W.C.M. Inc.
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PHASE I

Geology, Energy, and Mineral (GEM) Resource Evaluation of Homestead GRA, Oregon-Idaho, including the McGraw Creek (6-1), Homestead (6-2), and Sheep Mountain (6-3), Wilderness Study Areas

Bureau of Land Management
Contract No. YA-553-CT2-1039

By:

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Contributors:

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ANCHORAGE, ALASKA
MARCH 1983

WGM INC.
MINING AND GEOLOGICAL CONSULTANTS

EXECUTIVE SUMMARY

The Homestead Geology, Energy, and Mineral Resource Area (GRA) encompasses an area in the Snake River Canyon near Oxbow and Homestead on the Idaho-Oregon border. The GRA includes three Wilderness Study Areas (WSAs): the 1,610 acre McGraw Creek (6-1) WSA; the 10,700 acre Homestead (6-2 WSA; and the 6,350 acre Sheep Mountain (6-3) WSA.

Bedrock in the area consists of Permo-Triassic volcanic, volcaniclastic, epiclastic, and carbonate rocks which are overlain by Tertiary Columbia River basalts. The Permo-Triassic volcanic and volcaniclastic units are host to volcanogenic copper-gold-silver deposits.

The area contains numerous metallic mineral occurrences, prospects, deposits, and two operating mines including the Iron Dyke Mine near the boundary of the Homestead WSA. Many active unpatented and patented lode mining claims are in the GRA and a number are partially or wholly within the Homestead WSA. Consequently, the Homestead GRA is considered to be highly favorable for metallic mineral resources.

The geologic environment is generally unfavorable for non-metallic, geothermal, and oil and gas resources except for some barite potential in the Homestead WSA and low potential for sand, gravel and common varieties of limestone in the McGraw Creek WSA.

SUMMARY OF GEM RESOURCES

LAND CLASSIFICATION FOR THE HOMESTEAD GRA

	McGraw Creek (6-1)	Homestead (6-2)	Sheep Mountain (6-3)
1. Locatable Resources			
a. Metallic Minerals	3B	4D	3B
b. Uranium and Thorium	1C	1C	1C
c. Non-Metallic Minerals	1C	2C (barite)	1C
2. Leasable Resources			
a. Oil and Gas	1C	1C	1C
b. Low Temperature Geothermal	1B	1B	1B
High Temperature Geothermal	1B	1B	1B
c. Sodium and Potassium	1C	1C	1C
d. Other	1C	1C	1C
3. Saleable Resources	1C (sand and gravel) 2B (limestone)	1C	1C

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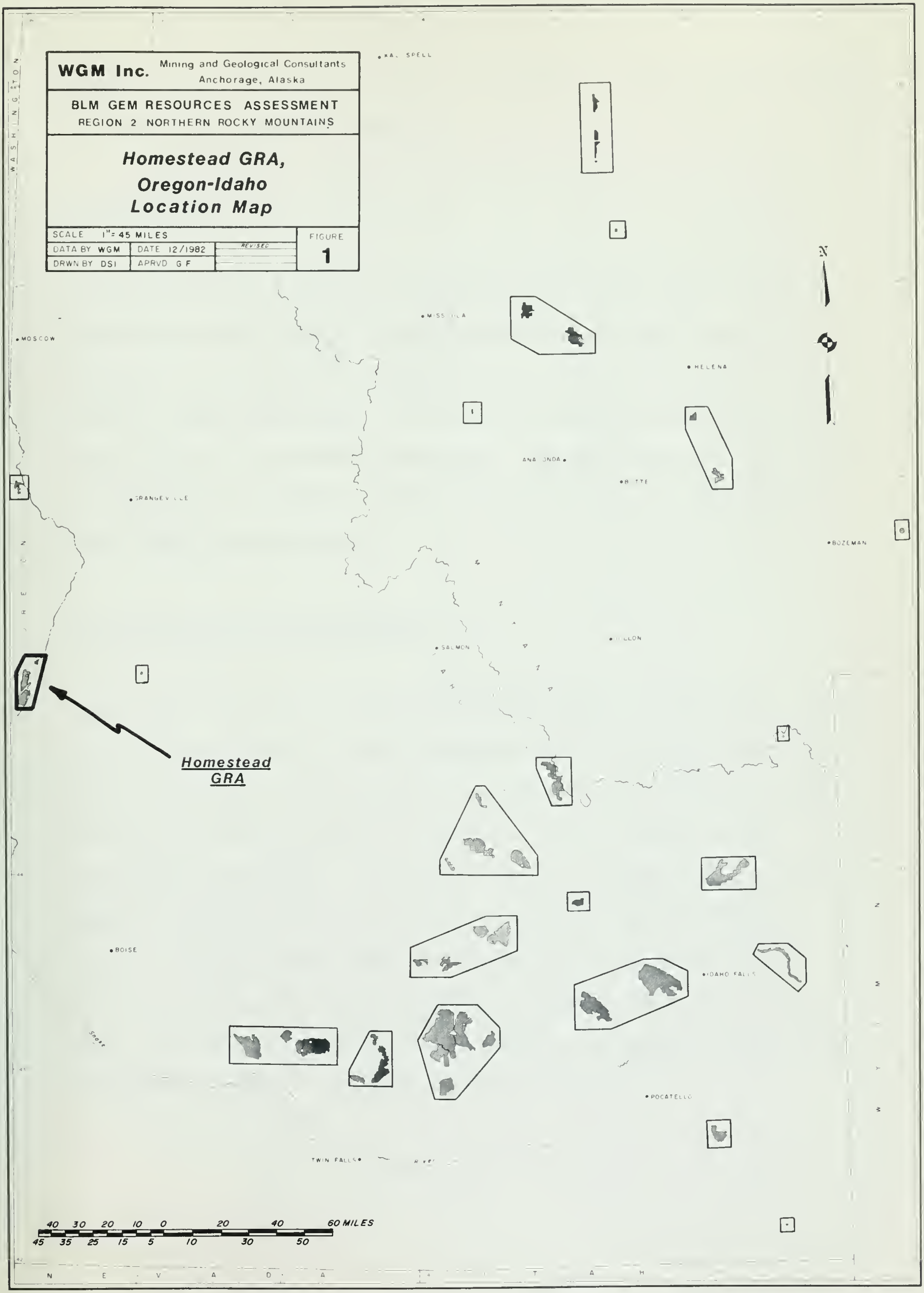
HOMESTEAD GRA, OREGON

1.0 INTRODUCTION

The Bureau of Land Management has adopted a two-phase procedure for the integration of geological, energy and minerals (GEM) resources data into the suitable/non-suitable decision making process for Wilderness Study Areas (WSAs). The objective of Phase I is the evaluation of existing data, both published and available unpublished data, and evaluation of the data for interpretation of the GEM resources potential of the WSAs. Wilderness Study Areas are grouped into areas based on geologic environment and mineral resources for initial evaluation. These areas are referred to as Geology, Energy, Mineral Resource Areas (GRAs).

The delineation of the GRAs is based on three criteria: (1) a 1:250,000 scale map of each GRA shall be no greater than 8½ x 11 inches: (2) a GRA boundary will not cut across a Wilderness Study Area; and (3) the geologic environment and mineral occurrences. The data for each GRA is collected, compiled, and evaluated and a report prepared for each GRA. Each WSA in the GRA is then classified according to GEM resources favorability. The classification system and report format are specified by the BLM to maintain continuity between regions.

This report is prepared for the Bureau of Land Management under contract number YA-553-CT2-1039. The contract covers GEM Region 2; Northern Rocky Mountains (Fig. 1). The Region includes 50 BLM Wilderness Study Areas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Anchorage, Alaska
BLM GEM RESOURCES ASSESSMENT
REGION 2 NORTHERN ROCKY MOUNTAINS
Homestead GRA,
Oregon-Idaho
Location Map
SCALE 1"= 45 MILES
DATA BY WGM
DATE 12/1982
REVISED
DRWN BY DSI
APRVD G F
FIGURE
1
WASHINGTON
MOSCOW
MISSOULA
HELENA
GRANGEVILLE
ANACONDA
BUTTE
BOZEMAN
SALMON
DILLON
Homestead
GRA
BOISE
IDAHO FALLS
POCATELLO
TWIN FALLS
N
40 30 20 10 0 20 40 60 MILES
45 35 25 15 5 10 30 50
N E V A D A
U T A H

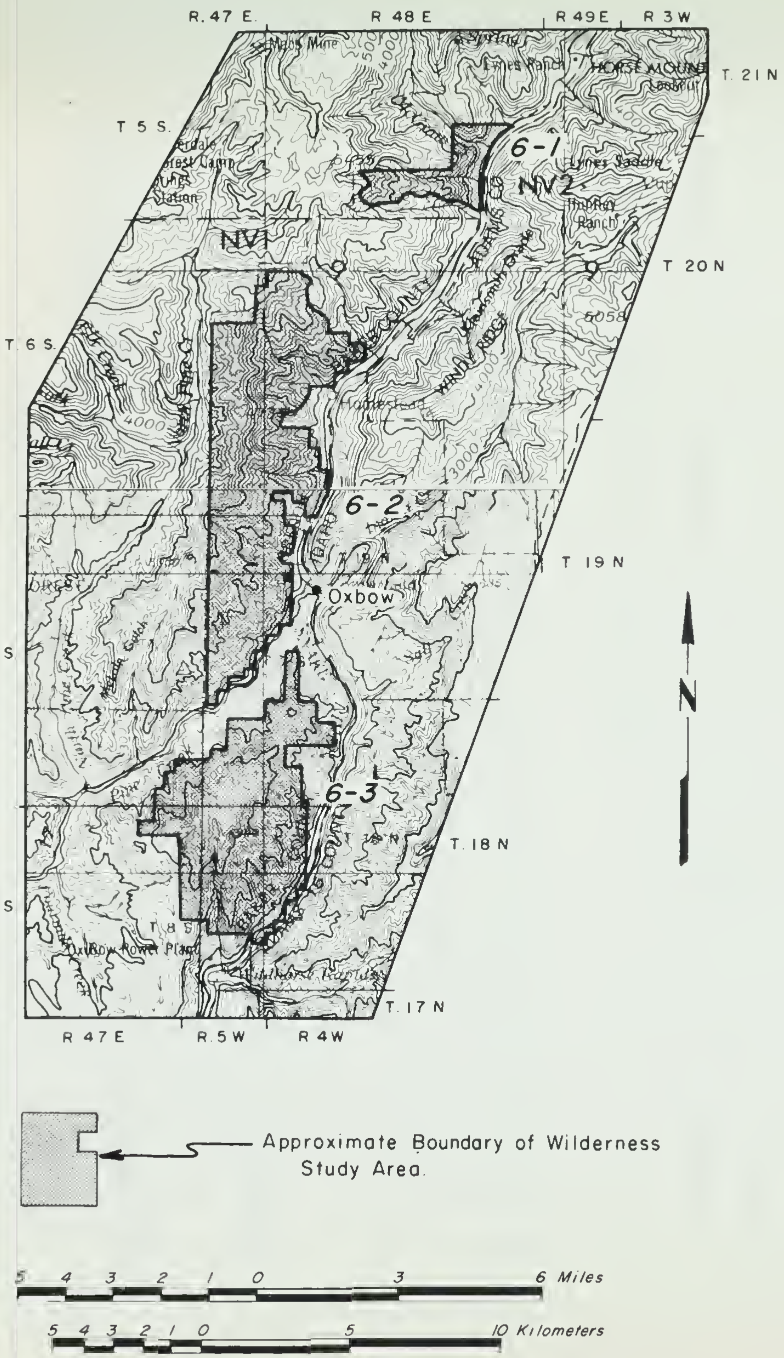
totalling 583,182 acres. The WSAs were grouped into 22 GRAs for purposes of the Phase I GEM resources evaluation.

1.1 Location

The Homestead GRA contains three Wilderness Study Areas (WSAs) located in northwestern Baker County and southeastern Wallowa County, Oregon and encompasses the Oregon-Idaho Boundary (Figs. 1 and 2). The GRA is located along the Snake River Canyon in Ts.5-8S., Rs. 47 48W (Willamette Meridian); and Ts.18-21N., Rs.3-4W. (Boise Meridian). The GRA includes the settlements of Oxbow and Pine Creek and administratively is within the Baker Resource Area in the Vale BLM district.

1.2 Population and Infrastructure

Oxbow, with a population of approximately 100 people, is the largest settlement in the area (Fig. 2). This settlement, which is located on the old townsite of Copperfield, is owned and managed by Idaho Power and Light for the purpose of housing workers to operate the Hells Canyon and Oxbow hydroelectric facilities. Limited facilities for lodging, gasoline, and groceries are available at Pine Creek, four miles southwest of Oxbow. Access is by way of paved roads from Halfway, Oregon to Oxbow and the Brownlee Dam. Access to the Idaho side of the Snake River Canyon is via Oxbow. Additionally, a gravel road is present along the Oregon side of the Hells Canyon reservoir from Oxbow to Copper Creek.



BLM Wilderness Study Areas Included in the Homestead GRA.

WSA	NAME	ACREAGE
6-1	McGraw Creek	1,610
6-2	Homestead	10,700
6-3	Sheep Mountain	6,350

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REGION 2 NORTHERN ROCKY MOUNTAINS

Homestead GRA, Oregon-Idaho Topographic Map

SCALE. 1"=4 MILES (1 250,000)			FIGURE
DATA BY WGM	DATE 9/1982	REVISED	2
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1.3 Basis of the Report

This report is based on a compilation, review, and analysis of the available published and unpublished data on the geology, energy, and mineral resources of the Homestead GRA. The area has been largely mapped by Vallier (1967; 1973) and is covered by a NURE study of the Baker NTMS Quadrangle (Berunardi and Robins, 1982). A minor geochemical investigation has also been conducted in the GRA by Morganti (1972). BLM records were reviewed to determine the status of mining claims and oil and gas leases in the area. Areal photos were also examined. Several prospects and mines were examined by WGM personnel in the course of this study to verify the compilation of data and inferred geologic environments.

Mr. R.S. Fredericksen of WGM was a principal contributor to this report. Mr. Fredericksen supervised the Texas Gulf exploration program in the Hells Canyon area from July 1974 to January 1978. During that time he mapped and sampled much of the Homestead GRA, conducted 20,000 feet of exploratory drilling and reopened the Iron Dyke Mine.

