GEOPHYSICAL REPORT

ON

AIRBORNE MAGNETIC AND VLF-EM SURVEYS

OVER THE

AMARETTO CLAIM GROUP

KASLO RIVER, KASLO AREA

SLOCAN MINING DIVISION

BRITISH COLUMBIA

PROPERTY

: Southeast corner is 7 km N55°W of Kaslo, B.C.

: 49° 58' north latitude

: 117° 03' west longitude

: N.T.S. 82F/14E

WRITTEN FOR

: RAYRICK GRUBSTAKING SYNDICATE

: #1120-1066 West Hastings Street

: Vancouver, B.C., V6E 2E6

SURVEYED BY

: COLUMBIA AIRBORNE GEOPHYSICAL SERVICES (1984) LTD.

: #1808-1450 West Georgia Street

: Vancouver, B.C. V6G 2T

WRITTEN BY

: David G. Mark, Geophys

: GEOTRONICS SURVEYS LTD

: #403-750 West Pender St

: Vancouver, B.C., V6C 2

DATED

: March 31, 1985
TYPE OF REPORT/SURVEY(S) | TOTAL COST
---|---
Airborne Magnetic and VLF-EM | $26,000.00

DATE STATEMENT OF EXPLORATION AND DEVELOPMENT FILED: Dec. 31, 1984
YEAR OF WORK: 84

PROPERTY NAME(S): Amaretto Claim Group

COMMODITIES PRESENT: None known, but gold is being explored for.

B.C. MINERAL INVENTORY NUMBER(S), IF KNOWN:

MINING DIVISION: Slocan
LATITUDE: 49° 58' north
LONGITUDE: 117° 03' west

NAMES and NUMBERS of all mineral tenures in good standing (when work was done) that form the property (Examples: TAX 1-4, FIRE 2 [12 units]; PHOENIX (Lot 1706); Mineral Lease M 123; Mining or Certified Mining Lease ML 12 [claims involved]):
- Amaretto (20 units)
- Blue Diamond (20 units)
- White Diamond (16 units)
- Black Diamond (20 units)

OWNER(S):
(1) Rayrick Grubstaking Syndicate
(2) Rayrick Grubstaking Syndicate

MAILING ADDRESS
#1120-1066 W. Hastings Street
Vancouver, B.C., V6E 2E6

OPERATOR(S) (that is, Company paying for the work):
(1) Rayrick Grubstaking Syndicate
(2) Rayrick Grubstaking Syndicate

MAILING ADDRESS
#1120-1066 W. Hastings Street
Vancouver, B.C., V6E 2E6

SUMMARY GEOLOGY (lithology, age, structure, alteration, mineralization, size, and attitude):
Property is almost entirely underlain by Slocan sediments of Triassic to (?) Lower Jurassic age. Kaslo volcanics occur just off northeast corner of Permian and/or Triassic age., Nelson Batholith of Jurassic age occurs along western boundary - No known mineralization to date.

REFERENCES TO PREVIOUS WORK: Two private reports by Goldsmith, et al, on preliminary geological mapping and soil geochemistry.
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**Total Cost:** $26,000.00

**FOR MINISTRY USE ONLY**

- Value work done (from report)
- Value of work approved
- Value claimed (from statement)
- Value credited to PAC account
- Value debited to PAC account
- Accepted

**NAME OF PAC ACCOUNT**

**DEBIT**

**CREDIT**

**REMARKS:** Information Class
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GEOTRONICS SURVEYS LTD.
LIST OF ILLUSTRATIONS

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Property Location Map 1: 8,600,000 Map 1
Claim Map 1: 50,000 Map 2

In Back Pocket

Airborne Magnetic 1: 10,000 Map 3
& VLF-EM Survey Results
Airborne magnetic and VLF-EM surveys were carried out over the Amaretto Claim Group owned by Rayrick Grubstaking Syndicate of Vancouver, B.C. during the latter part of December, 1984. The claim is located to the immediate southwest of Kaslo River and on Mount Holmes, 7 km N55°W of the town of Kaslo. Access is gained by a helicopter or four-wheel drive vehicle and hiking. The terrain consists of mainly steep and rugged slopes forested with moderately dense coniferous trees. The purpose of the surveys was to aid in the mapping of geology as well as to locate probable areas for exploration of gold mineralization.

