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NEW YORK BUTTE G-E-M

RESOURCES AREA

(GRA NO. CA-10)

TECHNICAL REPORT

(WSAs CA 010-055 and 010-056)

Contract YA-553-RFP2-1054

Prepared By

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For

Bureau of Land Management
Denver Service Center
Building 50, Mailroom
Denver Federal Center
Denver, Colorado 80225

Final Report

April 22, 1983

1911
The Great Lakes
The Great Lakes
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The Great Lakes

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ATTACHMENTS
(At End of Report)

CLAIM AND LEASE MAPS

Patented/Unpatented

Geothermal

MINERAL OCCURRENCE AND LAND CLASSIFICATION MAPS (Attached)

Metallic Minerals

Uranium and Thorium

Nonmetallic Minerals

Geothermal

LEVEL OF CONFIDENCE SCHEME

CLASSIFICATION SCHEME

MAJOR STRATIGRAPHIC AND TIME DIVISIONS IN USE BY THE U.S.
GEOLOGICAL SURVEY

EXECUTIVE SUMMARY

The New York Butte GRA covers much of the southern Inyo Mountains, east of Lone Pine in Inyo County, California. There are two WSAs in the GRA: CA 010-055 and CA 010-056.

The rocks of the GRA are mostly Paleozoic sediments (200 to 500 million years old) that have been intruded by small quartz monzonite stocks (about 200 million years old) in the WSAs although to the north there are large intrusive bodies of similar composition. All mineralization in the GRA is considered to be related to these intrusive bodies.

The principal mining district within the GRA, Cerro Gordo, is just east of the south end of WSA CA 010-055; it produced silver, lead and zinc, mostly in the late 1800s. The Bonham talc deposits, which were highly productive in the past, also lie just east of WSA CA 010-055. Along the west boundary of WSA CA 010-055, outside it, substantial production of limestone and dolomite has been made in the past; none of the quarries are operating presently. The Burgess mine in WSA CA 010-056 has produced an unknown amount of gold, and the Monte Carlo mine in the same WSA has produced some silver and lead. Several smaller mines in both WSAs have probably had limited production, mostly of silver and lead. Silver and lead are both strategic metals.

During a two-day field verification, by helicopter, most of the mines and prospects in the WSAs were examined and sampled; assay data from the samples is not yet available.

Three patented claims may be within WSA CA 010-055; they plot about on the WSA boundary. The southern half of WSA CA 010-055 is apparently almost completely covered with unpatented claims. There are many unpatented claims in WSA CA 010-056, mostly near the west edge but some scattered within the main body of the WSA, and a few in the vicinity of the Burgess mine. There are no oil and gas or sodium and potassium leases in the WSAs. There are geothermal leases a short distance west of the WSAs but none within them. There are no known material sites in the WSAs.

WSA CA 010-055 has two very small areas classified as highly favorable for metallic minerals with moderate confidence, and two larger areas classified as having low favorability for metals with low confidence; most of the WSA is classified as having no known favorability for metallic minerals with a low level of confidence. Virtually all of the WSA has moderate favorability for uranium with a moderate level of confidence; it has very low favorability for thorium with a low level of confidence. About one-fourth of the WSA has moderate favorability for lime or cement production, with a moderate level of confidence, while the remainder has low favorability for nonmetallic minerals with a low level of confidence. There is no known favorability for oil and gas, coal, oil shale, tar sands or sodium and potassium. The west edge of

the WSA has high favorability with high confidence for geothermal resources, while the remainder of the WSA has low favorability with a low level of confidence.

WSA CA 010-056 has two areas of several square miles with high favorability for metallic minerals and high to moderate confidence, and another very small area with high favorability and moderate confidence. Another area of several square miles has moderate favorability for metals with high confidence. Three areas totalling about one-third of the WSA have low favorability for metals, with low levels of confidence, while the remainder of the WSA, nearly two-thirds of it, has very low favorability for metals with low levels of confidence. Most of the WSA has moderate favorability for uranium, with a moderate level of confidence, but parts of the western edge have low favorability with low confidence. It has very low favorability for thorium, with low confidence. Two small areas have high to moderate favorability for beryl, with moderate confidence, and the southwestern edge has moderate favorability for lime or cement with moderate confidence. The remainder of the WSA has low favorability for nonmetallic minerals, with a low level of confidence. There is no known favorability for oil and gas, coal, oil shale, tar sands, or sodium and potassium. Parts of the western edge of the WSA have moderate favorability for geothermal resources with moderate confidence, while the remainder has low favorability with a low level of confidence.

The principal recommendations for further work are that an effort should be made to acquire existing but unpublished geological mapping in the New York Butte quadrangle, and that the quadrangle be mapped to present-day U. S. Geological Survey standards, including alteration.

I. INTRODUCTION

The New York Butte G-E-M Resources Area (GRA No. CA-10) covers approximately 157,000 acres (637 sq km) and includes the following Wilderness Study Areas (WSAs):

WSA Name	WSA Number
Cerro Gordo	010-055
Southern Inyo	010-056

The GRA is located in California in the Bureau of Land Management's (BLM) Bishop Resource Area, Bakersfield district. Figure 1 is an index map showing the location of the GRA. The area encompassed by the GRA is near 36°40' north latitude, 118° west longitude and includes the following townships:

T 13 S, R 36,37 E	T 15 S, R 36-38 E
T 14 S, R 36,37 E	T 16 S, R 37-39 E

The areas of the WSAs are on the following U. S. Geological Survey topographic maps:

15-minute:

Lone Pine	New York Butte
Independence	

The nearest town is Lone Pine which is located west of the GRA on U. S. Highway 395. Access to the area is via U. S. Highway 395 to the west and State Highways 190 and 136 to the southwest of the GRA. Access within the area is on Highway 190 adjacent to the Southern Pacific Railroad and Swansea Road and Cerro Gordo Road at the south end, both of which provide access to the southern part of the GRA. Most of the GRA is not accessible to vehicles.

Figure 2 outlines the boundaries of the GRA and the WSAs on a topographic base at a scale of 1:250,000.

Figure 3 is a geologic map of the GRA and vicinity, also at 1:250,000. At the end of the report, following the Land Classification Maps, is a geologic time scale showing the various geologic eras, periods and epochs by name as they are used in the text, with the corresponding age in years. This is so that the reader who is not familiar with geologic time subdivisions will have a comprehensive reference for the geochronology of events.

This GRA Report is one of fifty-five reports on the Geology-Energy-Minerals potential of Wilderness Study Areas in the Basin and Range Province, prepared for the Bureau of Land Management by the Great Basin GEM Joint Venture.

The principals of the Venture are Arthur Baker III, G. Martin Booth III, and Dennis P. Bryan. The study is principally a literature search supplemented by information provided by claim owners, other individuals with knowledge of some areas, and both specific and general experience of the authors. Brief field verification work was conducted on approximately 25 percent of the WSAs covered by the study.

The WSAs in this GRA were field checked.

One original copy of background data specifically applicable to this GEM Resource Area Report has been provided to the BLM as the GRA File. In the GRA File are items such as letters from or notes on telephone conversations with claim owners in the GRA or the WSA, plots of areas of Land Classification for Mineral Resources on maps at larger scale than those that accompany this report if such were made, original compilations of mining claim distribution, any copies of journal articles or other documents that were acquired during the research, and other notes as are deemed applicable by the authors.

As a part of the contract that resulted in this report, a background document was also written: Geological Environments of Energy and Mineral Resources. A copy of this document is included with the GRA File to this GRA report. There are some geological environments that are known to be favorable for certain kinds of mineral deposits, while other environments are known to be much less favorable. In many instances conclusions as to the favorability of areas for the accumulation of mineral resources, drawn in these GRA Reports, have been influenced by the geology of the areas, regardless of whether occurrences of valuable minerals are known to be present. This document is provided to give the reader some understanding of at least the most important aspects of geological environments that were in the minds of the authors when they wrote these reports.

FIGURE 1. GRA INDEX MAP OF REGION 3 1:3,168,000.