The data was compiled and reviewed by WGM project personnel and the panel of experts to produce the resource evaluation which comprises this report.

Greg Fernette, Senior Geologist, WGM Inc.	Project Manager
C.G. Bigelow, President, WGM Inc.	Chairman, Panel of Experts
Joel Stratman, Geologist, WGM Inc.	Project Geologist
Jami Fernette, Land and Environmental Coordinator, WGM Inc.	Claims and Lease Compilation

Panel of Experts

C.G. Bigelow, President, WGM Inc.	Regional geology, metallic and minerals, mineral economics.
R.S. Fredericksen, Senior Geologist, WGM Inc.	Regional geology, metallic minerals.
David Blackwell, Ph.D., Professor Geophysics, Southern Methodist University	Geothermal.
Jason Bressler, Senior Geologist, WGM Inc.	Regional geology, metallic minerals.
Gary Webster, Ph.D., Chairman, Department of Geology, Washington State University	Oil and gas.
William Jones, Senior Geologist, WGM Inc.	Metallic minerals, coal, industrial minerals.
J.F. McOuat, President, Watts, Griffis & McOuat Ltd.	Mineral economics, and industrial minerals.
E.F. Evoy, Senior Geologist, Watts, Griffis & McOuat Ltd.	Uranium and thorium

1.4 Acknowledgements

We would like to thank Bob Ciesil of the Vale BLM district for loaning us aerial photos and data on the region. Additionally, gratitude is due Alan Juhas of Texasgulf Minerals Inc. who allowed us to review unpublished data on the Iron Dyke Mine and Bruce Wise of Silver King Mines who allowed us to visit the Iron Dyke Mine.

2.0 GEOLOGY

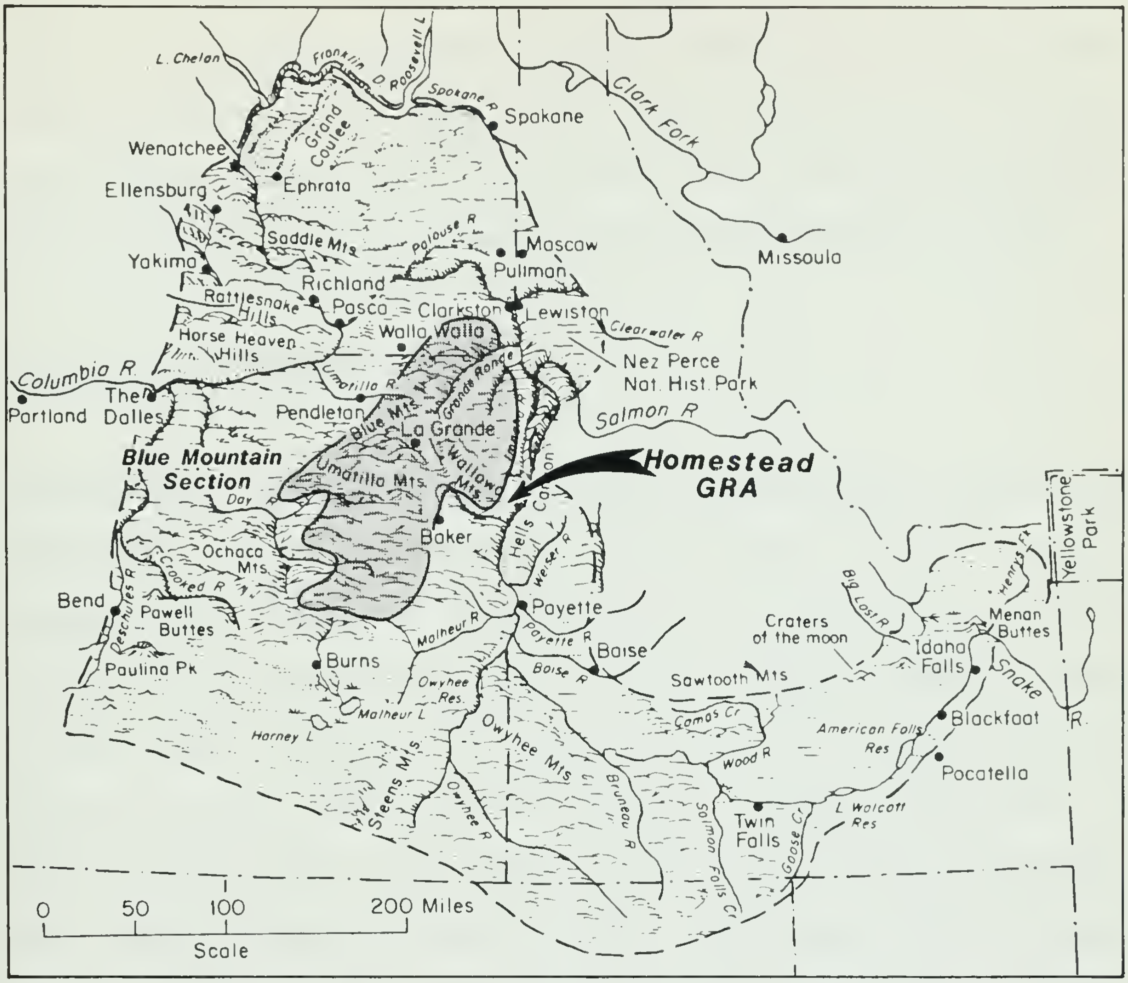
2.1 Introduction

Regionally the Homestead GRA emcompasses the Snake River Canyon, a deep drainage which dissects the Blue Mountains Uplift and Seven Devils region. Within the Snake River Canyon a window of Paleozoic (600-230 m.y.) and Mesozoic (230-65 m.y.) rocks is exposed under the Tertiary (65-2 m.y.) Columbia River Basalts which cover all pre-Tertiary rocks forming a regional unconformity. The late Paleozoic and Mesozoic stratigraphy comprises a section of predominantly volcanic and volcaniclastic rocks approximately 7,500 meters thick (Vallier, 1977).

Much of the Homestead GRA has been mapped in detail by Vallier (1967) whose work has provided the basis for most later work. The Oxbow area has been mapped in detail by Stearns and Anderson (1966). The most recent work is concerned with the geology around the Iron Dyke Mine (Juhas, Freeman, and Fredericksen, 1981).

2.2 Physiography

The Homestead GRA is located within the Columbia-Snake River Plateau physiographic province of Hunt (1974). The GRA is at the eastern boundary of the Blue Mountains section of the province and is dominated by the Snake River Canyon (Fig. 3). Relief in the area is considerable, with elevations ranging from 1,700 feet (Hells Canyon reservoir elevation) to over 5,500 feet at the Canyon rim. Approximately 12 miles north of the Homestead GRA,



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Location of the Homestead GRA in the Columbia-Snake River Plateaus Physiographic Province (from Hunt, 1974).

SCALE AS SHOWN			FIGURE
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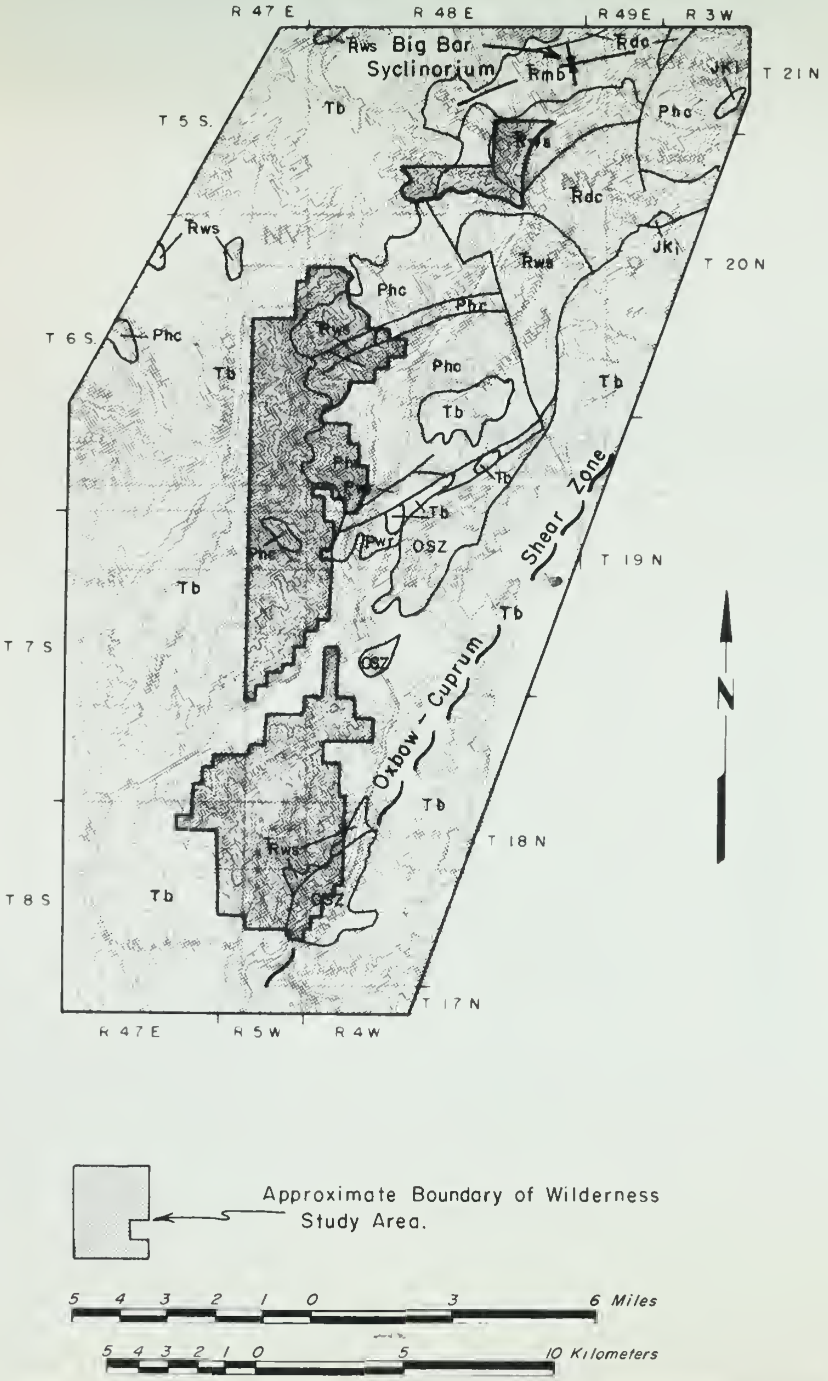
12 miles below Hells Canyon Dam, is the deepest gorge in North America -- over 5,300 feet deep. Vegetation changes dramatically from the canyon bottom to the surrounding ridges. The floor of the Snake River Canyon is largely below treeline and contains domestic fruit trees and grapes, but above the canyon rim, the terrain is covered with coniferous forests.

2.3 Description of Rock Units

The oldest rock units exposed in the Homestead GRA underlie Permo-Triassic (280-195 m.y.) rocks of the Seven Devils Group (Figs. 4 and 5). These basement rocks, although rarely exposed, crop out near Oxbow. The rocks represent a metamorphic and plutonic terrane. Wide shear zones marked by mylonitic rocks, amphibolite, hornblende and chlorite schists, gneiss, and phyllite (Vallier, 1977) are present and may represent suture zones. In the Homestead GRA basement rocks consist of amphibolite derived from gabbro, basalt and quartz diorite (Vallier, 1973). The basement complex ranges in age from Paleozoic(?) to possibly Late Jurassic (158-141 m.y.). These basement rocks crop out in the Sheep Mountain WSA (Fig. 4).

Unconformably or structurally overlying the basement complex are volcanogenic units of the Seven Devils Group. Four major formations comprise the Seven Devils group: (1) the Windy Ridge Formation, (2) the Hunsaker Creek Formation, (3) the Wild Sheep Formation, and (4) the Doyle Creek Formation. The Seven Devils Group is host to several producing base-precious metal volcanogenic deposits, and hundreds of prospects and occurrences of like character.



EXPLANATION

Tb	Calumbia River Basalt	Tertiary
JKi	granite and granadiarite	Cretoceaus to Jurassic
Ŧmb	Martin Bridge Farmatian	Triassic
Ŧdc	Doyle Creek Faramatian	Triassic
Ŧws	Wild Sheep Creek Farmatian	Triassic
Phc	Hunsaker Creek Farmation	Permian
Pwr	Windy Ridge Farmation	Permian
OSZ	Oxbaw Shear Zone-cantains Amphibalite, Diarite, mylanite, and gniess	

after Vallier, 1973

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Homestead GRA, Oregon-Idaho

Geologic Map

SCALE 1"= 4 MILES			FIGURE
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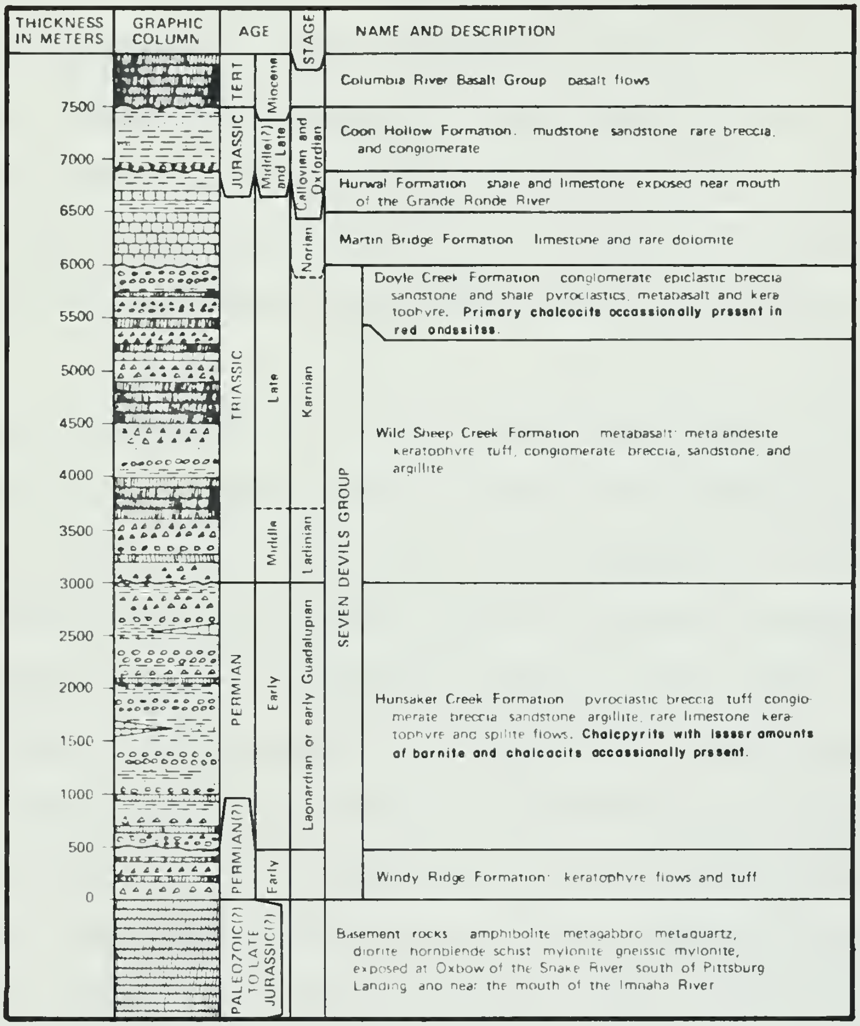

After Vallier, 1977.