The Amaretto Claim Group occurs within the Kootenay Arc. It is almost entirely underlain by sediments of the Slocan Group. To the immediate northeast of the property occur rocks of the Kaslo Group. Porphyritic granite of the Nelson Batholith occurs along the western edge of the property. Silver, lead, zinc, cadmium and gold mineralization occurs three to nine km to the south and southwest of the property within the Slocan sediments adjacent to the Nelson Batholith. Also in the area, primarily to the north, occurs gold, silver, lead and zinc mineralization usually hosted by an andesite flow breccia of the Kaslo Group near the contact with the Slocan Group. Soil sampling in the area has revealed strong anomalies in gold within the Slocan sediments.

The airborne surveys were flown at about a 50-meter terrain clearance on contour lines with a separation averaging about 200 meters. The instruments used were a Sabre Electronics proton precession magnetometer and a Sabre Electronics VLF-EM receiver. The magnetic data were picked from the strip charts and hand contoured. The contours were drawn on a survey plan on which the VLF-EM anomalies were plotted as well.
CONCLUSIONS

1. The magnetic survey indicates the entire property is underlain by the Slocan sediments as has been mapped by the G.S.C. It also maps the Nelson Batholith along the western edge of the property. It shows the batholith contact is somewhat different than has been mapped by the G.S.C.

2. The VLF-EM survey revealed nineteen conductors, three of which occur close to the Slocan/Kaslo contact. This contact is known in the area to be related to gold and sulphide mineralization. The other conductors occur entirely within the Slocan Group.

3. An EM conductive zone occurring mostly within the White Diamond claim, could be reflecting a different lithologic-al unit or possibly a zone of alteration that is hopefully associated with mineralization.

4. Both the VLF-EM and magnetic surveys revealed lineations within the survey area that are likely caused by fault, shear and/or contact zones. These can be important indicators of sulphide and native gold mineralization especially where the lineations cross.
RECOMMENDATIONS

The airborne geophysics has revealed several target areas throughout the property such as the magnetic highs and the VLF-EM highs. It is recommended to check these out by prospecting, geological mapping and possibly soil geochemistry. Soil geochemistry lines could be run in the areas of interest, such as across the VLF-EM conductors. Ground VLF-EM and magnetic surveying may be quite useful as well in finding and delineating more accurately the target areas.

It is not expected, however, that all gold-sulphide mineralization in the area will be reflected by the airborne magnetic and VLF-EM surveys. It is simply a start as far as defining target areas, since the property is so large.

However, if one wants to cover the property effectively, the following program is recommended:

1. Take large soil samples every 50 m along contour lines preferably about 100 m apart in elevation. In the lab, the total sample should be pulverized, and not screened at all in order to preclude the screening out of coarser gold. The anomalous samples should then be followed up by sampling on a tight grid, say 15 to 20 m centers on a grid, say 200 m square.

2. At the same time, careful geological mapping and prospecting should be carried out preferably by a geologist and prospector familiar with gold mineralization. One large benefit of this will be a better interpretation of any geophysics that are carried out. Special attention should be paid to the VLF-EM conductors and magnetic highs.
3. The defined soil anomalies in gold should then be 'cat' trenched, if access and terrain permit.

4. Resistivity - IP mapping and/or MaxMin EM should then be considered in order to optimize drill targets.

5. Diamond drilling should then be carried out using a large diameter drill and a face discharge bit.
INTRODUCTION AND GENERAL REMARKS

This report discusses the survey procedure, compilation of data and the interpretation of low-level airborne magnetic and VLF-EM surveys carried out over the Amaretto Claim Group within the Kaslo area during the latter part of December, 1984. The surveys were carried out by Lloyd Brewer, instrument operator and project manager, and John Kime, navigator, both of whom are of Columbia Airborne Geophysical Services (1984) Ltd. A total of 260 line km of airborne surveys were done over the property and surrounding area.

