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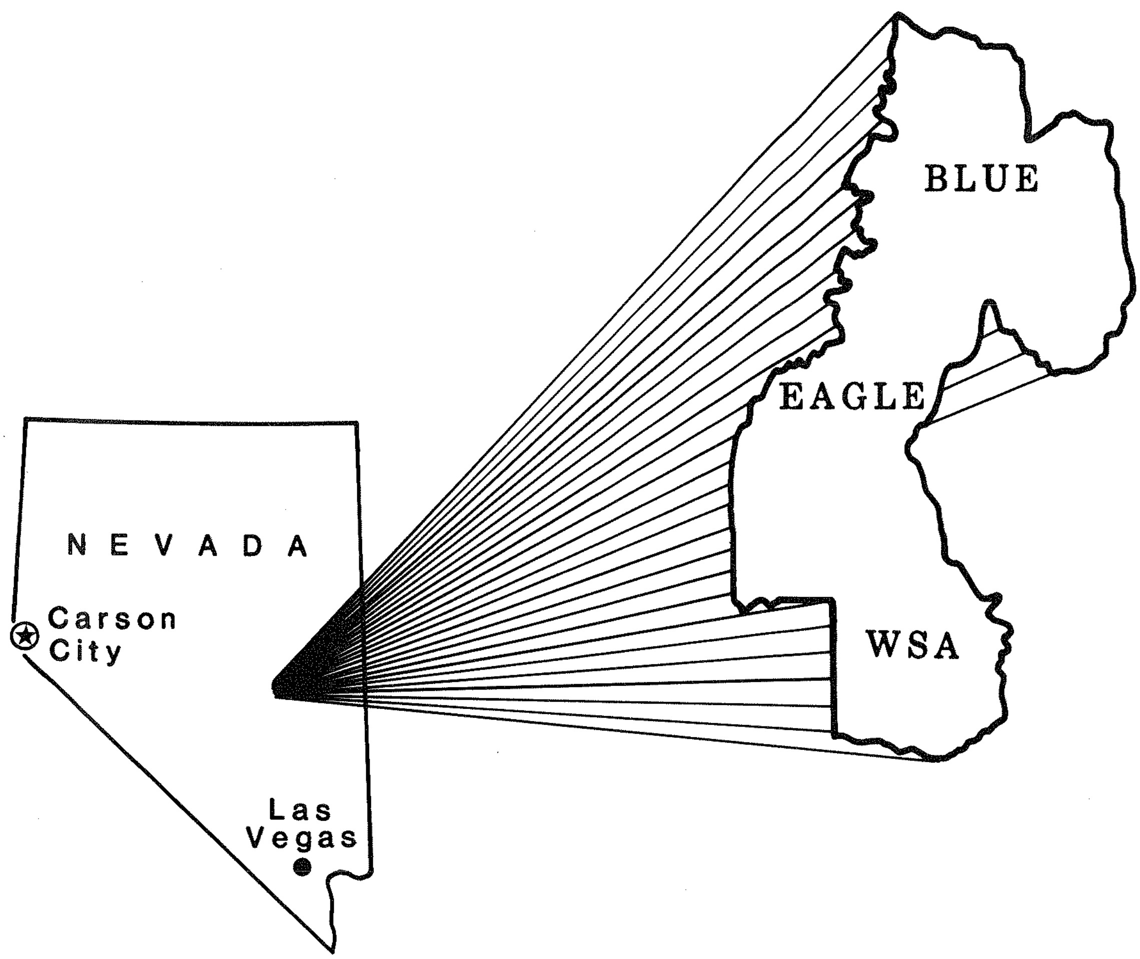
Mineral Resources of the Blue Eagle Wilderness Study Area (NV-060-158/199), Nye County, Nevada



United States Department of the Interior
Bureau of Mines

MINERAL RESOURCES OF THE BLUE EAGLE WILDERNESS STUDY AREA (NV-060-158/199), NYE COUNTY, NEVADA

by

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Intermountain Field Operations Center, Denver, Colorado

UNITED STATES DEPARTMENT OF THE INTERIOR
Donald P. Hodel, Secretary

BUREAU OF MINES
Robert C. Horton, Director

PREFACE

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine mineral values, if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a Bureau of Mines mineral survey of the Blue Eagle Wilderness Study Area (NV-060-158/199), Nye County, Nevada.

This open-file report summarizes the results of a Bureau of Mines wilderness study and will be incorporated in a joint report with the Geological Survey. The report is preliminary and has not been edited or reviewed for conformity with the Bureau of Mines editorial standards. Work on this study was conducted by personnel from Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, CO 80225.

CONTENTS

	Page
Summary	1
Introduction	1
Geographic setting	2
Previous investigations	2
Present investigation	2
Geologic setting	4
Mining history	4
Appraisal of sites examined	5
Oil and gas	6
Commodity highlights	7
Conclusions	8
Recommendations for further study	9
References	10
Appendix A.--Semiquantitative optical emission spectrographic analysis detection limits	20
Appendix B.--Semiquantitative optical emission spectrographic analysis for eighteen samples	21

ILLUSTRATIONS

Figure 1. Index map of the Blue Eagle Wilderness Study Area, Nye County, Nevada	3
Figure 2. Map showing sample locations and mining claims within and near the Blue Eagle Wilderness Study Area, Nye County, Nevada	11
Figure 3. Map showing sample locations 10-61, in the Galena Claim Group, Nye County, Nevada	12
Figure 4. Map of upper adit, Galena claim group, showing sample locations 37-51	13

ILLUSTRATIONS--Continued

Page

Figure 5. Map of lower adit, Galena claim group, showing sample locations 52-58 14

Figure 6. Map showing oil and gas leases and lease applications within and near the Blue Eagle Wilderness Study Area, Nye County, Nevada 15

TABLES

Table 1. Analytical data and descriptions of samples 10-61, from the Galena claims 16

Table 2. Analytical data and descriptions of samples 1-9, from the northern part of the Blue Eagle Wilderness Study Area and vicinity, Nye County, Nevada 18

Table 3. Miscellaneous mineral occurrences in and near the Blue Eagle Wilderness Study Area, Nye County, Nevada 19

UNITS OF MEASURE ABBREVIATIONS USED IN THIS REPORT

cps	counts per second
ft	foot/feet
in.	inch(es)
mi	mile(s)
oz	troy ounce(s)
oz/ton	troy ounces per ton
ppm	parts per million

MINERAL RESOURCES OF THE BLUE EAGLE WILDERNESS STUDY AREA (NV-060-158/199), NYE COUNTY, NEVADA

SUMMARY

In accordance with the Federal Land and Policy Management Act (Public Law 94-579), a mineral survey was conducted in May and June 1984, to appraise the resources in the part of the Blue Eagle Wilderness Study Area deemed preliminarily suitable for incorporation in the national wilderness system. The area of the Bureau's investigation includes 51,350 suitable acres of the original 59,650 acre Blue Eagle Wilderness Study Area in the central Grant Range, Nye County, Nevada.