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Homestead GRA, Oregon-Idaho

Stratigraphic Column

SCALE			FIGURE
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The Windy Ridge Formation is comprised of a sequence of metamorphosed silicic volcanic flows and volcaniclastic rocks exposed primarily across the Snake River from Oxbow along the south end of Windy Ridge. No stratigraphic section has been measured. The Windy Ridge Formation is distinguishable from younger units in that it is dominantly comprised of grayish-green quartz keratophyre tuff, quartz keratophyre tuff breccia, and quartz keratophyre flows. The formation lacks units which are definitely epiclastic; therefore, Vallier (1977) concluded that the formation is made up entirely of flow and pyroclastic rocks. The Windy Ridge Formation is considered to be of probable Early Permian (280-251 m.y.) age.

The Hunsaker Creek Formation is best exposed along tributary valleys which enter the Snake River Canyon from the Oregon side and include Hunsaker, Homestead, Herman, and Ballard Creeks. The formation is distinguished from the underlying Windy Ridge Formation by the presence of abundant conglomerate, volcanic sandstone, keratophyric water-laid tuff, mafic breccia, and spilite flows. Rocks are mostly volcanogenic consisting of pyroclastic breccia, agglomerate, tuff, epiclastic volcanic breccia, conglomerate, sandstone, siltstone, and minor limestone with quartz keratophyre and spilite flow rocks. Small hypabyssal plutons of quartz keratophyre and mafic rocks are common. Approximately 50% of the clastic rocks are estimated to be of epiclastic in origin. The total thickness of these rocks is not known. An estimate of 2,500 meters is conservative and estimates of 3,500 meters may be valid. Fossils from epiclastic rocks indicate an Early Permian age for the Hunsaker Creek Formation. The Hunsaker hosts the copper mineralization at the Iron Dyke and River Queen mines discussed later in this report.

The Wild Sheep Creek Formation unconformably overlies the Hunsaker Creek Formation. The formation is distinguished by rugged outcrops, thick flow and volcaniclastic units, dark green and greenish-black colors on fresh surfaces, and overall composition which generally approaches basaltic or andesitic. In general, three units can be distinguished within the Wild Sheep Creek Formation: (1) a lower volcaniclastic with keratophyric (andesitic) compositions dominant; (2) a middle unit, mostly spilitic (basaltic) in composition, made up of massive pillowed flows and breccias; and (3) an upper unit which is a mixture of spilitic and keratophyric clastic rocks, argillite, and limestone. Maximum thickness of the Wild Sheep Creek Formation is estimated to be 2,500 meters. Fossils present within the formation indicate an age of latest Middle Triassic (225-215 m.y.) and early Late Triassic (215-195 m.y.).

The Doyle Creek Formation is the uppermost formation of the Seven Devils Group. This formation is comprised of a sequence of red and green metamorphosed volcaniclastic rocks and volcanic flow rocks. The distinguishing features for the formation are the red colors and the presence of abundant epiclastic sediments, both of which are not characteristic of the underlying Wild Sheep Creek Formation. Formation contacts are ill-defined however and neither color or presence of epiclastics alone serve as distinguishing characteristics. The thickness of the unit is estimated at 500 meters. Age of the Doyle Creek Formation is bracketed by overlying and underlying units as Late Triassic. Red andesites in the Doyle Creek host the chalcocite mineralization at the Lime Peak and Copper Cliff mines discussed in a following section.

The Martin Bridge Limestone lies stratigraphically above the Seven Devils Group. This unit includes limestone (sparite, biosparite, and micrite), dolomite, and limestone breccia. In the Snake River Canyon a basal unit of calcareous graywacke, siltstone, and argillaceous limestone is present. Approximately 530 meters of Martin Bridge Limestone are present in the Canyon. Fossils are commonly well silicified and include ammonites of earliest Norian (Late Triassic) age.

Beyond the boundaries of the Homestead GRA the Martin Bridge Limestone is overlain by the Hurwal Formation, mainly shale and limestone, which is in turn overlain by the Coon Hollow Formation, comprised chiefly of mudstone, sandstone and rare breccia or conglomerate. These two units are of Jurassic (195-141 m.y.) age.

Minor amounts of Jurassic (195-141 m.y.) to Cretaceous (141-65 m.y.) granitic plutonic rocks are present in the northeast portion of the GRA (Morganti, 1972; White, 1968). These include the Eckles Creek granite and Huntley Gulch granodiorite. These small plutons intrude the Seven Devils Group and are considered outliers of the Idaho Batholith to the east. Outside the GRA similar plutons are associated with contact metasomatic copper-molybdenum-tungsten mineral deposits.

A conspicuous angular unconformity separates the pre-Tertiary rocks from the overlying Miocene (23-6 m.y.) flood basalts. Topographic relief on the unconformity is on the order of 500 to 700 meters. The old erosion surface is generally well exposed along the walls of the Snake River Canyon where boulder and cobble beds are commonly present along the base. The package of

Miocene flow basalts is known as the Columbia River Basalt Group. Along the Snake River Canyon two mappable units are present. The lowermost unit, a probable equivalent of the Picture Gorge Basalt (Vallier, 1973; 1977), is composed of porphyritic basalt flows with a distinctive waxy luster on fresh surfaces. The thickest sections range from 200 to 450 meters. The upper unit, probably correlative with the Takima Basalt, is comprised of a series of brown weathering, black basalt flows which attain a thickness of 900 meters near the mouth of the Grande Ronde River.

Quaternary (2 m.y.-present) deposits in the Snake River Canyon are thin and discontinuous and consist mostly of landslide, terrace, and alluvial fan deposits. The only noteworthy accumulations within the Homestead GRA are the landslide deposits at Big Bar, now virtually all submerged under the impounded waters of Hells Canyon Dam, and similar accumulations near the mouth of Copper Creek.

2.4 Structural Geology and Tectonics

The dominant structural grain of Pre-Tertiary stratigraphy is N40° to 80°E (Vallier, 1967; Morganti, 1972). Faults are the dominant structures with subordinate folds present (Fig. 4). Folding is best observed in units such as the Martin Bridge Formation which is preserved in a large synclinorium at Big Bar (Fig. 4). Other smaller scale folds are present in the area and are of local importance, i.e. as at the Iron Dyke Mine where folding (Stewart Syncline, Fig. 8) deforms the ore-bearing volcanic stratigraphy (Fredericksen, 1982; Juhas, Freeman, and Fredericksen, 1981).

Most major fault structures in the area trend northeast and northwest and dip steeply. Shear zones as wide as 50 feet are present. Vallier (1967) estimates the apparent stratigraphic displacement along some faults to be several thousand feet and in one instance at least 10,000 feet. Movement on most fault structures is believed to have a large strike slip component. The latest movement on faults occurred after deposition of the Martin Bridge Formation probably during the Jurassic.

The Oxbow-Cuprum shear zone is a major structural feature which extends from the Oxbow vicinity for 12 miles and trends N40° to 50°E. The shear zone is made up of a series of faults, some of which exert control on the configuration of the Oxbow and on the channels of Indian and Blue Creeks. Within the Oxbow-Cuprum shear zones are rocks which vary from unsheared to cataclastic, mylonitic, and gneissose. Vallier (1967) suggests the shear zone is a major wrench fault that may be of special significance in the tectonic framework of northeastern Oregon and western Idaho.

Geologic hazards within the GRA result primarily from the steepness of the terrain. The main geologic hazard consists of rock slides which disrupt travel on roads along the floor and sides of the Snake River Canyon. Rock slides commonly occur after unusually heavy downpours of rain and when spring melt waters saturate soils on the steep hillsides. Heavy summer thundershowers also can cause flash floods in the steeply incised tributaries of the Snake River. The area lacks seismic activity.

2.5 Paleontology

No systematic paleontological examination of units within the Homestead GRA has been completed except by Vallier (1967). Fossils are common in epiclastic rocks but are abundant in only a few locales. Fossil identification is useful in aiding differentiation of the Permian Hunsaker Creek Formation from the Triassic units. The Hunsaker Creek Formation commonly contains fossils of the brachiopod *Megosia* and the pelecypod *Aviculopecten* (Vallier, 1967; Fredericksen, 1977). These are common in the calcareous graywackes and limestones of Holbrook, Iron Dyke, and Homestead Creeks. In Triassic units distinctive flat clams, *Daonella*, serve to distinguish the Triassic from Permian units (Vallier, 1967). There are no good collecting localities mentioned in the literature.

2.6 Historical Geology

The Late Paleozoic and Triassic rock units found within the Homestead GRA are part of the Wrangellia tectonostratigraphic terrane (Jones et al., 1982). The Wrangellia terrane, now found as dismembered Permo-Triassic blocks in Oregon-Idaho, Canada and Alaska, originated about 300 million years ago as an island arc formed by volcanic activity distant from any continent. Most of the base and precious metal deposits contained within the Seven Devils Group were formed during this period of volcanic activity. Fusulinids and paleomagnetic data indicate that Wrangellia originated at low paleolatitudes presumably east of the Tethyan realm in the Panthalassa Ocean, the pedecessor of the Pacific. As volcanic activity waned and the arc cooled it sank and was covered by shallow-water sediments. About 220

million years ago the terrane rifted and was covered by thick accumulations of basalt establishing an emergent platform. These basalts are not present in the Snake River Canyon area as elsewhere in Wrangellia terrane. They may have been removed by erosion during the formation of the Permian-Triassic unconformity or be represented by andesitic volcanics of the Wild Sheep Creek Formation. In the Triassic the entire platform subsided below sea level where shallow water carbonates (i.e. the Martin Bridge Formation) and later, deep marine sediments (i.e. the Hurwal Formation) were deposited. The Wrangellia terrane, carried forth on the Pacific plate, began to collide with the North American plate during the Cretaceous. Rock units belonging to Wrangellia were dismembered by faulting, deformed, and eventually acreted to the North American plate. Faulting, generally strike-slip, has greatly attenuated the Wrangellia terrane, scattering segments of it from Oregon to south-central Alaska.

Orogenic activity culminated in Late Triassic accompanied by Jurassic-Cretaceous plutonism which gave rise to a second metallogenic process creating contact metasomatic mineral deposits and remobilizing earlier formed volcanogenic mineral deposits. Post orogenic erosion produced mountains of some relief. In the Miocene a tensional tectonic regimen in the Pacific Northwest brought about great outpourings of the Columbia River lavas which completely buried the hilly terrain. Oliogecene (38-23 m.y.) to Pliocene (6-2 m.y.) uplift of the Blue Mountains and subsequent erosion are responsible for the present relief. The Snake River dissects the Blue Mountain uplift in Hells Canyon exposing the pre-Miocene section and allowing for the present interpretation.

3.0 ENERGY AND MINERAL RESOURCES

3.1 Introduction

Data on known energy and mineral deposits and occurrences was compiled through a review of all available data. Principal sources are the U.S. Bureau of Mines MILS Data File, the USGS CRIB File, publications by Vallier and Brooks (1970), Juhas, Freeman, and Fredericksen (1981), Close et al. (1982), and Strowd et al. (1981). The Homestead GRA contains approximately 45 identified metallic mineral occurrences, deposits, and one operating copper-gold mine.

3.2 Known Mineral and Energy Deposits

The Homestead GRA contains one operating copper mine, the Iron Dyke, and six metallic mineral deposits (Table I). In addition, the Copper Cliff Mine is one mile east of the northeast boundary of the GRA (Fig. 6). A large number of other metallic mineral occurrences are also known in the GRA (Table II).