Fresno Sheet, Mathews and Burnett (1965);
Death Valley Sheet, Streitz and Stinson (1974)

New York Butte GRA CA-10

Figure 3

EXPLANATION

SEDIMENTARY AND METASEDIMENTARY ROCKS

IGNEOUS AND META-IGNEOUS ROCKS

CENOZOIC	QUATERNARY	Recent	Pleistocene	Pliocene	Miocene	Oligocene	Eocene	Paleocene
		Dune sand						
		Alluvium						
		Stream channel deposits						
		Fan deposits						
		Basin deposits						
		Salt deposits						
		Quaternary lake deposits						
		Glacial deposits						
		Quaternary nonmarine terrace deposits						
		Pleistocene marine and marine terrace deposits						
		Pleistocene nonmarine						
		Plio-Pleistocene nonmarine						
		Undivided Pliocene nonmarine						
		Upper Pliocene nonmarine						
		Upper Pliocene marine						
		Middle and/or lower Pliocene nonmarine						
		Middle and/or lower Pliocene marine						
		Undivided Miocene nonmarine						
		Upper Miocene nonmarine						
		Upper Miocene marine						
		Middle Miocene nonmarine						
		Middle Miocene marine						
		Lower Miocene marine						
		Oligocene nonmarine						
		Oligocene marine						
		Eocene nonmarine						
		Eocene marine						
		Paleocene nonmarine						
		Paleocene marine						

Recent volcanic: Qrv^r — rhyolite;
Qrv^a — andesite; Qrv^b — basalt;
Qrv^p — pyroclastic rocks

Pleistocene volcanic: Qpv^r — rhyolite;
Qpv^a — andesite; Qpv^b — basalt;
Qpv^p — pyroclastic rocks

Quaternary and/or Pliocene
cinder cones

Pliocene volcanic: Pvr^r — rhyolite;
Pvr^a — andesite; Pvr^b — basalt;
Pvr^p — pyroclastic rocks

Miocene volcanic: Mvr^r — rhyolite;
Mvr^a — andesite; Mvr^b — basalt;
Mvr^p — pyroclastic rocks

Oligocene volcanic: Ovr^r — rhyolite;
Ovr^a — andesite; Ovr^b — basalt;
Ovr^p — pyroclastic rocks

Eocene volcanic: Evr^r — rhyolite;
Evr^a — andesite; Evr^b — basalt;
Evr^p — pyroclastic rocks

		EXPLANATION CONT.	
Paleozoic	Ep	Paleocene marine	
	Q _{Tc}	Cenozoic nonmarine	Q _{Tv} Cenozoic volcanic: Q _{Tv} ^r -rhyolite; Q _{Tv} ^a -andesite; Q _{Tv} ^b -basalt; Q _{Tv} ^p -pyroclastic rocks
	T _c	Tertiary nonmarine	T _g Tertiary granitic rocks
	T	Tertiary lake deposits	Tertiary intrusive (hypabyssal) rocks: T _i ^r -rhyolite; T _i ^a -andesite; T _i ^b -basalt
	T _m	Tertiary marine	Tertiary volcanic: T _v ^r -rhyolite; T _v ^a -andesite; T _v ^b -basalt; T _v ^p -pyroclastic rocks
Mesozoic	K	Undivided Cretaceous marine	
	K _u	Upper Cretaceous marine	K _{ufv} Franciscan volcanic and metavolcanic rocks
	K _l	Lower Cretaceous marine	g _r Mesozoic granitic rocks: g _r ^a -granite and adamellite; g _r ^b -granodiorite; g _r ^t -tonalite and diorite
	J _k	Knoxville Formation	b _i Mesozoic basic intrusive rocks
	J _u	Upper Jurassic marine	u _b Mesozoic ultrabasic intrusive rocks
	J _m	Middle and/or Lower Jurassic marine	J _{rv} Jura-Trias metavolcanic rocks
	T	Triassic marine	
Paleozoic	m _{ls}	Pre-Cretaceous metamorphic rocks (ls = limestone or dolomite)	m _v Pre-Cretaceous metavolcanic rocks
	ms	Pre-Cretaceous metasedimentary rocks	g _r m Pre-Cenozoic granitic and metamorphic rocks
	p _{ls}	Paleozoic marine (ls = limestone or dolomite)	p _v Paleozoic metavolcanic rocks
	P	Permian marine	P _v Permian metavolcanic rocks
	C	Undivided Carboniferous marine	C _v Carboniferous metavolcanic rocks
	CP	Pennsylvanian marine	
	CM	Mississippian marine	
	D	Devonian marine	D _v Devonian metavolcanic rocks
	S	Silurian marine	D _{v?} Devonian and pre-Devonian? metavolcanic rocks
	pSs	Pre-Silurian meta-sedimentary rocks	pS Pre-Silurian metamorphic rocks pS _v Pre-Silurian metavolcanic rocks
Precambrian	O	Ordovician marine	
	C	Cambrian marine	
	C?	Cambrian - Precambrian marine	pC _c Precambrian igneous and metamorphic rock complex
	pC	Undivided Precambrian metamorphic rocks pC _g = gneiss, pC _s = schist	pC _{gr} Undivided Precambrian granitic rocks
	lpC	Later Precambrian sedimentary and metamorphic rocks	pC _{an} Precambrian anorthosite
	epC	Earlier Precambrian metamorphic rocks	

II. GEOLOGY

The New York Butte GRA encompasses the southern Inyo Mountains from Kearsage south to Keeler. The western escarpment of the Inyo Mountains forms the eastern boundary of the downdropped Owens Valley graben.

The study area contains a transitional facies of thick sequences of Paleozoic sediments of the eastern carbonate assemblage and the western clastic assemblage, with Triassic marine sediments overlying them unconformably. These sediments have been folded and intruded by Cretaceous quartz monzonite stocks and plutons. Faults associated with the adjustment of the sediments to the intrusions have been noted.

All known metalliferous ore deposits in the study area are genetically and spatially related to the Cretaceous intrusions.

Basin and Range faulting during the Pliocene is responsible for the present topography. These normal faults trend predominantly to the northwest and parallel the Owens Valley "Earthquake" fault.

1. PHYSIOGRAPHY

The New York Butte GRA encompasses the southern Inyo Mountains between the towns of Independence and Keeler, Inyo County, California. The Range trends northwest and lies between Owens Valley on the west and Saline Valley to the east.

The northern portion of the study area is predominantly Jurassic-Cretaceous quartz monzonite of the Paiute Monument and the Pat Keyes intrusive bodies. A thin fringe of Paleozoic sediments is present along the range front in the north and comprise most of the total area in the southern portion of the GRA (Ross, 1967).

Elevations along the crest of the range locally reach +11,000 feet and drainages predominantly run perpendicular to the northwest trend of the range.

Faulting in the area generally parallels the northwest trend of the Basin and Range type escarpment along the range front.

2. ROCK UNITS

The oldest rocks in the study area are Ordovician sediments of the Pogonip Group, overlain by Ordovician Eureka Quartzite. Above these are Silurian Devonian Hidden Valley and Ely Springs Dolomites, with Devonian Lost Burro Formation above them.

 

The Mississippian Rest Spring shale (Ross, 1967), also called the Chainman shale in some publications (Merriam, 1963), was deposited conformably above the Lost Burro. Next were deposited limestones and shales of the Pennsylvanian Keeler Canyon Formation, overlain by shales and limestones of the Permian Owens Valley Formation which locally has a disconformity near the top.

After a period of erosion that produced an unconformity, unnamed Triassic marine sediments, mostly limestone, were deposited upon the older sediments. An unnamed Triassic volcanic sequence was deposited above the sediments, its lower part sedimentary rocks of volcanic origin and its upper part similar material but with andesite flows and breccias.

A very large pluton, known as the Hunter Mountain quartz monzonite in the northern part of the GRA, was intruded in Late Triassic-Jurassic. Smaller masses of granitic rocks were intruded in the central part of the GRA, probably during the Jurassic or Cretaceous. All of the known metallic mineralization in the GRA is apparently related to this epoch of intrusions.

3. STRUCTURAL GEOLOGY AND TECTONICS

The oldest observable structures in the study area are broad folds formed by compressional forces during the Jurassic. These folds trend northwest and parallel the predominant fault trend. The predominant fold is a large syncline traceable from Waucoba Mountain to the southern end of the range. This syncline has been greatly faulted during two widely separated geologic periods, and disrupted by the intrusive bodies. Thrust faulting along the west front of the Inyos presumably was an effect of this folding.

There are two major faults in the GRA, both trending northwest. One is near the west edge of the mountains, and for its entire 14-mile mapped length has dropped Permian Owens Valley Formation on the west side against Triassic volcanic rocks on the east side. The other is about five miles farther northeast, and in part offsets the Hunter Mountain pluton (Ross, 1967). Both of these faults, although roughly parallel to Basin and Range faulting, evidently had at least initial movement during or soon after the time of Cretaceous intrusions, since the western fault has been at least partly responsible for the localization of mineralization at a couple of places (field verification observation by A. Baker III). North and northeast-striking faults in the Cerro Gordo district in the south part of the GRA are thought to be of similar early origin (Merriam, 1963). Frontal faults of the Basin and Range type, none of which are shown on available maps and perhaps are not seen because of alluvial cover, undoubtedly outline the Inyo Mountains; most of the movement

on these presumably took place in the Pliocene and more recently.

Close to the western edge of the New York Butte GRA is the "Earthquake" strike-slip fault in the middle of Owens valley which parallels the range front. Displacement on this fault caused the disastrous earthquake of 1867.

4. PALEONTOLOGY

Paleozoic marine sediments, in places abundantly fossiliferous occur within the New York Butte GRA. A general northeast strike is determined by regional synclinal structure, with Triassic and Jurassic rocks along the fold axis.

Ordovician rocks equivalent to the Palmetto and Pogonip, in part, are exposed on the western margin of the GRA, but no fossil localities are known to be recorded from them. Elsewhere, however, these units are known to contain rich faunas of both the "shelly facies" (brachiopods, trilobites, corals) and graptolites, in the argillaceous shales.

