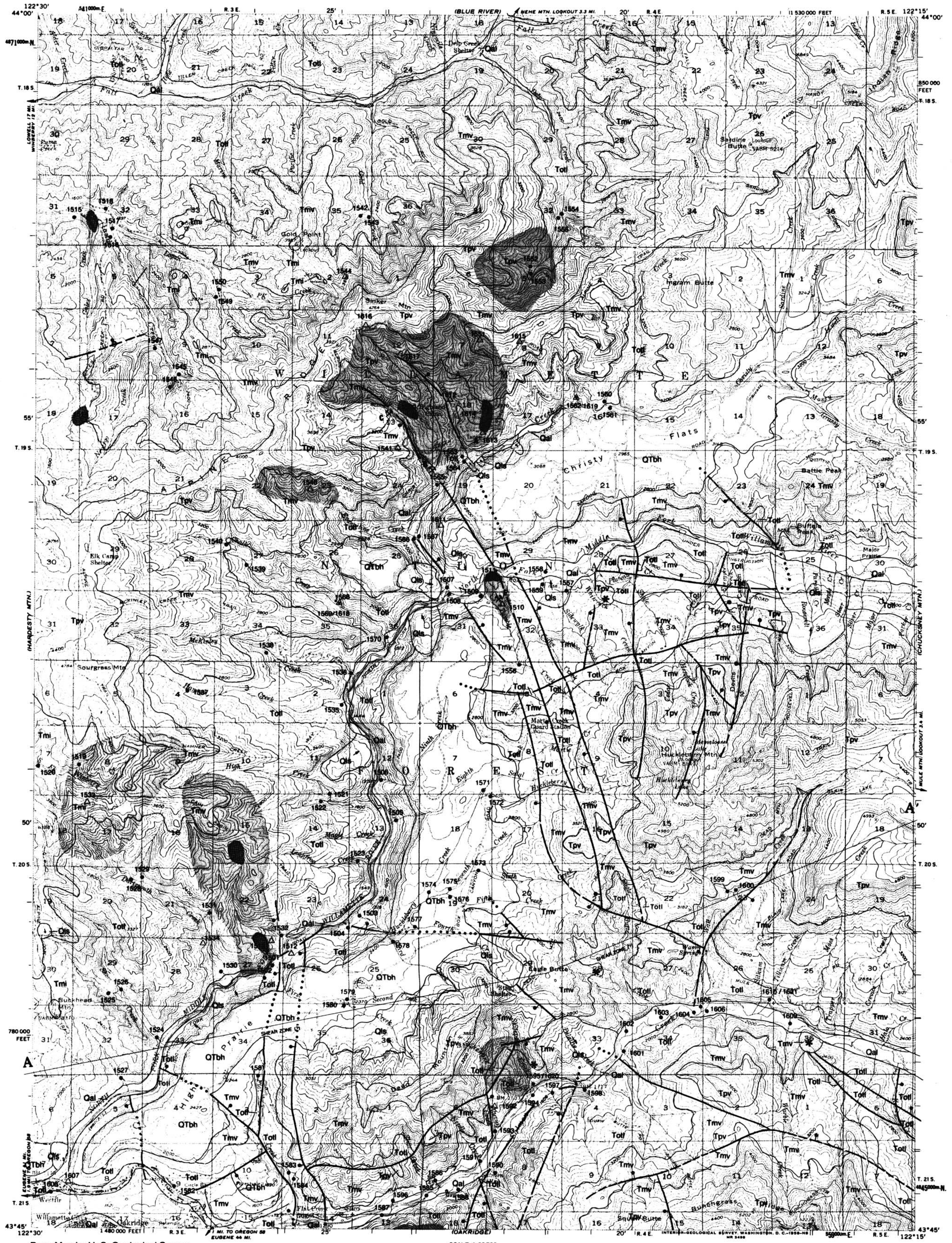
STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
DONALD A. HULL, STATE GEOLOGIST

Map Showing Sample Locations, Mines and Prospects, Alteration, and Geology of the Sardine Butte Quadrangle, Lane County, Oregon

1983

0-83-5
Mineral potential of the Fall Creek mining district:
A geological-geochemical survey
By J.J. Gray and D.A. Berri
Funded in part by the U.S. Forest Service under purchase order no. 43-04H1-1-2373
PLATE I



Base Map by U. S. Geological Survey
Control by USGS, USC&GS, and USCE
Topography from aerial photographs by multiplex methods
Aerial photographs taken 1954. Field check 1956
Polyconic projection. 1927 North American datum
10,000-foot grid based on Oregon coordinate system, south zone
1000-meter Universal Transverse Mercator grid ticks, zone 10, shown

APPROXIMATE MEAN DECLINATION, 1956

SCALE 1:62500

CONTOUR INTERVAL 80 FEET
DATUM IS MEAN SEA LEVEL

QUADRANGLE LOCATION

Geologic compilation, aerial photo interpretation, and field work by D.A. Berri, 1982
Geology modified from Brown and others (1980)

Map prepared by
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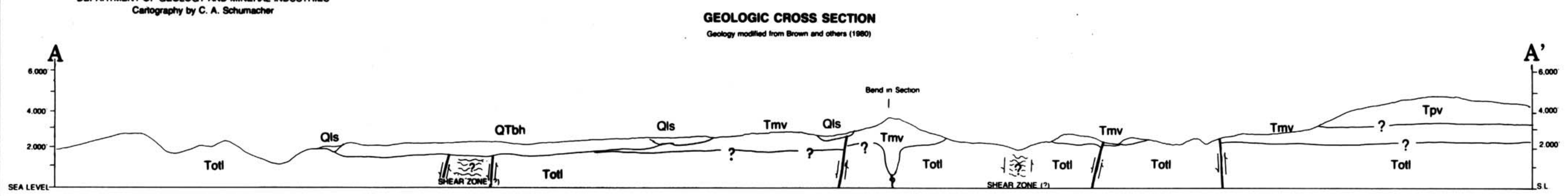
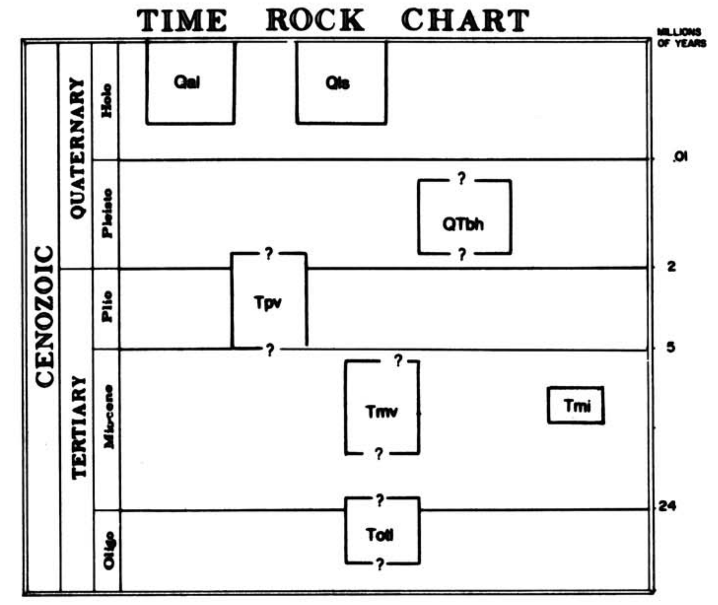
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
Cartography by C. A. Schumacher

GEOLOGIC CROSS SECTION

Geology modified from Brown and others (1980)



TIME ROCK CHART



Time rock chart modified from Brown and others (1980)

EXPLANATION

SURFICIAL DEPOSITS

Qal — **Recent alluvium and glacial deposits (Quaternary)** — *Unconsolidated, locally stratified deposits of silt, gravel, cobbles, and boulders up to 5 m in diameter; lenses of varved silts and clays where glacial deposits predominate. Forms flat-lying to hummocky deposits along river and creek channels. Includes undifferentiated alluvial, terminal-moraine, and glacial-outwash deposits*

Qls — **Landslide deposits (Quaternary)** — *Unconsolidated slump and slide blocks of bed rock and debris containing silt- and clay-size particles to blocks 250 m long. Direction of movement is indicated by arrows*

BEDROCK GEOLOGIC UNITS

Volcanic rocks of the upper High Cascades
(late High Cascade episode of Priest and others, 1983)

QTbh — **Basalts of High Prairie (upper Pliocene or Pleistocene?)** — *Medium-grey, diktytaxitic, glomeroporphyritic, olivine-bearing basalt flows, with euhedral to subhedral plagioclase phenocrysts. Forms a series of intracanyon flows in the canyon of the North Fork of the Middle Fork of the Willamette River north of Oakridge. Equivalent to basalts of High Prairie of Brown and others (1980) and to Pliocene-Pleistocene(?) basaltic lavas of Woller and Priest (1983); partially equivalent to volcanic rocks of the High Cascades, undivided, of Peck and others (1964)*

Volcanic rocks of the lower High Cascades
(early High Cascade episode of Priest and others, 1983)

Tpv — **Pliocene volcanic rocks (Pliocene-lower Pleistocene?)** — *Medium- to light-grey, diktytaxitic, glomeroporphyritic to aphyric olivine-bearing basaltic and andesitic flows with euhedral to subhedral plagioclase phenocrysts. Includes interflow pyroclastic and epiclastic rocks and quartz- and hypersthene-bearing dacitic flows and plugs. Unit caps ridges. Equivalent to Pliocene volcanic rocks and Pliocene (?) dacitic rocks of Brown and others (1980), upper Miocene lavas of Woller and Priest (1983), and Outerson formation of White (1980)*

Volcanic rocks of upper Western Cascades
(late Western Cascade episode of Priest and others, 1983)

Tmv | Tmi — **Miocene volcanic rocks (Miocene)** — *Dark-grey to black, dense, porphyritic, two-pyroxene plagioclase-rich andesite with minor basalt and dacite flows, autobreccias, tuffs, lapilli tuffs, ash flows, mudflows, and debris flows. Includes sanidine- to quartz-bearing rhyodacite and dacite flows, plugs, and dikes. Unit* **Tmi** *is intrusive equivalent. Unit* **Tmv/Tmi** *is equivalent to Miocene volcanic rocks and Miocene silicic rocks of Brown and others (1980), Miocene andesitic lavas of Woller and Priest (1983), and Sardine Formation of Peck and others (1964)*

Volcanic rocks of the lower Western Cascades
(early Western Cascade episode of Priest and others, 1983)

Totl — **Oligocene(?) and lower Miocene tuffs and lavas** — *Lithic tuffs, lapilli tuffs, and laharic tuffs; rocks of unit are sheared, altered, and contain green, low-grade metamorphic minerals. Unit includes minor flows of highly altered basalt and andesite flows and autobreccias. Equivalent to Oligocene(?) volcanic rocks of Brown and others (1980), Oligocene and lower Miocene tuffs and lavas, undifferentiated, of Woller and Priest (1983), Little Butte Volcanic Series of Peck and others (1964), and Breitenbush formation of White (1980)*

ALTERATION ZONES

Limonite/pyrite staining

Bleaching

Silicification

MAP SYMBOLS

Contact — Approximately located by reconnaissance mapping and aerial photo interpretation

Fault — Solid where exposed, dashed where inferred, dotted where concealed. Bar and ball on downthrown side

* **Volcanic center** — Includes volcanic pipes, necks, plugs, dikes, and shield volcanoes

Sample sites

1509 ● Stream-sediment sample site
△ 1506 Rock-chip sample site
1506 ▲ Both stream-sediment and rock-chip sample site

Mines or prospects

△A. Blanket
⚒B. Christy
⚒C. Fletcher
△D. Golden Eagle
⚒E. High Prairie
△F. Ironside

REFERENCES

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Priest, G.R., and Vogt, B.F., eds., 1982, Geology and geothermal resources of the Cascades, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report 0-82-7, 206 p.

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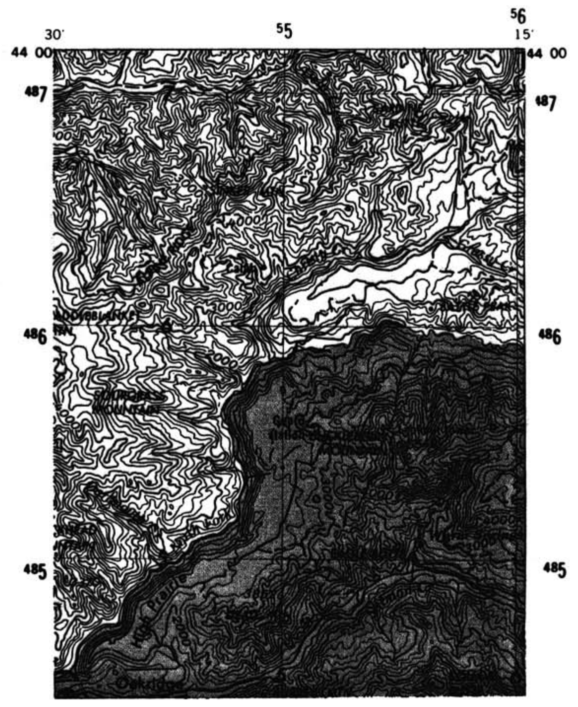
White, C.M., 1980, Geology of the Breitenbush Hot Springs quadrangle, Oregon: Oregon Department of Geology and Mineral Industries Special Paper 9, 26 p.

Woller, N.M., and Priest, G.R., 1982, Geology of the Lookout Point area, Lane County, Oregon, *in* Priest, G.R., and Vogt, B.F., eds., Geology and geothermal resources of the Cascades, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report 0-82-7, p. 119-134.

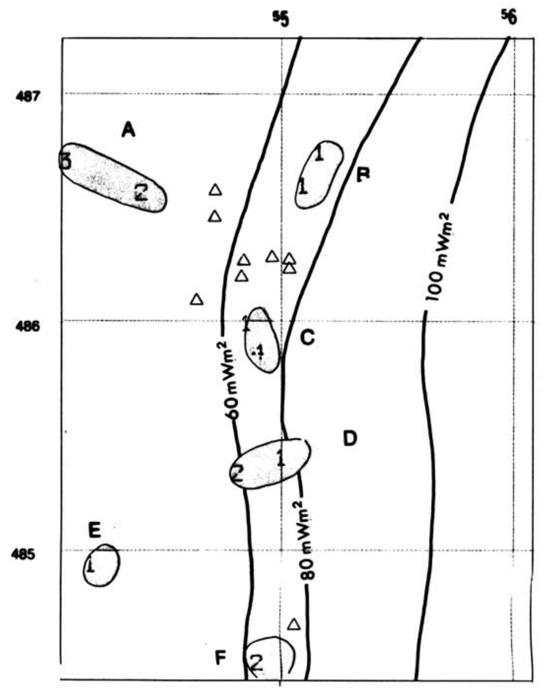
ELEMENT ABUNDANCE MAPS



Index to sources of map data

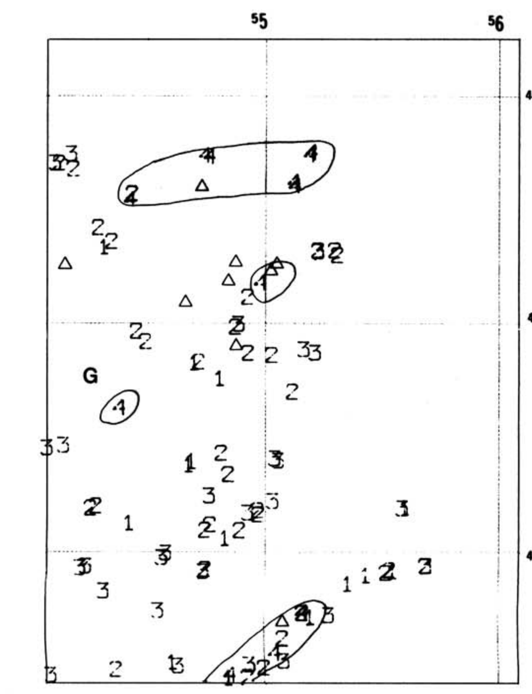
Geologic compilation, aerial photo interpretation, and field work by D.A. Berri, 1982

Geology modified from Brown and others (1980)



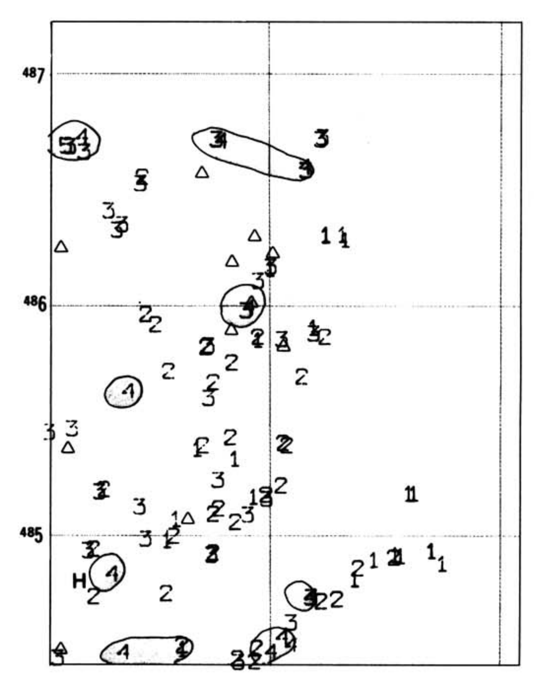
GOLD

Symbol	Silt-sample assay values (ppm)
1	0.0 to 0.005
2	0.0051 to 0.015
3	0.0151 to 0.030
4	0.0301 +
○A-F	Silt-sample anomalous area. Letters indicate areas discussed in text
△	Rock-chip sample assay value greater than 0.0049 ppm
-80mW/m²-	Heat-flow contours from Black and others (1982, Plate 7)



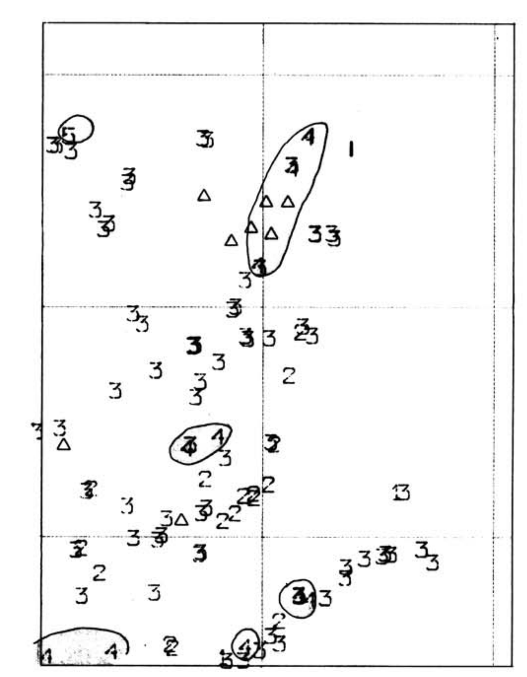
SILVER

Symbol	Silt-sample assay values (ppm)
1	0.0 to 0.02
2	0.021 to 0.04
3	0.041 to 0.07
4	0.071 +
○G	Silt-sample anomalous area. Letter indicates area discussed in text
△	Rock-chip sample assay value greater than 0.071 ppm



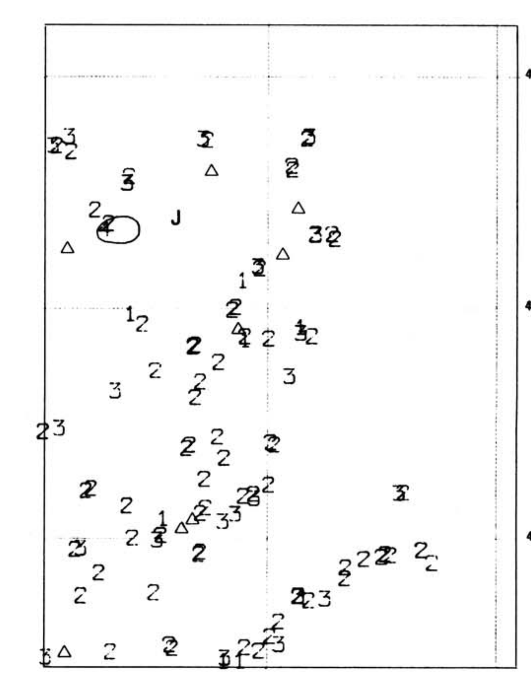
ARSENIC

Symbol	Silt-sample assay values (ppm)
1	0.0 to 1.0
2	1.1 to 3.0
3	3.1 to 10.0
4	10.1 to 40.0
5	40.1 +
○H	Silt-sample anomalous area. Letter indicates area discussed in text
△	Rock-chip sample assay value greater than 10.1 ppm



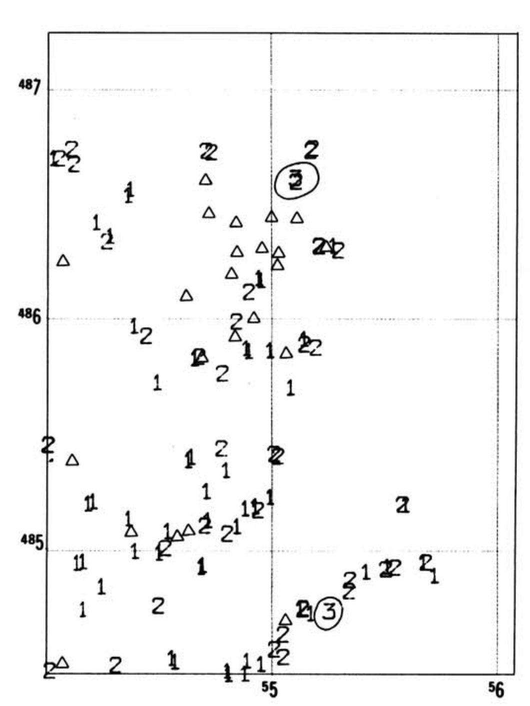
COPPER

Symbol	Silt-sample assay values (ppm)
1	0.0 to 7.5
2	7.51 to 12.0
3	12.1 to 22.0
4	22.1 to 32.0
5	32.1 +
○I	Silt-sample anomalous area. Letter indicates area discussed in text
△	Rock-chip sample assay value greater than 22.1 ppm



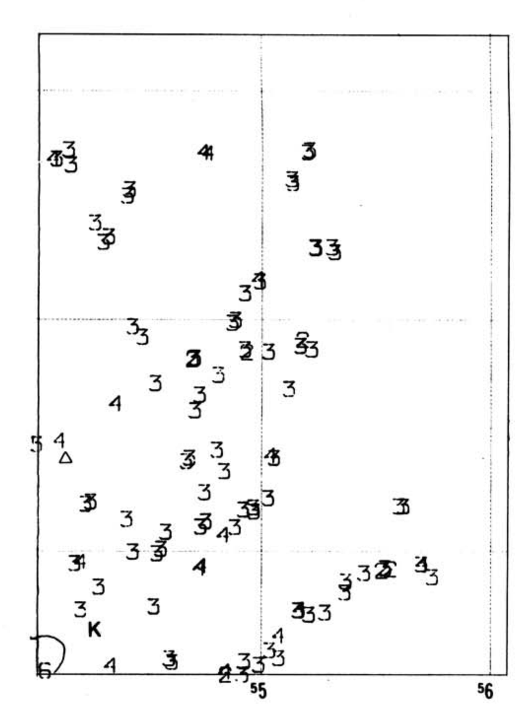
MERCURY

Symbol	Silt-sample assay values (ppm)
1	0.0 to 0.03
2	0.031 to 0.10
3	0.101 to 0.25
4	0.251 +
○J	Silt-sample anomalous area. Letter indicates area discussed in text
△	Rock-chip sample assay value greater than 0.251 ppm



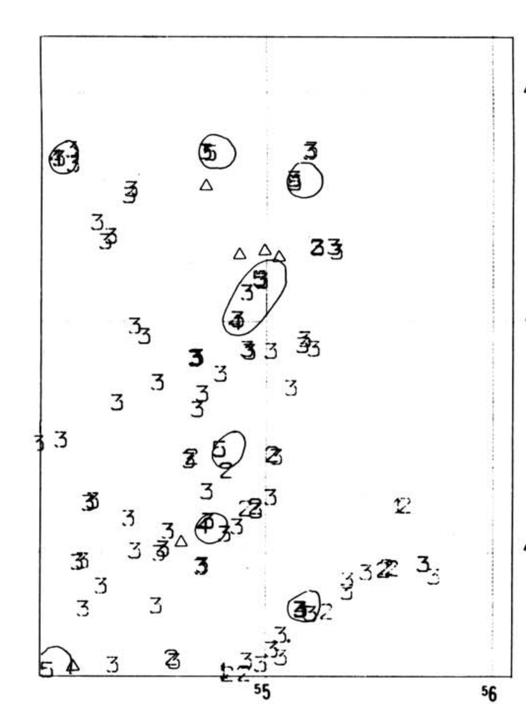
MOLYBDENUM

Symbol	Silt-sample assay values (ppm)
1	0.0 to 1.0
2	1.1 to 2.0
3	2.1 +
△	Rock-chip sample assay value greater than 2.1 ppm
○	Silt-sample anomalous area.



LEAD

Symbol	Silt-sample assay values (ppm)
2	0.0 to 4.6
3	4.61 to 11.0
4	11.1 to 19.0
5	19.1 to 25.0
6	25.1 +
○K	Silt-sample anomalous area. Letter indicates area discussed in text
△	Rock-chip sample assay value greater than 25.1 ppm



ZINC

Symbol	Silt-sample assay values (ppm)
1	0.0 to 20.0
2	20.1 to 37.0
3	37.1 to 60.0
4	60.1 to 75.0
5	75.1 +
△	Rock-chip sample assay value greater than 60.1 ppm
○	Silt-sample anomalous area

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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OPEN-FILE REPORT 0-83-5

MINERAL POTENTIAL OF THE FALL CREEK MINING DISTRICT: A GEOLOGICAL-GEOCHEMICAL SURVEY

by

Jerry J. Gray and Dulcy A. Berri
Oregon Department of Geology and Mineral Industries

1983

This work was funded in part by the U.S. Forest Service
under Purchase Order No. 43-04H1-1-2373

NOTICE

The Oregon Department of Geology and Mineral Industries is publishing this paper because the subject matter is consistent with the mission of the department. To facilitate timely distribution of information, this paper has not been edited to our usual standards.

CONTENTS

Page

ILLUSTRATIONS

Figures

Tables

Microfiche

EXECUTIVE SUMMARY

An agreement was negotiated between the U.S. Forest Service (USFS) and the Oregon Department of Geology and Mineral Industries (DOGAMI) for a study of the mineral potential of part of the Sardine quadrangle, Oregon. As part of the study, a geologic map was prepared, the distribution of alteration zones was mapped, and 124 geochemical samples were collected and assayed.

The results of the study indicate that mineralization is more widespread than had been reported previously. The study identified anomalous areas that warrant further study. Recommendations include (1) assay of heavy-mineral stream-sediment samples and (2) closer spacing of the stream-sediment and rock-chip samples. The economic metals most likely to be present in the study area are gold and silver.

INTRODUCTION

Objective

The objectives of the study were to (1) prepare a geologic map of the study area at a scale of 1:62,500, (2) review and update information on known mineral deposits, (3) systematically collect and analyze stream-sediment and rock-chip geochemical samples in order to delineate mineralized areas, and (4) integrate and publish the geologic map and resource data in a publication of the Oregon Department of Geology and Mineral Industries (DOGAMI).

Background

The project area is located in Lane County and includes the western portion of the Sardine Butte 15-minute quadrangle (scale 1:62,500) (Figure 1). Nearly all of the study area is on Federal land managed by the Willamette National Forest. The future use of the Federal lands in the project area cannot be properly planned without detailed geologic data which show areas that (1) are known to be mineralized and (2) are geologically favorable for mineral deposits.

Geologists of DOGAMI and its predecessor organization, the Oregon Bureau of Mines and Geology, have been collecting and publishing data on the geology and mineral resources of the State since 1914. Until now, DOGAMI's publications and files have been the chief source of data on the geology and the results of past exploration, development, and production of mineral deposits in the project area. The U.S. Forest Service (USFS), however, determined that this data base was inadequate for today's planning needs, and this study was initiated. As part of the project, a geologic map of the entire Sardine Butte 15-minute quadrangle was compiled, and a smaller area was chosen for sampling.

The project area has at its core the Fall Creek mining district, located in T. 19 S., Rs. 3 and 4 E., which is the site of low-grade gold mineralization which was mined between 1901 and 1931. The known mines and prospects of the study area are listed in Table 1.

