



31E11NE0015 2.3511 BUTT

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GEOLOGIC RECONNAISSANCE AND MAPPING
GRAPHITIC HORIZON
GRAPHITE LAKE, BUTT TOWNSHIP
NIPISSING DISTRICT, ONTARIO

22 May 1980

George E. W. Love
Professional Geologist
Certificate No. 3713

George E. W. Love

RECOMMENDATIONS

1. Trenching and drilling of the small topographic highs on Claims EO-514799, EO-514800, EO-514803, and EO-515060 should be conducted to determine the areal extent of the graphitic zone(s) and the downdip continuity and quality. These data will permit a reserve estimate to be prepared.
2. Claims EO-514798, EO-515061 and EO-515062 should be maintained until the trenching and drilling have been completed.
3. Bulk samples from the trenches and splits from the core dilling should be examined for their engineering as well as metallurgical characteristics.
4. Economic projections based on an open-pit mine operating 8 months per year at 2000 TPS with a 400 TPD flotation mill should be prepared prior to drilling to determine the range of tonnages and grades required to make a feasible project.

INTRODUCTION

A deposit of flake graphite was brought to the attention of Dravo Corporation in November of 1979, by Mr. P. G. Lacombe of Beloeil, Quebec, Canada.

Several short trips were made to the property in late 1979 and early 1980, and in May a geologic reconnaissance was conducted between 9 May and 13 May, 1980 to evaluate the potential of the property.

LOCATION AND ACCESS

The property lies in Butt Township, Nipissing District, Ontario, Canada, approximately 13.6 air miles NNE of the town of Kearney. The six unpatented claims occupy the northern half of Lots ⁶ ~~5~~ and ⁷ ~~8~~, Concession X, and portions of the unsubdivided lands north of Concession X.

Access to the property is via car. From Burk's Falls, the property can be reached by traveling south on Highway #11 to Highway #518 at Emsdale. At this intersection, proceed east on 518 to the north end of Sand Lake; then turn right onto a good gravel forest road which leads to an entrance of the Algonquin Provincial Park. Continue north past the entrance about 2-1/2 miles to the southeast end of Graphite Lake.

GENERAL AREA AND SITE DESCRIPTION

The regional topography is marked by the lakes, streams, bogs, and monadnock-like hills characteristic of the glaciated Canadian Shield. Overburden ranges from nothing on major portions of the hills, to a few feet on the lower flanks, to an unknown depth in the wider valleys. Vegetal cover is moderate, a blend of approximately one half conifers and one half deciduous trees, apparently second growth. Under bush is sparse to moderate.

The property has a moderate topography comprised of gently to steeply sloping hill-sides of 50 to 150-foot relief. The apparent eastern boundary of the graphitic zone is marked by a line of near-vertical slopes (fault scraps) 50 to 100 feet high. Three lakes, Graphite, McGuire and Minnow, occur within the 6000-foot strike length of the discontinuous graphite outcrops.

GEOLOGY

The area has not been mapped in detail by any governmental agency, but has been denoted as PreCambrian-Grenville in age. Field examination has differentiated two rock types on the claims:

1. Granitic gneiss - containing quartz, feldspar, and biotite with lesser amounts of mafic minerals. Banding ranging from a few millimeters to several centimeters in thickness, and appear to be mineral concentrations. Light grey to pink where fresh, weathers yellow to orange.
2. Metamorphosed Pelite to Quartzite - fine to coarse-grained sedimentary strata, predominately silica with secondary silica cement. Locally rich in carbon altered to graphite. Generally grey in color, weathers orange to rust brown.

The graphite appears as flakes, moderately to strongly oriented, in a metamorphosed sedimentary sequence of pelitic (silty) to arenaceous (sandy) beds. There seems to be a correlation between the original clast size, graphite flake size, and graphite concentration. The finer-grained rocks appear to have a higher concentration of smaller flakes, while the coarser-grained beds have a larger flake, but in lower concentrations.

The higher concentrations of graphite (the finer-grained rocks) seem to occur in small topographic highs strung along the eastern boundary of the zone of graphitic outcrops. These features are about 50 feet wide, 100 feet long, and 10 to 30 feet in height above the adjacent stream bed. Their

appearance suggests a string of pods, the long axis of each pod being parallel to the apparent strike of the outcrop. Visually estimated grade, as well as flake size, is greatest between Graphite and Minnow Lakes.

Graphite zone can be traced along a strike length of approximately 6000 feet, and intermittently over a maximum width of approximately 1000 feet. The true width of the zone is unknown, but is much less than 1000 feet. The thickness of the graphite-bearing strata is also unknown, but near Pits 2 and 3, a minimum thickness of 20 to 30 feet can be seen.