Devonian rocks, mostly carbonates and carbonaceous shales, contain abundant fossils near the top of the section, becoming rare in the more clastic underlying units. These units are exposed north of Cerro Gordo and at the eastern boundary of WSA CA-010-055 in Sections 1, 2, and 12, T 16 S, R 38 E, and parts of Sections 26, 27, 34, and 35, T 15 S, R 38 E. The Devonian fauna is characterized by brachiopods (dominated by *Atrypa* and *Stropheodonta*), corals (*Favosites*), and occasional trilobites.

Pennsylvanian (CP) and Permian (Pm) rocks, mostly carbonates, are widely distributed and commonly fossiliferous. Brachiopod and coral faunas from Mississippian carbonate units (CM) have been reported from T 16 S, R 38 E (University California Museum Paleontology), but more precise locality data are not known. The Late Paleozoic Pennsylvanian and Permian faunas are dominated by fusulinids and brachiopods, usually exclusive of each other. Fusulinids, mostly *Fusulina* sp. (Pennsylvanian) occur in Section 2, T 17 S, R 38 E. Brachiopod index fossils are mostly Productids. Silurian carbonates, including massive dolomitic limestones, are sparsely fossiliferous.

5. HISTORICAL GEOLOGY

Precambrian and early Paleozoic sedimentation is not recorded in the GRA, although from regional mapping it must have taken place here. The oldest rocks exposed are Ordovician sediments, and sedimentation continued with one minor interruption through the Permian. Uplift caused an unconformity between the younger Paleozoic rocks and Triassic

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marine sediments deposited upon them. Triassic volcanic clastic sediments and flows were deposited conformably over the marine sediments.

A period of compressive regional folding occurred during the late Jurassic and was followed by a period of intrusive activity related to the Sierra Nevada batholith during the Jurassic-Cretaceous. Faulting related to the displacement of the sediments by the intrusives occurred at this time, and mineralization in the areas is considered to be related to the intrusions.

Basin and Range faulting during the Pliocene produced the present topography.

III. ENERGY AND MINERAL RESOURCES

Note: Field verification in the New York Butte GRA was made on October 16-17, 1982 by Arthur Baker III, one of the authors of this report, and Richard W. Teixeira, Geology, Bishop Resources Area, BLM, by helicopter. The field verification work was entirely directed toward metallic mineral resources, and largely aimed toward confirming the existence and mineralization of known prospects and determining if there are prospects in the WSA that do not appear on maps. (In general there are not prospects that do not appear on maps, except for several in Sec. 13, T 14 S, R 36 E projected, which had earlier been found by BLM personnel.)

Twelve samples were collected and submitted to BLM for analysis. A list of the samples, with descriptive locations and descriptions of the material sampled, is in the GRA file, as are copies of the New York Butte and Lone Pine 15-minute topographic quadrangle maps on which are plotted the locations of the samples, and also a copy of the fire assay and spectrographic analysis reports by Metallurgical Laboratories, Inc. of San Francisco. Most of the area examined has not been surveyed for the land grid, so for locations townships, ranges and sections have been projected in from adjacent surveyed areas simply by extending the land grid lines shown on the topographic quadrangles.

In general, the analyses confirmed the presence of low gold values, low to high silver values, low copper values, and low to high lead values in samples that by visual examination were expected to have at least some base metal values and probably silver values. The spectrographic analyses provide little information about the three altered zones sampled.

A. METALLIC MINERAL RESOURCES

1. Known Mineral Deposits

There is one major mining district in the GRA: the Cerro Gordo district, which is east of the south end of WSA CA 010-055, outside the WSA. This district, which operated in the late 1800s and again in the early 1900s is estimated to have produced \$17 million (Goodwin, 1957) in silver, gold, lead and zinc from replacement orebodies in carbonate rocks (Merriam, 1963).

The Burgess Mine, a gold producer (Norman and Stewart, 1951), is in WSA CA 010-056, near the middle of its east edge. It is at the contact of Triassic marine sediments with Triassic volcanic sediments in an area with numerous granitic, felsitic and andesitic dikes trending southeasterly from the southeast edge of the intrusive body that underlies New York Butte. The hornfelsed clastic sediments are, at least in part, heavily iron-

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stained as though they were shattered and filmed with pyrite that is oxidized at the surface. Although the Burgess mine produced from a gold-bearing quartz vein, there are numerous places where the sediments have been replaced by pods of sulfides (mostly pyrite?) and a little magnetite. Old diggings and newer bulldozer cuts of unknown content and geology are scattered over an area of more than one square mile. The Burgess mine and its environs are essentially a small mining district of unknown production and, as far as published information is concerned, unknown geology or potential. Its isolation on top of the Inyo Range and being reachable only by two extremely rough roads, has no doubt impeded serious exploration of it. Two samples, #4 and #5, were taken here during field verification; sample descriptions are in the GRA file, with the descriptions of other samples taken that are mentioned below. Sample #4 was essentially barren. Sample #5, of quartz vein material with traces of copper stain, assigned 0.004 oz Au/ton, 9.87 oz Ag/ton and 4% Pb.

Along the west front of the Inyos are numerous mines, outside the WSAs being considered here. Some of these are small replacement lead-silver deposits such as the Pennsylvania near Swansea (A. Baker III, personal communication). Others are small silver-lead veins with quartz. There seem to be few, if any, gold mines or prospects here (Goodwin, 1957, Plate 1). There are also several limestone and dolomite quarries, none of which are known to be active at present.

Within the WSAs there are more than a dozen old mines and prospects, excluding those in the Burgess "district". Most of these were examined (by landing from helicopter) in the field verification made on October 16 and 17, 1982. They are as follows (both mines -- that clearly had production -- and prospects will be described here, for simplicity).

WSA CA 010-055

Unnamed prospect in Sec. 17, T 16 S, R 38 E projected, shown as prospect symbol on New York Butte topographic quad. (Lost Frenchman? MILS location in Sec. 16, lead-silver-copper). It was not found despite intensive helicopter search in the immediate area.

Flagstaff Mine, in Sec. 7, T 16 S, R 38 E projected, (Merriam, 1963, Plate 2), is not shown on the New York Butte topographic quadrangle. The workings are adjacent to the Swansea road. Several adits on the north and south sides of a draw are on a vein striking due north to north 60 west, nearly vertical and about parallel to schistosity of the Owens Valley formation which here is phyllite with

 

thin limestones. Sample #2 is of a six inch quartz vein in the north adit portal (see GRA file). It assayed 0.025 oz Au/ton, 1.24 oz Ag/ton, 0.6% Pb. One hundred feet or less east of the vein is the major northwest fault. East of this for a 150-foot width the Triassic volcanic sediments are intensely sheared and iron-stained, with a few stringers up to 2 inches wide of copper oxides mostly crosswise to the shearing. The length of this zone is at least 500 feet. Sample #3 is a chip sample across this zone in the draw bottom, avoiding visible copper. The spectrographic analysis of the sample provides no useful information. From the helicopter several adits were visible in a draw about one-quarter mile north, also very close to Swansea road, which were not examined.

WSA CA 010-056

Unnamed prospect in Sec. 28, T 15 S, R 37 E projected, a pair of adit symbols on the New York Butte topographic quadrangle map. These were not examined on the ground because it was too long a walk for the time available from the nearest helicopter landing site. From the air, the adit dumps are small and white. This may be the Big Horn uranium prospect listed as in Sec. 29 in MILS.

Unnamed prospect symbol, Secs. 22, 23, T 15 S, R 37 E projected, New York Butte quad, essentially at the west edge of the Burgess district. A 50 foot inclined shaft is on two intersecting quartz veins six inches wide, apparently not more than 20 feet long with attitude about N 70 W, 60 N. Sample #12 is a grab of dump high-grade: sugary quartz with some vugs, rare pyrite cubes, and nothing else visible. It assayed 0.06 oz/ton Au, 0.02 oz/ton Ag, 0.015 % Pb. This may be the Nellie H gold-copper prospect listed in MILS as in Sec. 15, or the Franklin D. Roosevelt lead prospect in Sec. 15.

Unnamed prospect, Sec. 21, T 15 S, R 37 E, projected, adit symbol labelled "tunnel" on New York Butte quad. The country rock is phyllite with limestone beds, sheeted about N 60 W, 80° NE. Pockety quartz veins up to three feet wide strike N 20-40° W, and are about vertical, with pockets of limonite also about vertical and not more than 10 feet long. Near this point are a couple of shafts less than 100 feet deep and a 100-foot adit around the ridge to the east. Sample #1 is of high-grade on the dump of the ridge-top shaft: quartz with a little galena and traces of copper stain. It assayed 0.004 oz/ton Au, 2.54 oz/ton Ag, 0.04% Cu, and 0.60% Pb.