Gold and pyrite mineralization was discovered in the area in 1881, the Ironside Mine (Plate 1, mine F) was worked in a small way for several years, and ore was ground in a five-stamp mill. The amount of gold recovered

Table 1. Known mines and prospects*

Name	Location on map on Plate 1	Location T.(S.)	R.(E.)	Section	Subsection	Geology	Mineralization	Development
Blanket	A	19	4	18	E ½	Iron-stained tuff breccia	Limonite	Numerous trenches and pits.
Christy	B	19	4	19	NW ¼	Vein of clay-altered silicified tuff breccia	Pyrite	Caved underground workings.
Fletcher	C	19	3	13	NW ¼	Veinlets of cherty quartz in clay alteration zone	Pyrite	Caved underground workings.
Golden Eagle (Jumbo or Hyland)	D	19	3	13	NE ¼	Mineralized clay alteration zone, 200-ft-wide trending north	Pyrite, gold	Three adits with a total of 660+ ft of workings.
High Prairie	E	19	4	30 31 32	S ½ E ½ SW ¼	750-ft-wide clay alteration zone with silicified areas. Forms a landslide at the junction of North Middle Fork of Willamette River	Pyrite	One adit with 20 ft of workings. Open pit for road metal.
Ironside	F	19	4	18	E ½	Clay alteration zone, iron-stained	Limonite, gold	Three adits with a total of 210 ft of workings. Small amount of ore was mined and ground in a five-stamp mill between 1901 and 1931.

* Sources: Callaghan and Buddington, 1938, and Brooks and Ramp, 1968.

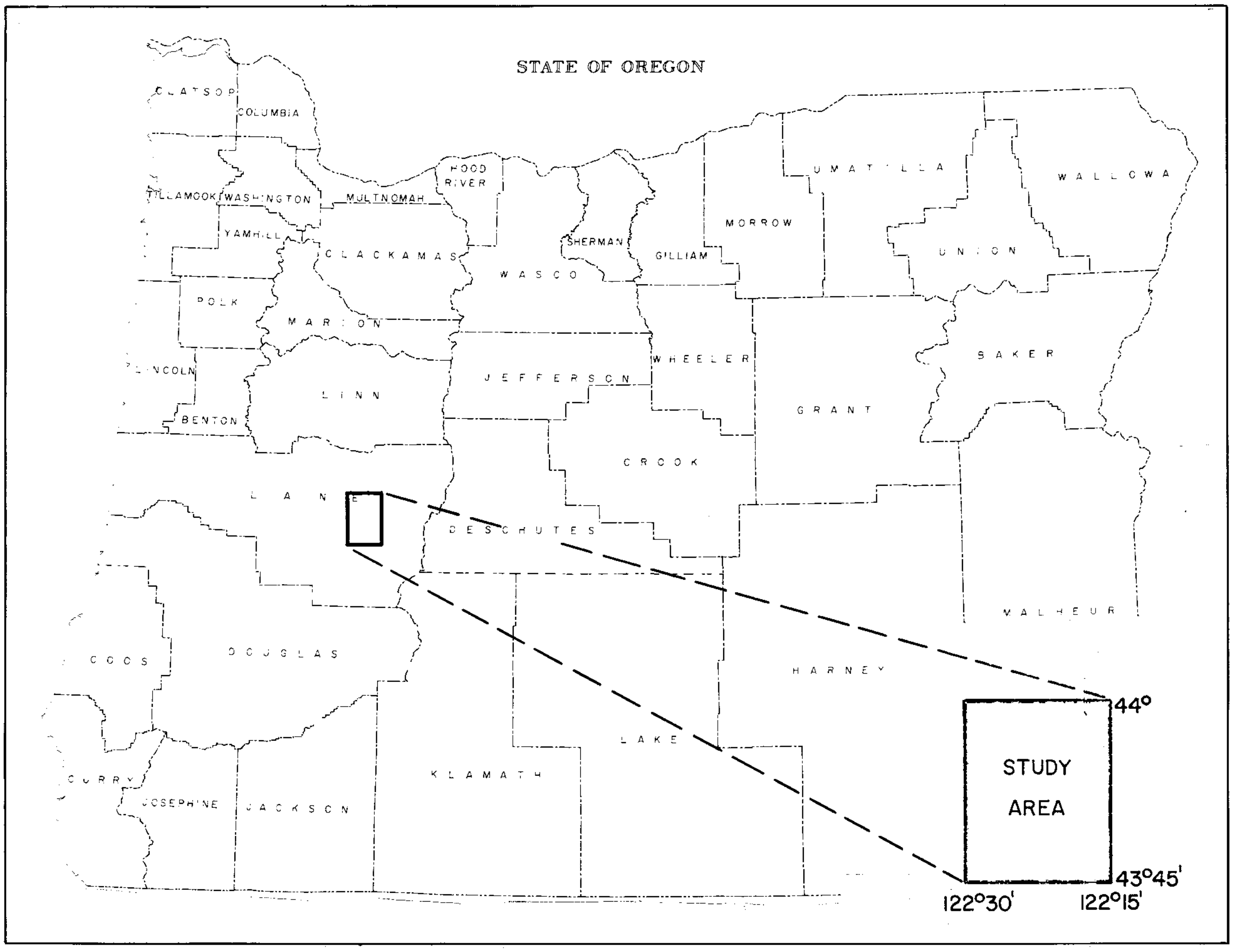

Figure 1. Index map of the Sardine Butte quadrangle.

was not recorded. Within the Fall Creek mining district, volcanic rocks of the upper Western Cascades (Miocene) have been intruded and mineralized by sanidine- to quartz-bearing rhyodacite and dacite plugs and dikes. Gold occurs in quartz veins and in disseminated zones without any apparent structural controls. Gold in quartz veins is associated with comb and cockade quartz. Pyrite is apparently the only sulfide present in the district. An estimated total of 1,000 ft of adit has been driven in the entire district (Callaghan and Buddington, 1938; Brooks and Ramp, 1968; Mason and others, 1977). In spite of this previous mining, however, at the time of this study, the only underground workings that were accessible were about 20 ft of the Golden Eagle adit (Plate 1, mine D).

Physiography

This study area is in a portion of the Western Cascade Range lying between Fall Creek to the north and the town of Oakridge to the south. Rugged and heavily vegetated slopes are broken by clear cuts and an extensive network of logging roads. Drainage is principally into the North Fork of the Middle Fork of the Willamette River that flows south-southwest across the study area. To the north, however, Alpine Ridge forms a divide north of which streams flow north to Fall Creek. To the southeast, Salmon Creek drains the area southeast of Dead and Huckleberry Mountains.

Funding

The USFS and DOGAMI negotiated an agreement in which the amount of $20,041 as part of Purchase Order No. 43-04H1-1-2373 was to be used to do this study. The project was started in the fall of 1982 and was completed by the summer of 1983.

Deliverables

The following deliverables were called for in the agreement and are part of this report:

(1) A compilation blackline geologic map (scale 1:62,500) of the Sardine Butte 15-minute quadrangle incorporating bedrock geology and areas of hydrothermal alteration;

(2) A geochemical sample-site location map (scale 1:62,500) containing locations of known mines and prospects;

(3) A tabulation of all geochemical data developed during the course of the project;

(4) An element-abundance map (scale 1:250,000) for each of the eight elements assayed;

(5) A short report discussing quality control, analytical methods, statistical treatment of the analytical data, and conclusions regarding the mineral-resource potential of the study area that will be useful for USFS planning purposes.

Acknowledgments

Jerry Gray was in charge of the total project. Dulcy Berri was in charge of the field work, thereby compiling the geologic map, mapping the alteration zones, and taking most of the samples. Clayton Schwartz was responsible for the analytical work. Others from DOGAMI who helped with the project included Beverly Vogt, publications manager; Klaus Neuendorf, editor; Paul Staub and Charles Schumacher, cartographers; and Anne Bradley, Kathleen Mahoney, and Barbara Jacob, typists.

Funding was secured through the support and encouragement of the late Milvoy M. Suchy, USFS, Portland. Help and advice were received from Conny Frisch, Eugene, and Robert Barstad, John Phipps, and David Murdough, Oakridge, all of the USFS. Robert Brenne of the Oregon State Computer Center provided the computer outputs. Reviewers were George R. Priest, DOGAMI, and Michael L. Cummings, Portland State University.

GEOLOGIC MAP COMPILATION

The study area lies within the Western Cascade province. In a simplified model, the oceanic Pacific Plate is being subducted under the continental North American Plate off the Oregon coast. As part of the subduction process, magma has been generated, resulting in numerous intrusions and volcanic eruptions that have formed the Cascade Range. Between 10 and 3 m.y. B.P., numerous dioritic-dacite intrusions (Priest and others, 1983) were emplaced into Tertiary volcanic rocks (lavas and tuffs) of the study area. The subduction process associated with volcanic and intrusive activity has also produced a great amount of fracturing, faulting, and shearing.

During these processes, the intrusions acted as heat sources, and the faulting and shearing became the piping system that allowed water to circulate and become heated and chemically active. Water at higher temperatures acts as solvent and can alter and mineralize the rocks through which it passes.

The geologic map, legend, and cross section (Plate 1) of this report were compiled from six major sources: Callaghan and Buddington (1938), Peck and others (1964), Brown and others (1980), Priest and others (1983), Woller and Priest (1982), and aerial photo interpretation.

The geologic map is a compiled map, and there was no field mapping. It is clear from mapping outside of the study area and from observations made in a minor portion within the study area that further work would result in some reinterpretation of the geologic map. Therefore, the geologic map should not be viewed as the final detailed geologic map of the area but rather should be used as a generalized geologic map on which alteration/mineralization patterns and the geochemical trends and anomalies can be observed.

STRATIGRAPHY

The Sardine Butte quadrangle is underlain by a calc-alkaline volcanic sequence of Oligocene(?)- and Miocene-age rocks which have been intruded by plugs and dikes. These rocks have been deeply eroded and partly covered by Pliocene-Pleistocene lava flows. The older rocks were faulted, sheared, altered, and mineralized.

During the Oligocene, volcanism was mainly in the form of silicic pyroclastic tuffs and breccias (map unit Totl, Plate 1). These rocks, which tend to be soft, alter to greenish-color rocks. Following the emplacement of the tuffs and breccias, uplift continued, and erosion produced steep-walled canyons. During the Miocene, these canyons were filled by lavas and subordinate tuffs (map unit Tmv) ranging in composition from basalt to andesite to rhyodacite. Sanidine- to quartz-bearing rhyodacite and dacite plugs and dikes were intruded into units of both ages. These intrusions acted as heat pumps to drive the geothermal systems which produced the alteration patterns and mineralization. Uplifting continued, along with formation of steep-sided canyons that, during the Pliocene, were filled by lava flows. Continued uplift and erosion have left these intra-canyon flows as ridge cappings. Rocks of all ages were further intruded by dacites. The Pliocene rocks are also altered and mineralized. The youngest series of intracanyon flows (map unit QTbh) are of late Pliocene or Pleistocene age. These basalts of the High Cascade episode, which crop out at High Prairie and Christy Flats, are not altered or mineralized. Recent alluvium and glacial deposits (Qal) are found along the present-day stream channels, and great landslides (Qls) have occurred. Perpendicular to the stream channels and canyon walls, some of the landslides appear to be centered at (1) intersections of faults and shear zones and (2) zones of alteration.

GEOCHEMICAL SURVEYING

Introduction

The sparse, previously published data (Callaghan and Buddington, 1938) suggested that the Fall Creek mining district is favorable for the occurrence of precious (gold and silver) and base (copper, lead, zinc, and molybdenum) metals in high-grade veins and disseminated deposits. For that reason, a systematic, stream-sediment soil- and rock-sampling program was undertaken to confirm mineralized zones in areas known to be mineralized and to delineate previously unknown occurrences of mineralization outside of the mining district. The 124 samples that were collected were assayed for gold, silver, arsenic, copper, mercury, molybdenum, lead, and zinc. A computer program was used (1) to store, retrieve, summarize, and print both the site and analytical data, and (2) to plot element assay-value maps.

Sample Collecting

Sampling and mapping of alteration (discussed in a later section) were conducted during October 1982. Three types of samples were collected. Stream-sediment sampling of the area included collecting two types of samples per site: (1) stream-deposited silt, and (2) a heavy-mineral concentrate panned from stream gravels. The third type of sample was collected at sites of conspicuous alteration (bleaching and/or iron-staining) which were found most frequently in road cuts.

The heavy-mineral concentrates were obtained by sieving stream gravels and sands to yield a full gold pan of minus-¼-in. material. Panning then reduced the volume of the sample and removed most lighter rock chips and minerals. The silt and concentrate samples were placed in brown paper envelopes and were later hung from racks to air dry. Rock samples were stored in cloth bags. A computer data form was completed (Figure 2) for each sample. Sample-site locations are shown on the map on Plate 1. Locations of sediment samples are shown as a dot, and rock-chip samples as a triangle. In addition, each of the known mines and prospects is marked with a letter (A through F) on this map.

Pan concentrates may include detrital sulfide grains, heavy resistate minerals (e.g., cassiterite), unweathered silicates (e.g., garnet), or rock fragments containing heavy minerals (Levinson, 1980). The likelihood of detecting an anomaly may be increased by collecting panned concentrates; however, because of funding limitations, these samples were not assayed for this study and are stored in the DOGAMI warehouse for assay at some future date.

Computer System

The USGS has developed computer systems (Rock Analysis Storage System [RASS] and Statistical Package [STATPAC]) to store, retrieve, and statistically analyze geochemical and geological assay data. The system is also interactive with a graphical plotter so that element data can be plotted on a map through the use of software available from the USGS. The systems were placed on line at the Oregon State University Computer Center. Figure 2 is a completed sample-site data-entry form which is divided into four sections containing information which is transfered to four different computer punch cards so that all the location and descriptive information about a sample and a sample site can be entered on the computer. The card number is in the lower right-hand corner of each section on the data-entry form. The field number (the number given to the sample when it is taken) must be on all cards. In the sample shown in Figure 2, the data for card 1 indicate to the computer that three data cards are to be entered. Data for the second section, card 2, are self-explanatory, except for the term "subsections." In this computer program, a section (one square mile) is quartered, with a "6" equaling the northeast quarter, "7" equaling the northwest quarter, "8" equaling the southeast quarter, and a "9" equaling the southwest quarter. The first number is the quarter section. The second number is the quarter-quarter section. The third number is the quarter-quarter-quarter section. Thus, for example, "6,6,9" is the southwest quarter of the northeast quarter of the northeast quarter. The sample is located within a 10-acre area.

Data for card 3 give the Universal Transverse Mercator (UTM) coordinates of the sample site and the geological map symbols for each of the geological formations which could have contributed to the sample site. The first geological symbol is for the geologic unit where the sample is taken, the next is from farther upstream, and if there is another number, it is from even farther upstream. In Figure 2, for example, the letters "TOTL" stand for "volcanic rocks of the lower Western Cascades," which are exposed at the sample site, and "TMV" means "volcanic rocks of the upper Western Cascades," which crop out upstream from the sample source.

The last section contains data for card 5, because, in this system, card 4 is not used. The USGS master code list (U.S. Geological Survey, 1969, 1970) was used to fill in data for card 5. In Figure 2, the "B" under material class means "unconsolidated sediment," "A" under sample type means "single" (grab), "G" under sample source means "other" (the terms listed under sample source do not include stream bed), "E" under rock type means "unconsolidated sediment," "Z" under geologic age means "Holocene," and "SI" under rock names means "silt".

Figure 3 shows a completed assay-data computer input form. Only one card is needed to input assay data for eight elements.

This computer system was used in this study to retrieve, analyze, and print out the data. It was also used to plot the data in form of histograms, scatter graphs, and element abundance maps. All computer-derived data are shown on the two microfiche which are part of this study.

Laboratory Support

General

The role of DOGAMI's laboratory in this project was four-fold. The first was to oversee, from the assaying standpoint, the taking, handling, and storage of the samples. As part of this project, the heavy-mineral pan concentrates that were collected at each stream-sediment site were put in chronological order and stored for future use by DOGAMI and/or the USFS.

The second laboratory task was to perform the assaying for silver (Ag), copper (Cu), lead (Pb), and zinc (Zn). The third was to choose outside laboratories to do the assaying for gold (Au), arsenic (As), mercury (Hg), and molybdenum (Mo). A total of three outside laboratories was involved in the assaying. The fourth role of the laboratory was the providing of quality control within and between the laboratories, including DOGAMI's laboratory.

Boolean string (1–5): _ T T _ T   Field# (71): A 1 5 2 8 F Ø 1   Card # (79 80): 1

Sampler's name (1–20): D B   Year (28 29): 8 2   Month (30 31): Ø 9   Day (32 33): 2 9

T (35 36): 2 Ø S   R (37 38): Ø 3 E   Sec. (39 40): 2 Ø   Subsections: 1st (41): 6 2nd (42): 6 3rd (43): 9

Study Area # (45–49): 6 1 6 8 Ø   Field# (71–78): A 1 5 2 8 F Ø 1   Card # (79 80): 2

(Lane = Ø39)

Lab # (1–8):   UTM-E (14–19): 5 4 2 4 2 5   UTM-N (21–27): 4 8 5 2 Ø Ø Ø   State (30 31): 4 1   County (32–34): Ø 3 9

Formation name (36–59): T O T L T m V (continues next line)

(60–70):   Field# (71–78): A 1 5 2 8 F Ø 1   Card # (79 80): 3

Material class (11): B   Sample type (12): A   Sample source (13): G   Rock type (14): E

Igneous form (15):   Structural setting (16):   Matrix (17):   Oxidation state (19):

Alteration (20):   Ore minerals (21):   Mineral deposit form (22):   Geologic age (24): Z

Rock name (25 26): S I   Code (27):   Quad name (28 29 30 35 36 37 38 39 60 61 62 63 64 65): S A R D I N E B U T T E

Field# (71–78): A 1 5 2 8 F Ø 1   Card # (79 80): 5

WRITE COMMENTS ON BACK OF PAGE

Figure 2. Sample and sample-site data-entry form. For details about the computer system and its functions, see Robert Brenne, Oregon State University Computer Center.

Lab #	Au - ppm	Ag - ppm	As - ppm	Cu - ppm	Hg - ppm	Pb - ppm	Mo - ppm	Zn - ppm		Field #	Card #
00000475	L .005	L .02	5.	18.	.050	5.3	1.	42.		A1530F01	10
00000476	L .005	.02	6.	17.	.076	5.3	1.	42.		A1531F01	10
00000477	L .005	L .02	1.	18.	.025	5.4	1.	42.		A1532F01	10
00000478	L .005	L .02	8.	16.	.080	4.9	L 1.	39.		A1535F01	10
00000479	L .005	L .02	2.	16.	.050	5.5	L 1.	51.		A1536F01	10
00000480	L .005	.11	11.	14.	.170	11.2	L 1.	45.		A1537F01	10
00000481	L .005	L .02	3.	15.	.100	5.1	1.	43.		A1538F01	10
00000482	L .005	.03	2.	18.	.040	6.1	2.	55.		A1539F01	10
00000483	L .005	.03	3.	16.	.030	5.2	1.	47.		A1540F01	10
00000484	L .005	.14	7.	18.	.135	11.9	2.	59.		A1542F01	10
00000485	L .005	.16	11.	19.	.095	14.0	2.	76.		A1543F01	10
00000486	L .005	.03	4.	20.	.040	5.8	1.	51.		A1545F01	10
00000487	L .005	.02	4.	13.	.515	7.3	2.	52.		A1546F01	10
00000488	L .005	.03	9.	16.	.090	7.0	1.	60.		A1547F01	10
00000489	L .000	.09	5.	19.	.155	6.7	1.	42.		A1549F01	10
00000490	.015	.03	2.	19.	.060	5.4	1.	47.		A1550F01	10
00000491	L .005	.08	12.	20.	.060	9.1	3.	38.		A1552F01	10
00000492	.005	.14	8.	27.	.100	9.0	2.	76.		A1553F01	10
00000493	.005	.08	4.	29.	.110	7.0	2.	56.		A1554F01	10
00000494	L .005	.09	8.	26.	.070	6.9	2.	58.		A1555F01	10
00000495	L .005	.04	2.	11.	.130	10.3	1.	57.		A1556F01	10
00000496	L .005	.06	3.	14.	.095	8.3	2.	56.		A1557F01	10
00000497	L .005	L .02	1.	18.	.030	3.7	1.	45.		A1558F01	10
00000498	L .005	.06	5.	10.	.105	8.0	2.	47.		A1559F01	10
00000499	L .005	.03	1.	17.	.085	5.1	1.	46.		A1560F01	10

Figure 3. Assay-data computer-input form.

In general, the term "sample" has two meanings in this study: (1) the raw or field sample taken, and (2) the analytical sample prepared from the field sample. The latter samples were analyzed to produce the composition data included herein. When the term "sample" is used, the meaning intended should be clear from the context.

The analytical samples for stream sediments were the minus-80 fraction of the raw samples. For rocks, the minus-80-mesh material (pulp) produced by grinding constituted the analytical samples. Hardened carbon steel was used for the crusher plate.

Sample Preparation

The procedures used in preparing the samples were designed to reduce or eliminate contamination and to prevent loss of the more volatile elements. The procedure steps were as follows, and the last few steps were for rock-chip samples:

1. The compositions of the various materials coming in contact with the samples were selected so that the metal load would not be increased.
2. Samples were air dried at room temperature rather than oven dried to minimize the loss of mercury.
3. All equipment was blown free of dust with compressed air before and after each sample was treated.
4. Affected surfaces were frequently vacuumed to pick up material lost in the inevitable "dusting" as samples were being prepared.
5. Waste rock, followed by quartz, was used to wash (by grinding) the residue left on the grinding plates after grinding gummy samples.
6. Grinding was done on an interrupted schedule to prevent heat buildup in the grinding plates.
7. Larger than necessary volumes of rock samples, many of which were obviously mineralized, were ground. The object was to dilute any material left in the pulverizer after grinding the prior sample.

Compacted silt samples were first broken up with a pestle in an unglazed porcelain mortar and gently ground. The samples were then sieved with all-stainless-steel sieves to produce minus-80-mesh material for analysis. Each minus-80-mesh fraction was then split with an all-stainless-steel splitter into two one-quarter portions and a one-half portion, and each part was transferred to a pre-numbered pulp envelope.

The entire rock sample (1 to 3 kg) was crushed in a Bico chipmunk jaw crusher to minus-¼-in. mesh. The crushed material was split repeatedly in an all-stainless-steel splitter until the desired mass of about 1 kg was obtained. This portion was stored in a plastic bag prior to grinding, and the balance of the crushed material was discarded. Each crushed portion was pulverized to about minus-80 mesh in a Bico pulverizer, split into two one-quarter portions and a one-half portion, and packaged as above.

Analytical Methods

The purpose of an analytical method for geochemical exploration is the determination of the concentration of an element. The method must have sufficient specificity, accuracy, detection limit, and precision so that the data are amenable to statistical analysis when a number of samples are compared for that element. In order to characterize a given element, a specific method must be employed. The difficulty is that this method can rarely be extended to all of the other elements to be determined. Therefore, to produce analytical results for a large number of elements in a large number of samples at a reasonable cost and within a reasonable time, compromise analytical methods must be employed.

The (compromise) analytical methods used for this study were based on work done by Viets (1978), information from mining and exploration companies, and current commercial laboratory practice. Detection limits were as follows: Au, 0.005 ppm; Ag, 0.02 ppm; As, 0.2 ppm; Cu, 5 ppm; Hg, 0.005 ppm; Mo, 1 ppm; Pb, 0.2 ppm; and Zn, 1 ppm.

In sediments and soils, part of the contained metals is derived from external sources and is bound up by the clay, organic matter, and/or hydrous iron and manganese oxide. Use of a mild decomposition reagent allows these absorbed metals to be extracted preferentially to the metals contained within the mineral fragments. Various combinations of hydrochloric acid and nitric acid and nitric acid alone are commonly used to extract a number of metals. The extracted metals are in turn treated singly or in groups by appropriate chemical and instrumental techniques.

For total-metal determinations, more drastic chemical treatment is necessary to free the metals contained within individual grains of sample. Here either hydrofluoric acid (in combination with other acids) or fusion with various fluxes is common practice.

All of the metals, except arsenic, were determined by instrumental methods after appropriate decomposition. Gold, silver, copper, molybdenum, lead, and zinc were determined by atomic absorption spectrometry (AAS or AA). Mercury was determined by cold vapor/AA. Arsenic was determined by a visual colorimetric comparison method.

Detailed instructions for DOGAMI's laboratory procedures and the contracted laboratories are contained in DOGAMI's files. Brief descriptions of the method used for each of the eight elements are summarized in Table 2 and are also discussed below, not as a geochemical cookbook such as that of Robertson (1956), but in order for the readers to be able to compare samples that are taken at a later date or that may have been assayed by different methods.

Gold: Gold was gathered by a fire-assay fusion decomposition with added silver. The resulting bead was dissolved in hydrochloric plus nitric acids. Gold was determined by AA.

Silver and lead: To determine silver and lead in sediments and soils, decomposition was with hydrochloric acid plus potassium chlorate. For rocks, decomposition was with hydrofluoric acid taken to dryness; then a solution of aluminum chloride was added and taken to dryness again, and the dried residue was taken up with hydrochloric acid plus potassium chlorate as with sediment and soil samples. For all samples at this point, an ascorbic acid plus potassium iodide solution was added, and the metals were extracted with a tricaprylyl methyl ammonium chloride plus methyl isobutyl ketone solution. The two metals were determined in the organic solution by AA.

Arsenic: To determine arsenic, decomposition was with hydrochloric acid plus nitric acid. The arsenic was reduced by adding stannous chloride causing it to evolve arsine gas. The gas was bubbled into a complexing-absorbing solution (silver diethyldithiocarbonate in pyridine). Because the color of the solution depends on the amount of arsenic, the arsenic can be measured colorimetrically.

Table 2. Stream-sediment sample analytical methods

Element	Detection limit*	Decomposition method**	Analytical method
Au (gold)	0.005 ppm	Fire assay	AA (atomic absorption)
Ag (silver)	0.02 ppm	Hydrochloric acid and potassium chlorate with Viet's extraction	AA
Pb (lead)	0.2 ppm	Same as for Ag	AA
Cu (copper)	5 ppm	Hydrochloric and nitric acids with potassium chlorate	AA
Zn (zinc)	1 ppm	Same as for Cu	AA
As (arsenic)	1 ppm	Hydrochloric and nitric acids	Colorimetric or hydride/AA
Mo (molybdenum)	1 ppm	Same as for As	AA
Hg (mercury)	0.005 ppm	Same as for As and Mo	Cold vapor/AA

*Approximate values, routine type analysis.

**Except for gold, dissolution techniques for the rock-chip samples entailed the additional use of hydrofluoric acid. Identical endpoint analytical methods were used.

Molybdenum: To determine molybdenum in sediment, decomposition was with nitric plus hydrochloric acids. For rocks, a hydrofluoric acid treatment was used in addition to the above acids. Molybdenum content was then determined by AA.

Copper and zinc: To determine the amount of copper and zinc in sediments, decomposition was with nitric plus hydrochloric acids plus potassium chlorate. For rocks, decomposition was with hydrofluoric plus hydrochloric acids, taken to dryness and finally taken up with the same reagents as used for sediments and soils. The amounts of the two elements were measured with AA.

Mercury: To determine the amount of mercury in sediment and rock samples, decomposition was with acid leach. The mercury in solution was reduced to mercury vapor with stannous sulfate. The vapor was circulated through a closed quartz cell in front of the light path of a hollow cathode lamp in an atomic absorption spectrophotometer.

Quality-Control Program

The maintaining of precision--the reproducibility of analytical results--was of primary importance.

Quality control was measured and maintained within an individual laboratory by re-assaying every twentieth sample. Intra-laboratory precision was measured by having twelve samples re-assayed by other laboratories. One outside laboratory ran all eight metals for quality control. Table 3 gives assay data for 12 samples which were re-assayed for quality control.

To measure the precision of the whole system from the field sampling through the assaying, four sample sites were randomly picked and re-sampled by another sampler. These were given new sample numbers and sent to the laboratories as blind samples. The data for these samples are given in Table 4. The data on the two tables show that the laboratories were producing consistent results.

Geochemical Data

General

The computer system described earlier was used to (1) print raw data, frequency tables, histograms, and correlation statistics and (2) plot element-abundance maps.

