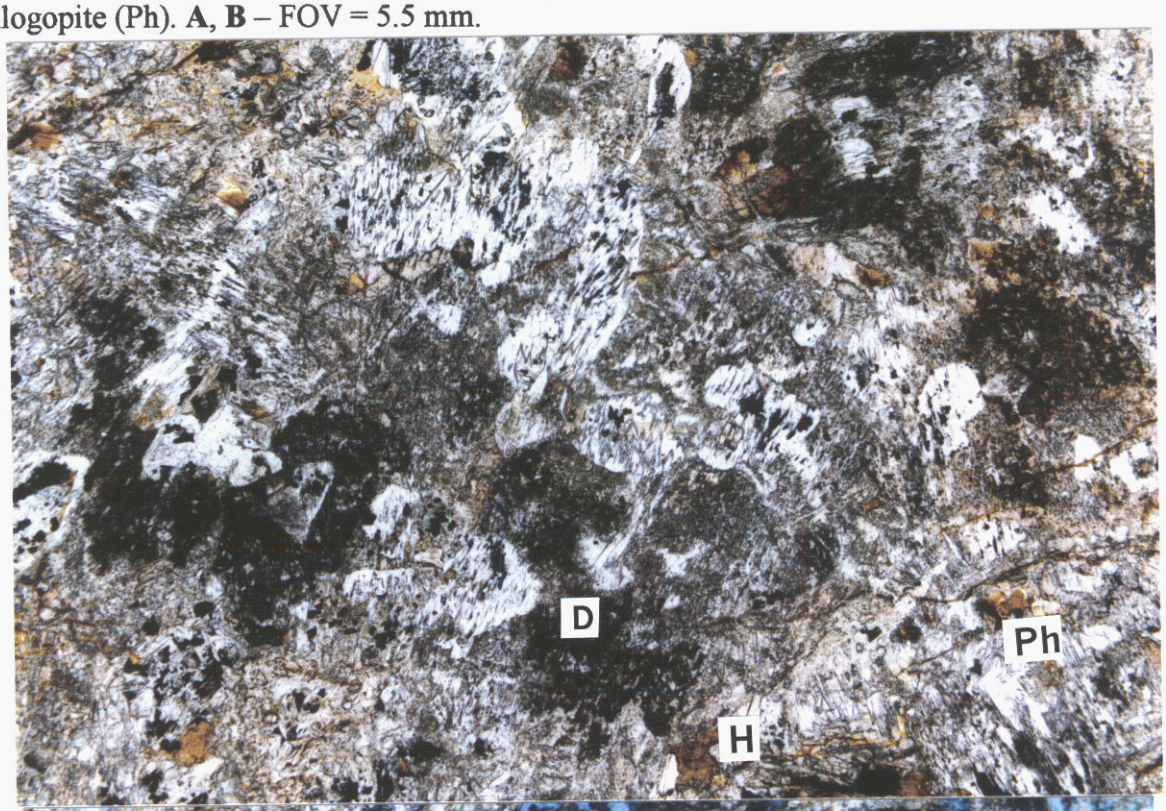


Plate 54. Photomicrographs, **A** – plane light, **B** – crossed nicols, show the texture and alteration of poikilitic diopside (D). In plane light, diopside has been discoloured by abundant ultra fine-grained iron oxide and tremolite (T)+sulphide (black) have replaced olivine. Primary hornblende (H) mantles diopside and is associated with interstitial phlogopite (Ph). **A**, **B** – FOV = 5.5 mm.

A



B

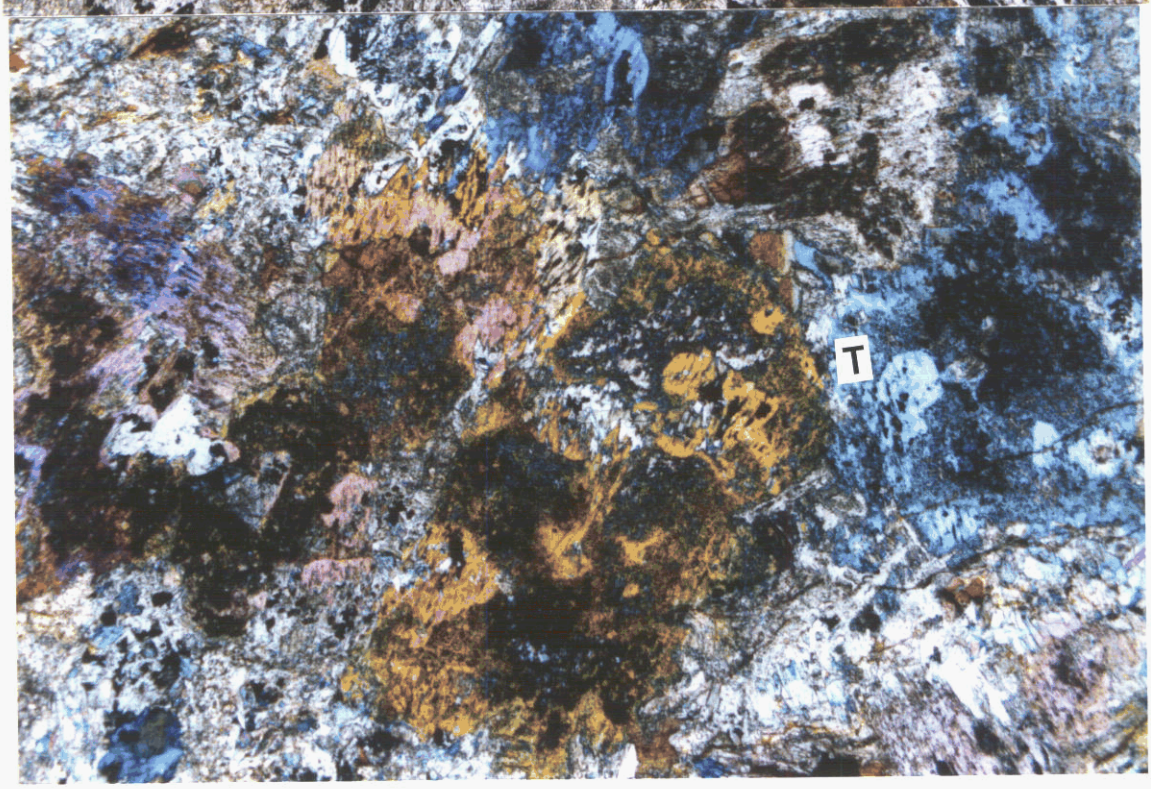


Plate 55. Photomicrographs, **A**, **B** – plane light, show the texture of primary intercumulus amphibole and mica. Hornblende (H) with well developed amphibole cleavage and very fine-grained phlogopite (Ph) is associated with clotted sulphide (cS) and remobilized and recrystallized disseminated very fine-grained sulphide. In **B**, sulphide occupies the intercumulus volume between serpentine+tremolite pseudomorphs after olivine.
A, **B** – FOV = 5.5 mm.

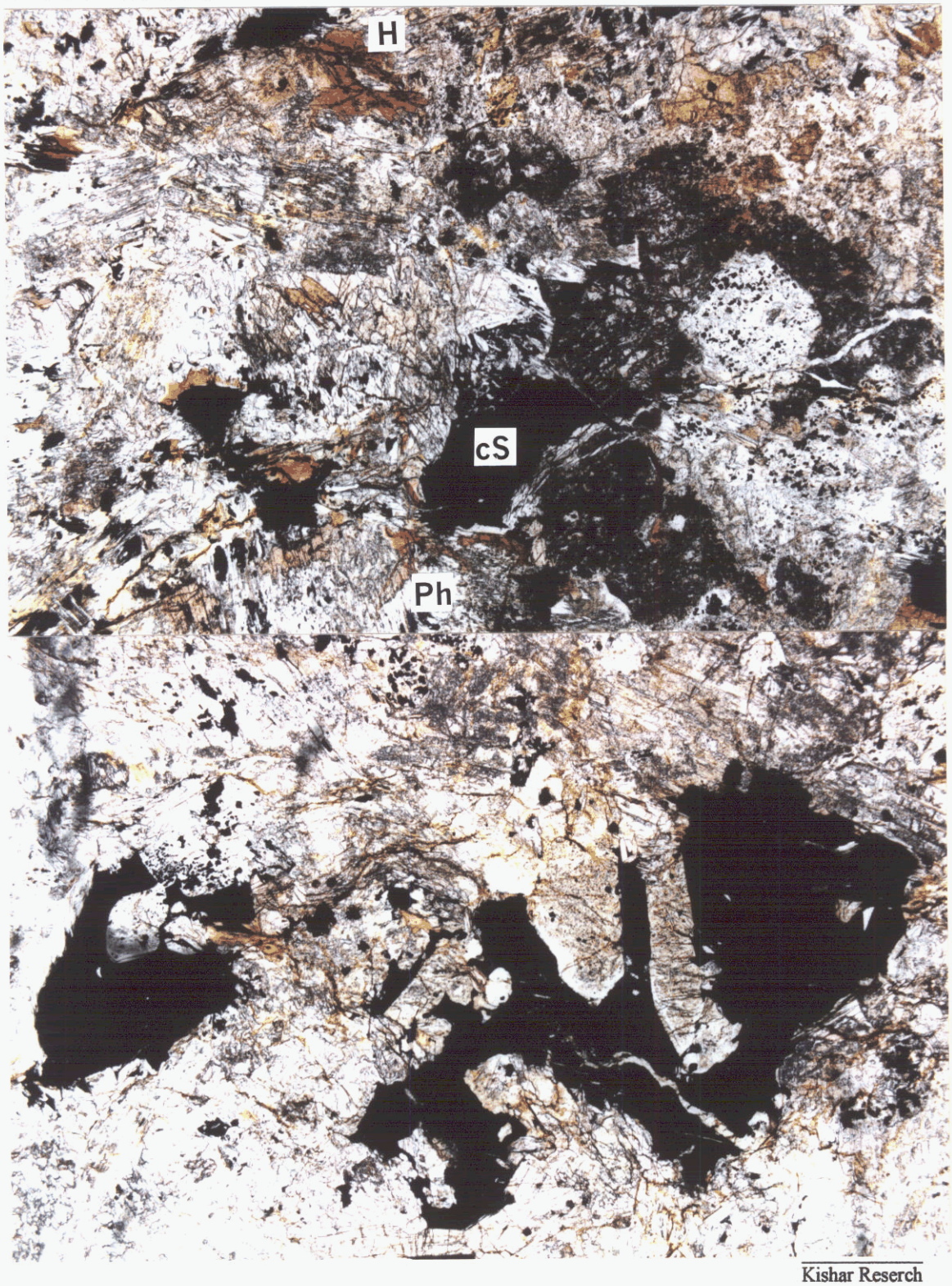


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Plate 56. Photomicrograph, plane light, shows a partially altered cumulus ophitic diopside. The margin of the cumulus diopside has been replaced by tremolite (T) whereas primary diopside (D) is present in the core. Subhedral sericite+clay pseudomorphs after plagioclase (P) are partially embedded in altered diopside. FOV = 5.5 mm.

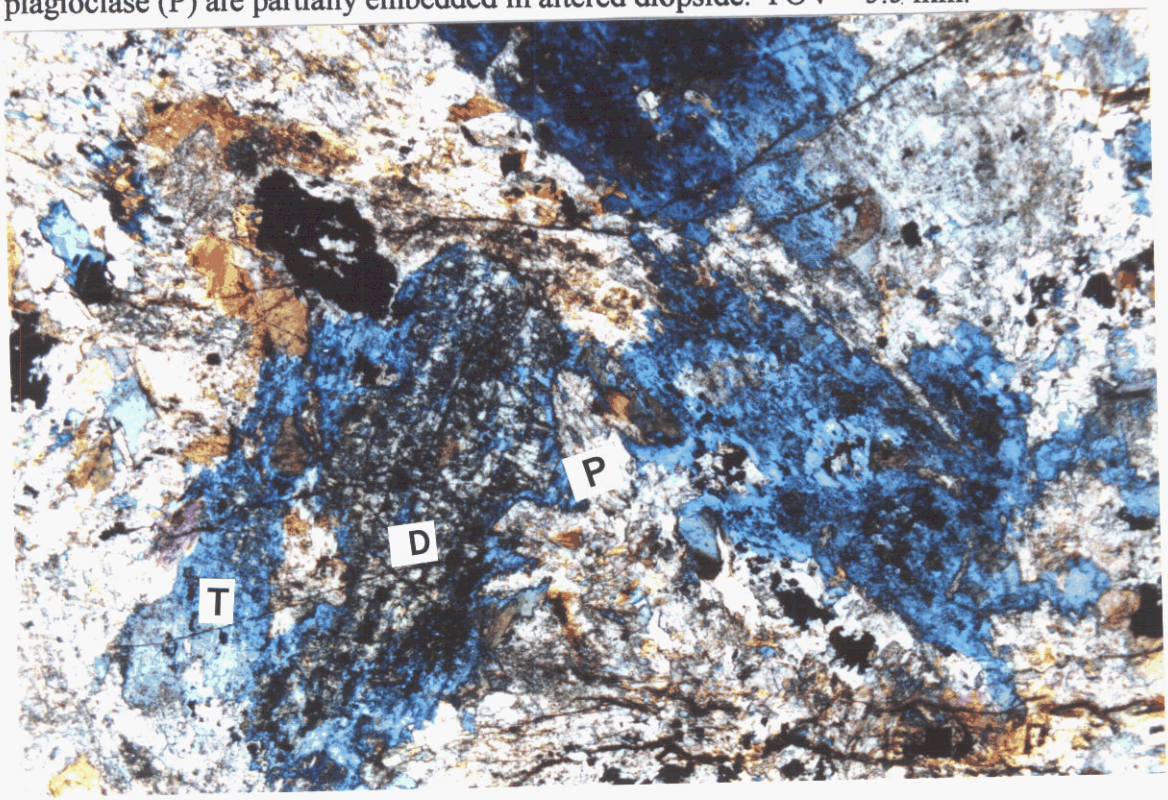
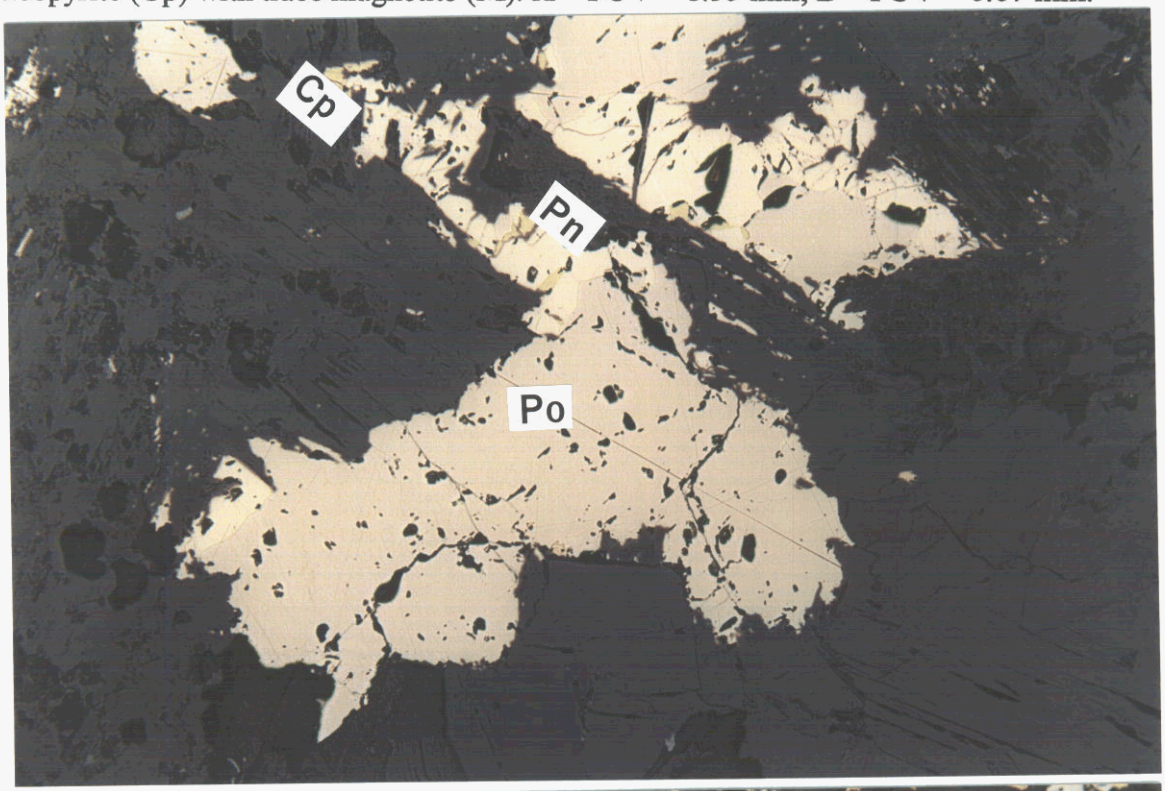


Plate 57. Photomicrographs, **A**, **B** – reflected light, show the variably recrystallized sulphide clots. The clots are comprised of pyrrhotite (Po), pentlandite (Pn) and chalcopyrite (Cp) with trace magnetite (M). **A** – FOV = 1.35 mm; **B** – FOV = 0.67 mm.

A



B

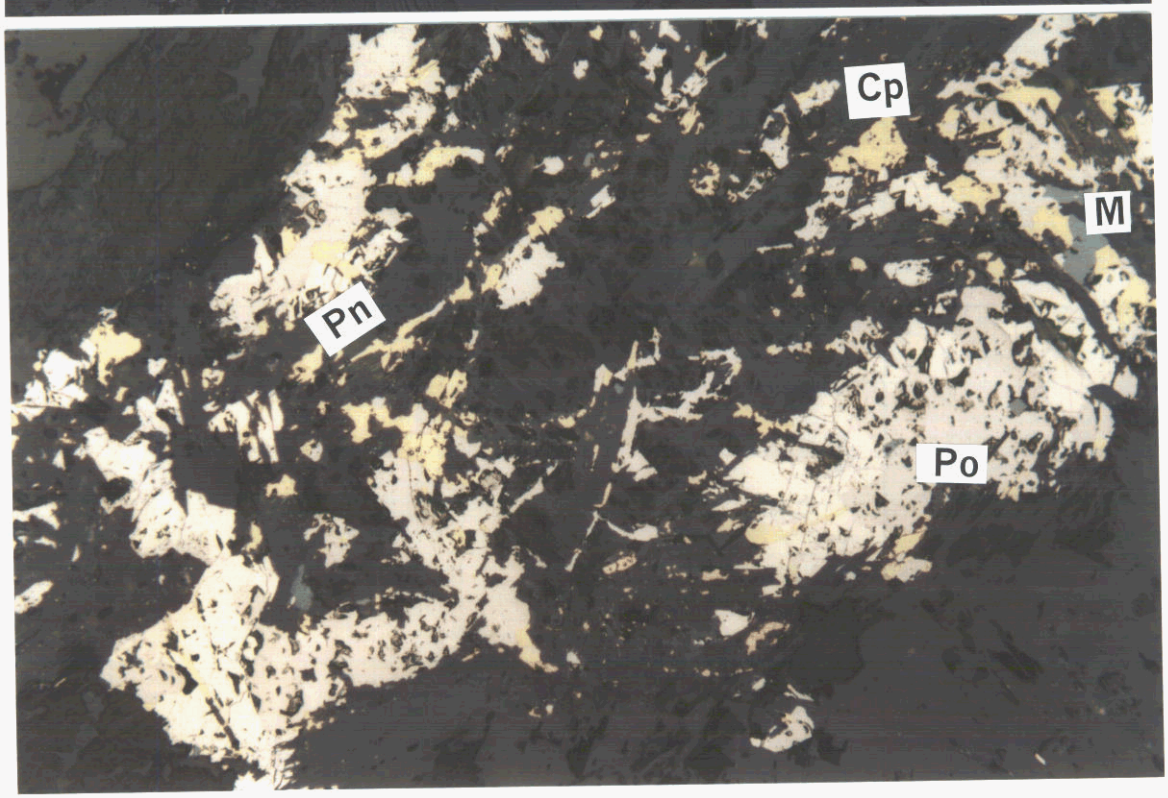


Plate 58. Photomicrograph, reflected light, shows the replacement of pentlandite (Pn) by violarite (V) and pyrrhotite (Po) by marcasite (Ma), both the product of Recent oxidation. Trace chalcopyrite (Cp) is present. FOV = 0.67 mm.

Plate 59. Electron backscattered image of Pd-telluride, inferred to be merenskyite (Me) based on the energy dispersive spectra. There is minor sulphur substituting for telluride. These minute grains are located along the interface of chalcopyrite (Cp) and silicate (black area).

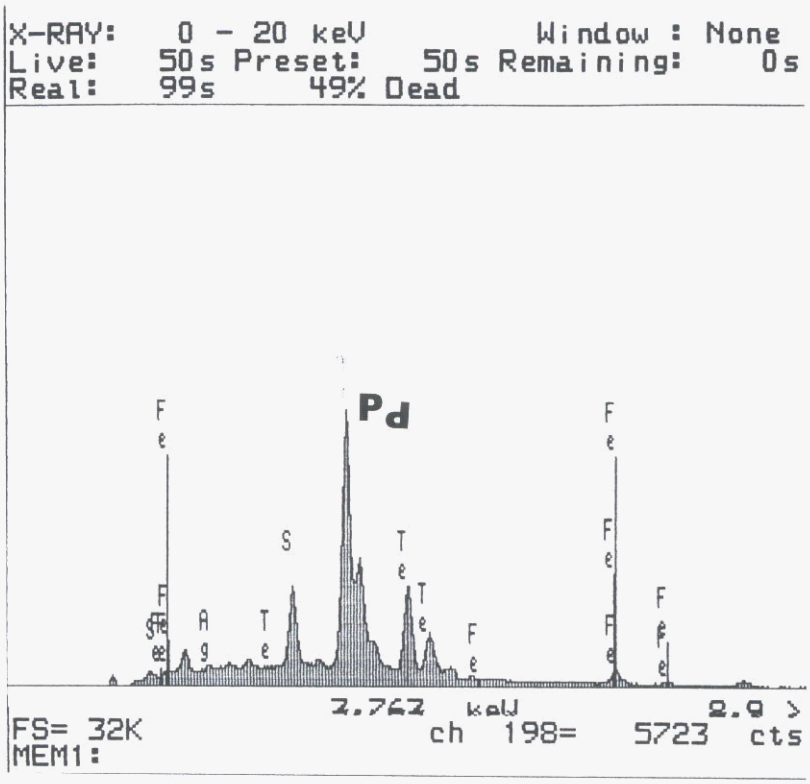
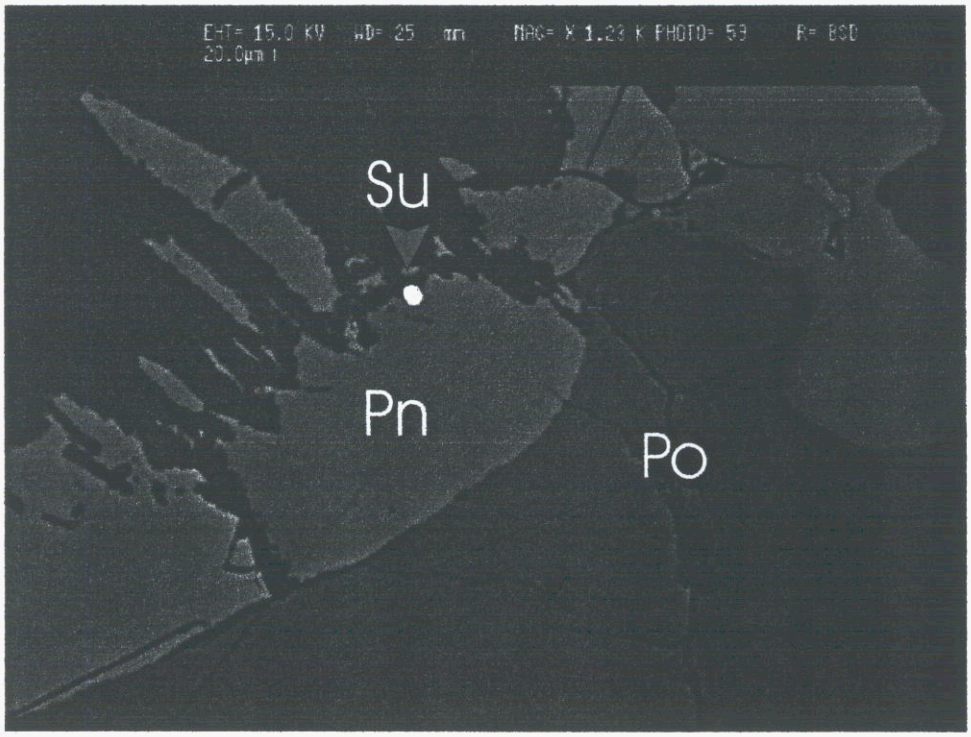


Plate 60. Electron backscattered image of Pd-antimonide, inferred to be sudburyite (Su) based on the energy dispersive spectra. Sudburyite is hosted within pentlandite (Pn) with accompanying pyrrhotite (Po).



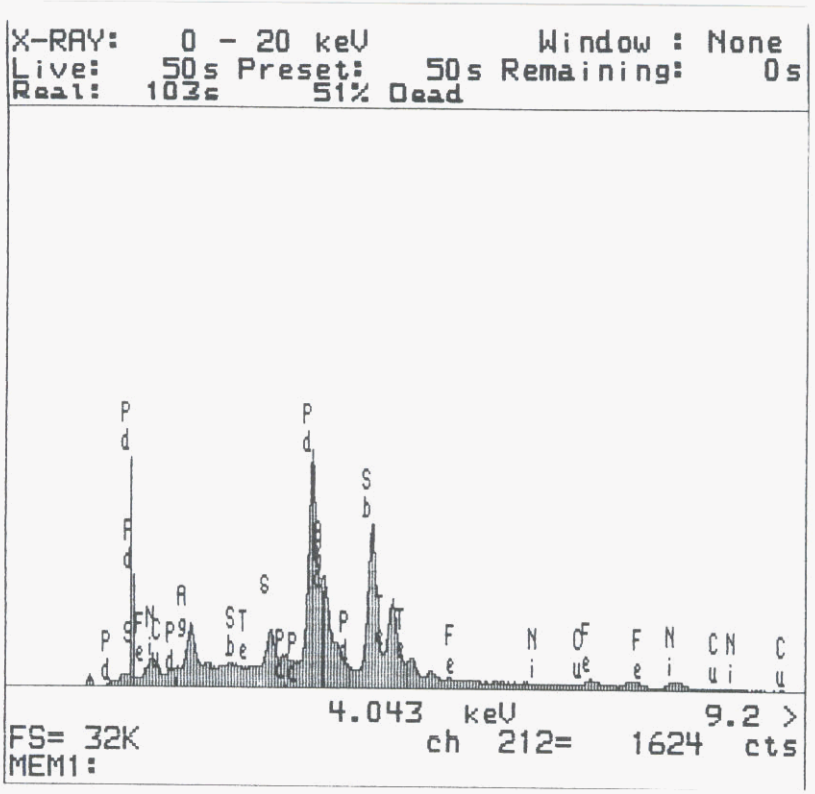


Plate 61. Electron backscattered image of Pd-antimonide, inferred to be sudburyite (Su) based on the energy dispersive spectra, is hosted within chalcopyrite (Cp).

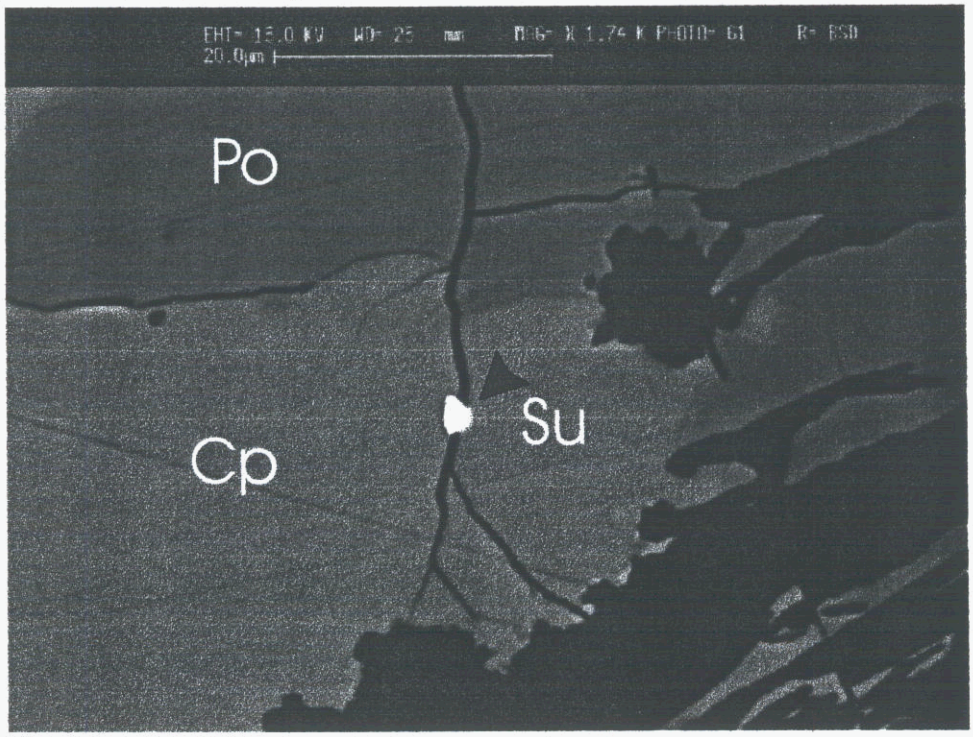
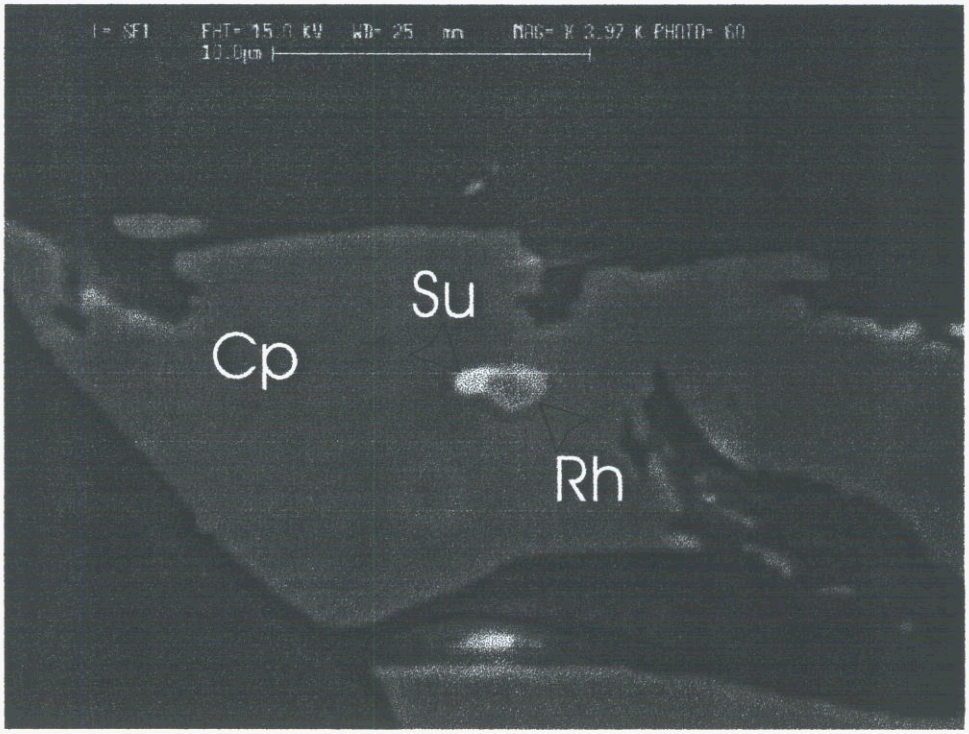
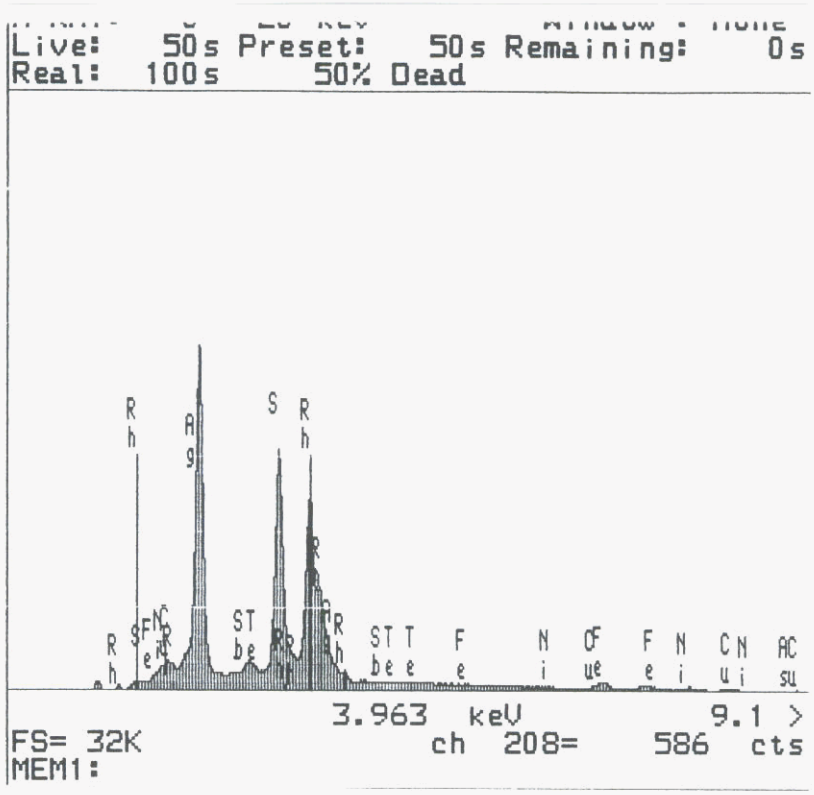


Plate 62. Electron backscattered image of two PGE-bearing minerals hosted within chalcopyrite (Cp). One grain comprised of Rh-As is inferred to be either cherepanovite or rhodoarsenide (Rh) and the adjacent grain is Pd+Sb, inferred to be sudburyite (Su).