Gold and silver are present in narrow quartz veins and along mineralized faults in and near the southwestern part of the study area. Precious metal values up to 3.8 oz gold per ton, and 9.52 oz silver per ton were obtained from samples collected from mines and prospects in this area. Distribution of precious metals in the veins and structures is too irregular to identify a resource.

INTRODUCTION

In May and June 1984, the Bureau of Mines, as part of a joint program with the U.S. Geological Survey (USGS), conducted a mineral investigation of part of the Blue Eagle Wilderness Study Area in east-central Nevada on lands administered by the Bureau of Land Management (BLM). Blue Eagle Wilderness Study Area (WSA) as used in this report refers to 51,350 acres preliminarily suitable for inclusion in the wilderness system of the original 59,650 acre Blue Eagle Wilderness Study Area. The Bureau surveys and studies mines, prospects, and mineralized areas to evaluate identified resources. The Geological Survey studies and assesses the potential for undiscovered mineral resources based on regional geological, geochemical, and geophysical surveys. This report presents the results of the Bureau's study.

Geographic setting

The Blue Eagle WSA comprises 51,350 acres of the central Grant Range in Nye County, Nevada, and lies about 55 mi southwest of Ely, and 110 mi northeast of Tonopah, Nevada. Improved and unimproved roads provide access to all but the southeastern border. The WSA lies south of Red Mountain and north of Heath Canyon. Railroad Valley borders the area to the west. The nearest town is Currant, 4 mi northwest of the study area (fig. 1).

Blue Eagle Mountain, at 9,561 ft above sea level, is the highest point in the WSA (fig. 1). The relief between Blue Eagle Mountain and Railroad Valley, the lowest elevation, is about 4,800 ft.

Previous investigations

Prospecting activity for uranium southeast of Currant is described by Kral (1951). Winfrey (1960) defines and describes the Eocene Sheep Pass Formation, which crops out in and underlies part of the study area, and discusses the possibility of this formation being a source and a reservoir for petroleum. Moores, Scott, and Lumsden (1968) describe the Tertiary stratigraphy and tectonics of the Grant Range. Hyde and Huttrer (1970) document the stratigraphy and structure of the Central Grant Range.

Present investigation

Prior to field work, a literature search was conducted for minerals information. Oil and gas plats were examined for leases; Bureau of Land Management records were checked for current mining claims. Two Bureau geologists conducted a seven-day field examination. Foot traverses and a helicopter reconnaissance were made to search for prospects and mines in and near the WSA. Of the 61 samples taken from prospects, mines, and outcrops, 38 were from inside the study area. All samples were analyzed for gold and

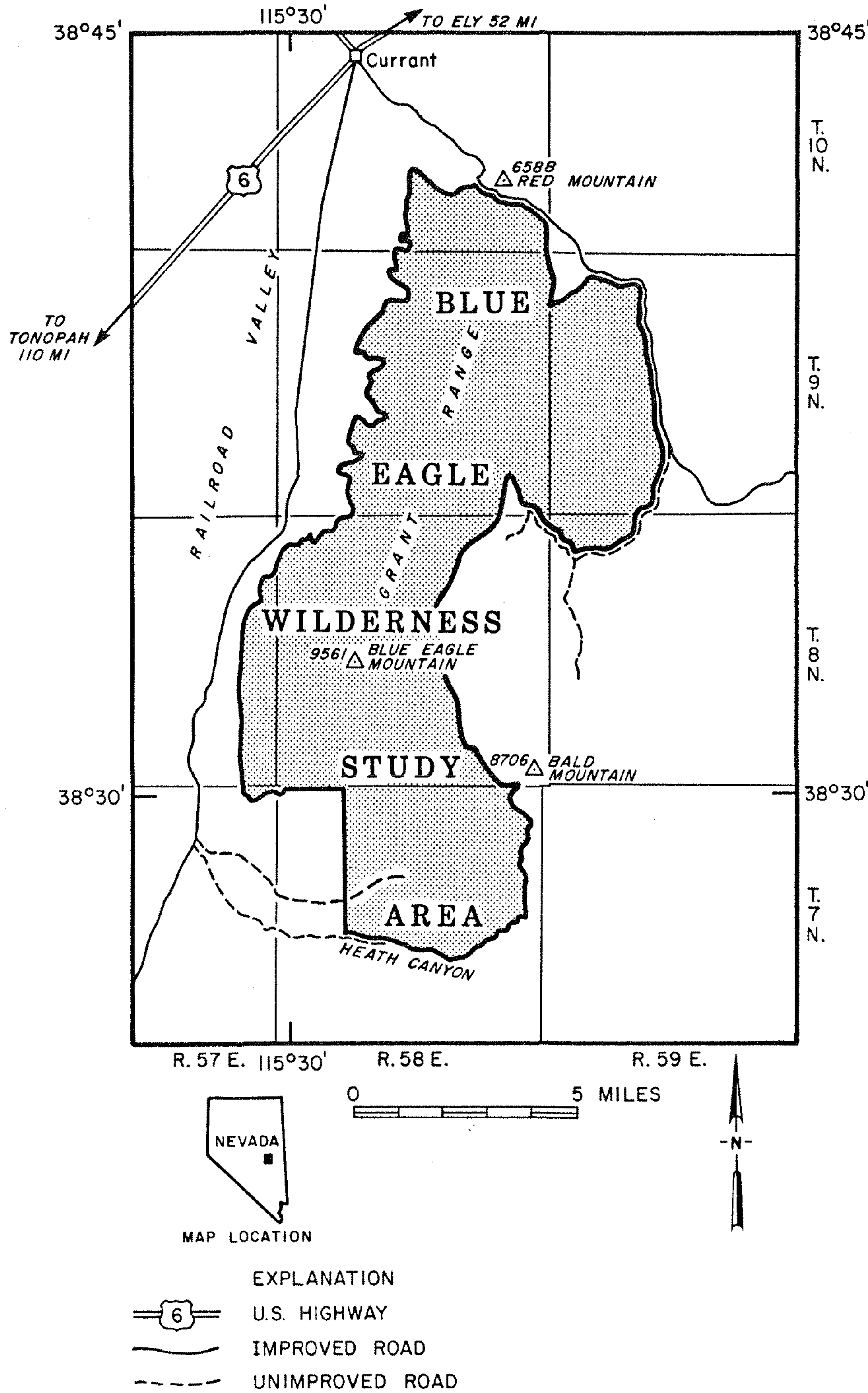

Figure 1.--Index map of the Blue Eagle Wilderness Study Area, Nye County, Nevada.

silver by inductively-coupled plasma analysis. Eighteen samples were tested for 40 elements by semiquantitative optical emission spectrographic analysis (appendices A and B). Fluorometric analysis was conducted on four samples for uranium. Selected samples were analyzed by atomic absorption spectrophotometry for arsenic, antimony, and lead, and by X-ray fluorescence analysis for tungsten and barium. Analytical results are listed in Tables 1 and 2.

GEOLOGIC SETTING

The Blue Eagle WSA is underlain by an eastward-tilted fault block of Paleozoic sedimentary rocks which are bounded on the west by a north-trending gravity fault. The Paleozoic rocks include 26,000 ft of Lower Cambrian through Pennsylvanian strata which are unconformably overlain by scattered occurrences of Tertiary sedimentary and volcanic rocks. Partial metamorphism of Cambrian limestone, dolomite, and shale has taken place in the vicinity of Heath Canyon resulting in phyllite interbedded with limestone (Hyde and Huttrer, 1970, p. 514).