The object of the two surveys was to aid in the geological mapping of lithology and structure for the purpose of exploration of the type of gold mineralization as is found in the Kaslo area. Magnetic surveys have especially been proven to be a good geological mapping tool. Also the VLF-EM has responded to some of the mineralization in the area.
PROPERTY AND OWNERSHIP

The property consists of four claims containing 76 units as shown on Map 2 and as described below:

<table>
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<tr>
<th>Claim Name</th>
<th>No. Units</th>
<th>Record No.</th>
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<td>Blue Diamond</td>
<td>20</td>
<td>3418</td>
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<tr>
<td>White Diamond</td>
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<tr>
<td>Black Diamond</td>
<td>20</td>
<td>3593</td>
<td>Feb. 20, 1986</td>
</tr>
</tbody>
</table>

The expiry date shown takes into account the surveys under discussion as being accepted for assessment credits.

The property is owned by Rayrick Grubstaking Syndicate of Vancouver, British Columbia.

LOCATION AND ACCESS

The southeastern corner of the property is found 7 km N55°W of the town of Kaslo, B.C. on the southwestern side of the Kaslo River. The peak of Mount Holmes occurs within the Black Diamond claim.

The geographical coordinates for the center of the property are 49° 58' north latitude and 117° 03' west longitude.

The property is most easily accessed by helicopter. However, Highway 31A cuts across the northeastern corner of the property about 6 km west and north of Kaslo. At about kilometer 16 on the same highway, a switchbacking road runs southerly up the northern slope of Mount Holmes within one km of the Black Diamond claim. Access to the southern part of the Amaretto claim is
gained by a road running northerly from the Keen Creek logging access road. However, the road is apparently deteriorated and is unusable for vehicles.

PHYSIOGRAPHY

The property is located within the Kokanee Range which is part of the Slocan Ranges. This mountain system lies on the eastern part of the Selkirk Mountains which is a physiographic division of the Columbia Mountains. The terrain is rugged with steep slopes throughout the whole property.

Elevations vary from 760 meters (2,500 feet) a.s.l. at the northeastern corner of the property on the Kaslo River, to 2,620 meters (8,600 feet) a.s.l. on Mount Holmes located within the southwestern corner of the Black Diamond claim. This gives a relief of 1,860 meters (6,100 feet).

The main water sources would be the southeasterly-flowing Kaslo River as well as its tributaries and those of Keen Creek.

The forest cover is moderately dense and consists of hemlock, fir, cedar, spruce and tamarack.

HISTORY OF PREVIOUS WORK

Exploration in the area probably dates back to the turn of the century. Prospecting has probably been done on the property and trenches, pits and adits could well be found throughout. Rayrick had soil sampling and a minor amount of geological mapping done on the Amaretto claim in 1982, and the same on the White Diamond and Blue Diamond claims in 1983. The results are given in two
GEOLOGY

The following is taken from Stewart's compilation of geological mapping done by government geologists, most notably Klepacki.

The Blanford property occurs within the central section of the Kootenay Arc. The Arc is composed of a band of sedimentary, volcanic and metamorphic rocks that extend from northern Washington where they strike northeasterly, to north of Revelstoke where they strike northwesterly. The age of the rocks varies from Precambrian to Jurassic.

The oldest rocks on the property are those of the Kaslo Group a small part of which may occur in the northeast corner of the claim.

It is of Mississippian(?) to Triassic(?) in age and consists of mafic volcanic breccia, andesite, basalt, chlorite schist, tuffaceous argillite, talc and serpentinite. Sills and small plugs of gabbro or diorite that probably are of this group occur throughout the older sediments.

The Slocan Group is the youngest and covers almost the entire property. It is Upper Triassic in age. The rocks are undifferentiated slate, argillite, limestone, quartzite and tuffaceous sediments with some dolomite.

Goldsmith, et al, on the northern part of the White Diamond and Blue Diamond claims mapped argillites, limestones, a phyllitic schist, and a phyllite of the Slocan Group as well as an andesite porphyry dyke probably related to the Kaslo Group. He also
mapped some calcareous tufa of recent age. He also noted quartz veins and pods within the argilites and schist as well as 1% pyrite within a silicified limey argillite.

Occurring along the western edge of the property is the Nelson Batholith of Jurassic age. In this area it consists mainly of porphyritic granite.