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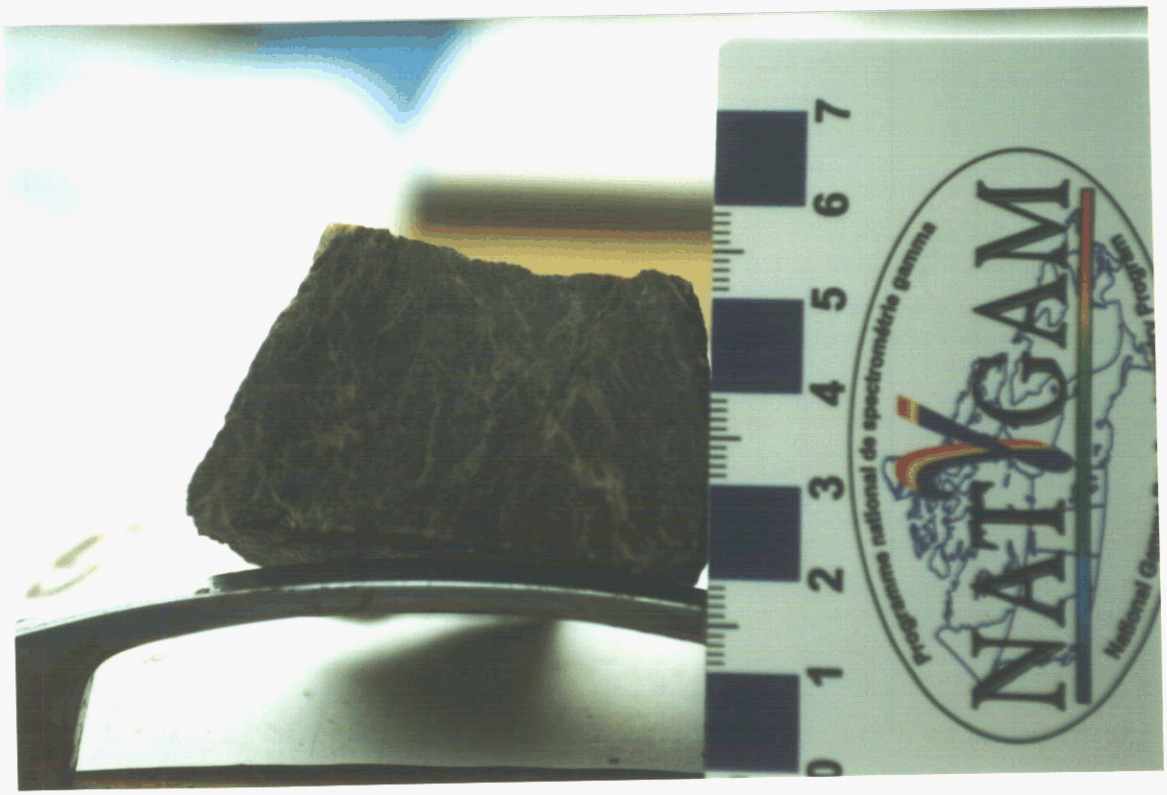
Sample #: Onion TS-5: Sax-Cessena Embayment area

Cu 5 ppm; Ni 1630 ppm; Co 100 ppm

1 ppb Au, 53 ppb Pt, 33 ppb Pd, 86 ppb PGE_T

Location	Northing	Easting
3+90 S / 0+70 E	6872494	521423



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SUMMARY: ***chlorite+talc+serpentine+carbonate schist***. This ultramafic rock has undergone complete hydration and carbonation with an accompanying well-formed anastomosing foliation. There are lenticular domains or lozenges within this fabric that retain some primary igneous textures. These textures include subequant to equant serpentine-rich pseudomorphs inferred to be after olivine and serpentine pseudomorphs after olivine with intercumulus magnetite+serpentine pseudomorphs inferred to be after pyroxene. Due to the well-developed schistocity and the lack of textural preservation at the thin section-scale in spite of textural preservation in lithons, it is difficult to establish which of the two textural variations are the most abundant. Consequently the protolith is inferred to be either a dunite or transitional into peridotitic dunite. The cumulate minerals in this rock included olivine and chromite with intercumulus pyroxene or feldspar. A low birefringent mineral inferred to be clay with secondary iron oxide has replaced intercumulus feldspar.

Serpentinization of the protolith is inferred to be the initial replacement process followed by deformation with coeval carbonatization. The introduction of CO_2 during deformation resulted in the formation of carbonate porphyroblasts after serpentine, talc with minor chlorite.

TYPE: PTS
ASSEMBLAGE: serpentine, talc, carbonate, chromite, magnetite, sulphide, chlorite, hematite, clay.
ESTIMATED MODE (visual): 55% serpentine, 15% talc, 25% carbonate, 5% chlorite, trace (chromite, magnetite, sulphide, hematite)

MINERALOGY:
Essential:

Serpentine: several textural-structural associations. 1) is the most abundant mineral in lenticular lozenges in which there is preservation of the igneous texture of the protolith. The serpentine is ultra fine-grained and associated with discontinuous seams and bands of talc+chlorite and porphyroblastic carbonate. 2) in anastomosing foliation bands

Talc: present as 1) as discontinuous bands and seams that define the anastomosing foliation, 2) intergrown with serpentine in the relict lithic fragments

Carbonate: as anhedral to subhedral porphyroblasts to 0.1 mm that are distributed through the serpentine+talc-bearing lenticular domains. There are other lenticular domains that are carbonate-rich and are comprised of coalesced porphyroblasts with subordinate serpentine+talc. Carbonate also forms discontinuous bands or seams that in part define the anastomosing foliation and subdivides the rock into a series of lenticular domains of different sizes.

Accessory:

Chlorite: two generations of chlorite: 1) present in the anastomosing foliation and a younger generation that is associated with chlorite+carbonate-filled veins that are discordant to the foliation and breccia the ultramafic schist.

Chromite: present as subhedral to euhedral grains to 0.1 mm distributed primarily through the relict lithic lozenges. Many have been replaced by hematite-magnetite

Hematite: as pseudomorphs after disseminated chromite, this may be related to the intense alteration. Iron oxide associated with clay after intercumulus feldspar.

Magnetite: minute grains, <0.05 mm, distributed through the altered lithic lozenges.

Clay: very low birefringent mineral associated with micron-sized iron oxide staining is inferred to have replaced intercumulus feldspar.

Sulphide: trace amount as minute grains, <0.005 mm, present in relict lithic lozenges and in carbonate+talc seams that are part of the anastomosing foliation.

TEXTURE & FABRIC:

An anastomosing foliation formed by the discontinuous bifurcating seams of carbonate, serpentine, talc and minor chlorite have dismembered the serpentinized protolith into numerous lenticular domains. Second order seams comprised of carbonate, serpentine, talc and minor chlorite crosscut these lenticular domains.

In spite of this penetrative fabric, relict igneous textures are recognizable in some of the lenticular domains. Some domains are comprised of subequant serpentine pseudomorphs - up to 0.5 mm in diameter, a texture that suggests derivation from an olivine-rich protolith. In addition, there are subhedral opaque grains interstitial to these serpentine pseudomorphs inferred to be after olivine. This texture is identical to the undeformed dunitic rocks typified by TS-2 and –3. There are also domains that display serpentine pseudomorphs after cumulus olivine and the intercumulus volumes that are replaced by are occupied by a low birefringent mineral+magnetite. This phase could have been feldspar or pyroxene.

ALTERATION:

Hydration along with carbonation have complete converted the protolith into a very fine-grained foliated assemblage of serpentine, carbonate, talc and chlorite that host less deformed lithons of the serpentinized protolith.

ROCK TYPE: dunite to peridotitic dunite.

Plate 63. Photomicrograph, plane light, shows the anastomosing foliation defined by bifurcating first and second order carbonate-rich veins and veinlets. This anastomosing foliation has subdivided the altered rock into micro-domains or lithons, some of which retain primary igneous textures. FOV = 11 mm.

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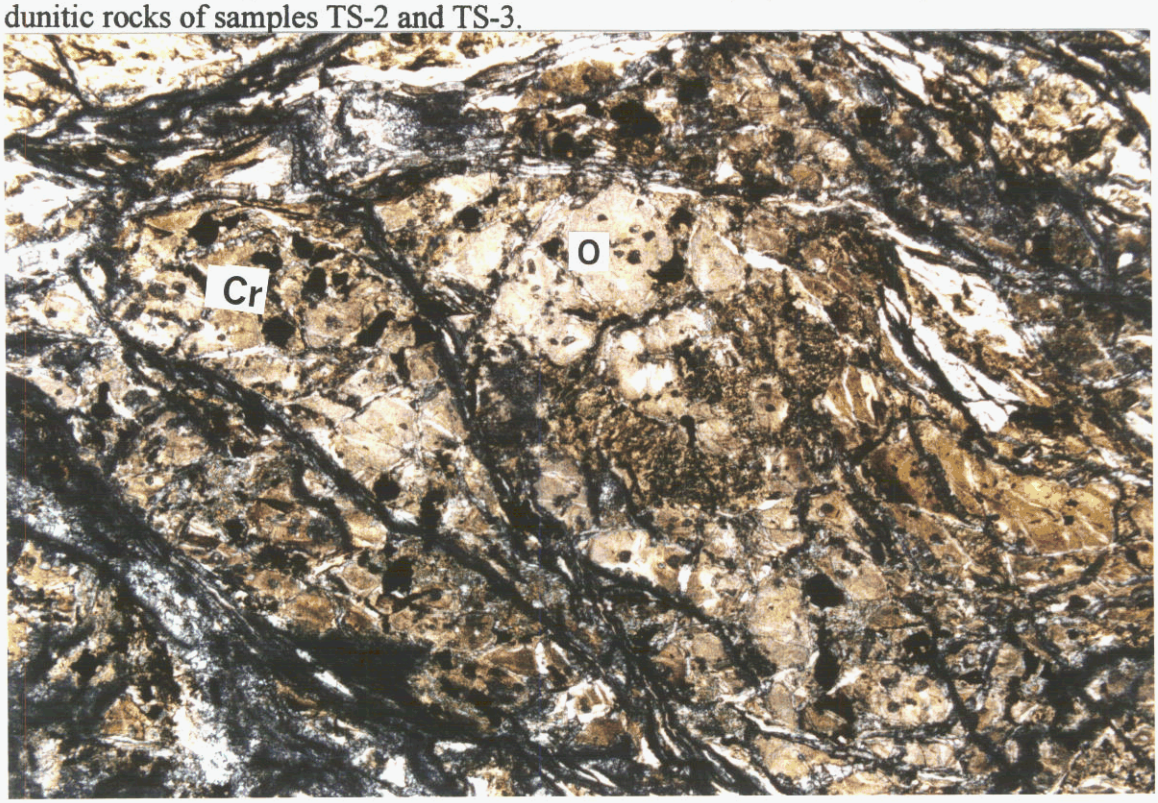
Plate 64. Photomicrographs, **A**, **B** – plane light, show relict igneous textures within different micro-domains or lithons, even though this rock displays a well-developed penetrative fabric and moderately intense overprinting carbonate alteration.
A, **B** – FOV = 5.5 mm.
A. Subequant round serpentine pseudomorphs after cumulus olivine (O) with sparsely disseminated fine-grained interstitial cumulus chromite (Cr) is texturally similar to the dunitic rocks of samples TS-2 and TS-3.



B. Intercumulus volumes between subequant round serpentine pseudomorphs after olivine are occupied by serpentine+magnetite (SrM), a texture similar to samples TS-2 and TS-3 and inferred to have been orthopyroxene.

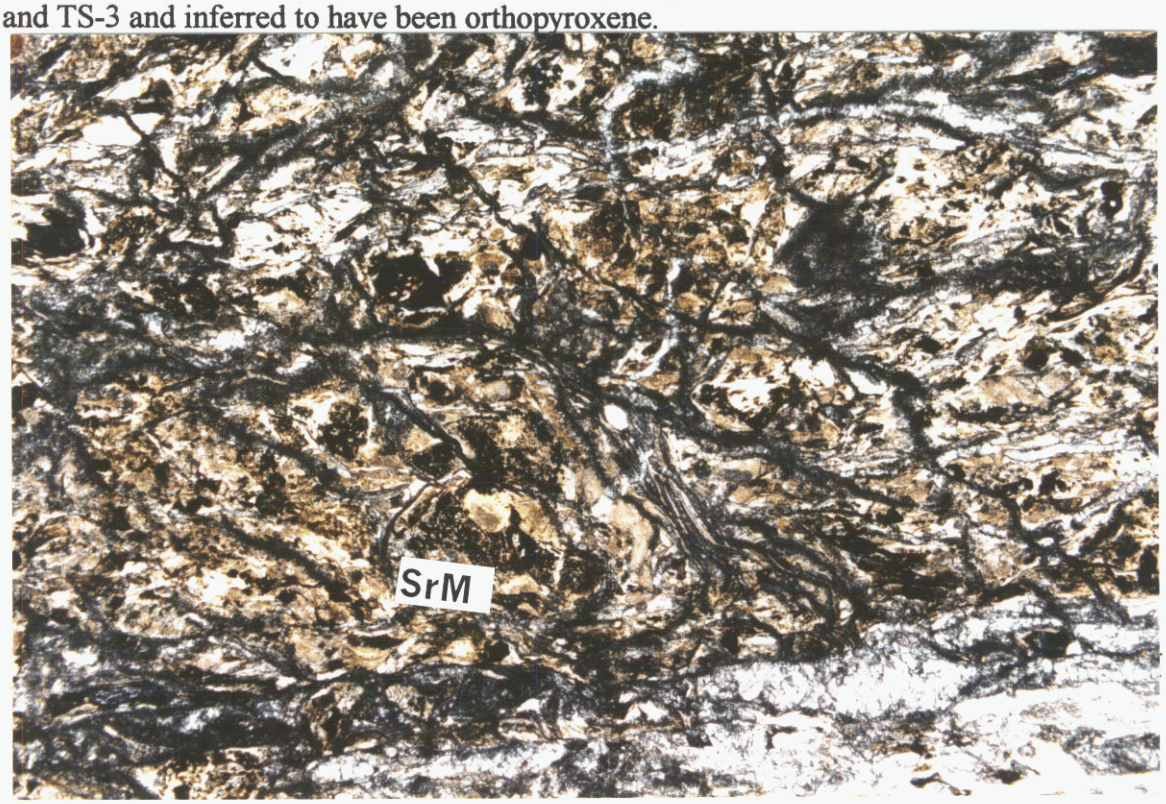
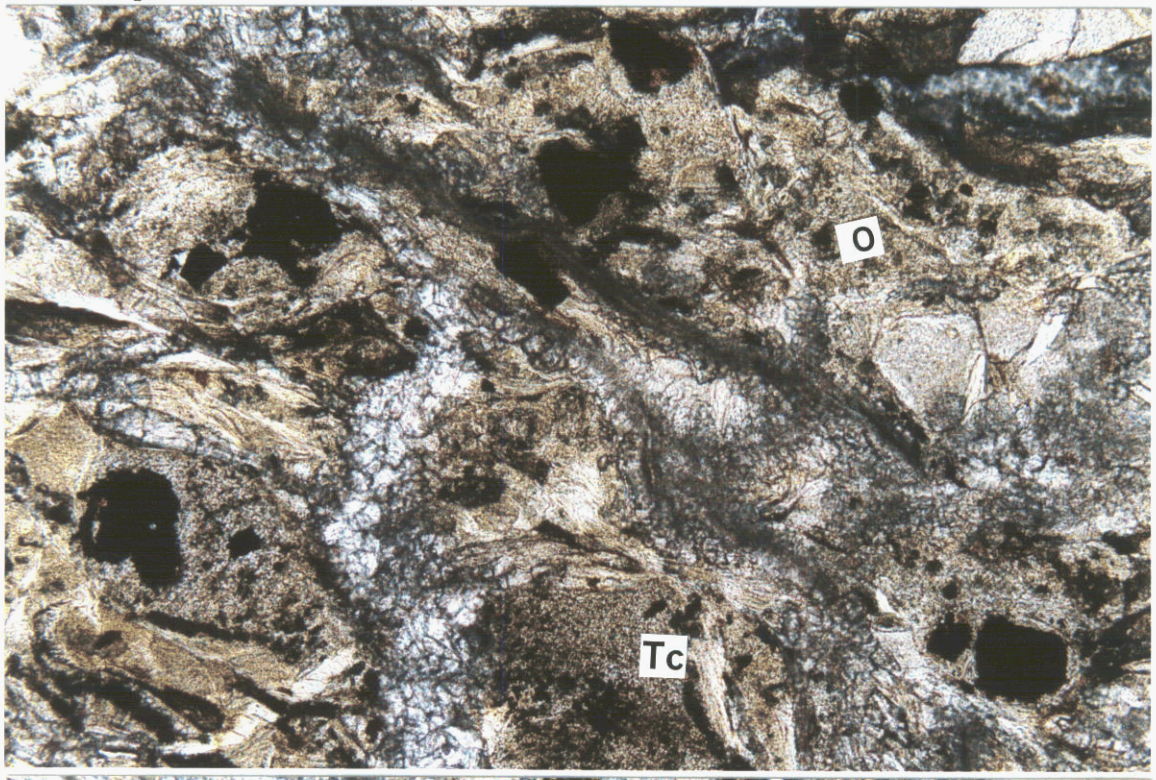


Plate 65. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, show the recrystallization of the relict texture of serpentine pseudomorphs after olivine (O) with associated cumulus chromite (Cr) due to the overprinting carbonatization. Very fine-grained talc (Tc) is a product of shearing and flux of CO_2-bearing fluid through this cumulate serpentinized rock. **A**, **B**, **C** – FOV = 1.35 mm.

A



B

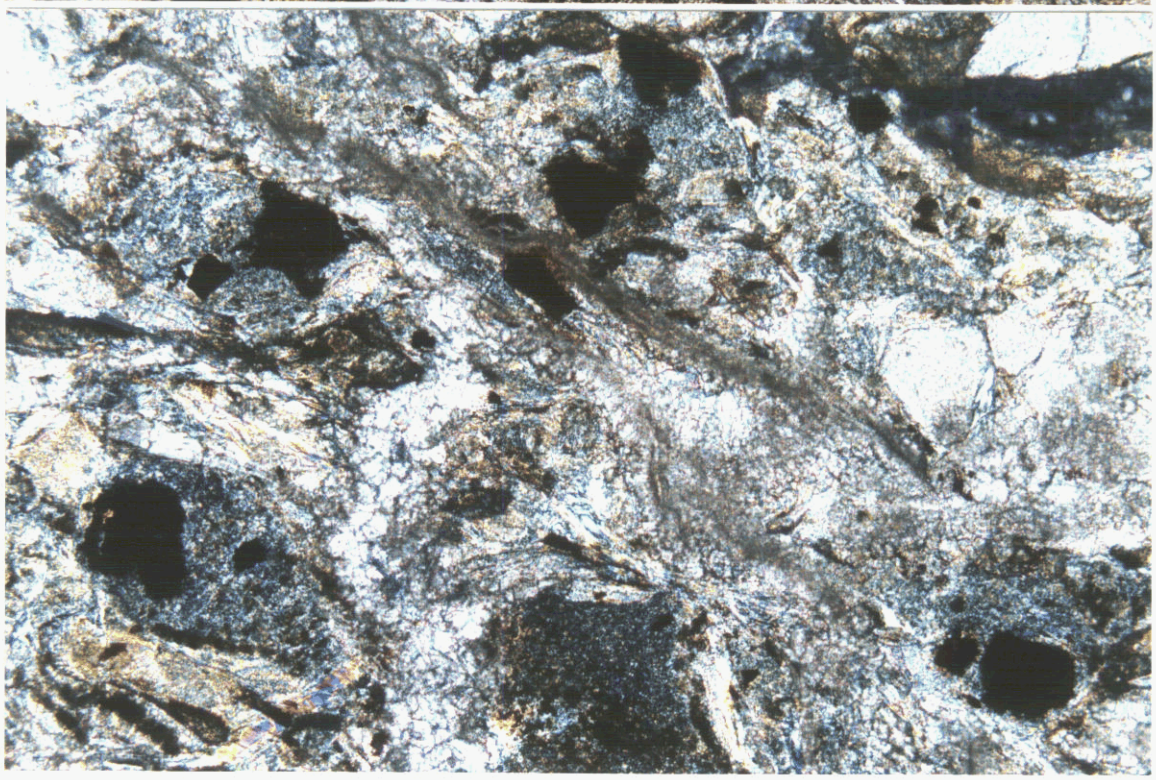


Plate 65C. moderately intense carbonatization formed talc after serpentine and also altered euhedral cumulus chromite (Cr). Altered chromite is anhedral and the grain margins are scalloped or serrated, a conclusive textural features that indicates dissolution or corrosion of chromite. The corroded chromite can be partially mantled by secondary magnetite (sM).

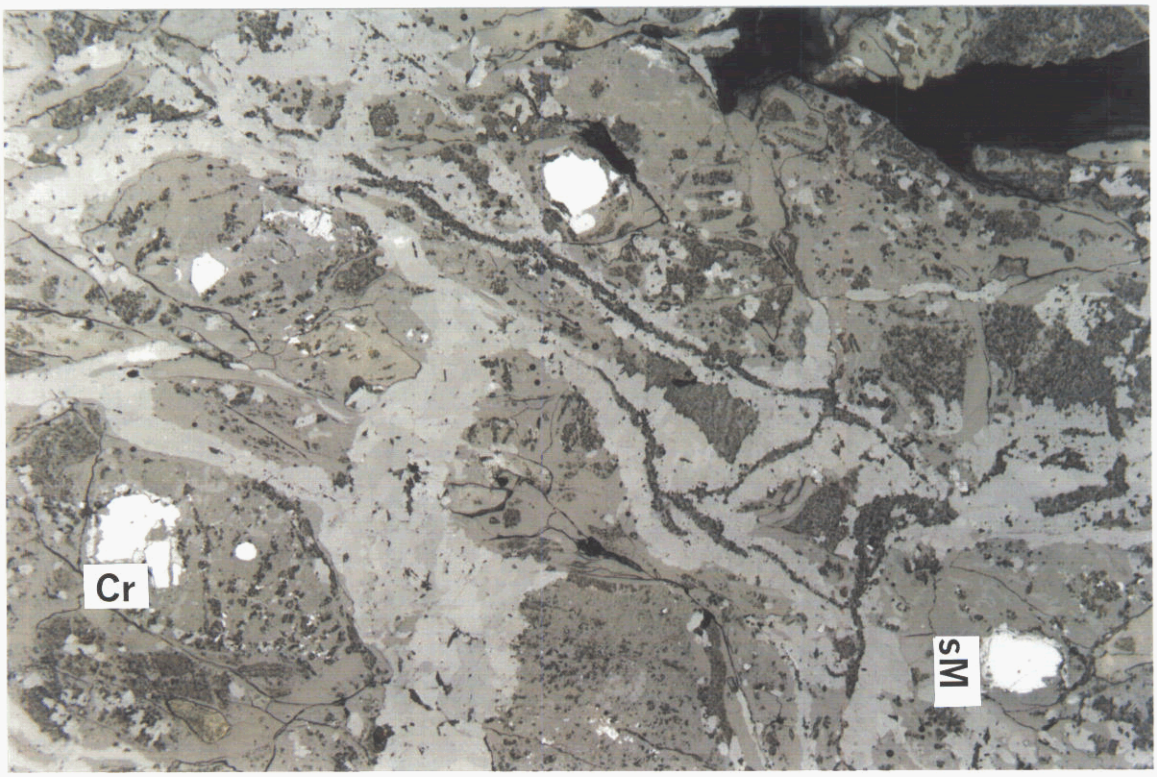
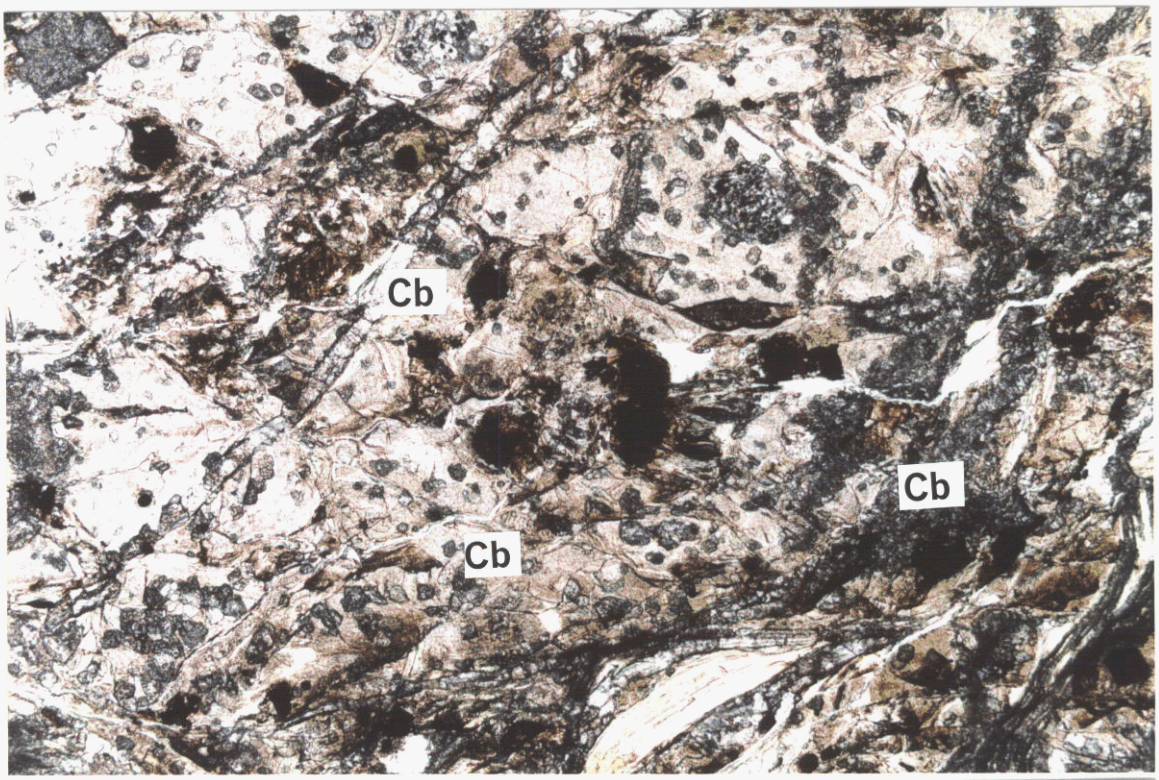


Plate 66. Photomicrographs, **A**, **C** – plane light, **B, D** – reflected light, show the different carbonate textures formed during the deformation-related carbonatization episode. Carbonate (Cb) is present as ultra fine-grained turbid aggregates that fill the anastomosing foliation, carbonate porphyroblasts after serpentine and carbonate-filled veinlets. **A**, **B** – FOV = 2.8 mm; **C**, **D** – FOV = 1.35 mm.