MINING HISTORY

There are no patented mining claims within the WSA; however, three unpatented lode claim groups and other mineralized zones have been located within and near the study area (fig. 2). No organized mining districts lie within the WSA.

On the Galena claims, on the east side of Blind Spring Basin (fig. 2), along the southwestern boundary of the study area, quartz veins and faults are exposed in 16 prospect pits, a shaft, and 3 small adits (fig. 3). These workings are held and intermittently operated by Don Lani, of Currant, Nevada.

The GM claims are located on outcrops of jasperoid (silicified limestone or dolomite) in the north-central part of the WSA. The jasperoid is associated with shale in the Mississippian Chainman Formation. Twelve holes were drilled into this sequence in 1981 by a joint venture between Energy Reserves Group, Golden, Colorado, and U.S. Minerals Exploration Company, Arvada, Colorado. The jasperoid-shale sequence was postulated to be a possible host for gold, but surface sampling and drilling provided no significant gold anomalies, and the claims have since been been dropped (Bob Hemming, U.S. Minerals Exploration Company, oral commun., July 8, 1985).

The Cathy claims, a group of 208 contiguous lode claims, lie east and south of Currant to the northwest border of the WSA (fig. 2). These claims are in alluvium; no prospects or evidence of drilling was observed.

Decorative stone (vitric tuff), used in facing buildings and ornamental structures has been produced from the El Padre Mine, one-half mile north of the WSA. The mine has not been worked in recent years.

Uranium prospects include a 30-ft-deep shaft in welded tuff, located about one-third mile north of the WSA on the west slope of Red Mountain. Bulldozer cuts and a small inclined shaft in vitric tuff exist at the El Padre Mine; bulldozer cuts are also present at a prospect just north of the El Padre Mine. No mineral production is reported from any of these prospects.

APPRAISAL OF SITES EXAMINED

Occurrences of gold and silver, decorative building stone, and trace amounts of uranium have been located within and near the Blue Eagle WSA.

Fifty-two samples were collected on the Galena claim group (fig. 3), east of Blind Spring Basin, along the southwestern boundary of the WSA, from veins and related structures on prospects in a Cambrian dolomite. They have a northeast strike and dip steeply to the southeast. The quartz veins are typically 3 to 6 in. thick; the length is undeterminable because of lack of surface exposures and because the veins are commonly off-set by faults. Gold and silver are irregularly distributed in some of these veins and structures. Most of the veins and structures have no detectable gold and silver. Sixteen of the 51 samples contained more than 0.1 oz gold/ton; 11 samples assayed more than 1.0 oz silver/ton (table 1). Sixteen of the samples which contained gold and silver were collected from quartz veins; five samples were collected from mineralized fault and fracture zones, and goethite pods in fault zones. The highest gold value (3.8 oz/ton) was from a chip sample across a 3-in.-wide quartz vein (fig. 4, sample 42), collected from an adit inside the WSA. Samples 52 and 57 from the nearby lower adit (fig. 5), contained at least 1.4 oz gold/ton. Other small gold-silver occurrences probably exist in quartz veins and along faults within and near the WSA east of Blind Spring Basin. Examination of surface exposures of quartz veins and structures is limited by detritus, preventing resource calculations.

In the northern part of the study area, jasperoid has been investigated as a possible host for a disseminated gold deposit. Surface sampling and drilling showed no significant gold values and claims held in this area have been dropped. North of the study area, vitric tuff has been mined as a decorative building stone, and has been prospected for uranium. Assay results of these occurrences are listed in Table 2, and are described in Table 3.

OIL AND GAS

Sandberg (1983) rates the Blue Eagle WSA as having a high potential for oil and gas. Cretaceous to Tertiary source rocks in Railroad Valley and Paleozoic source rocks in the range are at optimum maturation for oil and gas generation and the WSA borders the Eagle Springs oil field to the west. Structural traps have not been identified underlying the WSA.

The Eagle Springs oil field, about 2 mi west of the WSA, was discovered in 1954 by Shell Oil Company. This field, which has been extensively explored, lies in secs. 34-36, T. 9 N. R. 57 E. Production is from fractured welded tuff and crystal tuff of Oligocene age, from carbonate rocks of the Cretaceous-Eocene Sheep Pass Formation, and from fractured limestone beds of the Pennsylvanian Ely Formation (Bortz and Murray, 1979, p. 441, 445). The Eagle Springs field is separated from the Grant Range (and the WSA) by a series of step faults and dense Paleozoic rocks, exhibiting an apparent stratigraphic displacement of 10,000 to 15,000 ft near the Eagle Springs field (Bortz and Murray, 1979, p. 443, 447, 449). The Eagle Springs field is in a truncated wedge of Tertiary lacustrine sediments and volcanic rocks, having a top seal of impermeable Miocene valley fill sediments, and a bottom seal of Paleozoic rocks. The Eagle Springs field has produced 3.74 million barrels of oil through April 1985; total recoverable reserves for the field are estimated at 4.5 to 5.0 million barrels (Norman Melvin, BLM, Reno, Nevada, oral commun., July 22, 1985). Both Paleozoic and Tertiary rocks have been suggested as a source for the oil. Since discovery of the Eagle Springs oil field, two other oil fields have been discovered in Railroad Valley; the Trap Springs oil field (about 6 mi west of the Eagle Springs field), and another about 4 mi southeast of the WSA at Bacon Flat. Most of the WSA and surrounding area are covered by oil and gas leases (fig. 6).

COMMODITY HIGHLIGHTS

The principal commodities in the Blue Eagle WSA are gold and silver. Future development of metal resources in the WSA will be largely dependent on the price of gold and silver.

Principal uses of gold are in jewelry and arts, industrial and dental applications, and for investments. Demand for gold through 1985 is expected to increase by 2.0 percent. Apparent consumption in the United States for 1984 was 4.8 million oz. Domestic production accounted for 2.3 million oz with imports, mostly from Canada, making up the balance. The price of gold averaged $365 per oz in 1984; recent prices have ranged between $300 and $320. (See U.S. Bureau of Mines, Mineral Commodity Summaries, 1985, p. 60-61.)

Principal uses of silver are in photography, electronics, sterling ware and electroplate, jewelry, brazing alloys and solders. Demand for silver through 1985 is expected to increase by 2.2 percent. Apparent consumption in the United States for 1984 was 170 million oz. Domestic production accounted for 44.0 million oz with imports, mostly from Canada and Mexico, making up the balance. The price of silver averaged $8.25 per oz in 1984; recent prices have ranged between $6.00 and $6.50. (See U.S. Bureau of Mines, Mineral Commodity Summaries, 1985, p. 140-141.)

Decorative building stone is difficult to assess in terms of marketability and price. Demand would be largely dependent upon local and regional construction activity.

