

Homestake Mine Area, Kamloops Mining Division, Southwestern B.C.
Map Sheet: 82M/04W
Latitude: $49^{\circ} 17^{\prime}$ North, Longitude: $116^{\circ} 28^{\circ} \mathrm{W}$.

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51^{\circ} 06^{\prime} 40^{\prime \prime}
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### 1.0 SUMMARY

The Max project area overlies 203 contiguous four post claim units located in southcentral British Columbia. The claims are owned by Eagle Plains Resources Ltd. and are currently under option to Amarc Resources Ltd. The claims are underlain by a Ordovician to Devonian volcanic arc know as the Eagle Bay Assemblage. Supracrustal rocks are intruded by Devonian age gneisses and by Cretaceous-Jurassic intrusions.

Silver, gold, copper, lead, zinc and barite mineralization is associated with stratiform massive sulphide-sulphate horizons which are forming at, or near, a felsic volcanic, fine grained clastic sedimentary contact.

Exploration by Amarc Resources Ltd., between January 21 and April 20, 2005 has included:
i. The completion of 13 diamond drill holes totaling $2,728 \mathrm{~m}$, testing massive sulphide and barite lenses near the Homestake Mine.
ii. Development of a 1:2500 geological map base which integrates the results of the 2005 drill program with archival 1987 drillholes which were cored over broad stratigraphic and structural intervals within the Homestake Mine, Sin Claim, area.
iii. The development of a lithogeochemical data base and the examination of base metal zonation patterns both proximally and distally to the Homestake Mine.

Only the results of (ii.) and (iii.) are outlined in the present report.
Geological mapping clearly demonstrates that massive sulphide and barite lenses at the Homestake mine develop near the structural footwall contact of a sequence of quartz porphyritic felsic tuffs with a fine grained cherty tuff, or fine grained pyritic siltite, horizon. Multiple sulphide or barite lenses may be noted near this contact. The lenses have a strike of approximately $130^{\circ}-140^{\circ}$ and $\operatorname{dip} 30^{\circ}$ to the northeast. The lenses have east to northeast direct plunges at $25^{\circ}-30^{\circ}$.

The westerly surface strike extension, of the mineralized quartz porphyritic tuffs and cherty-pyritic siltites, is truncated by a shallow northeast dipping thrust fault, the Road Thrust. The down-dip extension of the sulphide lenses will be preserved beneath this thrust which has a shallower dip than the dip of lithology. The easterly strike extension of the Homestake lenses are truncated by a west side down extension fault, the 2250 Fault. Movement on the 2250 Fault pre-dates movement on the Road Thrust as this flat lying fault does not appear to be offset by the 2250 Fault.

Base metal and barium zonation patterns strongly suggest that the stratigraphic package at the Homestake Mine is upright. Changes in base metal chemistry are clearly noted across the trace of the 2250 Fault and the Road Thrust. Base metal zonation patterns
provide insights into the location of permissive stratigraphy within this significantly deformed rock package.

Recommendations for subsequent drilling east of the Homestake Mine are outlined. The proposed drill program is designed to intersect the polymetallic massive sulphide and barite lenses east of the 2250 Fault.

## 2. INTRODUCTION AND TERMS OF REFERENCE

This report has been commissioned by the management of Amarc Resources Ltd. The report documents the results of geological mapping and lithogeochemical sampling conducted on Amarc Resources SIN mineral claims during January 21 to April 20 of 2005. All work performed on this property was conducted under Mine Permit Work Number MX-4-375 in accordance with the guidelines of the Mines Act of British Columbia.

This report is based on an extensive review and compilation of private corporate reports and documents as well as publicly available geological and scientific papers. This report is also based on the authors personal knowledge of the property obtained during the recently completed drilling program near the Homestake Mine (January to March, 2005), from detailed mapping undertaken in April 2005, from sampling of archival drill core completed during April 2005 and from regional mapping completed for Esso Minerals in 1986 and 1987.

Some of the information compiled in this assessment report is obtained from drillholes collared within the historic crown grants of the Homestake Mine, in particular DDH's Kam 25, 26, 29 and MX5-01. The cost of acquiring this data is not been compiled against the cost of the overall program conducted on the SIN claims.

Throughout these time-frames, the author was directly involved with the mapping programs, sampling and interpretation of 1987 Esso Drill core, logging and interpretation of the 2005 diamond drill core, and detailed mapping within the Homestake Mine and SIN claim area.

### 3.0 DISCLAIMER

The author has compiled both archival and new data in the present report. The combination of technologies separated by nearly twenty years time frame does pose significant challenges. In particular, the location of archival, 1987, drill holes, the "Kam 22 to Kam 30 " series is based largely on archival data. No collar markers for these drillholes were located in the field and the boreholes appear to have been tied to an idealized grid. There may be significant margins of error in the real versus idealized location of these drillholes. Many of the boxes of the 1987 drillholes are in very fragile
condition and some core is missing from these drillholes. The condition of the core did impact on the sampling protocols and the intervals available for sampling.

Drillholes for the 2005 program do have accurately surveyed collars, and down-hole surveys. Their position is known to a high level of accuracy.

No other obvious errors or omissions were identified by the author.

### 4.0 PROPERTY DESCRIPTION AND LOCATION

Amarc Resources Ltd. Max project is located in the Kamloops Mining Division of southcentral British Columbia. Access to the property is via paved roads, the Yellowhead Route (Highway 5) for 45 km north of Kamloops turning off on the paved Agate Bay Road at Louis Creek and traveling northeast for 21 km to the site of the Homestake Mine, Figure 1. The Homestake Mine, a former producer of silver, gold and lead-zinc, is located approximately 3 km west from Agate Bay on Adams lake on the northeast side of the Sinmax Valley.

This region of the province forms part of the interior plateau or Adams Lake Plateau. Valley bottoms, such as the Sinmax Valley, are located at an elevation of 500 to 550 m . Topography rises rapidly, across steep to sub-vertical rock faces, to elevations over 2200 m at the top of the Adams Plateau.

Access to most of the claim block is possible through a series of excellent secondary logging roads and also via the Johnson Lake and Samatosum mine road. Forest cover ranges from open dryland ponderous pine near the valley bottoms to spruce and fir at higher elevations. Precipitation in either the form of snow or rain is strongly elevation dependent with snow accumulations greater than 2.5 m common in the upper plateau regions and less than 25 cm in the lower valleys. Geological fieldwork is possible over much the property from early April to late October.


The property includes 203 MGS claims which are under option from Eagle Plains Resources to Amarc Resources Ltd., Figure 2. The nature of the option agreements are available in the public filings of either company.

Tenure data for the SIN claims is complied in Table 1.

Table 1: SIN Claims

# Eagle Plains Resources Max (Acacia) Property Claims 

| Tenure Number | Claim Name | Owner | Map Number | Good To Date | Status | Mining Division | Area | Tag Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 376027 | SIN 1 | 138073(100\%) | 082M012 | 2006/APR/22 | GOOD | KAMLOOPS | 500.0 | 217505 |
| 376028 | SIN 2 | 138073 (100\%) | 082M012 | 2006/APR/22 | GOOD | KAMLOOPS | 500.0 | 217506 |
| 376037 | SIN 3 | 138073 (100\%) | $082 \mathrm{MO11}$ | 2006/APR/22 | GOOD | KAMLOOPS | 500.0 | 217507 |
| 376038 | SIN 4 | 138073 (100\%) | $082 \mathrm{MO11}$ | 2006/APR/22 | GOOD | KAMLOOPS | 100.0 | 217508 |
| 376039 | SIN 5 | 138073 (100\%) | 082M011 | 2006/APR/22 | GOOD | KAMLOOPS | 500.0 | 217509 |
| 376040 | SIN 6 | 138073 (100\%) | $082 \mathrm{MOT1}$ | 2006/APR/22 | GOOD | KAMLOOPS | 500.0 | 217510 |
| 376041 | SIN 7 | 138073 (100\%) | $082 \mathrm{M012}$ | 2006/APR/22 | GOOD | KAMLOOPS | 500.0 | 217511 |
| 376042 | SIN 8 | 138073 (100\%) | 082M001 | 2006/APR/23 | GOOD | KAMLOOPS | 400.0 | 217512 |
| 376043 | SIN 9 | 138073 (100\%) | 082M001 | 2006/APR/23 | GOOD | KAMLOOPS | 400.0 | 217513 |
| 376984 | SIN 10 | 138073 (100\%) | 082M011 | 2006/APR/22 | GOOD | KAMLOOPS | 500.0 | 220707 |
| 376985 | SIN 11 | 138073 (100\%) | 082M011 | 2006/APR/22 | GOOD | KAMLOOPS | 300.0 | 220708 |
| 376986 | SIN 12 | 138073 (100\%) | 082M011 | 2006/APR/23 | GOOD | KAMLOOPS | 375.0 | 220709 |



### 6.0 HISTORY

Amarc Resources Ltd., initiated a program of exploration for polymetallic volcanic hosted massive sulphides, the Max Project, on mineral claims which overlie the former Homestake Mine in south-central British Columbia. The mineral claims have had a long history of exploration and development. This activity has been well summarized by Downie (2001) and the following synopsis is based on his summary.

Earliest history of work within the claim area occurred during 1893-1894 when the exploration interest in the outcropping barite and massive sulphide lenses occurred was initiated. These mineralized zones would form the nucleus of the Homestake Mine. Ultimately, this led to 2770 tons of production during 1926 and 1927 followed by the erection of a 30 ton per day mill in 1935. Between 1935 and 1936, 3000 tons of massive sulphides and barite ore were processed.