A



B

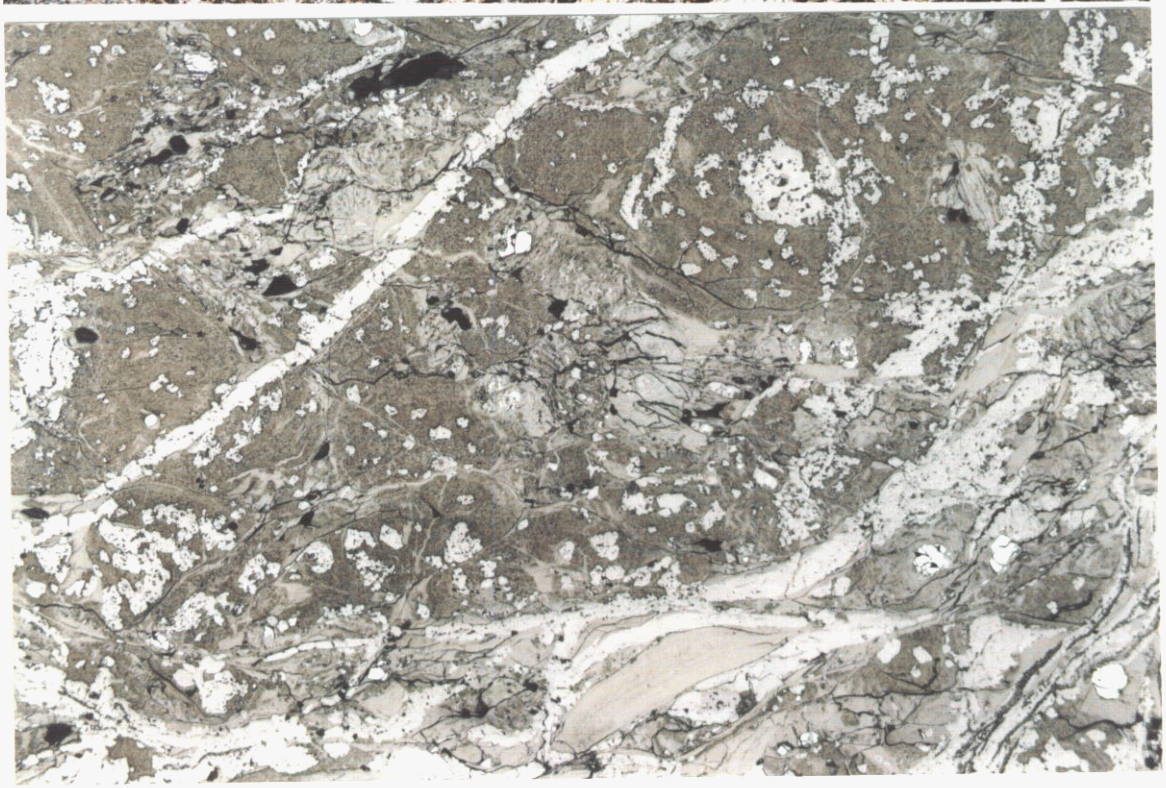


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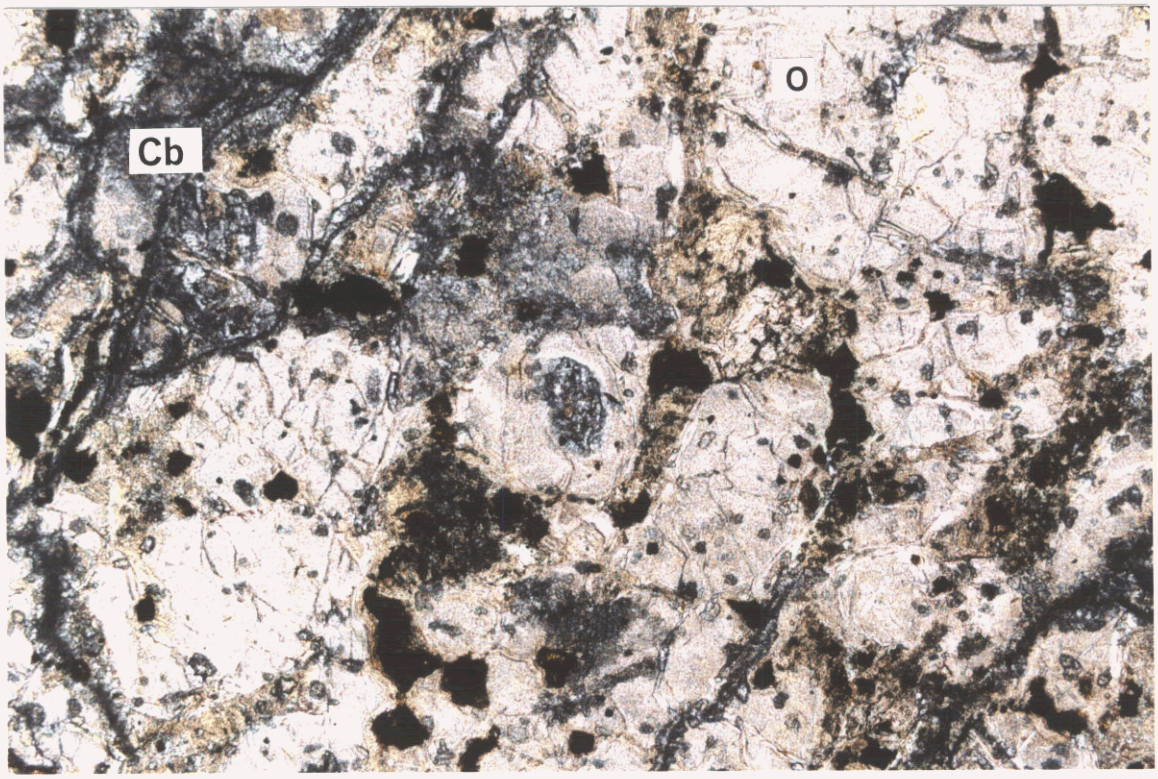
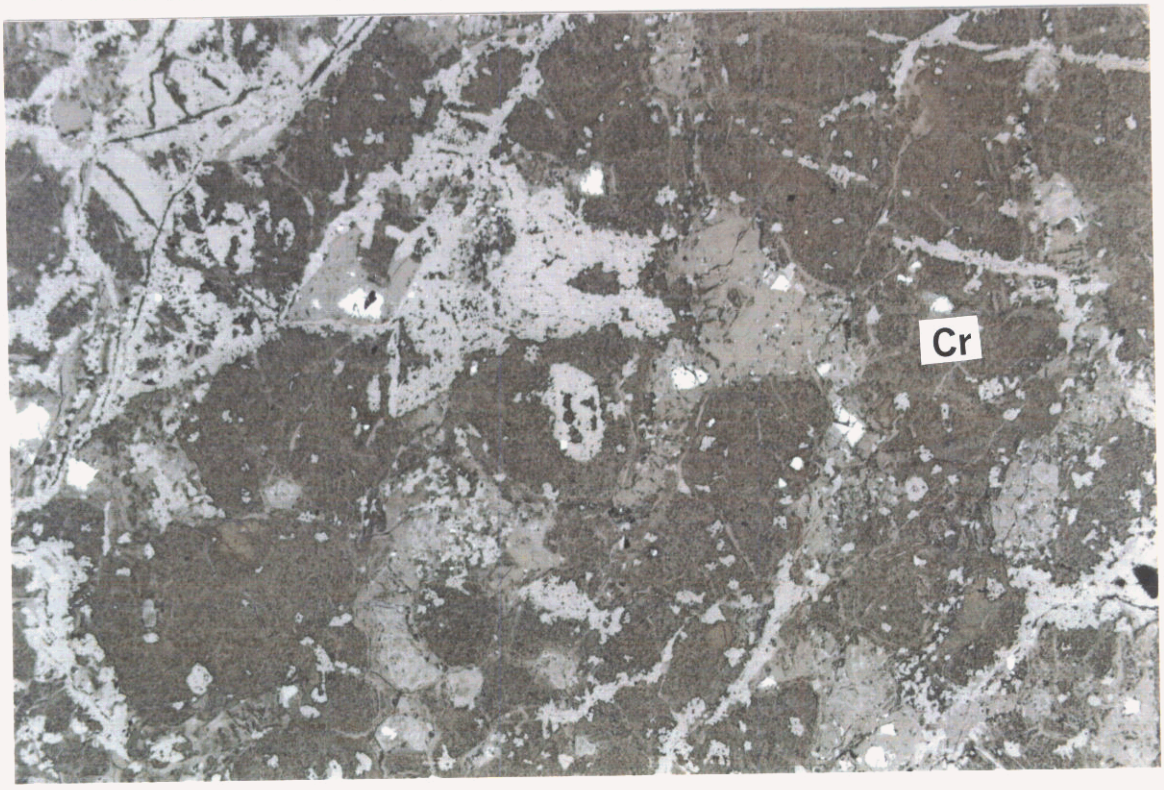
Plate 66**C, D**. Carbonate porphyroblasts are sparsely distributed through serpentine pseudomorphs after subhedral olivine (O). Discontinuous filaments of turbid carbonate are localized between pseudomorphs and concentrated in intercumulus volumes. Cumulus chromite is present in intercumulus volumes and as an inclusion in olivine.

C

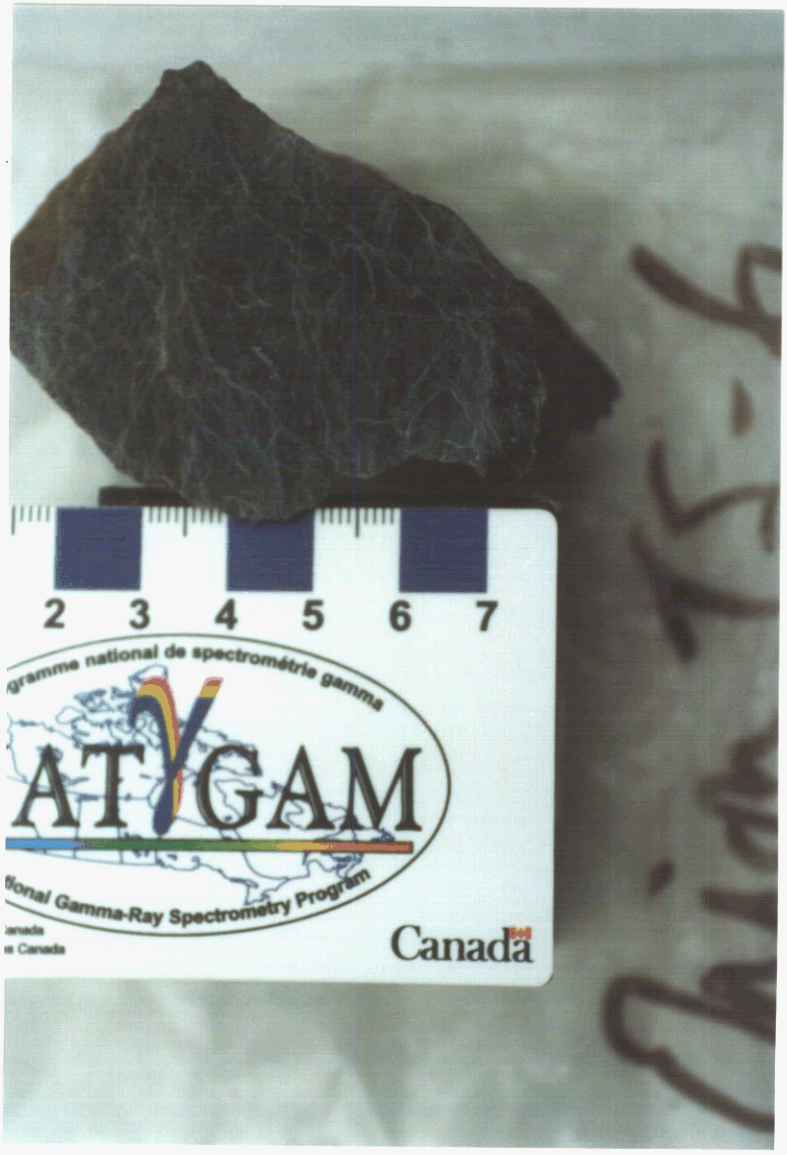


D



Sample #: Onion TS-6: Sax-Cessena Embayment area
Cu 106 ppm; Ni 1838 ppm; Co 126 ppm
7 ppb Au, 14 ppb Pt, 34 ppb Pd, 48 ppb PGE_T

Location	Northing	Easting
3+90 S / 0+70 E	6872494	521423



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SUMMARY: ***foliated intensely serpentinized and carbonatized wehrlite.*** This ultramafic rock has undergone complete replacement of all primary cumulate and intercumulus silicate minerals as well as partial replacement of cumulus spinel. Alteration is represented by serpentine after cumulus olivine and clay+iron oxide or serpentine after intercumulus feldspar or orthopyroxene respectively. Rare tremolite after intercumulus pyroxene inferred to have been clinopyroxene. Cumulus chromite is interstitial to and present as inclusions in cumulus olivine and as inclusions in intercumulus pyroxene. Chromite has been partially replaced during the alteration. Serpentinization is inferred to have been the first alteration processes and then was replaced by carbonate with trace talc. The replacement of serpentine by porphyroblastic carbonate and the localization of carbonate in the foliation support the interpretation that the carbonatization process was post-serpentinization. Even though the primary mineralogy has been completely replaced by both of these processes there are relict domains or lithons within this foliated ultramafic rock where igneous textures have been preserved. Fine-grained subequant to equant serpentine pseudomorphs after olivine clearly indicate that olivine was the most abundant cumulate minerals. Intercumulus volumes are occupied by low birefringent mineral inferred to be clay+iron oxide and serpentine with magnetite. This replacement mineralogy suggests that the precursor minerals were feldspar or othopyroxene respectively. Some of these serpentine pseudomorphs may have been oikocrystic. Utilizing the same inference, tremolite pseudomorphs are after intercumulus clinopyroxene. Trace amounts of sulphide is disseminated and remobilized through this serpentinized and carbonatized ultramafic rock. Ultra fine-grained sulphide, <0.005 mm, is disseminated through serpentine and slightly coarser grained aggregates are present in the carbonate-rich foliation. The sulphide assemblage is represented by pyrite>>pyrrhotite.

TYPE: PTS
ASSEMBLAGE: serpentine, carbonate, talc, chromite, sulphide, magnetite, tremolite, altered feldspar
ESTIMATED MODE (visual): 50% serpentine, 35% carbonate, 10% altered feldspar, trace (talc, chromite, sulphide, magnetite, tremolite).

MINERALOGY:
Essential:

Serpentine: as ultra fine-grained mats that host micron-sized opaque grains presumably iron oxide as well as sparsely disseminated sulphide. Locally there are areas in the section where the serpentine is clearly present as pseudomorphs after olivine. There are also interstitial intercumulus grains that are comprised of serpentine+iron oxide. These serpentine pseudomorphs are inferred to be after intercumulus pyroxene. Some of the serpentine has a yellow hue and may be iddingsite.

Carbonate: a minute anhedral to subhedral porphyroblasts up 0.04 mm distributed through the serpentine-rich mat after olivine. Locally the porphyroblasts coalesce into mats that are up to 0.5 mm in long dimension. Carbonate is also localized in the discontinuous anastomosing foliation.

Accessory:

Altered feldspar: has a brown colour in plane light due to the replacement by clay+iron oxide.

Talc: trace amount adjacent to carbonate-rich foliation planes.

Chromite: as cumulus subhedral to euhedral grains to 0.15 mm. These grains are interstitial to olivine, hosted in serpentine pseudomorphs after intercumulus pyroxene and as inclusions in serpentine pseudomorphs after olivine. Under high magnification, the margins of some grains are eroded or scalloped indicative of dissolution associated with alteration processes. Some grains display an atoll-like structure, another feature indicative of resorption during hydration-carbonation alteration. Some atoll-texture grains are partially mantled by magnetite.

Magnetite: as micron-sized dusting through serpentine mats and recognizable serpentine pseudomorphs after olivine, through serpentine after intercumulus to oikocrystic pyroxene.

Sulphide: sparsely disseminated through serpentine-carbonate matrix. Grains disseminated through serpentine after olivine are commonly <0.005 mm and inferred to be pyrite. Grains to 0.03 mm in carbonate-rich foliae indicate a minor component of sulphide remobilization during carbonatization (replacement of serpentine by carbonate porphyroblasts). Rare sulphide clots as large as 0.05 mm. Examination of the sulphide aggregates at 400x magnification shows that some aggregates are composite and comprised of pyrite+pyrrhotite?

Tremolite: minor amount; present as pseudomorphs after intercumulus pyroxene presumably clinopyroxene.

TEXTURE & FABRIC:

Discontinuous bands of relatively coarser grained serpentine and carbonate-rich seams and bands define a moderately well developed anastomosing foliation. Even though the anastomosing foliation is present as first and second foliae, there are relict lithons in which the primary igneous texture is recognizable in spite of serpentinization, carbonatization and the overprinting deformation. There are lithons in which subequant serpentine pseudomorphs to 0.8 mm after olivine are associated with anhedral intercumulus serpentine+magnetite pseudomorphs presumably after pyroxene, i.e. orthopyroxene. There are other areas in which the intercumulus to oikocrystic pyroxene has been replaced by tremolite and this is inferred to have been clinopyroxene. The proportion of cumulus olivine to intercumulus pyroxene indicates that this rock is near the boundary between an orthocumulate and mesocumulate rock i.e. 25%. The protolith was comprised of cumulate olivine with subordinate cumulate chromite and an altered intercumulus component of feldspar+orthopyroxene(?).

ALTERATION:

The cumulus olivine and intercumulus pyroxene (ortho) have been replaced by serpentine and then overprinted by very fine-grained carbonate porphyroblasts. Clinopyroxene has been replaced by tremolite.

ROCK TYPE: An olivine-rich cumulate rock with intercumulus feldspar, and pyroxene suggests this rock lies within or near the wehrlite-feldspathic wehrlite lithological boundary.

Plate 67. Photomicrographs, **A**, **B** – plane light, show the anastomosing foliation defined by turbid to opaque carbonate (Cb) and serpentine (Sr)-filled foliation bands and related micro-fractures. **A**, **B** – FOV = 11 mm.

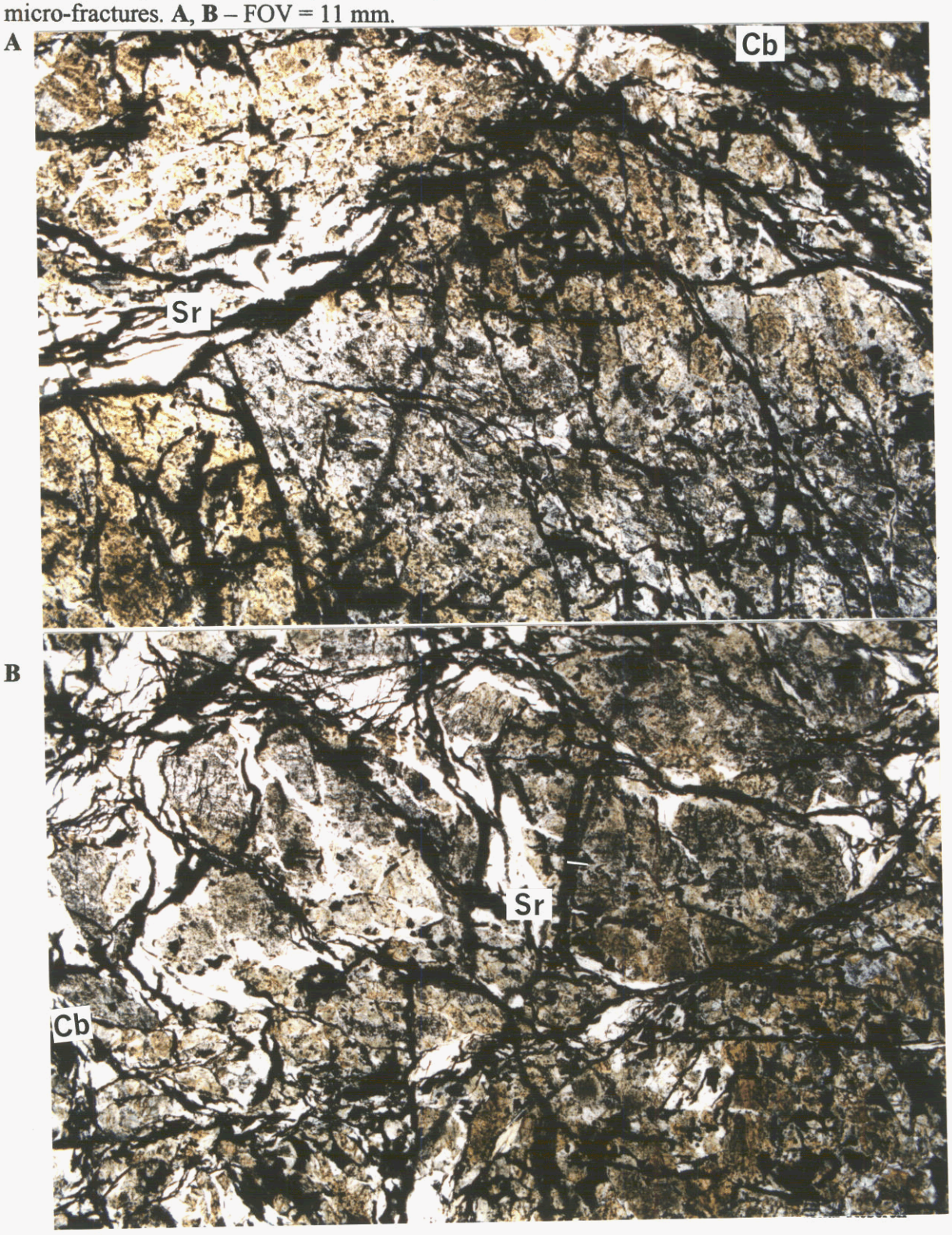


Plate 68. Photomicrograph, plane light, shows the relict cumulate texture that is preserved in one of the lithons. Cumulate equant subhedral serpentine pseudomorphs after olivine (O) are associated with intercumulus-textured serpentine+magnetite pseudomorph inferred to have replaced orthopyroxene. FOV = 5.5 mm.

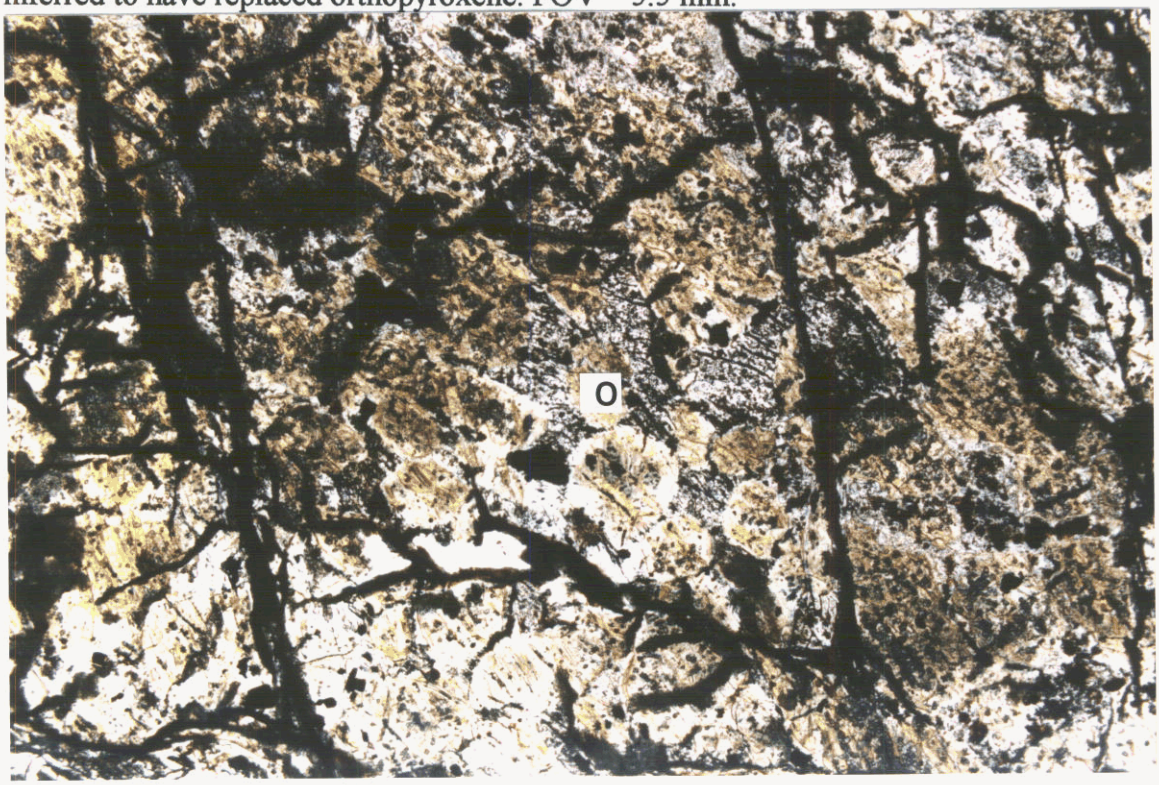
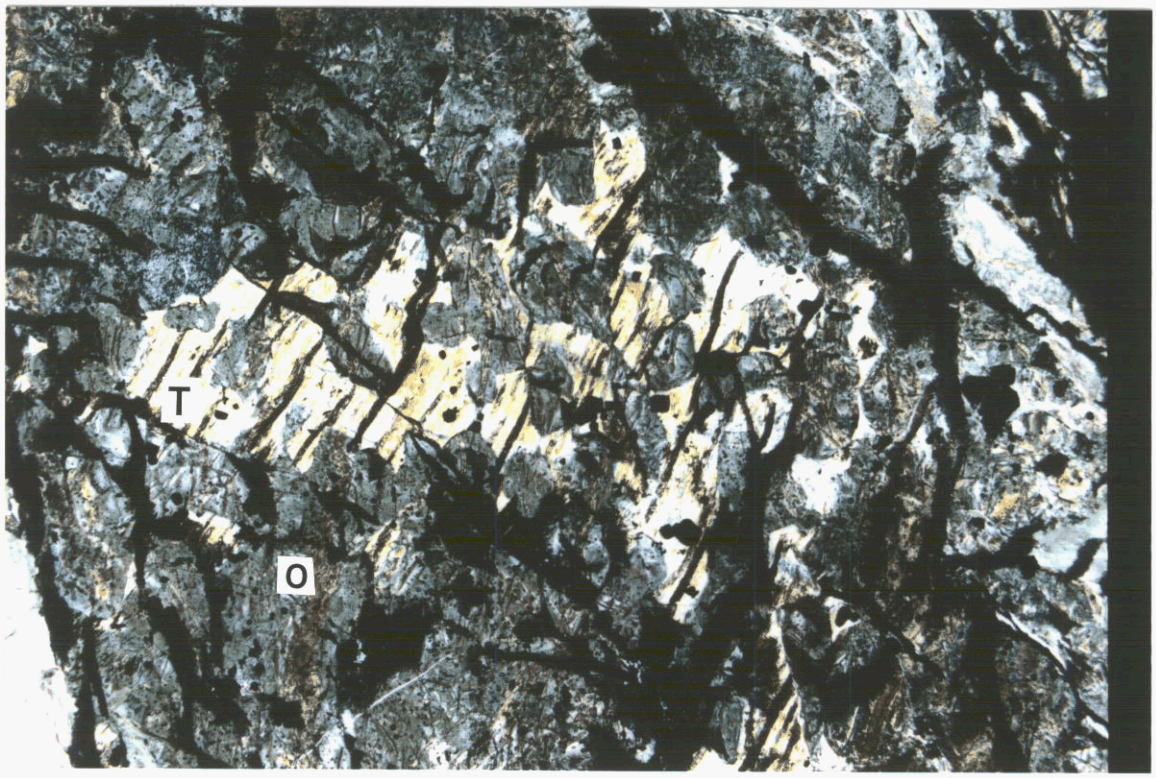


Plate 69. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, show cumulus euhedral chromite (Cr) and serpentine pseudomorphs after equant olivine (O) and tremolite pseudomorph after oikocrystic intercumulus clinopyroxene.
A, **B**, **C** – FOV = 5.5 mm.

A

Plate 69.

B



C

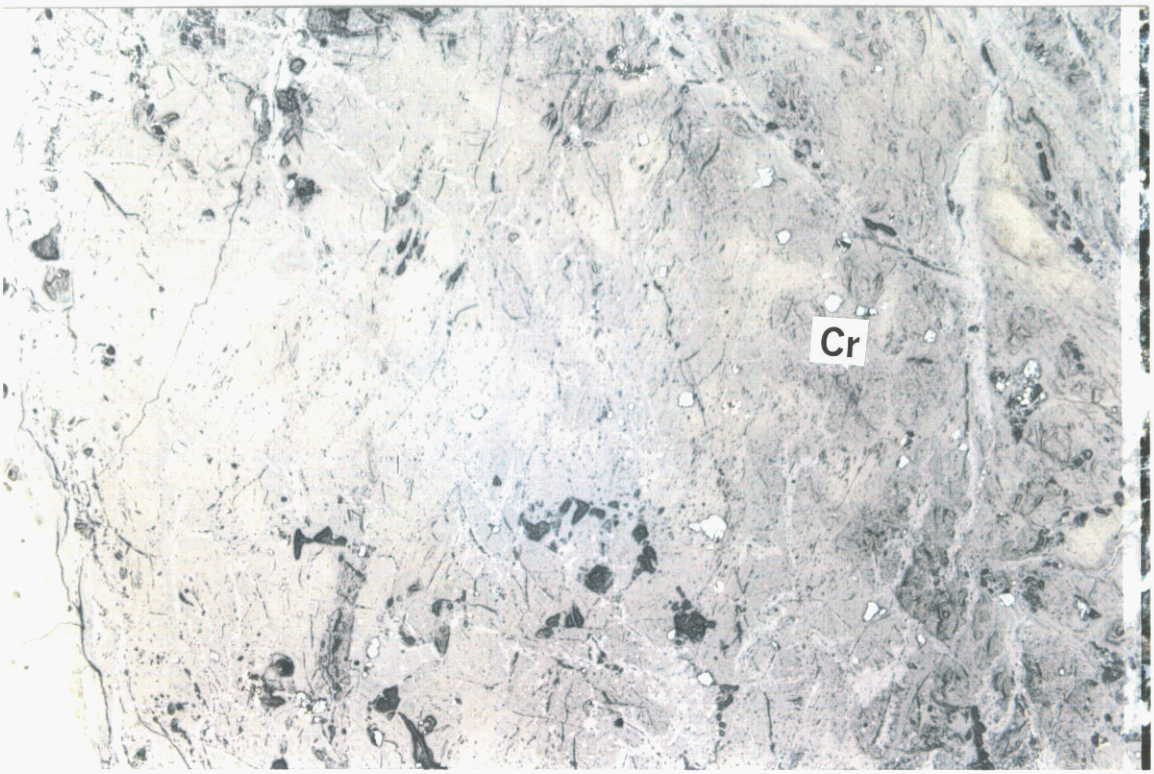
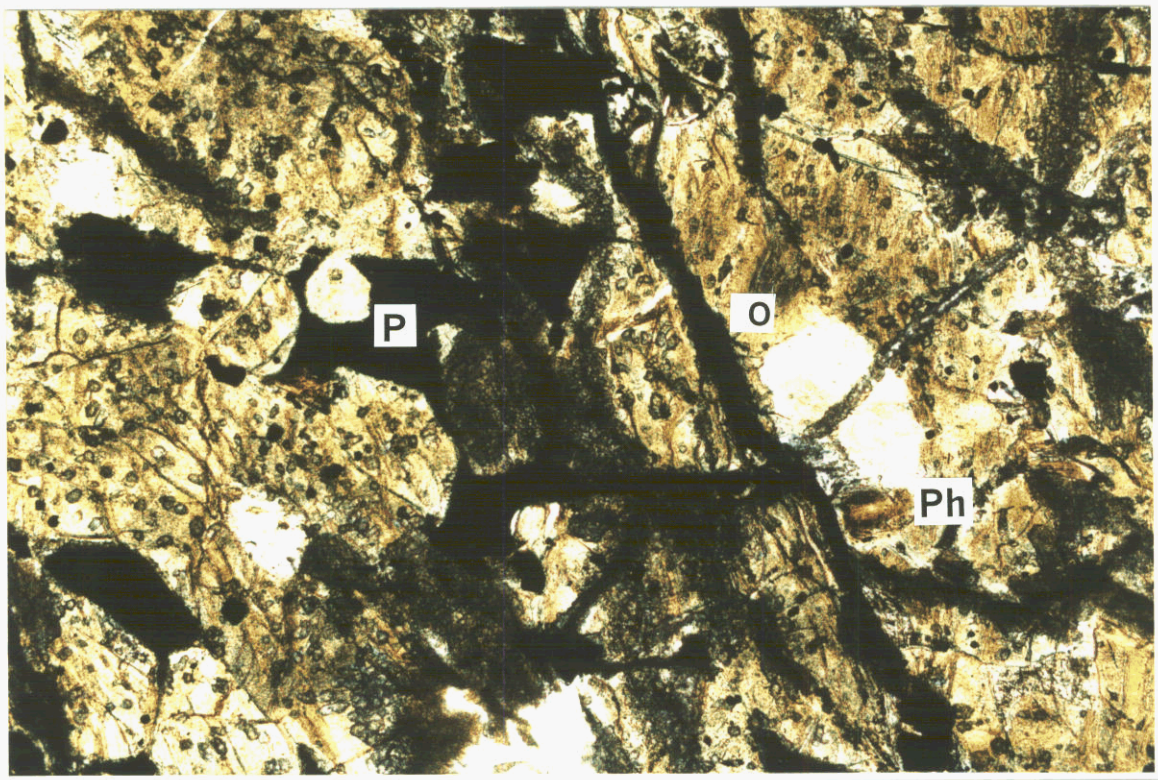


Plate 70. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, show the relict igneous texture formed by serpentine after cumulus olivine (O) and cumulus euhedral chromite (Cr) with intercumulus altered plagioclase (P) and rare phlogopite (Ph). Carbonatization is represented by carbonate (Cb), turbid to semi-opaque aggregates and veinlets. **A**, **B**, **C** – FOV = 2.8 mm.