Granites or granitic gneisses are common to abundant, and are intimately associated with the graphitic sandstones. These igneous rock types are, in most cases, very hard and resistant, capping the small elevated areas marking the graphitic outcrops.

The rocks east and west of the graphitic zone are gneissic in texture, and rich in silica and amphiboles. Biotite is a common accessory mineral which occasionally becomes a major constituent.

The contacts between the graphite zone and rocks to the east and west are covered. To the east, the contact appears quite sharp, with the gneissic material standing 100 to 200 feet above the graphite area. It is probable the contact is marked by a fault. The northern "end" of the graphite zone appears to be marked by both a thinning of the graphite horizon, and a NW-trending depression which may also mark a fault. To the south and west, the grade decreases and gradually the flakes disappear.

Structurally, the graphitic zone appears as a series of cuesta-type slopes, facing northwest. The beds all trend $N30^{\circ}E$ and dip from 10° to 50° SE. The ridgelines cut this trend at $N55^{\circ}$ to $60^{\circ}E$ giving an en echelon appearance to the graphite outcrops.

Numerous small faults have cut the area. The most prominent topographic feature, which appears to be structurally controlled, is the straight, steep-sided ridgeline on the southeast side of the graphite zone. This undoubtedly is a scarp marking a high-angle fault striking $N60^{\circ}E$; there is insufficient information to resolve the movement, but it seems reasonable to assume, as an initial exploration model, that the south side is the up-thrown block with dip-slip movement of at least 50 feet. Other topographic features suggest the fault may have a right - lateral strike - slip component. To the southwest this feature appears to end at Minnow Lake, or perhaps turns and continues parallel to the bedding in the graphite zone.

There is a less prominent, but equally interesting suggestion of a NE-trending structural fabric. The intersection of these two trends gives rise to a number of small topographic highs with a frequency of 1000 to 2000 feet. Examination of the topographic sheet of this area shows a pronounced NW trending drainage which is suggestive of both glacial and structural control.

CONCLUSIONS

1. The graphitic zone extends along strike for at least 6000 feet, and can be seen over a maximum width of 1000 feet. This width, however, is due to high-angle faulting with subsequent repetition of horizons.

2. The maximum stratigraphic thickness actually seen is between 20 and 30 feet, and the thickness of granitic intrusive beds within this total is unknown, but could be significant.

3. The samples which were collected appear to represent the outcrops with the highest flake concentration, rather than the average grade.

George E. W. Love

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Dravo Corporation

Planning and Development

2.3511



RESUME OF PROFESSIONAL QUALIFICATIONS

G. E. W. LOVE

EDUCATION: University of Pittsburgh - Civil Engineering - Graduate Courses - Ongoing

Franklin and Marshall College - M.S., Geology - 1970

Pennsylvania State University - B.S., Geology - 1968

REGISTRATION: Certified Professional Geological Scientist, #3713
Certified Geologist, Maine, #138

PROFESSIONAL MEMBERSHIP: Association of Engineering Geologists
Association of Professional Geological Scientists
Society of Mining Engineers of AIME

SUMMARY OF PROFESSIONAL EXPERIENCE:

<u>Date</u>	<u>Employer</u>	<u>Supervisor</u>
March 1978 - Present	Natural Resources Group Dravo Corporation 3600 Neville Road Pittsburgh, PA 15225	Mr. M. W. Robinson, Manager Planning and Development Natural Resources Group

As Chief Geologist of the Planning and Development Department, Natural Resources Group, Mr. Love is responsible for the screening of a variety of minerals projects which are proposed for acquisition to Dravo Corporation. This work ranges from evaluation of reserves and preliminary mining feasibility of operating companies to the development of potential new mineral areas for the entry of Dravo Corporation. These projects have included the evaluation of: operating coal surface mines in Ohio, Maryland, Kentucky and West Virginia; an abandoned gold mine in Nevada; limestone deposits in Kentucky and Indiana; and a brucitic marble deposit in Texas.

Mr. Love also continues his involvement as a consultant in engineering geology to the Dravo Lime Company, and the Civil Marine and Mining, and Zeni-McKinney-Williams Divisions of Dravo Corporation.

January 1977 - February 1978	Dravo Lime Company 650 Smithfield Pittsburgh, PA 15222	Mr. L. W. Lobdell, Supervisor Application Engineering
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As Staff Engineering Geologist, Mr. Love was responsible for all geotechnical evaluations of: potential SO₂ scrubber sludge disposal sites; existing coal fines disposal area; and selection of new disposal areas for coal fines in conjunction with the use of a proprietary Dravo stabilizing agent. He has conducted and/or supervised preliminary and detailed evaluations for these projects in eastern Kentucky, West Virginia and southeastern Ohio.