The property was essentially dormant until 1970 when Kamad Silver Ltd., acquired both the crown grants and surrounding mineral claims. This group expanded the underground workings on the 2250 level in an attempt to explore three silver-lead-zinc-barite lenses. Canadian Reserve Oil and Gas acquired the claims in the early 1980's and completed the development of an 800 m drift on the 1750 level which was connected to the 2250 level workings by single raise collared from near the northeast terminus of the 1750 drift . Detailed underground sampling and mapping was carried out and $2,072 \mathrm{~m}$ of underground drilling was completed, along with 2993 m of surface drilling. Canadian Reserve Oil and Gas terminated their exploration of the property circa 1982. The mine was re-opened during the winter of 1983/1984 and massive barite and sulphide ore was shipped to the Trail smelter during this time frame.

The discovery of the Rea Gold massive sulphide lens by A. Hilton in 1983 resulted in a dramatic increase in the exploration of the Adams Plateau. In 1985 Esso Minerals optioned the Kamad claims, which were the "forerunners" of the SIN group from Kamad Silver Ltd. In 1986, Esso Minerals conducted extensive geological, geochemical and geophysical surveys across both the Homestake and Rea Horizons.

Esso Minerals conducted a significant exploration program on these claims from 1986 to 1989. Their program utilized $1: 5,000$ and $1,2,500$ scale geological maps, lithogeochemical surveys, soil geochemistry and 1899 m of diamond drilling (Heberlein, 1987) within the highly altered rocks of the Homestake schist package. Significant massive sulphide intersections were not encountered in any of the 9 holes (Kam 22 to 30) drilled along the Homestake Bluffs and Esso Minerals shifted their exploration focus to other portions of the Kamad ground.

As part of their 1987 program of exploration, several mineral occurrences on the southwest side of the Sinmax valley were identified. The occurrences were historically known as the Acacia showings and consisted of zinc rich massive sulphides and galena-sphalerite-calcite veins located at a contact between altered mafic volcanics and argillites. Work on the Acacia area in 1988 by Esso was designed to outline the nature and extent of
the mineralization historically noted in this area. A 29 km blaze and flagged grid was established and the area was mapped at a scale of $1: 2500$, soil sampled and tested with VLF geophysical surveys. The technical surveys suggested that the Acacia showing area was geochemically anomalous and that in some areas mineralization occurred along a felsic - mafic volcanic contact. The contact was mapped for a total distance of approximately 2 km . The contact appeared to localize lenses of bedded massive sulphides associated with pyrite, sphalerite and galena. Calcite veins and stringers were associated with sphalerite and galena.

Portions of the SIN claims, the SIN 2 claims, also underlie the Twin Mountain occurrence located in the north-central portions of the Max project area. Twin Mountain is a vein occurrence hosted by a structural zone within strongly iron carbonate mafic volcanics. The occurrence has been explored since 1936. Underground development in 1953, on the Twin vein structure, permitted the vein to be drifted on for a length of 60 m . The principle showing is a 0.6 to 6.0 m wide $\mathrm{Ag}-\mathrm{Pb}-\mathrm{Zn}$ quartz dolomite vein. The average of 30 grab samples collected from the Twin Mountain vein zones was $0.894 \mathrm{~g} / \mathrm{t}$ $\mathrm{Au}, 28.89 \mathrm{~g} / \mathrm{t} \mathrm{Ag}, 6.72 \% \mathrm{~Pb}$ and $3.0 \% \mathrm{Zn}$ (Carmichael, 1991). No widths were recorded for these grab samples.

Apex Energy held the ground in 1981 during which time Neven-Sadler-Brown-Godbrand completed a program of soil sampling, trenching and geological mapping. This program extended the strike of the Twin Mountain mineralization east of the historical occurrences. The discovery of the Rea massive sulphide occurrence, to the northwest of the Twin Mountain occurrence, renewed interest in this property. The claims were optioned to Lincoln Resources Ltd who entered into an option agreement with Corporation Falconbridge Copper. The latter group conducted geological mapping in conjunction with Max-Min II and VLF-EM surveys. Surface geochemical targets were tested with two diamond drill holes AA1 and AA2 but the results of these drillholes were negative and Corporation Falconbridge Copper terminated their option agreement.

In 1986 Lincoln Resources conducted further geochemical and geophysical surveys on the Twin Claims. An additional 15.5 km of new grid was established, geologically mapped, sampled and trenched. Trenching indicated that the Rea massive sulphide horizons passed through the northwest portion of the claim area. The claims were optioned to Esso Minerals in 1986 and the targets developed by Lincoln Resources drill tested in 1987 by 2269 m of drilling. This resulted in the discovery of a small massive sulphide barite lens on the Twin 3 claim. Esso continued their exploration in 1988 with an additional 1278 m of drilling in 8 diamond drillholes but significant mineralized intersections were not obtained.

Homestake Canada Ltd. assumed interest in Esso Minerals mineral properties in 1989 and continued exploration in the Twin Mountain area. Following trenching of the Twin Mountain zone in 1989, 4017 m of diamond drilling was completed in 9 drillholes and 2235 m of downhole Pulse EM was completed in six of nine boreholes. Their exploration continued in 1991 with 4069 m of NQ diamond drilling. Homestake geologists believed that these deeper drilholes were successful in intersecting the southeastern strike
extensions of the Silver Zone. This mineralized zone was the host to the Samatosum Vein occurrence. On the Twin ground, the Silver Zone had a maximum width of 75 m's and consisted of strongly pyritized siltstones and chert pebble conglomerates. Their best intersection from this zone was a 20 cm wide stratiform massive sulphide which ran 9.46 $\mathrm{g} / \mathrm{t} \mathrm{Au}$.

With the down-turn in the mineral exploration in B.C. in the late 1990's the Kamad and Twin claims were allowed to lapse. These claims were re-staked by Eagle Plains Resources in 1999. Their claims covered the Twin Mountain, Inferno and Acacia showing areas in addition to the potential strike extensions of the Rea and Silver Zone stratigraphy. During the 2000 exploration season, Eagle Plains Resources conducted geochemical surveys over the Acacia occurrences and collected 518 soil samples from both soil geochemical grids and contour soil sampling.

The SIN claims were optioned to Amarc Resources Ltd. in December of 2004. Amarc initiated field programs on this property between January and April, 2005.

### 7.0 GEOLOGICAL SETTING

### 7.1 Regional Geology

The Adams Plateau overlies a sequence of Paleozoic rocks known as the Eagle Bay Assemblage. The Eagle Bay Assemblage is a sequence of Lower Cambrian to Mississippian bi-modal volcanic and sedimentary rocks which are inferred to have been deposited along the pericratonic margin of western North America. This assemblage forms part of the larger Kootenay Terrane. The Eagle Bay Assemblage was divided by Schiarizza and Preto (1987) and Preto (1981) into three principle elements including:
i. A Lower Cambrian package including the Tshinakin limestone and associated mafic metavolcanic rocks (unit EBG) and underlying quartzitic schists (unit EBH).
ii. A middle package dominated by gritty clastic metasediments and related carbonate and metavolcanic rocks (unit EBS, EBL, EBK and EBM).
iii. The top of the Eagle Bay assemblage comprises Devono-Mississippian felsic to mafic metavolcanic rocks and intercalated coarse grained sediments (units EBA, EBF and EBP).

In a similar vein, Bailey et al. (2001) suggested that the Eagle Bay assemblage is composed of two principle lithotectonic elements including an Upper Devonian mafic and felsic volcanic package and a Lower Cambrian mafic volcanic succession. Upper Devonian bimodal successions are alkalic with the older Cambrian components having sub-alkaline signatures. Supracrustal rocks are generally southwest facing with modest 25-35 degree southwest dips.

Several significant mineral occurrences are identified within the western Adams Lake region, including polymetallic veins at Samatosum, Twin Mountain and Acacia, mafic volcanic hosted massive sulphides, the Rea and K7 lenses, and bi-modal volcanic hosted massive sulphide and barite lenses at the Homestake Mine, Figure 3.

The section is locally repeated and disrupted through the action of 4 thrust faults which stacks slices and components of the Eagle Bay rocks on top of each other. Axial traces of tight to recumbent folds locally mirrors the orientation of regional thrusts. Most early folds are also southwest verging.

Metamorphic grades west of Adams lake are middle Greenschist. East of Adams Lake lower Amphibolite metamorphic grades are common. All rocks have a pronounced schistocity formed by the alignment of white micas, chlorite, and or biotite. At least two penetrative frabrics are identified regionally and most of the primary foliation surfaces are likely to be S2 fabrics. Earliest S1 fabrics are seldom preserved. Primary textural preservation within many of these units and particularly with unit EBA, the "Homestake Schist" is limited. In many cases the identification of rocks protoliths is problematic.

The section is also cut by generally north-northeast trending extension faults. Offsets across several of these structures are locally significant and both west side down and east side down offsets are noted.