A



B

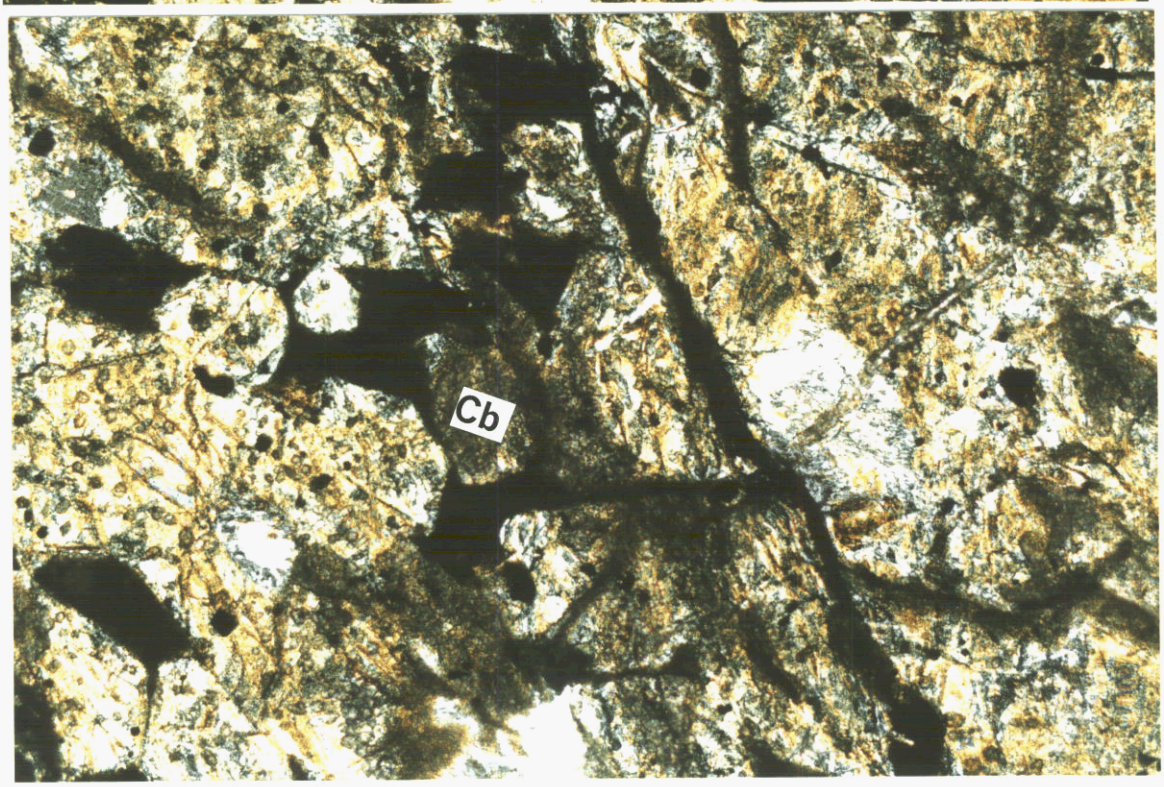


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Plate 70C.

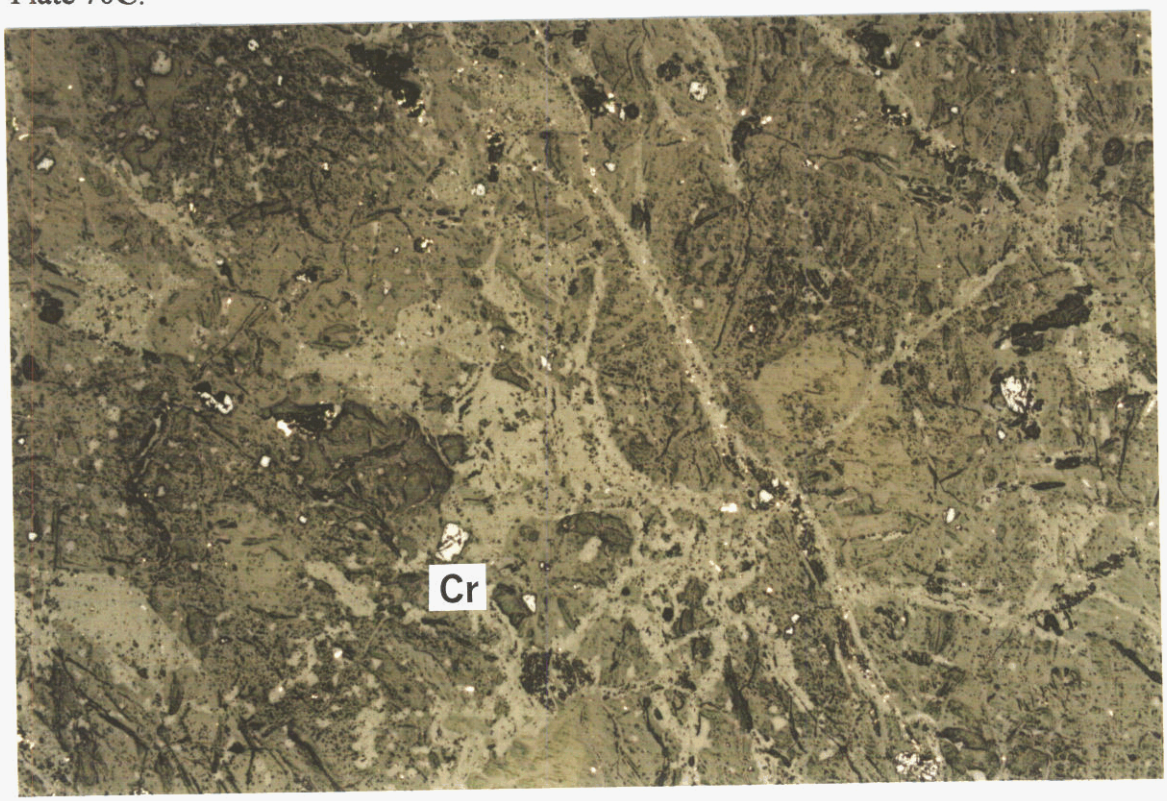
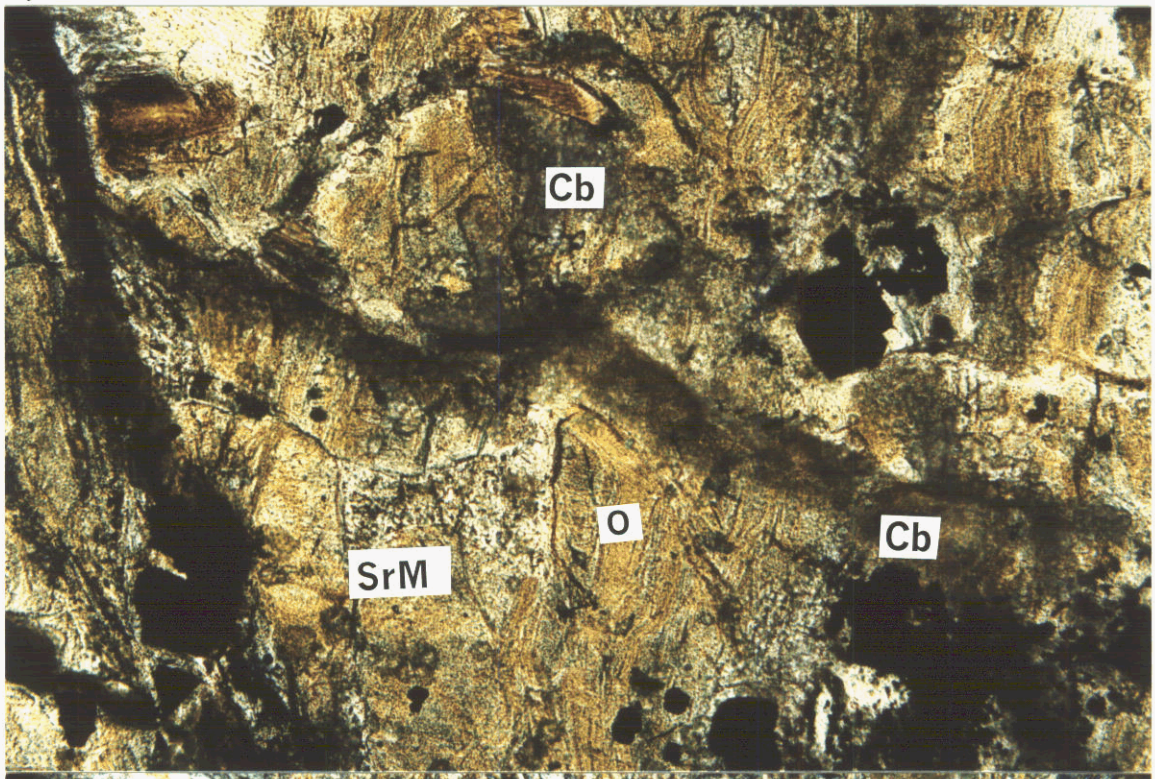


Plate 71. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, show the serpentinized and carbonatized relict igneous texture formed by cumulus chromite (Cr), serpentine after olivine (O) with intercumulus phlogopite and serpentine+magnetite (SrM) after pyroxene. Remobilized ultra fine-grained sulphide (S) is present in the turbid carbonate (Cb)-filled veinlets and disseminated through the host rock.
A, **B**, **C** – FOV = 1.35 mm.

A



B

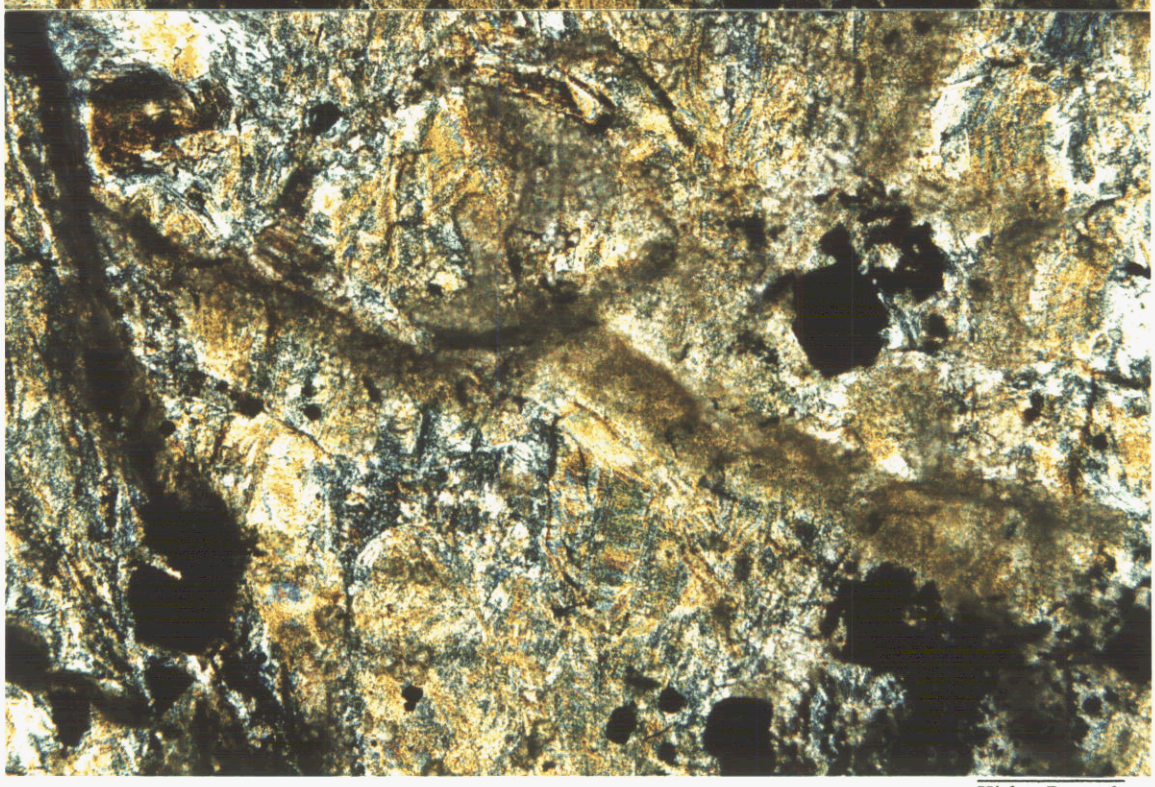


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Plate 71C.

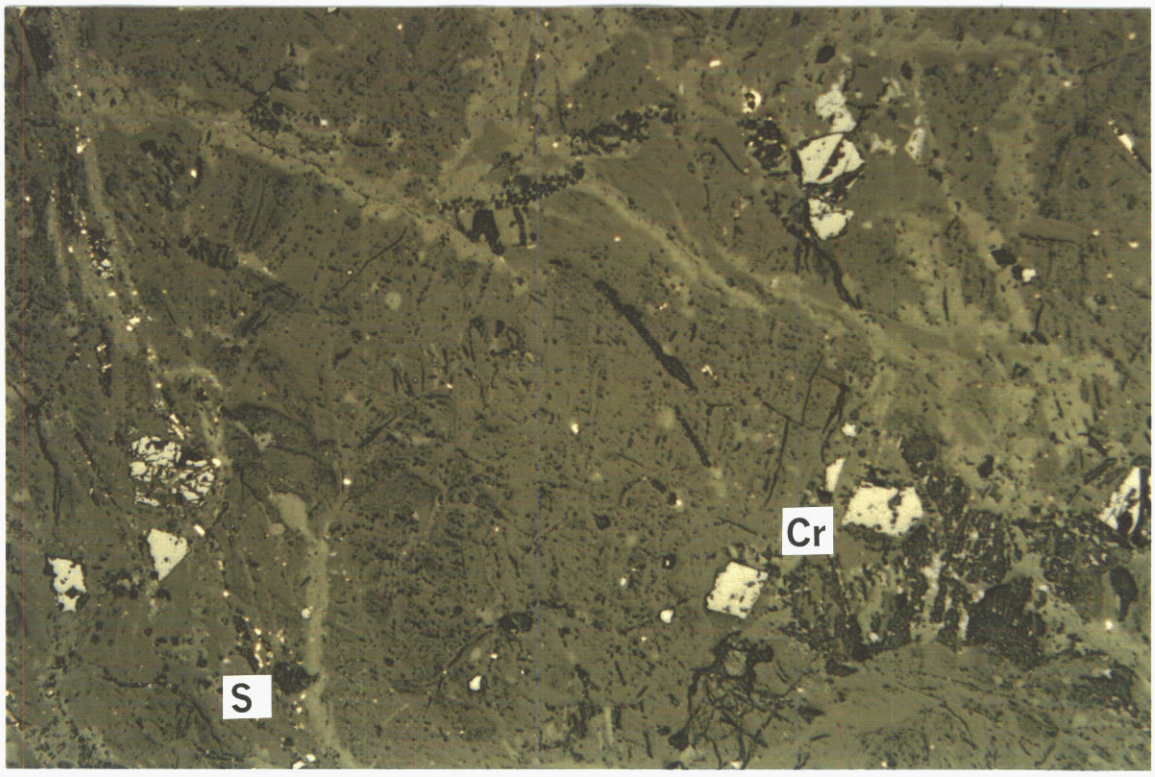


Plate 72. Photomicrograph, reflected light, (poor quality) shows ultra fine-grained pyrrhotite+chalcopyrite aggregates within a carbonate-filled veinlet. FOV = 0.275 mm.

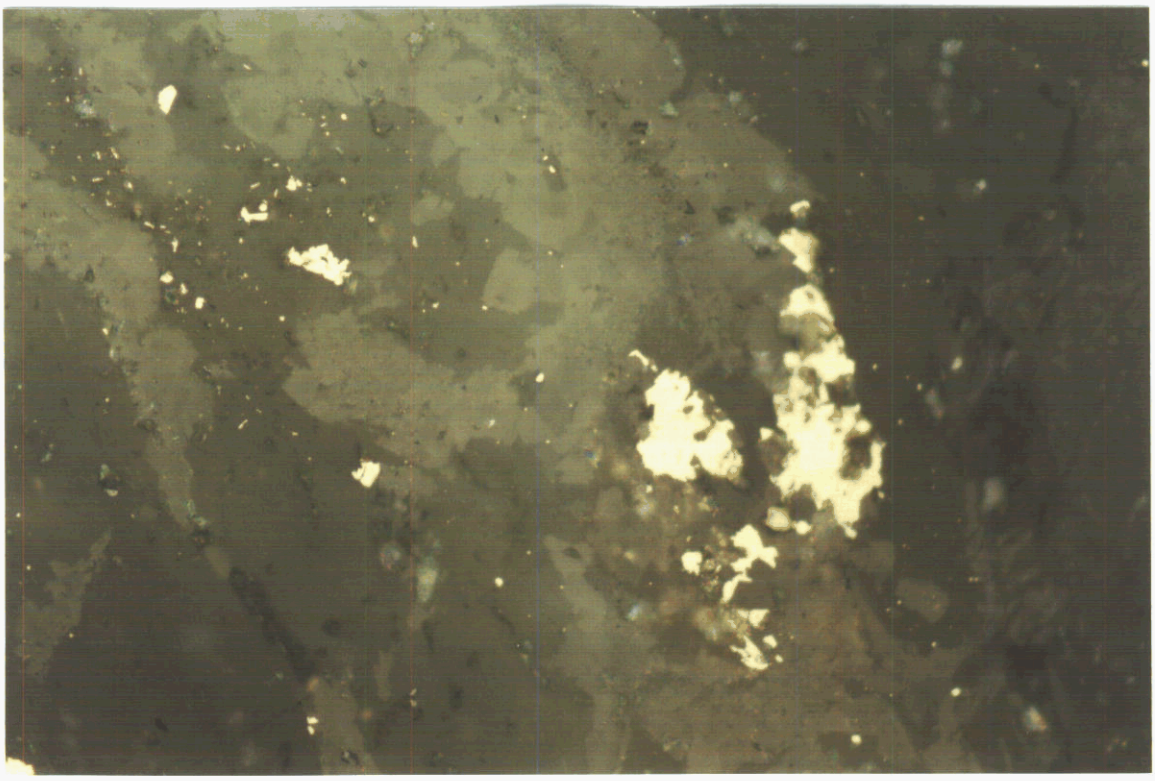
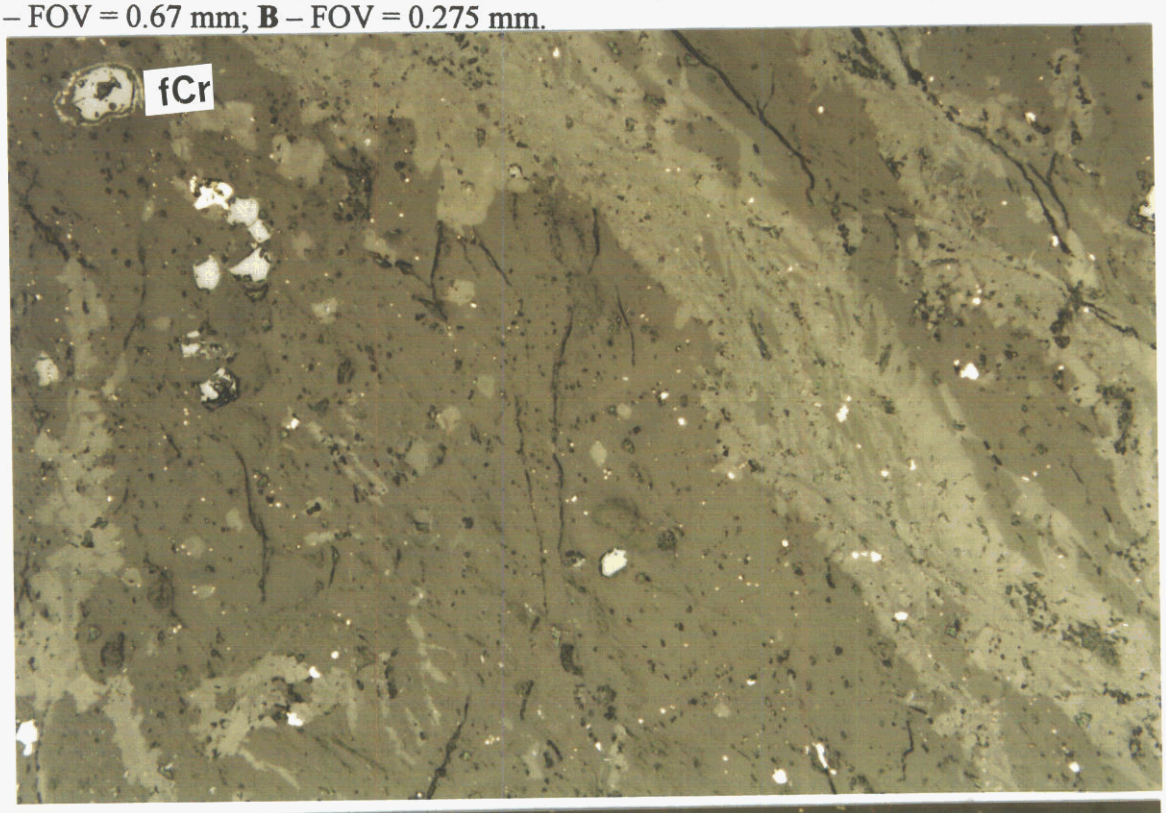
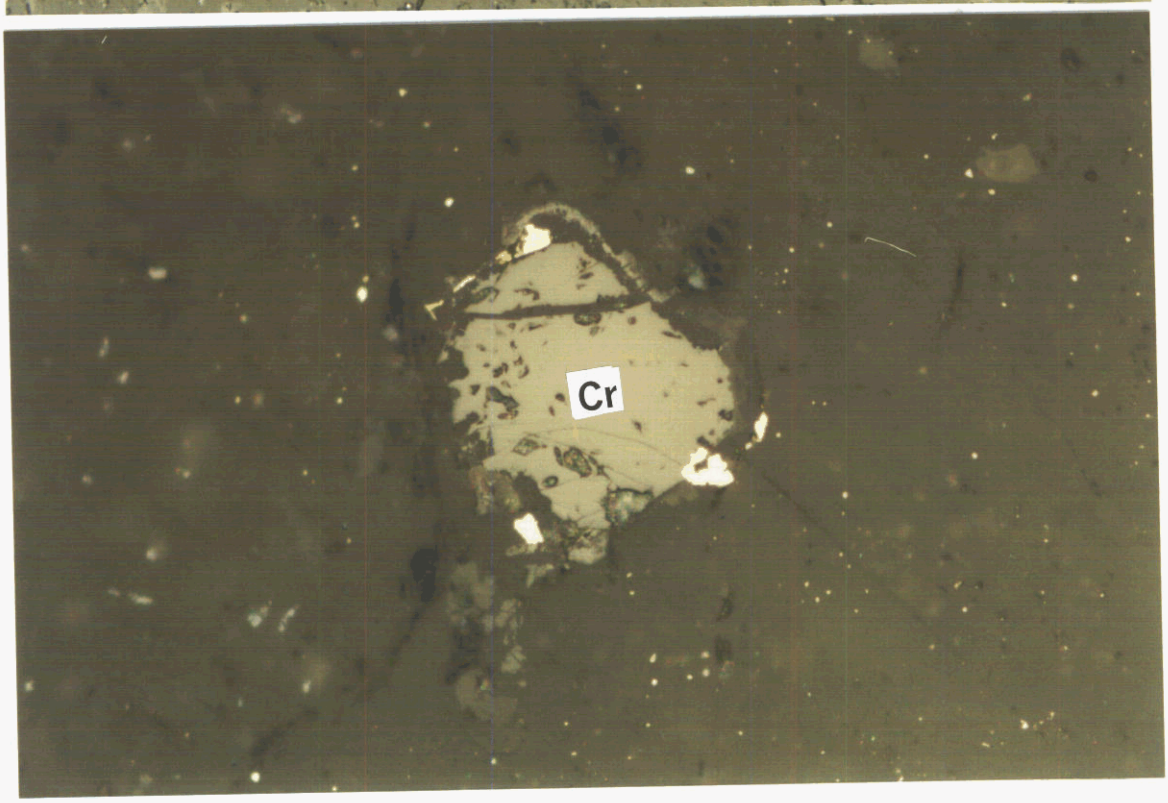


Plate 73. Photomicrographs, **A**, **B** – reflected light, show disseminated ultra fine-grained sulphide through the serpentinized and carbonatized host rock and the partial replacement of cumulus chromite to form ferrichromite atoll-like structures. Chromite grains are corroded and silicate, sulphide and magnetite have replaced the outer margin.
A – FOV = 0.67 mm; **B** – FOV = 0.275 mm.

A



B



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Sample #: Onion TS-9: Pix Showing
Cu 680 ppm; Ni 2880 ppm; Co 140 ppm
11 ppb Au, 201 Pt, 386 ppb Pd
17 ppb Rh, 22 ppb Os, 13 ppb Ir, 21ppb Ru, 660 ppb PGE_T

Location	Northing	Easting
521684 E / 6872036 N	6872036	521684

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SUMMARY: ***intensely hydrothermally altered gabbroic rock.*** The protolith has sustained intense replacement of all primary igneous minerals associated with carbonatization, argillitization and sulphidization. The intensely altered rock is comprised of Fe-carbonate inferred to be Fe-dolomite with minor clay/fuchsite+sericite and very finely disseminated to clotted sulphide. In spite of this intense alteration, pseudomorphs after primary minerals can be recognized and in turn is suggested regarding the protolith. Pseudomorphs of carbonate+hematite/clay after mica, possibly biotite or phlogopite, are distributed through the carbonate replaced hostrock. In addition blocky carbonate pseudomorphs are inferred to be after a mafic mineral, i.e. a pyroxene. Clay±carbonate aggregates are interpreted to have replaced feldspar. Euhedral ferrichromite pseudomorphs after chromite are sparsely distributed through the altered host rock. This sparse distribution of chromite compared to the ultramafic rocks and the above mineralogy based on pseudomorphs suggests a gabbroic protolith and perhaps a melanocratic gabbro based on the abundance of carbonate pseudomorphs inferred to be after pyroxene.
Sulphide present as very fine-grained disseminations and as clots is represented by the assemblage white pyrite+chalcopyrite with pentlandite+millerite. The remobilized sulphide assemblage is associated with micro-domains that are characterized by abundant clay+trace quartz.

TYPE: PTS
ASSEMBLAGE: carbonate, clay/fuchsite, sericite, quartz, sulphide, chromite-ferrichromite, magnetite
ESTIMATED MODE (visual): 85% carbonate, 13% (clay/fuchsite, sericite), 2% sulphide, trace (quartz, chromite-ferrichromite, magnetite)

MINERALOGY:
Essential:

Carbonate: the most abundant mineral that comprises this rock. Two generations of carbonate are present. 1) The host rock is comprised of very fine-grained carbonate that has a turbid appearance in plane light, a feature that indicates it is Fe-Mg-Ca bearing i.e. Fe-dolomite. In plane light, this carbonate species displays varying degrees of turbidity, a features that suggests there are different generations of Fe-dolomite. Carbonate has replaced a micaeous mineral and these pseudomorphs are up to 0.5 mm. 2) Clear colorless to very weakly turbid coloured carbonate-rich veinlets, inferred to be calcite to Fe-calcite, crosscut the Fe-carbonate-rich host rock and importantly crosscut and are later than the sulphide mineralization.

Clay/fuchsite: inferred to belong to the illite-group and present as ultra fine-grained micro-domains to 0.15 mm distributed through the carbonate-replaced host rock and local concentrations associated with sulphide clots. Based on the emerald-green colour of the hand specimen, this clay is either a Cr-bearing illite or fuchsite.

Accessory:

Sericite: ultra fine-grained platelets interstitial to carbonate and clay
Quartz: trace amount of quartz associated with sulphide+clay clots

Sulphide: as dissemination and clotted aggregates comprised primarily of pyrite and chalcopyrite with subordinate pentlandite+millerite.

Chromite-ferrichromite: subhedral to anhedral grains to 0.1 mm sparsely distributed through the carbonate-replaced host rock. Grains have a mottled texture due to extensive replacement

Magnetite: minute grains, 0.005 - 0.025 mm disseminated through the carbonate-replaced host rock, inferred to be secondary. Rare anhedral grains to 0.1 mm in the carbonate replaced host rock. The grain size and amoeboid shape of this magnetite is similar to the titaniferous magnetite in the ultramafic rocks, i.e. samples 166804 and 166810.

TEXTURE & FABRIC:

No penetrative fabric but the carbonatized host rock has been cut by at least two sets of carbonate-filled veins. The process of intense carbonatization formed a very fine-grained mixture of carbonate>clay+sericite+sulphide. Several pseudomorphs after different primary minerals are recognizable in spite of this intense carbonatization. Carbonate replacement along mica cleavage planes indicates the presence of mica (biotite or phlogopite) in the protolith. There are carbonate pseudomorphs up to 1 mm that display a pseudo-blocky habit similar to pyroxene or amphibole. There are subhedral tabular pseudomorphs comprised of ultra fine-grained carbonate+clay±sericite that are inferred to be after feldspar. One pseudomorph comprised of clay with bands of carbonate is interpreted to have been a plagioclase and narrow albite twins have been replaced by carbonate. Euhedral to subhedral ferrichromite grains after chromite is sparsely distributed through the carbonate-replaced matrix. These pseudomorphs suggest that the protolith was a chromite+biotite/phlogopite-bearing feldspar+pyroxene rock and the abundance of carbonate pseudomorphs after pyroxene suggest that the protolith may have been a melanocratic gabbro.

ALTERATION:

Carbonatization, argillitization with sulphidization has transformed this rock into a fine-grained mat of carbonate (Fe-dolomite)+kaolinite group minerals with sericite and remobilized sulphide.

ROCK TYPE: The protolith is inferred to have been a gabbroic rock based on the presence of carbonate+clay+sericite after plagioclase, carbonate+hematite/clay after mica (biotite or phlogopite) and carbonate after a mafic mineral possibly pyroxene.

Plate 74. Photomicrograph, plane light, shows the texture of the carbonate (Cb)-rich altered gabbroic rock. Carbonate is present as turbid veins and forms the groundmass to irregular very fine-grained clots of clay (C). FOV = 11 mm.