He recently completed work on a 200-foot high earth and fly ash embankment in West Virginia. He was Civil Project Engineer on the project during the surface and subsurface investigations and embankment design.

Mr. Love was involved in the preparation of proposals for plant design construction management and contract mining of limestone in Arizona and coal in West Virginia.

June 1974 -
December 1976

Dravo Corporation
Power Projects Div.
P. O. Box 12405
Pittsburgh, PA 15231

W. H. Lord, Manager
Synearth Engineering

As Staff Geologist, Mr. Love was responsible for all preliminary geological investigations for potential SO₂ scrubber sludge disposal sites for coal burning power plants. This involved site selection, site reconnaissance, evaluations of leakage potential foundation conditions and types and quantities of available construction materials. He was solely responsible for the preparation of the feasibility reports with their conclusions and recommendations on site suitability. This type of work has been completed for a 200-foot high embankment in West Virginia, a 185-foot high embankment in Ohio, and several 100 to 250-foot high embankments in southwestern Pennsylvania. He was also responsible for all soils investigations and selection of borrow materials for construction of large stabilization ponds for SO₂ sludges at a power station in southwestern Indiana.

As these jobs moved into more advanced stages of evaluation and design, Mr. Love was the geological consultant to the Project Director on each project. In this capacity he reviewed and commented on the work done by geotechnical consultants retained to do detailed foundation investigations and embankment design. He worked in this capacity on a 400-foot high stage-constructed embankment in southwestern Pennsylvania.

Mr. Love was Project Director for an economic and technical evaluation of the feasibility of recovering coal trapped in river sand bars in West Virginia. He also directed the compilation of geologic information on all underground coal mines within the bounds of the 48 contiguous states for a study for the U.S. Bureau of Mines.

Mr. Love consulted with the Engineering Construction Division and Zeni-McKinney-Williams subsidiary of Dravo Corporation on geologic problems encountered during shaft construction and underground coal bin excavations in southwestern Pennsylvania and Illinois. This work included evaluation of geologic structures affecting construction, bad ground conditions, and groundwater inflows. He also designed a dewatering system for construction of a large embayment for a floating nuclear generator.

<u>Date</u>	<u>Employer</u>	<u>Supervisor</u>
October 1973 - May 1974	Dravo Corporation Research Center 4800 Grand Avenue Pittsburgh, PA 15225	Mr. M. W. Robinson Director of Research

As Geologist, Mr. Love was involved in the evaluation of a limestone deposit in Kentucky. His work involved review of data from chemical analyses of samples from core borings and the selection of the final mining horizon. He coordinated and supervised the preliminary foundations investigations for locating plant facilities for the limestone processing area and barge docking facilities and coordinated the work of a geophysical consultant who was performing electrical resistivity and seismic refraction surveys. He also supervised the work of a geological consultant retained to evaluate the limestone deposit.

During this work with Dravo's Research and Development Department, Mr. Love became deeply involved with the engineering geological work of Dravo's ECD Division and subsequently transferred to that division.

February 1971 -	General Analytics, Inc. (Now GAI, Inc.) 560 Beatty Road Monroeville, PA 15146	Mr. Richard E. Gray, Vice President
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Mr. Love's duties with General Analytics included: Surface geologic reconnaissance for site evaluations; subsurface investigations to evaluate foundation conditions and slope stability; mining studies to evaluate subsidence potential; field testing of soils and construction inspection for earth embankments; and numerous environmental studies involving the geologic and soils aspects of solid waste and impoundment disposal areas. He has designed subsurface boring programs for industrial and residential developments, mines, and earth structures; prepared cost estimates and supervised drilling operations. He has been responsible for the analysis of data collected and preparation of geotechnical reports including recommendations.

Specific projects in which Mr. Love has been involved include: Evaluation of groundwater conditions and environmental geology studies for solid waste (fly ash and bottom ash) disposal sites in Pennsylvania and West Virginia and sludge impoundments in Pennsylvania, New York and West Virginia; Supervision of a geotechnical investigation for a 2.5 mile coal conveyor, Harrison Power Station, Haywood, West Virginia; Design of a subsurface investigation and cost estimates for a multiple family-unit residential development; Design, supervision, analysis of results and report preparation to evaluate the feasibility of developing a large, undermined site for public and private housing, a shopping center and schools; Preliminary evaluation of soils data

and preparation of land use maps for a proposed new community in the drumlin fields of Wayne County, New York; Site reconnaissance and feasibility evaluation of a proposed sidehill storage area for bottom ash, Haywood, West Virginia; Preliminary evaluation of site conditions and estimates of remaining sand and gravel quantities for the Bruce Mansfield Power Plant, Shippingport, Pennsylvania; soils testing of embankment materials for a 10 mile long coal conveyor line, Meigs and Gallia Counties, Ohio; and Preparation of proposals and cost estimates for numerous foundation investigations and several research projects for the U.S. Bureau of Mines and Pennsylvania Department of Environmental Resources.