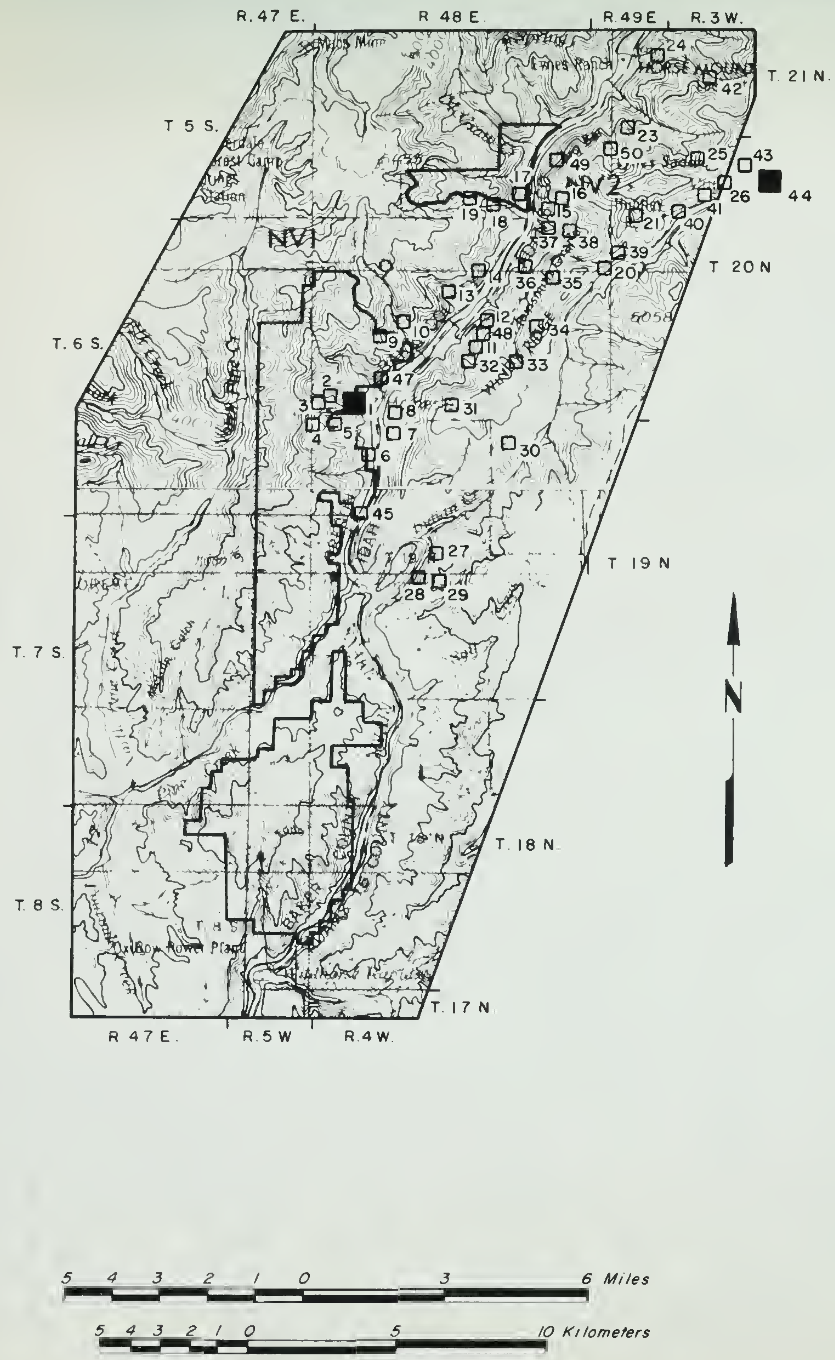
The Iron Dyke Mine (loc. 1, Fig. 6, 7) is located at Homestead Oregon in T.6S., R.48E., section 21 (Willamette Meridian). The mine and associated mineral occurrences impinge on the eastern boundary and occur partially within the Homestead WSA (Figs. 6 and 7). The Iron Dyke is Oregon's largest single copper producer. Between 1916 and 1928 approximately 239,000 tons of ore averaging 3.02% copper, 0.146 oz/ton gold and 1.07 oz/ton silver were produced (Juhas, Freeman, and Fredericksen, 1981). An attempt was made during the second World War to reopen the mine but was unsuccessful because

TABLE I

METALLIC MINERAL DEPOSITS IN THE HOMESTEAD GRA

Map No.	Name	Tonnage	Grade		
			Au (oz/t)	Ag (oz/t)	Cu (%)
(1)	Iron Dyke Mine[1]	1,786,000	0.116	0.69	1.51
(2)	Iron Dyke Mine[2]	325,000	0.25	0.70	2.7
(2)	Iron Dyke Mine[4]	50,000	0.3	----	2.75
(39)	Eureka[3]	96,000	----	0.32	0.9
(46)	Nix Claim Group[3]	45,600	0.03	0.02	0.4
(12)	River Queen[3]	7,100	----	----	1.7
(15)	Lime Peak[3]	4,150	----	0.15	1.4
(24)	Allison Creek[3]	2,620	----	----	0.72
(38)	Golden Star[3]	600	----	----	1.6

1. Fredericksen, 1982 - based on lower cut off grade (personal communication).
2. Juhas, Freeman, and Fredericksen, 1981 (published reserves).
3. Close, et al., 1982.
4. Silver King Mines, 1982, Reserves reported as "proven ore ready for mining".



LEGEND

- Mineral Orebody
- Mineral Deposit
- Mineral Occurrence
- Active Quarry
- Inactive Quarry
- Active. gravel or clay pit
- Inactive gravel or clay pit

1 occurrence number (See Table II).

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Homestead GRA, Oregon-Idaho

Mineral Occurrences

SCALE: 1" = 4 MILES (1:250,000)			FIGURE
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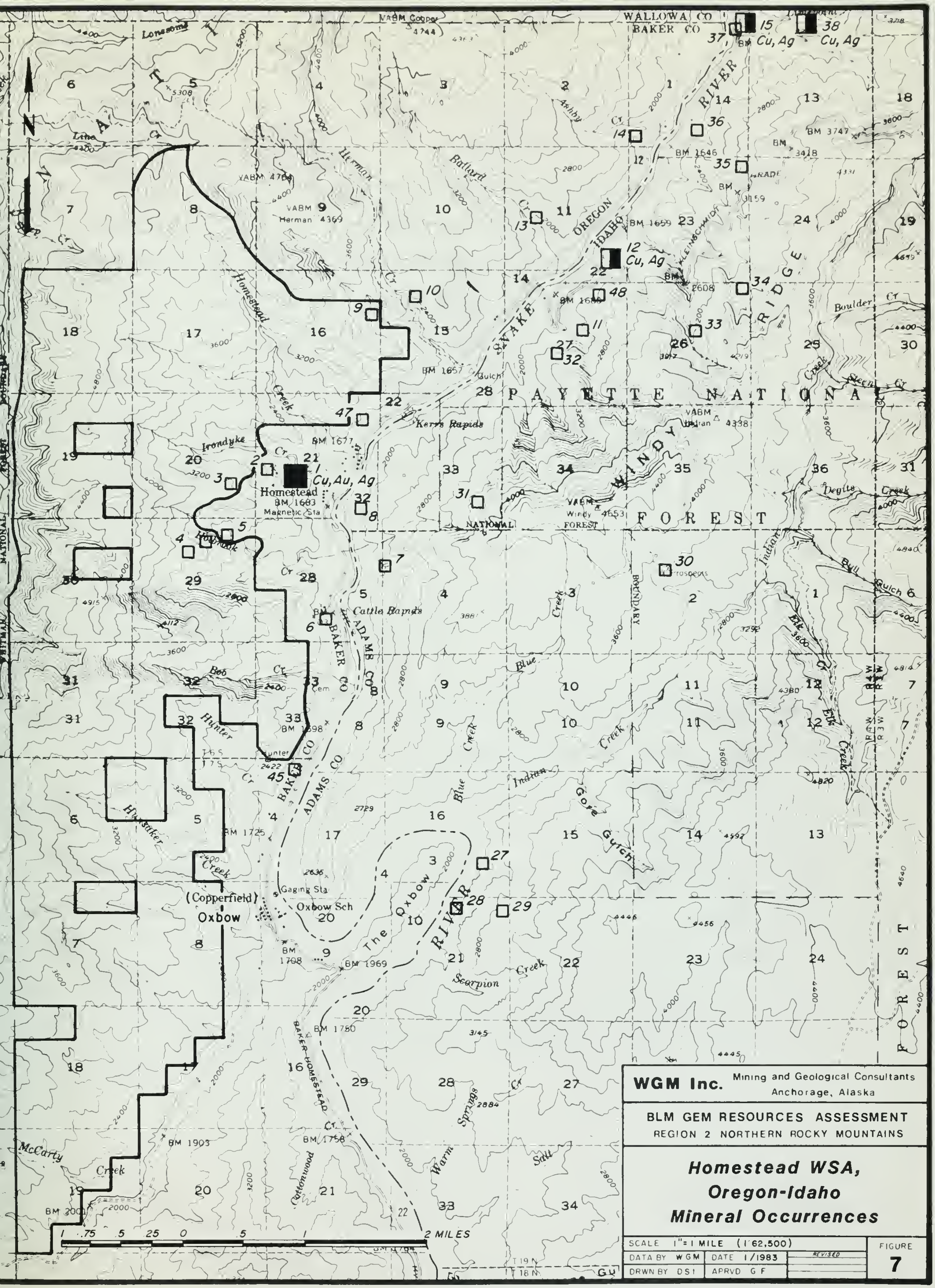

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REGION 2 NORTHERN ROCKY MOUNTAINS

Homestead WSA, Oregon-Idaho Mineral Occurrences

SCALE 1"=1 MILE (1:62,500)			FIGURE
DATA BY WGM	DATE 1/1983	REVISED	7
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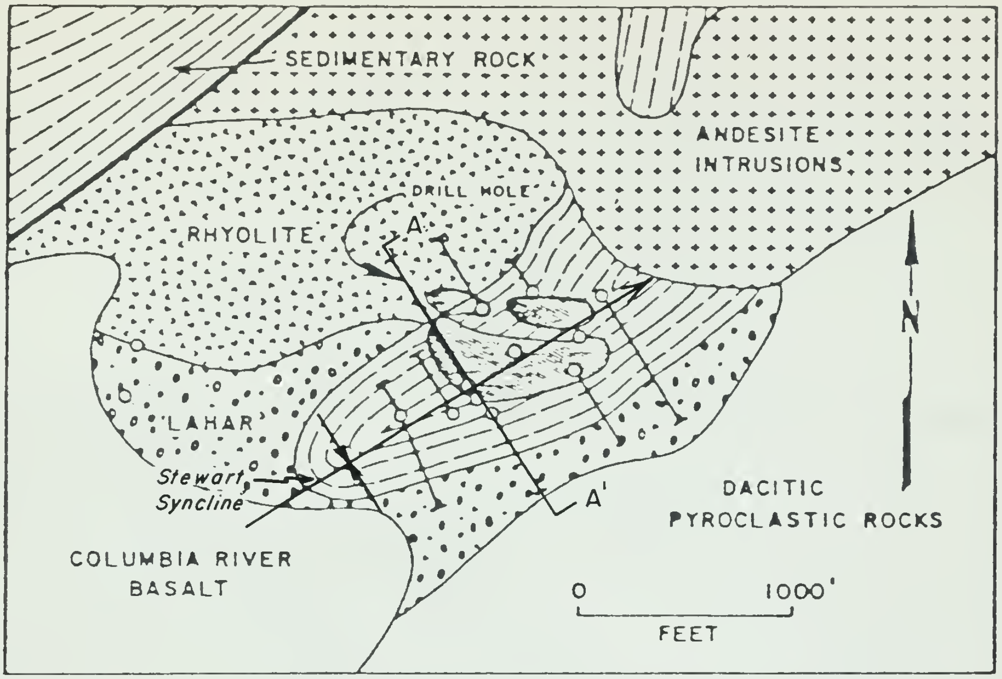
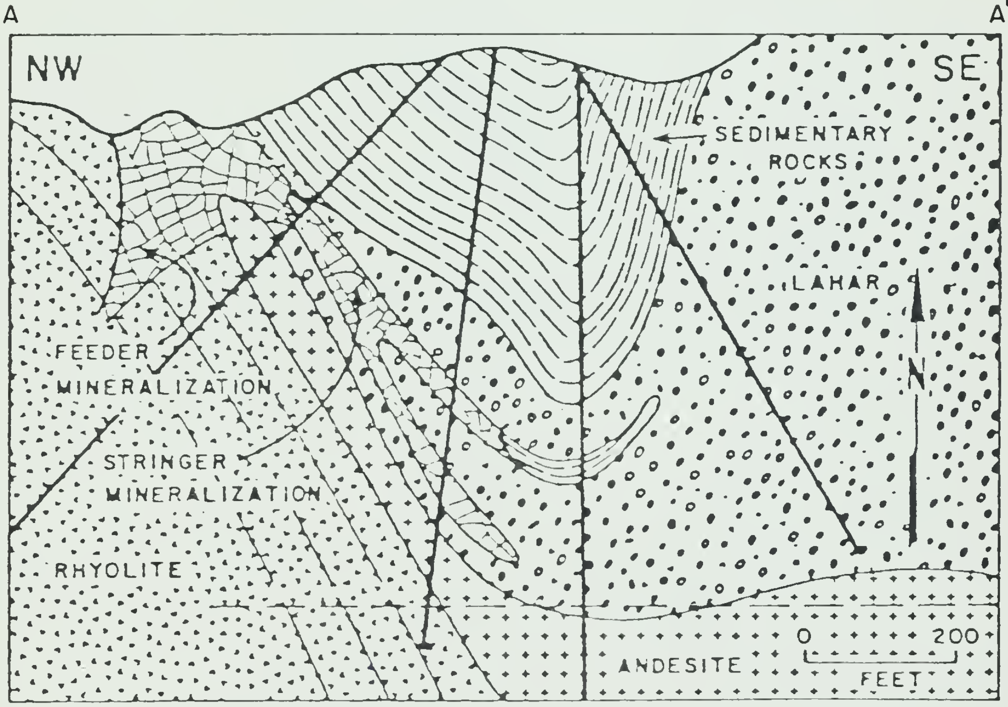
of manpower allotment problems. The property remained dormant until 1974 when geologists of Texasgulf Inc. recognized the volcanogenic nature of the deposit. Application of concepts related to volcanism and ore genesis brought about discoveries of additional high grade copper-gold-silver mineralization. The Iron Dyke Mine was recently producing at a rate of 75 tons per day with an ore grade of 2.75% copper, 0.3 oz/ton gold, and 0.5 oz/ton silver (Silver King Mines, 1982). Mineralization occurs as auriferous chalcopyrite in feeder and stringer stockwork ore localized within the top of a rhyolite and within an altered lahar (Figs. 8 and 9). The volcanic units hosting mineralization are within the Permian Hunsaker Creek Formation (Juhas, Freeman, and Fredericksen, 1981). The Iron Dyke Mine is operated by Silver King Mines in a joint venture with Texasgulf Inc. which owns 2/3 interest in the mine. The ore is hauled to Silver King's Copper Cliff facility for processing.

The River Queen Mine (loc. 12, Fig. 6, 7), located in Idaho about three miles north of Homestead, produced approximately 200 tons of hand-sorted ore containing 15 to 17% copper from 1936 to 1940 (Cook, 1954). The mine has been developed by several hundred feet of underground work much of which is now submerged by the impounded waters of Hells Canyon Reservoir. The ore consists of chalcopyrite and some bornite associated with a small rhyolite mass. The mineralization is contained within tuff, volcanic breccia, sandstone, and rhyolite of the Hunsaker Creek Formation (Vallier and Brooks, 1970). The deposit is classified as a volcanogenic lens by Close et al. (1982).





From: Juhas, et.al., 1981.