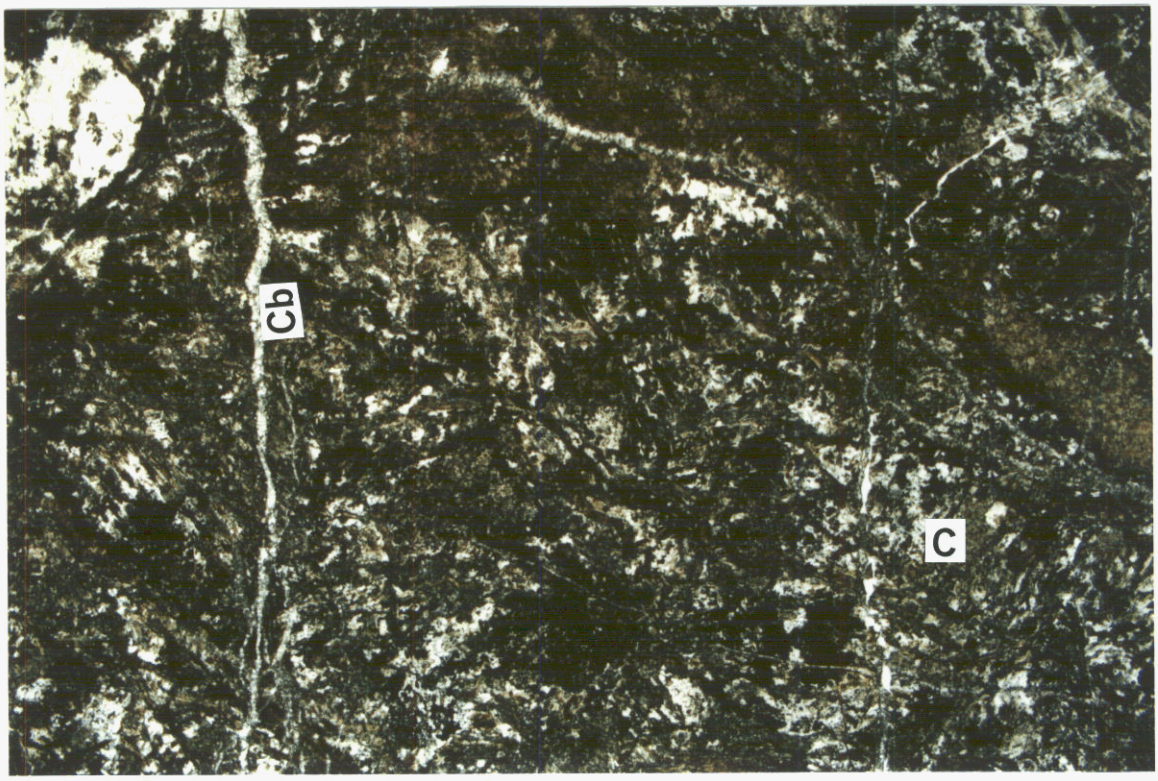
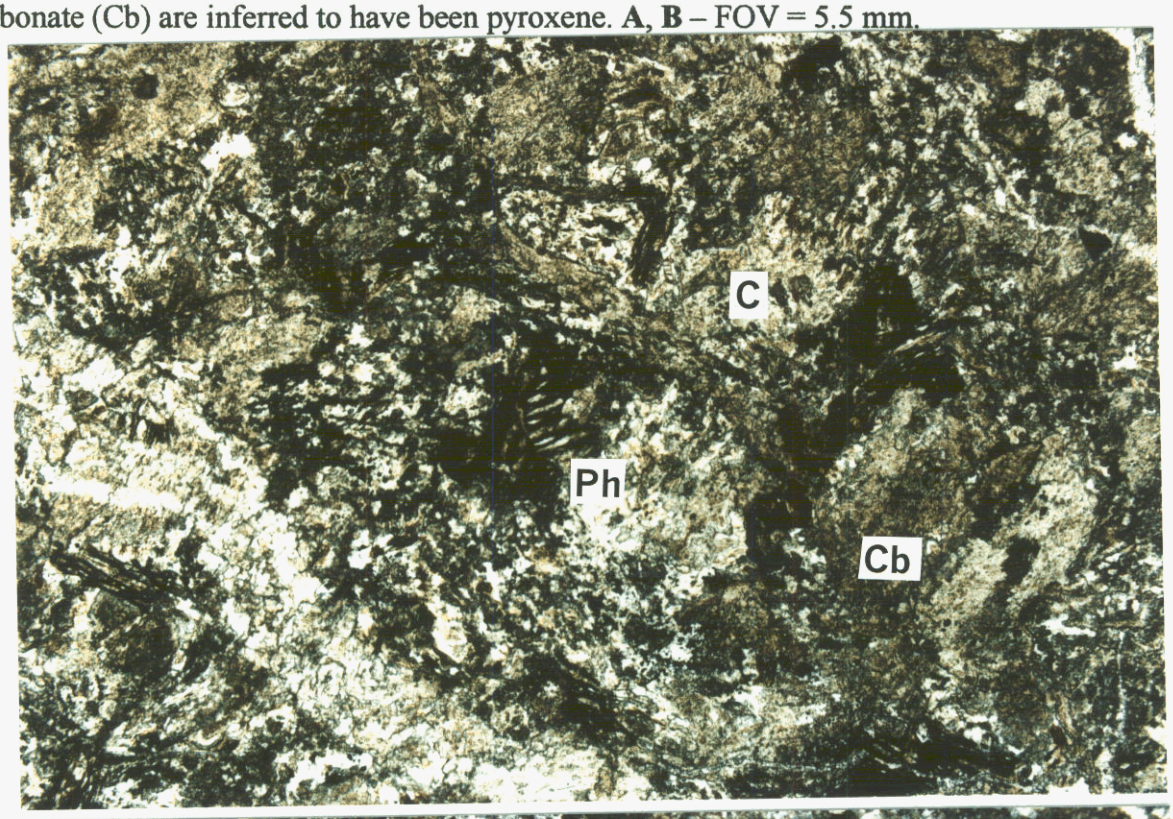


Plate 75. Photomicrographs, **A** - plane light, **B** - crossed nicols, show the relict textures that are present in this intensely altered gabbroic rock. Intercumulus mica, presumably phlogopite (Ph), has been replaced by carbonate+iron oxide. Clay (C)-rich micro-domains are inferred to have been feldspar. Very fine-grained aggregates of turbid carbonate (Cb) are inferred to have been pyroxene. **A**, **B** – FOV = 5.5 mm.

A



B

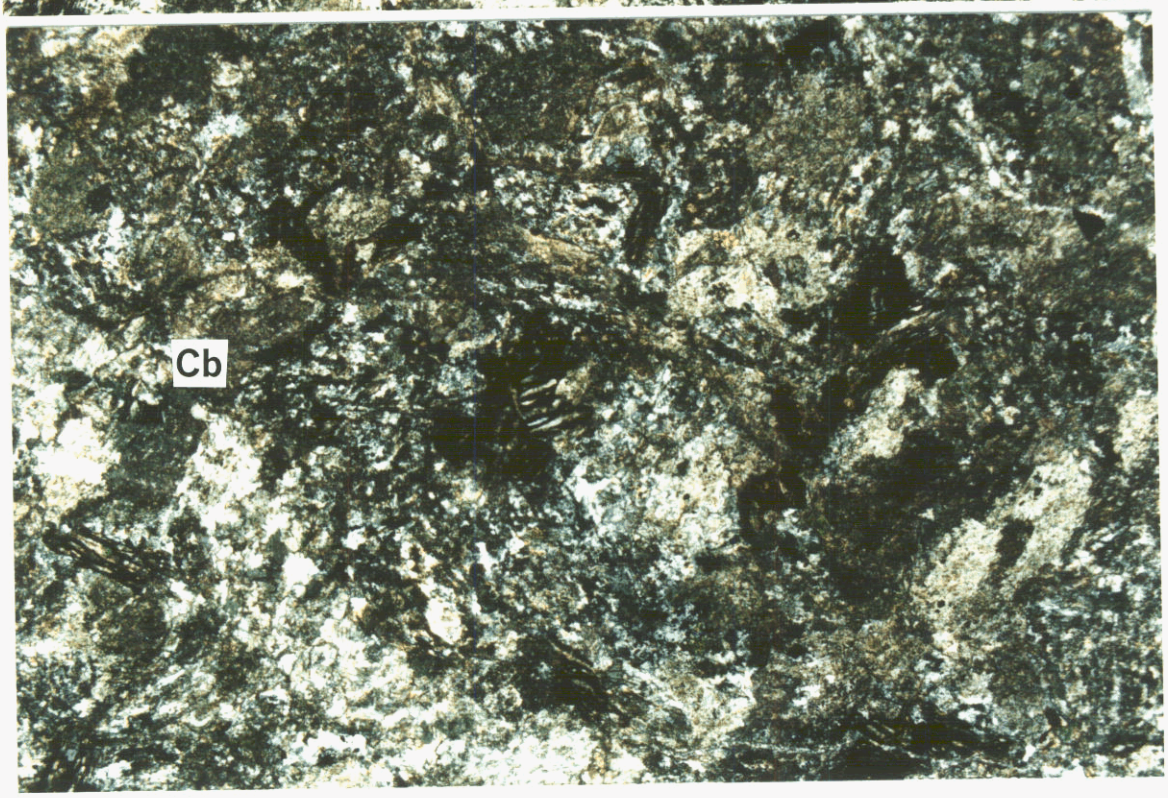


Plate 76. Photomicrographs, **A**, **B** – plane light, show clotted sulphide texture in the intensely carbonatized host rock. Disseminated and clotted sulphide (S - black) is associated with and enveloped by quartz+clay (QC)-rich micro-domains. Rare subhedral carbonate+clay pseudomorphs, possibly after plagioclase (P) are locally recognizable in the intensely altered hostrock. Carbonate veinlets crosscut the altered and recrystallized hostrock. **A** – FOV = 11 mm; **B** – FOV = 5.5 mm.

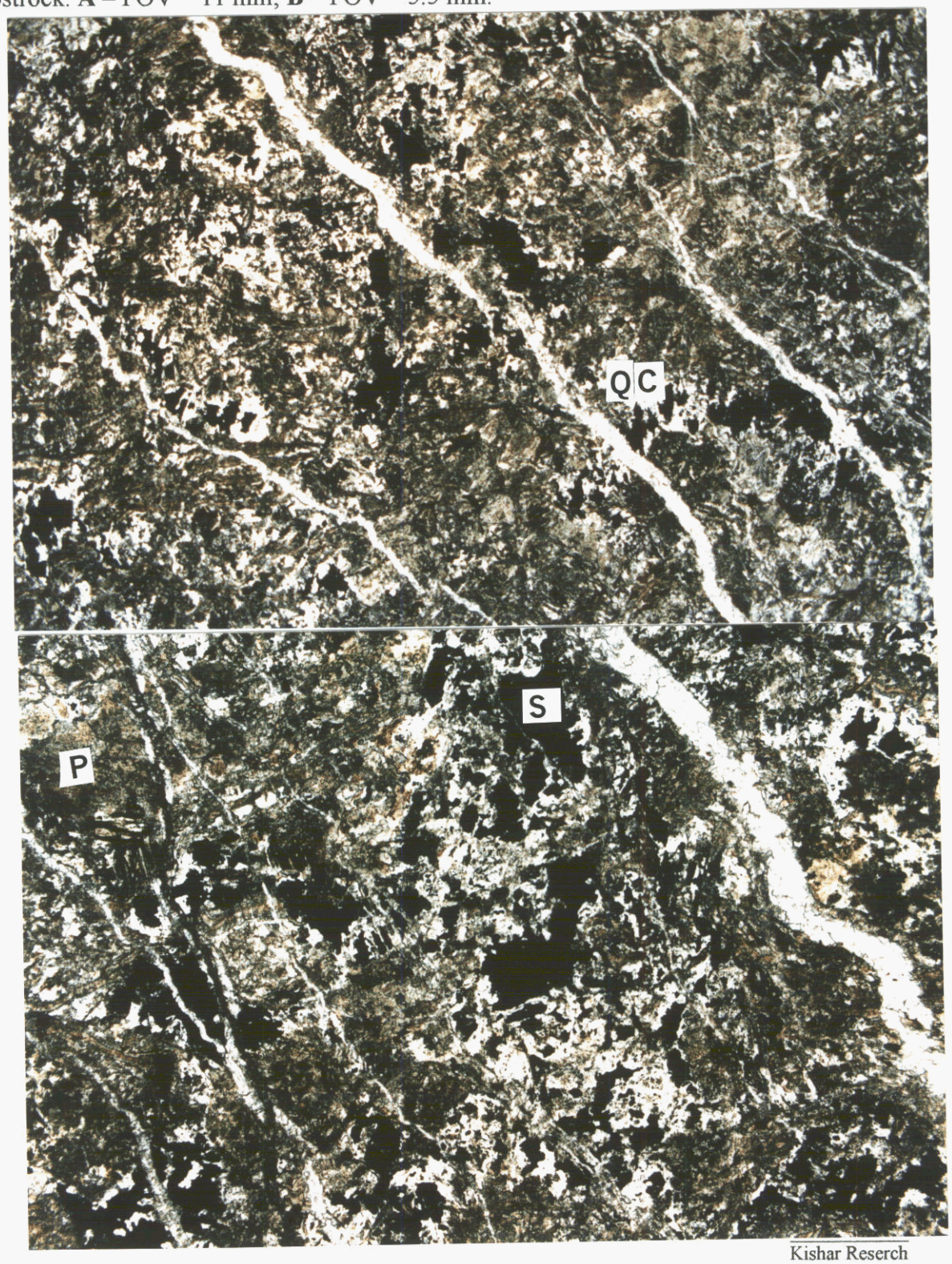


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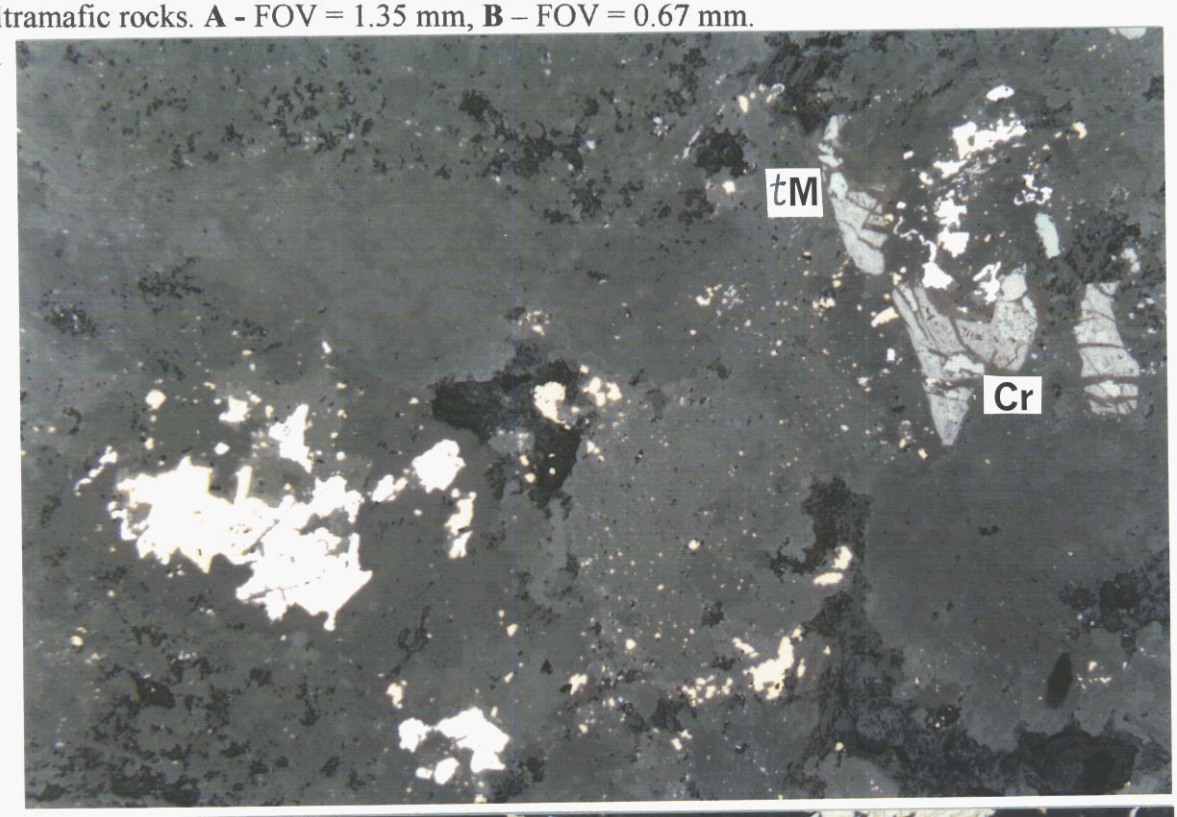
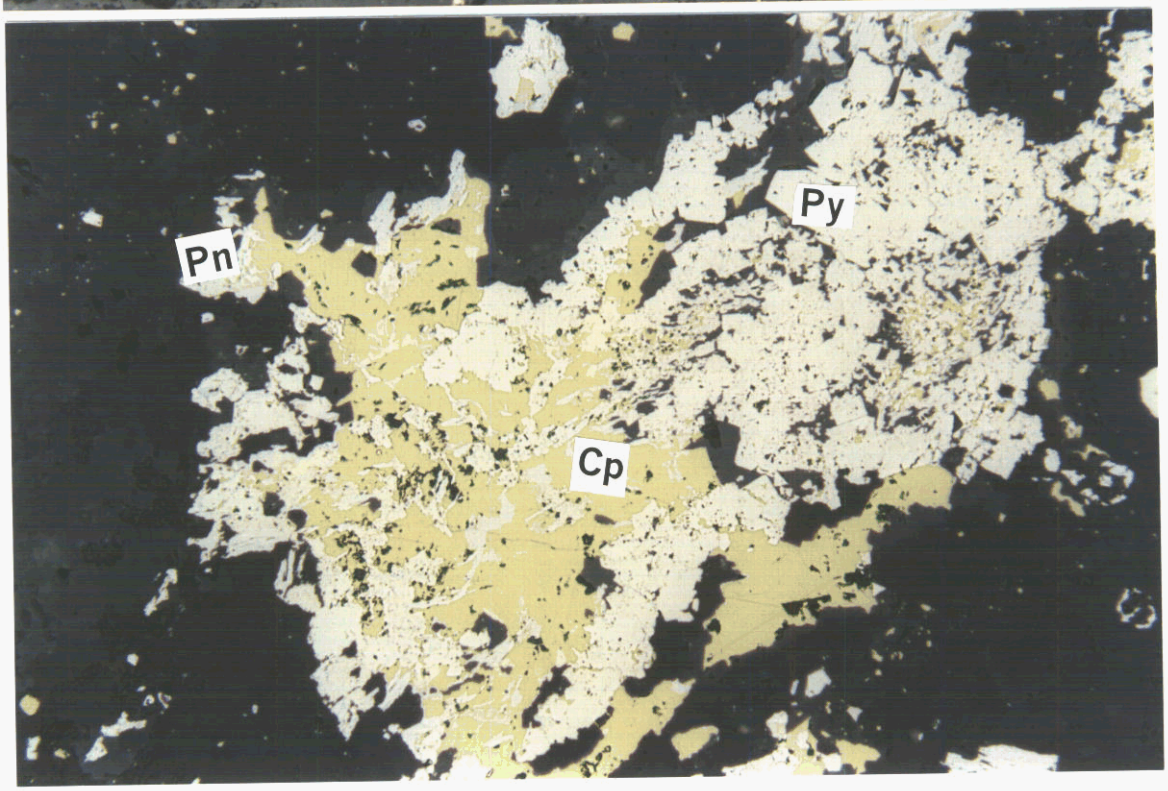
Plate 77. Photomicrographs, **A**, **B** – reflected light, show the disseminated and clotted texture of sulphide. The recrystallized and remobilized sulphide is dominated by pyrite (Py), chalcopyrite (Cp) with subordinate pentlandite (Pn) and is associated with relict chromite (Cr) and titanomagnetite (tM), the latter similar to titanomagnetite in other ultramafic rocks. **A** - FOV = 1.35 mm, **B** – FOV = 0.67 mm.

A



B



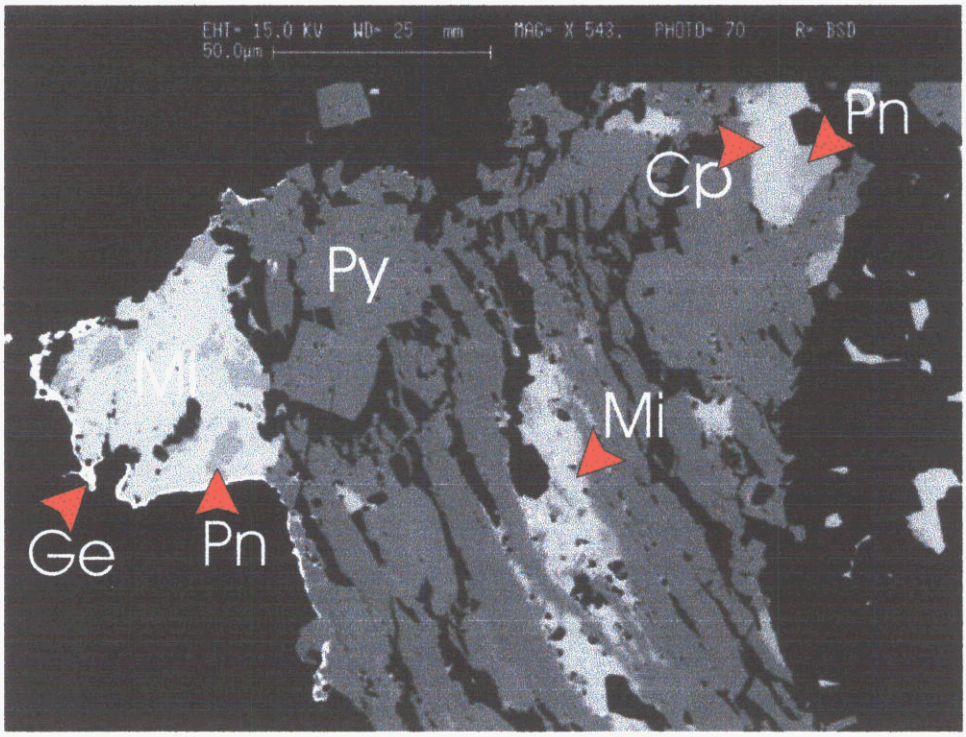


Plate 78. Electron backscattered image of recrystallized sulphide clot comprised of subhedral to anhedral pyrite (Py) with chalcopyrite (Cp), pentlandite (Pn), millerite (Mi) and discontinuous narrow rims of gersdorffite (Ge).

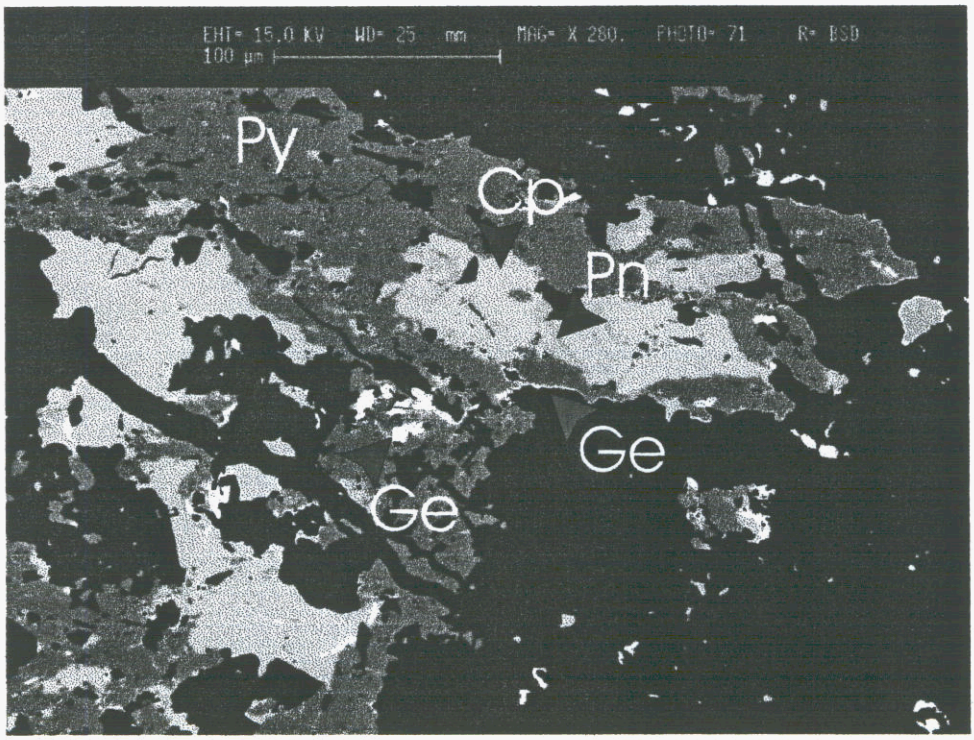


Plate 79. Electron backscattered image of recrystallized sulphide clot comprised of subhedral to anhedral pyrite (Py) with chalcopyrite (Cp) minor pentlandite (Pn). Gersdorffite (Ge) is present as minute subhedral grains in and as discontinuous narrow rims on pyrite.

Offcut slabs of altered White River country rocks.

Table 3: Petrographic summary: Altered White River county rocks.

Prospect	Section #	Rock name	Cumulate Nomen-clature	Type of cumulate	Essential mineralogy/ Accessory mineralogy	Cumulus minerals	Cumulus mineral morphology	Intercumulus minerals	Intercumulus mineral morphology	Alteration	Similar samples	Correlation with lithological formations
Discovery Showing	166809	moderately altered, carbonatized and sericitized, plagioclase porphyry: porphyritic andesitic to dacitic crystal tuff	----------	----------	plagioclase, quartzofeldspathic groundmass, carbonate, sericite/ iron oxide, magnetite	----------	----------	----------	----------	carbonate and sericite after plagioclase phenocrysts, the quartzofeldspathic groundmass and mafic(?) phenocrysts.	----------	Station Creek Formation andesite/basalt
Sax-Cessena Embayment area	TS-1	argillitized fine-grained gabbro/diorite or basalt/andesite	----------	----------	clay, diopside/ sericite, barite(?), iron oxide	----------	----------	----------	----------	Clay replacement of the feldspar component	----------	Station Creek Formation andesite/basalt (preferred) or Nikolai Group basaltic dyke
Sax-Cessena Embayment area	TS-4	contact between intermediate intrusive rock and serpentinized dunite (See Table 1 for the ultramafic rock description)	----------	----------	clay/chlorite, diopside, plagioclase, glass and glassy groundmass/ iron oxide, magnetite, sulphide	----------	----------	----------	----------	Clay/chlorite has replaced feldspar and fills irregular shaped cavities	----------	Cretaceous Kluane Range diorite-grano-diorite intrusive suite; sample represents chilled dyke rock
Onion SE Showing	TS-8	intensely hydrothermally altered niccolite-bearing rock.	----------	----------	diopside, clay, garnet/hematite, chlorite, carbonate nickeline group (niccolite, breithauptite) electrum, gold	----------	----------	----------	----------	hydrothermal recrystallization with the growth of garnet and diopside; possibly weak metasomatism.	TS-10	calcareous sedimentary rock - Hasen Creek Formation - argillite
Sax-Cessena Embayment area	TS-10	sulphide-bearing hydrothermally altered rock	----------	----------	garnet, diopside, sulphide (pyrrhotite, chalcopyrite) /chlorite, carbonate	----------	----------	----------	----------	hydrothermal recrystallization with the growth of garnet and diopside (skarn-like mineral assemblage)	TS-8	calcareous sedimentary rock - Hasen Creek Formation - argillite

Sample #: Onion 166809: Discovery Showing

Ni 397 ppm

Northing	Easting
6874411	519930

Kishar Reserch

SUMMARY: ***moderately altered, carbonatized and sericitized, plagioclase porphyry.*** The protolith may be a porphyritic andesitic to dacitic crystal tuff. This rock is comprised of abundant evenly distributed fine- to medium-grained plagioclase phenocrysts that are hosted in an ultra fine- to very fine-grained quartzofeldspathic groundmass. There is an absence of mafic minerals or pseudomorphs however there are relict skeletal-shaped subhedral pseudomorphs that are inferred to have been magnetite. Carbonate, the most abundant alteration mineral, is evenly distributed through the rock and has replaced both phenocrysts and groundmass. It is also present filling fractures. Carbonate is accompanied by subordinate sericite after plagioclase. This moderate intensity carbonate alteration is equated to the later carbonatization episode that has been described in some of the ultramafic rocks. Ultra fine-grained iron oxide is attributed to Recent weathering/oxidation processes.

TYPE: PTS
ASSEMBLAGE: plagioclase, quartzofeldspathic groundmass, carbonate, sericite, iron oxide, magnetite, barite
ESTIMATED MODE (visual): 25% plagioclase phenocrysts, 50% quartzofeldspathic groundmass, 20% (carbonate, sericite), 5% (iron oxide, magnetite)

MINERALOGY:
Essential:

Plagioclase: present as subhedral to euhedral phenocrysts hosted in an ultra fine-grained groundmass. Individual phenocrysts to 1.5 mm and rare glomeroporphyritic aggregates to 2.0 mm

Quartzofeldspathic groundmass: ultra fine-grained groundmass hosts plagioclase phenocrysts; carbonate and sericite have replaced this groundmass.

Accessory:

Carbonate: principal alteration/replacement mineral. Present filling fractures but also disseminated through phenocrysts and the quartzofeldspathic groundmass.

Sericite: ultra fine-grained and unevenly distributed through phenocrysts and groundmass.

Iron oxide: minute grains distributed through section. This iron oxide is attributed to Recent oxidation processes. Some could be after very fine-grained disseminated pyrite.

Altered magnetite: subhedral skeletal-like grains and composite grains are inferred to have been magnetite micro-phenocrysts.

Sulphide: trace amounts; ultra fine-grained pyrite.

Barite: identified during scanning electron microscope investigation.

TEXTURE & FABRIC:
No penetrative fabric; plagioclase phenocrysts are evenly distributed through the uniformly fine-grained groundmass. There may have been a mafic phenocryst in this rock but it has been replaced by iron oxide + quartzofeldspathic material. The pseudomorphs are stubby subhedral and range in size up to 1.3 mm in longest dimension. The primary mineral may have been amphibole or pyroxene.

ALTERATION:
Carbonatization is the most abundant alteration type and is represented as an ultra fine-grained dissemination/replacement of plagioclase phenocrysts and groundmass as well as several sets of intersecting carbonate-filled fractures. Sericitization accompanied carbonatization and is represented by sericite with carbonate after feldspar. There may have been a mafic phenocryst in this rock however this phenocryst has been replaced by ultra fine-grained quartzofeldspathic material with disseminated iron oxide.

ROCK TYPE: plagioclase porphyry, possible dacitic to andesitic crystal tuff.

Plate 80. Photomicrograph, crossed nicols, shows the texture of this plagioclase porphyry. Plagioclase (P) phenocrysts and iron oxide-rich pseudomorphs, possibly after a mafic mineral (arrow) are hosted in an ultra fine-grained quartzofeldspathic (QF) groundmass. FOV = 11 mm.

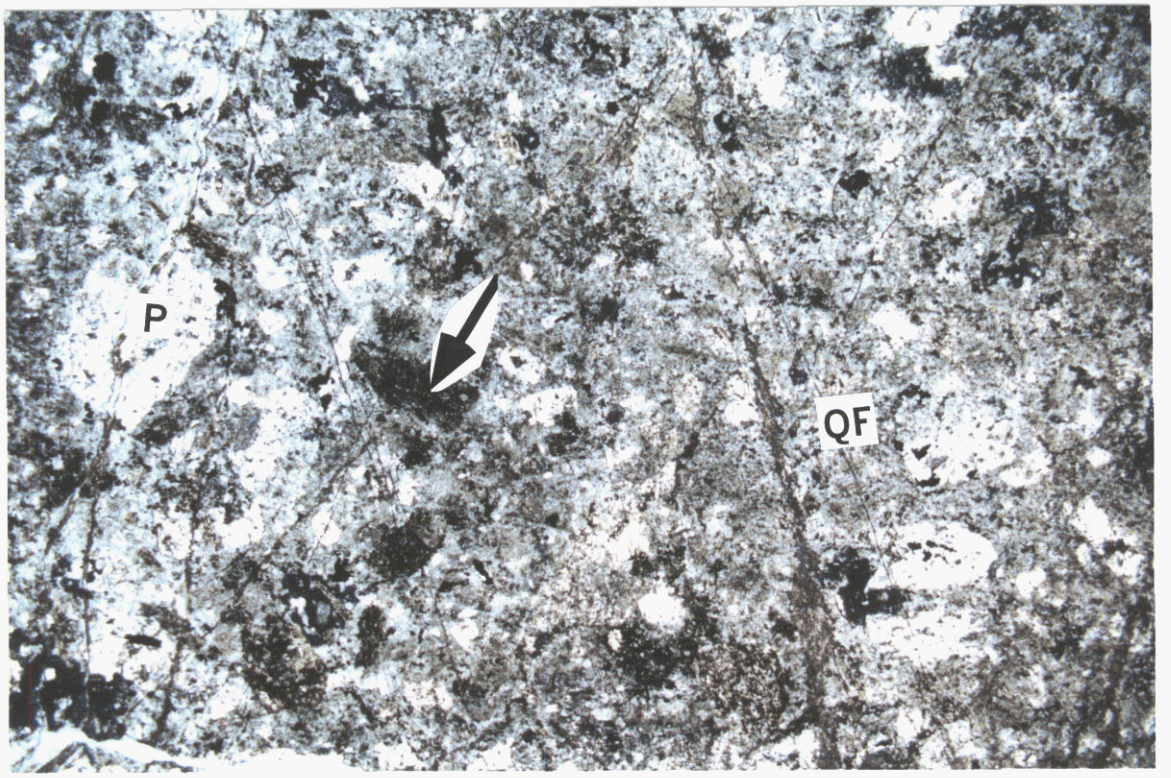
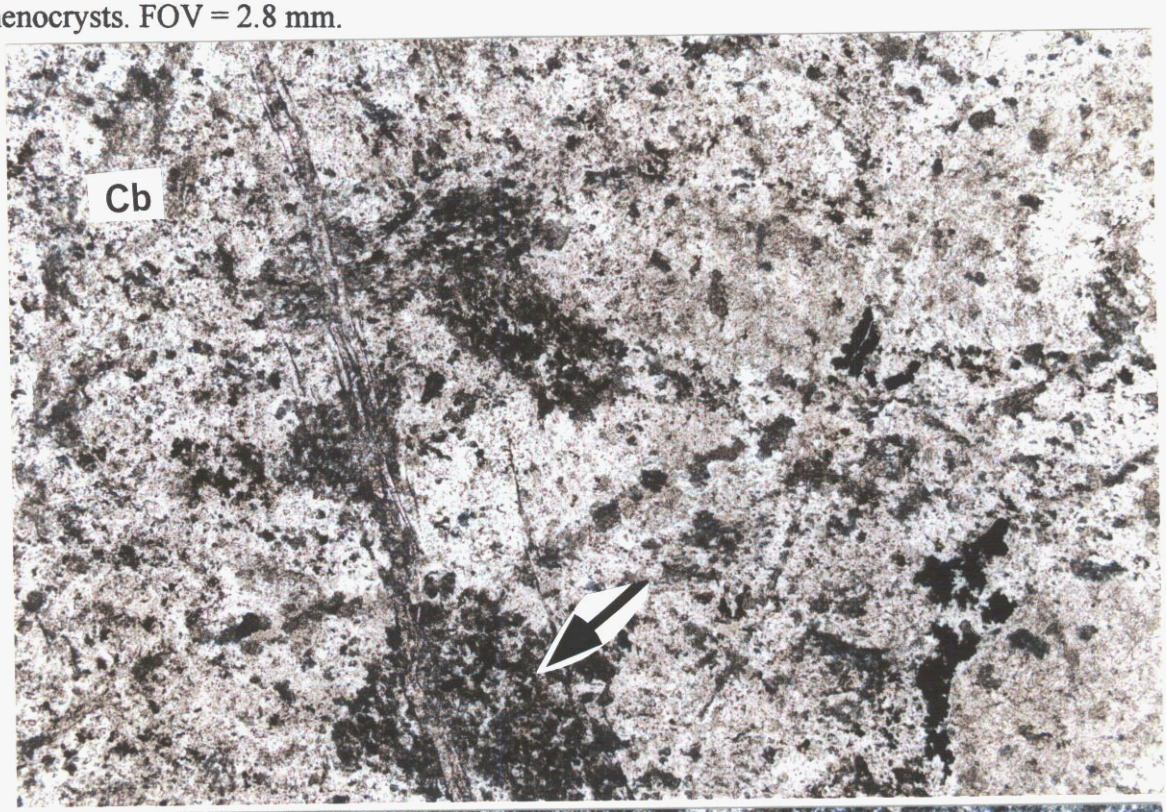


Plate 81. Photomicrographs, **A** – plane light, **B** – crossed nicols, show the weak carbonatization and sericitization of the porphyry. Minute carbonate porphyroblasts (Cb) are distributed through the quartzofeldspathic groundmass and plagioclase (P) phenocrysts. Carbonate-filled veinlets cut the porphyry. Very fine-grained sericite (Se) is distributed through the quartzofeldspathic groundmass and altered mafic phenocrysts (arrow). Altered opaque aggregates are inferred to have been magnetite (M) micro-phenocrysts. FOV = 2.8 mm.