CONCLUSIONS

An occurrence of gold and silver exists in quartz veins and fault zones in the southwestern part of the WSA. A jasperoid-shale sequence in the north-central part of the WSA has been explored for gold, but has been abandoned because of poor results. Trace amounts of uranium have been found in Tertiary volcanic rocks just north of the WSA, and some of this rock has been mined as a decorative building stone.

Gold and silver occur in thin, short, discontinuous high-grade veins in the WSA, east of Blind Spring Basin. Although other small, high-grade occurrences may exist, Bureau samples indicate that the thin quartz veins and fault zones have an irregular distribution of gold and silver. The small size of the gold- and silver-bearing veins and the erratic distribution of precious metals precludes mining at a profit at 1984 prices.

Deposits of vitric tuff used as decorative facing for buildings occur north of the WSA at the El Padre Mine. The vitric tuff extends into the northern part of the WSA, but it has not been evaluated; its aesthetic qualities cannot be determined from weathered outcrops.

Paleozoic rocks in the Blue Eagle WSA, which are at thermal maturity for oil and gas generation, may have contributed oil and gas to structural traps in Railroad Valley, west of the study area. Three oil fields are known in Railroad Valley, and other undiscovered oil and gas resources may exist in the valley. Structural traps for oil and gas have not been identified within the WSA.

RECOMMENDATIONS FOR FURTHER STUDY

Detailed mapping and surface and subsurface sampling are needed to determine the extent and grade of gold and silver occurrences inside the WSA east of Blind Spring Basin. Other occurrences may be discovered with further exploration.

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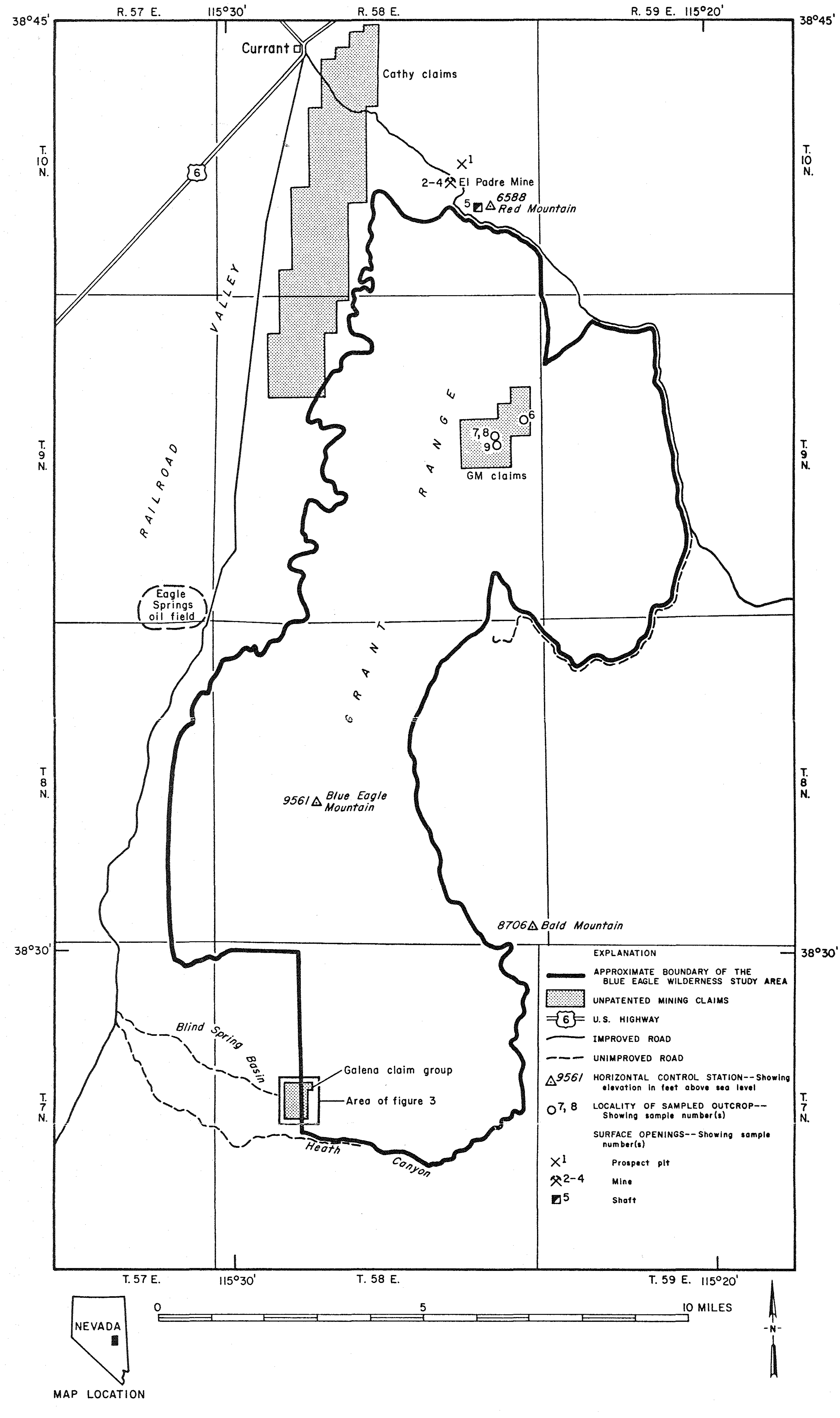
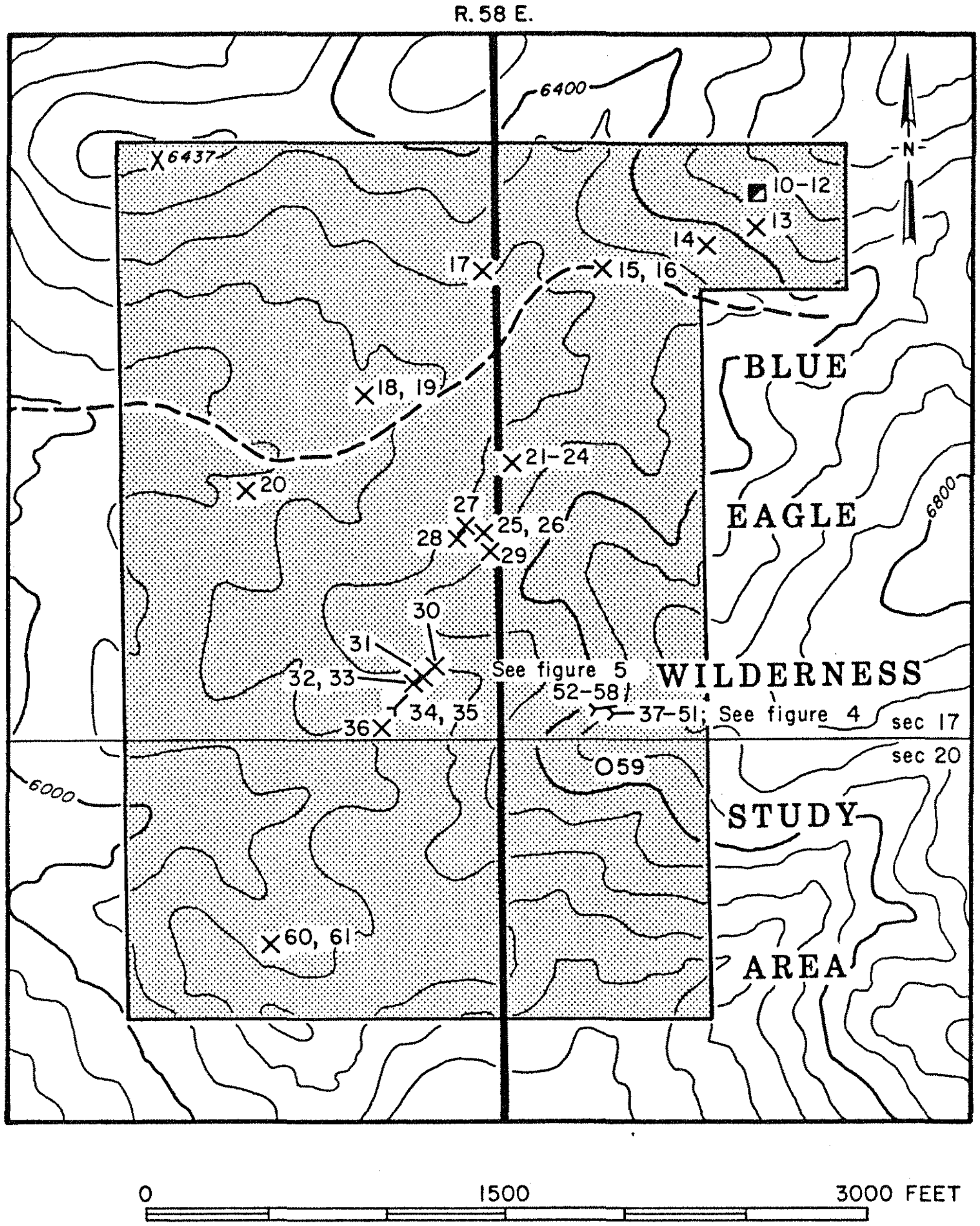