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REGION 2 NORTHERN ROCKY MOUNTAINS

Homestead GRA, Oregon - Idaho
Iron Dyke Geology and Cross Section

SCALE AS SHOWN			FIGURE
DATA BY	DATE 1/1983	REV SEC	8
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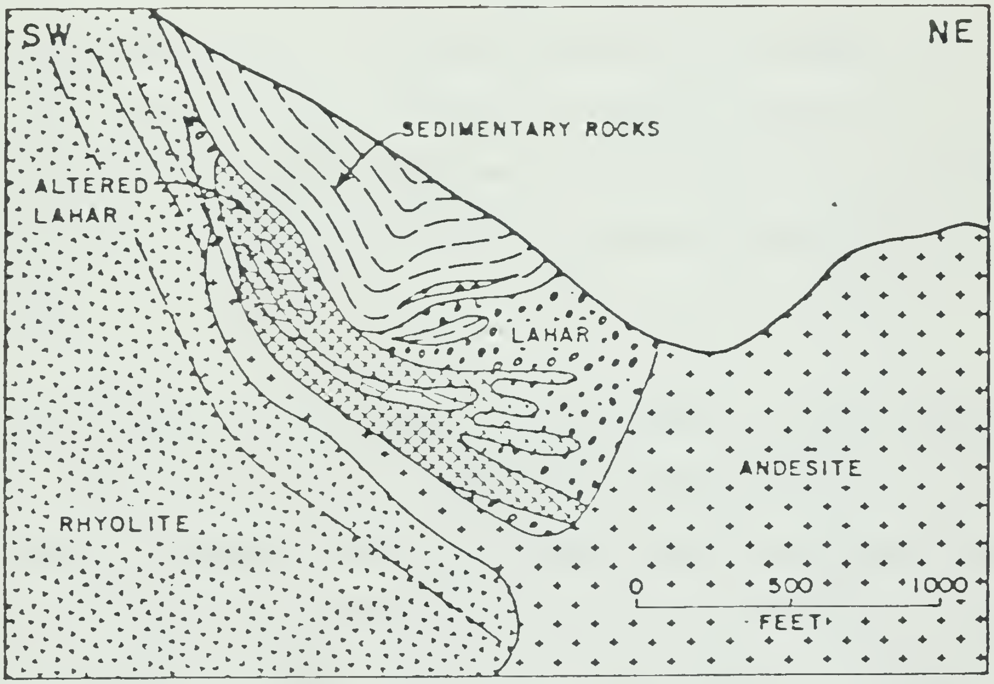

From: Juhas, et.al., 1981.

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REGION 2 NORTHERN ROCKY MOUNTAINS

Homestead GRA, Oregon - Idaho

Iron Dyke Longitudinal Section

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The Lime Peak Mine (loc. 15, Fig. 6, 7) is located in Idaho approximately five miles northeast of Homestead. Past production is unknown but believed to be small. Mineralization is contained within red andesite flows, tuffs, and volcanic breccia of the Doyle Creek Formation and consists primarily of chalcocite in one or more lenses. Mineralization is accompanied by weak propylitic alteration (Cook, 1954).

Little or no information is available concerning the geology of the Eureka (loc. 39, Fig. 6), Nix (loc. not certain), Allison Creek (loc. 24, Fig. 6), and Golden Star (loc. 38, Fig. 6) deposits except for the volcanogenic classification of the mineralization and tonnage estimates given by Close et al. (1982).

The Copper Cliff Mine (not shown) is located about 1.5 miles northeast of Cuprum, Idaho, one mile east of the Homestead GRA boundary. This copper-silver mine is localized within the Triassic Doyle Creek Formation and consists of bornite and chalcopyrite irregularly disseminated in meta-andesites (Morganti, 1972). This active mine, estimated in 1973 to contain 1.6 million tons averaging 1.0 to 1.4% copper, produces approximately 300 to 400 tons of ore per day (Bond and Markewich, in press).

No energy deposits are known in the Homestead GRA.

3.3 Known Mineralized Areas, Mineral Occurrences, and Prospects

Approximately 36 mineralized areas, mineral occurrences and prospects are reported in the Homestead GRA (Table II). All of these occurrences are within the Seven Devils Group which underlies the GRA and all of the three

TABLE II

MINES, MINERAL DEPOSITS, AND MINERAL OCCURRENCES OF THE HOMESTEAD GRA

Map No.	Name[1]	Location Sec.	T.	R.	Commodity	Type[2]	Data Source
1	Iron Dyke Mine	21	6S	48E	Cu-Au-Ag	Vol.	Juhas, et al. 1981
2	Iron Dyke Glory Hole	21	6S	48E	Cu-Ag	Vol.	Fredericksen, 1982
3	West Iron Dyke	20	6S	48E	Cu-Ag	Vol.	Fredericksen, 1982
4	Holbrook Creek (unnamed)	29	6S	48E	Cu	Vn.-Vol.	Fredericksen, 1982
5	Holbrook Creek (unnamed)	29	6S	48E	Cu	Vn.-Vol.	Fredericksen, 1982
6	Thorne Flat	28	6S	48E	Cu	Vn.-Vol.	Vallier and Brooks, 1970
7	McCarthy	4,5	19N	4W	Cu-Pb-Zn	Vn.-Vol.	Vallier and Brooks, 1970
8	Unnamed	32	20N	4W	Cu	Vol.	Fredericksen, 1982
9	Rand-McCarthy	16	6S	48E	Cu-Au-Ag	Vn.-Vol.	Vallier and Brooks, 1970
10	Rand-McCarthy	15	6S	48E	Cu-Au-Ag	Vn.-Vol.	Vallier and Brooks, 1970
11	Antz Creek	27	20N	4W	Cu-Ag	Vol.-Vn.	Vallier and Brooks, 1970
12	River Queen Mine	22	20N	4W	Cu-Ag	Vol.	Vallier and Brooks, 1970
13	Ballard Group	11	6S	48E	Cu	Vn.-Vol.	Vallier and Brooks, 1970
14	Ashby Creek	1	6S	48E	Cu	Vol.	Fredericksen, 1982
15	Lime Peak Mine	11,12	20N	4W	Cu-Ag	Vol.	Close et al., 1982
16	North Lime Peak	12	20N	4W	Cu-Ag	Vol.	Close et al., 1982
17	Unnamed	36	5S	48E	Cu	Vol.-Vn.	Fernette, this report
18	Copper Creek (unnamed)	35,36	5S	48E	Cu	Vol.	Fredericksen, 1982
19	Copper Creek (unnamed)	35	5S	48E	Cu	Vol.	Fredericksen, 1982
20	Windy Ridge	18	20N	3W	Cu		Morganti, 1972
21	Lynes	7,8	20N	3W	Cu		Morganti, 1972
22	Section Six	6	20N	3W	Cu		Morganti, 1972
23	Cable Line	31 6	21N 20N	3W 3W	Cu		Morganti, 1972
24	Allison Creek	29	21N	3W	Cu		Morganti, 1972; Close et al., 1982
25	Eckels Creek Stock	4	20N	3W	Cu-Zn	Cont.	Morganti, 1972
26	Hathaway Gulch	9	20N	3W	Cu-Zn		Morganti, 1972
27	Indian Creek	16	19N	4W	Au-Cu	Vn.?	Strowd et al., 1981

WSAs (Fig. 4). Additionally, all of the occurrences are found north of Oxbow Dam. The majority of mineral prospects and occurrences contain copper mineralization although various amounts of lead, zinc, silver, and gold are present in some locales. Copper minerals commonly found include chalcopyrite, bornite, and chalcocite. Tetrahedrite has been noted locally. Oxidation commonly produces malachite, azurite, rarely native copper, secondary chalcopyrite and chrysocolla. The red andesite units found within the Doyle Creek Formation commonly host primary chalcocite accumulations as at the Lime Peak Mine and several occurrences at Copper Creek along the south boundary of the McGraw Creek WSA. Copper occurrences within the Hunsaker Creek Formation and Wild Sheep Creek Formation are more commonly dominated by chalcopyrite with lesser bornite and chalcocite (Fredericksen, 1982). Several prospects and occurrences are located at the boundary of or slightly within the Homestead WSA and the McGraw Creek WSA. They include mineral occurrences associated with the Iron Dyke Mine, prospects on Hunter, Holbrook, and Herman Creeks as well as prospects on Copper Creek.

Close, et al. (1982) in an examination of the mineral resources of the Hells Canyon area indicate that five lode deposits in the GRA are believed to have mineral potential but are not sufficiently exposed to estimate their mineral resources. These include the Antz Creek (loc. 11, Fig. 6) and Azurite mines (loc. 32, Fig. 6), the Hibble Gulch (loc. 50, Fig. 6) and North Lime Peak (loc. 16, Fig. 6) prospects, and the Padacah Group (not shown).

No uranium occurrences have been located in the GRA and the area is considered unfavorable for uranium (Bernardi and Robins, 1982).

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TABLE II (Cont.)

Map No.	Name[1]	Location Sec.	T.	R.	Commodity	Type[2]	Data Source
28	Unnamed	21	19N	4W	Pb-Zn	Vn.?	Strowd et al., 1981
29	Lucky Strike Mine	21	19N	4W	Cu	Vn.?	Strowd et al., 1981
30	Unnamed	2	19N	4W	?	?	Strowd et al., 1981
31	Copper Belt	33	20N	4W	Cu	Vn.-Vol.	Strowd et al., 1981
32	Azurite	27	20N	4W	Cu-Pb-Zn	Vn.-Vol.	Close et al., 1982
33	Canyon View (Terry?)	26	20N	4W	Cu-Pb-Zn-Au-Ag	Vn.-Vol.	Strowd et al., 1981
34	Pine Hill 1 & 2 (Crackerjack?)	26	20N	4W	Cu-Zn	Vn.-Vol.	Close et al., 1982
35	Smith Claims	23,24	20N	4W	Cu-Ag-Au-Zn	Vn.-Vol.	Strowd et al., 1981
36	Inca	14	20N	4W	Cu	Vol.-Vn.	Strowd et al., 1981
37	Pine Hill	11	20N	4W	Cu-Zn	Vn.-Vol.	Close et al., 1982
38	Golden Star	12	20N	4W	Cu-Ag	Vol.	Close et al., 1982
39	Eureka		20N	3W	Cu-Ag	Vol.	Close et al., 1982
40	Red Wing	8	20N	3W	Cu	Cont.?	Strowd et al., 1981
41	1905 Mine	9	20N	3W	Cu-Au	Vol.?	Strowd et al., 1981
42	East Allison	27,28	21N	3W	--	Vol.-Vn.	Close et al., 1982
43	Mann Creek	3	20N	3W	Cu-Zn	Vol.	Morganti, 1972
44	Copper Cliff	2	20N	3W	Cu-Ag	Vol.	Morganti, 1972
	Mine[3]	2	20N	3W	Cu-Ag	Vol.	Morganti, 1972
45	Hunter	4	7S	48E	Cu	Vn.-Vol.	Fredericksen, 1982
46	Nix	13,14 23,24	20N	3W	Cu-Au-Ag	Vol.	Close et al., 1982
47	Unnamed	21	6S	48E	Cu	Vn.-Vol.	Fredericksen, 1982
48	Victory 1 & 2	27	20N	4W	Ag-Cu	Vn.-Vol.	Strowd, et al., 1981
49	H.B. Smith	2	20N	4W	Au	Vn.-Vol.	Strowd, et al., 1981
50	Hubble Gulch	6	20N	3W	Cu,Ag,Au	Vn.-Vol.	Strowd, et al., 1981

1. Deposits underlined
2. Vol. = volcanogenic
   Vn. = vein
   Cont. = contact metasomatic
3. One mile outside the Homestead GRA

3.4 Mining Claims, Leases and Material Sites

The status of mining claims in the GRA was compiled from a review of BLM claims records for Oregon (current to May 27, 1982) and Idaho (current to June 7, 1982). There are over 60 patented and over 600 unpatented mining claims in the GRA (Fig. 10). This reflects the areas long history of mining and the high level of recent mineral exploration activity. There are patented claims immediately adjacent to the McGraw Creek and Homestead WSAs. There are approximately 25 unpatented mining claims within or partially within the McGraw Creek WSA (Table III, Fig. 10) and about 47 unpatented mining claims in or partially within the Homestead WSA (Table III, Fig. 10).

A review of BLM oil and gas plats current to August 8, 1982 for Idaho and August 9, 1982 for Oregon shows that there are no oil and gas or geothermal leases in the GRA.