Supracrustal rocks are intruded by Late Devonian orthogneisses which are noted in the core of the Nikwikwaia Syncline on the eastern side of Adams Lake and by Jurassic to Cretaceous granodiorites. The largest of these is Baldy Batholith. Youngest intrusive rocks are Early Tertiary quartz feldspar porphyritic dykes.


|  | EBFfv | Felsic metavolcanic rocks: Quartz-sericite schist derived from quartz-feldspar-phyric rhyolite, and quartz-feldspar crystal lithic tuff, lapilli, to bomb-sized pyroclastics. |
| :---: | :---: | :---: |
|  | EBFin | Mafic to intermediate metavolcanic rocks: Chiorite schist derived from agglomerate and pyroclastics, dominantly tuffs, locally up to $80 \%$ fragments of felsic composition. |
| - $\cdot 7$ | EBS | Metasedimentary rocks: Dominantly fine- to coarse-grained quartzite, quartz-pebble lithic conglomerate. minor phyllite, quartz-sericite-ankerite schist, chiorite schist. and marble. |
| [i: | EGF/EBP | Metasedimentary rocks: Phyllite, and quartz-sericite schist derived from argillite to quartz wacke, sandstone, and pebble conglomerate. |
|  |  | Alteration zone: (Rea and Samatosum horizons) sericite-quartz-carbonate-pyrite alteration of metasedimentary rocks |
| - | EBFmv | Mafic metavolcanic flows and volcaniclastic rocks: Calcareous chorite schist derived from mafic volcanic rocks; mafic lapilli tuffs, pillow lavas, and pillow breccias, massive flows and minor diorite sills present |
| + ${ }^{+}+{ }^{+}$ | Dgn | Devonian orthoschist, quartz-feldspar-sericite-ankerite schist derived from foliated granodiorite to diorite |
| 为 ${ }^{5}$ | E日G | Mafic metavolcanic rocks: Light green, calcareous chlorite schist and greenstone derived from pillows, pillow breccias, and feldspathic crystal tuffs, abundant epidote atteration |
|  | EBGt | Tshinakin Limestone: Buff-white-weathering, layered, finely crystalline, white to grey marble and dolostone |
|  | EBGs | Metasedimentary rocks: Phyllite derived from shale and siltstone, banded chert plus minor white-grey marble units |
|  |  | Devonian U-Pb zircon date <br> Mineral occurrence <br> Fauth (undefined) <br> Overturned syncline <br> Thrust fault |

Figure 3. Regional Geology of the Adams Plateau (excerpted from Bailey et al., 2001),

### 7.2 Property Geology: Lithology

Details of the geology near the Homestake Mine are shown at the 1:1,2500 scale on Figure 4. Development of this map base has been achieved by:
i. Conducting a series of vertical traverses from the top of the steep cliffs overlooking the Homestake Mine.
ii. Mapping all possible road exposures.
iii. Integrating recent and archival borehole data in the geological base.
iv. Preparing more than 100 polished petrographic sections in order to better identify primary lithologic features within this highly strained rock mass.
v. Comparing field and petrographic observations with the data available from more than 100 whole rock lithogeochemical samples collected from the same rocks from which thin sections were prepared.


Plate 1. Homestake Creek Geological Section. The top of the steep cliffs near the sky line are exclusively mafic flows and fragmentals (unit EB-M). The bleached yellow cream weathering rocks form a part of the Homestake Schist package. Primary textural preservation in these rocks (unit EB-S) is limited. The succession becomes increasingly clastic dominant at lower topographic elevations. Rocks near the tree line at the edge of the hay field are dominated by strained, highly foliated quartz rich sediments, lithic to quartz wackes (unit EB-QL). Vertical relief in this photograph is approximately 800 m .

Two significant problems are encountered in the construction of this plan map:
i. Strong penetrative deformation, and potent hydrothermal alteration overprints, make the identification of rock protoliths extremely challenging. These problems are partly overcome by cutting abundant petrographic sections for the samples utilized in this study and through the application of whole rock and trace element geochemical techniques.
ii. The location of the archival, 1987 Esso Mineral, drillholes has some limitations. The boreholes appear never to have had accurate transit surveys of their drill collars. The Esso drillholes were tied to an on-the-ground idealized grid, which in this area of very steep topography, may introduce very significant errors in the location of the drill collars. Conflicting information is also noted in the drill log collar and elevation locations as is reported and plotted within the same maps that accompany Heberlein's (1987) report.

Irrespective of these difficulties, the detailed geological map for this area outlines several key lithologic and structural elements in the immediate vicinity of the Homestake Mine. Five principle rock packages are exposed in the steep cliffs and in drill core of this area. One major thrust fault is also identified. Relative age relations between these strongly deformed rock units, which locally have structural contacts, cannot be conclusively identified. For this reason, the structural position of the rocks may not reflect their stratigraphic position, ie. older rocks may overlie younger rocks.

The major lithologic packages outlined on Figure 4 include:

## EB-M: Eagle Bay Mafic Assemblage Including: Mafic Volcanics (Flows MVfl) and (Fragmentals MVIp).

Light to medium green, locally calcareous mafic volcanics. These units have moderately developed foliation surfaces and typically form tough, competent resistive cliffs. Rare lapilli sized fragments may be identified. Pillowed flows (MVP) are occasionally noted. Well defined, narrow argillite beds (A) usually less than 10 m in thickness are locally identified. This rock package appears to conformably overlie the underlying package of clastic dominant phyllites. More competent ribbon banded intermediate volcanics may form close to the base of the section (RbIV). A weakly foliated mafic intrusion, compositionally a gabbro-diorite (Md), is mapped as part of this package. It is located in the extreme southeastern corner of the map area.

## EB-VC: Eagle Bay Volcaniclastics: <br> Ankeritic Phyllites (AP), Sideritic Phyllites (SAP) Intermediate Volcaniclastics (RbIV) and Argillites (A)

This rock package appears most likely to be dominated by clastic sediments and volcaniclastics. The unit is significantly more schistose than the overlying mafic volcanic rocks and frequently contains elevated iron carbonates, ankerite or siderite, within the rock matrix, as well as identifiable lithic fragments. Wispy argillite lenses are also present. Tracing of more massive argillite units suggests that southwest verging overturned recumbent folds are present in this section.

This package is in structural, the "Road Thrust", contact with the underlying Homestake Schist.


Plate 2. Ankeritic Volcaniclastics. The matrix of the thin section is crowded with small sub-mm quartz grains, and light brownish buff iron carbonates. Good clast rotation is noted in the quartz grain in the centre of the field of view. All of the larger quartz grains demonstrate polygonal sutures. Kam 28 @ 46.0 m .25 X , field of view: 5.3 mm , transmitted light, crossed polars.

## EB-Ftq: Eagle Bay Quartz Porphyritic Felsic Tuffs

These rocks form the immediate hangingwall to cherty tuffs and the massive sulphide barite lenses at the Homestake Mine. The unit has abundant igneous quartz grains which commonly display well developed embayment structures. The rock contains an early S1 cleavage within darker grey tuffaceous fragments. This fabric is seldom preserved as it is strongly overprinted by the younger regional S2 fabric which forms the dominant schistocity in this area. Geochemically these rocks have very low base metal and barium contents. They appear to belong to a stratigraphic, as well as structural hangingwall, position to the main barite and sulphide lenses.


Plate 3. Quartz Porphyritic Tuff. The mm scale quartz phenocryst in the right centre field of view exhibits classic embayment features which are diagnostic of igneous quartz grains formed either in flow or tuffaceous rock environments. The fabric in the dark grains in the upper left field of view is an early S1 fabric which is truncated by the dominate S2 fabrics noted throughout the rock matrix.DDH MX5-01 @), $28.6 \mathrm{~m}, 25 \mathrm{X}$, field of view 5.3 mm , crossed polars.

## EB-Ct: Eagle Bay Cherty Tuffs and Pyritic Siltites.

This rock mass is the immediate proximal lithology to massive sulphide mineralized zones. It is characterized by an exceptionally talcose foliation surface, very high, often greater than $10 \%$ fine grained pyrite contents, and is locally cut by abundant sphalerite-galena stringers. Both base metals and barium values are strongly enriched within this rock. Increases in matrix silica content may shift the unit into a cherty tuffaceous volcanic field.

## EB-SB: Eagle Bay Massive Sulphide and Barite Lenses

Mineralization within the Homestake Mine area is characterized by exceptionally well laminated barite lenses. The largest of these has a surface outcrop expression of approximately 150 m in strike length and is up to 8 m in thickness. The lenses have been identified in two horizons. The upper lens is located near the structural hangingwall with the overlying quartz porphyritic tuffaceous contact and the lower lens near the structural footwall of the cherty tuff contact. These sulphide accumulations are likely zoned. Base and precious metals enrichment occurs near the base of the lens with a shift to higher barite contents at the hangingwall contact.

## EB-S: Eagle Bay Schist " Homestake Schist"

This rock unit is a complex amalgamation of several tuffaceous and clastic lithologies. Primary textural preservation within this unit is poor as the rock has experienced significant hydrothermal alteration, re-crystallization and flattening strain. In general, rock nomenclature is tied to bulk mineralogy, quartz sericite schists (QSS), chlorite schists (CS), pyritic quartz sericite schists (PyQSS) and sideritic to ankeritic schists and phyllites (SAP, SdP). Quartz porphyritic rocks (Ftq or IQeFl ) either tuffs or flows are sometimes noted.


Plate 4. Homestake Schist (unit EB-S). Although the rock sample exhibits strong evidence of recrystallization primary plagioclase phenocrysts are still noted, near the centre of the field of view. Disseminated, euhedral pyrite is the sole sulphide phase. Sample Kam 22 @ $232 \mathrm{~m}, 25 \mathrm{X}$ mag, crossed polars, field of view 5.3 mm .