Figure 2.--Map showing sample locations and mining claims within and near the Blue Eagle Wilderness Study Area, Nye County, Nevada.



EXPLANATION

APPROXIMATE BOUNDARY OF THE BLUE EAGLE WILDERNESS STUDY AREA

UNPATENTED MINING CLAIMS

UNIMPROVED DIRT ROAD

6800 INDEX CONTOUR--Showing elevation in feet above sea level

INTERMEDIATE CONTOUR

X 6437 UNCHECKED SPOT ELEVATION--Showing elevation in feet above sea level

O59 LOCALITY OF SAMPLED OUTCROP--Showing sample number

SURFACE OPENINGS--Showing sample number(s)

10-12 Shaft

X 20 Prospect pit

37-51 Adit

Figure 3.--Map showing sample locations 10-61, in the Galena Claim Group, Nye County, Nevada.

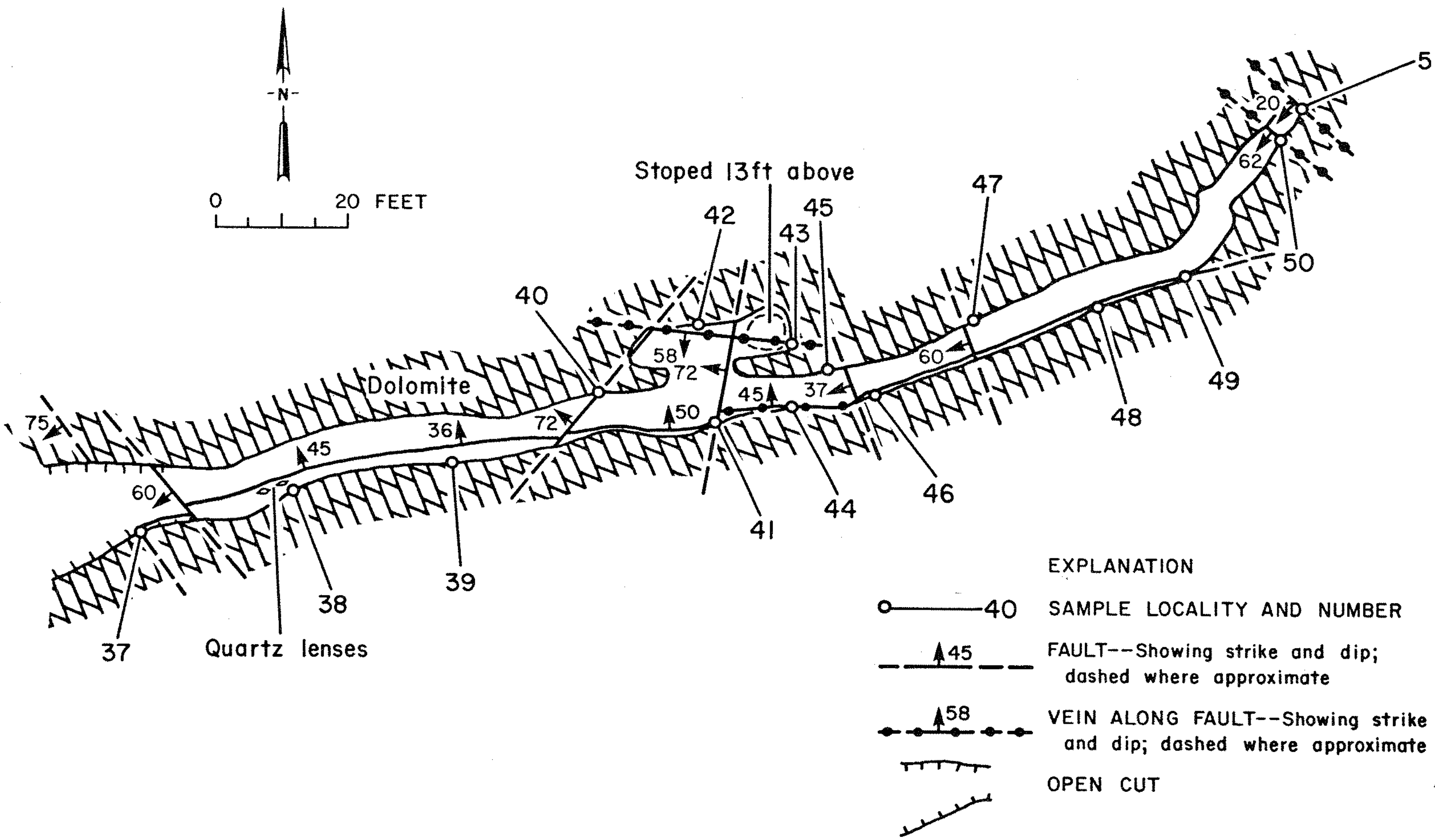


Figure 4.--Map of upper adit, Galena claim group, showing sample locations 37-51.