3.5 Mineral and Energy Deposit Types

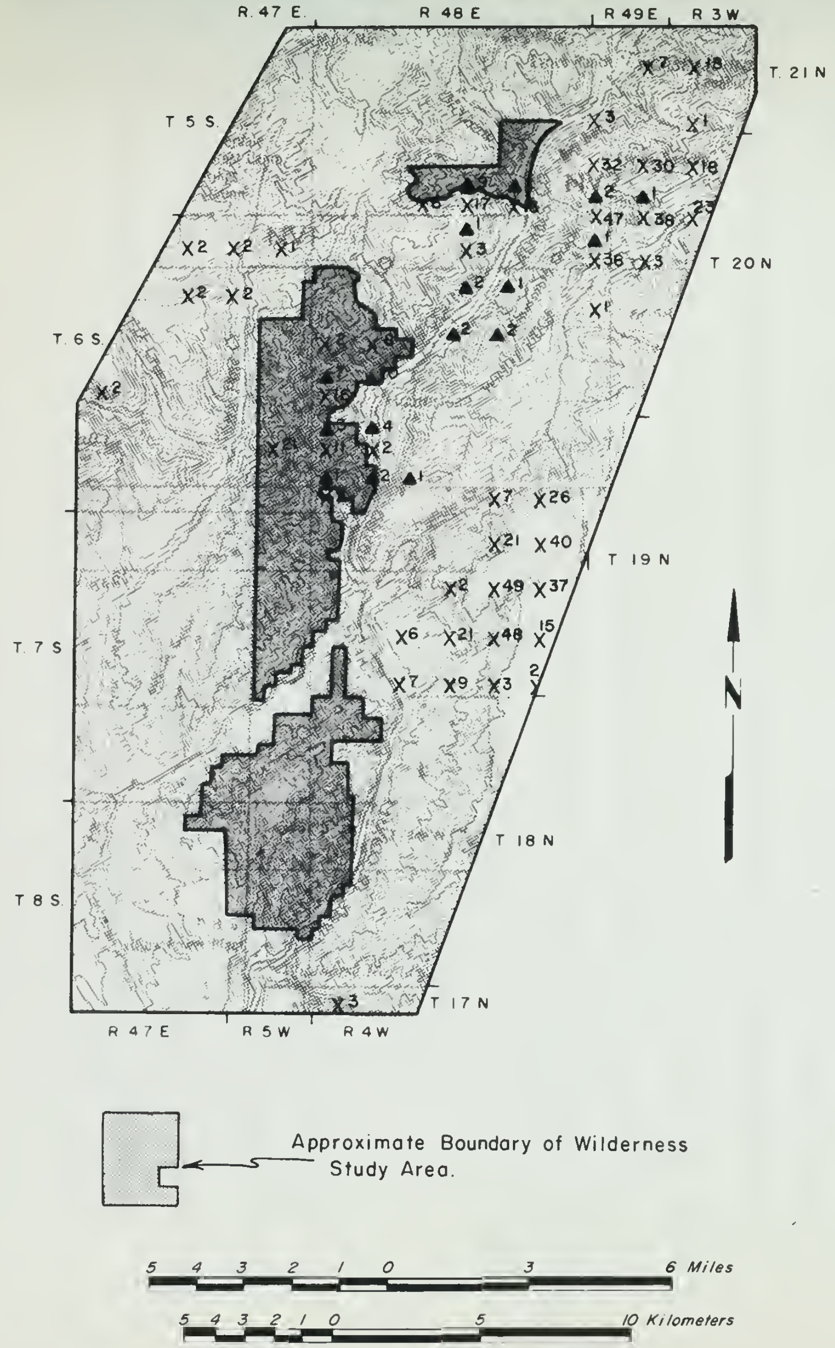
Mineral deposit types within the Homestead GRA can be classified into three principal subdivisions: (1) volcanogenic, (2) veins, and (3) contact metasomatic. The preponderence of mineral deposits and occurrences are volcanogenic or vein deposits. Volcanogenic mineralization is that resulting from volcanic fumarolic activity and includes stratabound massive to disseminated mineralization as well as stockwork and vein sulfides. Hydrothermal alteration of wall rocks at the time of mineralization is pervasive, as in some stockwork deposits, or may be virtually non-existant, as in some massive sulfide or disseminated deposits. The division between volcanogenic and

TABLE III

UNPATENTED MINING CLAIMS LOCATED IN WILDERNESS STUDY AREAS

IN THE HOMESTEAD GRA

WSA	BLM Claim Serial No.	Owner of Record	Location Date
McGraw Creek (6-1)	28163-165	John Binford	June 5, 1900
	23674-693	John Binford	June 5, 1900
	18345	John Binford	June 5, 1900
Homestead (6-2)	25599-609	Texasgulf Inc.	Oct. 14, 1974
	25588-591	Texasgulf Inc.	May 21, 1974
	25586-587	Silver King Mines	May 19, 1974
	25610-615	Texasgulf Inc.	Nov. 11, 1974
	25581-585	Texasgulf Inc.	May 16, 1974
	25592-598	Texasgulf Inc.	Oct. 8-10, 1974
	25616	Texasgulf Inc.	Jan. 3, 1921
	24857-867	William Jones	March 4, 1946 to Sept. 20, 1951



EXPLANATION

▲ Unpatented Mining Claim

X Patented Mining Claim

Number next to symbol denotes number of claims in group.

Area of seach: GRA

Source of Data: BLM Status Plats and Claims microfiche.

Data current to: June 7, 1982(Id.) May 27, 1982(Or.)

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Homestead GRA, Oregon-Idaho
Mining Claims Density Map

SCALE 1" = 4 MILES			FIGURE
DATA BY WGM	DATE 1/1983	REVISED	10
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vein type occurrences is equivocal in many of the Homestead GRA occurrences due to metamorphic and other geologic processes which are responsible for remobilization of originally syngenetic, volcanogenic mineralization. For instance, the volcanogenic nature of the Iron Dyke ore deposit remained unclear until detailed work in the 1970s (Juhas, Freeman, and Fredericksen, 1981; Vallier and Brooks, 1970; Stevens, 1981). Similarly the origin of the Copper Cliff deposit (Morganti, 1972) remained less than clear cut until the era of modern exploration. In a similar fashion the Red Ledge deposit, approximately seven miles north of the Homestead GRA, was evaluated by some workers as a porphyry copper-molybdenum deposit until later recognized as volcanogenic (Juhas and Gallagher, 1981). Close et al. (1982), classify the majority of the occurrences in the Snake River Canyon between Antz Creek (Fig. 6, No. 11) and Red Ledge as volcanogenic.

Only one or possibly two contact related deposits occur within the Homestead GRA. The Eckles Creek Stock occurrence consists of pyrite, chalcopyrite, chalcocite, and sphalerite within pyroxene hornfels associated with the Eckles Creek granite (Morganti, 1972). Another occurrence, the Red Wing, is spatially related to the Huntley Gulch foliated granodiorite and may be genetically related as well. A large number of contact metasomatic deposits occur just beyond the GRA boundary to the northeast around Landore. This area contains deposits of copper and tungsten (Cook, 1954).

No tests for hydrocarbon source or reservoir beds have been made in the Homestead area. Prospective source beds would be clayey limestones, shales and argillites in the pre-basalt strata. However, extensive metamorphism of these beds has probably destroyed any hydrocarbons which were present.

No hydrocarbon test wells have been drilled within the Homestead GRA. Numerous tests have been drilled in the western Snake River Basin 45 to 100 miles to the south (Breckenridge, 1982) where gas shows have been reported in Pliocene alluvial and fluvial sediments (Newton and Corcoran, 1963), but these sediments are not present in the Homestead GRA. Potential hydrocarbon source beds such as sandstones, lake sediments and coals (Stoffel, 1981; Hooper and Webster, in progress) are known in interbeds in the Columbia River Basalts approximately 60 to 90 miles to the north of the Homestead GRA, but they have not been reported in the Homestead area. These beds have not undergone sufficient thermal maturation for the generation of hydro-
carbons.

There are no hot springs or wells within 25-30 miles of the Homestead GRA (Riccio, 1978; Geothermal Resources of Oregon Map, 1982). Available gradient data are from near Cuprum, Idaho (6 miles to the east of the McGraw Creek WSA) and from the immediate vicinity of Homestead (at the east edge of the Homestead WSA). These values, 21°C/km (1.2°F/100 ft.) and 29°C/km (1.6°/100 ft.) respectively, (Brott et al., 1976; Blackwell et al., 1978), indicate the the geothermal gradient is normal in the Homestead GRA.

The Homestead GRA is in the northern part of the Idaho Batholith/Blue Mountains geothermal province. In this province there are relatively few hot springs north of approximately 45°N latitude. Heat flow studies suggest that background heat flow values are typical for those observed in the Montana Basin and Range province and range from 75 to 90 milliwatts per square meter (Brott et al., 1976). Typical background gradients in the

granitic rocks are 20 to 30°C/km. For these rocks fluid circulation is confined to zones of fracture permeability associated with faulting and jointing. Such areas usually show up as prominent linear features on topographic maps. Thus, it is unlikely that many blind anomalies exist since most of the circulation systems will have surface manifestations. From the above discussion, it is evident that the regional geological setting of the Homestead GRA is not favorable for the existence of geothermal resources.

3.6 Mineral and Energy Economics

The overall geological setting of the Homestead GRA is conducive to development of small high grade volcanogenic deposits such as those found at the Iron Dyke Mine and Copper Cliffs Mine. Most of the copper deposits in the area contain significant precious metal contents which increase the economic viability of the mining operation despite stagnant base metal prices.

With respect to infrastructure the Homestead GRA enjoys abundant electric power and water. A good road network connects to railroads in either Idaho or Oregon. Also an established local mining community is present to provide labor for any future development activities.

4.0 LAND CLASSIFICATION FOR GEM RESOURCES POTENTIAL

4.1 Explanation of Classification Scheme

In the following subsection the land in the Homestead GRA is classified for geology, energy and mineral (GEM) resources potential. The classification scheme used is shown in Table III. Use of this scheme is specified in the contract under which WGM prepared this report.

The evaluation of resource potential and integration into the BLM classification scheme has been done using a combination of simple subjective and complex subjective approaches (Singer and Mosier, 1981) to regional resource assessment. The simple subjective approach involves the evaluation of resources based on the experience and knowledge of the individuals conducting the evaluations. The complex subjective method involves use of rules, i.e. geologic inference, based on expert opinion concerning the nature and importance of geologic relationships associated with mineral and energy deposits (Singer and Mosier, 1981; Table II).

The GEM resource evaluation is the culmination of a series of tasks. The nature and order of the tasks was specified by the BLM, however they constitute the general approach by which most resource evaluations of this type are conducted. The sequence of work was: (1) data collection, (2) compilation, (3) evaluation, and (4) report preparation. Several prospects and mines were visited by WGM geologists in the course of this evaluation.

TABLE IV

BUREAU OF LAND MANAGEMENT GEM RESOURCES LAND CLASSIFICATION SYSTEM

CLASSIFICATION SCHEME	LEVELS OF CONFIDENCE
1. The geologic environment and the inferred geologic processes do not indicate favorability for accumulation of mineral resources.	A. The available data are either insufficient and/or cannot be considered as direct evidence to support or refute the possible existence of mineral resources within the respective area.
2. The geologic environment and the inferred geologic processes indicate low favorability for accumulation of mineral resources.	B. The available data provide indirect evidence to support or refute the possible existence of mineral resources.
3. The geologic environment, the inferred geologic processes, and the reported mineral occurrences indicate moderate favorability for accumulation of mineral resources.	C. The available data provide direct evidence, but are quantitatively minimal to support or refute the possible existence of mineral resources.
4. The geologic environment, the inferred geologic processes, the reported mineral occurrences, and the known mines or deposits indicate high favorability for accumulation of mineral resources.	D. The available data provide abundant direct and indirect evidence to support or refute the possible existence of mineral resources.

4.2 Classification of the McGraw Creek (6-1) Wilderness Study Area

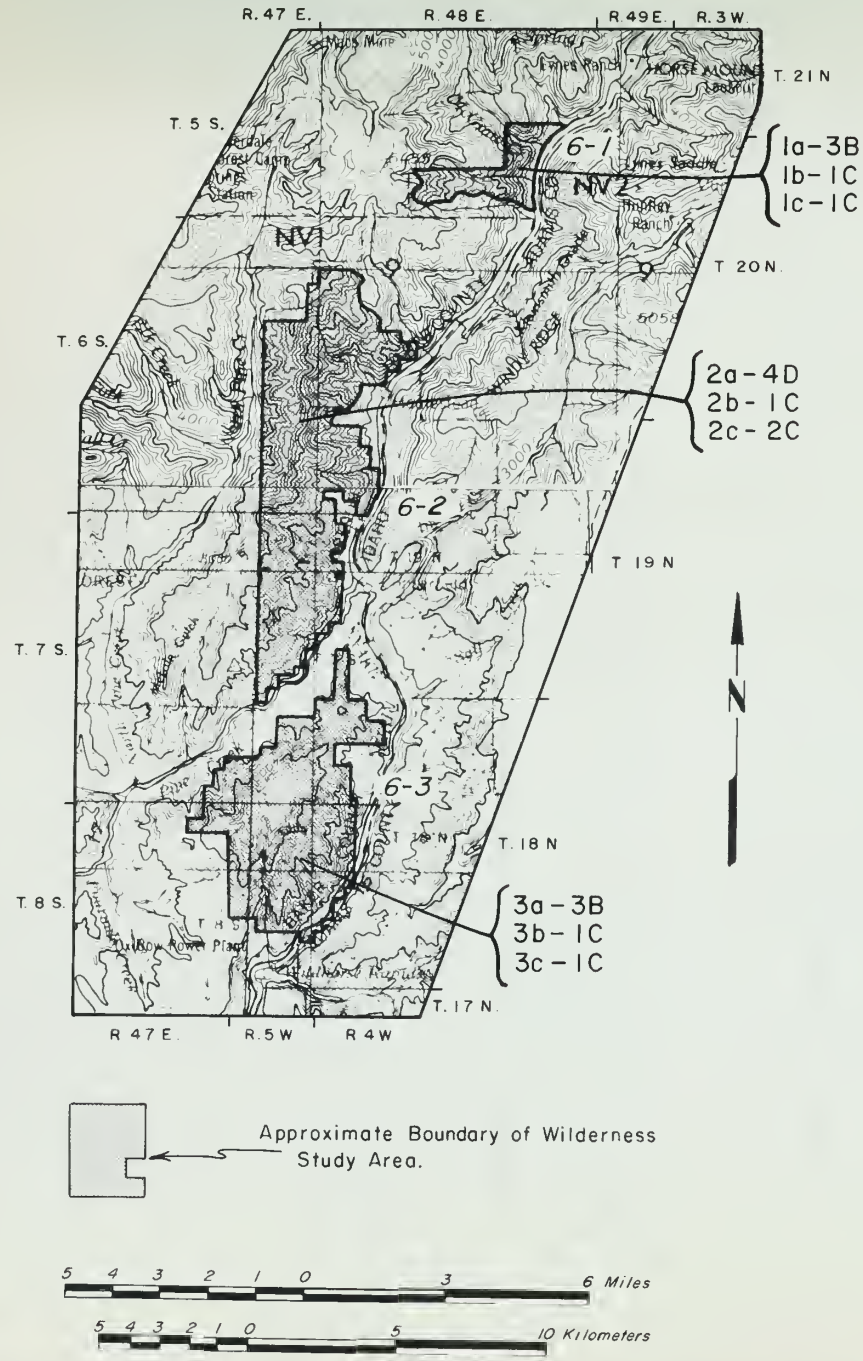
4.2.1 Locatable Minerals

Locatable minerals are those which are locatable under the General Mining Law of 1872, as amended, and the Placer Act of 1870, as amended. Minerals which are locatable under these acts include metals, ores of metals, non-metallic minerals such as asbestos, barite, zeolites, graphite, uncommon varieties of sand, gravel, building stone, limestone, dolomite, pumice, pumitice, clay, magnesite, silica sand, etc. (Maley, 1980).

4.2.1a Metallic Minerals. All of WSA (6-1) (1a, Fig. 11) is classified as having moderate favorability for metallic mineral resources based limited direct evidence (3C). This evidence consists of the presence of at least one mineral occurrence within the WSA and the similarity of the geologic setting to the geologic terrane hosting nearby volcanogenic sulfide deposits.