Raw Data

The computer printout of the raw data, which is reproduced on Michrofiche 1, is arranged with assay data and a statistical summary for the 100 silt samples first, followed by the assay data and statistical summary for the 24 rock-chip samples; next is a statistical summary for the combination of both silt and rock-chip samples. The site-location data for silt samples are given next, followed by those for rock-chip samples. The symbol "L" after an assay value

Table 3. Quality-control data for 12 samples analyzed by three laboratories

Sample number	Au (ppm)	Ag (ppm)	As (ppm)	Cu (ppm)	Hg (ppm)	Pb (ppm)	Mo (ppm)	Zn (ppm)
A1510R01	0.005L*	0.06	100	6	0.200	8.3	5	34
	0.010L	0.10	92	5	0.135	8.5	2	40
		0.06		6		7.9		34
A1516F01	0.005L	0.03	9	15	0.060	6.9	2	49
	0.010L	0.02L	10	15	0.105	7.0	1	60
		0.03		15		7.0		53
A1525F01	0.005L	0.07	6	17	0.040	7.5	1	55
	0.017	0.06	10	20	0.095	7.5	1 L	60
		0.04		16		7.1		53
A1535F01	0.005L	0.02L	8	16	0.080	4.9	1 L	38
	0.010L	0.03	8	20	0.105	5.5	1	50
		0.02L		16		5.3		39
A1545F01	0.005L	0.03	4	20	0.040	5.8	1	51
	0.027	0.03	6	20	0.046	6.0	1 L	50
		0.02L		19		5.4		42
A1558F01	0.005L	0.02L	1	18	0.030	3.7	1	45
	0.090	0.04	2	20	0.030	3.8	1 L	40
		0.02		17		3.6		38
A1569F01	0.005L	0.02	2	14	0.045	5.1	1	48
	0.010L	0.04	4	15	0.051	5.5	1	51
		0.02L		13		4.3		39
A1585F01	0.005L	0.03	3	18	0.020	4.7	1	35
	0.010L	0.06	5	20	0.020	5.0	1 L	40
		0.02		18		4.8		34
A1601F01	0.005L	0.02L	1	19	0.040	4.8	2	47
	0.010L	0.05	2	20	0.026	5.0	1 L	50
		0.02L		20		4.7		45
A1604F01	0.005L	0.03	2	14	0.045	4.2	2	27
	0.101L	0.07	2	15	0.043	5.5	1	50
		0.04		14		4.1		28
A1612R01	0.040	0.05	11	45	0.110	3.3	4	71
	0.032	0.32	11	50	0.065	4.0	1	80
		0.04		43		3.6		72
A1618F01	0.005L	0.02L	2	14	0.060	4.5	1	40
	0.010L	0.07	3	15	0.066	5.0	1	30
		0.02L		14		4.1		38

*L=below detection limit.

Table 4. Comparison of the assay values for original samples and for random samples that were resampled

Sample number*	Au (ppm)	Ag (ppm)	As (ppm)	Cu (ppm)	Hg (ppm)	Pb (ppm)	Mo (ppm)	Zn (ppm)
A1569F01	0.005L**	0.02	2	14	0.045	5.1	1	48
A1618F01	0.005L	0.02	2	14	0.060	4.5	1	40
A1562F01	0.005L	0.03	1	18	0.090	5.6	2	25
A1620F01	0.005L	0.05	1	21	0.120	5.4	2	40
A1595F01	0.005L	0.08	23	24	0.060	9.7	1	49
A1620F01	0.005L	0.19	22	17	0.105	13.4	2	51
A1621F01	0.005L	0.03	1	21	0.075	9.1	1	53
A1610F01	0.005L	0.06	1	16	0.095	11.2	2	55

*First number=original sample; second number=resample.

**L=below detection limit.

means that the amount of that element in the sample is below the value given.

Assay-Data Summary

Table 5 gives a statistical summary of the assay data for silt (stream-sediment), rock-chip, and total (combined silt and rock-chip) samples. "Number of samples" indicates the number of samples that had values above the detection threshold. Also shown are means, minimum values, maximum values, ranges, and standard deviations. These statistics are also part of the raw data shown in Microfiche 1.

Frequency Tables and Histograms

The computer program was used to generate frequency tables and histograms (1) by using raw data from all of the samples, (2) by using raw data from just the silt samples, and (3) by converting the silt-sample raw data to logarithms. A good histogram could not be generated by method 1 because very high values occurred in a few of the rock samples. The rock samples were collected because they were expected to carry anomalous metal values. The silt-sample sites, however, were picked from the topographic map, and were therefore the only unbiased samples. For that reason, further statistical analysis was computed only on silt-sample data. The histograms showed some tendency toward forming bell-shaped curves. The logarithms of silt data were then run, producing good bell-shaped histograms. These data are contained on Microfiche 2.

Least-Squares Correlations and Scatter Graphs

For a study of this kind, it is necessary to determine which elements show sympathetic variation with other elements--and how close the variations in one are matched by the other. The last part of the computer printout (Microfiche 2) contains the least-squares correlations and scatter graphs for each element against every other element. All values are in logarithms. The R^2 of each of the least-squares is given in Table 6. The number "1" that is shown diagonally down and across the table illustrates that an element is 100-percent correlated with itself. From Table 6, all pairs of elements that had an R^2 of 0.2 or greater were picked for Table 7, which, in turn, contains the least-squares equation for each of the pairs, the number of observations from which the equation was drawn, and the R^2 of the equation. The samples were assayed for eight elements. If the values for two elements are closely correlated (high R^2), then there is little value in assaying both

Table 5. Assay-data summary

SILT SAMPLES	AU -PPM	AG -PPM	AS -PPM	CU -PPM	HG -PPM	MO -PPM	PB -PPM	ZN -PPM
NUMBER OF SAMPLES	10.	88.	100.	100.	100.	95.	100.	100.
MEAN VALUES	.013	.053	5.630	16.940	.084	1.474	7.978	47.440
MINIMUM VALUES	.005	.020	1.000	7.000	.020	1.000	3.600	14.000
MAXIMUM VALUES	.035	.190	42.000	33.000	.515	3.000	32.500	102.000
RANGES	.030	.170	41.000	26.000	.495	2.000	28.900	88.000
STANDARD DEVIATIONS	.010	.036	6.801	5.138	.056	.543	3.933	13.361

ROCK SAMPLES	AU -PPM	AG -PPM	AS -PPM	CU -PPM	HG -PPM	MO -PPM	PB -PPM	ZN -PPM
NUMBER OF SAMPLES	10.	24.	24.	24.	24.	24.	24.	24.
MEAN VALUES	.039	.160	22.583	21.917	.413	4.875	8.004	44.417
MINIMUM VALUES	.005	.020	2.000	4.000	.095	3.000	.400	5.000
MAXIMUM VALUES	.235	.980	130.000	51.000	2.700	7.000	24.600	85.000
RANGES	.230	.960	128.000	47.000	2.605	4.000	24.200	80.000
STANDARD DEVIATIONS	.070	.238	30.577	16.357	.581	1.191	5.382	21.711

TOTALS	AU -PPM	AG -PPM	AS -PPM	CU -PPM	HG -PPM	MO -PPM	PB -PPM	ZN -PPM
NUMBER OF SAMPLES	20.	112.	124.	124.	124.	119.	124.	124.
MEAN VALUES	.026	.076	8.911	17.903	.148	2.160	7.983	46.855
MINIMUM VALUES	.005	.020	1.000	4.000	.020	1.000	.400	5.000
MAXIMUM VALUES	.235	.980	130.000	51.000	2.700	7.000	32.500	102.000
RANGES	.230	.960	129.000	47.000	2.680	6.000	32.100	97.000
STANDARD DEVIATIONS	.051	.121	16.040	8.565	.287	1.546	4.227	15.273

Table 6. Correlation $\underline{R}^2$ values between logarithms of element assays

	Au	Ag	As	Cu	Hg	Mo	Pb	Zn
Au	1	0.32	0.004	0.002	0.14	0.55	0.03	0.01
Ag		1	0.18	0.01	0.16	0.04	0.27	0.04
As			1	0.03	0.05	0.03	0.18	0.14
Cu				1	0.04	0.03	0.004	0.26
Hg					1	0.05	0.35	0.006
Mo						1	0.04	0.01
Pb							1	0.13
Zn								1

Table 7. Least-squares correlation equations for each pair of elements with $\underline{R}^2$ of 0.2 or better

Element		Equation			Number of observations	$\underline{R}^2$
Au (log)	=	1.9289	-	2.8409 Ag (log)	10	0.32
Au (log)	=	.5519	-	3.0212 Mo (log)	9	0.55
Ag (log)	=	-1.3618	+	2.8612 Pb (log)	88	0.27
Cu (log)	=	-1.0778	+	2.0807 Zn (log)	100	0.26
Hg (log)	=	-1.8231	+	0.7946 Pb (log)	100	0.35

elements. The $\underline{R}^2$ between gold and molybdenum is 0.55, which means that over half of the variance in gold values can be explained by the variance in molybdenum. The least-squares correlations and scatter graphs are also contained in Microfiche 2.

Computer-Generated Element-Abundance Maps

The frequency tables and histograms from Michrofiche 2 (split sample data only) were used to determine anomalous values and to determine the various assay-value groupings for computer-generated element-abundance maps (Table 8 and Plate 1). The range of assay values for an element was divided into four or five groups based on where the data tailed out of a bell-shaped curve. For gold any sample that had detectible gold was considered anomalous. Values for each element above which all other numbers are considered anomalous are shown in Table 8 and listed below: silver, 0.071 ppm; arsenic, 10.1 ppm; copper, 22.1 ppm; mercury, 0.251 ppm; molybdenum, 2.1 ppm; lead, 19.1 ppm; and zinc, 60.1 ppm.

For the lowest group of values for each element, the computer plotted a "1" on the element-abundance maps (for lead a "2" was plotted for the lowest group of values) at each site that had a value above the detection limit. For the next value group a "2" was plotted, next a "3," for the next a "4," and, if there was another value group, a "5" would be plotted. With this type of map, both the high and low anomalous areas are pinpointed. The groups of element values and the corresponding numerical map symbols are given in Table 8 and are listed below each element-abundance map on Plate 1.

Clusters and points of anomalous values were outlined on each of the element-abundance maps. For purposes of discussion later in this paper, the letters "A" through "F" were assigned to the various areas outlined on the gold element-abundance map. On each of the succeeding maps, only those anomalous areas that had not be assigned a letter on a previous map were given a letter, such as the "G" area on the silver map. Anomalous rock-chip assay values were hand plotted on each of the element maps as triangles. On the gold element assay map, the 60-, 80-, and 100-mW/m^2 heat-flow contours of Black and others (1982, Plate 7) were also plotted.

Table 8. Element-assay value groups used in computer-generated element-abundance maps on Plate 1.

Element	Group (ppm)	Map symbol
Gold	0.0* to 0.005	1
	0.0051 to 0.015	2
	0.0151 to 0.030	3
	0.0301+	4
Silver	0.0 to 0.02	1
	0.021 to 0.04	2
	0.041 to 0.07	3
	0.071+*	4
Arsenic	0.0 to 1.0	1
	1.1 to 3.0	2
	3.1 to 10.0	3
	10.1* to 40.0	4
	40.1+	5
Copper	0.0 to 7.5	1
	7.51 to 12.0	2
	12.1 to 22.0	3
	22.1* to 32.0	4
	32.1+	5
Mercury	0.0 to 0.03	1
	0.031 to 0.10	2
	0.101 to 0.25	3
	0.251+*	4
Molybdenum	0.0 to 1.0	1
	1.1 to 2.0	2
	2.1+*	3
Lead	0.0 to 4.6	2
	4.61 to 11.0	3
	11.1 to 19.0	4
	19.1* to 25.0	5
	25.1+	6
Zinc	0.0 to 20.0	1
	20.1 to 37.0	2
	37.1 to 60.0	3
	60.1* to 75.0	4
	75.1+	5

*Values greater than this number are considered anomalous in this study.

ALTERATION MAPPING

Alteration mapping consisted of roadcut examination for limonite/pyrite staining (yellowish-brown color), bleaching of soil and rock, and silicification that produced resistant outcrops, silica cementation, and fracture coatings. Areas with any of the three types of alteration are indicated on the geologic map.

The limonite/pyrite stained areas, as shown on the geologic map, are several times larger than the bleached areas, which are several times larger than the silicified areas.

MINERAL POTENTIAL

Mineral Deposit Models

To determine the mineral potential for the study area, which includes both the Fall Creek mining district and other mineralized areas within and slightly to the south of the Sardine quadrangle, the area should be compared to models of other areas where mineral deposits have formed. Two models, the porphyry copper model (Sillitoe, 1973; Munts, 1978; Olson, 1978; and Power and Field, 1982) and the epithermal (hot spring-fumarolic) silver-gold model (Berger and Eimon, 1982), are appropriate.

Porphyry Copper Model

Large bodies of low-grade copper-molybdenum are commonly associated with subduction caused by converging plate boundaries. The oceanic Juan de Fuca Plate is moving toward the northeast under Oregon, which, in turn, is moving west on the lighter continental North American Plate. Partial melting of the downward-moving oceanic plate generates magmas that rise through the overlying continental rocks, sometimes reaching the surface to form volcanoes. The intrusions tend to have stock shapes. The upper portions and cores of the intrusions often contain copper and molybdenum with gold and silver byproducts. To have the intrusion exposed at the surface, a great deal of erosion must take place to remove the stratovolcanic superstructure. The general model of the system includes a stock, with its disseminated mineralized top, and below this level veins and pegmatite mineralization. Above the stock, dikes, sills, and plugs intrude country rock surrounding the stock. If the magma that formed the stock were to retreat into its chamber a short way, breccia pipes could be formed in the overlying rocks, or explosion-type pipes could be produced by volatile buildup. Several types of alteration can accompany the formation of this system. Starting with the stock, the concentric shells of alteration are potassium silicate, sericitic, argillic, and propylitic. Toward the top of the system within the volcanic superstructure, the alteration tends to possess a less regular distribution, and propylitic and argillic types are common. There can also be smaller areas of intense silicification and advanced argillic alteration. Pyrite is ubiquitous. Copper, lead, zinc, and precious metal veins and metal-bearing replacement bodies may occur within the breccia pipes. Within the superstructure, intrusive rocks are rare, and those present have plug and dikelike shapes.

Epithermal (Hot Spring-Fumarolic) Gold and Silver Model

Epithermal gold and silver deposits form at low to moderate temperatures at or near the surface. The most important deposits are found as veins and replacements in volcanic rocks and as replacements in sedimentary rocks. The epithermal (hot spring-fumarolic) model of gold and silver deposition starts with a heat source, a plumbing system, and a supply of water. Downward-percolating ground water is superheated by the heat source and forced upward along the plumbing system. The heat source could be a cooling magma, and the plumbing system could be open fractures (which become veins where filled) or breccia pipes. As ground water percolates downward and is heated and forced upward, it experiences chemical changes that allow it to dissolve metal from the rock through which it passes. After the fluid reaches the plumbing system and is traveling upward, if it experiences a change in pressure such as reaching the boiling point, encounters a source of carbon or carbonate that changes the pH, or encounters cold water, then gold, silver, and/or other metals and nonmetals may be deposited.

Ore Depositional Models for the Sardine Butte Quadrangle

Field work and literature search for this study suggest that the mineralization found in the Sardine Butte quadrangle is the type that is present at the top of a copper porphyry system. Erosion has not yet removed the associated volcanic superstructure and exposed its base, as it has in the nearby Bohemia (Schaubs, 1978) and North Santiam (Olson, 1978) mining districts. Although the disseminated copper mineralization portion of the system may be too deep to be economically exploited, there may be smaller bodies of ore hidden in the alteration zones and/or beneath or near the anomalies found with the geochemical sampling. No large quartz veins have been observed in the area; however, quartz veinlets were reported at the Ironside Mine (Callaghan and Buddington, 1938), and the large landslide at the junction of Christy Creek and the North Fork of the Willamette River appears to be a large pyritized, kaolinitized, silicified breccia pipe. The mineralization in the Sardine Butte quadrangle may also partially fit the model of epithermal gold-silver (hot spring-fumarolic) deposition with its heat source, plumbing system, and silica deposition. The area has had and may still have a heat source. The gold element-abundance map on Plate 1 shows that the heat flow changes from less than 60 mW/m^2 to more than 100 mW/m^2 from west to east within the quadrangle. The geological map shows many faults and shear zones which could have been the plumbing system. As shown by the large area of alteration, the volcanic tuffs were highly permeable and susceptible to alteration. The silicified areas could have represented silica capping of the plumbing system. The plumbing system appears to have been too open to have produced much hydrothermal brecciation found in other areas.

Geochemical Anomalies

All of the computer-generated element-abundance maps (silt-sample data only) have clusters and points of anomalous values that have been assigned letters for purposes of discussion (see section on computer-generated element-abundance maps). The gold map on Plate 1 was picked to be the standard to which the other seven maps were compared. The clusters and points shown on the gold map were lettered "A" through "F." The Fall Creek mining district lies within the area covered by "A," "B," and "C." Some of the clusters appear to exhibit linear trends. The anomalous areas "B," "C," "D," and "F," fall between the 60- and 80-mW/m^2 contours taken from Black and others (1982, Plate 7). The west-to-east trend of "A" and "B" is repeated and clarified by the clustering on the silver, arsenic, copper, molybdenum and zinc maps. The anomalous area cluster "C" occurs also on the silver, arsenic, and zinc maps. The cluster "D" is reflected on the copper and zinc maps. The anomalous point "F" is shown by a cluster or a group of clusters on the silver, arsenic, copper, and molybdenum maps. All anomalous clusters and points on the silver map also occur on the gold map except for the point labeled "G," which can also be found on the arsenic map. The arsenic map has two more anomalous areas, "H" and "I," that are not found on the gold or the silver maps. Point "H" is not found on any of the other maps. "I" is repeated on the copper map. Only one anomaly occurs on the mercury map, and it is labeled "J". No other map has anomalous values at this point. The "K" point on the lead map is also found on the copper and zinc map. This point is at the townsite of Westfir, and the anomalous values for the silt sample could have been caused by septic tanks, although the presence of arsenic, mercury, molybdenum, and zinc in rock-chip samples from the same area indicates that the anomaly is naturally occurring.

Rock-Chip Verification

Rock-chip samples were collected at the same time that silt samples were collected and alteration was mapped. The anomalous values based on values categorized as anomalous in Table 8 and plotted as triangles on the gold element-abundance map on Plate 1 fill in and further identify the area between "A," "B," and "C" as being anomalous. This area contains the mines and prospects of the Fall Creek mining district. The triangles on the other maps on Plate 1 extend the outlined areas of mineralization. The rock-chip sample site at the town of Westfir was anomalous in arsenic, mercury, molybdenum, and zinc. Because anomalous values were found in both silt and rock-chip samples, the anomalous values of the silt sample may not have been caused by septic tanks in the town.

Summary and Recommendations

From the preceding discussion, it is clear that the Sardine Butte quadrangle is mineralized. The trends shown on the gold element-abundance map and the other element maps point to the Fall Creek mining district as having the strongest anomaly over all; however, several of the other areas such as "F" on the gold element-abundance map are of interest because other elements have anomalous values in the same area. From this reconnaissance-level study, it is apparent that this quadrangle has enough mineralization to warrant a closer examination by mineral exploration firms. The most likely economic metals are gold and silver. The following recommendations are justified by the results of this study:

1. The heavy-mineral stream-sediment samples should be examined and assayed.
2. Other stream-sediment samples should be collected at closer intervals and assayed.
3. Rock-chip samples should be collected across all of the alteration zones.
4. Soil-sample profiles should be collected across the anomalous areas.
5. If the four above recommendations produce positive results, then a drilling program might be warranted.

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Open-file report 0-83-5

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BERYLIUM =       0
CADMIUM  =       0
COBALT   =       0
COPPER   =     100
LEAD     =     100
MANGANES =       0
MERCURY  =     100
MOLYBDNU =      95
NICKEL   =       0
TIN      =       0
TUNGSTEN =       0
URANIUM  =       0
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5	-2.05957	-1.99921	0	0.000
6	-1.99921	-1.93885	0	0.000
7	-1.93885	-1.87848	0	0.000
8	-1.87848	-1.81812	3	30.000
9	-1.81812	-1.75775	0	0.000
10	-1.75775	-1.69739	0	0.000
11	-1.69739	-1.63702	0	0.000
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CUMULATIVE FREQUENCY DISTRIBUTION
VARIABLE GOLD

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2	-2.18030	5	50.000
3	-2.11994	5	50.000
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5	-1.99921	5	50.000
6	-1.93885	5	50.000
7	-1.87848	5	50.000
8	-1.81812	8	80.000
9	-1.75775	8	80.000
10	-1.69739	8	80.000
11	-1.63702	8	80.000
12	-1.57666	9	90.000
13	-1.51630	9	90.000
14	-1.45593	9	90.000
15	-1.39557	10	100.000

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          HISTOGRAM OF VARIABLE GOLD

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        4  .     *
        3  .     *                      *
        2  .     *                      *
        1  .     *                      *          *       *
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4	-1.48946	-1.41962	0	0.000
5	-1.41962	-1.34978	15	17.045
6	-1.34978	-1.27995	10	11.364
7	-1.27995	-1.21011	7	7.955
8	-1.21011	-1.14027	10	11.364
9	-1.14027	-1.07043	3	3.409
10	-1.07043	-1.00060	2	2.273
11	-1.00060	-.930759	1	1.136
12	-.930759	-.860921	1	1.136
13	-.860921	-.791084	4	4.545
14	-.791084	-.721246	1	1.136
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CUMULATIVE FREQUENCY DISTRIBUTION
VARIABLE SILVER

INTERVAL	VALUE	NUMBER LESS THAN VALUE	PERCENT LESS THAN VALUE
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5	-1.34978	48	54.545
6	-1.27995	58	65.909
7	-1.21011	65	73.864
8	-1.14027	75	85.227
9	-1.07043	78	88.636
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13	-.791084	86	97.727
14	-.721246	87	98.864
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          HISTOGRAM OF VARIABLE SILVER

FREQUENCY
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     18  .               *
     16  .--------       *
     15  .               *       *
     14  .     *         *       *
     13  .     *         *       *
     11  .     *         *       *
     10  .     *         *       *     *       *
      9  .     *         *       *     *       *
      8  .     *         *       *     *   *   *
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  6 .     *       *      *    *   *  *
  5 .     *       *      *    *   *  *
  4 .     *       *      *    *   *  *
  3 .     *       *      *    *   *  *  * *         *
  1 .     *       *      *    *   *  *  * *    * *  ** **  *
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3	.231893	.347839	17	17.000
4	.347839	.463786	0	0.000
5	.463786	.579732	17	17.000
6	.579732	.695678	6	6.000
7	.695678	.811625	12	12.000
8	.811625	.927571	7	7.000
9	.927571	1.04352	9	9.000
10	1.04352	1.15946	2	2.000
11	1.15946	1.27541	2	2.000
12	1.27541	1.39136	3	3.000
13	1.39136	1.50730	1	1.000
14	1.50730	1.62325	1	1.000
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CUMULATIVE FREQUENCY DISTRIBUTION
VARIABLE ARSENIC

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4	.463786	39	39.000
5	.579732	56	56.000
6	.695678	62	62.000
7	.811625	74	74.000
8	.927571	81	81.000
9	1.04352	90	90.000
10	1.15946	92	92.000
11	1.27541	94	94.000
12	1.39136	97	97.000
13	1.50730	98	98.000
14	1.62325	99	99.000

```
   15        1.73920              100          100.000

+HISTOGRAM VV(J)$G

          HISTOGRAM OF VARIABLE ARSENIC

 FREQUENCY
     22 .*
     21 .*
     19 .*
     18 .*     *  *
     16 .*     *  *
     15 .*     *  *
     13 .*     *  *
     12 .*     *  *
     10 .*     *  *
      9 .*     *  *
      7 .*     *  *
      6 .*     *  *  * **  *
      4 .*     *  *  * **  ***
      3 .*     *  *  * **  ***
      1 .*     *  *  * ** ***** ** *** * *
         +.........+.........+.........+.........+
        0.        .500      1.00      1.50      2.00

+15 COMMENT

+SET,J=J+1.

+IF (J.LE.8.) GOTO 10

+10 COMMENT

+SET,VV(J)=LOG10(VV(J))

+FREQ,VV(J)

  LOWER BOUND FOR FIRST INTERVAL=            [illegible]
  NUMBER OF INTERVALS=    [illegible]
  INTERVAL WIDTH=             [illegible]
```

```
   15       1.73920           100        100.000

+HISTOGRAM VV(J)$G

          HISTOGRAM OF VARIABLE ARSENIC

 FREQUENCY
      22 .*
      21 .*
      19 .*
      18 .*     *  *
      16 .*     *  *
      15 .*     *  *
      13 .*     *  *
      12 .*     *  *
      10 .*     *  *
       9 .*     *  *
       7 .*     *  *
       6 .*     *  *  * **  *
       4 .*     *  *  * **  ***
       3 .*     *  *  * **  ***
       1 .*     *  *  * ** ***** ** *** * *
          +.........+.........+.........+.........+
         0.         .500      1.00      1.50      2.00

+15 COMMENT

+SET,J=J+1.

+IF (J.LE.8.) GOTO 10

+10 COMMENT

+SET,VV(J)=LOG10(VV(J))

+FREQ,VV(J)


LOWER BOUND FOR FIRST INTERVAL=          .845098E+00
NUMBER OF INTERVALS=    15
INTERVAL SIZE=          .481011E-01
```

FREQUENCY DISTRIBUTION

VARIABLE COPPER

INT	FROM	UP TO BUT NOT INCLUDING	FREQUENCY	PERCENT FREQ
1	.845098	.893199	2	2.000
2	.893199	.941300	1	1.000
3	.941300	.989401	3	3.000
4	.989401	1.03750	6	6.000
5	1.03750	1.08560	6	6.000
6	1.08560	1.13370	2	2.000
7	1.13370	1.18181	17	17.000
8	1.18181	1.22991	8	8.000
9	1.22991	1.27801	25	25.000
10	1.27801	1.32611	18	18.000
11	1.32611	1.37421	0	0.000
12	1.37421	1.42231	6	6.000
13	1.42231	1.47041	3	3.000
14	1.47041	1.51851	2	2.000
15	1.51851	1.56662	1	1.000

CUMULATIVE FREQUENCY DISTRIBUTION

VARIABLE COPPER

INTERVAL	VALUE	NUMBER LESS THAN VALUE	PERCENT LESS THAN VALUE
1	.893199	2	2.000
2	.941300	3	3.000
3	.989401	6	6.000
4	1.03750	12	12.000
5	1.08560	18	18.000
6	1.13370	20	20.000
7	1.18181	37	37.000
8	1.22991	45	45.000
9	1.27801	70	70.000
10	1.32611	88	88.000
11	1.37421	88	88.000
12	1.42231	94	94.000
13	1.47041	97	97.000
14	1.51851	99	99.000
15	1.56662	100	100.000

```
+HISTOGRAM VV(J)$G
```

HISTOGRAM OF VARIABLE COPPER

```
 FREQUENCY
        13 .-----------------------------------     *
        12 .                                      * *
        11 .--------------------------     *      * *
        10 .                               *      * *
         9 .--------------------------     *      * *
         8 .                               *    * * * *
         7 .--------------------------     *    * * * *
         6 .                    *          *  * * * * * *
         5 .---------------     *          *  * * * * * *
         4 .                    *  *       *  * * * * * **    *
         3 .-----------     *   *  *       *  * * * * * **    *
         2 .       *        *   *  *  *  * *  * * * * * **    *
         1 .--     *    *   *   *  *  *  * *  * * * * * **    ** *** ****
            +.........+.........+.........+.........+.........+.........+
            .750      .875      1.00      1.13      1.25      1.38      1.50
```

```
+15 COMMENT

+SET,J=J+1.

+IF (J.LE.8.) GOTO 10

+10 COMMENT

+SET,VV(J)=LOG10(VV(J))

+FREQ,VV(J)
```

LOWER BOUND FOR FIRST INTERVAL= .556303E+00
NUMBER OF INTERVALS= 15
INTERVAL SIZE= .682558E-01

FREQUENCY DISTRIBUTION
VARIABLE LEAD

INT	FROM	UP TO BUT NOT INCLUDING	FREQUENCY	PERCENT FREQ
1	.556303	.624558	5	5.000
2	.624558	.692814	7	7.000
3	.692814	.761070	20	20.000

4	.761070	.829326	14	14.000
5	.829326	.897581	17	17.000
6	.897581	.965837	12	12.000
7	.965837	1.03409	8	8.000
8	1.03409	1.10235	9	9.000
9	1.10235	1.17060	2	2.000
10	1.17060	1.23886	4	4.000
11	1.23886	1.30712	1	1.000
12	1.30712	1.37537	0	0.000
13	1.37537	1.44363	0	0.000
14	1.44363	1.51188	0	0.000
15	1.51188	1.58014	1	1.000