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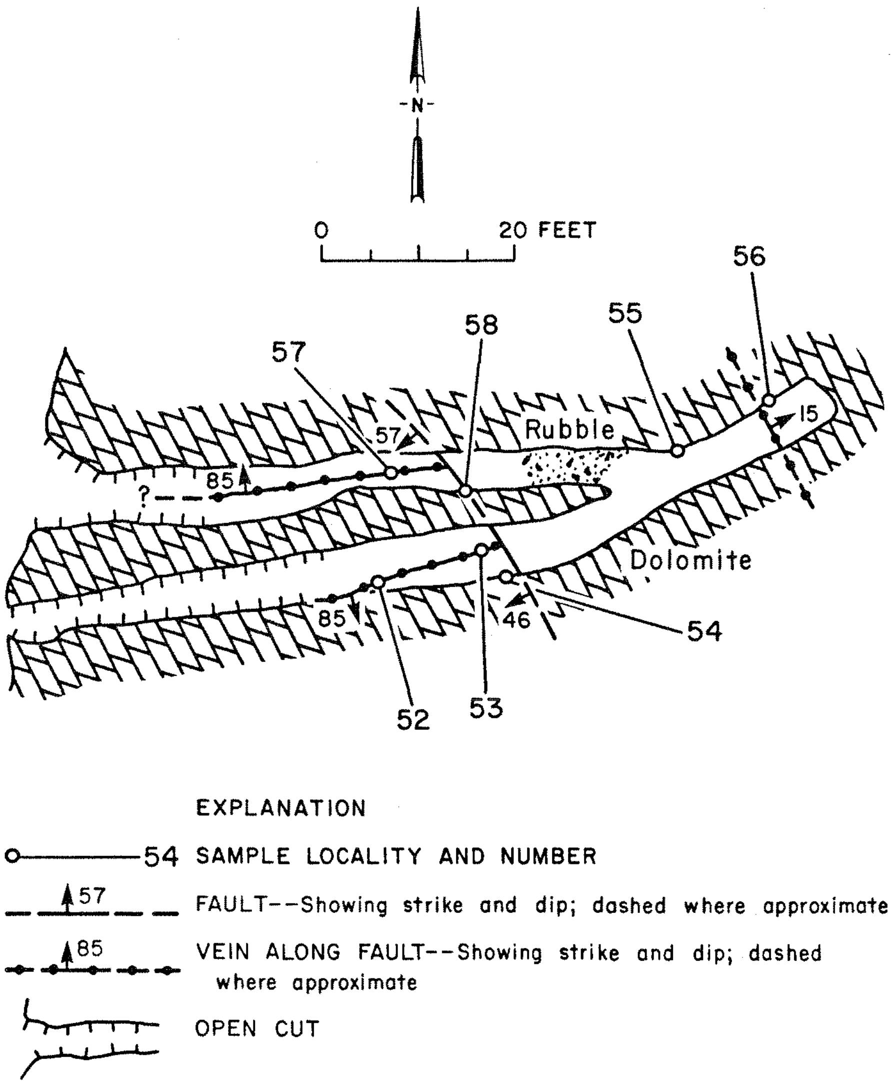

Figure 5.--Map of lower adit, Galena claim group, showing sample locations 52-58.

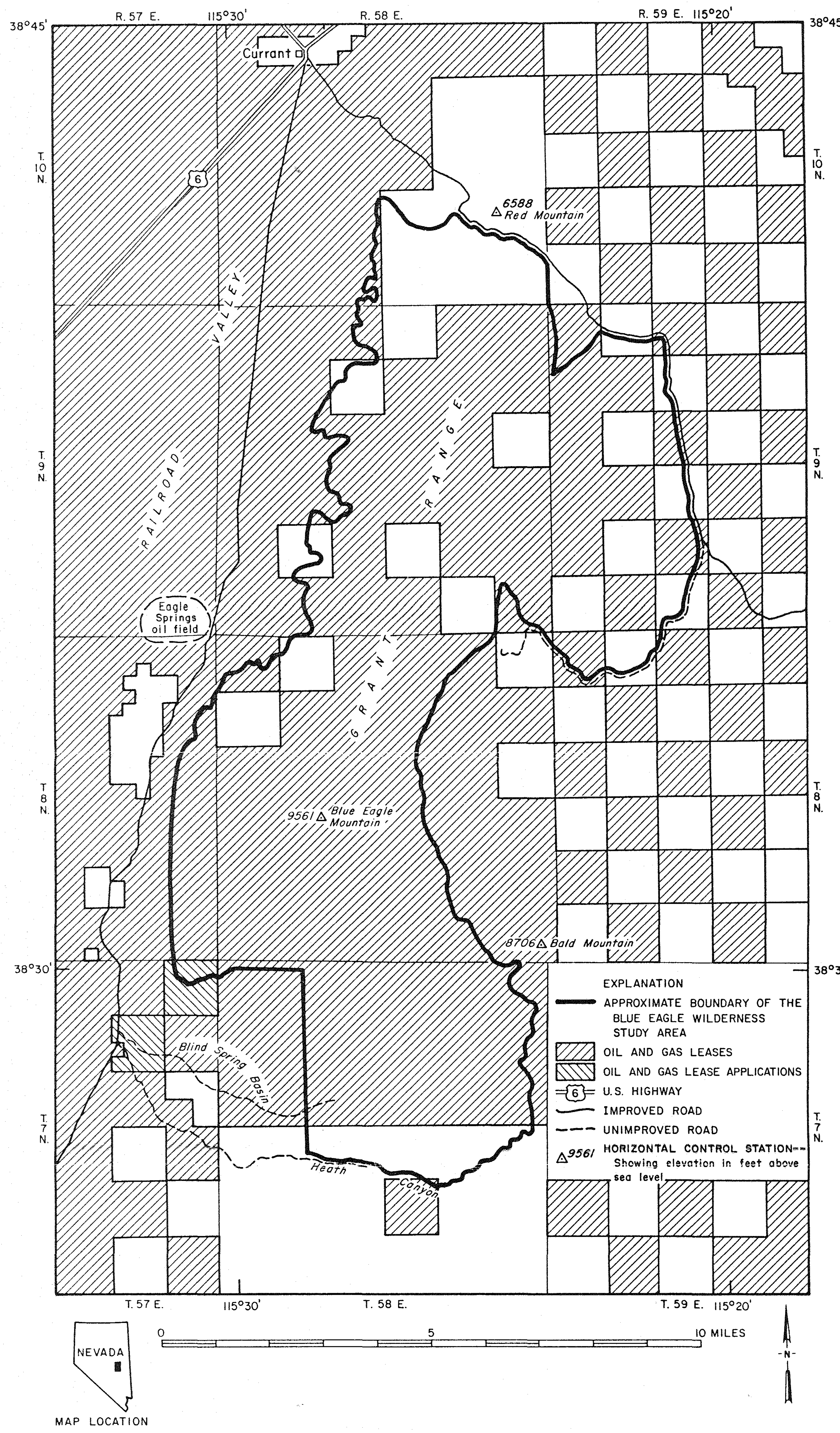

Figure 6.--Map showing oil and gas leases and lease applications within and near the Blue Eagle Wilderness Study Area, Nye County, Nevada.

Oil and gas lease information from the Bureau of Land Management as of 1984

Table 1.--Analytical data* and descriptions of samples 10-61, from the Galena claims. [Au, gold; Ag, silver; N.D., assayed for but not detected; N.A., not applicable; Tr, trace].