## EB-QL: Eagle Bay Schistose Lithic Quartzites to Chloritic Schists

The structural base of the deformed rock mass mapped in the vicinity of the Homestake Mine area is characterized by its buff to brown resistive weathering nature and locally by minor chlorite streaks and stringers. The yellow cream quartz sericite schists of the Homestake Schist package are generally absent. Most significantly, the rock contains an abundance of quartz rich lithic fragments. These fragments always display polysutured textures and never demonstrate primary embayments which were diagnostic of the felsic tuffs noted up section.


Plate 5. Foliated Quartz Rich Ltihics (unit EB-QL). Deeper portions of the stratigraphic package near Homestake Creek become increasingly dominated by mm scale polysutured quartz-lithic fragments. In comparison, note the absence of sutured textures in the igneous derived quartz grains show in Plate 3. Sample Kam $30 @ 86.9 \mathrm{~m}, 25 \mathrm{x}$ magnification, field of view 5.3 mm , crossed polars.

### 7.3 Property Geology: Structure

The 2500 scale geological map of this area clearly demonstrates several critical structural elements. Two exceptionally important faults are identified on this map. These include:
i. The Road Thrust: This fault is spectacularly exposed in the re-developed drill road immediately above the Homestake Mine workings. The thrust has a strike of $120^{\circ}$ and $\operatorname{dips} 15^{\circ}-25^{\circ}$ to the northwest. This fault is often
localized within a thin black clastic horizon. Net movement across this fault is in-determinant but it is likely significant. The Road thrust stacks "older?" volcaniclastic sediments (EB-VC) over the Homestake Schist Package.
ii. The 2250 Fault. This important fault is named after its initial identification within the 2250 level of the Homestake Mine. The fault terminates the easterly outcrop expression, not only of the main sulphide lenses, but also truncates the cherty tuffs and quartz porphyritic tuffs which are closely associated with mineralization. The orientation of very large extensional veins in the westerly hangingwall to this fault, as well as the nature of lithologic offsets, assist in defining west side down movements across the 2250 Fault.

The 2250 Fault does not appear to offset the Road Thrust and it is possible that movement along the Road Thrust post-dates offset along the 2250 Fault.

The intense foliation development within the Homestake schist is definitively an S2 fabric. Several of the units, particularly quartz porphyritic tuffs display a preserved S1 fabric within small preserved clastic or tuffaceous fragments. In general, S2 fabrics appear to be co-planar with bedding or compositional layering. The data for 159 S2 fabrics are displayed on Steronet 1 and 1a. The nets have a well developed single pole position with a dip direction of $036^{\circ} / 34^{\circ}$ or a strike dip of $126^{\circ} / 34^{\circ} \mathrm{N}$. It is relevant to note that this fabric, which is coplanar to bedding, is sub-parallel to the strike of the Road Fault but on average $10^{\circ}$ steeper.

Steronet 1 and 1a: Poles to S2 Foliation.


Steronet 1.


Steronet 1a.
lineation is developed. Intersection lineations were noted at 18 locations. As is shown on Steronet 2 linear fabric elements are widely dispersed. This dispersion and rotation is likely occurring across fold axis which post-date the formation of S2 cleavages. In a general sense, shallow east to southeast plunges are dominant. Most significantly, plunges within the main sulphide and barite lenses are consistently east to northeast, ie: $26^{\circ} \rightarrow 069^{\circ}$, Steronet 2 .

## Steronet 2. Linear Fabric



Near the Homestake Mine, deformed argillite lenses within unit EB-VC are folded into southwest verging tight to recumbent synforms and antiforms. Plunges within these folds most likely conform to the east - southeast plunges noted within Steronet 2 .

### 8.0 DEPOSIT TYPES and MINERALIZATION

Within the Adams Plateau district at least four principle deposit types are identified. These include:
i. Mafic Volcanic Hosted Massive Sulphide Lenses.

The Rea Gold massive sulphide body, along with the K7 lens are excellent examples of stratiform massive sulphides developing at a well defined volcanic sediment contact. Both the Rea Gold and K7 occurrences are found within a structurally inverted panel of rock at the contact between sericitized and ankeritically altered mafic fragmentals and an underlying strongly pyritic, fine grained clastic sediment. The Rea Lens is estimated to contain 120,000 tonnes of $18.2 \mathrm{~g} / \mathrm{t} \mathrm{Au}, 141.2 \mathrm{~g} / \mathrm{t} \mathrm{Ag}$, $0.85 \% \mathrm{Cu}, 4.11 \% \mathrm{Zn}$ and $3.67 \% \mathrm{~Pb}$ (White, 1985; Hoy and Goutier, 1986). The host mafic rocks to these occurrences have petrochemical affinities of akalic, within plate, mafic sequences.

## ii. Bimodal Volcanic Hosted Massive Sulphide Lenses.

Unlike the host stratigraphy to the Rea massive sulphide lenses, units with felsic affinities, quartz porphyritic tuffs and quartz porphyritic intrusions form in very close proximity to the polymetallic Homestake massive sulphide and barite lenses. Definitive quartz pophyritic felsic tuffs form the immediate structural hangingwall to these lenses. Hoy and Goutier (1986) have also identified the felsic affinity for the occurrences within the Homestake Mine area.

## iii. Structurally Controlled Veins

Both the Samatosum deposit, Twin Mountain and most of the Acacia occurrences are structurally controlled veins. By far the best of these was the Samatosum deposit contained 634,984 tons of $1035 \mathrm{~g} / \mathrm{t} \mathrm{Ag}, 1.2 \% \mathrm{Cu}, 1.7 \% \mathrm{~Pb}, 3,6 \% \mathrm{Zn}$ and $1.9 \mathrm{~g} / \mathrm{t} \mathrm{Au}$ (Bailey et al., 2000). The deposit was quartz vein system which appears to have been localized within a thrust fault at the contact between structurally overlying mafic volcanic rocks and under-lying fine grained and locally very pyritic clastic sediments.
iv. Stratabound Lead-Zinc-Silver Deposits Hosted by Sedimentary and Carbonate Rocks.

Due east of Adams Lake, several lead-zinc silver deposits are associated with calc-silicate rocks which have formed in close association with thin impure limestones, calcareous phyllites and cal silicate gneisses. These would include Mosquito King, Spar, Lucky Coon and Elsie (Hoy, 1999).

The SIN claims include occurrences that are either bimodal volcanic hosted massive sulphides (ie. Homestake) or structurally controlled veins (Acacia). The Homestake massive sulphide and barite lens has been demonstrated by recent drilling to occupy two stratigraphic horizons, to have a down dip extension of greater than 200 m and strike length of greater than 150 m , prior to its termination by the 2250 Fault.

The Acacia Zone consists of both $10-30 \mathrm{~cm}$ quartz ankerite stringers and veins which are dominated by significant values in lead-zinc-silver and plus or minus copper. The strike length of these veins is unknown. Massive sulphide pods up to 2 m thick are dominated by pyritic sulphides with low base and precious metal values. Smaller 15 cm thick massive sulphide seams have higher $0.08 \% \mathrm{Cu}, 0.96 \% \mathrm{~Pb}, 19.2 \% \mathrm{Zn}$, and $8.5 \mathrm{~g} / \mathrm{t}$ Ag (Marr, 1989).

### 9.0 EXPLORATION

During the 2005 exploration season, work on the SIN claims by Amarc Resources consisted of a diamond drill exploration program, a geological mapping program and a lithogeochemical sampling program. During February to March, 2005 2,728 m of diamond drilling were completed in 13 diamond drill holes (Thiessen, 2005). For the purposes of this assessment report only the results of the latter two programs of exploration are reported on. Details of geological mapping are illustrated on Figure 4 with the results of the mapping program summarized in section 7.2.

The third facet of the 2005 exploration program consisted of a lithogeochemical program. The purpose of this program of study was to compare and contrast the selected results of the 2005 drilling with the historical drilling done by Esso Minerals in 1987 and reported by Heberlein (1987). These data are used to develop geochemical vectors and define permissive stratigraphic elements over a large volume of the Homestake Schist rock package. Results of the lithogeochemical program are discussed in section 12.0.

### 10.0 SAMPLE METHODS AND APPROACH

One recent, borehole selected from the 2005 drill core, MX5-01 was sampled, and 9 archival boreholes, Kam 22-30, were sampled from the 1987 Esso Minerals drill core. The core samples provided the foundation of a major and trace element lithogeochemical analytical study. Out Amarc's 2005 diamond drill program, DDH MX5-01, was selected to represent proximal alteration patterns to the main massive sulphide lenses. This borehole does not intersect massive sulphide or barite lenses but it does core a thick sequence of highly altered volcanic and volcaniclastic rocks within a few 10 's of m of these lenses. Samples selected from this drillhole were taken from the sample rejects previously crushed and sampled during diamond drilling program of February to March 2005. Most of these samples were taken on 3.0 m intervals.

Samples from the 1987 Esso Minerals drill core, DDH's Kam 22, 23A, 24, 25, 26, 27, 28, 29 and 30 were selected from the cross lapped core piles which are still on site near the Homestake Mine. An effort was made to sample the archival core at, or near, lithologic contacts and approximately on $30-40 \mathrm{~m}$ sample spacings. Each sample consisted of approximately 80 cm of generally unsplit NQ core. In some cases core was already spilt. During the sampling process the entire drill hole was digitally photographed. The quality of the archival samples is affected by two parameters:
i. Many of the samples have significant surface oxide coatings.
ii. Occasionally missing boxes, labels or identification marks made uniform sampling on 30-40 m intervals difficult.
All lithogeochemical data for this program is compiled in Appendix I and analytical techniques in Appendix II.