A



B

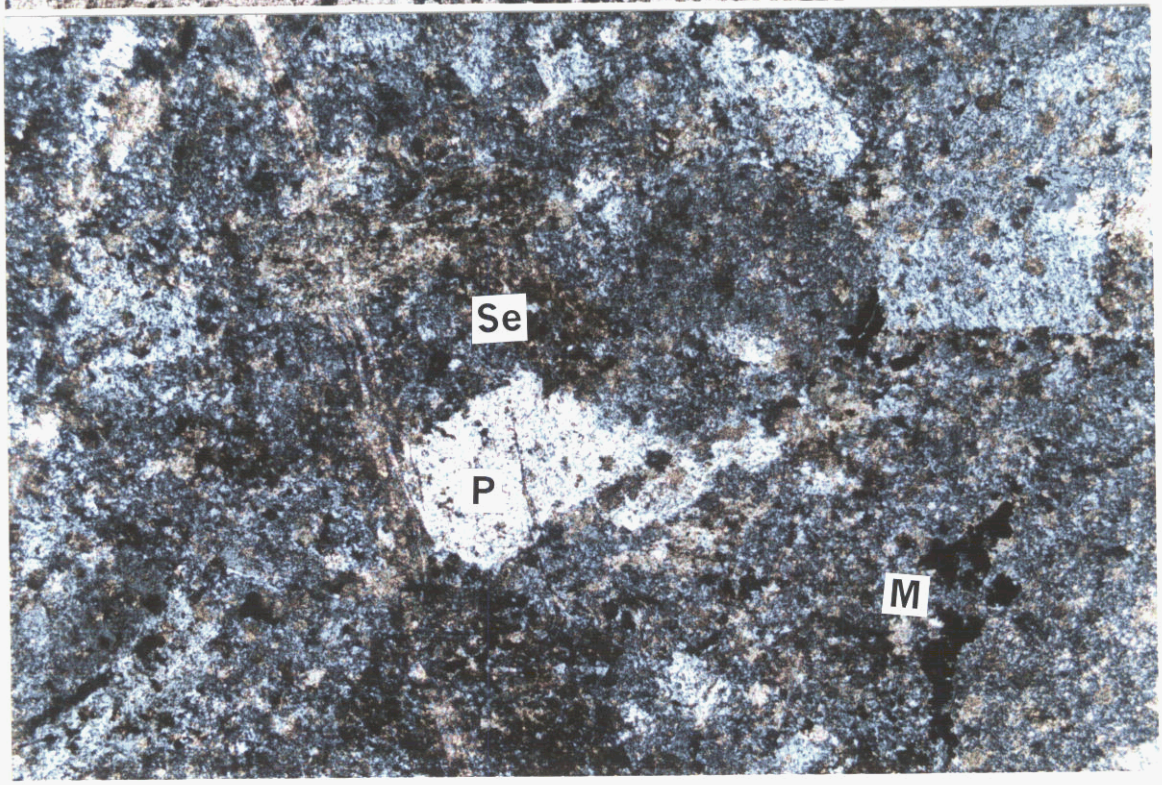
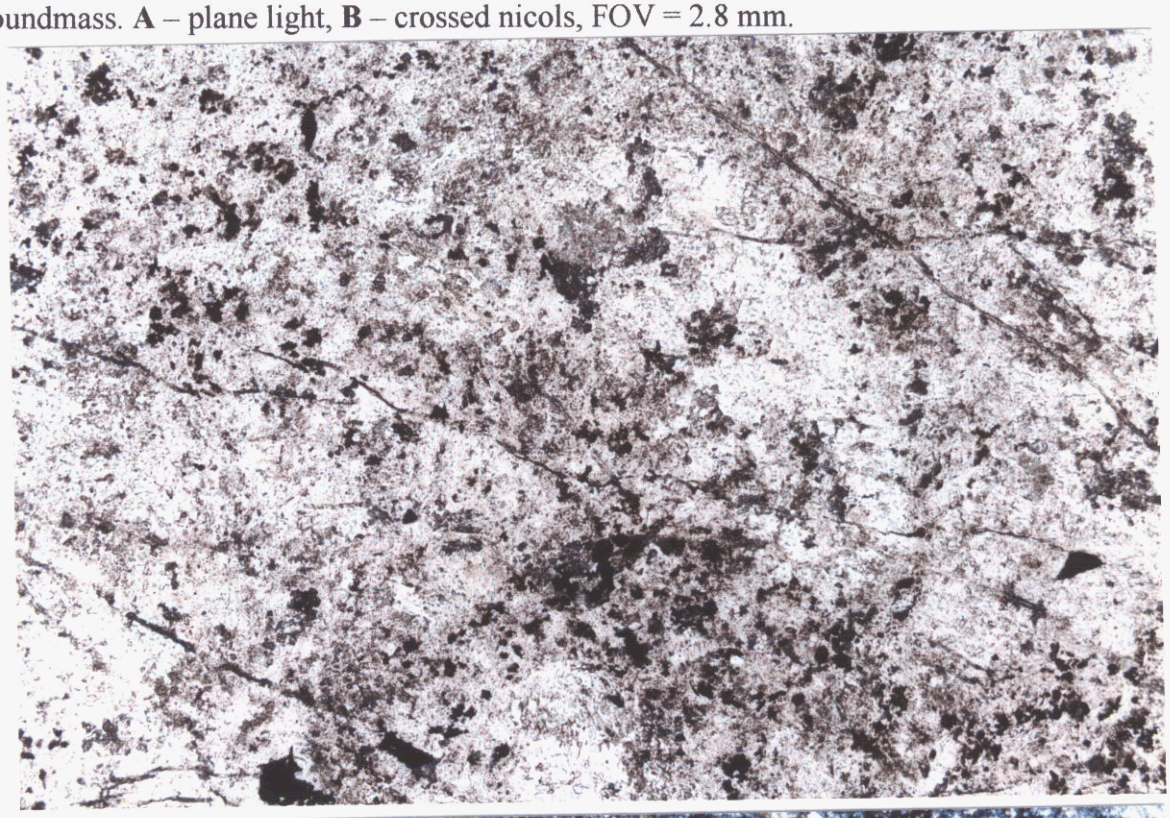


Plate 82. Photomicrographs, **A** – plane light, **B** – crossed nicols, show the weakly altered plagioclase (P) phenocrusts in the carbonate+sericite altered quartzofeldspathic groundmass (QF). Fine-grained opaque grains are sparsely distributed through the groundmass. **A** – plane light, **B** – crossed nicols, FOV = 2.8 mm.

A



B

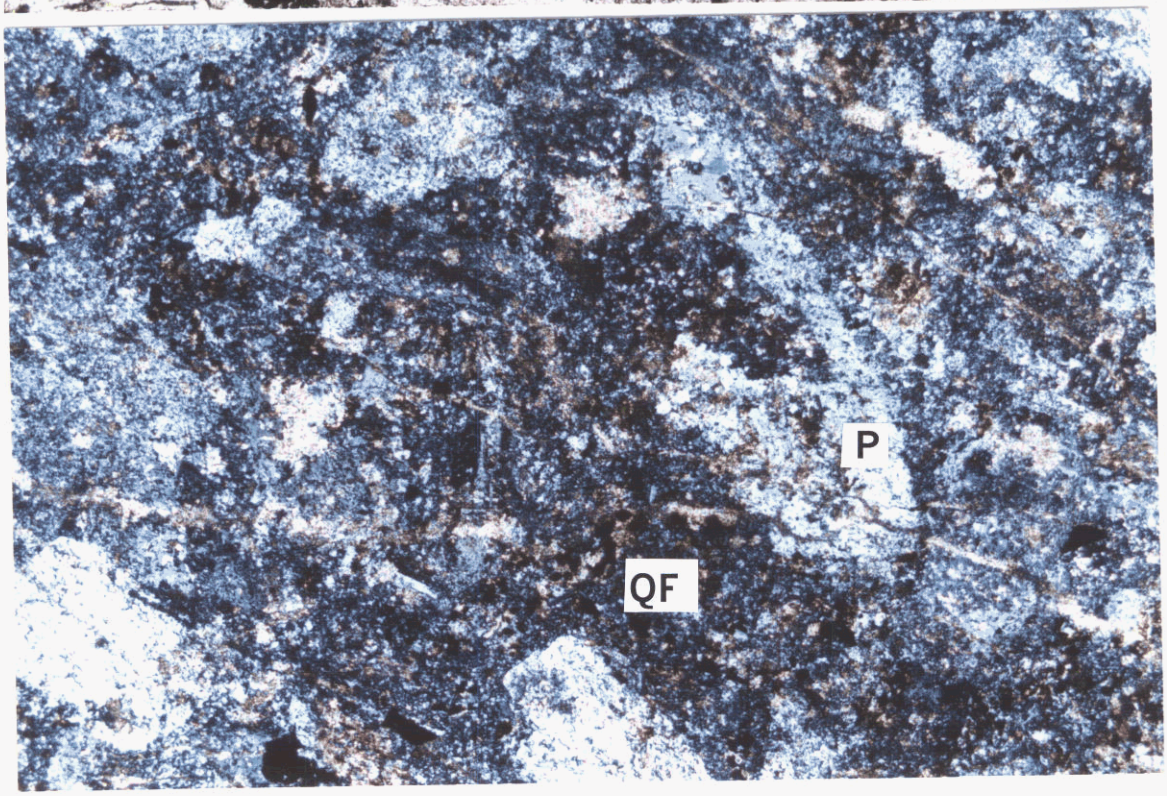
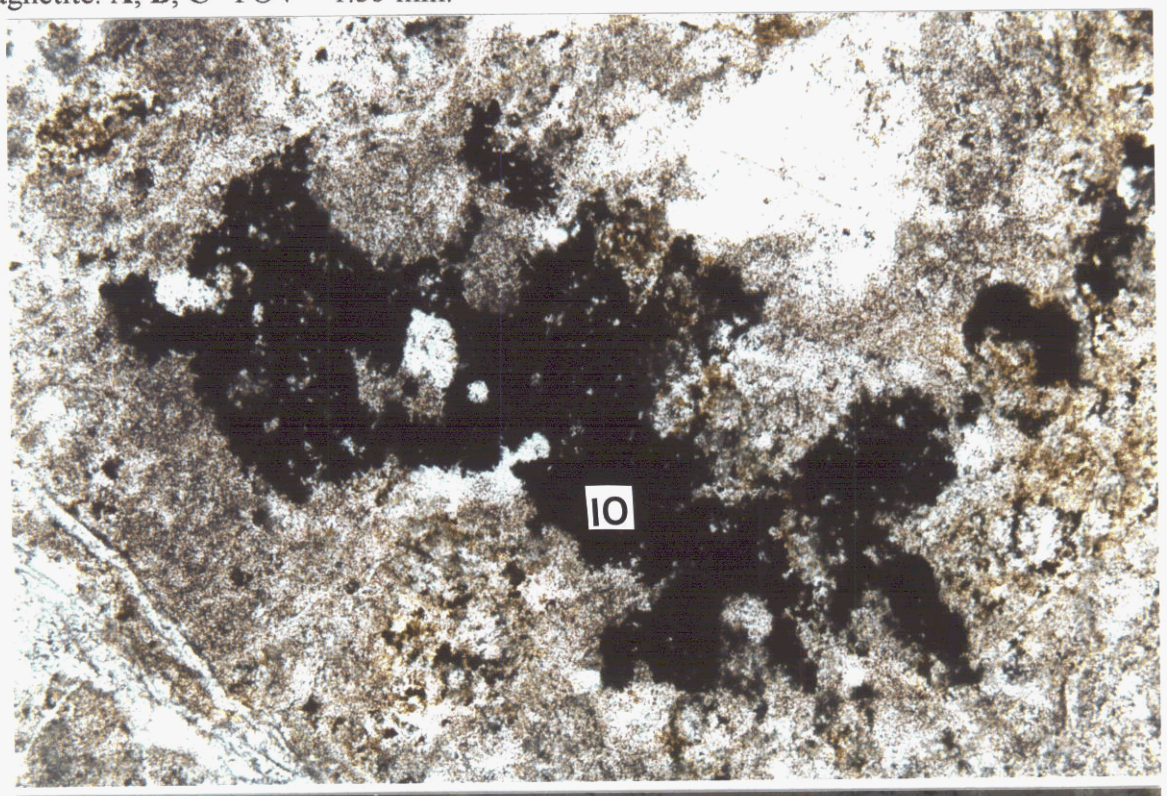


Plate 83. Photomicrographs, **A** – plane light, **B** & **C** – reflected light, show irregular-shaped aggregates of iron oxide (IO) that are sparsely distributed through the carbonate-altered quartzofeldspathic groundmass. These iron oxide pseudomorphs may be after magnetite. **A**, **B**, **C**– FOV = 1.35 mm.

A



B

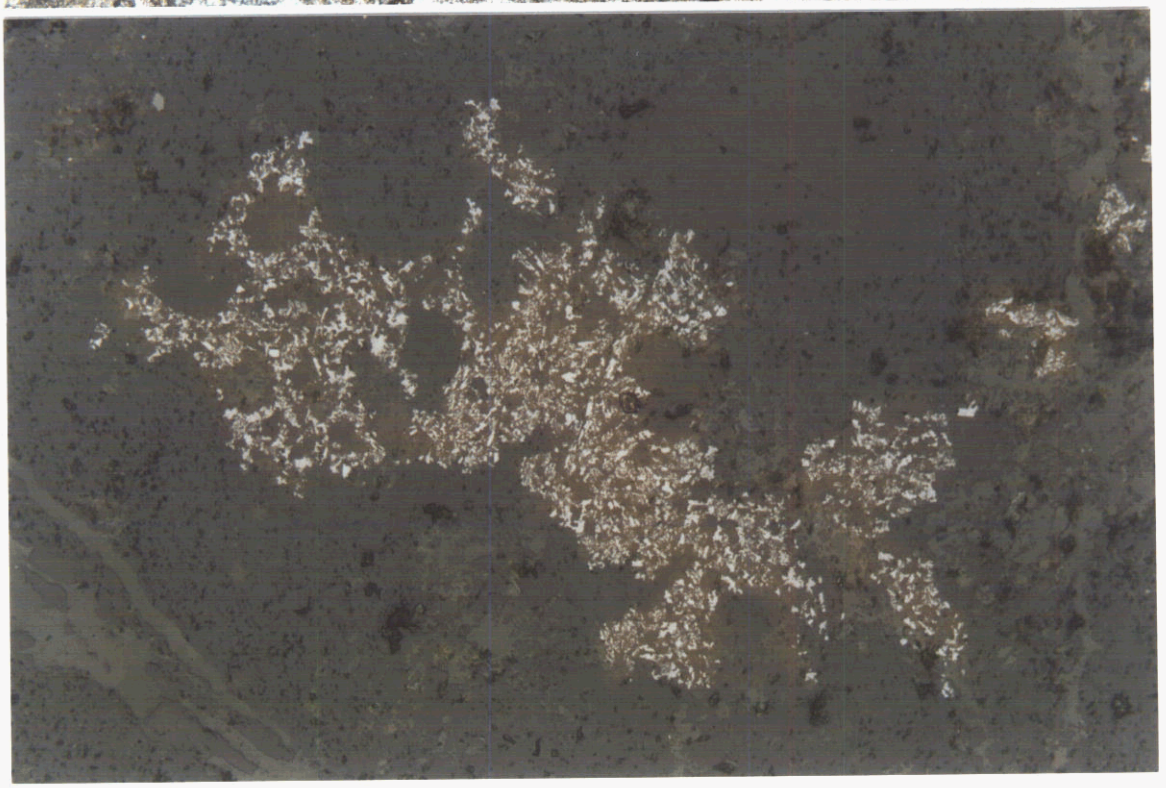
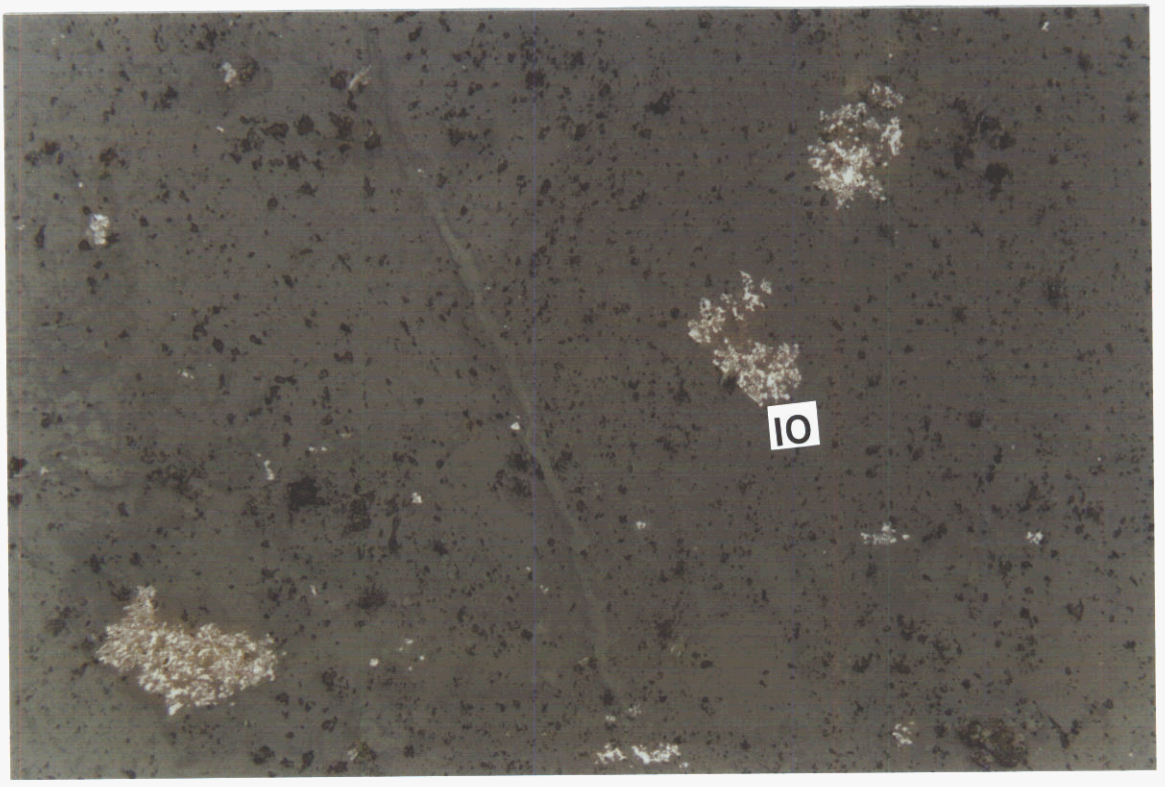


Plate 83C.



Kishar Reserch

Sample #: Onion TS-1: Sax-Cessena Embayment area

Location	Northing	Easting
521380 E / 6872339 N	6872339	521380

Kishar Reserch

SUMMARY: ***argillitized fine-grained gabbro/diorite or basalt/andesite***. The correct lithology would be based on the plagioclase composition. However the feldspathic component of this rock has been completely argillitized. The igneous texture is superbly preserved in spite of this intense alteration. This rock was comprised of unoriented fine-grained, to 0.8 mm, subhedral lath-like plagioclase with interstitial anhedral fine-grained diopside. The igneous texture formed by feldspar and pyroxene is termed an intergranular texture, typical of mafic volcanic and hypabyssal rocks and is not considered to be part of the White River Intrusive Complex. This rock is inferred to be part of the country rock sequence. This rock may be a xenolith belonging to the Station Creek Formation basalt/andesite (preferred interpretation) or a dyke related to the Nikolai Group basalt.

TYPE: PTS
ASSEMBLAGE: clay, diopside, sericite, barite(?), iron oxide
ESTIMATED MODE (visual): 65% clay after feldspar, 35% diopside, trace (sericite, barite(?), iron oxide)

MINERALOGY:
Essential:

Clay: present as ultra fine-grained mats that are pseudomorphs after plagioclase.

Diopside: anhedral grains to 0.5 mm occupy the interstitial volumes between clay pseudomorphs after feldspar

Accessory:

Sericite: minor amount confined to a narrow band of altered wall rock adjacent to a fracture.

Barite(?): trace amount; present in narrow fractures.

Iron oxide: ultra fine-grained distributed through interstitial pyroxene and some altered clay pseudomorphs after feldspar. Maybe due to Recent weathering processes?

TEXTURE & FABRIC:
No penetrative fabric. The igneous texture of this rock is well preserved in spite of the complete replacement of the feldspathic component. The feldspathic portion of this rock was originally represented by subhedral lath-like grains up to 0.8 mm long. These lath-like grains form an interlocking texture with anhedral diopside occupying the interstitial volumes between altered plagioclase. Feldspar phenocrysts vary up to 1.3 mm and glomeroporphyritic aggregates to 2 mm are present. The texture formed by interlocking feldspar with interstitial pyroxene is termed intergranular.

ALTERATION:
Complete argillitization of the feldspar component in this rock.

ROCK TYPE: fine-grained gabbro/basalt or diorite/andesite; the complete replacement of plagioclase does not permit an anorthite component of plagioclase to be measured in order to better classify the rock type.

Plate 84. Photomicrographs, **A** – plane light, **B** – crossed nicols, show the fine-grained intergranular texture formed by altered plagioclase (P) laths with interstitial anhedral diopside (D). **A, B** – FOV = 11 mm.

A

B

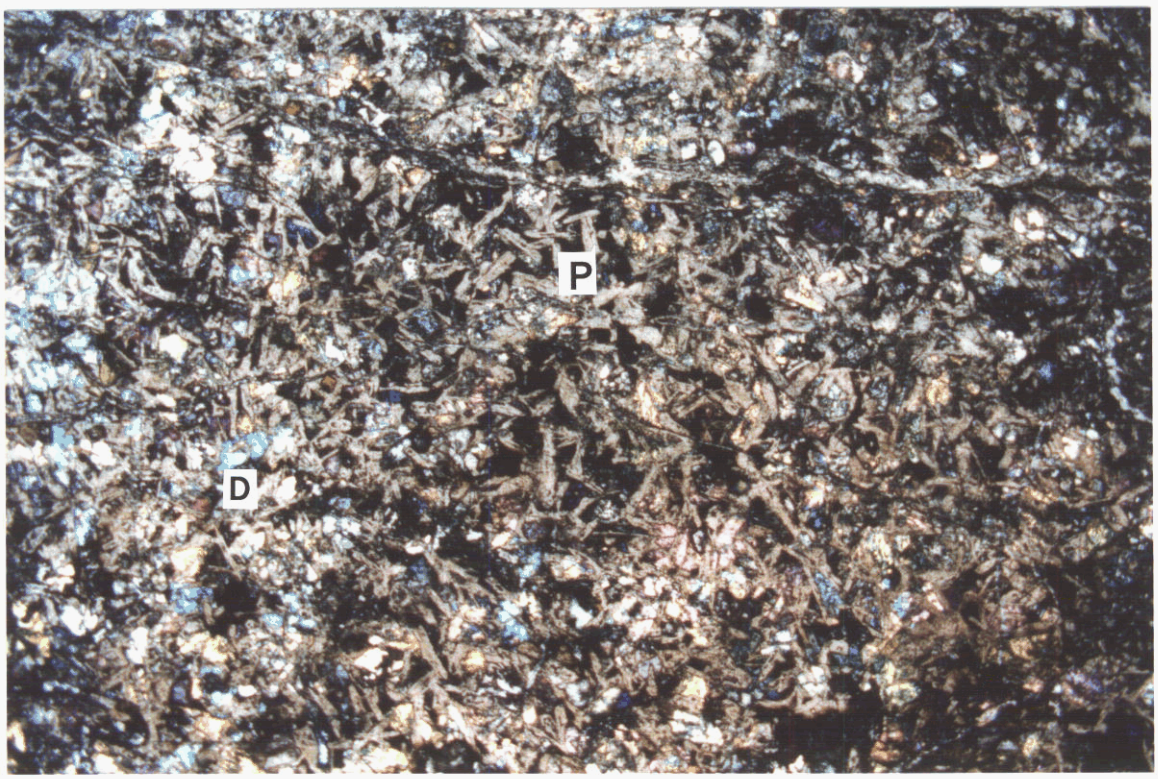


Plate 84. Photomicrographs, **C** – plane light, **D** – crossed nicols, show the intergranular texture formed by altered plagioclase (P) laths and anhedral interstitial diopside (D). Altered glomeroporphyritic aggregates of plagioclase (arrow) are sparsely distributed through the intergranular-textured rock. **C**, **D** – FOV = 11 mm.

C

D

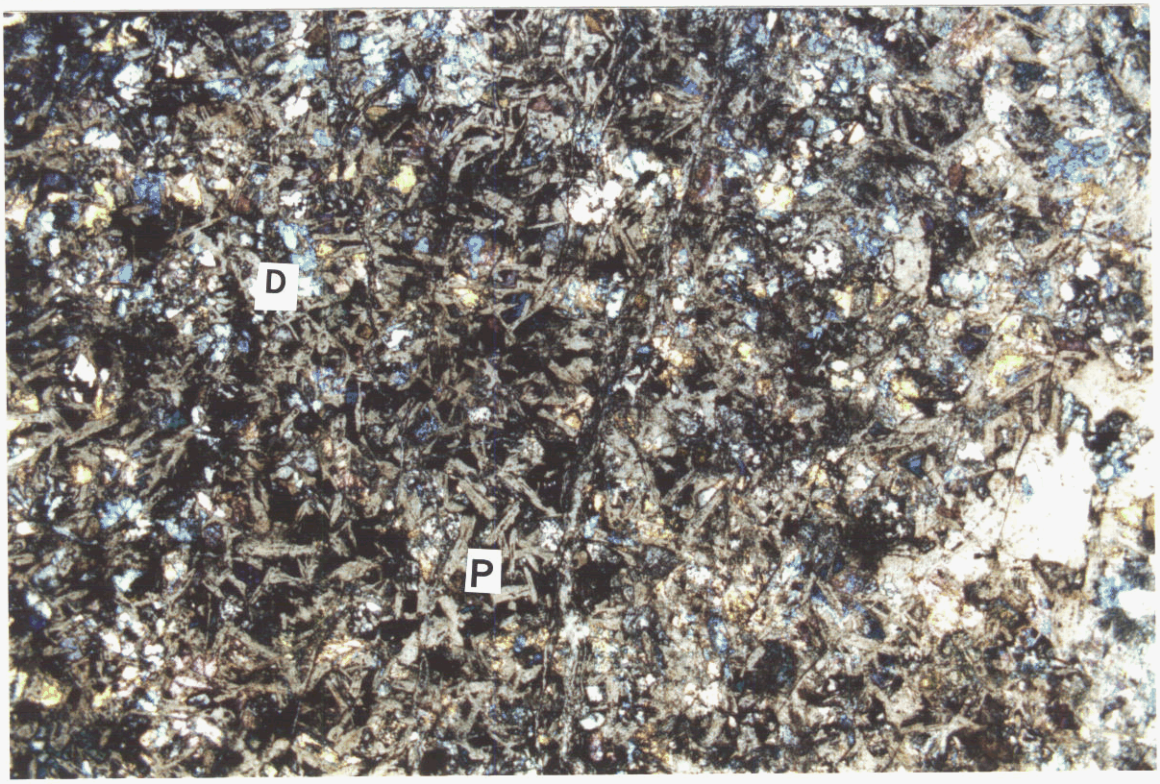
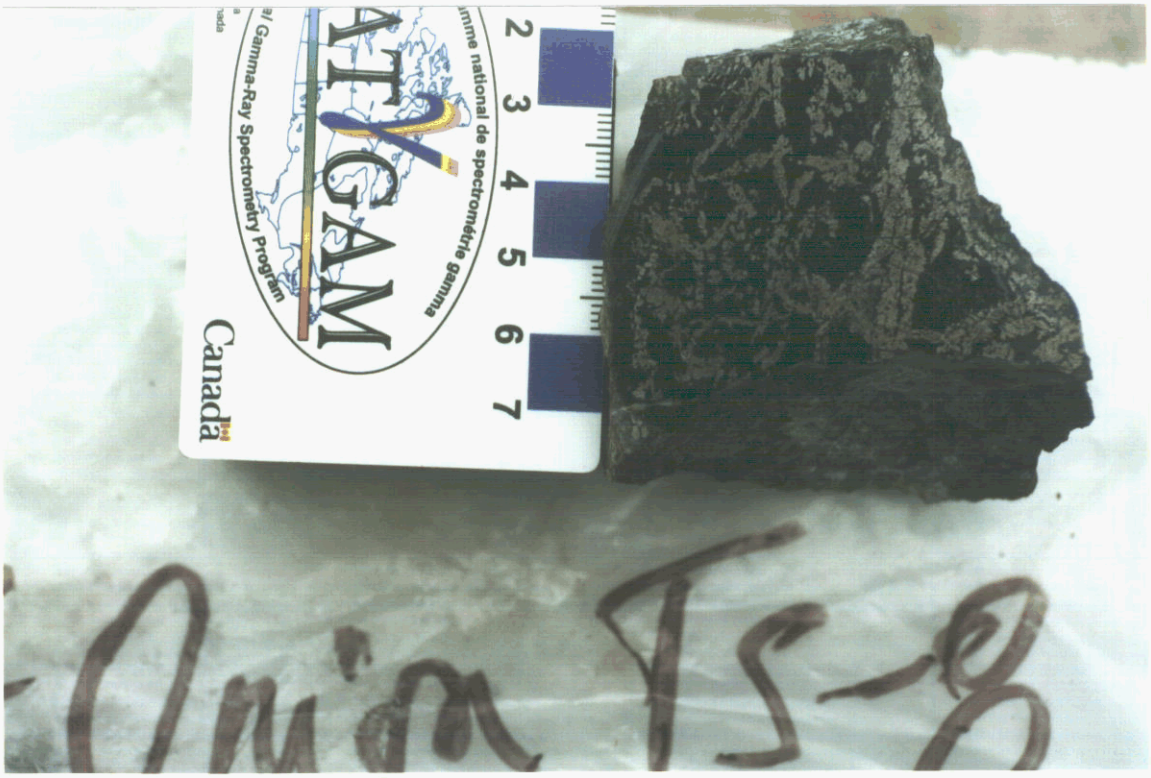


Plate 84**E**. Photomicrograph, plane light, a higher magnification of Plate 84D, shows the fine-grained intergranular texture formed by altered plagioclase (P) laths with interstitial anhedral diopside (D). FOV = 5.5 mm.