Unnamed prospect in Sec. 7, T 15 S, R 37 E projected, adit symbols labelled "tunnels" on New York Butte quadrangle. There is a 10-foot to 50-foot wide zone of intensely sheared rock, partly conglomerate, a quarter of a mile

long striking N 80 W, with some iron staining. In the zone are occasional irregular quartz veins up to one foot wide, apparently not more than 25 feet long, mostly cross-wise to shearing of the zone. The quartz has small spots and clots of limonite that appears to be derived from siderite, with no visible copper or lead. Sample #11 is chips from a pile of quartz on the dump of the upper, 10-foot adit. It assayed 0.008 oz/ton Au, 0.28 oz/ton Ag, 0.06% Cu, 0.40% Pb, 0.35% Zn.

Duarte mine, Sec. 1, T 15 S, R 37 E projected, New York Butte quadrangle. The adit shown on the quadrangle was not accessible in the time available, so a 15-foot adit about 300 yards east of Duarte in same zone N 70° W, 35-45° NE was examined. The zone is 20 to 50 feet wide, intensely sheared, of lightly iron stained hornfels and perhaps partly rhyolitic dike with rare spots of copper stain. There are occasional lenses of vuggy quartz up to one inch wide and about one foot long. The hornfels in this area has somewhat more visible epidote than elsewhere, and some float fragments have knots of garnetite an inch or two in diameter, not seen elsewhere. A few float fragments of magnetite, up to fist-size, were also seen. Sample #10 is a 10-foot chip through part of the shear zone in the west wall of the adit. The spectrographic analysis of the sample shows relatively higher values in base and precious metals than do the analyses of other altered material (Samples Nos. 3 and 9).

Unnamed prospect in Sec. 31, T 15 S, R 38 E projected, one mile east of the Duarte mine, could not be found with intensive air and ground search.

Monte Carlo mine (Goodwin, 1957), Sec. 14 T 14 S, R 36 E projected, shown as a line of adit and prospect symbols half a mile long on the Lone Pine quadrangle. Goodwin credits the mine with over 100,000 ounces of recorded silver production before 1902, as well as later unspecified production. The vein strikes N 80 W and dips steeply north. It was examined at a couple of prominent pits and/or glory holes near its east end. The vein here is locally as much as 12 feet wide, mostly sugary quartz with irregular areas up to a couple of feet wide containing numerous irregular narrow galena veinlets. The north side of the vein has been stoped to surface for a width of three feet and a length of at least 25 feet. Sample #6 is of high-grade piled on the dump, quartz with galena. It assayed 0.055 oz/ton Au, 11.40 oz/ton Ag, and "major" Pb. The lowest, westernmost adit of the Monte Carlo apparently is outside the WSA as drawn, but the other workings are within the WSA.

Unnamed prospects in Sec. 13, T 14 S, R 36 E projected, about a mile northeast of Monte Carlo, not on Lone Pine quadrangle but found earlier by BLM reconnaissance.

Quartz veins are in hornfels, with maximum width of 2 feet and N 20-40 E strike with steep easterly dips. Sample #7 is of sugary quartz with light copper stain and rare spots of galena up to one-half inch diameter, from the dump of an adit northeast of the saddle above the "7200" contour designation. It assayed 0.002 oz/ton Au, 0.15 oz/ton Ag, 0.6% Pb and 0.4% Zn. Sample #8 is of quartz with abundant galena and fairly abundant copper staining, from the dump of an adit south of the saddle. Most of the vein in place appears barren, but in a partly-caved glory hole there is similar material in place, one foot wide. A third adit, on the north side of the saddle and 25 feet below it, has a similar barren vein exposed and material on the dump much like that of the Monte Carlo.

Unnamed prospect in Sec. 10, T 14 S, R 36 E, about 1 mile south of Reward on Lone Pine quadrangle but not shown on the quadrangle map; the adit was seen from the air but not examined on the ground. It apparently is within WSA 010-056. This may be the Hirsh gold-lead-silver-copper mine of MILS, listed as in Sec. 3.

2. Known Prospects, Mineral Occurrences and Mineralized Areas

Prospects and mineral occurrences examined during field verification have been described above.

The altered zone in Triassic volcanics adjacent to the Flagstaff mine has been described above. Ground color variations seen from the helicopter northwest of the Flagstaff may be a continuation of this zone, mostly covered by colluvium; if so, the zone may be half a mile long, or more.

From the site of the not-found adit a mile east of the Duarte mine (Sec. 31, T 15 S, R 38 E projected) a zone of dark red alteration locally several hundred feet wide could be seen half a mile north. The zone, roughly plotted on the field copy of the New York Butte quadrangle that is in the GRA file, trends about N 40 W and is at least half a mile long.

In Sec. 13, T 14 S, R 36 E, just north of the adits of samples #7 and #8, is a similar northwest-trending zone of dark red alteration. This is at least several hundred feet long with very erratic width of from 10 feet to 50 feet. It is a dense, dark gray felsite with very abundant fine-grained pyrite preserved in the interior of pieces even at the surface. Sample #9 is of this material. The spectrographic analyses of this sample provides no useful information.

MILS data lists about a dozen prospects in Secs. 15 and 16, T 16 S, R 38 E, in the south end of WSA CA 010-055. The New York Butte quadrangle does not show any prospects in these sections, and none were seen in field verification helicopter reconnaissance.

3. Mining Claims

Plotting of patented claims shows three sections with claims that might be within WSA CA 010-055. Two of these are in the southeast corner of the WSA, near Cerro Gordo, and may well be outside the WSA boundary. The third is east of Swansea and also may be outside the boundary. Two patented sections with claims plot in WSA CA 010-056, both in the vicinity of Long John Canyon. One of these probably is on one of the mines in the Canyon and outside the WSA. The other appears to be well within the WSA and may cover the property in Sec. 21, T 15 S, R 37 E described above.

The southern part of WSA CA 010-055 is essentially solidly covered with unpatented claims in a band extending westward from Cerro Gordo; this is the same area as the prospect locations cited in MILS, mentioned above, in which helicopter reconnaissance showed no old diggings. Near the middle of the northeast border, south of the old tramline, claims are plotted that may be within the WSA, close to the Cerro Gordo-Burgess road.

There are a great many unpatented claims in WSA CA 010-056. A few of them are in the vicinity of the Burgess Mine, but most are along the west side of the WSA in country that is relatively accessible but nonetheless extremely rugged. Some of them undoubtedly cover some or all of the old mines and prospects described above.

4. Mineral Deposit Types

All of the metallic mineral deposits known in the WSAs fall into one or the other of two categories: quartz veins with primarily gold values, and quartz veins with primarily silver-lead values.

The Burgess vein and probably the Flagstaff vein fall into the first category. These are mesothermal veins related to the granitic intrusions. The Burgess vein was not seen at any point, so its size is unknown. The Flagstaff vein is visible in several of the adits driven on it; at the portals it is nowhere more than a few inches wide, and at some places there seems to be no vein at all, only a shear zone a few inches wide which may carry gold values.

All the other mines and prospects examined belong to the second category, quartz veins with silver-lead values -- as indicated by the presence of galena in them. They may also have substantial gold values, since most descriptions of mines in this region mention gold production. These, too, are mesothermal veins related to the granitic intrusions.

The large lead-silver orebodies of the Cerro Gordo district were almost all replacement bodies -- not veins -- in the Devonian Lost Burro Formation (Merriam, 1963), as were at least those of the Pennsylvania mine in the Swansea district (A. Baker III, personal communication). The only place where the Lost Burro Formation is exposed within the WSAs is a small strip in the vicinity of Sec. 28, T 15 S, R 37 E as nearly as Ross' (1967) generalized geology can be plotted; the two adits in this section that were not examined during the field verification may be in the Lost Burro Formation. The Formation should be present at considerable depth under the WSAs.

Small bodies of iron oxides found at some localities during the field verification -- notably south of Long John Canyon and near the Burgess mine, as described above -- are the oxidized remains of replacement sulfide bodies in limestone. Judging by the nature of the iron oxides, and also the fact that none of the bodies appear to have been extensively mined or prospected, these replacement bodies probably originally consisted almost entirely of pyrite, rather than lead and zinc sulfides. Their existence suggests that it is possible there are lead-zinc-silver replacement deposits somewhere in the limestones and dolomites inside the WSAs, although none have been found and the highly favorable Lost Burro limestones are not present near the surface.

The significance of the altered zones seen in the field verification is unknown. The two in WSA CA 010-056 are not related to any known mineralization other than the abundant pyrite seen disseminated in the one zone and inferred to be in the other zone. The altered zone in WSA CA 010-055 lies along a major fault, contains visible copper mineralization, and is immediately adjacent to the gold(?) vein of the Flagstaff mine, all of which suggest that it may have significance that could lead to mineral resources.

5. Mineral Economics

Most of the veins in the WSAs are narrow and probably irregular. They are not likely to be of interest to major mining companies because their size precludes any expectation of substantial tonnages of ore. However, depending on metal values and metal prices, it is possible

that some of them could be mined by small organizations. Most of them have formidable problems of access: in the early days everything that went into them or came out of them was carried on the backs of men, burros or mules. Road building to them would be extremely expensive.