CUMULATIVE FREQUENCY DISTRIBUTION
VARIABLE LEAD

INTERVAL	VALUE	NUMBER LESS THAN VALUE	PERCENT LESS THAN VALUE
1	.624558	5	5.000
2	.692814	12	12.000
3	.761070	32	32.000
4	.829326	46	46.000
5	.897581	63	63.000
6	.965837	75	75.000
7	1.03409	83	83.000
8	1.10235	92	92.000
9	1.17060	94	94.000
10	1.23886	98	98.000
11	1.30712	99	99.000
12	1.37537	99	99.000
13	1.44363	99	99.000
14	1.51188	99	99.000
15	1.58014	100	100.000

```
+HISTOGRAM VV(J)$G

          HISTOGRAM OF VARIABLE LEAD

 FREQUENCY
       9  .----------        *
       8  .                  *     *
       7  .----------        **    *    *
       6  .                  **  * *    *
       5  .----------        **  * * *  *   *
       4  .                 **** * ***  *   *
       3  .---------        ************* * * *
       2  .              * ************* * * ***    * *
       1  .--     ** ************************ ** * **           *
           +.........+.........+.........+.........+.........+.........+
          .400      .600      .800      1.00      1.20      1.40      1.60
```

```
+15 COMMENT

+SET,J=J+1.

+IF (J.LE.8.) GOTO 10

+10 COMMENT

+SET,VV(J)=LOG10(VV(J))

+FREQ,VV(J)
```

```
LOWER BOUND FOR FIRST INTERVAL=          -.169897E+01
NUMBER OF INTERVALS=     15
INTERVAL SIZE=              .100770E+00
```

FREQUENCY DISTRIBUTION
VARIABLE MERCURY

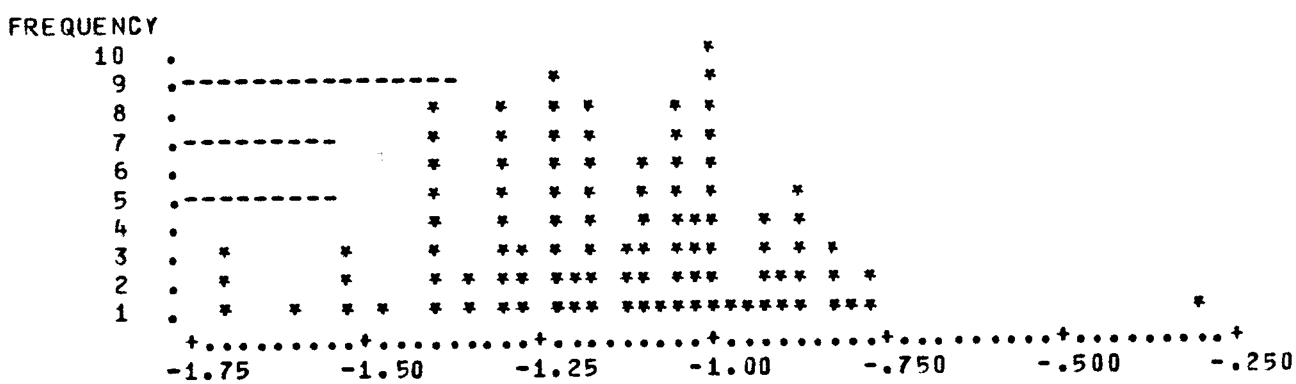
INT	FROM	UP TO BUT NOT INCLUDING	FREQUENCY	PERCENT FREQ
1	-1.69897	-1.59820	4	4.000
2	-1.59820	-1.49743	3	3.000
3	-1.49743	-1.39666	9	9.000
4	-1.39666	-1.29589	10	10.000
5	-1.29589	-1.19512	12	12.000
6	-1.19512	-1.09435	19	19.000
7	-1.09435	-.993581	20	20.000
8	-.993581	-.892812	9	9.000
9	-.892812	-.792042	11	11.000
10	-.792042	-.691272	2	2.000
11	-.691272	-.590502	0	0.000
12	-.590502	-.489732	0	0.000
13	-.489732	-.388963	0	0.000
14	-.388963	-.288193	0	0.000
15	-.288193	-.187423	1	1.000

CUMULATIVE FREQUENCY DISTRIBUTION
VARIABLE MERCURY

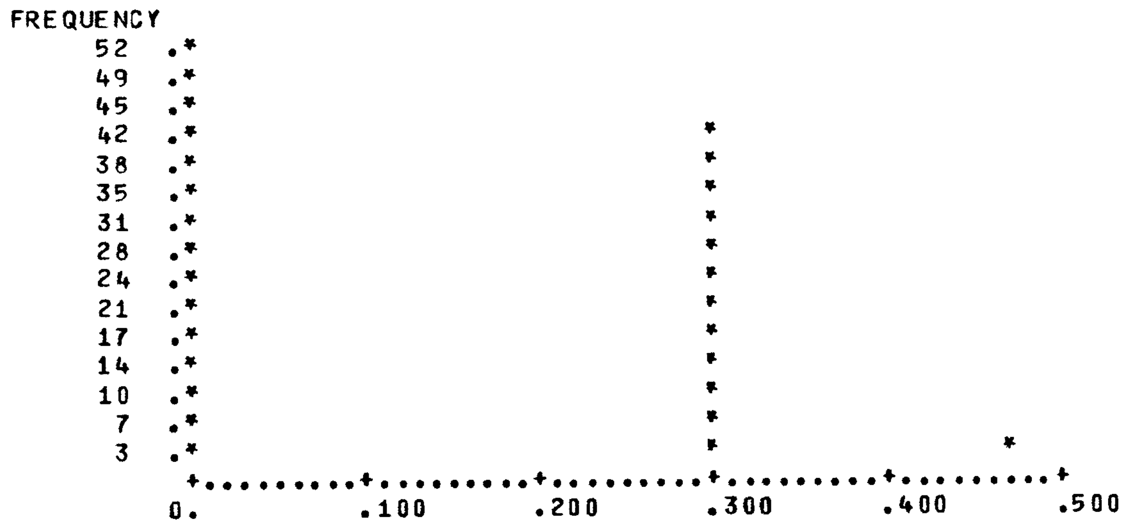
INTERVAL	VALUE	NUMBER LESS THAN VALUE	PERCENT LESS THAN VALUE
1	-1.59820	4	4.000
2	-1.49743	7	7.000
3	-1.39666	16	16.000
4	-1.29589	26	26.000
5	-1.19512	38	38.000
6	-1.09435	57	57.000
7	-.993581	77	77.000
8	-.892812	86	86.000
9	-.792042	97	97.000
10	-.691272	99	99.000
11	-.590502	99	99.000
12	-.489732	99	99.000
13	-.388963	99	99.000
14	-.288193	99	99.000
15	-.187423	100	100.000

+HISTOGRAM VV(J)$G

HISTOGRAM OF VARIABLE MERCJRY



```
+15 COMMENT

+SET,J=J+1.

+IF (J.LE.8.) GOTO 10

+10 COMMENT

+SET,VV(J)=LOG10(VV(J))
                       *
** INFORMATIVE..MISSING DATA ENCOUNTERED.

+FREQ,VV(J)


LOWER BOUND FOR FIRST INTERVAL=          0.
NUMBER OF INTERVALS=     15
INTERVAL SIZE=           .340801E-01
              FREQUENCY DISTRIBUTION
                    VARIABLE MOLYBDNU
                    UP TO BUT                      PERCENT
INT       FROM    NOT INCLUDING   FREQUENCY          FREQ
 1   0.             .340801E-01      52             54.737
 2    .340801E-01   .681602E-01       0              0.000
 3    .681602E-01   .102240           0              0.000
 4    .102240       .136320           0              0.000
 5    .136320       .170400           0              0.000
 6    .170400       .204481           0              0.000
 7    .204481       .238561           0              0.000
 8    .238561       .272641           0              0.000
 9    .272641       .306721          41             43.158
10    .306721       .340801           0              0.000
11    .340801       .374881           0              0.000
12    .374881       .408961           0              0.000
13    .408961       .443041           0              0.000
14    .443041       .477121           0              0.000
15    .477121       .511201           2              2.105


         CUMULATIVE FREQUENCY DISTRIBUTION
                    VARIABLE MOLYBDNU
                          NUMBER LESS   PERCENT LESS
INTERVAL      VALUE        THAN VALUE    THAN VALUE
    1        .340801E-01      52          54.737
    2        .681602E-01      52          54.737
    3        .102240          52          54.737
    4        .136320          52          54.737
    5        .170400          52          54.737
    6        .204481          52          54.737
    7        .238561          52          54.737
    8        .272641          52          54.737
    9        .306721          93          97.895
   10        .340801          93          97.895
   11        .374881          93          97.895
   12        .408961          93          97.895
   13        .443041          93          97.895
   14        .477121          93          97.895
   15        .511201          95         100.000

+HISTOGRAM VV(J)$G

           HISTOGRAM OF VARIABLE MOLYBDNU
```




```
+15 COMMENT

+SET,J=J+1.

+IF (J.LE.8.) GOTO 10

+10 COMMENT

+SET,VV(J)=LOG10(VV(J))

+FREQ,VV(J)
```

LOWER BOUND FOR FIRST INTERVAL= .114613E+01
NUMBER OF INTERVALS= 15
INTERVAL SIZE= .616052E-01

FREQUENCY DISTRIBUTION
VARIABLE ZINC

INT	FROM	UP TO BUT NOT INCLUDING	FREQUENCY	PERCENT FREQ
1	1.14613	1.20773	2	2.000
2	1.20773	1.26934	0	0.000
3	1.26934	1.33094	0	0.000
4	1.33094	1.39255	0	0.000
5	1.39255	1.45415	3	3.000
6	1.45415	1.51576	5	5.000
7	1.51576	1.57736	6	6.000
8	1.57736	1.63897	24	24.000
9	1.63897	1.70057	25	25.000
10	1.70057	1.76218	22	22.000
11	1.76218	1.82378	6	6.000
12	1.82378	1.88539	4	4.000
13	1.88539	1.94700	1	1.000
14	1.94700	2.00860	1	1.000
15	2.00860	2.07021	1	1.000

CUMULATIVE FREQUENCY DISTRIBUTION
VARIABLE ZINC

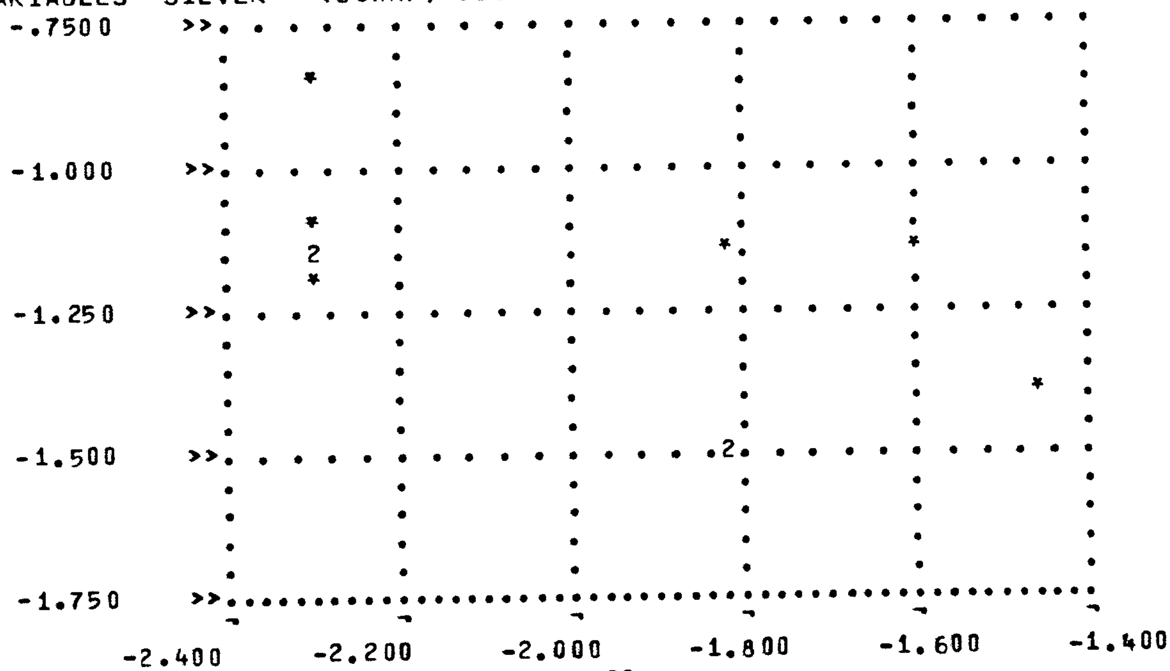
INTERVAL	VALUE	NUMBER LESS THAN VALUE	PERCENT LESS THAN VALUE
1	1.20773	2	2.000
2	1.26934	2	2.000
3	1.33094	2	2.000

4	1.39255	2	2.000
5	1.45415	5	5.000
6	1.51576	10	10.000
7	1.57736	16	16.000
8	1.63897	40	40.000
9	1.70057	65	65.000
10	1.76218	87	87.000
11	1.82378	93	93.000
12	1.88539	97	97.000
13	1.94700	98	98.000
14	2.00860	99	99.000
15	2.07021	100	100.000

```
+HISTOGRAM VV(J)$G

          HISTOGRAM OF VARIABLE ZINC

 FREQUENCY
      12 .                                   *
      11 .------------------------------     *
      10 .                              *    * *
       9 .-------------------------     ** * * *
       8 .                              ** * * *
       7 .-------------------------     ** *** *
       6 .                              ****** *
       5 .------------------------     ******* *
       4 .                             ******* *
       3 .--------------------     *   **********     *
       2 .                     * * **************  *  *
       1 .--     **          * * * ***************** **   * *
          +.........+.........+.........+.........+.........+
          1.00      1.20      1.40      1.60      1.80      2.00

+15 COMMENT

+SET,J=J+1.

+IF (J.LE.8.) GOTO 10

+N,A
GOLD     =        10
SILVER   =        88
ARSENIC  =       100
BARIUM   =         0
BERYLIUM =         0
CADMIUM  =         0
COBALT   =         0
COPPER   =       100
LEAD     =       100
MANGANES =         0
MERCURY  =       100
MOLYBDNU =        95
NICKEL   =         0
TIN      =         0
TUNGSTEN =         0
URANIUM  =         0
ZINC     =       100

+SCALAR,K

+SET,J=1.

+100 COMMENT
```

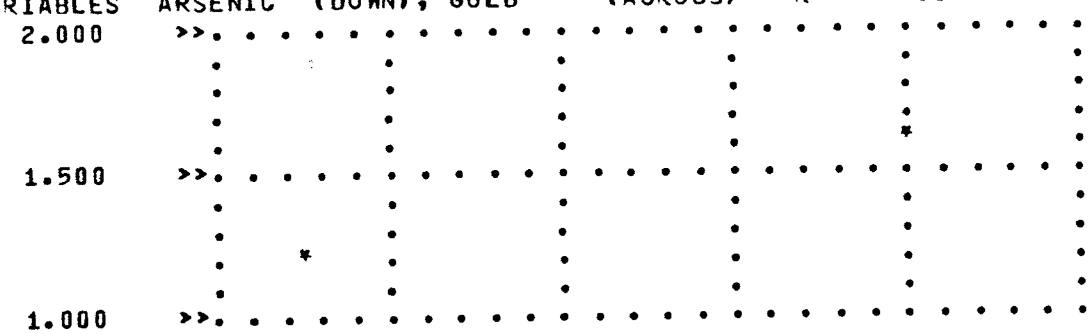
```
+SET,K=J+1.

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=    -2.30103        UPPER BOUND OF X=    -1.45593
LOWER BOUND OF Y=    -1.69897        UPPER BOUND OF Y=    -.721246
```

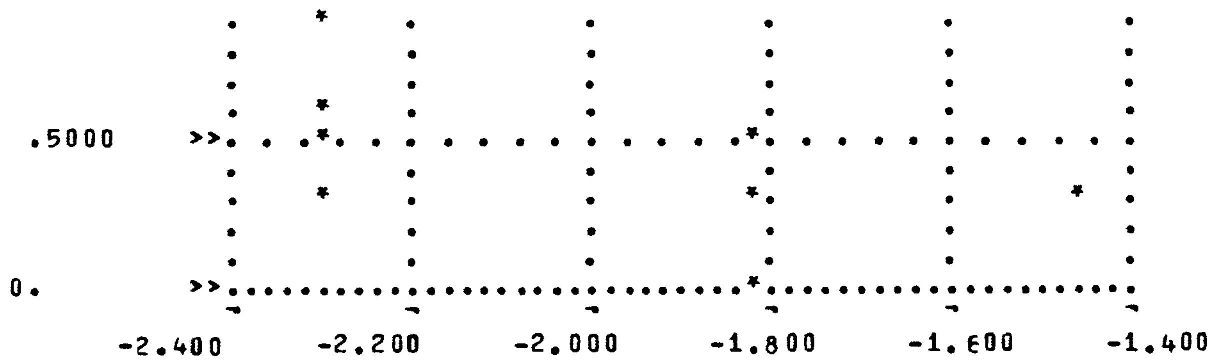
VARIABLES SILVER (DOWN), GOLD (ACROSS) R = -.5703




```
NUMBER OF MISSING OBSERVATIONS=      90

+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=    -2.30103        UPPER BOUND OF X=    -1.45593
LOWER BOUND OF Y=    0.              UPPER BOUND OF Y=     1.62325
```

VARIABLES ARSENIC (DOWN), GOLD (ACROSS) R = -.0554



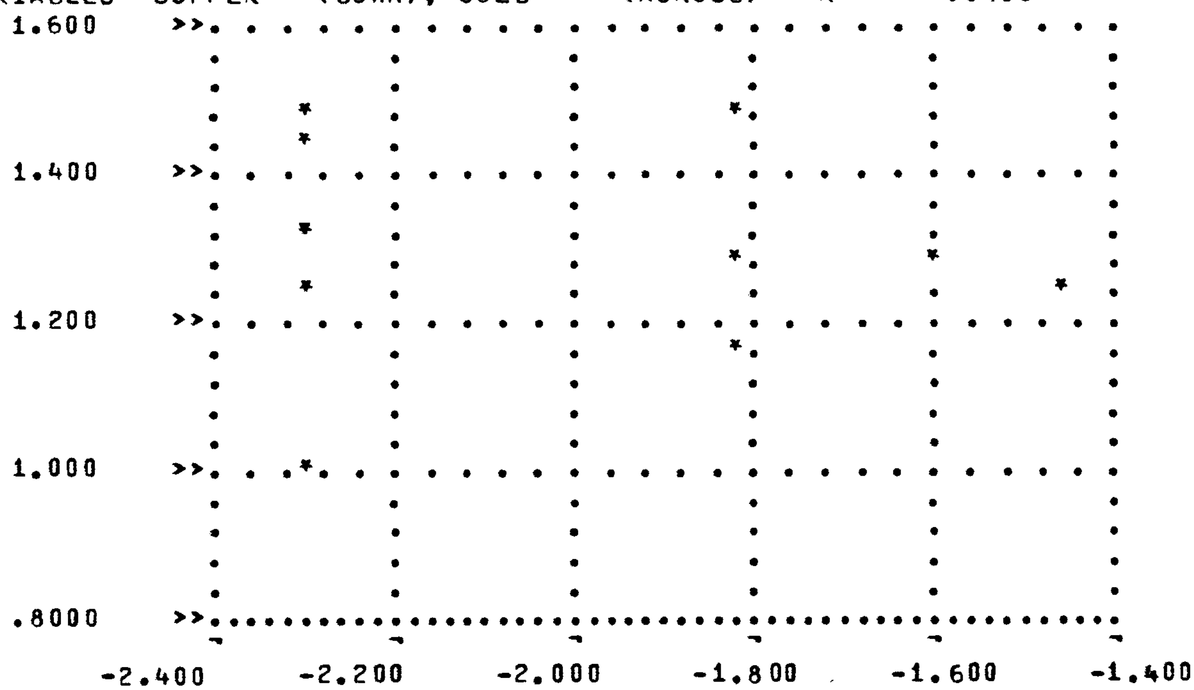


NUMBER OF MISSING OBSERVATIONS= 90

```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
```

LOWER BOUND OF X= -2.30103 UPPER BOUND OF X= -1.45593
LOWER BOUND OF Y= .845098 UPPER BOUND OF Y= 1.51851

VARIABLES COPPER (DOWN), GOLD (ACROSS) R = -.0406

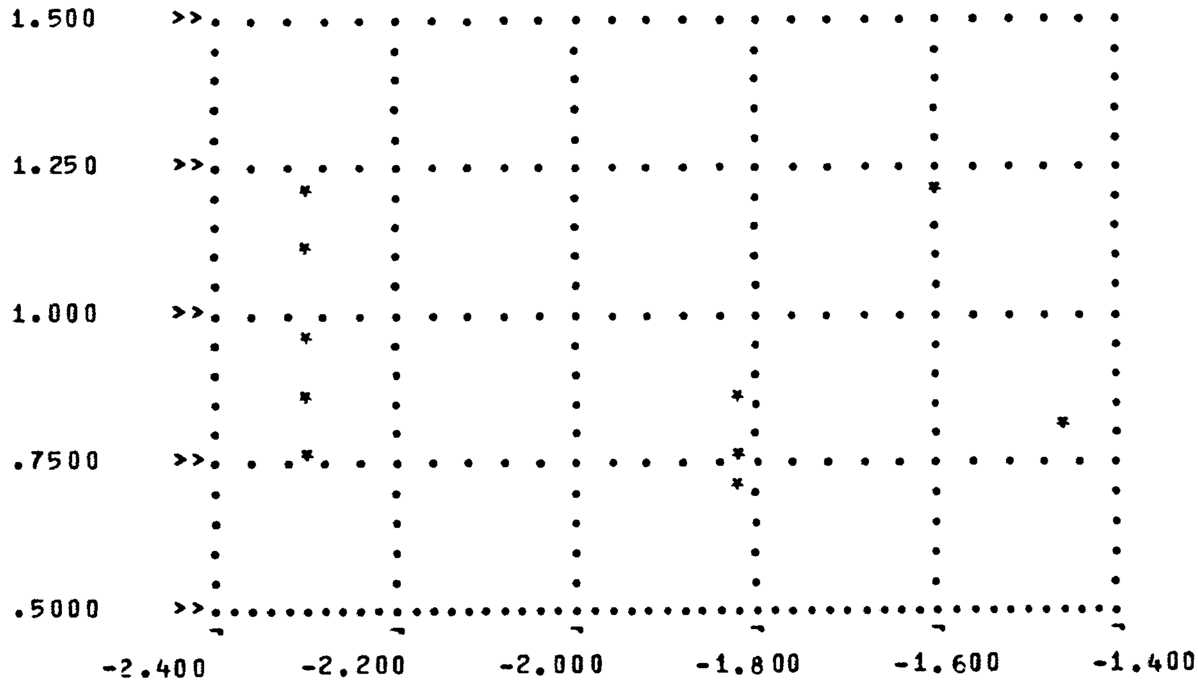


NUMBER OF MISSING OBSERVATIONS= 90

```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
```

LOWER BOUND OF X= -2.30103 UPPER BOUND OF X= -1.45593
LOWER BOUND OF Y= .556303 UPPER BOUND OF Y= 1.51188

VARIABLES LEAD (DOWN), GOLD (ACROSS) R = -.1556

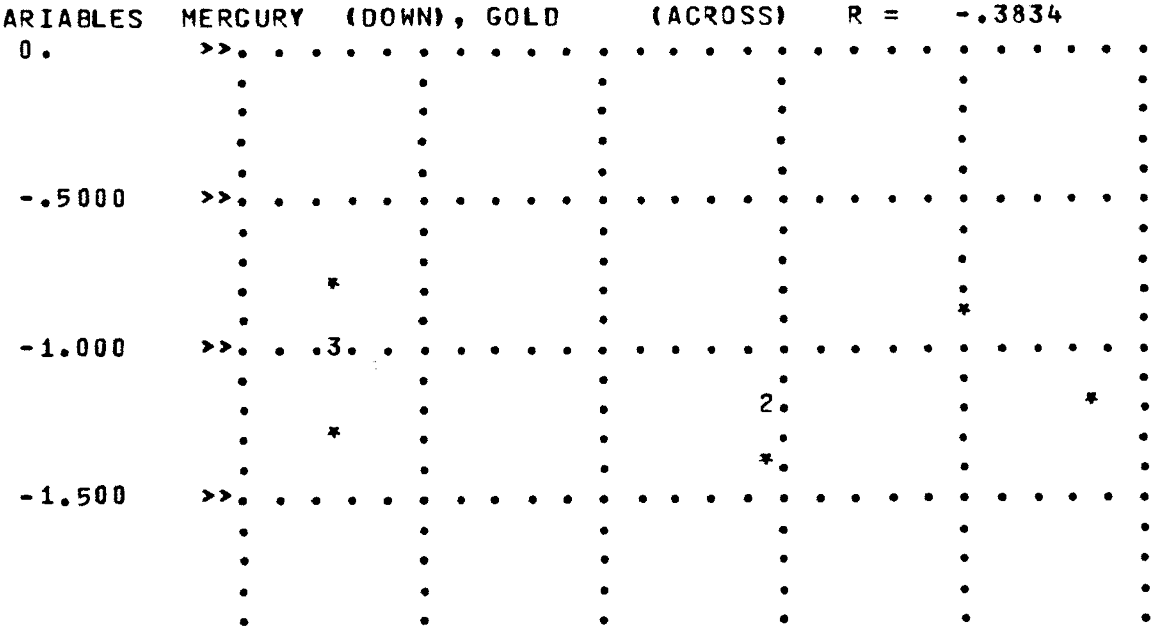


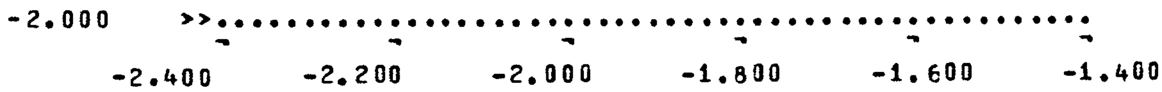
NUMBER OF MISSING OBSERVATIONS= 90

```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
```

LOWER BOUND OF X= -2.30103 UPPER BOUND OF X= -1.45593
LOWER BOUND OF Y= -1.69897 UPPER BOUND OF Y= -.288193

VARIABLES MERCURY (DOWN), GOLD (ACROSS) R = -.3834





NUMBER OF MISSING OBSERVATIONS= 90

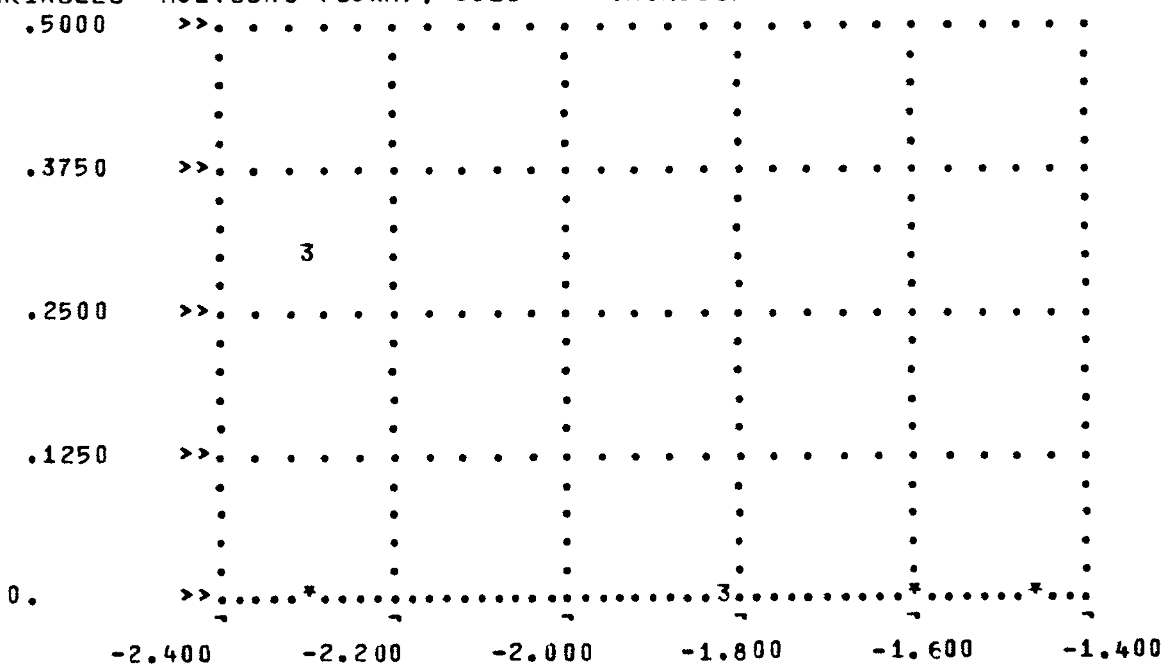
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X= -2.30103 UPPER BOUND OF X= -1.45593
LOWER BOUND OF Y= 0. UPPER BOUND OF Y= .477121