### 11.0 DATA VERIFICATION

All analytical data presented within this report is in the form of either major or trace element data. Verification of whole rock chemical data was achieved by inserting either duplicate or standard samples into the sample stream. On average one duplicate or standard sample is inserted for every 10 samples
i. Of the 110 whole rock samples analyzed in this report 4 duplicates where used. The use of duplicate samples characterizes the reliability of the analytical process.
ii. Out of 110 samples, 5 whole rock standards were used. The use of standard samples is used to characterize the accuracy and precision of the analytical process. Whole rock geochemical standards are commercially available but infrequently used due to the cost associated with these standards. In this report two standards, SY2 and SY3 were purchased from Canmet and the analytical characteristics of these standards are complied in Appendix III. These were inserted into the sample stream and the current lab results compared with the results of the known standards.

Within this relatively small sample size the number of standards, 5 , and the number of duplicates 4 , falls below the level required for a quantitative statistical analysis of sample variability. However, the data does permit a rapid check of on the quality of the whole rock analytical process used in this report. With very minor exceptions, the precision and accuracy of the analytical methods used meets the widely accepted standards within the industry. The reader is invited to review and compare the standard data supplied in Appendix III with the standard data presented in Appendix I.

### 12.0 INTERPRETATION AND CONCLUSIONS

## 12.1: Interpretation of Geological Map Data

The 1:2500 scale geological map, Figure 4, suggests that several critical factors, relevant to the current distribution of massive sulphide and barite lenses, can be identified. The map indicates:
i. The Road Thrust will place non-mineralized hangingwall rocks directly against the underlying mineralized stratigraphy.
ii. The Road Thrust has the potential to create a "blind target". The thrust dips at shallower angles than the underlying rock units. Because of this it is unlikely that this fault will ever truncate the down dip extent of the mineralized zone. The fault does appear to cut the westerly strike extension of the host stratigraphy to the barite lenses.
iii. Map scale, southwesterly verging, tight to overturned recumbent folds have been identified in the immediate hangingwall to the Road Thrust. These folds may also influence the distribution of the proximal host stratigraphy to the sulphide and barite lenses.
iv. The 2250 Fault truncates the easterly strike extension of the mineralized zone. The fault is well exposed on surface and in drill core. It has the hallmark signatures of a west side down extension fault.
v. Near the Homestake Mine, the section dips $30^{\circ}$ northeast. The 2250 Fault has a steep, $>60^{\circ}$ west dip. Under these conditions a fault gap, will be introduced which is approximately equal to the throw of the fault. However, the exact throw on this fault has not been determined.
vi. Fault offset contacts noted on the footwall and hangingwall to the 2250 Fault cannot be carried through the Road Thrust. It is probable that the movement on the Road Thrust post-dates movement on the 2250 Fault.
vii. The massive sulphide and barite lenses at the Homestake Mine have modest 25-30 degree east to northeast plunges.

### 12.2 Interpretation of Base Metal and Barite Zonation Data.

Base metal zonation patterns are documented on Figures 5 and 6. The figures may be interpreted as a form of geochemical fence diagram where the spatial relationships in $\mathrm{X}, \mathrm{Y}$ and Z space are represented within the 10 boreholes selected for this study. In addition, the position of the Road Thrust, 2250 Fault and the two mineralized horizons within DDH MX5-01 are identified. On these boreholes, two element patterns are plotted. Higher temperature base metal assemblages are represented by Cu and Pb , Figure 5. Lower temperature assemblages are represented by Ba and Zn , Figure 6. The width of the histogram sample bars is equivalent to the width of the rock sample. Note the difference between the horizontal scale ( $1: 4000$ ) and vertical scale $(1: 1000)$ on both Figures 5 and 6.

Distribution of Cu and Pb Homestake Mine Area: Figure 5.
Figure 5 demonstrates the following:
i. DDH's Kam 22, 23A and Kam 24 have been collared in the footwall side to the mineralized stratigraphic interval.
ii. The distribution of Cu and Pb in DDH MX5-01 strongly suggests that the section is upright. Both copper and lead mineralization exist at low levels, below 20 ppm , in the immediate hangingwall to the mineralized horizon. In DDH MX5-01 the hangingwall rock is a sericitized and pyritic quartz porphyritic felsic tuff.
iii. In DDH MX5-01 below the 170 m mark Cu and Pb chemistry markedly decrease. This interval corresponds to the onset of a deformed clastic
sedimentary package which forms the deep footwall to the barite and sulphide lenses at the Homestake mine.
iv. Although Kam 29 is collared close to the Homestake Mine 2250 Level workings, the borehole is collared east of the 2250 Fault. The abrupt change, decrease, in Cu and Pb chemistry between DDH MX5-01 and Kam 29 is most likely a direct reflection of the offset in this fault. The borehole appears to have been collared in the deep footwall to the barite and sulphide lenses.
v. In DDH Kam 28 an increase in Cu and Pb chemistry occurs in the immediate footwall to the Road Thrust. The overlying package of volcaniclastic rocks has experienced enough transport to place geochemically barren volcaniclastic rocks over geochemically active footwall volcanic rocks.
vi. The upper 150 m of DDH Kam 25 has a Cu and Pb signature which most clearly mirrors the proximal footwall geochemical signature noted in DDH MX5-01. Significantly this borehole is collared nearly 1000 m 's to the west of the Homestake Mine.

## Distribution of Ba and Zn Homestake Mine Area: Figure 6.

The distribution of lower temperature sulphate (barite) and sulphide phases (sphalerite) is plotted on this geochemical fence diagram. The data of Figure 6 suggests:
i. A discernible difference exists in the Ba numbers for drillholes collared west of the 2250 Fault, on the hangingwall side versus the Ba numbers for drillholes collared east of the 2250 Fault on the footwall side. DDH Kam $22,23 \mathrm{~A}, 24$ and MX5-01 have typically have Ba numbers greater than 1000 ppm . These boreholes are all collared on the hangingwall side of the 2250 Fault. DDH's Kam 29, 28, 25, 26 and 30 are all collared on the footwall side of this fault. Most typically their Ba numbers are below 1000 ppm . Elevated barium geochemistry may be correlated with the presence of bright green barium rich micas which are common identified in boreholes collared west of the 2250 Fault. These data might suggest that either there is a large Ba fringe anomaly or halo to the Homestake lenses or a second deeper barite-sulphide horizon exists west of DDH Kam 22.
ii. In contrast, Zn values for those boreholes collared east of the 2250 Fault appear by inspection to be generally higher than in those boreholes collared west of the fault.
iii. Ba values within the volcaniclastic rocks which form the hangingwall to the Road Thrust are typically less than 500 ppm . Barium enrichment within these sediments appears unlikely.

In combination, the $\mathrm{Cu}-\mathrm{Pb}-\mathrm{Ba}-\mathrm{Zn}$ geochemical data supports the lithologic and structural model which has been developed for the Homestake Mine area. Both the 2250 Fault and Road Thrust, and the rock in the footwall and hangingwall to these faults, have definable geochemical signatures.

### 13.0 RECOMMENDATIONS:

The geological data, structural interpretation and zonation of base metals strongly suggests that significant potential exists, east of the current mine workings, to identify the faulted offset of the Homestake Mine sulphide lenses. The position of the lenses, east of the Homestake Mine and east of the 2250 Fault is suggested by:
i. The 2250 Fault is inferred from lithologic, base metal zonation patterns, and kinematic interpretations to be a west side down extension fault. Barite lenses, and their host stratigraphy, are anticipated to lie east of this fault and upthrown, possibly as much as 100 to 200 vertical m.
ii. None of the historical boreholes, Kam 22-Kam 30, with the exception of Kam 28 are collared sufficiently high in the section to cut the relevant stratigrpahic position in the up-thrown easterly block. Kam 28 is collared more than 800 m east of the Homestake mine and ignores the east to northeast plunge directions which are so well defined within the main barite lenses.
iii. The location of a barite lens east of the Homestake Mine will likely to be a "blind" target due to the action of the both overturned recumbent antiforms and synforms and due to the presence of the Road Thrust which places a sequence of older (?) volcaniclastic sediments on top of the mineralized stratigraphy. A fault gap, approximately equal to the throw of the 2250 Fault will also introduce a barren rock wedge into the section.

A helicopter supported diamond drill program should be initiated to define the location, and size, of fault offset massive sulphide lenses. Topographic constraints are unlikely to permit the positioning of these drillholes without airborne support.

It is estimated that 2000 m of helicopter supported NQ-2 drilling would provide a sufficient test to prove or disprove the presence of the main barite and sulphide lenses east of .the 2250 Fault trace. Using an "all in cost" of approximately $\$ 100 / \mathrm{m}$, this program could be executed for $\$ 200,000$ Canadian.