The Monte Carlo lead-silver mine in WSA CA 010-056 may be an exception to these generalizations: the vein is large although the size of ore shoots in it is unknown, and at least the lowest part is readily accessible. The Flagstaff mine and the Burgess district are exceptions to the access generalization since they lie on the Swansea road, though it is described as a very poor road suitable only for four-wheel drive vehicles.

The major uses of silver are in photographic film, sterlingware, and increasingly in electrical contacts and conductors. It is also widely used for storage of wealth in the form of jewelry, "coins" or bullion. Like gold it is commonly measured in troy ounces, which weigh 31.1 gram grams, twelve of which make one troy pound. World production is about 350 million ounces per year, of which the United States produces about one-tenth, while it uses more than one-third of world production. About two-thirds of all silver is produced as a byproduct in the mining of other metals, so the supply cannot readily adjust to demand. It is a strategic metal. Demand is expected to increase in the next decades because of growing industrial use. At the end of 1982 the price of silver was \$11.70 per ounce.

The major use of gold is for storing wealth. It is no longer used for coinage because of monetary problems, but many gold "coins" are struck each year for sale simply as known quantities of gold that the buyer can keep or dispose of relatively easily. The greatest other use of gold is in jewelry, another form of stored wealth. In recent years industrial applications have become increasingly important, especially as a conductor in electronic instrumentation. In the United States and some other countries gold is measured in troy ounces that weigh 31.1 grams -- twelve of which make one troy pound. Annual world production is about 40 million ounces per year, of which the United States produces somewhat more than one million ounces, less than one-fourth of its consumption, while the Republic of South Africa is by far the largest producer at more than 20 million ounces per year. World production is expected to increase through the 1980s. For many years the price was fixed by the United States at \$35 per ounce, but after deregulation the price rose to a high of more than \$800 per ounce and then dropped to the neighborhood of \$400 per ounce. At the end of 1982 the price was \$460.50 per ounce.

The largest use for lead is in electrical storage batteries, the second being a gasoline antiknock additive. It has many other uses, however, including radiation shielding, solders, numerous chemical applications and in construction. About four million metric tons of lead are produced in the world annually. The United States produces about half a million tons per year, and recovers about the same amount from scrap -- much of it through the recycling of old batteries. It imports about one-quarter of a million tons. Lead is classified as a strategic mineral. Demand is projected to increase somewhat in the next couple of decades, but environmental concerns will limit the increase. The United States has large ore reserves that are expected to last well beyond the end of this century at current production rates even without major new discoveries. At the end of 1982 the price was about 22 cents per pound.

The largest use for copper is in electrical equipment and supplies and in smaller-gauge wire where its electrical conductivity is essential. It is also used in large quantities in applications where its corrosion resistance is important -- in housing, brass and bronze, sea-water corrosion resistant alloys and others. It is used also in ammunition, many chemicals, and in applications where its conductivity of heat is important. World production is about 7.5 million metric tons annually, of which the United States produces about 1.5 million tons, nearly sufficient to satisfy domestic demand. Copper is a strategic metal. There are large reserves of copper ore in the world, and the United States has greater reserves and greater resources than any other country. United States demand is expected to nearly double by the year 2000, but reserves are thought to be sufficient to meet the demand. However, environmental problems of smelting copper may hinder production, and in times of low prices foreign producers tend to maintain full production for political reasons, while domestic producers tend to restrict production for economic reasons. These pressures on the domestic copper industry weaken its competitive capability on the world market. At the end of 1982 the price of copper was 73 cents per pound.

B. NONMETALLIC MINERAL RESOURCES

1. Known Mineral Deposits

Two tons of hand-cobbed beryl ore are reported produced from a deposit in Sec. 8, T 15 S, R 37 E (Benson, 1962) or Sec. 29, T 15 S, R 37 E in WSA CA 010-056 (Davis, 1983).

Relatively large quantities of limestone and dolomite have been mined along the western front of the Inyo Range immediately west of the western boundary of WSAs CA 010-

055 (Logan, 1947). There are no known quarries within the WSAs and no evidence that any serious attention has been given to limestone and dolomite prospecting -- there is plenty of material easily available along the mountain edge, which offers little incentive to prospect for such low-priced commodities in the rugged higher mountains.

Talc and quartzite have been mined just west of the western boundaries of both WSAs according to Davis (1983), who quotes Ver Planck (1966) to the effect that the Eureka quartzite here is one of the very few sources of high-purity quartzite in California.

Large quantities of talc have been produced from the Bohnam talc deposits east of WSA CA 010-055. Some of these deposits have been mined within half a mile of the WSA boundary, but there is nothing to indicate that the talc extends within the WSA.

2. Known Prospects, Mineral Occurrences and Mineralized Areas

There are numerous prospects on limestone, dolomite and talc in the GRA, but none are known within either of the WSAs.

A beryl occurrence is reported in Sec. 19, T 15 S, R 37 E in WSA CA 010-056 (Benson, 1962 and Davis, 1983).

3. Mining Claims, Leases and Material Sites

It is not known whether any of the mining claims within the WSAs are on nonmetallic mineral occurrences. No nonmetallic mineral occurrences are known within the WSAs. No material sites are known within the WSAs.

4. Mineral Deposit Types

At the mine that produced two tons of beryl ore, the beryl occurs in granitic rocks near the contact with limestone, while at the other prospect it occurs as crystals in granitic rocks (Davis, 1983). It is worth noting that almost any rock can be developed into a saleable nonmetallic commodity, especially if it has some unusual characteristic which may be as simple as a particular color or a special mineral makeup. Thus, the WSAs have potential for nonmetallic deposits even though none other than the beryl occurrences are known to exist there.

5. Mineral Economics

Nonmetallic mineral deposits that might be developed in the New York Butte GRA share a problem common to all nonmetallics in the Owens Valley area -- their considerable distance from the major marketing area of Los Angeles. To be economically exploitable, they must be unusual enough that similar deposits cannot be found closer to Los Angeles that would have the advantage of a shorter haul.

Pure limestone and dolomite are used principally to produce lime, but some is used as rock for building stone, crushed rock, and similar applications. The principal uses of lime are in steel smelting, water purification, as an alkali, in paper and pulp manufacture, and sewage treatment. Other uses for lime are in sugar purification, mortar, and as an agricultural soil conditioner. Limestone with certain clay impurities (called cement rock), or purer limestone with clay added, is used to make cement that is mostly consumed in construction. The United States uses about 20 million tons of lime and 85 million tons of cement annually. For both lime and cement the raw material must be mined within a very few miles of the processing plant, because it has a very low value in the form of run-of-mine rock -- two or three dollars per ton. There are numerous lime and cement plants in the United States, and most of them sell most of their product within a 200 mile radius of the plant. Some cement is imported in the form of clinker, which is the kiln-fired rock that is then ground in the United States. In the early 1980s the price F.O.B. plant of both lime and cement is about \$40 per ton.

Talc and pyrophyllite are two different minerals but have somewhat similar chemical compositions and physical characteristics, so they can be used interchangeably in some applications but also each of them has applications in which it is more suitable than the other. Most available economic data treat the two minerals (and small amounts of others) together, so they are treated this way here and the term talc is used to include all the talc-like minerals. About one-fourth of all talc is used in ceramics, with a somewhat smaller portion used in paint and a still smaller portion in plastics as a filler; these three uses account for about two-thirds of talc consumption. The most well-known use, in talcum powder and other cosmetics, uses only about 7 percent of total consumption. Pyrophyllite as such is particularly heavily used in insecticides and refractories. United States consumption of talc is about one million short tons per year and production is about 1.3 million tons per year with the average being exported. Talc consumption is forecast to about double by the year 2000, with domestic production increasing enough to keep up with demand but

exports probably ceasing. The price of crude talc as mined is about \$15 per ton, while processed talc sold by producers (principally ground), is about \$65 per ton.

About 80 percent of beryllium is used in alloys, mostly with copper, and most of the alloys are used in electrical applications such as springs, contacts, relays and other equipment. Some is used in aerospace applications, either in alloys or as beryllium metal which has high strength, light weight and excellent anticorrosion characteristics. The United States consumes about 300 tons of beryllium annually, probably more than half of which is produced domestically. Beryllium consumption is not expected to change greatly by the year 2000, partly because it can be highly toxic especially while being processed, so other materials are used in its stead wherever possible. The mineral beryl, which contains about 11 percent beryllium oxide and is one of the major ores of beryllium, is priced at about \$475 per ton, though all sales are negotiated. Some beryl is used as a semi-precious gemstone, and one variety, the emerald, is highly prized.

C. ENERGY RESOURCES

Uranium and Thorium Resources

1. Known Mineral Deposits

There are no known uranium or thorium deposits within or near the WSAs or the GRA.

2. Known Prospects, Mineral Occurrences and Mineralized Areas

There are no known thorium occurrences within the WSAs or the GRA.

Radioactive occurrences are indicated on the Land Classification and Mineral Occurrences Map included at the back of the report.