VARIABLES MOLYBDNU (DOWN), GOLD (ACROSS) R = -.7384



NUMBER OF MISSING OBSERVATIONS= 91

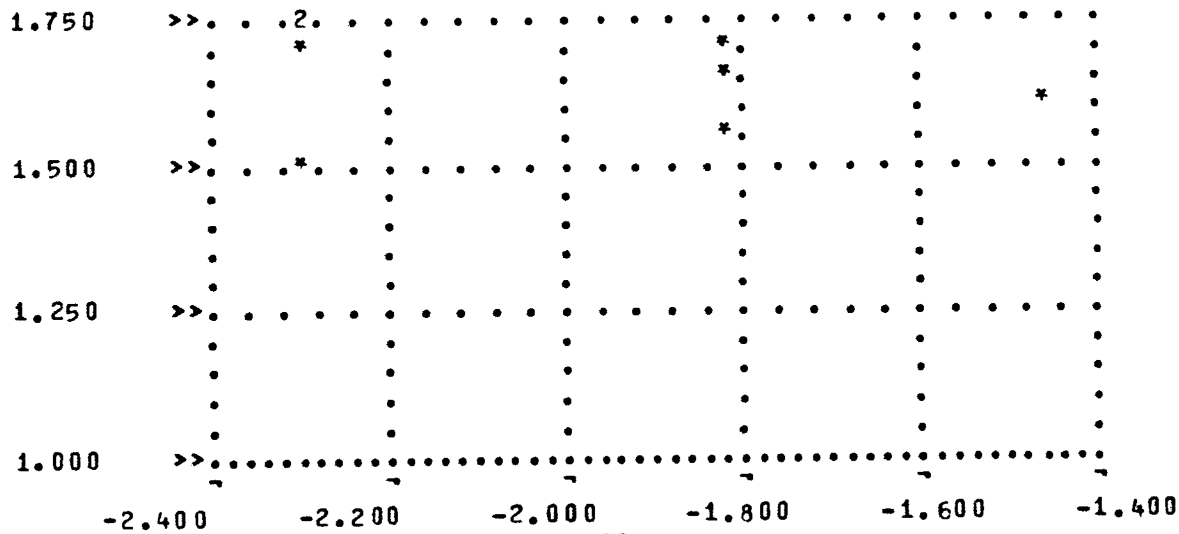
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

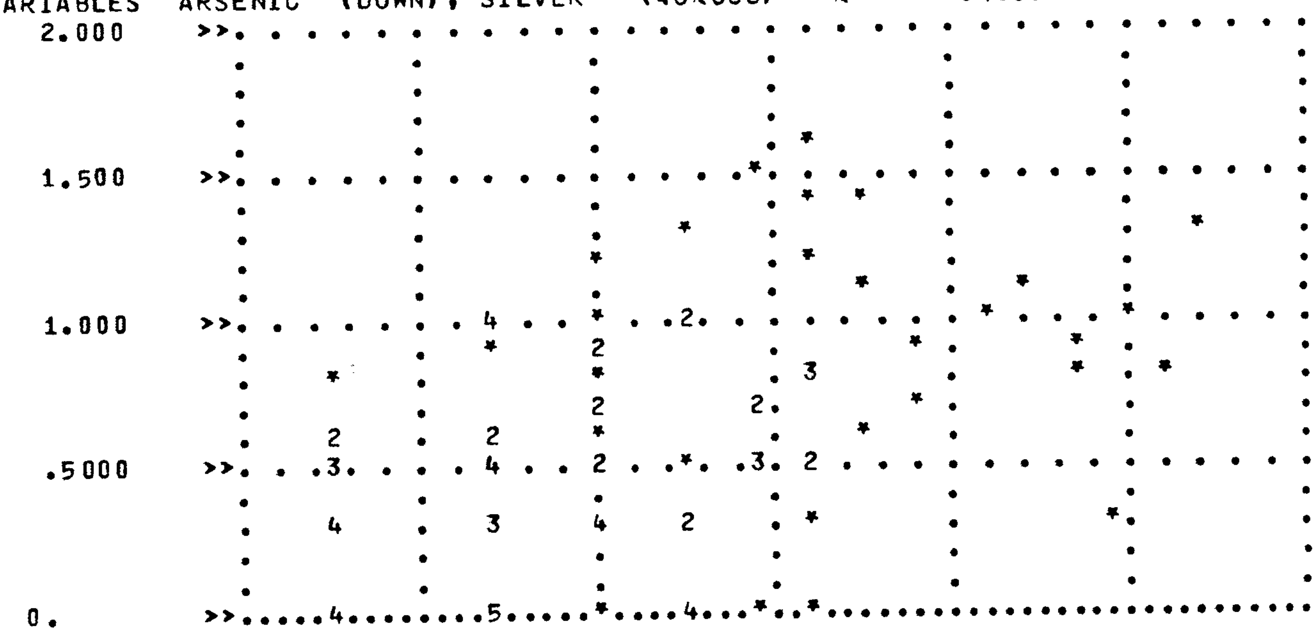
+SCATTER,VV(J),VV(K)
LOWER BOUND OF X= -2.30103 UPPER BOUND OF X= -1.45593
LOWER BOUND OF Y= 1.14613 UPPER BOUND OF Y= 2.00860

VARIABLES ZINC (DOWN), GOLD (ACROSS) R = -.0833




```
NUMBER OF MISSING OBSERVATIONS=      90

+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+SET,J=J+1.

+IF (J.LE.7.) GOTO 100

+100 COMMENT

+SET,K=J+1.

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=      -1.69897          UPPER BOUND OF X=        -.721246
LOWER BOUND OF Y=      0.                UPPER BOUND OF Y=        1.62325
```

```
VARIABLES  ARSENIC  (DOWN), SILVER   (ACROSS)    R =     .4305
```



-1.800 -1.600 -1.400 -1.200 -1.000 -.8000 -.6000

NUMBER OF MISSING OBSERVATIONS= 12

+SET,K=K+1.

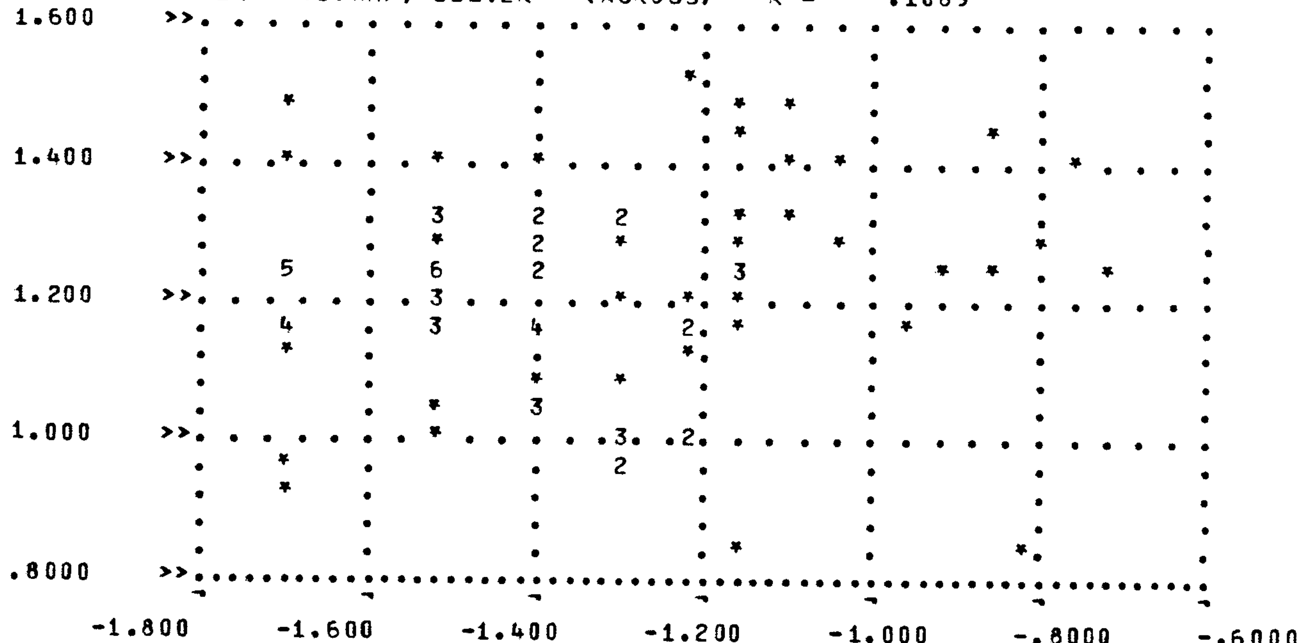
+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)

LOWER BOUND OF X= -1.69897 UPPER BOUND OF X= -.721246
LOWER BOUND OF Y= .845098 UPPER BOUND OF Y= 1.51851

VARIABLES COPPER (DOWN), SILVER (ACROSS) R = .1089



NUMBER OF MISSING OBSERVATIONS= 12

+SET,K=K+1.

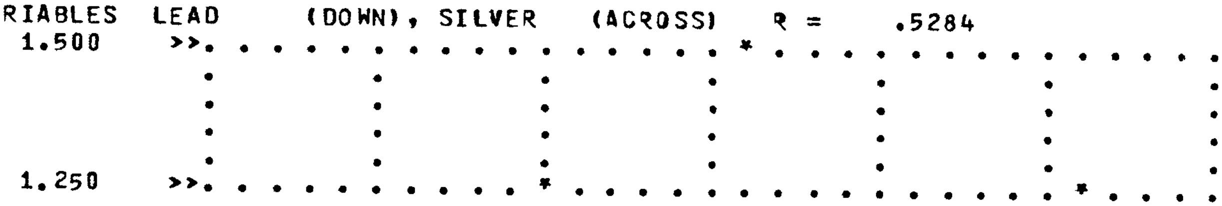
+IF (K.LE.8.) GOTO 200

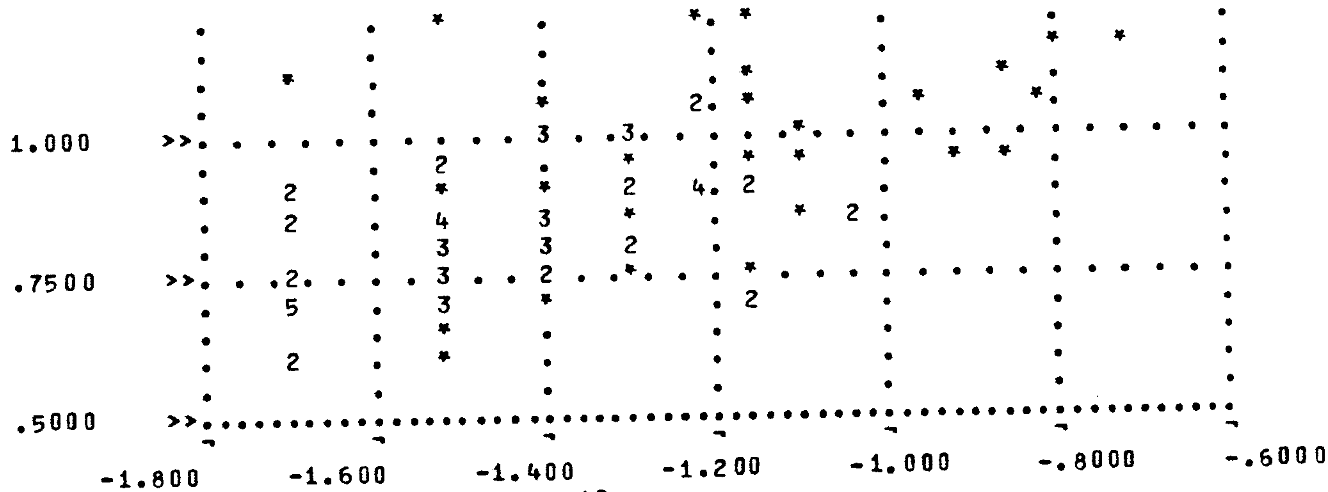
+200 COMMENT

+SCATTER,VV(J),VV(K)

LOWER BOUND OF X= -1.69897 UPPER BOUND OF X= -.721246
LOWER BOUND OF Y= .556303 UPPER BOUND OF Y= 1.51188

VARIABLES LEAD (DOWN), SILVER (ACROSS) R = .5284



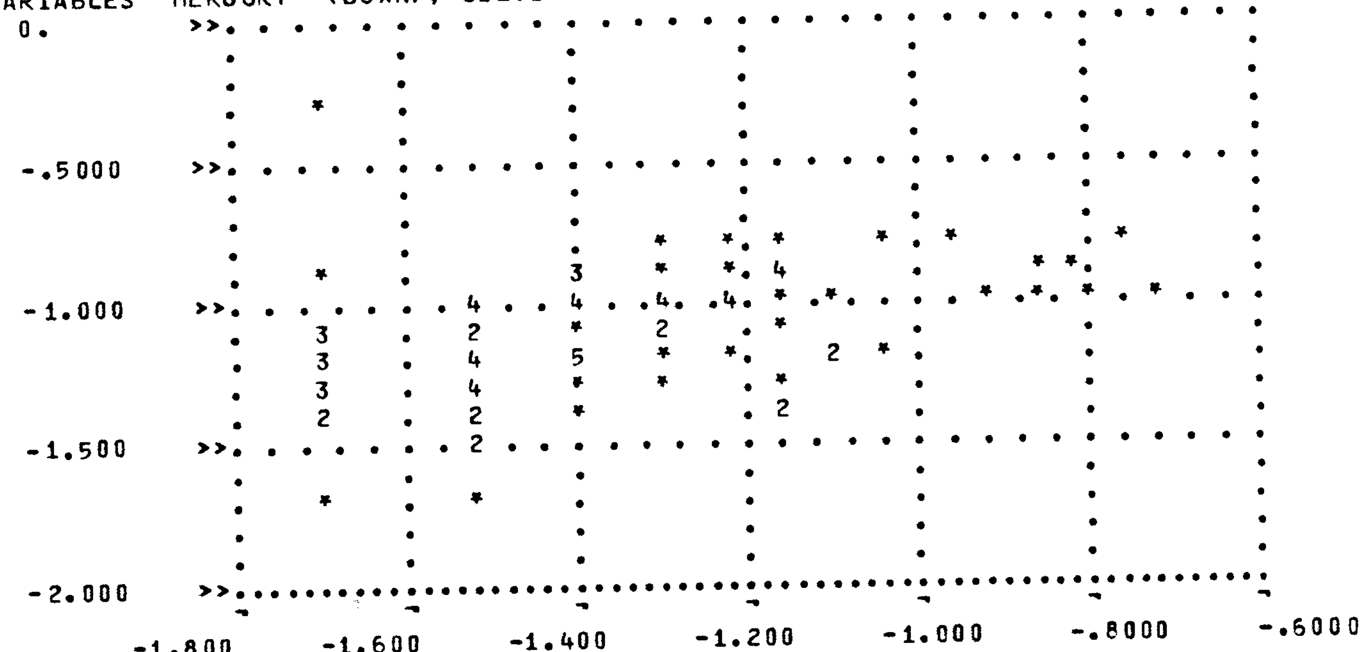


NUMBER OF MISSING OBSERVATIONS= 12

```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
```

LOWER BOUND OF X= -1.69897 UPPER BOUND OF X= -.721246
LOWER BOUND OF Y= -1.69897 UPPER BOUND OF Y= -.288193

VARIABLES MERCURY (DOWN), SILVER (ACROSS) R = .3985

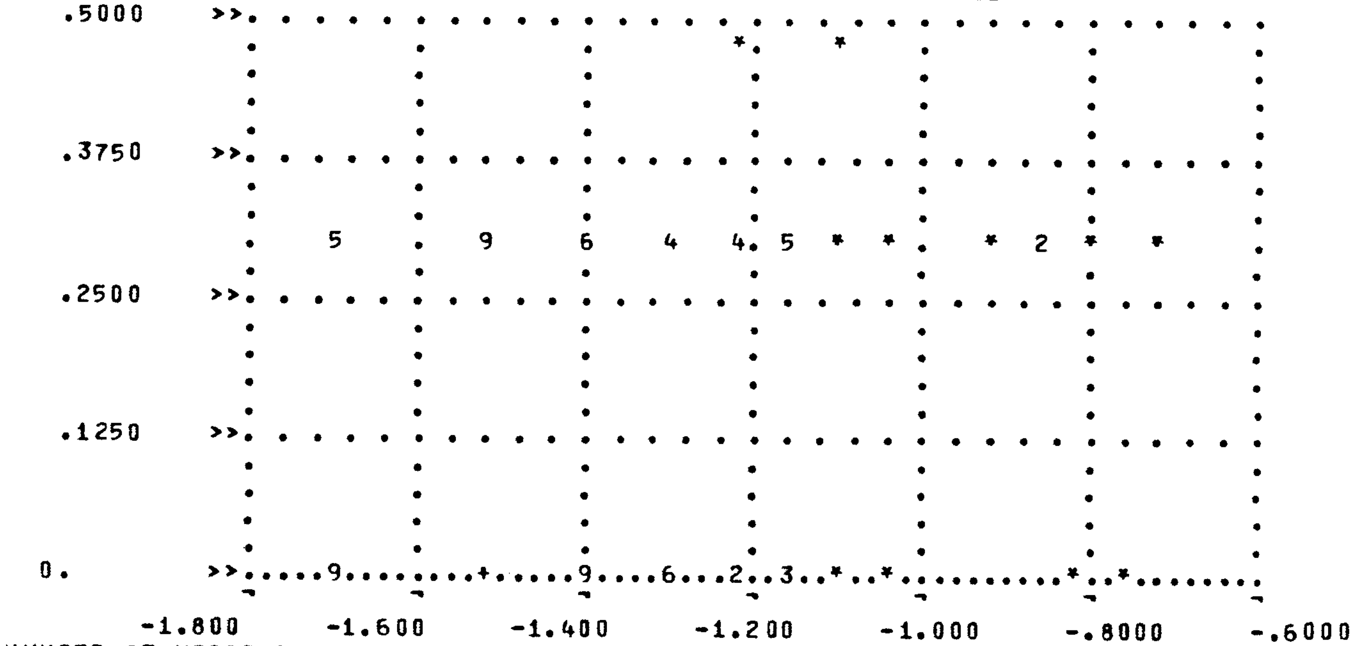


NUMBER OF MISSING OBSERVATIONS= 12

```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT
```

```
+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=    -1.69897        UPPER BOUND OF X=    -.721246
LOWER BOUND OF Y=     0.             UPPER BOUND OF Y=     .477121
```

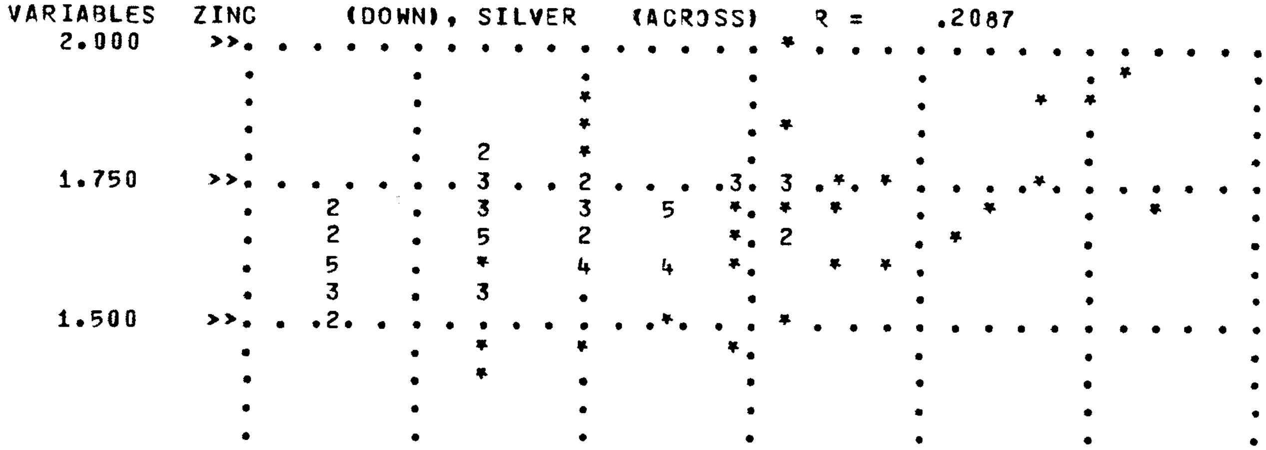
VARIABLES MOLYBDNU (DOWN), SILVER (ACROSS) R = .2117

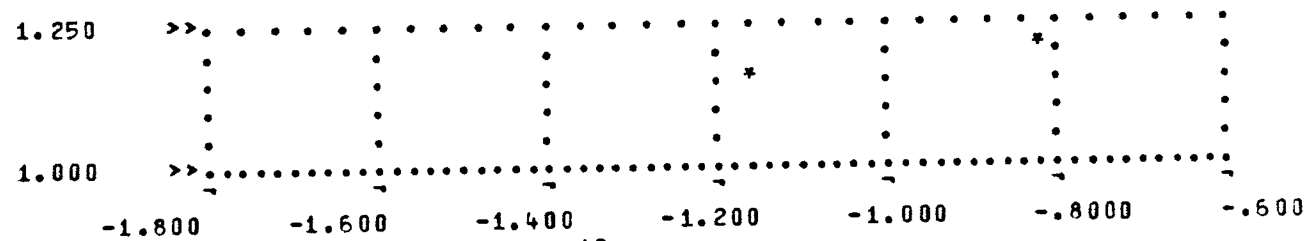


NUMBER OF MISSING OBSERVATIONS= 15

```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=    -1.69897        UPPER BOUND OF X=    -.721246
LOWER BOUND OF Y=     1.14613        UPPER BOUND OF Y=     2.00860
```

VARIABLES ZINC (DOWN), SILVER (ACROSS) R = .2087



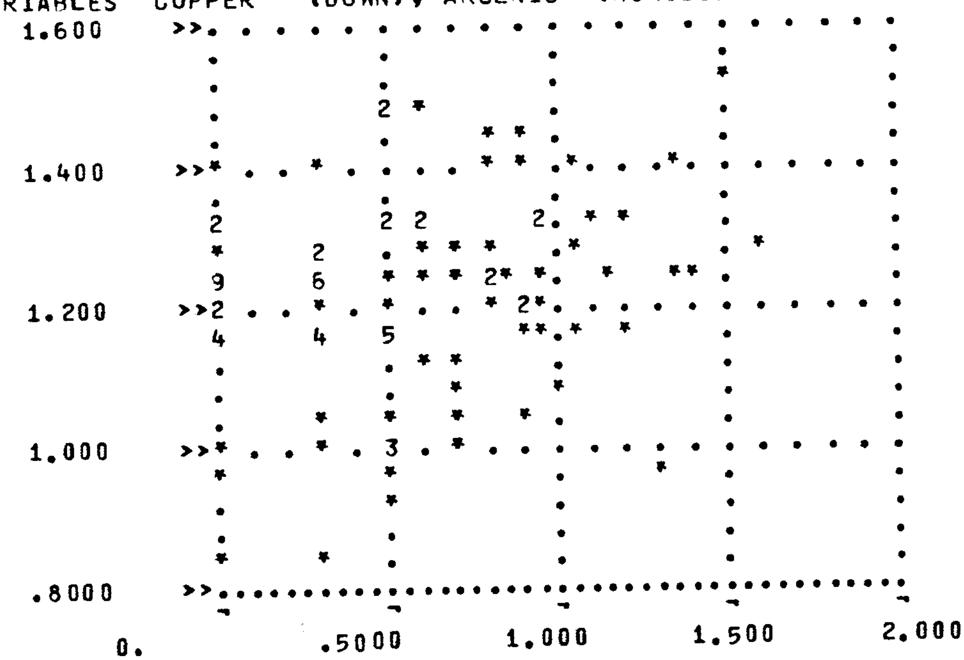


NUMBER OF MISSING OBSERVATIONS= 12

```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+SET,J=J+1.

+IF (J.LE.7.) GOTO 100

+100 COMMENT

+SET,K=J+1.

+200 COMMENT

+SCATTER,VV(J),VV(K)
```

LOWER BOUND OF X= 0.
LOWER BOUND OF Y= .845098
UPPER BOUND OF X= 1.62325
UPPER BOUND OF Y= 1.51851

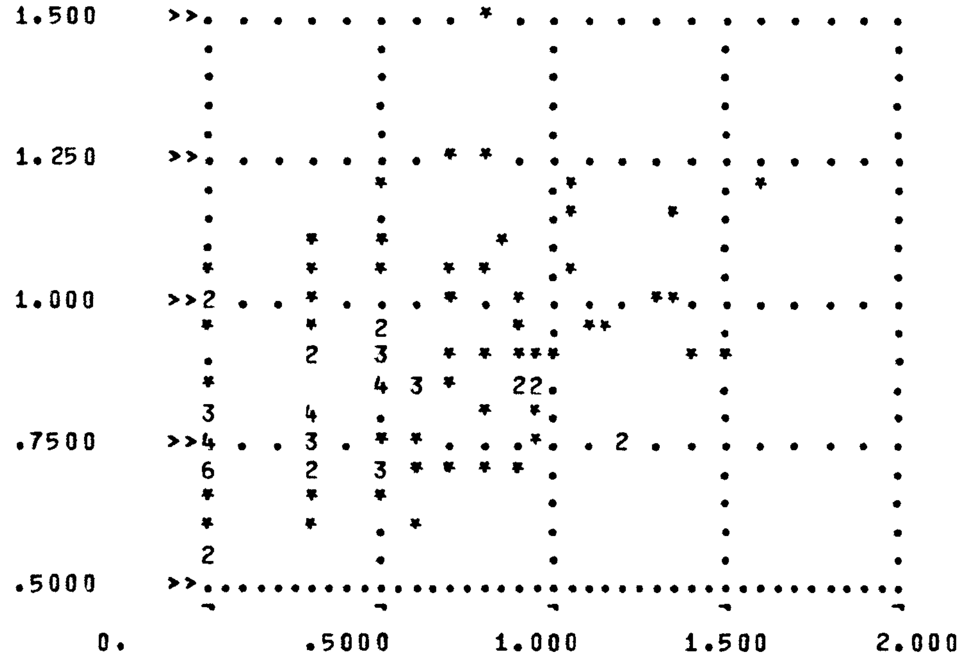
VARIABLES COPPER (DOWN), ARSENIC (ACROSS) R = .1854




```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
```

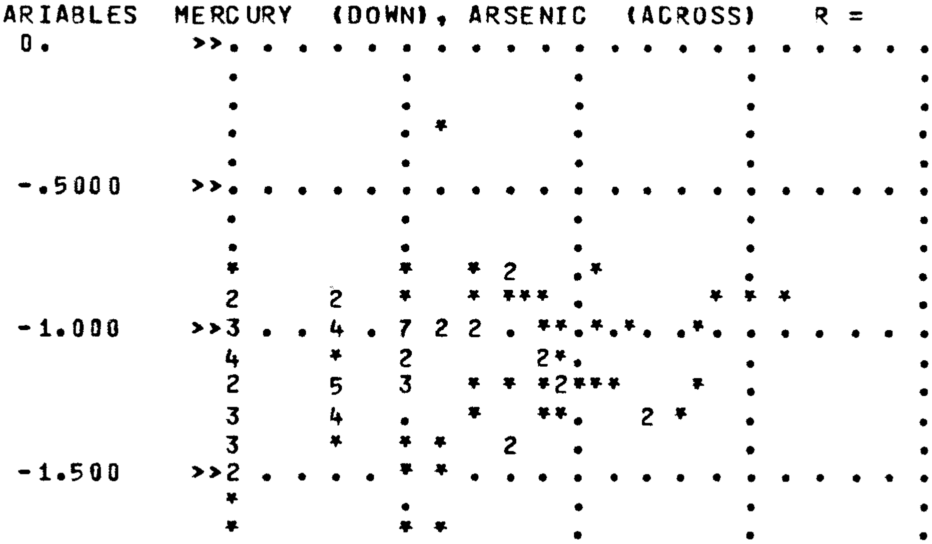
```
LOWER BOUND OF X=     0.              UPPER BOUND OF X=      1.62325
LOWER BOUND OF Y=      .556303        UPPER BOUND OF Y=      1.51188
```