### 14.0 STATEMENT OF EXPENDITURES: 2005 EXPLORATION SIN CLAIMS

The following costs were incurred between January 21 and April 20, 2005 on the SIN Claims. Costs of report writing were incurred between April 20 and July 17,2005. The statement of costs excludes the costs of diamond drilling conducted on the Homestake crown grants during February to March of 2005. The statement of costs also excludes the costs of analytical and petrographic data collected from boreholes within the Crown Grants, DDH's Kam 25, 26, 29 and MX5-01, however the data from these boreholes is included in this report.
Assay and Analytical:
58 lithogeochemical samples @ \$ 60.00 per sample: ..... \$ 3,480.00
Purchase of whole rock standards: ..... $\$ 500.00$
Interpretation of Whole Rock Data: ..... $\$ 700.00$
Petrographic:
Preparation of 58 polished thin sections @ $\$ 40.00$ per sample: ..... \$ 2,320.00
Thin section review and interpretation: ..... \$ 1,400.00
Geological Mapping:
J. Oliver: 8 man days @ $\$ 700$ per day: ..... $\$ 5,600.00$
Digitizing:
Conversion of Archival Analogue to Digital Databases: ..... $\$ 6,500.00$
Logistics:
Road rehabilitation: ..... \$3,000.00
Road reclamation, re-seeding and fertilizing ..... \$ 1,000.00
Truck rental ( 10 days @ 85.00 per day) ..... \$ 850.00
Fuel ..... $\$ 200.00$
Report Preparation:
Graphics, Digital Maps and Sections: ..... \$ 2,500.00
Report Writing, J. Oliver 4 days @ \$700.00 per day: ..... $\$ 2,800.00$
Report Reproduction (7 copies) .....  $\$ 500.00$
GRAND TOTAL 2005 MAX EXPLORATION PROGRAM (excluding diamond drilling expenditures) ..... \$ 31,350.00


Geo.

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### 16.0 CERTIFICATE OF THE AUTHOR

I, Jim L. Oliver, Ph.D., P.Geo., do hereby certify that:

1. I am currently employed as a consultant geologist by:

Oliver Geoscience International Ltd., 4377 Karindale Road, Kamloops, B.C.
Canada. V2B 8N1.
2. I hold a B.A. (Hons.) in Psychology, conferred by Simon Fraser University in 1976; a B.Sc. (Hons.) in Geophysics and Geology conferred by the University of British Columbia in 1982; a M.Sc. and Ph.D. in Geology conferred by Queens's University in 1985 and 1996 respectively.
3. I am a member, in good standing, of the Association of Professional Engineers and Geoscientists of British Columbia.
4. 1 have worked continuously as a geologist for 23 years in a wide variety of geological environments both within Canada and in approximately 20 countries internationally.
5. I have read the definition of "qualified person" set out in the National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with professional associations (as defined in NI-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I am responsible for (subject to points noted in the "Disclaimer" - Section 3) the preparation of Sections $1-16$ of the technical report titled: "Geological and Geochemical Report: SIN Claims MAX Project Homestake Mine Area, Kamloops Mining Division, 82M/04W" and dated July 17, 2005 ("the technical report") relating to the Homestake Mine area. I worked on site on subject claims between January 21 and April 20, 2005.
7. I have previously worked on portions of the SIN claim area between 1984 and 1988 for both Corporation Falconbridge Copper, for Rea Gold Corporation and for Esso Minerals Canada.
8. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report.
9. I am independent of the Amarc Resources Ltd., but do own 50,000 common shares in this company.
10. I have read National Instrument 43-101 and Form 42-101F1. and Technical Report has been prepared in compliance with that instrument and form.
11. I consent to the filing of the Technical Report with any stock exchange and other regulatory and any publication by them, including electronic publication in the public company files on their websites accessible by the public of the Technical Report.

Dated this $17^{\text {th }}$ day of July, 2005.


Signature of Qualified Person:
Min Oh ir
Printed name of qualified person:
Nim Oliver

## Appendix I

Whole Rock Lithogeochemical Data


|  | : |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | 8:8\% |  |  |  |  |























## Appendix II.

Analytical Techniques.

## ALS Chemex

## Sample Preparation Package - PREP-31 Standard Sample Preparation: Dry, Crush, Split and Pulverize

Sample is dried and the entire sample is crushed to better than $70 \%$ passing a 2 mm (Tyler 10 mesh) screen. A split of up to 250 grams is taken and pulverized to better than $85 \%$ passing a 75 micron (Tyler 200 mesh) screen.

| ALS Chemex <br> Method Code | Description |
| :---: | :--- |
| LOG-22 | Sample is logged in tracking system and a bar code label is <br> attached. |
| CRU-31 | Fine crushing of rock chip and drill samples to better than <br> $70 \%$ of the sample passing 2 mm. |
| SPL-21 | Split sample using riffle splitter. |
| PUL-31 | A sample split of up to 250 g is pulverized to better than $85 \%$ of <br> the sample passing 75 microns. |

## ALS Chemex

Geochemical Procedure - ME-MS81
Ultra-Trace Level Methods (con't)

| Element | Symbol | Detection <br> Limit | Upper <br> Limit | Units |
| :--- | :---: | :---: | :---: | :---: |
| Rubidium | Rb | 0.2 | 10,000 | ppm |
| Samarium | Sm | 0.1 | 1,000 | ppm |
| Tin | Sn | 1 | 10,000 | ppm |
| Strontium | Sr | 0.1 | 10,000 | ppm |
| Tantalum | Ta | 0.5 | 10,000 | ppm |
| Terbium | Tb | 0.1 | 1,000 | ppm |
| Thorium | Th | 1 | 1,000 | ppm |
| Thallium | Tl | 0.5 | 1,000 | ppm |
| Thulium | Tm | 0.1 | 1,000 | ppm |
| Uranium | U | 0.5 | 1,000 | ppm |
| Vanadium | V | 5 | 10,000 | ppm |
| Tungsten | W | 1 | 10,000 | ppm |
| Yttrium | Y | 0.5 | 10,000 | ppm |
| Ytterbium | Yb | 0.1 | 1,000 | ppm |
| Zinc | Zn | 5 | 10,000 | ppm |
| Zirconium | Zr | 0.5 | 10,000 | ppm |

## ALS Chemex

## Geochemical Procedure - ME-MS81

## Ultra-Trace Level Methods

## Sample Decomposition: Lithium Metaborate Fusion <br> Analytical Method: Inductively Coupled Plasma - Mass Spectroscopy (ICP - MS)

A prepared sample ( 0.200 gram) is added to lithium metaborate flux ( 0.90 gram), mixed well and fused in a furnace at $1050^{\circ} \mathrm{C}$. The resulting melt is then cooled and dissolved in 100 ml of $4 \%$ nitric acid. This solution is then analyzed by inductively coupled plasma - mass spectrometry.

| Element | Symbol | Detection <br> Limit | Upper <br> Limit | Units |
| :--- | :---: | :---: | :---: | :---: |
| Silver | Ag | 1 | 1,000 | ppm |
| Barium | Ba | 0.5 | 10,000 | ppm |
| Cerium | Ce | 0.5 | 10,000 | ppm |
| Cobalt | Co | 0.5 | 10,000 | ppm |
| Chromium | Cr | 10 | 10,000 | ppm |
| Cesium | Cs | 0.1 | 10,000 | ppm |
| Copper | Cu | 5 | 10,000 | ppm |
| Dysprosium | Dy | 0.1 | 1,000 | ppm |
| Erbium | Er | 0.1 | 1,000 | ppm |
| Europium | Eu | 0.1 | 1,000 | ppm |
| Gallium | Ga | 1 | 1,000 | ppm |
| Gadolinium | Gd | 0.1 | 1,000 | ppm |
| Hafnium | Hf | 1 | 10,000 | ppm |
| Holmium | Ho | 0.1 | 1,000 | ppm |
| Lanthanum | La | 0.5 | 10,000 | ppm |
| Lutetium | Lu | 0.1 | 1,000 | ppm |
| Molybdenum | Mo | 2 | 10,000 | ppm |
| Niobium | Nb | 1 | 10,000 | ppm |
| Neodymium | Nd | 0.5 | 10,000 | ppm |
| Nickel | Ni | 5 | 10,000 | ppm |
| Lead | Pb | 5 | 10,000 | ppm |
| Praseodymium | Pr | 0.1 | 1,000 | ppm |

## ALS Chemex

## Whole Rock Geochemistry - ME-XRF06

Sample Decomposition: Lithium Tetraborate Fusion*<br>Analytical Method: X-Ray Fluorescence Spectroscopy (XRF)

A prepared sample ( 1.000 gram) is added to lithium tetraborate flux ( 9.000 grams), mixed well and fused in a furnace at $1100^{\circ} \mathrm{C}$. A flat glass disc is prepared from the resulting melt. This disc is then analyzed by X -ray fluorescence spectrometry. Oxide concentration is calculated from the determined elemental concentration and the result is reported in that format.

To determine loss on ignition (L.O.I.), a porcelain crucible is dried in an oven at $105^{\circ} \mathrm{C}$, cooled and the weight recorded. A prepared sample ( 3.00 grams ) is added to the crucible and then ashed at $1000^{\circ} \mathrm{C}$ for one hour. The sample is then cooled in a desiccator, weighed and the percent loss on ignition is calculated.

| Oxide Determined | Symbol | Lower Reporting Limit | Upper Reporting Limit | Units |
| :---: | :---: | :---: | :---: | :---: |
| Aluminum Oxide | $\mathrm{Al2O}_{3}$ | 0.01 | 100 | \% |
| Barium Oxide | BaO | 0.01 | 100 | \% |
| Calcium Oxide | CaO | 0.01 | 100 | \% |
| Chromium Oxide | $\mathrm{Cr} 2 \mathrm{O}_{3}$ | 0.01 | 100 | \% |
| Ferric Oxide | $\mathrm{Fe}_{2} \mathrm{O}_{3}$ | 0.01 | 100 | \% |
| Magnesium Oxide | MgO | 0.01 | 100 | \% |
| Manganese Oxide | MnO | 0.01 | 100 | \% |
| Phosophorus Oxide | $\mathrm{P}_{2} \mathrm{O}_{5}$ | 0.01 | 100 | \% |
| Potassium Oxide | $\mathrm{K}_{2} \mathrm{O}$ | 0.01 | 100 | \% |
| Silicon Oxide | $\mathrm{SiO}_{2}$ | 0.01 | 100 | \% |
| Sodium Oxide | $\mathrm{Na}_{2} \mathrm{O}$ | 0.01 | 100 | \% |
| Strontium Oxide | SrO | 0.01 | 100 | \% |
| Titanium Oxide | $\mathrm{TiO}_{2}$ | 0.01 | 100 | \% |
| Loss On Ignition | L.O.I. | 0.01 | 100 | \% |

*Note: For samples that are high in sulphides, we may substitute a peroxide fusion in order to obtain better results.