Dyke-shaped intrusives trend northwesterly and north-northwesterly through the Amaretto and Black Diamond claims. The petrology varies from granite to quartz diorite and is of unknown age.

The only structure known on the property is the northwesterly contact between the Kaslo and Slocan groups and the northerly contact between the Nelson Batholith and the Slocan Group. Much folding, foliation and schistosity occur within the sedimentary rocks.

To date no mineralization is known to exist within the claim. However, six to ten km to the west and southwest along Keen Creek, nine deposits occur within the Slocan rocks next to the Nelson Batholith. Two of the better known ones are the Cork-Province and the B.N.A., both described by Little.

On the Cork-Province property, the underlying rocks are argillite, limestone and quartzite. These rocks are highly metamorphosed next to the batholith. The metallic minerals consist of sphalerite, galena, pyrite and some chalcopyrite in a gangue of siderite, calcite, quartz and fragments of wallrock. The property was mined at different intervals from 1900 to 1953 producing 169,433 reported tons of zinc, lead, silver, cadmium and gold ore.

The B.N.A. property is underlain by banded argillite and quartz-
ite of the Slocan Group in a narrow belt flanked by porphyritic Nelson granite. The sedimentary rocks are metamorphosed and silicified. The mineralization consists of sphalerite and galena with some pyrite and native silver within a gangue cemented with calcite and a little quartz. 99 reported tons of silver, zinc, lead and gold ore were mined at sporadic intervals from 1900 to 1952.

Much mineralization has been found in the area related to the Kaslo Group/Slocan Group contact, most notably on the Red Diamond property 12 km to the north. Usually the host rock is an andesite flow breccia with the mineralization being sulphides of iron, lead, zinc, copper and silver, with gold values. Also on the Red Diamond property, soil anomalies in gold have been located within the Slocan and Kaslo Groups.

**INSTRUMENTATION AND THEORY**

a) **Magnetic Survey**

The magnetic data are detected using a nuclear free precession proton magnetometer, manufactured by Sabre Electronic Instruments Ltd. of Burnaby, B.C. The magnetometer measures the total count of the earth's magnetic field intensity with a sensitivity of one gamma. The data are recorded on magnetic tape and 12 cm analog strip chart.

The magnetic patterns obtained from a regional airborne survey are directly related to the distribution of magnetite in the survey area. However, the geology cannot be deduced from isomagnetic maps by simply assuming that all magnetic highs are underlain by gabbro or ultramafic rocks, and that all magnetic lows are caused by limestone or chert. The problem with such a simplistic approach is that magnetite is not uniformly distri-
buted in any type of rock. Other problems arise from the fact that most geologic terrains have rocks of high susceptibility superimposed on less 'magnetic' rocks, and vice versa. Cultural features such as powerlines, pipelines and railways also complicate matters. So many variables can be involved that it may be impossible to make a strictly accurate analysis of the geology of an area from magnetic data alone. It is preferable to use other information such as geological, photogeological and electromagnetic in combination with magnetic data to obtain a more accurate geological analysis.

b) VLF-EM Survey

A two-frequency omni-directional receiver unit, manufactured by Sabre Electronic Instruments Ltd., of Burnaby, B.C., was used for the VLF-EM survey. The transmitter used was the one located at Annapolis, Maryland, transmitting at 21.4 KHz.

The VLF (Very Low Frequency) method uses powerful radio transmitters set up in various parts of the world for military communications. These powerful transmitters can induce electric currents in conductive bodies thousands of kilometers away from the radio source. The induced currents set up secondary magnetic fields which can be detected at surface through deviations in the normal VLF field. The VLF method is inexpensive and can be a useful initial tool for mapping structure and prospecting. Successful use of the VLF requires that the strike of the conductor be in the direction of the transmitting station so that the lines of magnetic field from the transmitter cut the conductor. Thus, conductors with northeasterly to southeasterly strikes should respond to Annapolis transmissions.

It is impossible to determine the quality of conductors with any reliability, using field strength data alone. The question of
linearity is in doubt if the conductor does not appear to cross the adjacent flight lines. The relatively high frequency results in a multitude of anomalies from unwanted sources such as swamps, creeks and cultural debris. However, the same characteristic also results in the detection of poor conductors such as faults, shear zones, and rock contacts, making the VLF-EM a powerful mapping tool.