4.2.1b Uranium and Thorium. The entire area of WSA (6-1) (1b, Fig. 11) is classified as unfavorable for uranium and thorium based on limited direct evidence (1C) including an unfavorable geologic environment and lack of any known occurrences.

4.2.1c Non-Metallic Minerals. WSA (6-1) (1c, Fig. 11) is classified as unfavorable for non-metallic minerals based indirect evidence (1C) including the absence of any known occurrences within a similar geologic setting anywhere in the region.



BLM LAND CLASSIFICATION SYSTEM FOR GEM RESOURCES

CLASSIFICATION SCHEME

1. THE GEOLOGIC ENVIRONMENT AND THE INFERRED GEOLOGIC PROCESSES DO NOT INDICATE FAVORABILITY FOR ACCUMULATION OF MINERAL RESOURCES.
2. THE GEOLOGIC ENVIRONMENT AND THE INFERRED GEOLOGIC PROCESSES INDICATE LOW FAVORABILITY FOR ACCUMULATION OF MINERAL RESOURCES.
3. THE GEOLOGIC ENVIRONMENT, THE INFERRED GEOLOGIC PROCESSES, AND THE REPORTED MINERAL OCCURRENCES INDICATE MODERATE FAVORABILITY FOR ACCUMULATION OF MINERAL RESOURCES.
4. THE GEOLOGIC ENVIRONMENT, THE INFERRED GEOLOGIC PROCESSES, THE REPORTED MINERAL OCCURRENCES, AND THE KNOWN MINES OR DEPOSITS INDICATE HIGH FAVORABILITY FOR ACCUMULATION OF MINERAL RESOURCES.

LEVELS OF CONFIDENCE

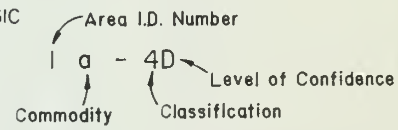
A. THE AVAILABLE DATA ARE EITHER INSUFFICIENT AND/OR CANNOT BE CONSIDERED AS DIRECT EVIDENCE TO SUPPORT OR REFUTE THE POSSIBLE EXISTENCE OF MINERAL RESOURCES WITHIN THE RESPECTIVE AREA.

B. THE AVAILABLE DATA PROVIDE INDIRECT EVIDENCE TO SUPPORT OR REFUTE THE POSSIBLE EXISTENCE OF MINERAL RESOURCES.

C. THE AVAILABLE DATA PROVIDE DIRECT EVIDENCE, BUT ARE QUANTITATIVLEY MINIMAL TO SUPPORT OR REFUTE THE POSSIBLE EXISTENCE OF MINERAL RESOURCES.

D. THE AVAILABLE DATA PROVIDE ABUNDANT DIRECT AND INDIRECT EVIDENCE TO SUPPORT OR REFUTE THE POSSIBLE EXISTENCE OF MINERAL RESOURCES.

EXPLANATION



a) Metallic Minerals
b) Uranium and Thorium
c) Non-Metallic Minerals

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BLM GEM RESOURCES ASSESSMENT	REGION 2 NORTHERN ROCKY MOUNTAINS
Homestead GRA, Oregon-Idaho	*Wilderness Study Area Land Classification Locatable Resources*
SCALE 1" = 4 MILES (1:250,000)	FIGURE 11
DATA BY. WGM	DATE 9/1982
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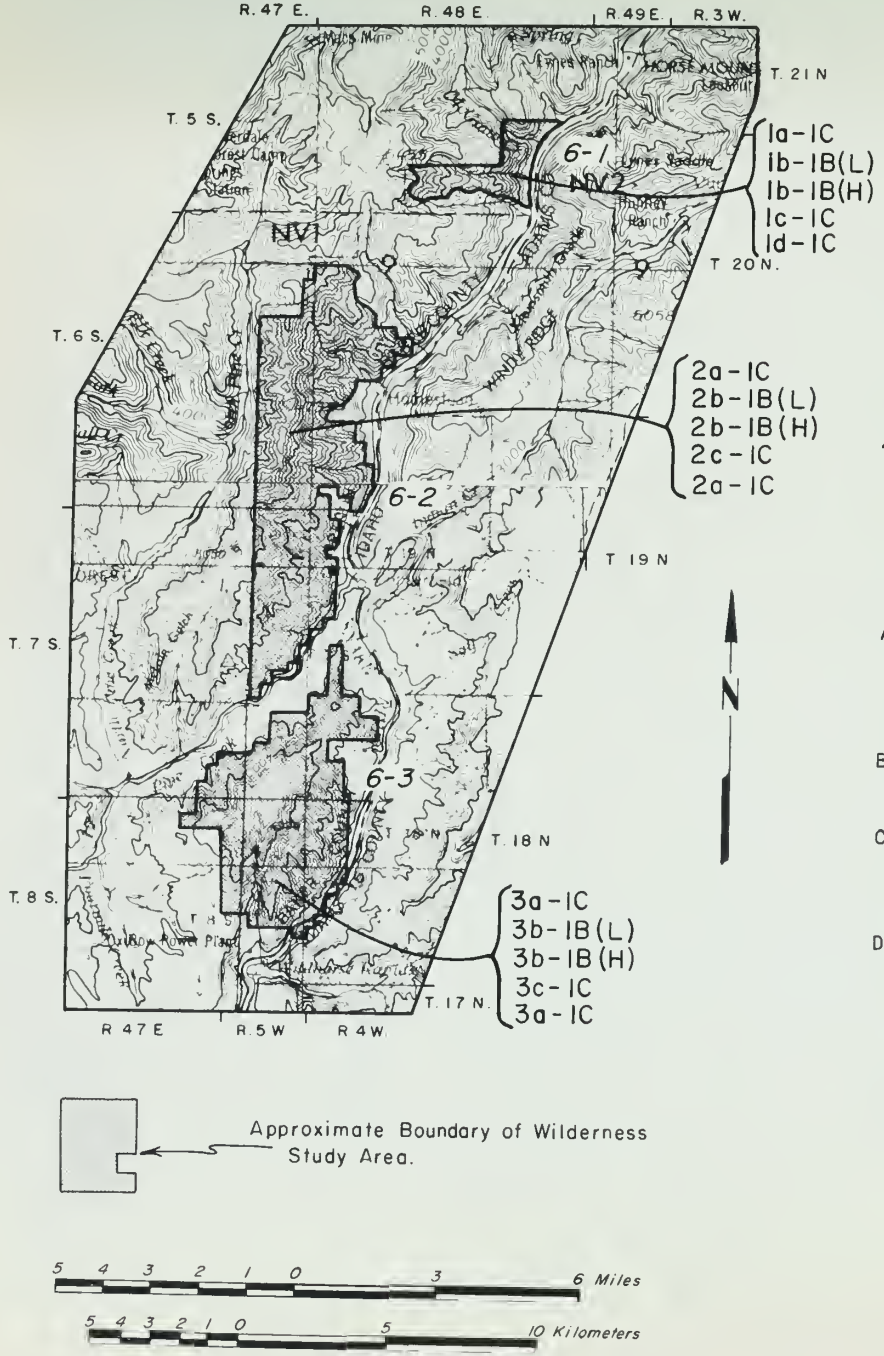
4.2.2 Leasable Resources

Leasable resources include those which may be acquired under the Mineral Leasing Act of 1920 as amended by the Acts of 1927, 1953, 1970, and 1976. Materials covered under this Act include: asphalt, bitumen, borates and sodium and potassium, carbonates of sodium and potassium, coal, natural gas, nitrates of sodium and potassium, oil, oil shale, phosphate, silicates of sodium and potassium, sulfates of sodium and potassium, geothermal resources, etc. (Maley, 1980).

4.2.2a Oil and Gas. The entire area of WSA (6-1) (1a, Fig. 12) is classified as unfavorable for oil and gas resources based on limited direct evidence (1C). The basis of the classification is: (1) the extensive metamorphism of any pre-Miocene source and reservoir rocks and (2) the lack of thermal maturation of any Miocene or younger rocks which are potential source beds.

4.2.2b Geothermal. The entire area of WSA (6-1) (1b, Fig. 12) is classified as unfavorable for the occurrence of both low temperature geothermal resources and high temperature geothermal resources based on indirect evidence (1B). The basis for the ranking is its regional setting, the lack of known surface manifestations of high heat flow or hot water circulation, and the existence of a normal geothermal gradient at the edge of the WSA.



BLM LAND CLASSIFICATION SYSTEM FOR GEM RESOURCES

CLASSIFICATION SCHEME

1. THE GEOLOGIC ENVIRONMENT AND THE INFERRED GEOLOGIC PROCESSES DO NOT INDICATE FAVORABILITY FOR ACCUMULATION OF MINERAL RESOURCES.

2. THE GEOLOGIC ENVIRONMENT AND THE INFERRED GEOLOGIC PROCESSES INDICATE LOW FAVORABILITY FOR ACCUMULATION OF MINERAL RESOURCES.

3. THE GEOLOGIC ENVIRONMENT, THE INFERRED GEOLOGIC PROCESSES, AND THE REPORTED MINERAL OCCURRENCES INDICATE MODERATE FAVORABILITY FOR ACCUMULATION OF MINERAL RESOURCES.

4. THE GEOLOGIC ENVIRONMENT, THE INFERRED GEOLOGIC PROCESSES, THE REPORTED MINERAL OCCURRENCES, AND THE KNOWN MINES OR DEPOSITS INDICATE HIGH FAVORABILITY FOR ACCUMULATION OF MINERAL RESOURCES.

LEVELS OF CONFIDENCE

A. THE AVAILABLE DATA ARE EITHER INSUFFICIENT AND/OR CANNOT BE CONSIDERED AS DIRECT EVIDENCE TO SUPPORT OR REFUTE THE POSSIBLE EXISTENCE OF MINERAL RESOURCES WITHIN THE RESPECTIVE AREA.

B. THE AVAILABLE DATA PROVIDE INDIRECT EVIDENCE TO SUPPORT OR REFUTE THE POSSIBLE EXISTENCE OF MINERAL RESOURCES.

C. THE AVAILABLE DATA PROVIDE DIRECT EVIDENCE, BUT ARE QUANTITATIVLEY MINIMAL TO SUPPORT OR REFUTE THE POSSIBLE EXISTENCE OF MINERAL RESOURCES.

D. THE AVAILABLE DATA PROVIDE ABUNDANT DIRECT AND INDIRECT EVIDENCE TO SUPPORT OR REFUTE THE POSSIBLE EXISTENCE OF MINERAL RESOURCES.

EXPLANATION

1 a - 4D

Area I.D. Number; Commodity; Classification; Level of Confidence

a) oil and gas

b) Geothermal: high temperature (H), Low temperature (L)

c) Sodium and Potassium

d) others: Asphalt (As) bitumen (bt), phosphate (ph), No specific commodity designation indicates that the rating applies to all of the above.

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BLM GEM RESOURCES ASSESSMENT
REGION 2 NORTHERN ROCKY MOUNTAINS

Homestead GRA, Oregon-Idaho
Wilderness Study Area Land Classification Leasable Resources

SCALE 1" = 4 MILES (1:250,000)			FIGURE
DATA BY WGM	DATE 9/1982	REVISED	12
DRWN BY DS!	APRVD G.F.		

4.2.2c Sodium and Potassium. The entire area of WSA (6-1) (1c, Fig. 12) is classified as unfavorable for the occurrence of sodium and potassium based on limited direct evidence (1C). The classification is based on the unfavorable geologic environment within the WSA.

4.2.2d Others. All of WSA (6-1) is classified as unfavorable for the occurrence of other leasable resources in the subsurface of the WSA based on limited direct evidence (1C).

4.2.3 Saleable Resources

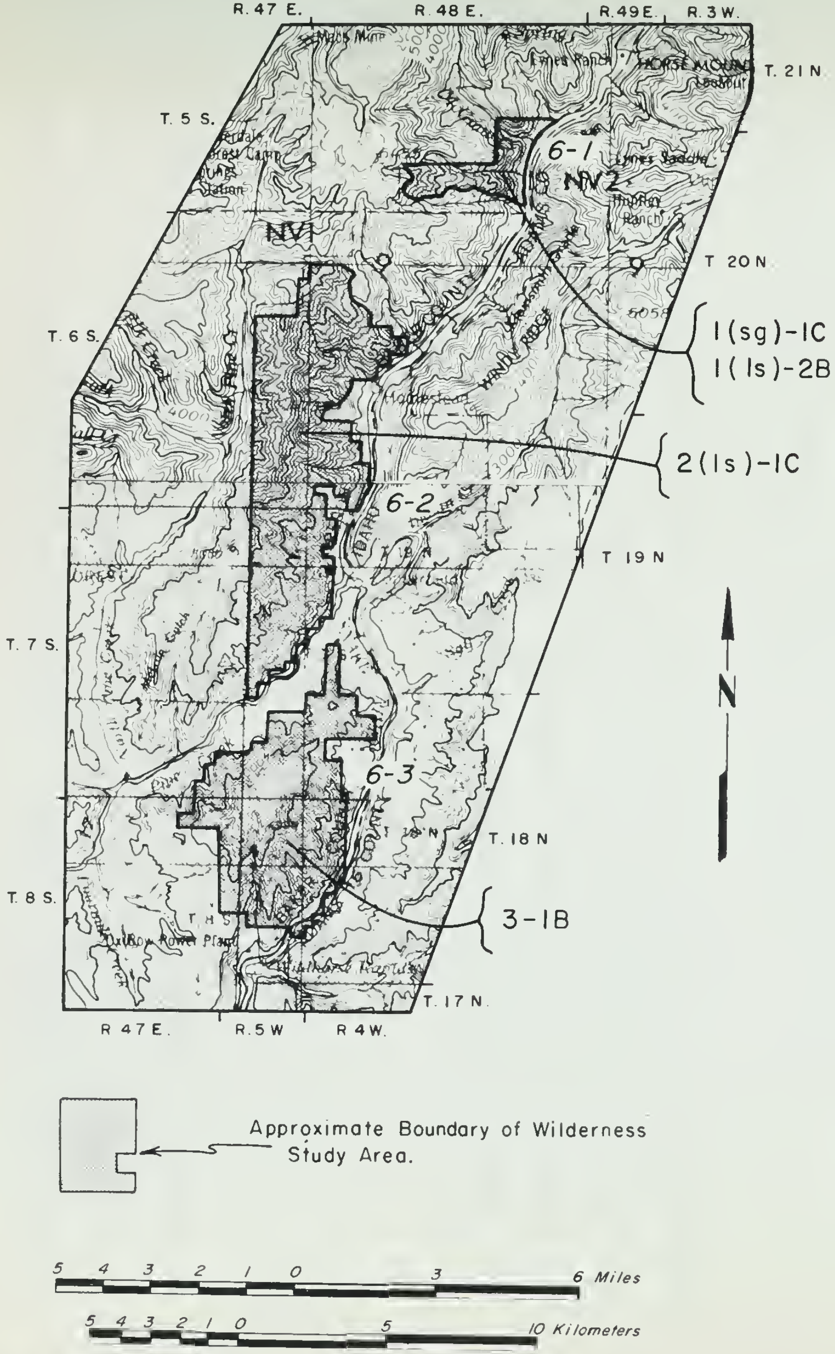
Saleable resources include those which may be acquired under the Materials Act of 1947 as amended by the Acts of 1955 and 1962. Included under this Act are common varieties of sand, gravel, stone, cinders, pumice, pumicite, clay, limestone, dolomite, peat and petrified wood (Maley, 1980).