Just prior to leaving General Analytics, Mr. Love was involved in the site evaluation for a proposed 400-foot high earth and rockfill embankment to retain sludge in western Pennsylvania. He prepared the preliminary geologic evaluation of the site, including mineral evaluations and recommendations for subsurface investigations of potential problem areas. He was responsible for the work of three geologists who were supervising the drilling and pressure testing of the embankment area, and he led a team of geologists during field reconnaissance of the reservoir.

He was responsible for all the collection and preparation of all geologic data for environmental permits and design and environmental geologic aspects of this project which involved the installation of a groundwater monitoring system. This project, which will ultimately result in a 900-acre lake filled with stabilized SO₂ scrubber sludge, is the largest undertaking of its kind in Pennsylvania to receive approval from the Pennsylvania Department of Environmental Resources - Division of Water Quality.

PUBLICATIONS:

LOVE, G.E.W., 1970. Interpretation of the Depositional Environment of Cyclic Carbonate Rocks of the Conococheague Group near Morgantown, Southeastern Pennsylvania; M.S. Thesis, Franklin and Marshall College.

LOVE, G.E.W., 1975. Some Engineering Geologic Problems of Reservoir Siting in Pennsylvanian Sedimentary Terrains; (abs.) Geol. Soc. America Bull. v. 7, No. 1, Abs. With Programs, Jan., 1975, p. 90.

LOVE, G.E.W., 1978. Evaluation of Abandoned Strip Mines for Hydraulic Disposal of Power Plant Wastes - A Case Study; (abs.) Assoc. Engng. Geol., 1978 Annual Meeting, Oct. 16-21, 1978.

LOVE, G.E.W., and Kauffman, M.E., 1969. Structural Interpretation of the Geology near Morgantown, Southeastern Pennsylvania: Proc. Pa., Acad. Sci., V. 43, p. 177-179.



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

OCT 20 1980

MINING LANDS SECTION

Type of Survey(s) Geologic Survey
Township ~~on Area~~ Butt
Claim Holder(s) H. Barry
J. McVittie
Survey Company Dravo Corporation
Author of Report George E.W. Love
Address of Author 3600 Neville Rd., Pgh., Pa. 15225
Covering Dates of Survey May 5 to May 22, 1980
(linecutting to office)
Total Miles of Line Cut None

MINING CLAIMS TRAVERSED
List numerically

EO	514798
(prefix)	(number)
EO	514799
EO	514800
EO	514801
EO	514802
EO	515060
EO	515061
EO	515062

If space insufficient, attach list

<u>SPECIAL PROVISIONS CREDITS REQUESTED</u>	<u>DAYS per claim</u>
ENTER 40 days (includes line cutting) for first survey.	Geophysical -Electromagnetic _____ -Magnetometer _____ -Radiometric _____ -Other _____
ENTER 20 days for each additional survey using same grid.	Geological <u>16</u> Geochemical _____

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

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

DATE: 30 MAY SIGNATURE: George E.W. Love
Author of Report or Agent

Res. Geol. _____ Qualifications qual on this file

Previous Surveys

File No. Type Date Claim Holder

File No.	Type	Date	Claim Holder

TOTAL CLAIMS 7

OFFICE USE ONLY

SELF POTENTIAL

Instrument _____ Range _____

Survey Method _____

Corrections made _____

RADIOMETRIC

Instrument _____

Values measured _____

Energy windows (levels) _____

Height of instrument _____ Background Count _____

Size of detector _____

Overburden _____

(type, depth - include outcrop map)

OTHERS (SEISMIC, DRILL WELL LOGGING ETC.)

Type of survey _____ Geologic Mapping

Instrument _____ Pace and Brunton Compass

Accuracy _____ + 10 feet (+ 3 meters)

Parameters measured _____ Pertinent geologic data such as rock type, areal distribution, and mineral concentration; structural data, i.e., strike, dip, plunge of

Additional information (for understanding results) _____ beds, bands, joints, faults, etc.

AIRBORNE SURVEYS

Type of survey(s) _____

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

Accuracy _____
(specify for each type of survey)

Aircraft used _____

Sensor altitude _____

Navigation and flight path recovery method _____

Aircraft altitude _____ Line Spacing _____

Miles flown over total area _____ Over claims only _____