Sample #: Onion TS-8: Onion SE
Cu 110 ppm; 326 ppm Zn, Ni 70100 ppm; Co 450 ppm
8688 ppb Au, 89.3 Pt, 175 ppb Pd
0.5 ppb Rh, 1 ppb Os, 0.5 ppb Ir, 38 ppb Ru, 304.3 ppb PGE_T

Northing	Easting
6874123	520225

The crisscrossing geometry of the blade-like niccolite bands is similar to but coarser than the texture of fracture-controlled sulphide in the hydrothermally altered sample TS-10.



SUMMARY: ***Intensely hydrothermally altered rock***, possibly formed through processes of recrystallization and metasomatism. This rock has a granoblastic texture formed by fine-grained subhedral to euhedral diopside and garnet hosted in a very fine-grained clay host/matrix. Accessory Mg-chlorite is part of the former assemblage and is characteristically intergrown with hematite. Niccolite is present as relatively coarse blade-like bands that host inclusions of the former mineral assemblage. The silicate-niccolite texture implies that both formed during the same hydrothermal event. There are no relict textures that suggest a specific protolith. The Ca-rich mineral assemblage supports a Ca-rich protolith and potential protoliths could have been either a clinopyroxenite or calcareous sediment.

TYPE: PTS
ASSEMBLAGE: diopside, clay, nickeline group, garnet, hematite, chlorite, carbonate
ESTIMATED MODE (visual): 35% diopside, 15% garnet, 10% clay, 30% nickeline group, 5% hematite, 5% chlorite, trace carbonate

MINERALOGY:
Essential:

Diopside: present as euhedral to anhedral grains that vary in size from 0.1 – 1.5 mm. There is considerable grain size variation, i.e. there are micro-domains that are comprised of 0.1 – 0.5 mm anhedral grains whereas there are other micro-domains that are comprised of anhedral to subhedral fine to medium-grained diopside with

Clay: ultra fine-grained low birefringent grains and aggregates represent the matrix to diopside. This is also the host to ultra fine-grained garnet.

Garnet: inferred to be andradite; characterized by a translucent dark honey brown through to opaque and the outer margins of the coarser grains are commonly opaque, possibly due to iron content. Present in two size ranges: 1) as subhedral to euhedral crystals to 0.3 mm and these minute cubes and octahedra coalesce into mats that are hosted by clay. This garnet may have formed through reaction with clay. Minute garnet euhedra are commonly intergranular/interstitial to diopside. 2) as anhedral to subhedral grains up to 3 mm.

Nickeline Group: niccolite – characterized by the pinkish brown reflectance colour. Present as crisscrossing blade-like bands associated with the assemblage of diopside+garnet+clay with chlorite. Niccolite grains surround and enclose the latter mineral aggregates and this texture suggests that the niccolite and silicates are coeval. Importantly the opaque assemblage excluding the accompanying hematite is monomineralic.

Accessory:

Chlorite: present as sheaths intergrown with hematite. Plates have a kaki interference colour indicative of a Mg-rich composition.

Hematite: associated with and forms aggregates of hematite-chlorite that are intergrown with clay+garnet+diopside.

Carbonate: trace amount present in banded veinlets that crosscut the nickeline-silicate assemblage.

TEXTURE & FABRIC:
No penetrative fabric. The texture of this rock is best described as granoblastic and consists of predominantly fine-grained subhedral to euhedral diopside+garnet, both hosted in very fine- to ultra fine-grained clay. The distribution of very fine-grained garnet through the clay host suggests that garnet formed at the expense of clay. The crisscrossing blades of niccolite are clearly not controlled by a penetrative foliation.

ALTERATION:
The mineral assemblage is interpreted to be the product of hydrothermal recrystallization and possibly metasomatism.

ROCK TYPE: Protolith is unknown due to extensively recrystallization/metasomatism. Any direct inference to the possible protolith is hindered by the lack of relict textures. However the Ca-rich mineral assemblage of this altered rock suggests derivation from a Ca-rich protolith, potential protoliths are either a clinopyroxenite or a calcareous sedimentary rock; the former is preferred.

Plate 85. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, show the texture of the skarn-like assemblage formed by silicates-nickeline group minerals-iron oxide. Hematite-chlorite (HtCh) aggregates and elongate aggregates of niccolite (Ni) are hosted in a silicate assemblage dominated by anhedral to euhedral diopside (D) with andradite (A). **A**, **B**, **C** – FOV = 11 mm.

A

B

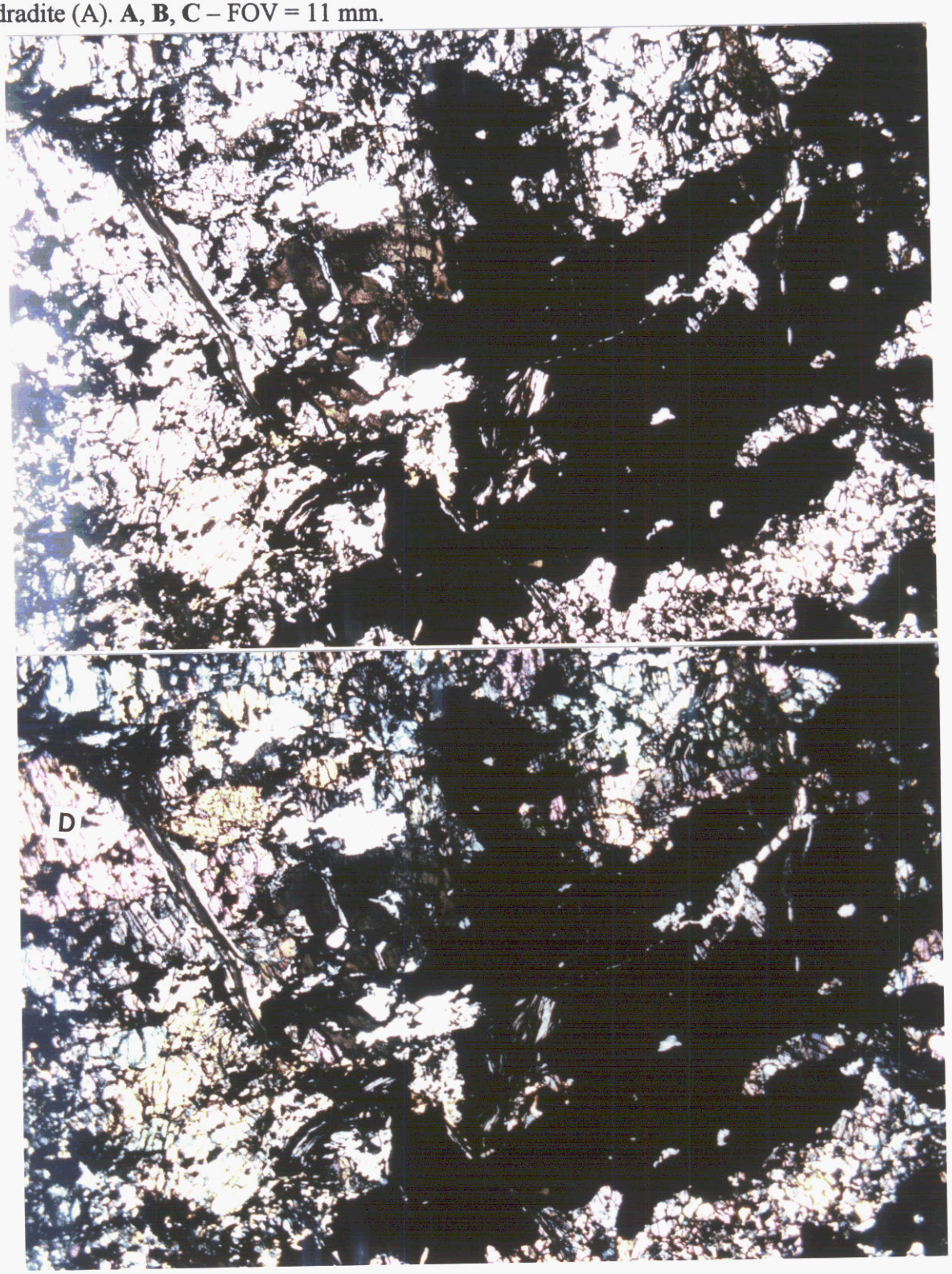


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Plate 85C.

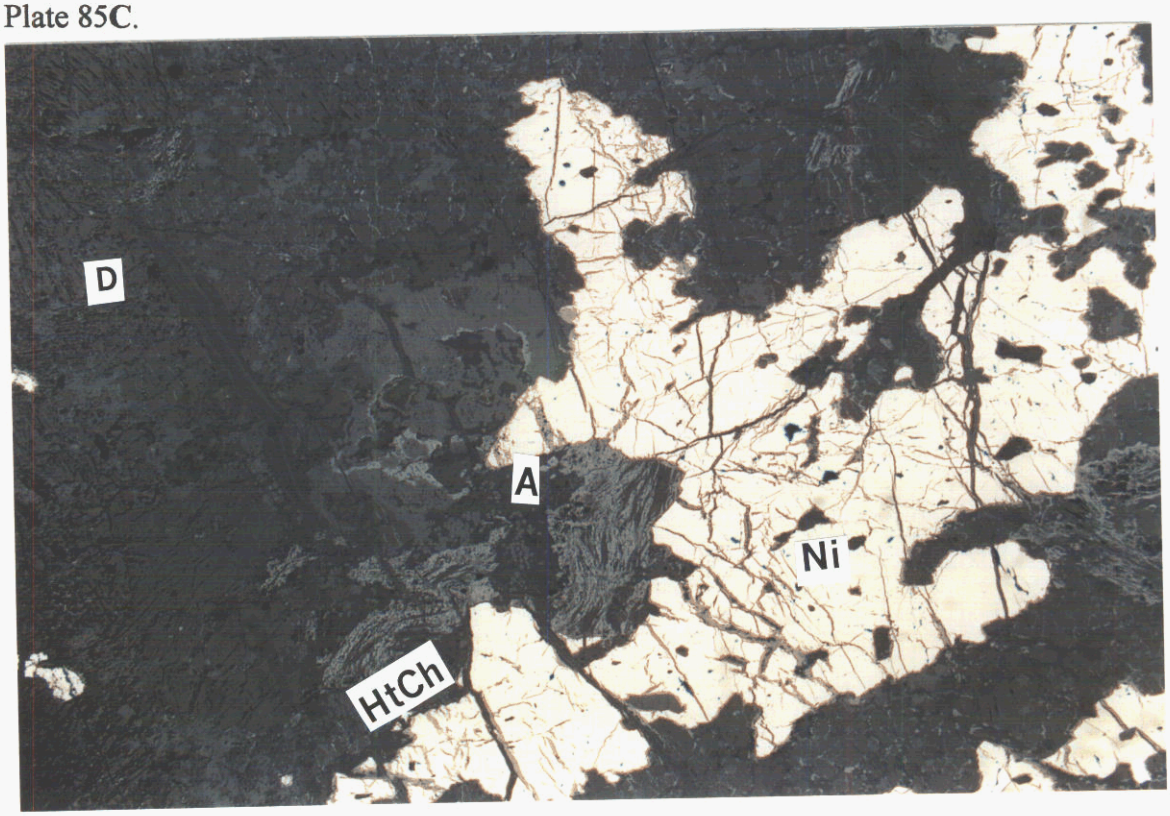
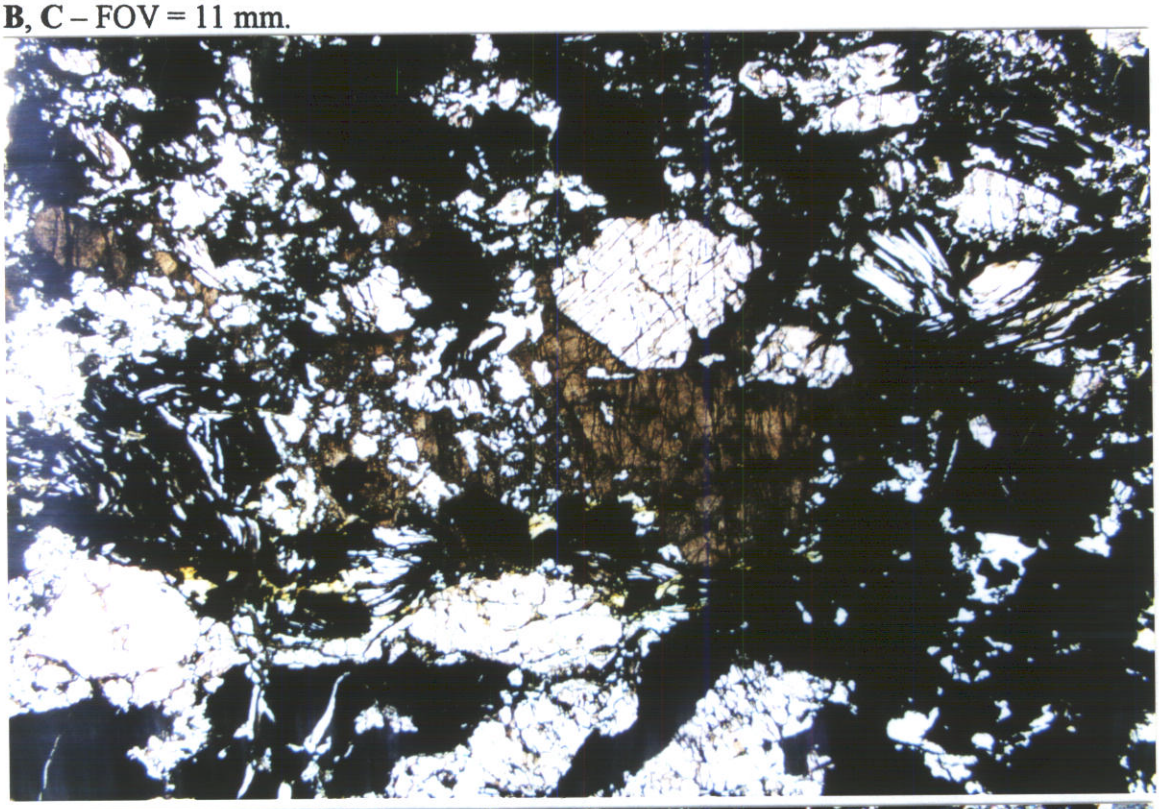


Plate 86. Photomicrographs, **A** – plane light, **B** – crossed nicols, **C** – reflected light, show the typical texture of this skarn-like assemblage formed by intense hydrothermal alteration. Anhedral to euhedral diopside (D) is associated with turbid coloured andradite (A), complex intergrowths of hematite+Mg-chlorite (HtCh) with niccolite (Ni).
A, **B**, **C** – FOV = 11 mm.

A



B

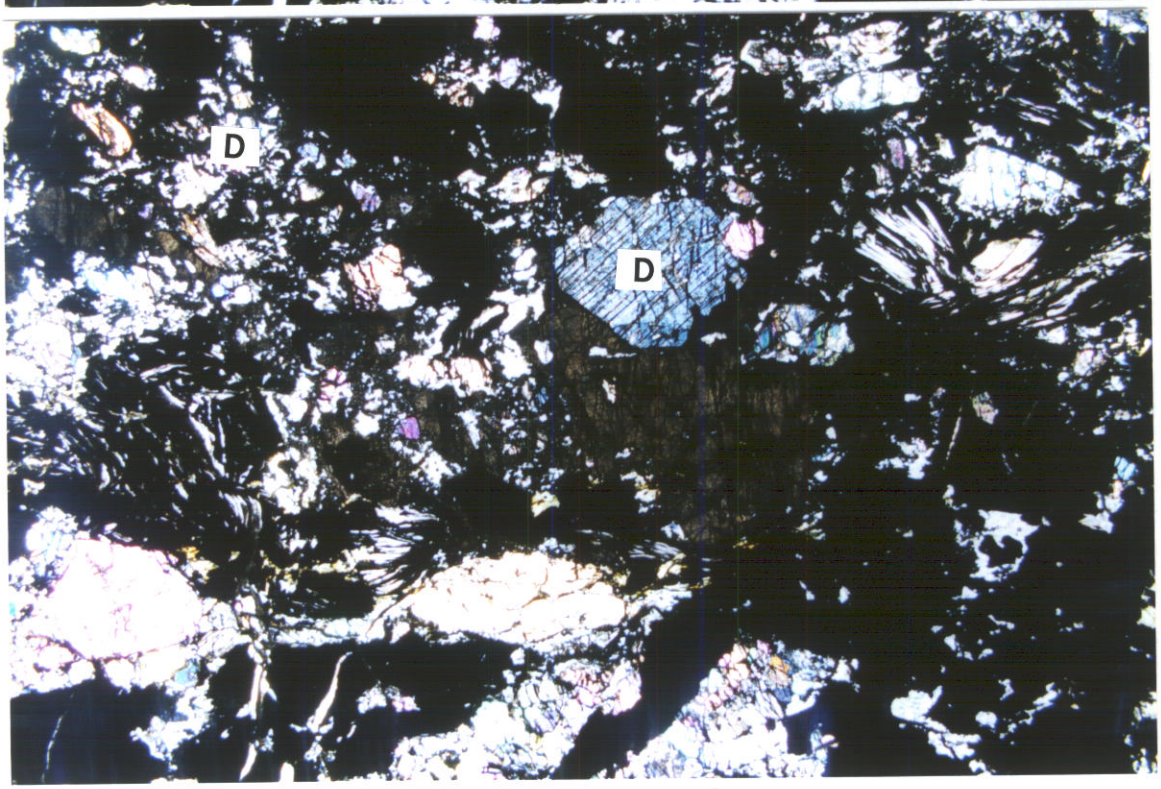


Plate 86C.

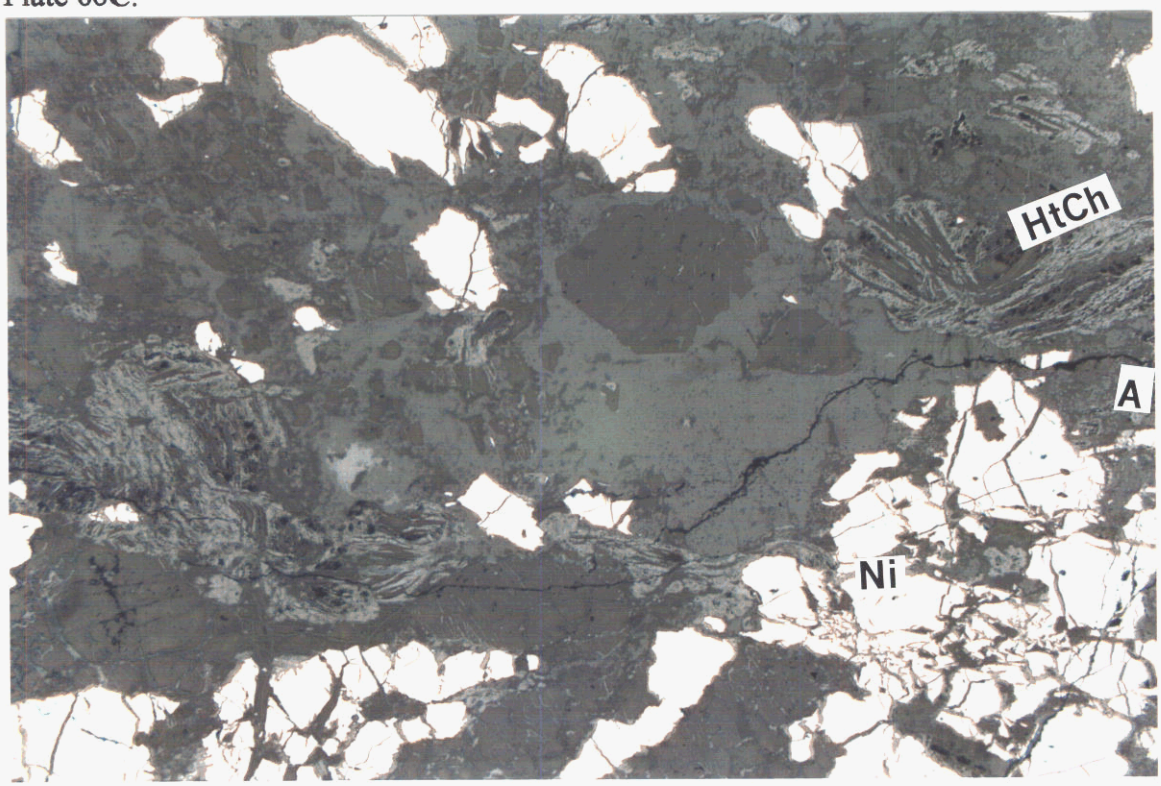
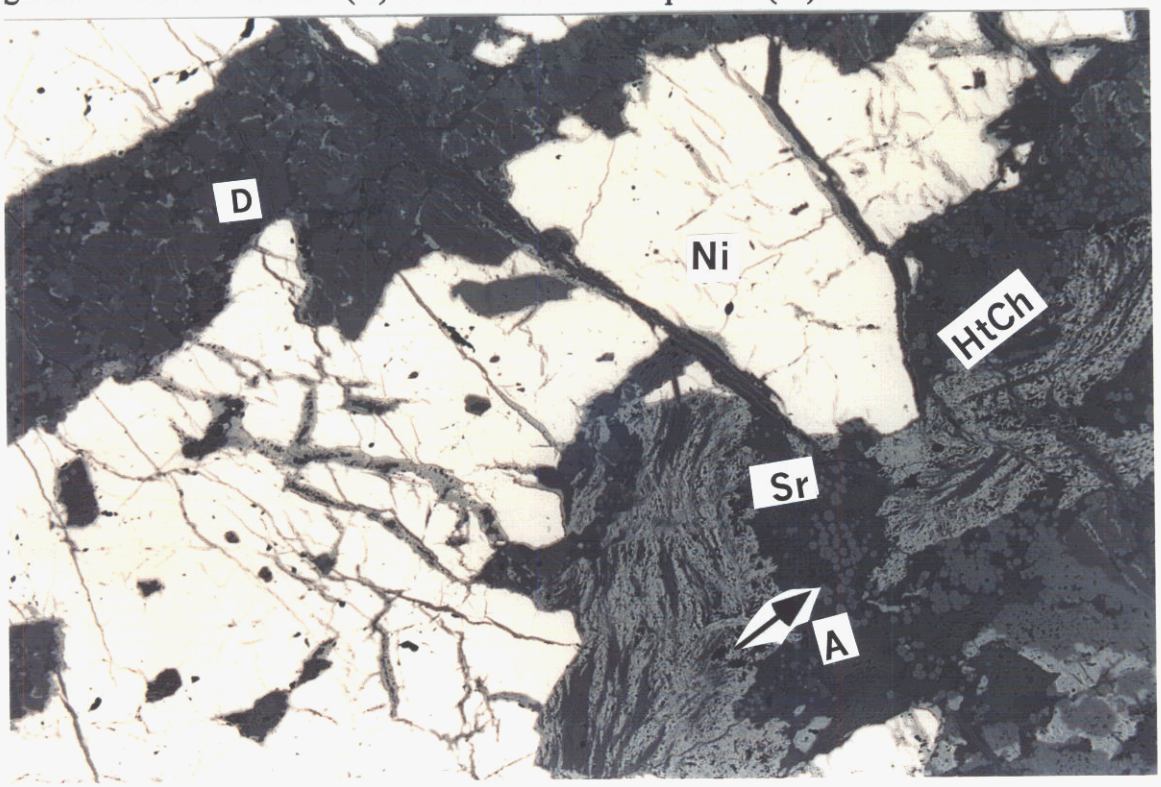


Plate 87. Photomicrograph, reflected light, shows niccolite (Ni) and hematite-chlorite aggregates (HtCh) are associated with very fine-grained diopside (D) and very fine-grained andradite euhedra (A) that are hosted in serpentine (Sr). FOV = 5.5 mm.



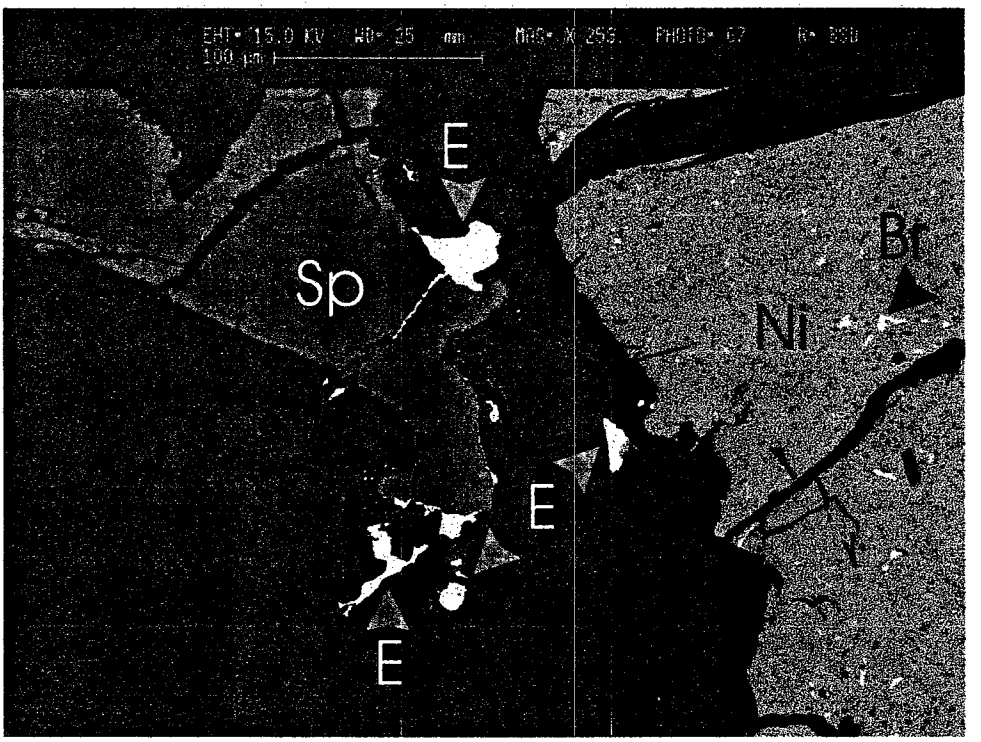
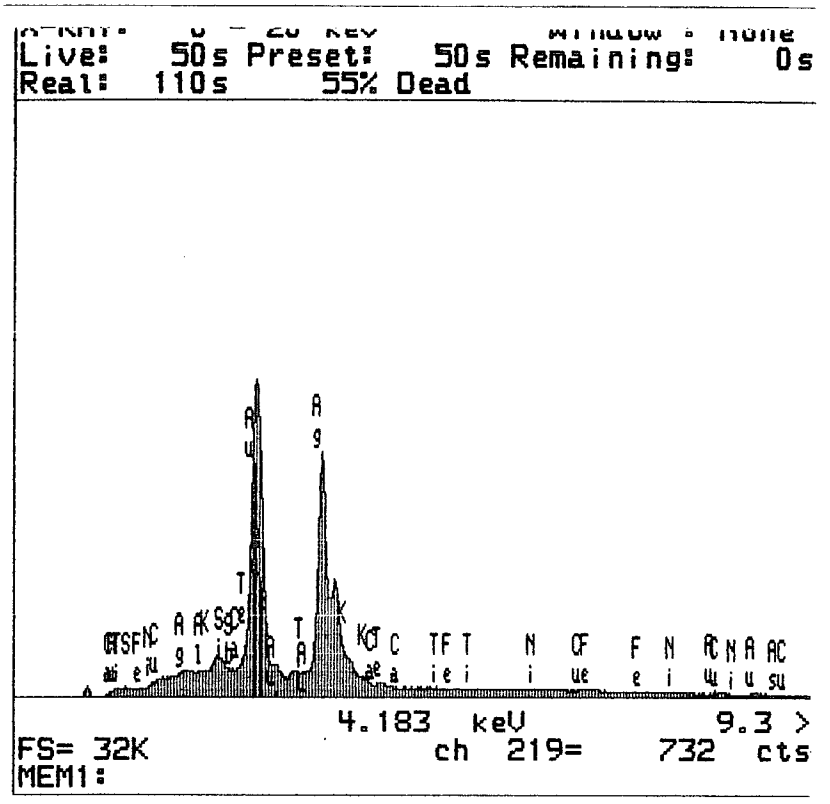


Plate 88. Electron backscattered image of niccolite (Ni) with exsolved inclusions of breithauptite (Br; composition Ni-Sb). Minute grains of electrum (E) are in contact with sphalerite (Sp) and within the immediately adjacent silicate (black). Based on the energy dispersive spectra below, the electrum is comprised of gold and silver with a ratio ~1:1.



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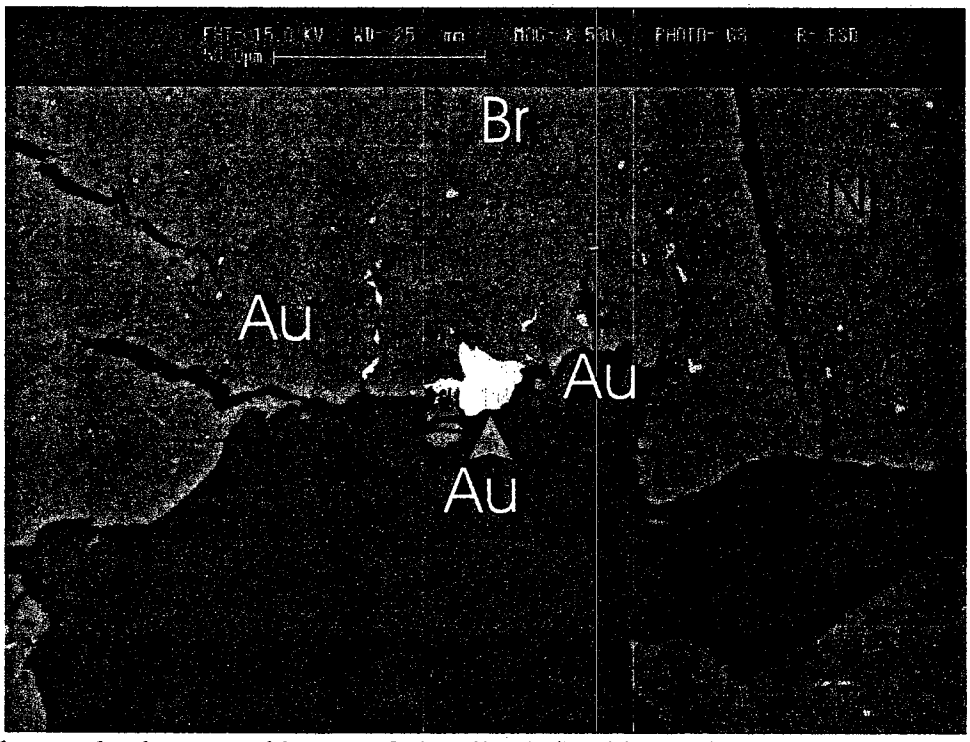
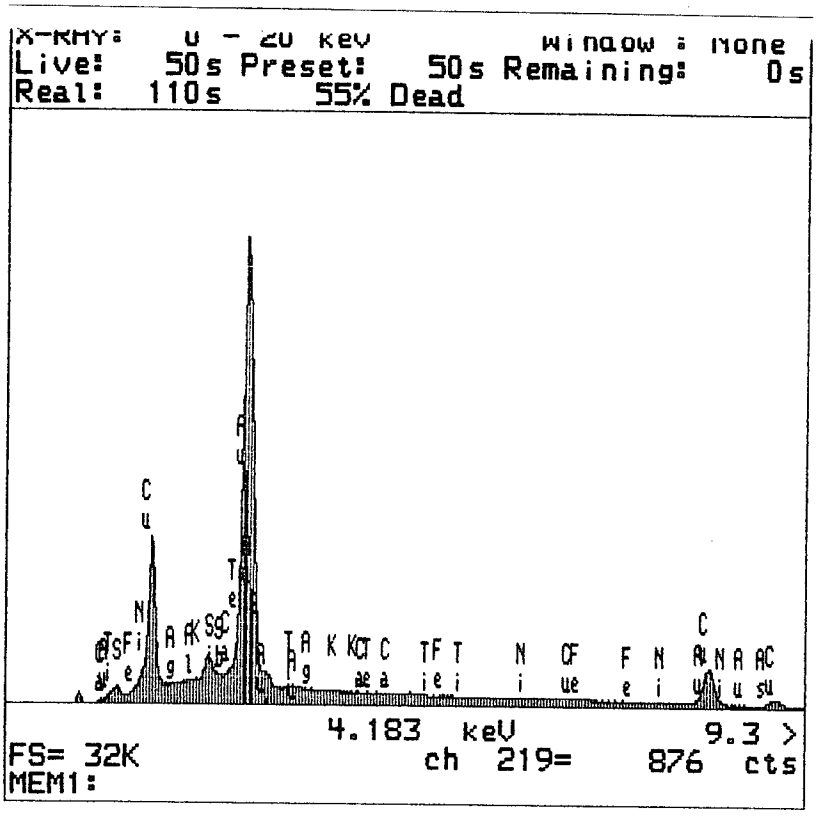


Plate 89. Electron backscattered image of niccolite (Ni) with exsolved inclusions of breithauptite (Br). Minute grains of gold (Au) are in contact with and as inclusions in niccolite. Based on the energy dispersive spectra below, the gold is remarkably pure with trace amounts of copper.