WSA (6-1) (1(sg), Fig. 13) is classified as unfavorable for the occurrence of sand and gravel based on limited direct evidence (1C). It is classified as having low favorability for common variety limestone (1(ls), Fig. 13) based on indirect evidence (2B). Should the Martin Bridge Formation extend into the WSA (Fig. 4), then the ranking for limestone would be higher.

4.3 Classification of the Homestead (6-2) Wilderness Study Area

4.3.1 Locatable Minerals

Locatable minerals are those which are locatable under the General Mining Law of 1872, as amended, and the Placer Act of 1870, as amended. Minerals



BLM LAND CLASSIFICATION SYSTEM FOR GEM RESOURCES

CLASSIFICATION SCHEME

1. THE GEOLOGIC ENVIRONMENT AND THE INFERRED GEOLOGIC PROCESSES DO NOT INDICATE FAVORABILITY FOR ACCUMULATION OF MINERAL RESOURCES.

2. THE GEOLOGIC ENVIRONMENT AND THE INFERRED GEOLOGIC PROCESSES INDICATE LOW FAVORABILITY FOR ACCUMULATION OF MINERAL RESOURCES.

3. THE GEOLOGIC ENVIRONMENT, THE INFERRED GEOLOGIC PROCESSES, AND THE REPORTED MINERAL OCCURRENCES INDICATE MODERATE FAVORABILITY FOR ACCUMULATION OF MINERAL RESOURCES.

4. THE GEOLOGIC ENVIRONMENT, THE INFERRED GEOLOGIC PROCESSES, THE REPORTED MINERAL OCCURRENCES, AND THE KNOWN MINES OR DEPOSITS INDICATE HIGH FAVORABILITY FOR ACCUMULATION OF MINERAL RESOURCES.

LEVELS OF CONFIDENCE

A. THE AVAILABLE DATA ARE EITHER INSUFFICIENT AND/OR CANNOT BE CONSIDERED AS DIRECT EVIDENCE TO SUPPORT OR REFUTE THE POSSIBLE EXISTENCE OF MINERAL RESOURCES WITHIN THE RESPECTIVE AREA.

B. THE AVAILABLE DATA PROVIDE INDIRECT EVIDENCE TO SUPPORT OR REFUTE THE POSSIBLE EXISTENCE OF MINERAL RESOURCES.

C. THE AVAILABLE DATA PROVIDE DIRECT EVIDENCE, BUT ARE QUANTITATIVLEY MINIMAL TO SUPPORT OR REFUTE THE POSSIBLE EXISTENCE OF MINERAL RESOURCES.

D. THE AVAILABLE DATA PROVIDE ABUNDANT DIRECT AND INDIRECT EVIDENCE TO SUPPORT OR REFUTE THE POSSIBLE EXISTENCE OF MINERAL RESOURCES.

EXPLANATION

1(ls) - 4D

Area I.D. Number: 1; Commodity: (ls); Classification: 4; Level of Confidence: D

s	Sand
g	Grovel
st	Stone
c	Cinders
p	Pumice
pt	Pumicite
cl	Cloy
ls	Limestone
dl	Dolomite
P	Peat
pw	Petrified wood

WGM Inc. Mining and Geological Consultants, Anchorage, Alaska

BLM GEM RESOURCES ASSESSMENT
REGION 2 NORTHERN ROCKY MOUNTAINS

Homestead GRA, Oregon-Idaho
Wilderness Study Area Land Classification Saleable Resources

SCALE 1" = 4 MILES (1 250,000)			FIGURE
DATA BY WGM	DATE 9/1982	REVISED	13
DRWN BY DSI	APRVD G.F		

which are locatable under these acts include metals, ores of metals, non-metallic minerals such as asbestos, barite, zeolites, graphite, uncommon varieties of sand, gravel, building stone, limestone, dolomite, pumice, pumitice, clay, magnesite, silica sand, etc. (Maley, 1980).

4.3.1a Metallic Minerals. All of WSA (6-2) (2a, Fig. 11) is classified as having high favorability for the occurrence of metallic minerals based on direct evidence (4D). The classification is based on the presence of numerous mineral occurrences and prospects in and adjacent to WSA (6-2), the presence of a producing mine near the boundary of WSA (6-2), and indications of favorable metal-bearing volcanic stratigraphy in the subsurface of WSA (6-2).

4.3.1b Uranium and Thorium. WSA (6-2) (2b, Fig. 11) is classified as unfavorable for uranium and thorium based on limited direct evidence (1C) due to generally unfavorable geologic environment.

4.3.1c Non-Metallic Minerals. All of WSA (6-2) (2c, Fig. 11) is classified as having low favorability for the occurrence of non-metallic minerals based on indirect evidence (2C) due to the regional absence of occurrences in this geological environment. Some potential exists for occurrence of barite in the Seven Devils Group.

4.3.2 Leasable Resources

Leasable resources include those which may be acquired under the Mineral Leasing Act of 1920 as amended by the Acts of 1927, 1953, 1970, and 1976. Materials covered under this Act include: asphalt, bitumen, borates and

sodium and potassium, carbonates of sodium and potassium, coal, natural gas, nitrates of sodium and potassium, oil, oil shale, phosphate, silicates of sodium and potassium, sulfates of sodium and potassium, geothermal resources, etc. (Maley, 1980).

4.3.2a Oil and Gas. The entire area of WSA (6-2) (2a, Fig. 12) is classified as unfavorable for oil and gas resources based on limited direct evidence (1C). The basis of the classification is the unfavorable regional and local geologic setting of the WSA, and the absence of potential source and reservoir rocks in the area as outlined in Section 3.5.

4.3.2b Geothermal. All of WSA (6-2) (2b, Fig. 12) is classified as unfavorable for the occurrence of low temperature geothermal resources and high temperature geothermal resources based on indirect evidence (1B). The basis of the ranking is the regional geological setting, a lack of known surface manifestations of high heat flow or hot water circulation, and the existence of normal geothermal gradients at the edge of the Homestead WSA.

4.3.2c Sodium and Potassium. WSA (6-2) (2c, Fig. 12) is classified as unfavorable for the occurrence of sodium and potassium based on limited direct evidence (1C). The classification is based on the unfavorable geologic environment present in the WSA.

4.3.2d Others. The entire area of WSA (6-2) (2d, Fig. 12) is classified as unfavorable for the occurrence of other leasable resources in the subsurface of the WSA based on limited direct evidence (1C).

4.3.3 Saleable Resources

Saleable resources include those which may be acquired under the Materials Act of 1947 as amended by the Acts of 1955 and 1962. Included under this Act are common varieties of sand, gravel, stone, cinders, pumice, pumicite, clay, limestone, dolomite, peat and petrified wood (Maley, 1980).

The entire area of WSA (6-2) (2, Fig. 13) is classified as unfavorable for the occurrence of saleable resources based on limited direct evidence (1C).

4.4 Classification of the Sheep Mountain (6-3) Wilderness Study Area

4.4.1 Locatable Minerals

Locatable minerals are those which are locatable under the General Mining Law of 1872, as amended, and the Placer Act of 1870, as amended. Minerals which are locatable under these acts include metals, ores of metals, non-metallic minerals such as asbestos, barite, zeolites, graphite, uncommon varieties of sand, gravel, building stone, limestone, dolomite, pumice, pumitice, clay, magnesite, silica sand, etc. (Maley, 1980).

4.4.1a Metallic Minerals. The entire area of WSA (6-3) (3a, Fig. 11) is classified as having moderate favorability for the occurrence of metallic minerals based on indirect evidence (3B). Much of WSA (6-3) is covered by basalt flows; thus, the classification is based on the potential similarity of pre-Miocene subsurface geology with that found further north in the Homestead WSA (6-2).

4.4.1b Uranium and Thorium. All of WSA (6-3) (3b, Fig. 11) is classified as unfavorable for the occurrence uranium and thorium based on limited direct evidence (1C) due to the generally unfavorable geologic environment.

4.4.1c Non-Metallic Minerals. WSA (6-3) (3c, Fig. 11) is classified as unfavorable for the occurrence of non-metallic minerals based on limited direct evidence (1C). Occurrences are absent in the same geologic environment elsewhere in the region.

4.4.2 Leasable Resources

Leasable resources include those which may be acquired under the Mineral Leasing Act of 1920 as amended by the Acts of 1927, 1953, 1970, and 1976. Materials covered under this Act include: asphalt, bitumen, borates and sodium and potassium, carbonates of sodium and potassium, coal, natural gas, nitrates of sodium and potassium, oil, oil shale, phosphate, silicates of sodium and potassium, sulfates of sodium and potassium, geothermal resources, etc. (Maley, 1980).

4.4.2a Oil and Gas. The entire area of WSA (6-3) (3a, Fig. 12) is classified as unfavorable for oil and gas resources based on limited direct evidence (1C). The basis of the classification is the disadvantageous regional and local geologic setting of the WSA, and the absence of potential source and reservoir rocks in the area as outlined in section 3.5.

4.2.2b Geothermal. All of WSA (6-3) (3b, Fig. 12) is classified as unfavorable for the occurrence of low temperature geothermal resources and high temperature geothermal resources based on indirect evidence (1B). The basis of this ranking is the unfavorable regional setting, the lack of known surface manifestations of high heat flow or hot water circulation, and the existence of a normal geothermal gradient at the edge of the Homestead WSA.

4.4.2c Sodium and Potassium. WSA (6-3) (3c, Fig. 12) is classified as unfavorable for the occurrence of sodium and potassium based on limited direct evidence (1C). The classification is based on the unfavorable geologic environment of the WSA.

4.4.2d Others. The entire area of WSA (6-3) (3d, Fig. 12) is classified as unfavorable for the occurrence of other leasable resources in the subsurface of the WSA based on limited direct evidence (1C).

4.4.3 Saleable Resources

Saleable resources include those which may be acquired under the Materials Act of 1947 as amended by the Acts of 1955 and 1962. Included under this Act are common varieties of sand, gravel, stone, cinders, pumice, pumicite, clay, limestone, dolomite, peat and petrified wood (Maley, 1980).

WSA (6-3) (3, Fig. 13) is classified as unfavorable for the occurrence of saleable resources based on indirect evidence (1B).

5.0 RECOMMENDATIONS FOR FURTHER STUDY

The greatest base and precious metal potential in the Homestead GRA is contained within the Hunsaker Creek and Doyle Creek Formations. These two formations contain a number of mappable lithologies. A detailed geologic map at a scale of 1:12,000 should be made of the GRA with emphasis upon defining and tracing the volcanic stratigraphy and defining associated mineralization.

Characterization of potential hydrocarbon source beds and thermal maturation studies of the pre-Mesozoic sediments and Mesozoic interbeds within the basalts would provide more complete information on potential source and reservoir rocks within the area. However, these studies will probably not be of benefit to the Homestead GRA.

There is a large area involved in the three WSAs, but only a small part of the area has any possibility of geothermal resources. A spring geochemistry reconnaissance along the valleys of the Snake River and Pine Creek would locate any undocumented warm springs that might have previously missed detection.

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APPENDIX I

Report of Field Visit to the Homestead GRA

To: Homestead GRA File
Fm: Greg Fernette, Bill Jones

Subject: Visit to GRA - October 17-18, 1982

Our review of publications on the Homestead area together with discussions with Howard Brooks of the Oregon Geologic Survey and Bob Ciesel of the Baker BLM indicated that the area has very high metallic mineral potential. This conclusion is confirmed by R.S. Fredericksen of WGM who worked in the area for Texgasulf Inc. from 1974-1978. Although the data and Mr. Fredericksen's experience clearly indicate high potential for the Homestead WSA, it was decided that additional field verification would be desirable in the assessment of the McGraw Creek and Sheep Mountain areas.

On October 17 we visited the Iron Dyke Mine at Homestead. Mr. Bruce Wise, geologist with Silver King Mines, reviewed the geology of the mine and guided us on a detailed tour of the 650 level of the mine and related surface exposures.

The deposit is well described in several reports and thesis which are cited in the Homestead GRA report. Our purpose in visiting the mine was to confirm a deposit model for use in evaluating the GRA. In particular, we wished to determine whether the mineralization is confined to the Hunsaker Creek Formation or extends throughout the Seven Devils Group. Our visit and discussions with R.S. Fredericksen confirmed that hydrothermal activity and related volcanogenic mineralization occur in most of the Seven Devils Island arc package.

On October 18 we visited the McGraw Creek and Sheep Mountain WSAs. In the McGraw Creek WSA we did a foot traverse along the east facing slope above the Snake River. The rocks observed were lavender andesite and volcaniclastic rocks of the Triassic Wild Sheep Creek and Doyle Creek Formations. About one mile north of the southern boundary of the WSA we found an area of propylitic altered andesite with numerous quartz veinlets and disseminated pyrite and chalcopyrite. One prospect pit or adit was present.

The Sheep Mountain WSA is underlain by a thick section of Columbia River Basalt. The only outcrops of pre-Miocene rocks are along the highway on the east side of the WSA. We examined these exposures and found them to be sheared diorites of Oxbow Shear zone. We did not observe any volcanic rocks, however Tracy Vallier reports Wild Sheep Creek Formation in two stream valleys.

DATE LOANED	BORROWER