Sample			Assay data		
No.	Type	Length (ft)	Au oz/ton	Ag oz/ton	Remarks
10	Chip	1.0	N.D.	N.D.	Quartz vein along fault.
11	do.	1.0	0.27	0.18	Do.
12	Select	N.A.	.21	1.6	Dump sample; vein quartz.
13	Grab	N.A.	N.D.	N.D.	Dump sample; dolomite.
14	Select	N.A.	N.D.	Tr	Dump sample; quartz pods in dolomite.
15	Chip	2.5	N.D.	N.D.	Diabase dike.
16	do.	1.0	N.D.	Tr	Quartz vein in dolomite.
17	Select	N.A.	N.D.	.87	Dump sample; vein quartz.
18	Chip	.2	N.D.	.60	Quartz vein in dolomite.
19	do.	.1	N.D.	Tr	Fault gouge and breccia.
20	do.	4.0	Tr	N.D.	Quartz veins in dolomite.
21	do.	1.5	N.D.	N.D.	Diabase dike.
22	do.	3.5	N.D.	Tr	Dolomite.
23	do.	.2	N.D.	N.D.	Quartz vein in dolomite.
24	do.	.2	N.D.	N.D.	Fault gouge with quartz pods.
25	do.	5.0	.14	Tr	Shear zone, dolomite breccia.
26	do.	5.0	N.D.	N.D.	Do.
27	do.	5.0	N.D.	N.D.	Quartz veinlets in dolomite.
28	do.	.4	N.D.	N.D.	Quartz vein in dolomite.
29	do.	2.0	N.D.	N.D.	Fracture zone in dolomite.
30	do.	.5	.13	.31	Quartz vein in dolomite.
31	do.	1.0	N.D.	N.D.	Do.
32	do.	N.A.	2.50	9.52	Gossan from pods in dolomite.
33	do.	.6	N.D.	N.D.	Quartz pod in dolomite.
34	do.	.3	.64	1.69	Fracture zone with calcite.
35	do.	.1	2.31	3.22	Quartz-calcite vein in dolomite.
36	do.	1.5	N.D.	Tr	Fractured dolomite.
37	do.	2.0	N.D.	N.D.	Fault in dolomite.
38	do.	2.0	.23	.86	Quartz lenses in fault.

Table 1.--Analytical data* and descriptions of samples 10-61, from the Galena claims--Continued

Sample			Assay data		
No.	Type	Length (ft)	Au oz/ton	Ag oz/ton	Remarks
39	Chip	1.0	0.12	1.67	Fault in dolomite.
40	do.	.3	N.D.	N.D.	Do.
41	do.	.3	N.D.	N.D.	Do.
42	do.	.3	3.83	2.91	Quartz vein in dolomite.
43	do.	.5	.03	1.70	Do.
44	do.	.3	.02	4.63	Do.
45	do.	.1	Tr	Tr	Fractured dolomite.
46	do.	.4	N.D.	Tr	Fault in dolomite.
47	do.	.4	.03	Tr	Do.
48	do.	.4	N.D.	N.D.	Do.
49	do.	.3	N.D.	N.D.	Do.
50	do.	.3	.72	.52	Quartz vein in dolomite.
51	do.	.2	Tr	Tr	Do.
52	do.	.5	1.40	1.30	Do.
53	do.	.3	.23	1.53	Do.
54	do.	.8	N.D.	N.D.	Fault in dolomite.
55	do.	1.0	.29	.77	Quartz veinlets in dolomite.
56	do.	1.0	.20	.26	Quartz vein in dolomite.
57	do.	1.0	1.48	1.70	Do.
58	do.	.8	N.D.	Tr	Fault in dolomite.
59	do.	1.5	N.D.	N.D.	Breccia zone in dolomite.
60	Grab	N.A.	N.D.	N.D.	Dump sample; diabase.
61	Select	N.A.	N.D.	N.D.	Do.

*Gold and silver were determined by inductively coupled plasma analysis. Detection limit for gold is 0.007 ppm (table shows values converted to oz/ton); detection limit for silver is 0.3 ppm.

Table 2.--Analytical data* and descriptions of samples 1-9, from the northern part of the Blue Eagle Wilderness Study Area and vicinity, Nye County, Nevada. [Au, gold; Ag, silver; U, uranium; N.D., assayed for but not detected; N.A., not applicable; ---, not assayed for].

Sample			Assay data			
No.	Type	Length (ft)	Au	Ag ppm	U	Remarks
1	Grab	N.A.	N.D.	N.D.	---	Vitric tuff; 60-80 cps on scintillometer (background is 20 cps).
2	do.	N.A.	N.D.	N.D.	3.3	Vitric tuff; El Padre Mine; radioactive anomaly to 80 cps.
3	do.	N.A.	N.D.	N.D.	3.1	Vitric tuff; El Padre Mine; radioactive anomaly to 100 cps.
4	Chip	5.0	N.D.	N.D.	2.4	Vitric tuff; El Padre Mine; radioactive anomaly to 100 cps; adjacent to inclined shaft at southeast end of bulldozer cut.
5	Grab	N.A.	N.D.	N.D.	23.0	Dump sample; 30-ft-deep shaft in welded tuff. Radioactive anomaly from 240-300 cps.
6	Chip	5.0	N.D	N.D.	---	Jasperoid outcrop.
7	do.	5.0	N.D.	N.D.	---	Do.
8	do.	3.0	N.D.	N.D.	---	Do.
9	do.	4.0	N.D.	N.D.	---	Do.

*Gold and silver were determined by inductively coupled plasma analysis. Detection limit for gold is 0.007 ppm; detection limit for silver is 0.3 ppm. Uranium determined by fluorometric analysis. Detection limit for uranium is 1.0 ppm.

Table 3.--Miscellaneous mineral occurrences in and near the Blue Eagle Wilderness Study Area, Nye County, Nevada. [Asterisk(*) indicates outside study area]

Sample No. (fig. 2)	Name (commodity)	Summary	Workings and production	Sample and resource data
6-9	GM Claims	Jasperoid (silicified limestone or dolomite) associated with shale of the Mississippian Chainman Formation has been investigated as a possible host for a disseminated gold deposit.	Twelve holes were drilled into the jasperoid-shale sequence in 1981, by Energy Reserves Group, Golden, CO, U.S. Minerals Exploration Co., Arvada, CO.	Gold and silver were not detected in the four Bureau samples. Claims held by Energy Reserves Group and U.S. Minerals Exploration Co. have been dropped.
1-5	Unnamed prospects* (uranium)	Vitric tuff and rhyolite containing radioactive anomalies have been investigated for uranium.	Workings consist of a a 30-ft-deep shaft in porphyritic rhyolite on the west slope of Red Mountain and bull-dozer cuts in vitric tuff at and just north of the El Padre Mine.	Background radiation averaged 20 cps in the northern part of the WSA. Anomalous radioactivity (to 300 cps) was noted from dump material at sample site 5. A grab sample from this dump assayed 23 ppm uranium. Samples 1-4 had anomalies ranging from 40-100 cps, with assays up to 3.3 ppm uranium.
2-4	El Padre Mine* (decorative building stone)	Vitric tuff mined as a decora-tive building stone used in facing buildings and other structures. Iron oxides color some of this material in bands and swirls of yellow, brown, red, and purple. This tuff is a facies of the Miocene-Pliocene Horse Camp Formation (Moores and others, 1968, p. 1711).	The El Padre Mine consists of 0.4 mi of bulldozer cuts. This mine has not been active for several years.	Decorative building stone is difficult to assess in terms of marketability and price. Small stockpiles at the mine have been handsorted for color and size.