The Big Horn or Lucky Strike uranium prospect is in Sec. 29 (projected), T 15 S, R 37 E (Minobras, 1978) within WSA CA 010-056. The mineralization occurs in granite. No further information as to the size or type of deposit is available.

3. Mining Claims

The Big Horn Prospect is the only known uranium claim within the GRA, and it has probably lapsed. There are apparently no thorium claims within or near the GRA.

4. Mineral Deposit Types

Lack of known mineral occurrences prevents a description of deposit types for the GRA.

5. Mineral Economics

Lack of known mineral occurrences prevents an economic determination though both uranium and thorium appear to be of no economic importance for the area.

Uranium in its enriched form is used primarily as fuel for nuclear reactors, with lesser amounts being used in the manufacture of atomic weapons and materials which are used for medical radiation treatments. Annual western world production of uranium concentrates totaled approximately 57,000 tons in 1981, and the United States was responsible for about 30 percent of this total, making the United States the largest single producer of uranium (American Bureau of Metal Statistics, 1982). The United States ranks second behind Australia in uranium resources based on a production cost of \$25/pound or less. United States uranium demand is growing at a much slower rate than was forecast in the late 1980s, because the number of new reactors scheduled for construction has declined sharply since the accident at the Three Mile Island Nuclear Plant in March, 1979. Current and future supplies were seen to exceed future demand by a significant margin and spot prices of uranium fell from \$40/pound to \$25/pound from January, 1980 to January, 1981 (Mining Journal, July 24, 1981). At present the outlook for the United States uranium industry is bleak. Low prices and overproduction in the industry have resulted in the closures of numerous uranium mines and mills and reduced production at properties which have remained in operation. The price of uranium at the end of 1982 was \$19.75/pound of concentrate.

Thorium is used in the manufacture of incandescent gas mantles, welding rods, refractories, as fuel for nuclear power reactors and as an alloying agent. The principal source of thorium is monazite which is recovered as a byproduct of titanium, zirconium and rare earth recovery from beach sands. Although monazite is produced from Florida beach sands, thorium products are not produced from monazite in the United States. Consequently, thorium products used in the United States come from imports, primarily from France and Canada, and industry and government stocks. Estimated United States consumption of thorium in 1980 was 33 tons, most of which was used in incandescent lamp mantles and refractories (Kirk, 1980b). Use of thorium as nuclear fuel is relatively small at present, because only two commercial thorium-fueled reactors are in operation. Annual United States demand

for thorium is projected at 155 tons by 2000 (Kirk, 1980a). Most of this growth is forecast to occur in nuclear power reactor usage, assuming that six to ten thorium-fueled reactors are on line by that time. The United States and the rest of the world are in a favorable position with regard to adequacy of thorium reserves. The United States has reserves estimated at 218,000 tons of ThO_2 in stream and beach placers, veins and carbonatite deposits (Kirk, 1982); and probable cumulative demand in the United States as of 2000 is estimated at only 1,800 tons (Kirk, 1980b). The price of thorium oxide at the end of 1981 was \$16.45 per pound.

Oil & Gas Resources

There are no oil and gas fields, hydrocarbon shows in wells, or surface seeps in the region; nor are there any Federal oil and gas leases in the immediate region. The stratigraphy within the GRA is not conducive to the generation of petroleum hydrocarbons. There is no oil and gas lease map, no oil and gas occurrence and land classification map in this report.

Geothermal Resources

1. Known Geothermal Deposits

There are no geothermal deposits within the New York Butte GRA, nor adjacent to it on the western flank of the southern Inyo Mountains.

2. Known Prospects, Geothermal Occurrences, and Geothermal Areas

On the southern boundary of the GRA or just to the south there are unnamed springs which have a temperature of 30°C (Geothermal Occurrence and Land Classification Map). The computed estimate of the total dissolved solids is 2,150 mg/l, and the flow is 57 l/min at the edge of Owens Lake. Eleven miles to the south, also at the edge of Owens Lake, the 183-meter Dirty Socks Hot Springs well has a temperature of 34°C , a flow of 380 l/min, and a salinity of 5,530 mg/l (NOAA, 1982).

In Saline Valley, on the opposite flank of the Inyo Mountains, there are four thermal occurrences:

Spring	Temp.	Flow (l/min)	TDS (mg/l)
Upper Warm Spring	Warm	---	---
Palm Spring	49°C	---	1000
Lower Warm Springs	43°C	---	1050
Little Hunter Canyon Springs	27°C	568	540

3. Geothermal Leases

Within the Owens Lake valley on the east side where Kerr-McGee Corporation operates a salt-winning operation from brines, there are at least 13 Federally-administered geothermal leases in a contiguous block (Geothermal Lease Map). Five of these are within the GRA between the lake and the Inyo Mountains.

Six miles east of the northeastern corner of the GRA in Saline Valley, the U.S. Geological Survey has designated five sections as Saline Valley KGRA for leasing purposes. There are no leases in this prospect area.

4. Geothermal Deposit Types

Data is not available from which to determine the type of prospect at the Salt Works, but it is expected that the thermal waters are part of a deep hot water system circulating upwards along Basin and Range faults.

5. Geothermal Economics

There is no data upon which to base the economics of a geothermal system. It is likely that the lessee may plan to develop the resource for direct use, and if temperatures permit, for electrical power as well.

Geothermal resources are utilized in the form of hot water or steam normally captured by means of drilling wells to a depth of a few feet to over 10,000 feet in depth. The fluid temperature, sustained flow rate and water chemistry characteristics of a geothermal reservoir determine the depth to which it will be economically feasible to drill and develop each site.

Higher temperature resources (above 350°F) are currently being used to generate electrical power in Utah and California, and in a number of foreign countries. As fuel costs rise and technology improves, the lower temperature

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limit for power will decrease appreciably -- especially for remote sites.

All thermal waters can be beneficially used in some way, including fish farming (68°F), warm water for year around mining in cold climates (86°F), residential space heating (122°F), greenhouses by space heating (176°F), drying of vegetables (212°F), extraction of salts by evaporation and crystallization (266°F), and drying of diatomaceous earth (338°F).

Unlike most mineral commodities remoteness of resource location is not a drawback. Domestic and commercial use of natural thermal springs and shallow wells in the Basin and Range province is a historical fact for over 100 years.

Development and maintenance of a resource for beneficial use may mean no dollars or hundreds of millions of dollars, depending on the resource characteristics, the end use and the intensity or level of use.

D. OTHER GEOLOGICAL RESOURCES

No other geological resources are known in the GRA. Coal is not known in the GRA, and there is no known potential for coal.

E. STRATEGIC AND CRITICAL MINERALS AND METALS

A list of strategic and critical minerals and metals provided by the BLM was used as a guideline for the discussion of strategic and critical materials in this report.

The Stockpile Report to the Congress, October 1981-March 1982, states that the term "strategic and critical materials" refers to materials that would be needed to supply the industrial, military and essential civilian needs of the United States during a national emergency and are not found or produced in the United States in sufficient quantities to meet such need. The report does not define a distinction between strategic and critical minerals.

Silver and lead, both strategic metals, probably have been produced in small quantities from WSA CA 010-055 and have been produced in somewhat greater quantities from WSA CA 010-056. A small amount of beryl, containing the strategic metal beryllium, has been produced from WSA CA 010-056.

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IV. LAND CLASSIFICATION FOR G-E-M RESOURCES POTENTIAL

Detailed geologic mapping is not available for WSAs CA 010-055 and 010-056, though generalized mapping distinguishing between igneous and sedimentary rocks, and major subdivisions of the latter, is available. The geological data available are moderately good in both quantity and quality, except in the area of alteration for which there are no data. Published information on mines and prospects is fairly good as to location and production, and the field verification work supplements this information; there is little information as to the extent of mineralization at any site. This writer has a high level of confidence in the general geology and the distribution of known mineralization, but a low level of confidence in the completeness of information about the distribution of mineralization overall.

Land classification areas are numbered starting with the number 1 in each category of resources. Metallic mineral land classification areas have the prefix M, e.g. M1-4D. Uranium and thorium areas have the prefix U. Nonmetallic mineral areas have the prefix N. Oil and gas areas have the prefix OG. Geothermal areas have the prefix G. Sodium and potassium areas have the prefix S. The saleable resources are classified under the nonmetallic mineral resource section. Both the classification Scheme, numbers 1 through 4, and the Level of Confidence Scheme, letters, A, B, C and D, as supplied by the BLM are included as attachments to this report. These schemes were used as strict guidelines in developing the mineral classification areas used in this report.

Land classifications have been made here only for the areas that encompass segments of the WSAs. Where data outside a WSA has been used in establishing a classification area within a WSA, then at least a part of the surrounding area may also be included for clarification. The classified areas are shown on the 1:250,000 mylars or the prints of those that accompany each copy of this report, and on the 1:62,500 quadrangles that accompany the original of the report.