VARIABLES LEAD   (DOWN), ARSENIC   (ACROSS)   R =   .4194

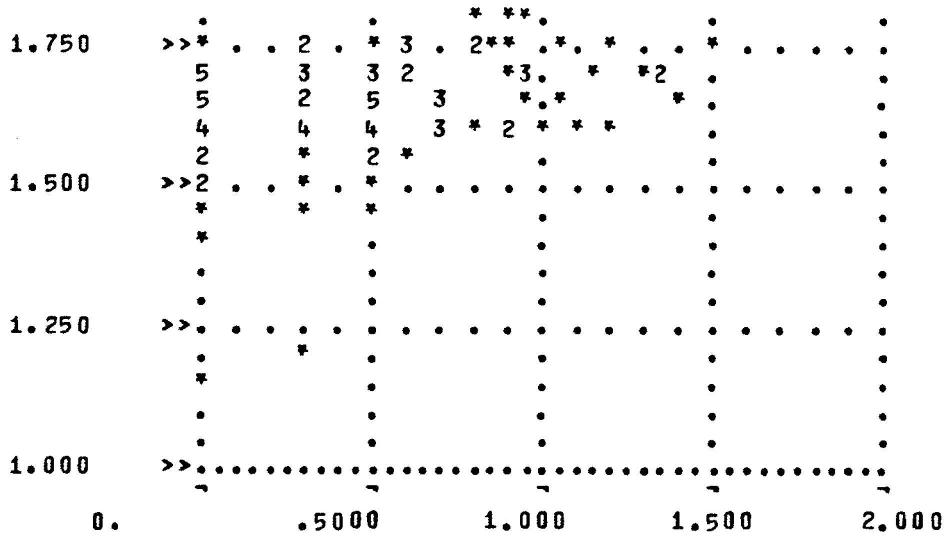



```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=     0.              UPPER BOUND OF X=      1.62325
LOWER BOUND OF Y=    -1.69897         UPPER BOUND OF Y=     -.288193
```

VARIABLES MERCURY   (DOWN), ARSENIC   (ACROSS)   R =   .2219

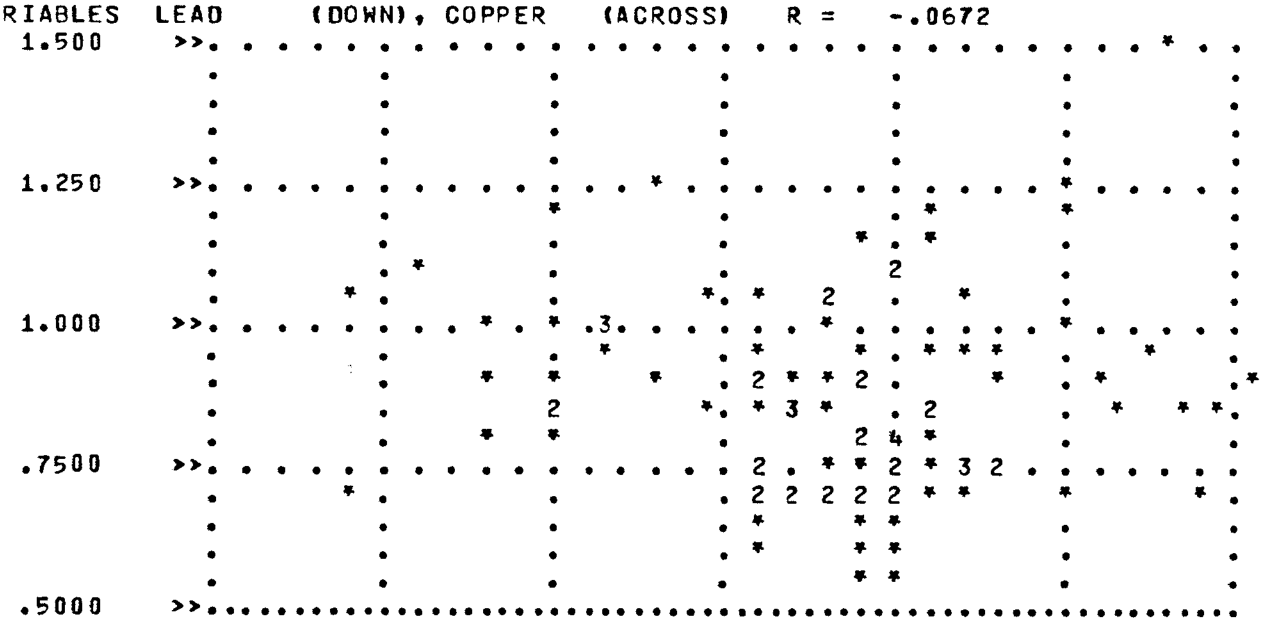


```
                    .         .         .         .         .
                    .         .         .         .         .
  -2.000     >>.........................................
                    -         -         -         -         -

          0.          .5000       1.000       1.500       2.000

+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=     0.              UPPER BOUND OF X=      1.62325
LOWER BOUND OF Y=     0.              UPPER BOUND OF Y=      .477121


VARIABLES   MOLYBDNU (DOWN), ARSENIC  (ACROSS)    R =     .1776
   .5000     >>. . . . . . . . . . . . . . . . . . . . .
                    .         *         . *       .         .
                    .         .         .         .         .
                    .         .         .         .         .
                    .         .         .         .         .
   .3750     >>. . . . . . . . . . . . . . . . . . . . .
                    .         .         .         .         .
                    .         .         .         .         .
                    7     8   4 4 3 2*33.2 *    ** *        .
                    .         .         .         .         .
   .2500     >>. . . . . . . . . . . . . . . . . . . . .
                    .         .         .         .         .
                    .         .         .         .         .
                    .         .         .         .         .
                    .         .         .         .         .
   .1250     >>. . . . . . . . . . . . . . . . . . . . .
                    .         .         .         .         .
                    .         .         .         .         .
                    .         .         .         .         .
                    .         .         .         .         .
  0.         >>+.....8...+.2.3.3.22*...*.**....*.......
                    -         -         -         -         -

          0.          .5000       1.000       1.500       2.000
NUMBER OF MISSING OBSERVATIONS=       5

+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=     0.              UPPER BOUND OF X=      1.62325
LOWER BOUND OF Y=      1.14613        UPPER BOUND OF Y=      2.00860


VARIABLES   ZINC     (DOWN), ARSENIC  (ACROSS)    R =     .3706
   2.000     >>. . . . . . . . *. . . . . . . . . . . .
                    .         .       *  .         .         .
                    .     *   .        * .*        .         .
                    .     *   .         .         . *       .
```




```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+SET,J=J+1.

+IF (J.LE.7.) GOTO 100

+100 COMMENT

+SET,K=J+1.

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=      .845098        UPPER BOUND OF X=      1.51851
LOWER BOUND OF Y=      .556303        UPPER BOUND OF Y=      1.51188
```

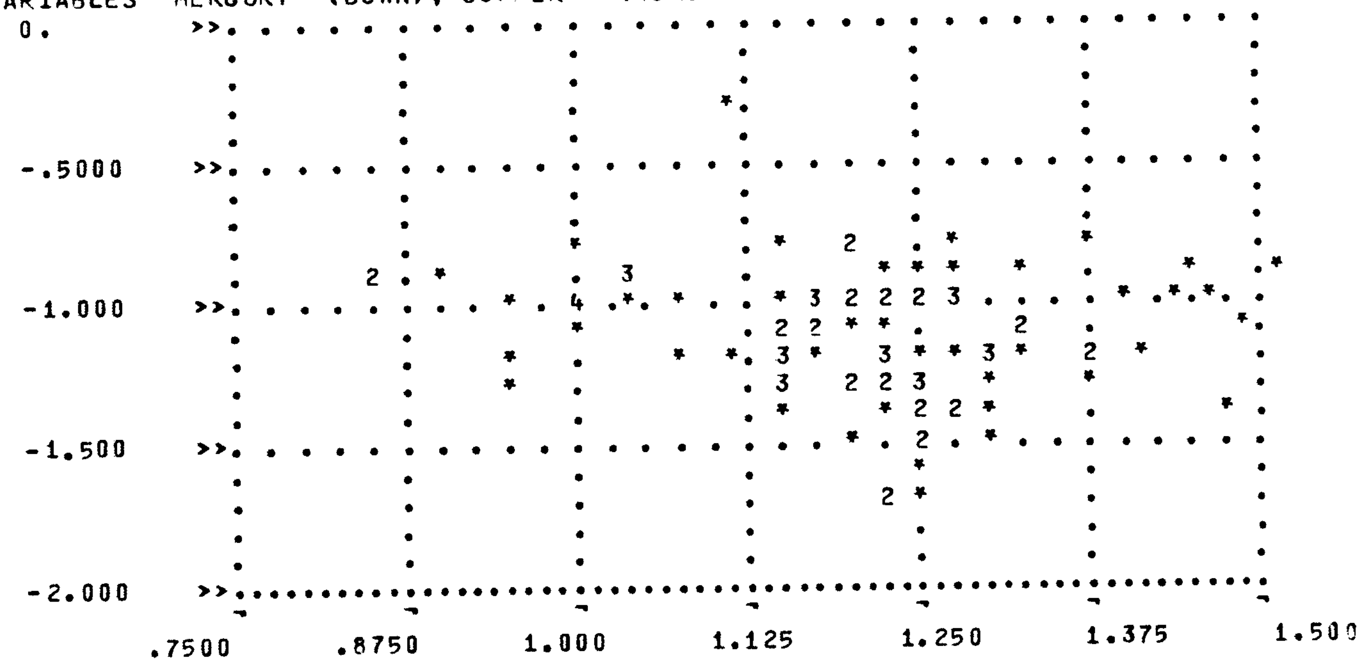
VARIABLES LEAD (DOWN), COPPER (ACROSS) R = -.0672



.7500 .8750 1.000 1.125 1.250 1.375 1.500

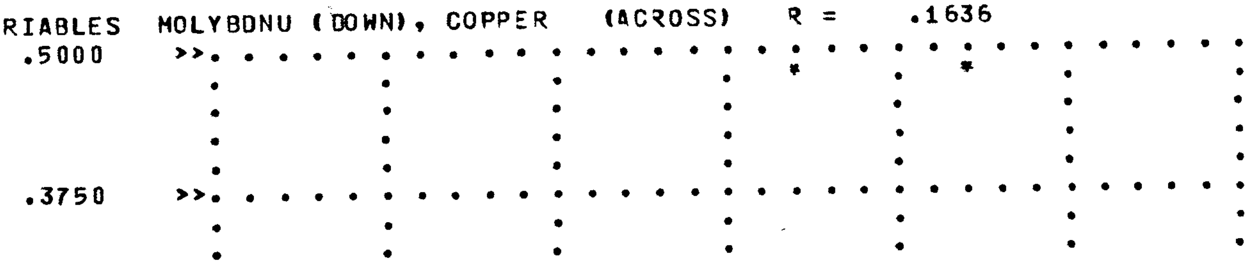
```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=      .845098        UPPER BOUND OF X=      1.51851
LOWER BOUND OF Y=    -1.69897         UPPER BOUND OF Y=     -.288193
```

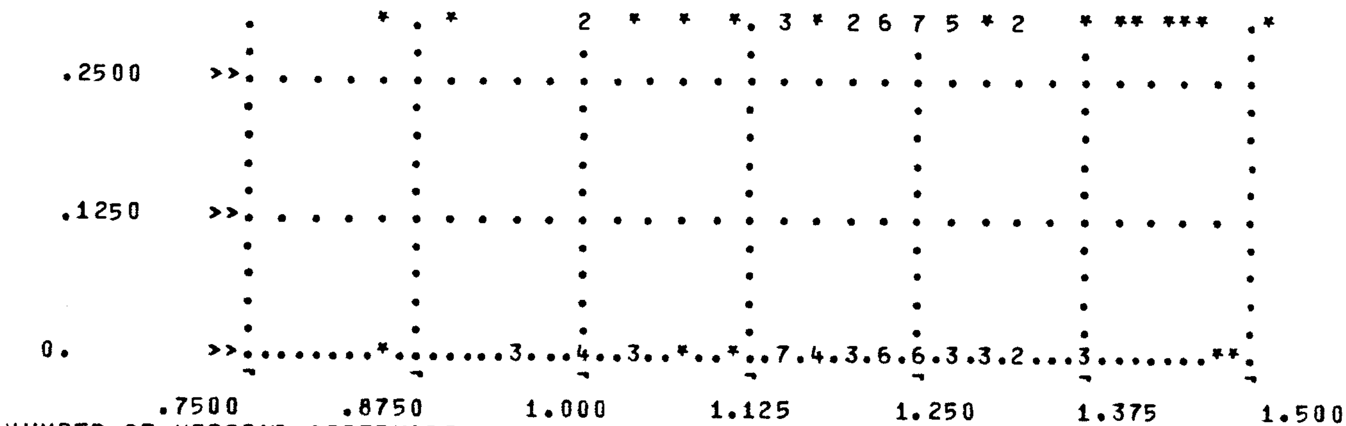
VARIABLES MERCURY (DOWN), COPPER (ACROSS) R = -.2045



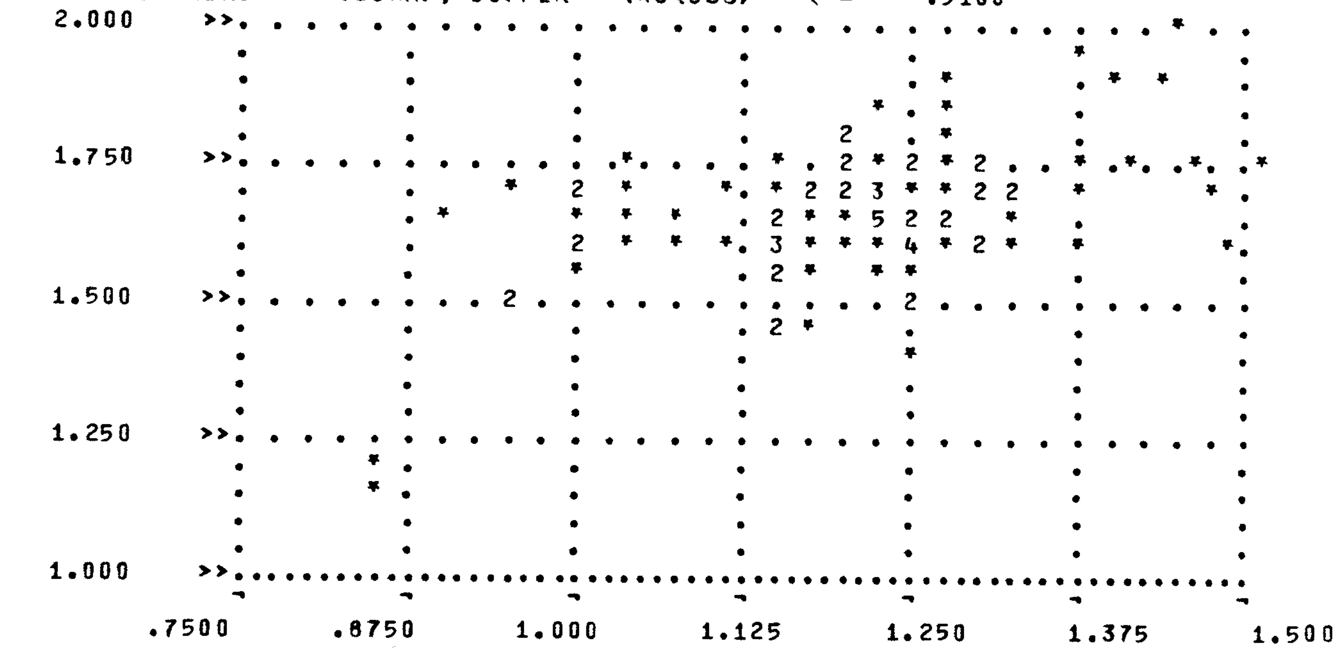

```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=      .845098        UPPER BOUND OF X=      1.51851
LOWER BOUND OF Y=    0.               UPPER BOUND OF Y=      .477121
```

VARIABLES MOLYBDNU (DOWN), COPPER (ACROSS) R = .1636





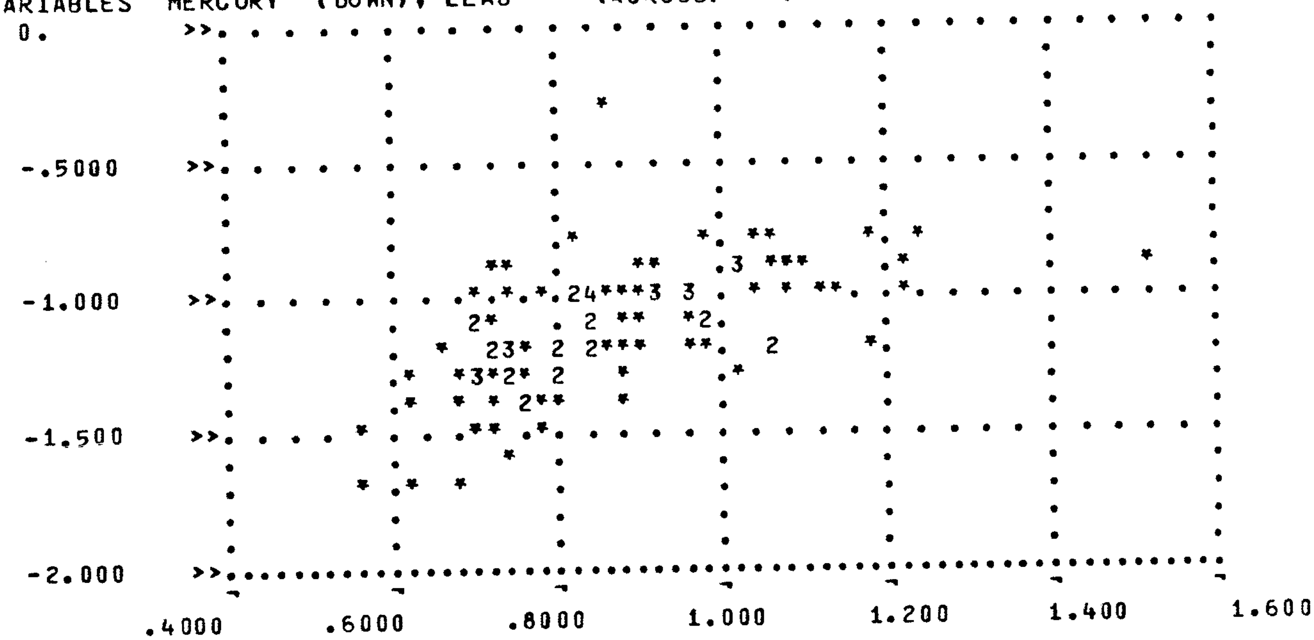

```
NUMBER OF MISSING OBSERVATIONS=       5

+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=      .845098        UPPER BOUND OF X=      1.51851
LOWER BOUND OF Y=     1.14613         UPPER BOUND OF Y=      2.00860


VARIABLES  ZINC     (DOWN), COPPER   (ACROSS)   R =    .5100
```




```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+SET,J=J+1.

+IF (J.LE.7.) GOTO 100
```

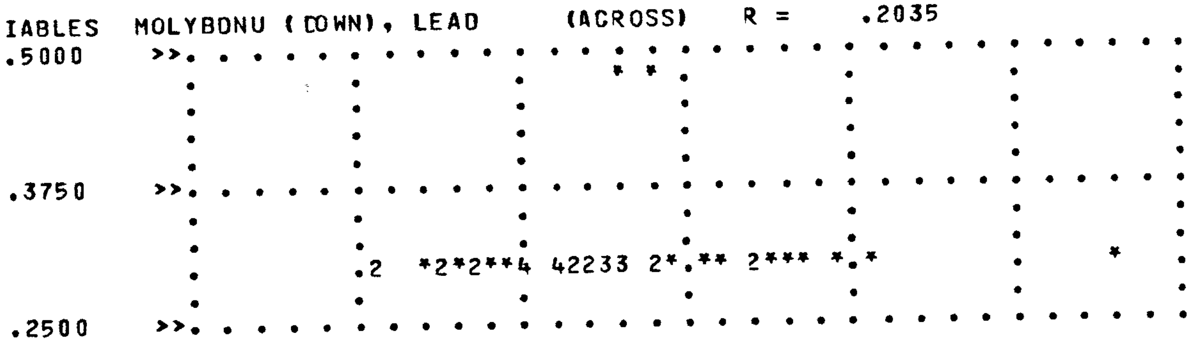
```
+100 COMMENT

+SET,K=J+1.

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=      .556303        UPPER BOUND OF X=      1.51188
LOWER BOUND OF Y=    -1.69897         UPPER BOUND OF Y=     -.288193
```

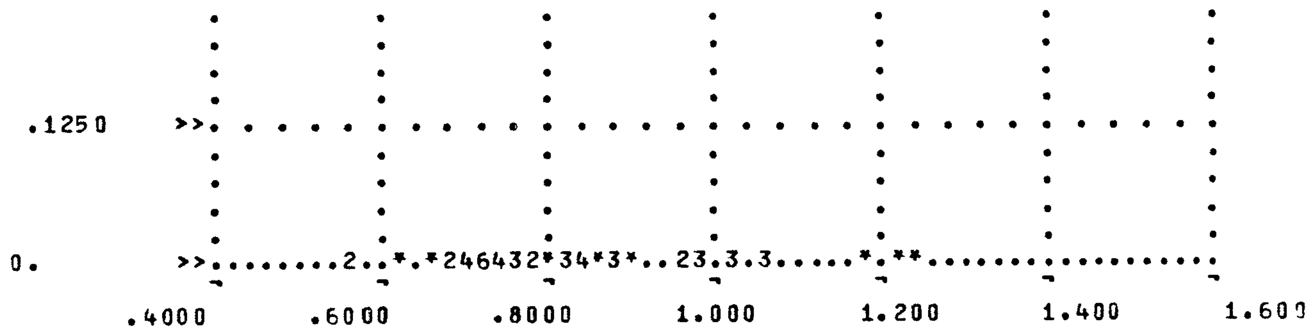
VARIABLES MERCURY (DOWN), LEAD (ACROSS) R = .5861




```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=      .556303        UPPER BOUND OF X=      1.51188
LOWER BOUND OF Y=     0.              UPPER BOUND OF Y=      .477121
```

VARIABLES MOLYBDNU (DOWN), LEAD (ACROSS) R = .2035



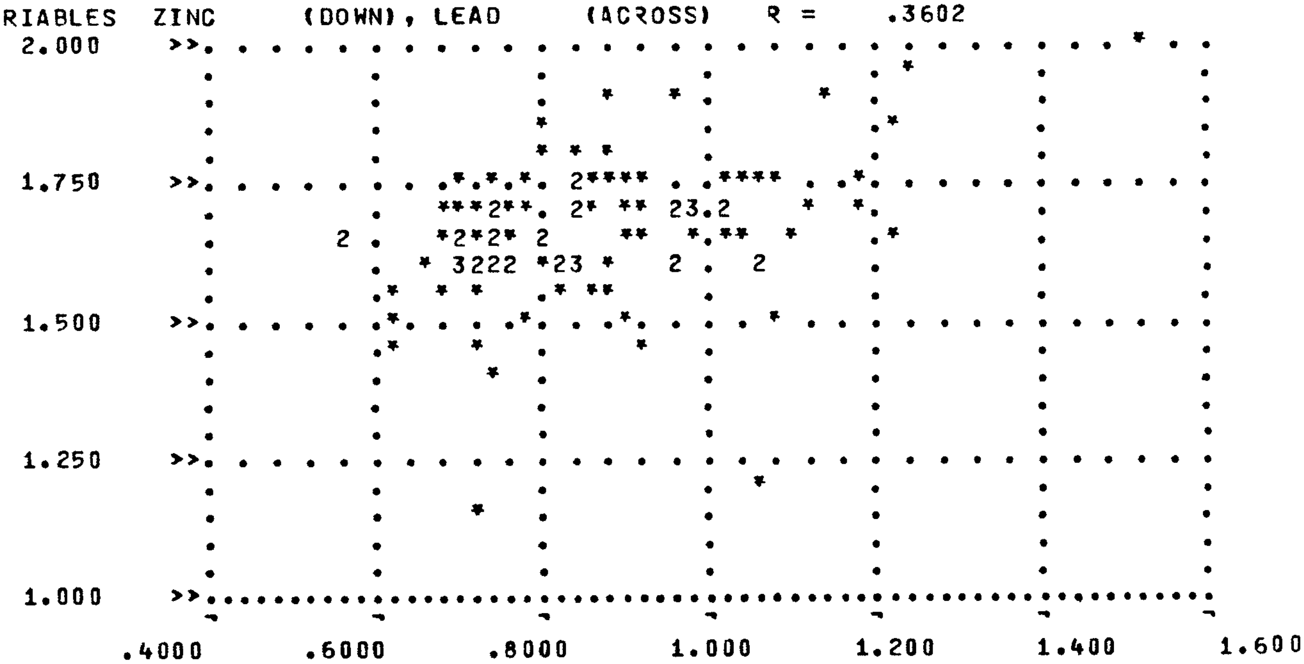


NUMBER OF MISSING OBSERVATIONS=   5

```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
```

LOWER BOUND OF X=   .556303   UPPER BOUND OF X=   1.51188
LOWER BOUND OF Y=   1.14613   UPPER BOUND OF Y=   2.00860

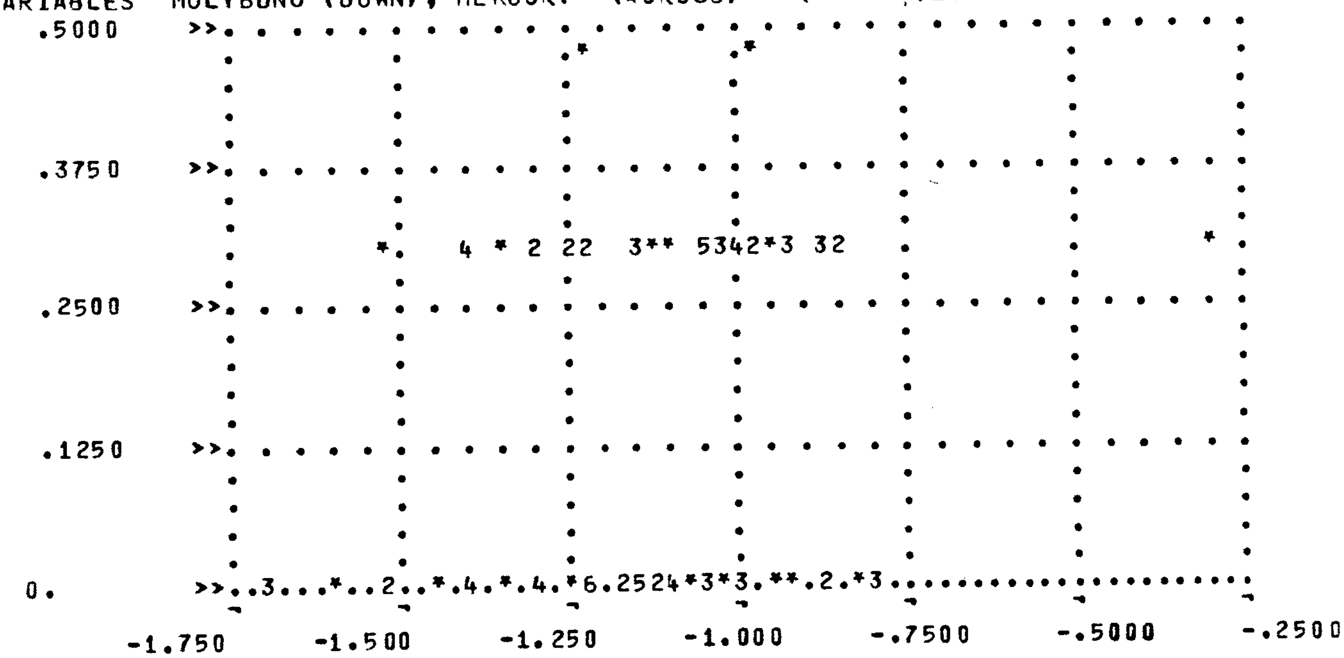
VARIABLES ZINC   (DOWN), LEAD   (ACROSS)   R =   .3602




```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+SET,J=J+1.

+IF (J.LE.7.) GOTO 100

+100 COMMENT

+SET,K=J+1.
```