APPENDIX A.--Semiquantitative optical emission spectrographic analysis detection limits, U.S. Bureau of Mines, Reno Research Center.

Element	Detection limit (percent)	Element	Detection limit (percent)
Ag	0.002	Mo	0.0001
Al	.001	Na	.3
As	.01	Nb	.007
Au	.002	Ni	.0005
B	.003	P	.7
Ba	.002	Pb	.001
Be	.0001	Pt	.0001
Bi	.01	Re	.0006
Ca	.05	Sb	.06
Cd	.0005	Sc	.0004
Co	.001	Si	.0006
Cr	.0003	Sn	.001
Cu	.0006	Sr	.0001
Fe	.0006	Ta	.02
Ga	.0002	Te	.04
K	2.0	Ti	.03
La	.01	V	.005
Li	.002	Zn	.0001
Mg	.0001	Zr	.003
Mn	.001	Y	.0009

These detection limits represent an ideal situation. In actual analyses, the detection limits vary with the composition of the material analyzed. These numbers are to be used only as a guide.

Appendix B.--Semiquantitative optical emission spectrographic analysis for 18 samples.

Sample Numbers

Elements	4	5	9	10	13	15	16	18	23	26	32	33	38	43	47	50	52	56
AG	<.004	<.004	<.006	<.009	<.006	<.006	<.008	<.007	<.003	<.005	<.07	<.004	<.003	<.01	<.003	<.005	<.01	<.003
AL	>7.	>6.	.9	>6.	>5.	>6.	.9	.2	>2.	>5.	.9	.2	>5.	>5.	>3.	.8	1.	>5.
AS	<.02	.04	<.02	<.02	<.009	<.02	<.04	<.009	<.01	<.02	<.009	<.01	<.02	<.01	<.01	<.03	<.01	<.009
AU	<.003	<.003	<.004	<.003	<.002	<.002	<.004	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002
B	.03	.01	.01	.01	<.005	.008	.01	<.007	<.008	.01	<.004	.009	.009	<.005	<.005	<.004	<.006	<.004
BA	.5	.7	.03	.07	.04	.2	.02	.003	.01	.04	.02	.002	.04	.03	.006	.004	.01	.03
BE	.0005	.0007	.002	<.0001	<.0001	.001	.0006	.0003	.0006	.0003	<.0001	.0005	.0004	<.0003	<.0002	.0004	.0004	<.0001
BI	<.02	<.01	<.01	<.01	<.01	<.01	<.01	<.03	<.01	<.01	<.05	<.01	<.02	<.01	<.01	<.01	<.01	<.01
CA	9.	>10.	.5	>10.	>10.	10.	10.	8.	9.	>10.	2.	10.	10.	>10.	>10.	10.	2.	>10.
CD	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	.03	<.0005	<.0005	<.0005	<.0005	<.0006	.006	.0006	<.0005	<.001	<.0005
CO	<.001	<.001	<.001	<.001	<.001	<.001	<.002	<.001	<.001	<.001	<.002	<.001	<.001	<.001	<.001	<.001	<.003	<.001
CR	<.0006	<.0003	.008	.003	.001	<.0003	.009	.002	.001	.002	.002	.02	.001	.001	<.0008	.002	.004	.003
CU	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	.004	<.0006	<.0006	.4	<.0006	.1	.06	<.0006	.03	.1	.01
FE	4.	3.	4.	4.	4.	9.	2.	3.	3.	4.	10.	2.	7.	4.	5.	7.	8.	6.
GA	<.001	<.0006	.002	.002	<.0002	<.002	.002	<.0002	<.0002	<.0004	<.0006	<.0002	<.0005	<.0002	<.0002	<.0002	<.001	<.0002
K	>10.	>10.	9.	<.7	6.	>10.	6.	10.	10.	5.	9.	5.	>10.	10.	<.6	10.	8.	10.
LA	<.01	<.01	<.02	<.01	<.01	<.01	<.02	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
LI	>.5	<.003	.01	.009	<.004	.006	<.002	<.002	.005	.02	<.002	<.002	.006	<.004	<.002	<.002	<.002	<.002
MG	1.	.3	.03	2.	2.	1.	.4	.5	.4	1.	.9	.4	1.	2.	1.	1.	.7	1.
MN	.2	.1	.05	.1	.06	.7	.04	.02	.03	.08	.03	.02	.04	.07	.1	.01	.005	.05
MO	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
NA	<.5	<.4	<.3	<.3	<.3	5.	<.3	<1.	<.3	<.3	2.	<.3	<1.	<.3	<.3	<.3	<1.	<.3
NB	<.02	<.02	<.007	<.02	<.007	<.03	<.007	<.007	<.007	<.009	<.007	<.007	<.01	<.009	<.007	<.007	<.007	<.007
NI	.001	.001	.002	.003	.002	.003	.002	.001	.001	.002	.005	.001	.002	.002	.001	.002	.003	.001
P	<.7	<.9	<1.	<.7	<.7	<1.	<.8	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7
PB	.009	.009	.01	.01	<.008	.03	2.	5.	<.006	.02	8.	.04	5.	8.	.2	.9	3.	2.
PD	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
PT	<.0006	<.0006	<.001	<.001	<.0006	<.002	<.002	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006
SB	<.06	<.06	<.06	<.06	<.06	<.06	<.06	<.06	<.06	<.06	<.1	<.06	<.06	<.06	<.06	<.06	<.06	<.06
SC	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004
SI	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.
SN	<.007	<.006	.01	<.01	<.006	<.02	.01	.003	<.004	<.006	.01	.004	<.01	<.005	<.003	<.002	.01	<.003
SR	.02	.04	.003	.08	.07	.03	.01	.01	.005	.07	.01	.02	.009	.07	.04	.004	.001	.05
TA	<.02	<.02	<.02	<.02	<.02	<.03	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02
TE	<.05	<.08	.2	<.04	<.04	<.09	.2	<.05	<.09	<.04	<.04	<.09	<.04	<.04	<.04	<.04	<.04	<.04
TI	.3	.3	.2	.3	.2	1.	.1	<.05	.08	.2	.1	<.04	.1	.2	.09	<.03	.1	.2
V	<.005	<.005	.02	<.01	<.005	.04	.02	<.005	<.005	<.005	<.009	<.005	.03	.02	<.005	<.007	.01	<.005
Y	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009
ZN	<.002	.003	<.003	.001	.004	.03	.03	.7	.006	.02	.2	.03	.3	.2	.05	.07	.5	.2
ZR	.004	<.003	.01	.003	<.003	<.003	.005	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	.005	<.003