The interpretive technique requires information from magnetic surveys, air photo analyses, and ground traverses to aid in discrimination between important and unwanted anomalies. Even armed with this information the interpreter can easily be misled.

**SURVEY PROCEDURE**

A two-meter bird was fitted with a magnetometer coil and two omni-directional EM receivers and towed beneath the helicopter on a 10-meter cable. The terrain clearance for the bird was 50 m.

The surveys were contour-line flown at an average line spacing of 200 m. Navigation was visual, using 1:50,000 scale maps blown up to 1:10,000.

The aircraft used to conduct this survey was a Bell Jet Ranger helicopter. Airspeed was a constant 60 KPH so that creek valley sand canyons were penetrated thoroughly. The slow airspeed provided safety, detailed coverage of boxed-in areas, and consistency of data retrieval, which is critical in rugged terrain, such as within this survey.

The number of line km flown as shown on Map 3 is 260.
The project supervisor, Mr. L. Brewer, has over 4 years of experience in conducting aerial magnetic and electromagnetic surveys from rotary-wing aircraft, under all types of terrain conditions.

**DATA REDUCTION AND COMPILATION**

The observant magnetic total field was recorded on analogue strip charts. These were played-back together with audio recordings containing fiducial markers, and the fiducial markers were transferred to the strip charts. The fiducial markers were identified with topographic features along the flight lines.

The magnetic data were taken from the strip charts and plotted at a scale of 1:10,000 (1 cm = 100 m). The data were then contoured at a 25-gamma interval onto Map 3.

The VLF-EM anomalies were taken from the strip charts and plotted on the sheet with the magnetics. A distinction has been made on the map between weaker and stronger anomalies.

**DISCUSSION OF RESULTS**

a) **Magnetics**

The magnetic field over almost the entire property is very quiet which is very typical of sediments. The intensity is 350 to 600 gammas which can be considered as the magnetic background. The sediments, as mentioned above, are mainly those of the Slocan Group.

The magnetic field, in a general sense, increases from the southwest to the northeast so that very general northwesterly
trends are evident in the property's magnetic field. The background in the southwestern part of the property is 300 to 400 gammas, whereas in the northeastern part, it is 500 to 600 gammas. It is suspected the southwestern low, which is as low as 250 gammas, is caused by the dipole effect from the strong magnetic high produced from the Nelson Batholith. On the other hand, the higher background in the northeastern part of the property probably results from the magnetic high caused by the Kaslo volcanics northeast of the property and the Kaslo River. The high is not seen within this survey area but can be seen on the government aero-magnetic maps.

A strong magnetic high occurs along the northwestern corner of the property. It reaches a high of 775 gammas which is about 300 gammas above the local background. A second magnetic high occurs at the southwestern corner of the property which is also about 300 gammas above the local background. Both highs are reflecting the Nelson Batholith which G.S.C. geologists claim is composed of porphyritic granite in this area. The writer has drawn in the Nelson contact from the magnetic highs which should be more accurate than that mapped by the G.S.C.

Magnetic lows often occur along creek valleys, and/or areas of low topography. The reasons for this are as follows:

1. Valleys almost always contain deeper overburden which means the detecting element is further from the bedrock causing the magnetic field.

2. If the survey is flown across the valley or gulley, then the detecting element is also further from the bedrock.

3. Gulleys and valleys are often caused by faults or shear zones which are often reflected by magnetic lows.
b) **VLF-EM**

The major cause of VLF-EM anomalies, as a rule, are geologic structure such as fault, shear and breccia zones. It is therefore logical to interpret VLF-EM anomalies to likely be caused by these structural zones. Of course, sulphides may also be a causative source. But in the writer's experience, when VLF-EM anomalies correlate with sulphide mineralization, the anomalies are usually reflecting the structure associated with the mineralization rather than the mineralization itself.

There is some variation in intensity from one VLF-EM anomaly to the next. This is not only due to the conductivity of a causative source, but also the direction it strikes relative to the direction to the transmitter. In other words, those conductors lying close to the same direction as the direction to the transmitter can be picked up easier than those that are lying at a greater angle. Depending upon its conductivity, a conductor may not be picked up at all if it is at too great an angle.