In connection with nonmetallic mineral classification, it should be noted that in all instances areas mapped as alluvium are classified as having moderate favorability for sand and gravel, with moderate confidence, since alluvium is by definition sand and gravel. All areas mapped as principally limestone or dolomite have a similar classification since these rocks are usable for cement or lime production. All areas mapped as other rock, if they do not have specific reason for a different classification, are classified as having low favorability, with low confidence, for nonmetallic mineral potential, since any mineral material can at least be used in construction applications.

1. LOCATABLE RESOURCES

a. Metallic Minerals

WSA CA 010-055

M1-4C. This classification area is about a mile long and a quarter of a mile wide, lying in part along the Swansea road and covering parts of WSAs CA 010-055 and 010-056. It lies along the major fault separating Owens Valley formation sediments from Triassic volcanic rocks and volcanic sediments. Within it are the Flagstaff mine and other diggings farther north, and the altered area along the fault in the Triassic rocks. It is classified as highly favorable because the Flagstaff mine produced ore, but with only moderate confidence because the productivity of the other diggings is not known and the altered zone, though clearly containing copper mineralization, has not been mined.

M2-4C. This classification area covers about three square miles and it, too, lies partly in WSA CA 010-055 and partly in 010-056, as well as extending eastward out of the WSAs. It includes the Burgess mine and the surrounding area in which there are numerous prospects and the coloration of the ground indicates strong alteration. It is classified as highly favorable because the Burgess mine was productive, but with moderate confidence because the remainder of the area, although altered, is not known to have been productive.

M3-2B. This classification area covers a large part of WSA CA 010-056 and a smaller part of 010-055. Its outline is roughly half a mile outside the gross outline of the pluton that underlies New York Butte and the long narrow intrusive body south of the pluton. Within it is the higher-favorability classification area M2-4C that includes the Burgess mine, as well as the Duarte mine at the north end of the pluton and the nearby altered zone seen in the field verification. Aside from these mineralization occurrences, its classification as having low favorability is based on the common association of mineral deposits with granitic intrusives; the half-mile zone around the intrusives is chosen arbitrarily. Again, aside from the Burgess district and the few mineralization occurrences the only support for the classification is geologic reasoning, hence the low level of confidence.

M4-2B. This classification area covers four or five square miles, about half in WSA CA 010-055 and half in 010-056. Like M3-2B, its boundary is drawn roughly half a mile outside the gross outline of the smaller pluton near M1-4C, and that classification area is surrounded by M4-2B. The reasoning on which M4-2B is based is the same as that for M3-2B.

M5-1B. This classification area covers the remainder of WSA CA 010-055 that is not included in the above classification areas, and a strip along the west edge of 010-056 northwestward to the WSA boundary reentrant in Long John Canyon. The pair of adits in Sec. 28, T 15 S, R 37 E and the prospect that was not found during field verification in Sec. 17, T 16 S, R 38 E lie within the classification area. There is no other evidence of mineralization, which suggests the rocks are not highly favorable for mineralization, and there are no known intrusive rocks that might serve as a source of mineralizing solutions. The classification is based entirely on this geological reasoning, hence the low level of confidence.

WSA CA 010-056

M1-4C, M2-4C, M3-2B, M4-2B, and M5-1B. All of these classification areas, described above, lie partly in WSA CA 010-056.

M6-3D. This classification area covers about one square mile south of Long John Canyon and is an extension of the reentrant drawn in the WSA boundary to exclude mines near the mouth of Long John Canyon. It includes the "tunnel" in Sec. 21, T 15 S, R 37 E and other old diggings seen during field verification that are not shown on the New York Butte quadrangle and were not examined, lying between the "tunnel" and the mines near the mouth of the canyon. It is classified as moderately favorable on the basis of the several diggings and exposures of mineralization, none of which are known to have produced ore. The level of confidence is high because there clearly are several mineral occurrences in the area.

M7-4D. This classification area includes parts of Secs. 12, 13 and 14, T 14 S, R 36 E and is an extension of the reentrant drawn in the WSA boundary to exclude the lowest adit of the Monte Carlo mine. The part of the Monte Carlo vein that was examined in field verification, well within the WSA, has clearly produced ore. Two of the old adits in Sec. 13 probably produced at least some ore. These are the reasons for the high favorability and the high level of confidence in this classification.

M8-2B. This classification area includes about half of the northern tip of WSA CA 010-056. Its southern boundary is the boundary of M7-4D. Its northeastern boundary is the major fault that puts the large Hunter Mountain pluton to the east in contact with lesser intrusives and sediments to the west. Its western boundary is the western boundary of the WSA, or, geologically, the range front fault that presumably lies somewhat farther west; it is not drawn. Just south of it is the Monte Carlo mine

and other mines and prospects of M7-4D. Very close to its north end is the Reward mine, excluded from the WSA by the present boundary. Within it are, in part, the host rocks of those mines, and intrusive rocks that might well have served as the source of mineralizing solutions. The reasoning for its classification is the same as for M3-2B and M4-2B.

M9-1B. This classification area covers the remainder of WSA CA 010-056 that is not covered by the above classification areas. No mineral occurrences are known in it, and no intrusives (other than part of the main mass of the Hunter Mountain pluton) are known that might serve as sources of mineralizing solutions.

b. Uranium and Thorium

WSAs CA 010-056, and CA 010-055

U1-3C. This land classification area covers essentially all of WSA CA 010-055 and most of WSA CA 010-056. The area has moderate favorability for uranium concentration, at a moderate level of confidence, in the Jurassic-Cretaceous granitic and rhyolitic rocks and the Paleozoic metasediments which cover the area. The granitic rocks and rhyolitic volcanics are possible uranium sources and uranium could be concentrated in any of the formations of the range as vein-type or fracture-fill deposits. There are a number of base and precious metal deposits in quartz veins and replacement deposits primarily in limestone and dolomite but also occurring in other metasediments, granitic, and rhyolitic rocks. The proposed source of these metallic deposits are the Cretaceous granitic intrusions. Uranium deposits are frequently found along with other metals in quartz veins and alteration zones in other areas and should also be prospective within the WSAs. The Big Horn uranium prospect in WSA Ca 010-056 indicates that uranium has been available, at least locally, to hydrothermal systems within the WSAs.

Thorium has low favorability, at a low level of confidence, for the area. It could be concentrated as primary mineralization in pegmatites of the Cretaceous granitic intrusion though there is not much reference to pegmatites occurring in the area.

WSA CA 010-056

U2-2B. This land classification covers the west central border of the WSA. The area has low favorability for uranium and thorium concentration at a low level of confidence in the Quaternary alluvium which covers the flank of the range in this section. Epigenetic sandstone-

type uranium deposits could occur here, being precipitated from ground waters coming from the granitic and rhyolitic rocks of the range.

Thorium could possibly form resistate mineral concentrations in the alluvium, though there is little evidence for thorium occurring in the granitic rocks of the range and the rapid sedimentation along the alluvial fans would not be suitable for concentration of resistate minerals.

c. Nonmetallic Minerals

WSA CA 010-055

N1-3C. This classification area covers the eastern one-fourth of the WSA. In it the rocks are principally limestones and dolomites of the lower part of the Paleozoic sediments, which are suitable for the production of lime or cement and some other materials. The certain presence of these usable rocks, but the lack of production of them, is the reason for the classification as moderately favorable while the moderate level of confidence stems from the fact that the quality of the rocks is not known.

N2-2B. This classification area covers the remainder of the WSA. The rocks in it, upper Paleozoic sediments and Triassic sediments and volcanics, are usable for construction materials and any rock may be developed into a moderately high priced industrial mineral if an entrepreneur can find a market for its particular physical or chemical properties. The presence of the rocks, but only potential uses for them, are the reason for the low level of favorability and the low level of confidence in this classification.

WSA CA 010-056

N2-2B. This classification area covers most of the WSA. The reasoning behind the classification and level of confidence are given immediately above.

N3-3C. This classification area covers the southwestern edge of the WSA. The rocks in it are lower Paleozoic sediments, mostly limestone and dolomite, some of which have been mined for lime outside the WSA, and the Ordovician Eureka Quartzite which has been mined for silica outside the WSA. The reason for the classification and level of confidence are the same as for N1-3C.

N4-4C. This classification covers a small but unknown area, its exact location uncertain, in Sec. 8 or 29, T 15 S, R 37 E. It is the site of the mine that produced beryl, and an unknown area surrounding it. It is classified highly favorable for beryllium on the basis of the known production. The level of confidence is only moderate because of the uncertainty of the location within the section.

2. LEASABLE RESOURCES

a. Oil and Gas

WSAs CA 010-055 and CA 010-056

OG1-1D. There has been no serious oil and gas exploration, nor are there any recorded occurrences of oil and gas in this westernmost sector of the Basin and Range province where it meets the Sierra Nevadas. The two WSAs are underlain by highly distorted Paleozoic and Mesozoic strata which have been intruded by the Sierran batholith. Granitic outcrops are in evidence throughout the WSAs. There is no evidence of source beds being present in the area. These are the reasons for the very low favorability for oil and gas and the high level of confidence in this classification.

b. Geothermal

WSA CA 010-055

G1-4D. The lands included in this classification include unnamed thermal springs and shallow drill holes which reportedly penetrated thermal water bearing strata at a shallow depth. The drill holes were located in the area of the Federal geothermal leases, but not necessarily on these leased lands.