## Appendix III.

Whole Rock Lithogeochemical Standards.

# CANMET REPORT 79-35 

Canada Centre for Mineral and Energy Techriology

Centre canadien de la technologie des minéraux et de l'energie

# REFERENCE MATERIALS - ROCK SAMPLES SY-2, SY-3, MRG-1 

SYDNEY ABBEY

MINERALS RESEARCH PROGRAM


## DISCUSSION

Tables 1 and 2 reveal an erratic pattern in the analyticel tasks parformed. Although all participants were informed that $5 Y-3$ contained unusually high concentrations of uranium, thorium and the rare earths, and tiat MRG-1 contained somewhat higher concentrations than usual of chromium, copper, nickel and vanadium, some analysts nevertheless provided only a limited amount of data. Moreover some interference in determining the more common components may have been overlooked.

The great spread of values for each component is somewhat offset by the process of seleotive eliaination used in arriving at the recomended values. Nevertheless, rellable values for some componentis may never be attained, no matter how many additional analyses are reported. In the case of D.S. Geological Survey standard $\mathrm{W}-1,20$ years after the sample became available, only magnituden values were listed for such common trace components as $\mathrm{B}, \mathrm{Be}, \mathrm{Ce}, \mathrm{Cl}, \mathrm{Ge}, \mathrm{Se}$, and $W$ (16). Only 24 of the 48 other trace element values listed for $\mathrm{H}-1$ in the same compilation are given as "recommended".

Some of the oollaborsting laboratories used more than one analytiaal method, thereby providing (in some cases) independent checks on their own results; others depended entirely on one method.

A disappointingly sialil number of participants reported results for the common components - ferrous iron, water, carbon dioxide and fluorine. Further complications arose in the case of carbon dioxide beoause of the failure of some contributors to speciry whether they determinad the carbon dioxide evolved by acid treatment, hence carbonates, or that resulting from the combustion of the sample, bence total oarbon. At least two laboratories reported appreciably different results by the two approaches. The difference way represent non-oarbonate oarbon on contamination. A similar difference bas been observed by laboratories of the Geologioal Survay of Canada with sarmles having no appreciable noncarbonate aarbon.

Because of the evallability of additional data it is now possible to make some distinction between carbon dioxide results obtained by acid evolution and by combustion. The following resplts clearly indicate a significant difference between the two techniques. All of the following velues are expressed as per oent carbon dioxide:

| SY-2 |  | SY-3 |  | MRC-1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Acid | Combust | Acid | Combust | Acld | Conbust |
| 0.49 | 0.66 | 0.47 | 0.60 | 1.22 | 1.22 |
| 0.48 | 0.63 | 0.42 | 0.55 | 1.08 | 1.21 |
| 0.48 | 0.60 | 0.41 | 0.55 | 1.06 | 1.15 |
| 0.47 | 0.59 | 0.41 | 0.50 | 1.03 | 1.14 |
| 0.46 | 0.59 | 0.40 | 0.50 | 1.03 | 1.14 |
| 0.46 | 0.57 | 0.40 | 0.46 | 1.02 | 1.13 |
| 0.46 | 0.55 | 0.40 | 0.44 | 1.00 | 1.11 |
| 0.46 | 0.55 | 0.35 | 0.43 | 0.98 | 1.11 |
| 0.44 | 0.53 | 0.34 | 0.41 | 0.90 | 1.10 |
| 0.43 | 0.53 | 0.26 | 0.33 | 0.90 | 1.06 |
| 0.42 | 0.52 | 0.18 |  | 0.88 | 1.05 |
| 0. 32 |  |  |  |  |  |

The two sets of resuits for carbon dioxide in each sample were treated as different determinations. Results for whioh there was insufficient information on the method used wore ignored. The reocmmended value for "carbon dioxiden is derived from the acid-evolution results. "Carbon" represents the difference between the derived values by both methods, recaloulated to the element.

Hesults raceived from one reliable source suggested inhomogeneity in sample sy-3, with regard to uranium, thorium, lead, and copper. Because the base material used in preparing SY-3 was very simiar to $5 Y-2$, and the four disted elements are asong those for whioh there is a marked difference between SY-2 and SY-3, there is reason to suspect that the inhowogensity, if any, is the result of incoaplete mixing in the autogenous grinding step mentioned above. Although the data from earlier spectrographic examination of the variation of individual rare earths in $S Y-3$ showed no noticeable evidence of inhomogeneity, additional tests werv undertaken, using X-ray fluorescence. The elewents observed were uranium,
thorium, ceriun, lanthanum, yttrium, strontium and rubidium. Results obtained were not sufficiently conclusive either to confirm or to contradict the suggestion of inhomogeneity. The issue therefore reusins in doubt, although the weight of evidence suggests that the one observed example of inhomogeneity may have been fortultous.

Some questions could be raised regarding the possibility that inhomogeneity is a major source of the genersl spread of values, particularly for trace elements. Rooks are essentially heterogeneous, and the ertificial "homagenization" processes used in sample preparation are reversible to some extent. However, a perusal of the available data suggests that inter-laboratory bias is a wach greater souroe of deviation than could generally be expected from sample inhomogeneity. For example, some of the participating laboratories showed a persistent blas that affected several different elements in a manner that would be difficult to justify in terms of segragation of individual minerals. In many cases, a particular bias in the results for a given element coming from a given laboratory was observable in all three samples. It is also noteworthy that the spread of values for most of the components of the three rocks is not very different from those observed in similar programs criginating in other countries (2-6).

## DERIVATYON OF ASSIGNED VALUES

The errors and aberrations from using mere averages or straightforward astatistical treatment to arrive at assigned values have been pointed out elsewhere $(9,10,17)$. The ompirical wethod used in this work was first applied in a study of six samples from the U.S. Ceologioal Survey $(2,10)$ and aubsequentily modified (10,11). It is baned on the assumption that the best values nust be derived from results reported only by laboratories with the best over-all parformance. The method involved a series of staps:
(1) Based on the $\mathrm{H}_{2} \mathrm{O}^{-}$percentages reported with each group of data, all results were converted to the "dry basis". Where no $\mathrm{H}_{2} \mathrm{O}^{-}$was reportad, results ware assumed
to be an the dry basis.
(2) There fewer than three results were available for a particular oonstituent of a partioular sample, no value mas assigned.
(3) Where three or four results were available, a value was assigned equal to the median of the reported results, provided they were based on at least three mutually independent methods and were in reasonable agreement. Such values are shown with question marks, to indicate uncertainty.
(4) Were rive to nine results were available, the median was also used as an assigned value, ragardless of mathod, but also shown with a question mark.
(5) Where ten or more results were available, the mean and standard deviation were calculated. All values removed from the mean by more than ane standard deviation were categorized as "poor", eaoh being identified with the laboratory that produced it.
(6) The poor results were set aside and the mean and standard deviation of the reaaining values oaloulated. All values removed from that mean by more than its standard deviation were categorized as "fair" and each identifed With the laboratory that produced it.
(7) The fair results were set aside and the remaning "hard core" of values categorized as "good" and identified with the laboratories that produced them.
(8) After operations (5), (6) and (7) had been completed for all eligible values for all oontitituents of all three samplea, eaoh contributing laboratory was given a rating,

- determined by the following formula:
$R=\frac{N_{g}-N_{p}}{N_{g}+N_{f}+\mathbb{K}_{p}} \times 100$


## where

$R=$ rating
$\mathrm{N}_{\mathrm{g}}=$ number of good reaulta
$N_{r}=$ number of fair results
$N_{p}=$ number of poor results
(9) Results reported by laboratories with ratings of 40 or higher were ategorized as "select".
(10) For each ocnstituont of each sample, any outlying selact resuit that differed from its nearest neighbour by as much as or by more than the lattar differed from the opposite extreae, was eliminated.
(11) For constituents where fewer than five seleot values wore available, the median of the available seloot vaives was assigned, but again with a question mark.
(12) Where five or more select results were available, a subjective decision was made in choosing either the seleot median or the seleot mean as an assigned value.

All recomended values have been oategorized as "A", "Bn, or "?". The "A" is for constituents for wich at least 20 resulta were reported, where thers is no evidence of bias in the distribution and where there is close agreement betweem mode, median, mean, select median and select masn. It follows that any further reaults received are not likely to affect such values beyond one or two units in the last significant figure. The "q" category includes the values mentioned above, and also others where erratic distribution or other factors cast doubt on the derived valut. The "g" is intended for values intermediate betwasn the other two.