The Amaretto Claim Group occurs in extremely rough topography which adversely affects the VLF-EM results. The noise level is greatly increased which can thus obliterate signals from EM conductors such as geological structure and/or mineral zones. Therefore, the VLF-EM system may have responded to some of the known mineral zones but the signal may have been masked by the noise level.

However, nineteen EM conductors have been mapped which stand out above the noise level. These have been labelled by the lower case letters a to s, respectively.

The conductors vary in length from 200 m for conductor o, to 1,700 m each for conductors h and i. Many or possibly all of the
conductors are caused by structure, but certainly the longer, more lineal-shaped conductors are more indicative of geological structure. Examples are conductors b, e, h and i.

The strike is predominantly northeasterly. Exceptions are conductors b, d and n, which are more easterly; conductors g, j, and k, which are northwesterly; conductor r which is close to northerly, and conductor a, which, because it is more rounded does not have an apparent strike.

The underlying rock type for all conductors seems to be the Slocan sediments. However, conductors j, k and l occur close to the Nelson granite contact. In fact the magnetics suggest that conductor l may occur within the granite, though, it is more likely that it is reflecting the contact itself. Conductor k and an unlabelled conductor to the immediate west of the property boundary probably reflect the contact as well.

Conductors j, k and l are quite interesting from an exploration point of view since they do occur close to the Nelson contact. As mentioned under 'Geology', several mineral deposits occur within the Slocan sediments adjacent to the Nelson Batholith. It is therefore a possibility that any of these conductors could be reflecting a mineral deposit.

A large, broad conductive zone occurs largely within the Center of the White Diamond claim. This could be reflecting a different petrological unit, or possibly an alteration zone associated with mineralization.

c) Lineations

Lineal trends considered to be indicative of geological structure have been drawn on Map 3 taking into account:
a) Magnetic lows which are often caused by the magnetite within the rocks being altered by geological structure processes.

b) VLF-EM anomalies which more often than not are reflecting structure.

c) Topographic depressions such as creek valleys which are usually caused by structure.

Several lineations that are indicative of faults and contacts have been mapped across the property striking in different directions but primarily northwest, and secondarily northeast. This is not surprising since the predominant trend of the geological structure in the general area is northwesterly. The northeast trend indicated cross-structure. Some or parts of the lineations in other areas have been known to correlate directly with lithologic contacts and shear zones.

The lineations cross each other on the property in different areas. Structure is often important for the emplacement of mineralizing fluids especially where lineations intersect. Thus these areas may have greater exploration interest.

Respectfully submitted,
GEOTRONICS SURVEYS LTD.

March 31, 1985

David G. Mark,
Geophysicist
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GEOPHYSICIST'S CERTIFICATE

I, DAVID G. MARK, of the City of Vancouver, in the Province of British Columbia, do hereby certify:

That I am a Consulting Geophysicist of Geotronics Surveys Ltd., with offices located at #403-750 West Pender Street, Vancouver, British Columbia.

I further certify:

1. That I am a graduate of the University of British Columbia (1968) and hold a B.Sc. degree in Geophysics.

2. I have been practising my profession for the past 16 years and have been active in the mining industry for the past 19 years.

3. That I am an active member of the Society of Exploration Geophysicists and a member of the European Association for Exploration Geophysicists.

4. This report is compiled from data obtained from airborne magnetic and VLF-EM surveys carried out by Columbia Airborne Geophysical Services (1984) Ltd., under the supervision of L. Brewer during the latter part of December, 1984.

5. I have no direct or indirect interest in any of the properties mentioned within this report, nor in the Rayrick Grubstaking Syndicate, nor do I expect to receive any as a result of writing this report.

David G. Mark
Geophysicist

March 31, 1985
AFFIDAVIT OF COSTS

I, Lloyd Brewer, president of Columbia Airborne Geophysical Services (1984) Ltd., certify that the airborne magnetic and VLF-EM surveys were flown in December of 1984, and that they were flown at a cost of $100/km, the total number of km being 260 to give a total cost of $26,000.00.

Lloyd Brewer

March 31, 1985