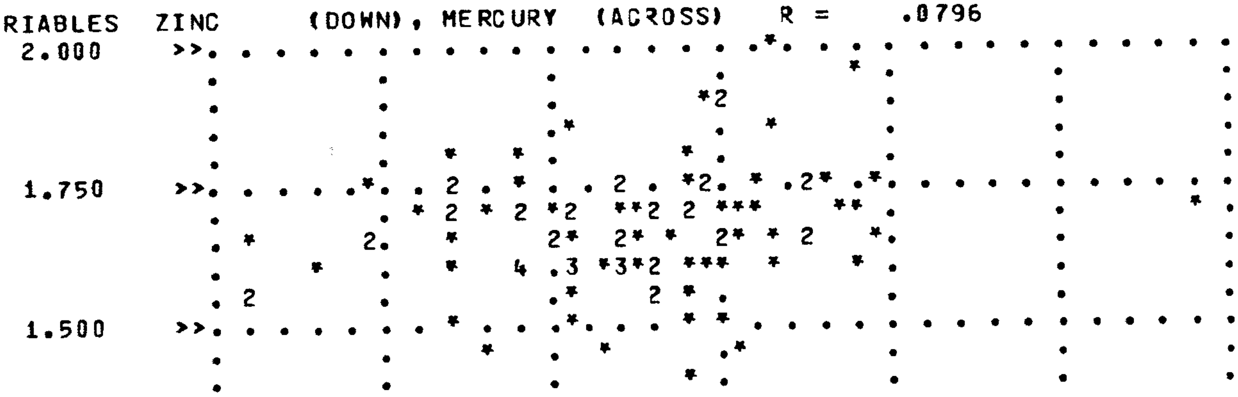
```
+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=    -1.69897        UPPER BOUND OF X=     -.288193
LOWER BOUND OF Y=    0.              UPPER BOUND OF Y=      .477121
```

VARIABLES MOLYBDNU (DOWN), MERCURY (ACROSS) R = .2302

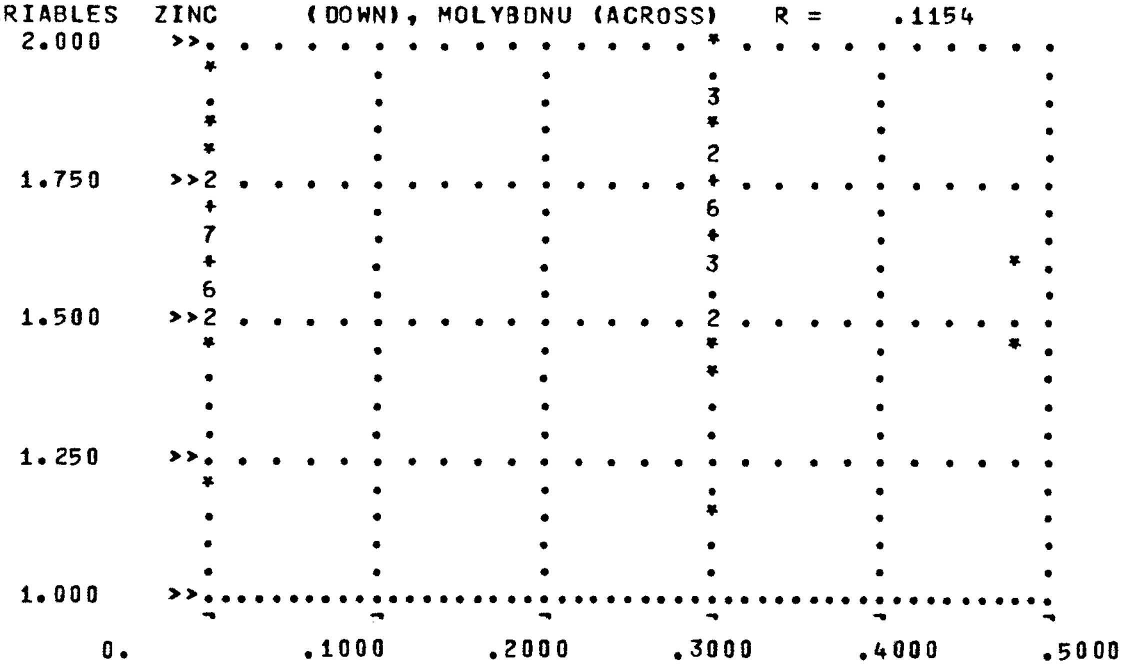


```
NUMBER OF MISSING OBSERVATIONS=     5

+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=    -1.69897        UPPER BOUND OF X=     -.288193
LOWER BOUND OF Y=     1.14613        UPPER BOUND OF Y=      2.00860
```

VARIABLES ZINC (DOWN), MERCURY (ACROSS) R = .0796




```
+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+SET,J=J+1.

+IF (J.LE.7.) GOTO 100

+100 COMMENT

+SET,K=J+1.

+200 COMMENT

+SCATTER,VV(J),VV(K)
LOWER BOUND OF X=     0.              UPPER BOUND OF X=      .477121
LOWER BOUND OF Y=      1.14613        UPPER BOUND OF Y=      2.00860


VARIABLES  ZINC      (DOWN), MOLYBDNU (ACROSS)    R =     .1154
```




```
NUMBER OF MISSING OBSERVATIONS=      5

+SET,K=K+1.

+IF (K.LE.8.) GOTO 200

+SET,J=J+1.
```

```
*IF (J.LE.7.) GOTO 100

$EXIT
```

OSU 573.5 JOB ORIGIN = BATCH. USER NUMBER = BUBQ20 83/05/23. 17.24.47.

0493 0493 0493 0493 RNB

BOB BRENNE

ROOM 149:

Open file report O-83-5

ASSAY DATA FOR WILDERNESS STUDY AREA, FALL CREEK

WSA UNIT NUMBERS..

SILT SAMPLES

SITE	AREA	UTM-E	UTM-N	AU -PPM	AG -PPM	AS -PPM	CU -PPM	HG -PPM	MO -PPM	PB -PPM	ZN -PPM
A1501F01	61680	545700	4850050	.005L	.050	2.000	19.000	.090	2.000	8.500	51.000
A1502F01	61680	545500	4849850	.005L	.050	1.000	16.000	.150	1.000	9.500	49.000
A1503F01	61680	547650	4851250	.005L	.040	3.000	15.000	.100	1.000	6.800	52.000
A1504F01	61680	547400	4851000	.005L	.040	2.000	17.000	.060	2.000	6.200	67.000
A1505F01	61680	548450	4853430	.015	.030	1.000	14.000	.060	1.000	7.200	34.000
A1506F01	61680	548150	4854350	.005L	.040	2.000	25.000	.100	2.000	7.500	79.000
A1507F01	61680	549350	4858700	.035	.040	2.000	18.000	.060	1.000	6.200	42.000
A1508F01	61680	549450	4858575	.005L	.020L	1.000	17.000	.020	1.000	3.600	45.000
A1509F01	61680	550375	4858600	.005L	.040	8.000	15.000	.080	1.000	6.900	41.000
A1515F01	61680	541000	4867025	.025	.070	42.000	19.000	.120	1.000	16.700	73.000
A1516F01	61680	541800	4866750	.005L	.030	9.000	15.000	.060	2.000	6.900	49.000
A1517F01	61680	541180	4867000	.005L	.030	9.000	18.000	.055	2.000	6.400	47.000
A1518F01	61680	541700	4867400	.005L	.060	33.000	33.000	.140	2.000	7.900	57.000
A1519F01	61680	541250	4854750	.005L	.070	6.000	16.000	.170	1.000L	11.300	57.000
A1520F01	61680	540250	4854600	.005L	.050	9.000	21.000	.080	2.000	7.800	53.000
A1521F01	61680	546950	4854000	.005L	.020	2.000	14.000	.080	1.000	7.600	36.000
A1522F01	61680	546800	4853850	.005L	.020	1.000	24.000	.050	1.000	5.100	40.000
A1523F01	61680	547600	4852500	.005L	.050	10.000	12.000	.070	1.000	7.600	40.000
A1524F01	61680	543000	4848400	.005L	.050	20.000	9.000	.055	1.000	10.500	49.000
A1525F01	61680	541950	4849425	.005L	.070	6.000	17.000	.040	1.000	7.500	55.000
A1526F01	61680	542200	4849500	.005	.060	3.000	10.000	.155	1.000	15.400	50.000
A1527F01	61680	542200	4847425	.005L	.020L	3.000	21.000	.070	1.000	5.400	45.000
A1528F01	61680	542425	4852000	.005L	.040	9.000	20.000	.070	1.000	5.500	50.000
A1529F01	61680	542650	4852100	.005L	.030	3.000	11.000	.100	1.000	9.100	42.000
A1530F01	61680	544475	4849925	.005L	.020L	5.000	18.000	.050	1.000	5.300	42.000
A1531F01	61680	544200	4851350	.005L	.020	6.000	17.000	.070	1.000	5.300	42.000
A1532F01	61680	545900	4850775	.005L	.020L	1.000	18.000	.025	1.000	5.400	42.000
A1535F01	61680	547200	4856075	.005L	.020L	8.000	16.000	.080	1.000L	4.900	39.000
A1536F01	61680	547400	4856750	.005L	.020L	2.000	16.000	.050	1.000L	5.500	51.000
A1537F01	61680	543700	4856375	.005L	.110	11.000	14.000	.170	1.000L	11.200	45.000
A1538F01	61680	545475	4857250	.005L	.020L	3.000	15.000	.100	1.000	5.100	43.000
A1539F01	61680	544900	4859250	.005L	.030	2.000	18.000	.040	2.000	6.100	55.000
A1540F01	61680	544475	4859700	.005L	.030	3.000	16.000	.030	1.000	5.200	47.000
A1542F01	61680	547550	4867300	.005L	.140	7.000	18.000	.135	2.000	11.900	59.000
A1543F01	61680	547750	4867225	.005L	.160	11.000	19.000	.095	2.000	14.000	76.000
A1545F01	61680	543450	4863600	.005L	.030	4.000	20.000	.040	1.000	5.800	51.000
A1546F01	61680	543200	4863350	.005L	.020	4.000	13.000	.515	2.000	7.300	52.000
A1547F01	61680	542850	4864200	.005L	.030	9.000	16.000	.090	1.000	7.000	60.000
A1549F01	61680	544250	4865375	0.000B	.090	5.000	19.000	.155	1.000	6.700	42.000
A1550F01	61680	544350	4865650	.015	.030	2.000	19.000	.060	1.000	5.400	47.000
A1552F01	61680	551400	4866100	.005L	.080	12.000	20.000	.060	3.000	9.100	38.000
A1553F01	61680	551425	4865925	.005	.140	8.000	27.000	.100	2.000	9.000	76.000
A1554F01	61680	552150	4867375	.005	.080	4.000	29.000	.110	2.000	7.000	56.000
A1555F01	61680	552050	4867275	.005L	.090	8.000	26.000	.070	2.000	6.900	58.000
A1556F01	61680	551250	4857000	.005L	.040	2.000	11.000	.130	1.000	10.300	57.000
A1557F01	61680	552250	4858700	.005L	.060	3.000	14.000	.095	2.000	8.300	56.000
A1558F01	61680	551850	4859100	.005L	.020L	1.000	18.000	.030	1.000	3.700	45.000
A1559F01	61680	551750	4858850	.005L	.060	5.000	10.000	.105	2.000	8.000	47.000
A1560F01	61680	553125	4863125	.005L	.030	1.000	17.000	.085	1.000	5.100	46.000
A1561F01	61680	553250	4862925	.005L	.030	1.000	17.000	.055	2.000	6.200	46.000
A1562F01	61680	552400	4863125	.005L	.030	1.000	18.000	.090	2.000	5.600	25.000
A1563F01	61680	549900	4861750	.005L	.170	6.000	24.000	.160	1.000	17.500	92.000
A1564F01	61680	550000	4861650	.005L	.020L	1.000	17.000	.050	1.000	4.700	51.000
A1565F01	61680	549350	4861125	.005L	.030	4.000	20.000	.030	2.000	4.900	54.000
A1566F01	61680	548800	4859850	.005L	.040	6.000	19.000	.040	2.000	6.300	63.000
A1567F01	61680	548950	4859975	.005	.070	16.000	20.000	.050	1.000L	5.400	58.000
A1568F01	61680	547200	4858325	.005L	.040	4.000	19.000	.090	2.000	7.400	55.000
A1569F01	61680	547100	4858300	.005L	.020	2.000	14.000	.045	1.000	5.100	48.000
A1570F01	61680	548200	4857600	.005L	.020	2.000	17.000	.070	2.000	5.700	46.000

A1571F01	61680	550450	4854100	.005	.070	2.000	18.000	.100	2.000	12.000	30.000
A1572F01	61680	550600	4854000	.005L	.050	3.000	10.000	.090	2.000	6.900	38.000
A1573F01	61680	550350	4852250	.005L	.050	2.000	10.000	.095	1.000	6.500	38.000
A1574F01	61680	549250	4851750	.005L	.050	1.000	9.000	.090	1.000	6.100	32.000
A1575F01	61680	549700	4851850	.005L	.030	3.000	10.000	.090	1.000	6.700	37.000
A1576F01	61680	549725	4851675	.005L	.040	5.000	11.000	.120	2.000	10.400	45.000
A1577F01	61680	548900	4850975	.005L	.040	8.000	11.000	.115	1.000	10.400	49.000
A1578F01	61680	548375	4850650	.005L	.020	3.000	8.000	.135	2.000	12.500	43.000
A1579F01	61680	547400	4849300	.005L	.040	3.000	20.000	.065	1.000	11.300	40.000
A1580F01	61680	547325	4849225	.005L	.060	5.000	13.000	.070	1.000	11.600	40.000
A1581F01	61680	545375	4847550	.005L	.070	3.000	14.000	.075	2.000	9.400	46.000
A1582F01	61680	543500	4844975	.005L	.030	11.000	24.000	.070	2.000	15.100	56.000
A1583F01	61680	546075	4845275	.005L	.020	3.000	9.000	.060	1.000	8.100	32.000
A1584F01	61680	546175	4845125	.005L	.050	1.000	10.000	.080	1.000	9.500	52.000
A1585F01	61680	549225	4844575	.005L	.030	3.000	18.000	.020	1.000	4.700	35.000
A1586F01	61680	549300	4845150	.015	.070	3.000	30.000	.040	1.000	5.200	50.000
A1587F01	61680	548500	4844550	.005L	.020	4.000	17.000	.020	1.000	4.100	34.000
A1588F01	61680	549930	4845000	.005L	.040	16.000	14.000	.050	1.000	5.800	41.000
A1590F01	61680	550800	4845300	.005L	.070	25.000	17.000	.130	2.000	8.200	45.000
A1591F01	61680	550400	4845625	.005L	.120	14.000	17.000	.090	2.000	9.200	49.000
A1593F01	61680	550775	4846275	.005L	.040	5.000	12.000	.100	2.000	16.900	43.000
A1594F01	61680	551650	4847375	.005L	.030	8.000	16.000	.050	2.000	7.700	66.000
A1595F01	61680	551625	4847375	.005L	.080	23.000	24.000	.060	1.000	9.700	49.000
A1596F01	61680	548450	4844700	.005L	.150	2.000	7.000	.135	1.000	11.400	15.000
A1597F01	61680	552100	4847200	.005L	.020	3.000	31.000	.075	1.000	7.000	41.000
A1598F01	61680	552800	4847275	.005L	.060	3.000	15.000	.105	3.000	8.400	27.000
A1599F01	61680	556000	4851900	.005L	.070	1.000	7.000	.140	2.000	5.200	14.000
A1600F01	61680	556200	4851900	.005L	.020	1.000	15.000	.080	1.000	5.200	37.000
A1601F01	61680	553650	4848150	.005L	.020L	1.000	19.000	.040	2.000	4.800	47.000
A1602F01	61680	553700	4848625	.005L	.020	2.000	18.000	.050	2.000	4.900	39.000
A1603F01	61680	554500	4849000	.005L	.020	1.000	14.000	.040	1.000	5.800	40.000
A1604F01	61680	555250	4849100	.005L	.030	2.000	14.000	.045	2.000	4.200	27.000
A1605F01	61680	555400	4849200	.005L	.040	1.000	14.000	.065	1.000	5.200	29.000
A1606F01	61680	555650	4849150	.005L	.020	1.000	18.000	.040	2.000	4.200	32.000
A1608F01	61680	540650	4844750	.005L	.070	6.000	28.000	.120	2.000	32.500	102.000
A1609F01	61680	557450	4848825	.005L	.020L	1.000	18.000	.035	1.000	6.000	52.000
A1610F01	61680	556975	4849375	.005L	.060	1.000	16.000	.095	2.000	11.200	55.000
A1618F01	61680	547075	4858275	.005L	.020L	2.000	14.000	.060	1.000	4.500	40.000
A1619F01	61680	552425	4863100	.005L	.050	1.000	21.000	.120	2.000	5.400	40.000
A1620F01	61680	551650	4847400	.005L	.190	22.000	17.000	.105	2.000	13.400	51.000
A1621F01	61680	556975	4849375	.005L	.030	1.000	21.000	.075	1.000	9.100	53.000
NUMBER OF SAMPLES				10.	88.	100.	100.	100.	95.	100.	100.
MEAN VALUES				.013	.053	5.630	16.940	.084	1.474	7.978	47.440
MINIMUM VALUES				.005	.020	1.000	7.000	.020	1.000	3.600	14.000
MAXIMUM VALUES				.035	.190	42.000	33.000	.515	3.000	32.500	102.000
RANGES				.030	.170	41.000	26.000	.495	2.000	28.900	88.000
STANDARD DEVIATIONS				.010	.036	6.801	5.138	.056	.543	3.933	13.361

ROCK SAMPLES

SITE	AREA	UTM-E	UTM-N	AU -PPM	AG -PPM	AS -PPM	CU -PPM	HG -PPM	MO -PPM	PB -PPM	ZN -PPM
A1500R01	61680	548650	4862700	.005	.200	6.000	43.000	.140	7.000	4.800	85.000
A1510R01	61680	550800	4858300	.005L	.060	100.000	6.000	.200	5.000	8.300	34.000
A1511R01	61680	548575	4859050	.005	.110	35.000	4.000	2.700	6.000	10.900	44.000
A1512R01	61680	546050	4850450	.005L	.060	8.000	23.000	.450	6.000	5.500	75.000
A1513R01	61680	546600	4850675	.005L	.040	12.000	28.000	.500	4.000	7.300	30.000
A1514R01	61680	541150	4862500	.005L	.080	15.000	6.000	.800	6.000	12.600	38.000
A1533R01	61680	541450	4853775	.005L	.020	130.000	29.000	.140	4.000	24.600	26.000
A1534R01	61680	544100	4850600	.005L	.050	3.000	5.000	.130	4.000	13.900	23.000
A1541R01	61680	548400	4861875	.040	.980	16.000	11.000	.140	7.000	17.500	39.000
A1544R01	61680	547200	4865850	.015	.770	26.000	8.000	.280	3.000	10.200	78.000
A1548R01	61680	546475	4860975	.005	.250	4.000	10.000	.165	6.000	7.400	28.000
A1551R01	61680	550200	4864400	.005L	.060	8.000	48.000	.100	6.000	4.500	48.000
A1589R01	61680	548500	4843700	.005L	.150	30.000	16.000	.150	6.000	9.300	30.000
A1592R01	61680	550800	4846825	.015	.310	35.000	6.000	.120	4.000	10.700	18.000
A1607R01	61680	541100	4844950	.005L	.050	14.000	46.000	1.200	3.000	9.100	63.000
A1611R01	61680	549400	4860075	.005L	.040	23.000	13.000	.110	5.000	4.600	30.000
A1612R01	61680	549600	4863050	.040	.050	11.000	45.000	.110	4.000	3.300	71.000
A1613R01	61680	550375	4862300	.235	.280	30.000	10.000	1.000	5.000	5.900	26.000
A1614R01	61680	550400	4862875	.025	.160	8.000	51.000	.165	4.000	3.200	81.000
A1615R01	61680	551150	4864375	.005L	.030	10.000	33.000	.800	4.000	4.600	42.000
A1616R01	61680	547375	4864650	.005	.030	4.000	37.000	.130	4.000	2.300	41.000
A1617R01	61680	548675	4864100	.005L	.030	5.000	20.000	.095	4.000	2.700	57.000
A1618R03	61680	547075	4858275	.005L	.020	2.000	24.000	.155	4.000	8.500	54.000
A1619R03	61680	552425	4863100	.005L	.020	7.000	4.000	.125	6.000	.400	5.000
NUMBER OF SAMPLES				10.	24.	24.	24.	24.	24.	24.	24.
MEAN VALUES				.039	.160	22.583	21.917	.413	4.875	8.004	44.417
MINIMUM VALUES				.005	.020	2.000	4.000	.095	3.000	.400	5.000
MAXIMUM VALUES				.235	.980	130.000	51.000	2.700	7.000	24.600	85.000
RANGES				.230	.960	128.000	47.000	2.605	4.000	24.200	80.000
STANDARD DEVIATIONS				.070	.238	30.577	16.057	.581	1.191	5.382	21.711

SOIL SAMPLES

SITE	AREA	UTM-E	UTM-N	AU -PPM	AG -PPM	AS -PPM	CU -PPM	HG -PPM	MO -PPM	PB -PPM	ZN -PPM
NUMBER OF SAMPLES				0.	0.	0.	0.	0.	0.	0.	0.
MEAN VALUES				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MINIMUM VALUES				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MAXIMUM VALUES				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RANGES				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
STANDARD DEVIATIONS				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

TOTALS

	AU -PPM	AG -PPM	AS -PPM	CU -PPM	HG -PPM	MO -PPM	PB -PPM	ZN -PPM
NUMBER OF SAMPLES	20.	112.	124.	124.	124.	119.	124.	124.
MEAN VALUES	.026	.076	8.911	17.903	.148	2.160	7.983	46.855
MINIMUM VALUES	.005	.020	1.000	4.000	.020	1.000	.400	5.000
MAXIMUM VALUES	.235	.980	130.000	51.000	2.700	7.000	32.500	102.000
RANGES	.230	.960	129.000	47.000	2.680	6.000	32.100	97.000
STANDARD DEVIATIONS	.051	.121	16.040	8.565	.287	1.546	4.227	15.273

GEOLOGICAL DATA FOR WILDERNESS STUDY AREAS

SITE DESCRIPTIONS FOR

SILT SAMPLES

SAMPLE ID	SUBMITTER	DATE SUBMITTED	TOWNSHIP/RANGE	SECTION/SUBSECTION	WSA	
	LAB NUMBER	UTM-E	UTM-N	STATE/COUNTY	GEOLOGICAL FORMATION	
	MATERIAL	SAMPLE TYPE	SAMPLE SOURCE	ROCK TYPE	IGNEOUS FORM	STRUCTURAL SETTING
	MATRIX	OXIDATION STATE	ORE MINERALS	ALTERATION	MINERAL DEPOSIT	
	GEOLOGIC AGE	ROCKNAME	MODIFIER	QUADRANGLE		
A1501F01	D B	82-09-23	20S 3E	27 688	61680	
	00000450	545700	4850050	OREGON/ LANE	TOTL QTBH QLS TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1502F01	D B	82-09-23	20S 3E	27 867	61680	
	00000451	545500	4849850	OREGON/ LANE	TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1503F01	D B	82-09-23	20S 3E	24 978	61680	
	00000452	547650	4851250	OREGON/ LANE	TOTL QTBH QLS TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1504F01	D B	82-09-23	20S 3E	23 888	61680	
	00000453	547400	4851000	OREGON/ LANE	TOTL QTBH	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1505F01	D B	82-09-23	20S 3E	13 696	61680	
	00000454	548450	4853430	OREGON/ LANE	TOTL QTBH TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1506F01	D B	82-09-23	20S 3E	12 986	61680	
	00000455	548150	4854350	OREGON/ LANE	TOTL QTBH	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1507F01	D B	82-09-23	19S 4E	30 989	61680	
	00000456	549350	4858700	OREGON/ LANE	TOTL QTBH TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1508F01	D B	82-09-23	19S 4E	31 767	61680	
	00000457	549450	4858575	OREGON/ LANE	TMV TPV QTBH	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		

SAMPLE ID	SUBMITTER LAB NUMBER MATERIAL MATRIX GEOLOGIC AGE	DATE SUBMITTED UTM-E SAMPLE TYPE OXIDATION STATE ROCKNAME	TOWNSHIP/RANGE UTM-N SAMPLE SOURCE ORE MINERALS MODIFIER		SECTION/SUBSECTION STATE/COUNTY ROCK TYPE ALTERATION QUADRANGLE		WSA GEOLOGICAL FORMATION IGNEOUS FORM MINERAL DEPOSIT	STRUCTURAL SETTING
A1509F01	D B	82-09-23	19S	4E	31	667	61680	
	00000458	550375	4858600		OREGON/ LANE		TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1515F01	D B	82-09-24	18S	3E	31	867	61680	
	00000459	541000	4867025		OREGON/ LANE		TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1516F01	D B	82-09-24	18S	3E	32	879	61680	
	00000460	541800	4866750		OREGON/ LANE		TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1517F01	D B	82-09-24	18S	3E	32	968	61680	
	00000461	541180	4867000		OREGON/ LANE		TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1518F01	D B	82-09-24	18S	3E	32	897	61680	
	00000462	541700	4867400		OREGON/ LANE		TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1519F01	D B	82-09-28	20S	3E	8	776	61680	
	00000463	541250	4854750		OREGON/ LANE		TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1520F01	D B	82-09-27	20S	3E	7	668	61680	
	00000464	540250	4854600		OREGON/ LANE		TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1521F01	D B	82-09-28	20S	3E	14	676	61680	
	00000465	546950	4854000		OREGON/ LANE		TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			

SAMPLE ID	SUBMITTER	DATE SUBMITTED	TOWNSHIP/RANGE		SECTION/SUBSECTION		WSA	
	LAB NUMBER	UTM-E	UTM-N		STATE/COUNTY		GEOLOGICAL FORMATION	
	MATERIAL	SAMPLE TYPE	SAMPLE SOURCE		ROCK TYPE		IGNEOUS FORM	STRUCTURAL SETTING
	MATRIX	OXIDATION STATE	ORE MINERALS		ALTERATION		MINERAL DEPOSIT	
	GEOLOGIC AGE	ROCKNAME	MODIFIER		QUADRANGLE			
A1522F01	D B	82-09-28	20S	3E	14	676	61680	
	00000466	546800	4853850		OREGON/ LANE		TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1523F01	D B	82-09-28	20S	3E	13	999	61680	
	00000468	547600	4852500		OREGON/ LANE		TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1524F01	D B	82-09-28	20S	3E	33	998	61680	
	00000469	543000	4848400		OREGON/ LANE		TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1525F01	D B	82-09-28	20S	3E	29	897	61680	
	00000470	541950	4849425		OREGON/ LANE		TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1526F01	D B	82-09-28	20S	3E	29	896	61680	
	00000471	542200	4849500		OREGON/ LANE		TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1527F01	D B	82-09-29	21S	3E	5	676	61680	
	00000472	542200	4847425		OREGON/ LANE		TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1528F01	D B	82-09-29	20S	3E	20	669	61680	
	00000473	542425	4852000		OREGON/ LANE		TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1529F01	D B	82-09-29	20S	3E	20	666	61680	
	00000474	542650	4852100		OREGON/ LANE		TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			

SAMPLE ID	SUBMITTER	DATE SUBMITTED	TOWNSHIP/RANGE	SECTION/SUBSECTION	WSA	
	LAB NUMBER	UTM-E	UTM-N	STATE/COUNTY	GEOLOGICAL FORMATION	
	MATERIAL	SAMPLE TYPE	SAMPLE SOURCE	ROCK TYPE	IGNEOUS FORM	STRUCTURAL SETTING
	MATRIX	OXIDATION STATE	ORE MINERALS	ALTERATION	MINERAL DEPOSIT	
	GEOLOGIC AGE	ROCKNAME	MODIFIER	QUADRANGLE		
A1530F01	D B	82-09-29	20S 3E	27 977	61680	
	00000475	544475	4849925	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1531F01	D B	82-09-29	20S 3E	21 866	61680	
	00000476	544200	4851350	OREGON/ LANE	TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1532F01	D B	82-09-30	20S 3E	22 888	61680	
	00000477	545900	4850775	OREGON/ LANE	TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1535F01	D B	82-09-30	20S 3E	2 868	61680	
	00000478	547200	4856075	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1536F01	D B	82-09-30	20S 3E	1 779	61680	
	00000479	547400	4856750	OREGON/ LANE	TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1537F01	D B	82-09-30	20S 3E	4 698	61680	
	00000480	543700	4856375	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1538F01	D B	82-09-30	19S 3E	34 896	61680	
	00000481	545475	4857250	OREGON/ LANE	TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1539F01	D B	82-10-01	19S 3E	27 967	61680	
	00000482	544900	4859250	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		