Because some trace olements are present at sufficiently high levels to affect the complete analysis of the samples, calculations on those elements were done first. Reoonmended values are given in Table 3. Most of those with question marks are based on the medizins, the others on the select medians. In both aasas, some rounding of values has been introduced.

An expeption wes made for rubidium in sy-3, whore two isotopio-dilution masespectrom metry laboratories, one in Canada, the other in Austraila, repónted 208.4 and 208 ppm respectivaly. The aeleot median, 208 ppa , was therefore taken as the recommended value and listed to one significant figure eore than usuri.

Equivaient percentages as oxides are also given in Tuble 3 only where those values are 0.01
or higher. They wers used in the subsequent oalculations on the major and minor olements. The equivalent percentages for non-oarbonate carbon and chlorine are expressed as the slements, the fars in which those constituents are usually reported in a complete rook analysis.

Recommended values for major and minor constituents are listed in Table 4 in which "otbers" represents the sum of the "equivalent percentages" of the trace elements, adjusted upward to allow for additional rare-earth elewents for which reported results were too limited to justify assigning values. $\mathrm{Fe}_{2} \mathrm{O}_{3} T R$ represents the value for total iron, expressed as ferric oxide and derived from reported values for total iron. $\mathrm{Fe}_{2} \mathrm{O}_{3} \mathrm{TC}$ represents the value for total iron, expressed as ferric oxide, but calculated from the values derived for $\mathrm{Fe}_{2} \mathrm{O}_{3}$ and FeO from reported values for ferric and ferrous iron. Closeness of agreement between the two values for total iron is a rough mansure of the validity of the procedures used in deriving recomended yalues. closeness of the total to 1005 is another, but less reliable, indicator of that validity. The values of elements for which insufficient data were received to assign Mrecommended" values are recorded in Table 5.

## CONCLUSIONS

The present collaborative program has placed the quantitative compositional data for the three saxples on a much firmer footing than they were originaliy. There are, however, some negative aspects to the results:
(1) The suspioion of heterogeneity resulting fron the autokienous grinding used in preparing SY-3.
(2) The limited quantity of data, and hence the uncertainty in the assigned values, for uranium, thorium, the rare earths and several additional elements which distinguish 5y-2 and SY-3 from other available reterence samples.

Table 3 - Recommended values - "trace" elenents

|  | SY-2 |  | SY-3 |  | Mag-1 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | ppm | $\frac{\text { oxide }}{8}$ | ppe | $\frac{\text { oxide }}{8}$ | PDP | oxide |  |
| Ag |  |  |  |  | 0.142 |  |  |
| As | 188 |  | 208 |  | 0.78 |  |  |
| B | $85 ?$ | 0.027 | 110 B | 0.035 | 137 |  | $\mathrm{B}_{2} \mathrm{O}_{3}$ |
| Ba | 460A | . 051 | 4308 | . 048 | 502 | 0.006 | $-\mathrm{BaO}$ |
| 80 | 23A | . 006 | 22. | . 006 | 0.69 |  | BeO |
| c |  | . 0277 |  | . 0257 |  | . 0258 | c |
| Ce | 2107 | . 026 | 22008 | . 27 | 257 |  | $\mathrm{CuO}_{2}$ |
| C. | 1302 | . 013. | $140 ?$ | . 014 | 1507 | . 015 | CI |
| Co | 118 |  | 121 |  | 86A | . 011 | Coo |
| Cr | 12B |  | 10 B | - | 4501 | . 066 | $\mathrm{Cr}_{2} \mathrm{O}_{3}$ |
| cs | 2.37 |  | 2.57 |  | 0.67 |  |  |
| Cu | 5A |  | 164 |  | 135A | . 017 | CuO |
| Dy | 202 |  | 807 | . 009 | 37 |  | $\mathrm{Dy}_{2} \mathrm{O}_{3}$ |
| Er | 127 |  | $50 \%$ | . 006 |  |  | $\mathrm{Er}_{2} \mathrm{O}_{3}$ |
| Eu | 2.4 |  | 147 |  | 1.47 |  |  |
| Ga | 28a |  | 26A |  | $18 \%$ |  |  |
| Od |  |  | 553 | . 006 |  |  | $\mathrm{Ca}_{2} \mathrm{O}_{3}$ |
| H5 | 83 |  | 97 |  |  |  |  |
| но |  |  | 207 |  | 0.57 |  |  |
| La | 888 | . 010 | 13508 | . 16 | 102 |  | $\mathrm{La}_{2} \mathrm{O}_{3}$ |
| Li | 93A | . 020 | 924 | . 020 | 48 |  | $\mathrm{Li}_{2} \mathrm{O}$ |
| Lu | 37 |  | 87 |  | 0.28 |  |  |
| Ho | 37 |  | 2.57 |  |  |  |  |
| \% | 239 |  | 1308 | . 019 | 207 |  | $\mathrm{MH}_{2} \mathrm{O}_{5}$ |
| Nd | 717 | . 008 | $800 ?$ | . 093 | 197 |  | $\mathrm{Hd}_{2} \mathrm{O}_{3}$ |
| Wi | 10a |  | 118 |  | 195a | . 025 | H10 |
| Pb | 80a | . 009. | 1308 | . 014 | 108 | . | Pbo |
| Fr |  |  | 1207 | . 014 |  |  | $\mathrm{Pr}_{6} \mathrm{O}_{11}$ |
| Rb | 2204 | . 024 | 208a | . 023 | 88 |  | $\mathrm{Rb}_{2} \mathrm{O}$ |
| Sb | 0.28 |  | 0.38 |  | 0.48 |  |  |
| So | 72 |  | 77 |  | $48 \%$ | . 007 | $\mathrm{SO}_{2} \mathrm{O}_{3}$ |
| Sm | 157 |  | $100 ?$ | . 012 | 59 |  | $\mathrm{Sa}_{2} \mathrm{O}_{3}$ |
| 3 n | 48 |  | 67 |  | 3.29 |  |  |
| sr | 2751 | . 032 | 306A | . 036 | 260A | . 031 | SrO |
| Tb | 27 |  | 112 |  |  |  |  |
| In | 3809 | . 043 | 9908 | . 115 | $1 ?$ |  | $\mathrm{mo}_{2}$ |
| Im | 27 |  | 87 |  | 0.12 |  |  |
| 0 | 2908 | . 034 | 6501 | . 077 | 0.37 |  | $\mathrm{U}_{3} \mathrm{O}_{8}$ |
| $v$ | 524 | . 009 | 514 | . 009 | 5204 | . 093 | $\mathrm{V}_{2} \mathrm{O}_{5}$ |
| I | 130A | . 017 | 7402 | . 094 | 167 |  | $\mathrm{Y}_{2} \mathrm{O}_{3}$ |
| Ib | 178 |  | 658 | . 007 | 17 |  | $\mathrm{rb}_{2} \mathrm{O}_{3}$ |
| 2 n | 2508 | . 031 | 2404 | . 030 | 1908 | . 024 | 2 nO |
| \%r | 2801 | . 038 | 3201 | . 043 | 105A | . 014 | $2 \mathrm{CO}_{2}$ |
|  |  | . 037 |  | . 087 |  |  | $\mathrm{OrP2}_{2} \mathrm{O}_{3}$ |



- Table 4-Recomended values - "complete malyais" (\$, dry basis)

|  | SY-2 | S3-3 | MRG-1 |
| :---: | :---: | :---: | :---: |
| $\mathrm{SIO}_{2}$ | 60.10 A | 59.688 | 39.32A |
| $\mathrm{Al}_{2} \mathrm{O}_{3}$ | 12.12A | 11.804 | 8.50 A |
| $\mathrm{Pa}_{2} \mathrm{O}_{3}$ | 2.288 | 2.448 | 8.268 |
| F*0 | 3.62A | 3.584 | 8.634 |
| M90 | 2.702 | 2.67a | 13.49A |
| - CO | 7.988 | 8.264 | 14.778 |
| $\mathrm{Na}_{2} \mathrm{O}$ | $4.34 \wedge$ | 4.154 | 0.718 |
| $\mathrm{K}_{2} \mathrm{O}$ | 4.48A | 4.201 | 0.18 A |
| $\mathrm{H}_{2}{ }^{+}$ | 0.438 | 0.428 | 0.98 B |
| $\mathrm{CO}_{2}$ | 0.46 B | 0.388 | 1.008 |
| $\mathrm{TiO}_{2}$ | 0.14 A | 0.151 | 3.698 |
| $\mathrm{P}_{2} \mathrm{O}_{5}$ | - 0.43 A | 0.54 A | 0.06A |
| 7 | 0.518 | 0.668 | 0.0258 |
| s. | 0.0118 | 0.058 | 0.06 B |
| 140 | 0.324 | 0.32a | 0.172 |
| Others* | 0.43? | 1.189 | 0.337 |
| $\Sigma$ | $100.35 ?$ | 100.487 | 100.187 |
| 0/P, eto. | 0.222 | 0.312 | 0.048 |
| L. (00r\%.) | 109.138 | 100.172 | 100.147 |
| $\mathrm{Pa}_{2} \mathrm{O}_{3} \mathrm{TR}$ | 6.28A | 6.428 | 17.82A |
| $\mathrm{Fe}_{2} \mathrm{O}_{3} \mathrm{TC}$ | 6.278 | 6.428 | 17.858 |

"Others represente the sum of the "equivelant percentagea" of the trace olementa, adjusted upward to allow for additional rare-earth elements for which raported reaulta wore too limited to justify aasigning values.

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