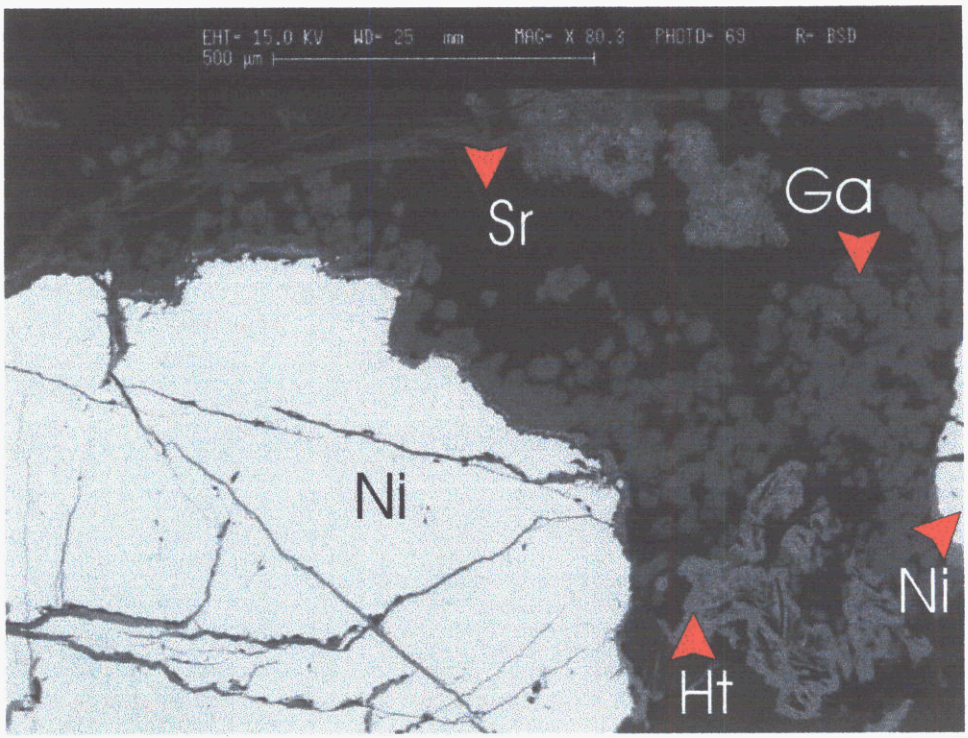


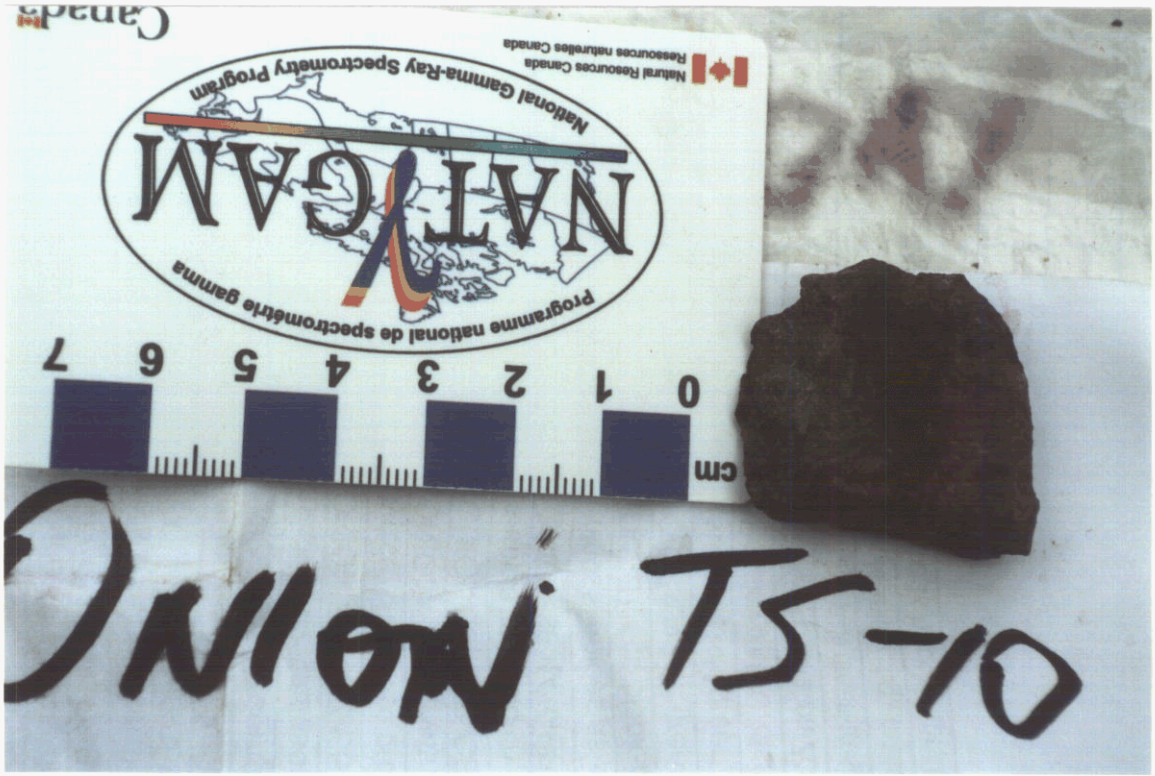
Plate 90. Electron backscattered image shows the typical silicate assemblage associated with niccolite (Ni). Serpentine (Sr – black) hosts minute subhedral to euhedral porphyroblasts of garnet (Ga). Contorted aggregates of hematite (Ht) + chlorite are present in the serpentine host.

Sample #: Onion TS-10: Sax-Cessena Embayment area

1660 ppm Cu, 169 ppm Zn, 5 ppm Ni, 70 ppm Co

309 ppb Au, 3 ppb Pt, 2 ppb Pd, 5 ppb PGE_T

Location	Northing	Easting
3+90 S / 0+70 E	6872478	521429



Kishar Reserch

SUMMARY: ***Sulphide-bearing hydrothermally altered rock***. The sample is interpreted based on the silicate assemblage to be similar to and genetically related to samples TS-8 except that the metallic minerals are different. This rock is comprised of ultra fine- to fine-grained diopside+garnet+chlorite and this silicate assemblage is host to veins, veinlets and cloys of pyrrhotite with minor chalcopyrite. Minor amounts of marcasite after pyrrhotite is inferred to be due to Recent oxidation. Based on the silicate mineral assemblage, this hydrothermally altered rock may have been derived from a calcareous sedimentary rock.

TYPE: PTS
ASSEMBLAGE: garnet, diopside, sulphide, chlorite, carbonate
ESTIMATED MODE (visual): 75% diopside, 10% sulphide, 10% garnet, 5% chlorite, trace carbonate

MINERALOGY:
Essential:

Garnet: as subhedral grains to 0.1 mm distributed through the pyroxene-rich rock

Diopside: most abundant mineral. The greater portion of the section is comprised of ultra fine-grained, <0.05 mm, diopside and is associated with garnet+chlorite. There are micro-domains of relatively coarser grained, 0.1 – 0.3 mm, diopside that host clots, disseminated and veinlets of sulphide.

Accessory:

Chlorite: ultra fine-grained platelets interstitial to diopside+garnet and evenly distributed through the host rock

Carbonate: trace amount associated with the garnet+chlorite-bearing diopside-rich hostrock.

Sulphide: sulphide is present as veins and smaller scale veinlets and irregular-shaped clots. The dominant sulphide is pyrrhotite with minor chalcopyrite. Pyrrhotite has been weakly altered to marcasite along micro-fractures and along the margins of silicate-sulphide.

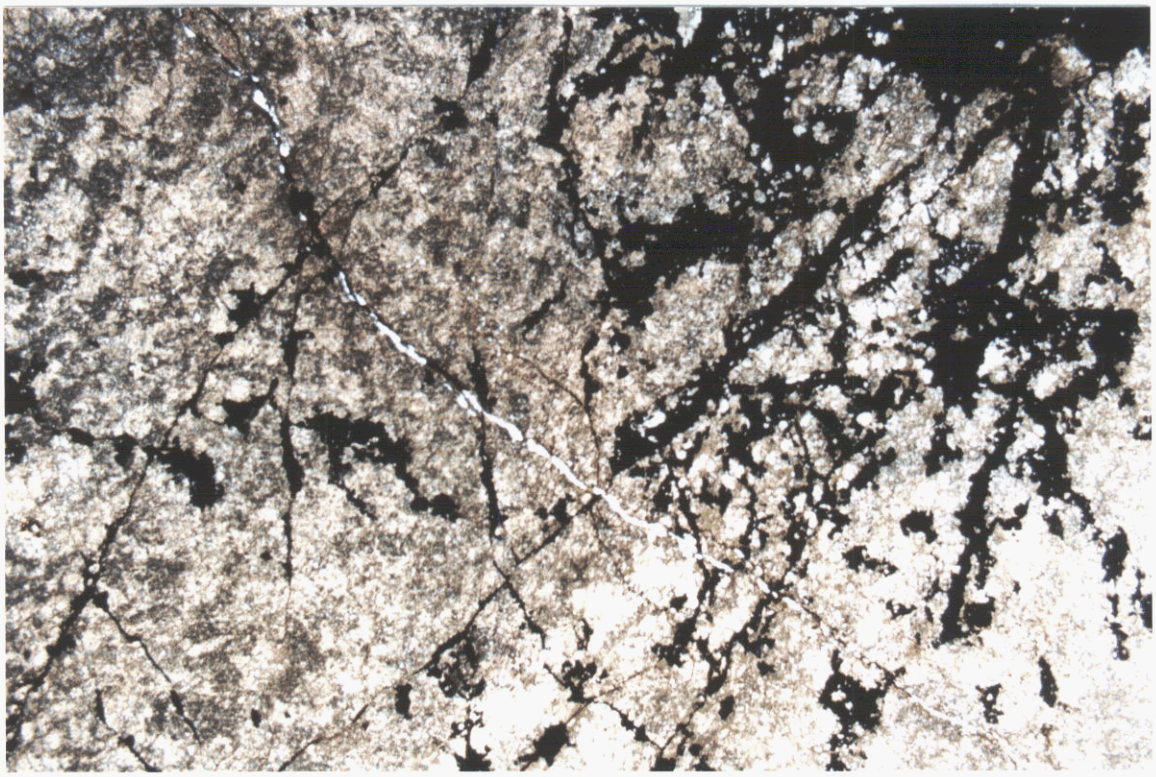
TEXTURE & FABRIC:
No penetrative fabric. This rock is comprised of an ultra fine to fine-grained equigranular assemblage of diopside+garnet+chlorite with a crisscrossing array of sulphide-filled veins, veinlets and clotted sulphide. The texture formed by this silicate mineral assemblage is granoblastic.

ALTERATION:
The mineral assemblage is interpreted to have formed by hydrothermal processes and possibly with a metasomatic component.

ROCK TYPE: This rock is inferred to be similar to TS-8 but significantly fine-grained and a different metallic assemblage. The protolith may have been a calcareous sedimentary rock.

Plate 91. Photomicrographs, **A** – plane light, **B** – crossed nicols, show the very fine grain size of the hydrothermally altered rock and the fracture-controlled sulphide mineralization. **A, B** – FOV = 11 mm.

A



B

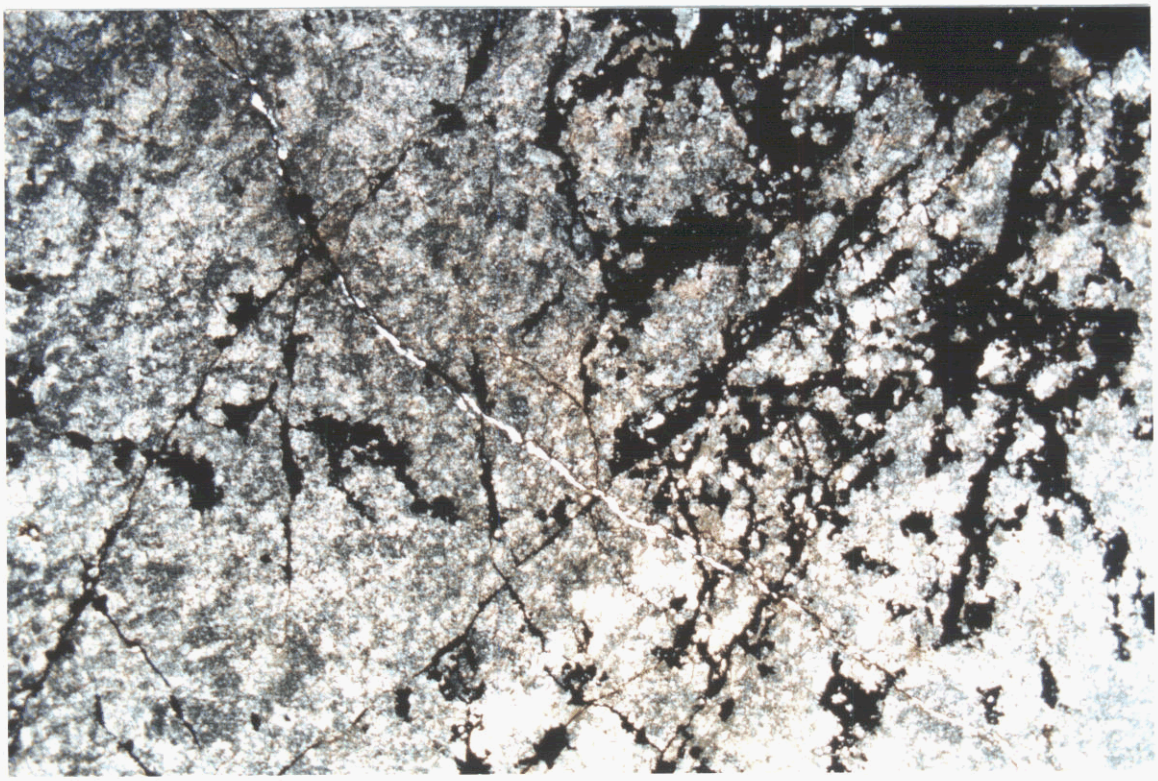


Plate 92. Photomicrographs, **A** – plane light, **B** – reflected light, show the texture of unoriented sulphide-filled fractures in the very fine-grained hydrothermally altered hostrock. Sulphide, pyrrhotite (Po) and chalcopyrite (Cp), fill fractures and form irregular-shaped micro-domains. Both fractures and irregular-shaped micro-domains of sulphide host fragments of the altered hostrock.
A – FOV = 5.5 mm; **B** – FOV = 1.35 mm.

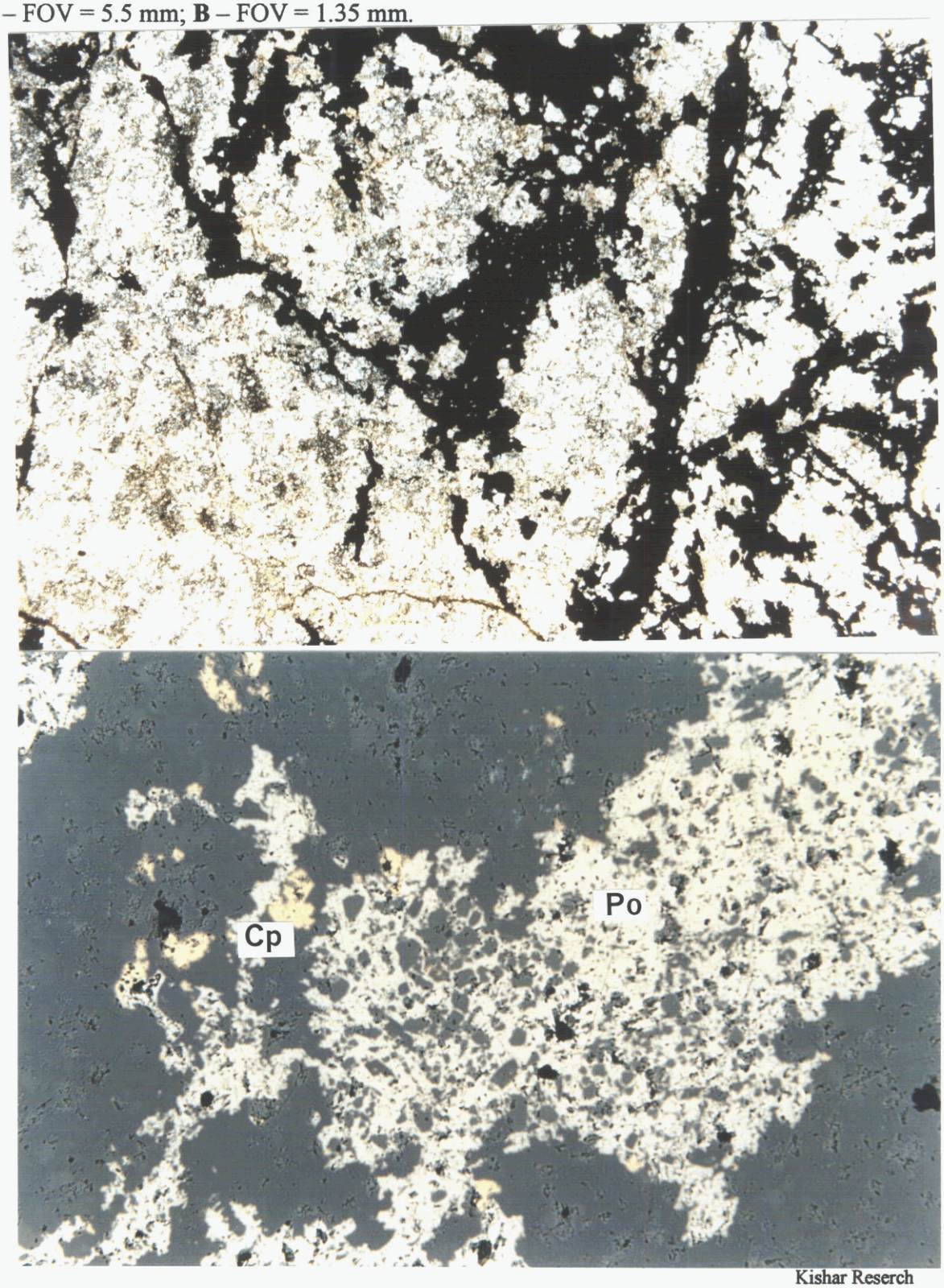
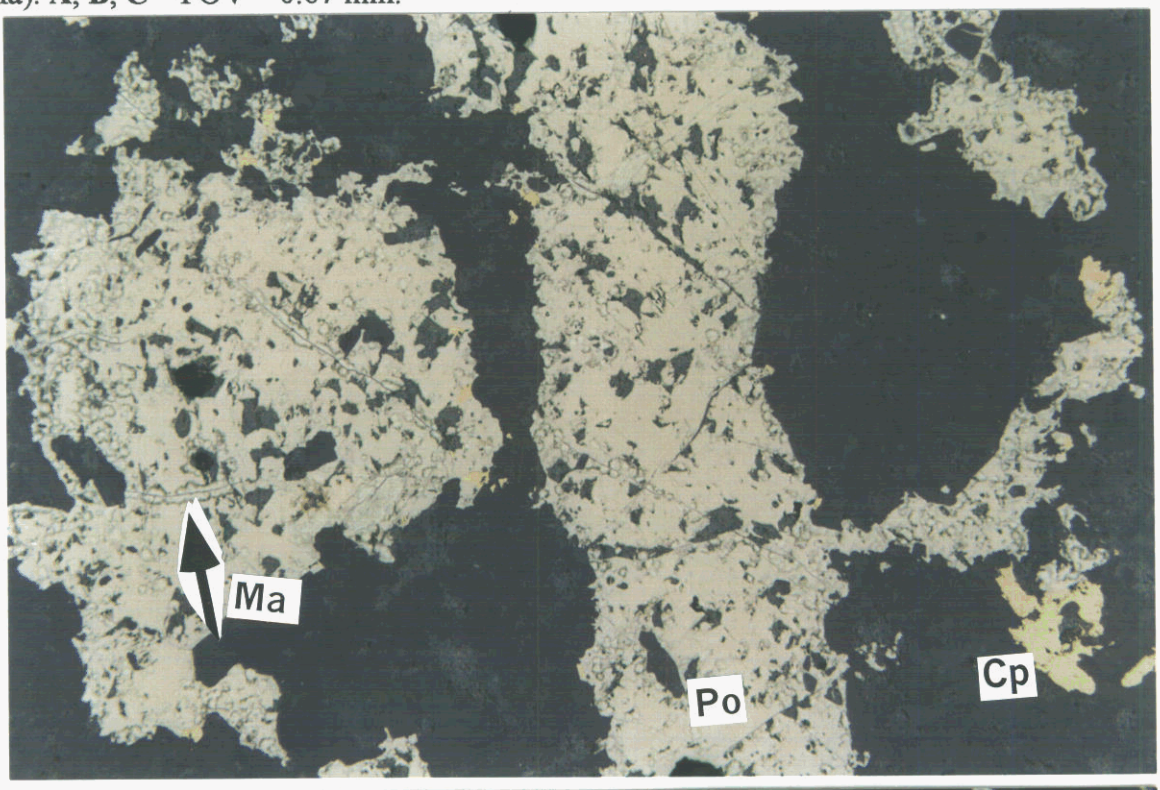


Plate 93. Photomicrographs, **A**, **B**, **C** – reflected light, show the sulphide assemblage that is dominated by pyrrhotite (Po) with minor chalcopyrite (Cp). The pyrrhotite has been partially replaced along fractures and silicate-sulphide grain boundaries by marcasite (Ma). **A**, **B**, **C** – FOV = 0.67 mm.

A



B

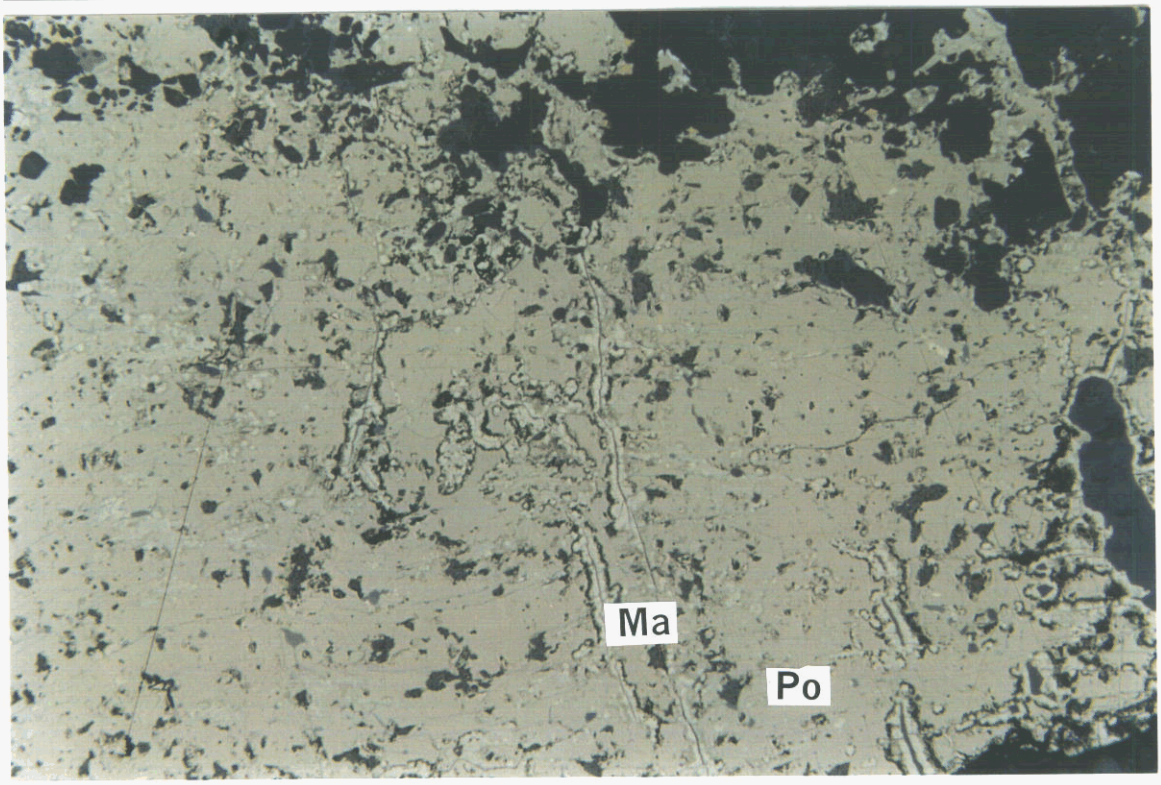
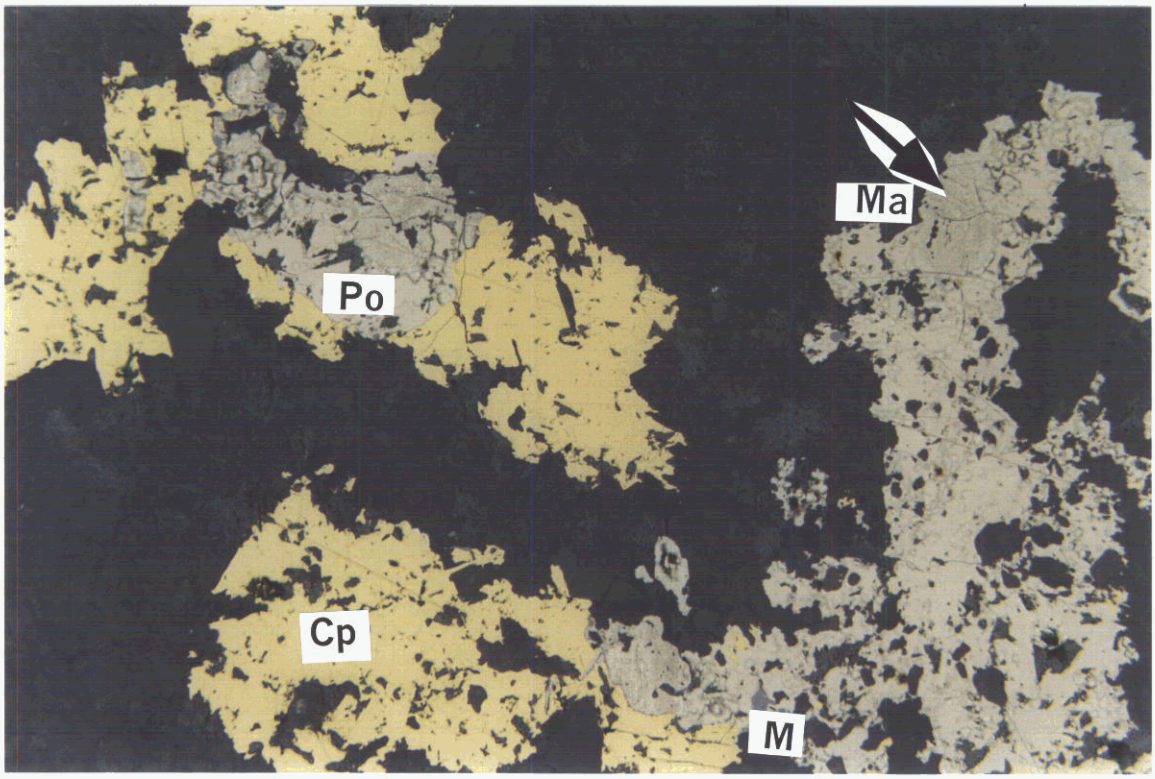
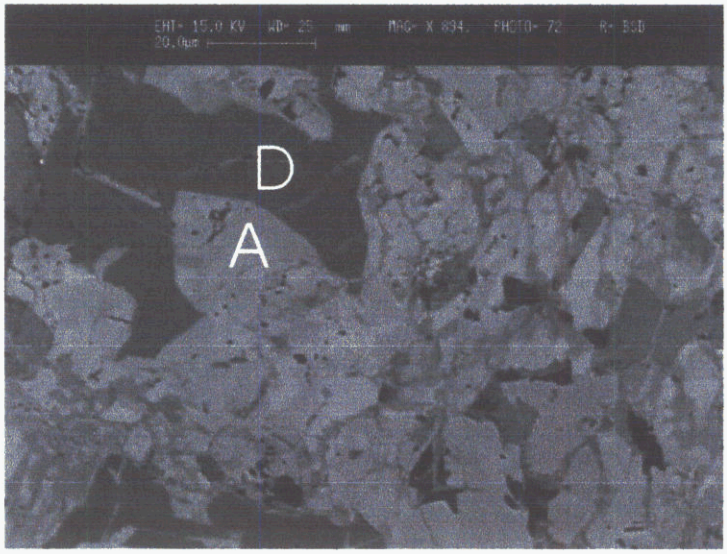


Plate 93C.



D. Scanning backscattered electron image of the very fine-grained skarn-like assemblage comprised of anhedral diopside (D) and subhedral to euhedral andradite (A).



CERTIFICATE OF QUALIFICATION

I, Allan Ross Miller, do hereby certify

1. that I am a geologist residing at 87 Findlay Avenue, Ottawa, Ontario K1S 2V1.

2. that I graduated from Carleton University, Ottawa, Canada with a B.Sc. Honours in Geology in 1971 and from the University of Western Ontario, London, Ontario, Canada with a Ph.D. in Economic Geology in 1977.

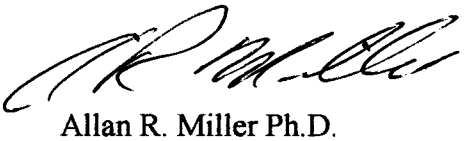
3. that I am a member of the Prospectors and Developers Association of Canada.

4. that I have practiced my profession continuously since 1973.

5. that as of the date of this certificate, I am not aware of any material fact or material change with regard to the property that would make the report misleading.

6. that my report on the White River Intrusive Complex of Uravan Minerals Inc. is based on a review of published information on the property and area and an understanding of magmatic Ni-Cu-PGE deposits.

7. that I have written this report as a totally independent and unbiased geologist.



December 3, 2001

Allan R. Miller Ph.D.