SAMPLE ID	SUBMITTER	DATE SUBMITTED	TOWNSHIP/RANGE		SECTION/SUBSECTION		WSA	
	LAB NUMBER	UTM-E	UTM-N		STATE/COUNTY		GEOLOGICAL FORMATION	
	MATERIAL	SAMPLE TYPE	SAMPLE SOURCE		ROCK TYPE		IGNEOUS FORM	STRUCTURAL SETTING
	MATRIX	OXIDATION STATE	ORE MINERALS		ALTERATION		MINERAL DEPOSIT	
	GEOLOGIC AGE	ROCKNAME	MODIFIER		QUADRANGLE			
A1540F01	D B	82-10-01	19S	3E	27	797	61680	
	00000483	544475	4859700		OREGON/ LANE		TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1542F01	D B	82-10-04	18S	3E	35	866	61680	
	00000484	547550	4867300		OREGON/ LANE		TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1543F01	D B	82-10-04	18S	3E	36	877	61680	
	00000485	547750	4867225		OREGON/ LANE		TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1545F01	D B	82-10-04	19S	3E	9	988	61680	
	00000486	543450	4863600		OREGON/ LANE		TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1546F01	D B	82-10-04	19S	3E	16	767	61680	
	00000487	543200	4863350		OREGON/ LANE		TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1547F01	D B	82-10-04	19S	3E	9	977	61680	
	00000488	542850	4864200		OREGON/ LANE		TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1549F01	D B	82-10-05	19S	3E	4	886	61680	
	00000489	544250	4865375		OREGON/ LANE		TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1550F01	D B	82-10-05	19S	3E	3	979	61680	
	00000490	544350	4865650		OREGON/ LANE		TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			

SAMPLE ID	SUBMITTER / LAB NUMBER / MATERIAL / MATRIX / GEOLOGIC AGE	DATE SUBMITTED / UTM-E / SAMPLE TYPE / OXIDATION STATE / ROCKNAME	TOWNSHIP/RANGE / UTM-N / SAMPLE SOURCE / ORE MINERALS / MODIFIER	SECTION/SUBSECTION / STATE/COUNTY / ROCK TYPE / ALTERATION / QUADRANGLE	WSA / GEOLOGICAL FORMATION / IGNEOUS FORM / MINERAL DEPOSIT	STRUCTURAL SETTING
A1552F01	D B	82-10-06	19S 4E	5 697	61680	
	00000491	551400	4866100	OREGON/ LANE	TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1553F01	D B	82-10-06	19S 4E	5 699	61680	
	00000492	551425	4865925	OREGON/ LANE	TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1554F01	D B	82-10-06	18S 4E	32 867	61680	
	00000493	552150	4867375	OREGON/ LANE	TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1555F01	D B	82-10-06	18S 4E	32 876	61680	
	00000494	552050	4867275	OREGON/ LANE	TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1556F01	D B	82-10-07	20S 4E	5 766	61680	
	00000495	551250	4857000	OREGON/ LANE	TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1557F01	D B	82-10-07	19S 4E	28 999	61680	
	00000496	552250	4856700	OREGON/ LANE	QLS TMV TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1558F01	D B	82-10-07	19S 4E	29 869	61680	
	00000497	551850	4859100	OREGON/ LANE	TOTL TMV TPV QTBH QLS	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1559F01	D B	82-10-07	19S 4E	29 998	61680	
	00000498	551750	4858850	OREGON/ LANE	QLS TMV TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		

SAMPLE ID	SUBMITTER	DATE SUBMITTED	TOWNSHIP/RANGE	SECTION/SUBSECTION	WSA	
	LAB NUMBER	UTM-E	UTM-N	STATE/COUNTY	GEOLOGICAL FORMATION	
	MATERIAL	SAMPLE TYPE	SAMPLE SOURCE	ROCK TYPE	IGNEOUS FORM	STRUCTURAL SETTING
	MATRIX	OXIDATION STATE	ORE MINERALS	ALTERATION	MINERAL DEPOSIT	
	GEOLOGIC AGE	ROCKNAME	MODIFIER	QUADRANGLE		
A1560F01	D B	82-10-08	19S 4E	16 679	61680	
	00000499	553125	4863125	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1561F01	D B	82-10-08	19S 4E	15 698	61680	
	00000500	553250	4862925	OREGON/ LANE	QTBH TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1562F01	D B	82-10-12	19S 4E	16 778	61680	
	00000501	552400	4863125	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1563F01	D B	82-10-13	19S 4E	19 677	61680	
	00000502	549900	4861750	OREGON/ LANE	TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1564F01	D B	82-10-13	19S 4E	19 679	61680	
	00000503	550000	4861650	OREGON/ LANE	QLS TOTL QAL TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1565F01	D B	82-10-13	19S 4E	19 798	61680	
	00000504	549350	4861125	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1566F01	D B	82-10-13	19S 3E	25 669	61680	
	00000505	548800	4859850	OREGON/ LANE	TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1567F01	D B	82-10-13	19S 3E	25 669	61680	
	00000506	548950	4859975	OREGON/ LANE	TOTL QAL TOTL QAL TOTL QTBH TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		

SAMPLE ID	SUBMITTER LAB NUMBER MATERIAL MATRIX GEOLOGIC AGE	DATE SUBMITTED UTM-E SAMPLE TYPE OXIDATION STATE ROCKNAME	TOWNSHIP/RANGE UTM-N SAMPLE SOURCE ORE MINERALS MODIFIER	SECTION/SUBSECTION STATE/COUNTY ROCK TYPE ALTERATION QUADRANGLE	WSA GEOLOGICAL FORMATION IGNEOUS FORM MINERAL DEPOSIT	STRUCTURAL SETTING
A1568F01	D B	82-10-14	19S 3E	35 669	61680	
	00000507	547200	4856325	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1569F01	D B	82-10-14	19S 3E	35 678	61680	
	00000508	547100	4858300	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1570F01	D B	82-10-14	19S 3E	36 969	61680	
	00000509	548200	4857600	OREGON/ LANE	TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1571F01	D B	82-10-14	20S 4E	7 888	61680	
	00000510	550450	4854100	OREGON/ LANE	QTBH TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1572F01	D B	82-10-14	20S 4E	18 666	61680	
	00000511	550600	4854000	OREGON/ LANE	QTBH TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1573F01	D B	82-10-15	20S 4E	19 667	61680	
	00000512	550350	4852250	OREGON/ LANE	QTBH TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1574F01	D B	82-10-15	20S 4E	19 799	61680	
	00000513	549250	4851750	OREGON/ LANE	QTBH TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1575F01	D B	82-10-15	20S 4E	19 788	61680	
	00000514	549700	4851850	OREGON/ LANE	QTBH TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		

SAMPLE ID	SUBMITTER LAB NUMBER MATERIAL MATRIX GEOLOGIC AGE	DATE SUBMITTED UTM-E SAMPLE TYPE OXIDATION STATE ROCKNAME	TOWNSHIP/RANGE UTM-N SAMPLE SOURCE ORE MINERALS MODIFIER	SECTION/SUBSECTION STATE/COUNTY ROCK TYPE ALTERATION QUADRANGLE	WSA GEOLOGICAL FORMATION IGNEOUS FORM MINERAL DEPOSIT	STRUCTURAL SETTING
A1576F01	D B	82-10-15	20S 4E	19 788	61680	
	00000515	549725	4851675	OREGON/ LANE	QTBH TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1577F01	D B	82-10-15	20S 3E	24 888	61680	
	00000516	548900	4850975	OREGON/ LANE	QTBH QLS TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1578F01	D B	82-10-15	20S 3E	25 677	61680	
	00000517	548375	4850650	OREGON/ LANE	QTBH QLS TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1579F01	D B	82-10-18	20S 3E	26 888	61680	
	00000518	547400	4849300	OREGON/ LANE	QTBH QLS TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1580F01	D B	82-10-18	20S 3E	26 888	61680	
	00000519	547325	4849225	OREGON/ LANE	QTBH QLS TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1581F01	D B	82-10-18	21S 3E	3 676	61680	
	00000520	545375	4847550	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1582F01	D B	82-10-18	21S 3E	9 968	61680	
	00000521	543500	4844975	OREGON/ LANE	TOTL TMV TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1583F01	D B	82-10-18	21S 3E	11 799	61680	
	00000522	546075	4845275	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		

SAMPLE ID	SUBMITTER	DATE SUBMITTED	TOWNSHIP/RANGE	SECTION/SUBSECTION	WSA	
	LAB NUMBER	UTM-E	UTM-N	STATE/COUNTY	GEOLOGICAL FORMATION	
	MATERIAL	SAMPLE TYPE	SAMPLE SOURCE	ROCK TYPE	IGNEOUS FORM	STRUCTURAL SETTING
	MATRIX	OXIDATION STATE	ORE MINERALS	ALTERATION	MINERAL DEPOSIT	
	GEOLOGIC AGE	ROCKNAME	MODIFIER	QUADRANGLE		
A1584F01	D B	82-10-18	21S 3E	11 976	61680	
	00000523	546175	4845125	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1585F01	D B	82-10-19	21S 4E	7 997	61680	
	00000524	549225	4844575	OREGON/ LANE		
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1586F01	D B	82-10-19	21S 4E	7 976	61680	
	00000525	549300	4845150	OREGON/ LANE	TOTL TMV TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1587F01	D B	82-10-19	21S 3E	12 899	61680	
	00000526	548500	4844550	OREGON/ LANE	TOTL QLS TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1588F01	D B	82-10-19	21S 4E	7 879	61680	
	00000527	549930	4845000	OREGON/ LANE	TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1590F01	D B	82-10-19	21S 4E	8 799	61680	
	00000528	550800	4845300	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1591F01	D B	82-10-19	21S 4E	7 686	61680	
	00000529	550400	4845625	OREGON/ LANE	TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		
A1593F01	D B	82-10-20	21S 4E	5 997	61680	
	00000530	550775	4846275	OREGON/ LANE	TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER	UNCONSOL. SEDIMENT	*	*
	*	*	*	*	*	
	HOLOCENE	SILT	*	SARDINE BUTTE		

SAMPLE ID	SUBMITTER	DATE SUBMITTED	TOWNSHIP/RANGE		SECTION/SUBSECTION		WSA	
	LAB NUMBER	UTM-E	UTM-N		STATE/COUNTY		GEOLOGICAL FORMATION	
	MATERIAL	SAMPLE TYPE	SAMPLE SOURCE		ROCK TYPE		IGNEOUS FORM	STRUCTURAL SETTING
	MATRIX	OXIDATION STATE	ORE MINERALS		ALTERATION		MINERAL DEPOSIT	
	GEOLOGIC AGE	ROCKNAME	MODIFIER		QUADRANGLE			
A1594F01	D B	82-10-20	21S	4E	5	697	61680	
	00000531	551650	4847375		OREGON/ LANE		TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1595F01	D B	82-10-20	21S	4E	5	679	61680	
	00000532	551625	4847375		OREGON/ LANE		TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1596F01	D B	82-10-20	21S	3E	12	897	61680	
	00000533	548450	4844700		OREGON/ LANE		TOTL TMV TOTL TMV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1597F01	D B	82-10-20	21S	4E	5	687	61680	
	00000534	552100	4847200		OREGON/ LANE		TOTL	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1598F01	D B	82-10-21	21S	4E	4	769	61680	
	00000535	552800	4847275		OREGON/ LANE		TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1599F01	D B	82-10-21	20S	4E	23	789	61680	
	00000536	556000	4851900		OREGON/ LANE		TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1600F01	D B	82-10-21	20S	4E	23	788	61680	
	00000537	556200	4851900		OREGON/ LANE		TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			
A1601F01	D B	82-10-21	20S	4E	33	868	61680	
	00000538	553650	4848150		OREGON/ LANE		TOTL TMV TPV	
	UNCONSOL. SEDIMENT	SINGLE (GRAB)	OTHER		UNCONSOL. SEDIMENT		*	*
	*	*	*		*		*	
	HOLOCENE	SILT	*		SARDINE BUTTE			

SAMPLE ID	SUBMITTER LAB NUMBER MATERIAL MATRIX GEOLOGIC AGE	DATE SUBMITTED UTM-E SAMPLE TYPE OXIDATION STATE ROCKNAME	TOWNSHIP/RANGE UTM-N SAMPLE SOURCE ORE MINERALS MODIFIER	SECTION/SUBSECTION STATE/COUNTY ROCK TYPE ALTERATION QUADRANGLE	WSA GEOLOGICAL FORMATION IGNEOUS FORM MINERAL DEPOSIT	STRUCTURAL SETTING
A1602F01	D B 00000539 UNCONSOL. SEDIMENT * HOLOCENE	82-10-21 553700 SINGLE (GRAB) * SILT	20S 4E 4848625 OTHER * *	33 688 OREGON/ LANE UNCONSOL. SEDIMENT * SARDINE BUTTE	61680 TOTL TMV * *	*
A1603F01	D B 00000540 UNCONSOL. SEDIMENT * HOLOCENE	82-10-21 554500 SINGLE (GRAB) * SILT	20S 4E 4849000 OTHER * *	34 768 OREGON/ LANE UNCONSOL. SEDIMENT * SARDINE BUTTE	61680 TOTL * *	*
A1604F01	D B 00000541 UNCONSOL. SEDIMENT * HOLOCENE	82-10-22 555250 SINGLE (GRAB) * SILT	20S 4E 4849100 OTHER * *	34 667 OREGON/ LANE UNCONSOL. SEDIMENT * SARDINE BUTTE	61680 TOTL TMV TPV * *	*
A1605F01	D B 00000542 UNCONSOL. SEDIMENT * HOLOCENE	82-10-22 555400 SINGLE (GRAB) * SILT	20S 4E 4849200 OTHER * *	34 666 OREGON/ LANE UNCONSOL. SEDIMENT * SARDINE BUTTE	61680 TOTL TMV TOTL TMV TOTL TMV TPV * *	*
A1606F01	D B 00000543 UNCONSOL. SEDIMENT * HOLOCENE	82-10-22 555650 SINGLE (GRAB) * SILT	20S 4E 4849150 OTHER * *	35 777 OREGON/ LANE UNCONSOL. SEDIMENT * SARDINE BUTTE	61680 TOTL TMV TPV * *	*
A1608F01	D B 00000544 UNCONSOL. SEDIMENT * HOLOCENE	82-10-25 540650 SINGLE (GRAB) * SILT	21S 3E 4844750 OTHER * *	7 878 OREGON/ LANE UNCONSOL. SEDIMENT * SARDINE BUTTE	61680 TOTL TMV * *	*
A1609F01	D B 00000545 UNCONSOL. SEDIMENT * HOLOCENE	82-10-25 557450 SINGLE (GRAB) * SILT	20S 4E 4848825 OTHER * *	36 796 OREGON/ LANE UNCONSOL. SEDIMENT * SARDINE BUTTE	61680 TOTL TMV TPV * *	*
A1610F01	D B 00000546 UNCONSOL. SEDIMENT * HOLOCENE	82-10-25 556975 SINGLE (GRAB) * SILT	20S 4E 4849375 OTHER * *	26 888 OREGON/ LANE UNCONSOL. SEDIMENT * SARDINE BUTTE	61680 TOTL TMV * *	*

SAMPLE ID	SUBMITTER LAB NUMBER MATERIAL MATRIX GEOLOGIC AGE	DATE SUBMITTED UTM-E SAMPLE TYPE OXIDATION STATE ROCKNAME	TOWNSHIP/RANGE UTM-N SAMPLE SOURCE ORE MINERALS MODIFIER	SECTION/SUBSECTION STATE/COUNTY ROCK TYPE ALTERATION QUADRANGLE	WSA GEOLOGICAL FORMATION IGNEOUS FORM MINERAL DEPOSIT	STRUCTURAL SETTING
A1618F01	JJ GRAY 00000547 UNCONSOL. SEDIMENT * HOLOCENE	82-10-27 547075 SINGLE (GRAB) * SILT	19S 3E 4858275 OTHER * *	35 678 OREGON/ LANE UNCONSOL. SEDIMENT * SARDINE BUTTE	61680 TOTL TMV * *	*
A1619F01	JJ GRAY 00000548 UNCONSOL. SEDIMENT * HOLOCENE	82-10-27 552425 SINGLE (GRAB) * SILT	19S 4E 4863100 OTHER * *	15 778 OREGON/ LANE UNCONSOL. SEDIMENT * SARDINE BUTTE	61680 TOTL TMV TPV * *	*
A1620F01	JJ GRAY 00000549 UNCONSOL. SEDIMENT * HOLOCENE	82-10-27 551650 SINGLE (GRAB) * SILT	21S 4E 4847400 OTHER * *	5 679 OREGON/ LANE UNCONSOL. SEDIMENT * SARDINE BUTTE	61680 TOTL TMV * *	*
A1621F01	JJ GRAY 00000550 UNCONSOL. SEDIMENT * HOLOCENE	82-10-27 556975 SINGLE (GRAB) * SILT	20S 4E 4849375 OTHER * *	26 888 OREGON/ LANE UNCONSOL. SEDIMENT * SARDINE BUTTE	61680 TOTL TMV * *	*

GEOLOGICAL DATA FOR WILDERNESS STUDY AREAS

SITE DESCRIPTIONS FOR

ROCK SAMPLES

SAMPLE ID	SUBMITTER	DATE SUBMITTED	TOWNSHIP/RANGE	SECTION/SUBSECTION	WSA	
	LAB NUMBER	UTM-E	UTM-N	STATE/COUNTY	GEOLOGICAL FORMATION	
	MATERIAL	SAMPLE TYPE	SAMPLE SOURCE	ROCK TYPE	IGNEOUS FORM	STRUCTURAL SETTING
	MATRIX	OXIDATION STATE	ORE MINERALS	ALTERATION	MINERAL DEPOSIT	
	GEOLOGIC AGE	ROCKNAME	MODIFIER	QUADRANGLE		
A1500R01	D B	82-09-23	19S 3E	13 698	61680	
	00000552	548650	4862700	OREGON/ LANE	TMV	
	ROCK	SINGLE (GRAB)	MINE	IGNEOUS ROCK	EXTRUSIVE	*
	FE/MN	PARTIALLY OXIDIZED	*	ARGILLITIC	*	
	MIOCENE	TUFF	*	SARDINE BUTTE		
A1510R01	D B	82-09-23	19S 4E	32 779	61680	
	00000553	550800	4858300	OREGON/ LANE	TMV	
	ROCK	SINGLE (GRAB)	DUMP/PROSPECT PIT	IGNEOUS ROCK	EXTRUSIVE	SHEAR OR FAULT
	FE/MN	OXIDIZED	*	ARGILLITIC	*	
	MIOCENE	RHYOLITE	*	SARDINE BUTTE		
A1511R01	D B	82-09-23	19S 4E	30 868	61680	
	00000554	548575	4859050	OREGON/ LANE	TMV	
	ROCK	SINGLE (GRAB)	OUTCROP	OTHER	*	SHEAR OR FAULT
	CLAY	PARTIALLY OXIDIZED	*	ARGILLITIC	*	
	MIOCENE	CLAY	*	SARDINE BUTTE		
A1512R01	D B	82-09-23	20S 3E	25 779	61680	
	00000555	546050	4850450	OREGON/ LANE	TOTL	
	ROCK	SINGLE (GRAB)	OUTCROP	IGNEOUS ROCK	EXTRUSIVE	SHEAR OR FAULT
	FE/MN	OXIDIZED	OTHER	ARGILLITIC	VEIN	
	MIOCENE	*	*	SARDINE BUTTE		
A1513R01	D B	82-09-24	20S 3E	27 667	61680	
	00000556	546600	4850675	OREGON/ LANE	TOTL	
	ROCK	SINGLE (GRAB)	OUTCROP	IGNEOUS ROCK	EXTRUSIVE	SHEAR OR FAULT
	SILICA	OXIDIZED	*	SILICEOUS	*	
	OLIGOCENE	BRECCIA	*	SARDINE BUTTE		
A1514R01	D B	82-09-24	19S 3E	17 977	61680	
	00000557	541150	4862500	OREGON/ LANE	TMV	
	ROCK	SINGLE (GRAB)	OUTCROP	IGNEOUS ROCK	EXTRUSIVE	*
	FE/MN	OXIDIZED	*	ARGILLITIC	*	
	MIOCENE	RHYOLITE	*	SARDINE BUTTE		
A1533R01	D B	82-09-30	20S 3E	17 776	61680	
	00000558	541450	4853775	OREGON/ LANE	TMV	
	ROCK	SINGLE (GRAB)	OUTCROP	CLAYSTONE	*	*
	FE/MN	OXIDIZED	*	ARGILLITIC	*	
	MIOCENE	CLAYSTONE	*	SARDINE BUTTE		
A1534R01	D B	82-09-30	20S 3E	28 666	61680	
	00000559	544100	4850600	OREGON/ LANE	TOTL	
	ROCK	SINGLE (GRAB)	OUTCROP	IGNEOUS ROCK	EXTRUSIVE	*
	FE/MN	OXIDIZED	*	ARGILLITIC	*	
	OLIGOCENE	ANDESITE	*	SARDINE BUTTE		

SAMPLE ID	SUBMITTER	DATE SUBMITTED	TOWNSHIP/RANGE	SECTION/SUBSECTION	WSA	
	LAB NUMBER	UTM-E	UTM-N	STATE/COUNTY	GEOLOGICAL FORMATION	
	MATERIAL	SAMPLE TYPE	SAMPLE SOURCE	ROCK TYPE	IGNEOUS FORM	STRUCTURAL SETTING
	MATRIX	OXIDATION STATE	ORE MINERALS	ALTERATION	MINERAL DEPOSIT	
	GEOLOGIC AGE	ROCKNAME	MODIFIER	QUADRANGLE		
A1541R01	D B	82-10-01	19S 3E	13 988	61680	
	00000560	548400	4861875	OREGON/ LANE	TMV	
	ROCK	SINGLE (GRAB)	OUTCROP	IGNEOUS ROCK	EXTRUSIVE	SHEAR OR FAULT
	FE/MN	OXIDIZED	*	ARGILLITIC	*	
	MIOCENE	TUFF	*	SARDINE BUTTE		
A1544R01	D B	82-10-04	19S 3E	2 698	61680	
	00000561	547200	4865850	OREGON/ LANE	TMV	
	ROCK	SINGLE (GRAB)	OUTCROP	IGNEOUS ROCK	EXTRUSIVE	SHEAR OR FAULT
	FE/MN	PARTIALLY OXIDIZED	*	ARGILLITIC	*	
	MIOCENE	TUFF	*	SARDINE BUTTE		
A1548R01	D B	82-10-05	19S 3E	23 967	61680	
	00000562	546475	4860975	OREGON/ LANE	TMV	
	ROCK	SINGLE (GRAB)	OUTCROP	IGNEOUS ROCK	EXTRUSIVE	SHEAR OR FAULT
	FE/MN	PARTIALLY OXIDIZED	*	ARGILLITIC	*	
	MIOCENE	TUFF	*	SARDINE BUTTE		
A1551R01	D B	82-10-05	19S 4E	7 689	61680	
	00000563	550200	4864400	OREGON/ LANE	TPV	
	ROCK	SINGLE (GRAB)	OUTCROP	IGNEOUS ROCK	EXTRUSIVE	SHEAR OR FAULT
	FE/MN	PARTIALLY OXIDIZED	*	ARGILLITIC	*	
	PLIOCENE	BASALT	*	SARDINE BUTTE		
A1589R01	D B	82-10-19	21S 3E	13 699	61680	
	00000564	548500	4843700	OREGON/ LANE	TMV	
	ROCK	SINGLE (GRAB)	OUTCROP	IGNEOUS ROCK	EXTRUSIVE	SHEAR OR FAULT
	FE/MN	PARTIALLY OXIDIZED	*	SILICEOUS	DISSEMINATED	
	MIOCENE	ANDESITE	*	OAKRIDGE		
A1592R01	D B	82-10-19	21S 4E	5 977	61680	
	00000565	550800	4846825	OREGON/ LANE	TOTL	
	ROCK	SINGLE (GRAB)	OUTCROP	IGNEOUS ROCK	EXTRUSIVE	SHEAR OR FAULT
	FE/MN	OXIDIZED	*	SILICEOUS	*	
	OLIGOCENE	BRECCIA	*	SARDINE BUTTE		
A1607R01	D B	82-10-25	21S 3E	8 977	61680	
	00000566	541100	4844950	OREGON/ LANE	TOTL	
	ROCK	SINGLE (GRAB)	OUTCROP	IGNEOUS ROCK	EXTRUSIVE	SHEAR OR FAULT
	FE/MN	OXIDIZED	*	ARGILLITIC	*	
	OLIGOCENE	TUFF	*	SARDINE BUTTE		
A1611R01	D B	82-10-26	19S 4E	30 776	61680	
	00000567	549400	4860075	OREGON/ LANE	TOTL	
	ROCK	SINGLE (GRAB)	OUTCROP	IGNEOUS ROCK	EXTRUSIVE	FRACTURE/JOINT
	SILICA	OXIDIZED	*	SILICEOUS	*	
	OLIGOCENE	BRECCIA	*	SARDINE BUTTE		

SAMPLE ID	SUBMITTER LAB NUMBER MATERIAL MATRIX GEOLOGIC AGE	DATE SUBMITTED UTM-E SAMPLE TYPE OXIDATION STATE ROCKNAME	TOWNSHIP/RANGE UTM-N SAMPLE SOURCE ORE MINERALS MODIFIER	SECTION/SUBSECTION STATE/COUNTY ROCK TYPE ALTERATION QUADRANGLE	WSA GEOLOGICAL FORMATION IGNEOUS FORM MINERAL DEPOSIT	STRUCTURAL SETTING
A1612R01	D B 00000568 ROCK FE/MN OLIGOCENE	82-10-26 549600 SINGLE (GRAB) OXIDIZED ANDESITE	19S 4E 4863050 OUTCROP * *	18 789 OREGON/ LANE IGNEOUS ROCK ARGILLITIC SARDINE BUTTE	61680 TOTL DIKE/SILL *	*
A1613R01	D B 00000569 ROCK FE/MN QUATERNARY UNDIF.	82-10-26 550375 SINGLE (GRAB) OXIDIZED ANDESITE	19S 4E 4862300 DUMP/PROSPECT PIT * *	18 889 OREGON/ LANE IGNEOUS ROCK ARGILLITIC SARDINE BUTTE	61680 QTBH DIKE/SILL *	*
A1614R01	D B 00000570 ROCK FE/MN OLIGOCENE	82-10-26 550400 SINGLE (GRAB) OXIDIZED ANDESITE	19S 4E 4862875 DUMP/PROSPECT PIT * *	18 867 OREGON/ LANE IGNEOUS ROCK ARGILLITIC SARDINE BUTTE	61680 TOTL EXTRUSIVE *	*
A1615R01	D B 00000571 ROCK FE/MN PLIOCENE	82-10-26 551150 SINGLE (GRAB) OXIDIZED ANDESITE	19S 4E 4864375 OUTCROP * *	8 788 OREGON/ LANE IGNEOUS ROCK ARGILLITIC SARDINE BUTTE	61680 TPV DIKE/SILL *	*
A1616R01	D B 00000572 ROCK FE/MN PLIOCENE	82-10-26 547375 SINGLE (GRAB) OXIDIZED ANDESITE	19S 3E 4864650 OUTCROP * *	12 779 OREGON/ LANE IGNEOUS ROCK ARGILLITIC SARDINE BUTTE	61680 TPV DIKE/SILL *	*
A1617R01	D B 00000573 ROCK FE/MN MIOCENE	82-10-26 548675 SINGLE (GRAB) OXIDIZED ANDESITE	19S 3E 4864100 OUTCROP * *	12 876 OREGON/ LANE IGNEOUS ROCK ARGILLITIC SARDINE BUTTE	61680 TMV DIKE/SILL *	*
A1618R03	JJ GRAY 00000574 ROCK SILICA MIOCENE	82-10-27 547075 SINGLE (GRAB) PARTIALLY OXIDIZED BRECCIA	19S 3E 4858275 FLOAT * *	35 678 OREGON/ LANE CHERT OR JASPEROID SILICEOUS SARDINE BUTTE	61680 TOTL * *	*
A1619R03	JJ GRAY 00000575 ROCK CARBONATE OLIGOCENE	82-10-27 552425 SINGLE (GRAB) UNOXIDIZED BRECCIA	19S 4E 4863100 OUTCROP * *	15 778 OREGON/ LANE CARBONATE OTHER SARDINE BUTTE	61680 TOTL * *	SHEAR OR FAULT

GEOLOGICAL DATA FOR WILDERNESS STUDY AREAS

SITE DESCRIPTIONS FOR

SOIL SAMPLES

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17.25.45.UCLP, AA, 22,       1.121KLNS.
17.25.45.UCLP, AA, 22,       0.026KPGS.
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