WSAs CA 010-055 and CA 010-056

G2-3C. This classification incorporates the Owens Lake Valley and the adjacent Inyo Mountain range front which is a structural extension of the area classified as G1-4D. The entire linear area is within the Owens Valley fault zone which has multiple surface thermal manifestations along its strike length.

G3-2B. This classification incorporates the Inyo Mountains proper which consists of Paleozoic strata intruded by granitic rocks. Only at the extreme south end are Pliocene volcanics present. The range is broken by normal faults -- some very long, but the favorability

varies between moderate to low. The steep relief of much of the area precludes easy development of a resource that may be present.

c. Sodium and Potassium

WSAs CA 010-055 and 010-056

S1-1D. This classification area covers all of both WSAs, there is no known favorability for sodium or potassium. No map is presented for sodium and potassium.

3. SALEABLE RESOURCES

Saleable resources have been covered in connection with nonmetallic mineral resources.

V. RECOMMENDATIONS FOR ADDITIONAL WORK

1. The New York Butte 15-minute quadrangle has been geologically mapped, but this mapping has not been published (see index to sources of data, Ross, 1967). An effort should be made to get a copy of the map. Some of the mapping was done in 1963, and the remainder perhaps earlier. It probably does not meet today's standards, particularly with respect to mapping of alteration areas.
2. The New York Butte quadrangle and the adjacent part of the Lone Pine quadrangle should be mapped to present U. S. Geological Survey standards.
3. The samples collected during field verification should be assayed. Other than this assaying, there is little that can be done to increase knowledge of the mineral potential of the WSAs, short of complete geological mapping.

VI. REFERENCES AND SELECTED BIBLIOGRAPHY

American Bureau of Metal Statistics Inc., 1982, Non-ferrous metal data - 1981, Park City Press, New York, New York, p. 133-134.

Bateman, P. C., and Irwin, W. P., 1954, Tungsten in southeastern California, in chap. 8 of Jahns, R. H., ed.

Bateman, P. C., 1961, Willard D. Johnson and the strike-slip component of fault movement in the Owens Valley, California, earthquake of 1872: Seismol. Soc. America Bull., v. 51, no. 4, p. 483-493.

Bateman, P. C. and C. Wahrhaftig, 1966, Geology of the Sierra Nevada, in Bailey, E. H. (ed.), Geology of northern California: California Div. Mines and Geology Bull. 190, p. 107-172.

Benson, W. T., 1962, Inyo beryl deposit, Inyo County, California: U. S. Bur. of Mines Report of Investigations RI 6013.

Berry, W.B.N. and A. J. Boucot, 1970, Correlation of the North American silurian rocks, with contributions by J. M. Berdan and others: Geol. Soc. America Spec. Paper 102, p. 1-289.

Carlisle, Donald, Davis, D. L., Kildale, M. B., and Stewart, R. M., 1954, Base metal and iron deposits of southern California, in chap. 8 of Jahns, R. H., ed.: p. 41-50.

Davis, J. F., 1983, Letter dated January 17, 1983 to Reginald Reed, with comments by California Division of Mines personnel on Final Draft of New York Butte and other GRA reports. Copy in GRA File.

Durham, J. W., 1964, Occurrence of the Helicoplacoidea (Echinodermata): Geol. Soc. America Spec. Paper 76, p 52.

Easton, W. H., 1960, Permian corals from Nevada and California: Jour. Paleontology, v. 34, no. 3, p. 570-583.

Goodwin, J. G., 1957, Lead and zinc in California: Calif. Div. Mines, Calif Jour. Mines and Geology, vol. 53, pp 353-724. Tabulation with some description of geology, production, etc.

Goodyear, W. A., 1888, Inyo County (California): California State Mining Bur. 8th Ann. Rept. of State Mineralogist, p. 224-300.

Greife, J. L. and R. L. Langenheim, Jr., 1963, Sponges and Brachiopods from the Middle Ordovician Mazourka Formation, Independence Quadrangle, California: Jour. Paleontology, v. 37, no. 3, p. 564-574.

Hamil, G. S., IV, 1966, Structure and stratigraphy of the Mt. Shader Quadrangle, Nye County, Nevada - Inyo County, California: Ph.D. dissertation Rice Univ. 130p.

Hazzard, J. C., 1937, Paleozoic section in the Nopah and Resting Springs Mountains, Inyo County, California: California Div. Mines and Geology, v. 33, no. 4, p. 273-339.

Hazzard, J. C., 1954, Revision of Devonian and Carboniferous sections, Nopah Range, Inyo County, California: American Assoc. Petroleum Geologists Bull., v. 38, no. 5, p. 878-885.

High Life Helicopters, Inc., 1980, Airborne gamma ray spectrometer and magnetometer survey, Fresno Quadrangle, California, U.S. Dept. of Energy, Open File Report GJBX-231(80).

Jahns, R. H., ed., 1954, Geology of southern California: California Div. Mines Bull. 170.

Kirk, William S., 1980a, Thorium in Mineral Facts and Problems, 1980 ed., U. S. Bureau of Mines, Bull. 671, p. 937-945.

Kirk, William S., 1980b., Thorium in Minerals Yearbook, vol. I, Metals and Minerals, U. S. Bureau of Mines, p. 821-726.

Kirk, William S., 1982, Thorium in Mineral Commodity Summaries - 1982, U. S. Bureau of Mines, p. 160-161.

Knopf, Adolph, 1918, A geologic reconnaissance of the Inyo Range and the eastern slope of the southern Sierra Nevada, California, with a section on the stratigraphy of the Inyo Range by Edwin Kirk: U.S. Geol. Survey Prof. Paper 110, 130 p.

Langenheim, R. L., Jr., and others, 1956, Middle and Upper(?) Ordovician rocks of Independence quadrangle, California: Am. Assoc. Petroleum Geologists Bull., v 40, no. 9, p. 2081-2097.

Langenheim, R. L., Jr., and H. Tischler, 1960, Mississippian and Devonian paleontology and stratigraphy, Quartz Spring area, Inyo County, California: California Univ. Pub. Geol. Sci., v. 38, no. 2, p. 89-150.

Langenheim, R. L. Jr., and E. R. Larson, 1973, Correlation of Great Basin stratigraphic units: Nevada Bureau Mines and Geology Bull. 72, p. 1-36.

Logan, C. A., 1947, Limestone in California: Calif. Div. Mines, Calif. Jour. Mines and Geology, v. 43, pp 175-357.

Mathews, R. A., and Burnett, J. L., 1965, Geologic map of California, Fresno sheet: California Div. of Mines and Geology.

McAllister, J. F., 1952, Rocks and structure of the Quartz Spring area northern Panamint Range, California: California Div. Mines, Special Rept. 25.

McKee, E. H., and R. A. Gangloff, 1969, Stratigraphic distribution of archaeocyathids in the Silver Peak Range and the White and Inyo Mountains, western Nevada and eastern California: Jour. Paleontology, v. 43, no. 3, p. 716-726.

Meek, F. B., 1870, Descriptions of fossils collected by the U. S. Geological Survey under the charge of Clarence King, Esq. Acad. Nat. Sci. Philadelphia, Proc., v. 22, p. 56-64.

Merriam, C. W., 1963, Geology of the Cerro Gordo mining district, Inyo County, California: U.S. Geol. Survey Prof. Paper 408, 83 p. Good stratigraphy for New York Butte quadrangles. Reconnaissance geological map of south half of New York Butte.

Merriam, C. W., and W. E. Hall, 1957, Pennsylvanian and Permian rocks of the southern Inyo Mountains, California: U. S. Geol. Survey Bull. 1061-A, p. 1-15.

Mineral inventory location system, 1982, U. S. Bureau of Mines.

Mining Journal, July 24, 1981, vol. 297, No. 7641.

Minobras, 1978, Uranium deposits of Arizona, California and Nevada.

Moore, J. G., 1963, Geology of the Mount Pinchot quadrangle, southern Sierra Nevada, California: U.S. Geol. Survey Bull. 1130, p. 1-152.

Moore, J. N., 1976, Depositional environments of the Lower Cambrian Poleta Formation and its stratigraphic equivalents, California and Nevada: Geol. Studies Brigham Young Univ., v. 23, no. 2, p. 23-38.

Moore, J. N., 1976, The Lower Cambrian Poleta Formation: A tidally dominated open coastal and carbonate bank depositional complex, western Great Basin: Unpublished Ph.D. dissertation, Univ. California Los Angeles, 312 p.

Muffler, L. J. P., ed. (1979) Assessment of geothermal resources of the United States - 1978: U. S. Geol. Survey Circ. 790.

NOAA/National Oceanic and Atmospheric Administration (1980) Geothermal Resources of California: Map prep. by Nat. Geophys. and Solar-Terrestrial Data Center from data compiled by California Division of Mines and Geology, California Geologic Data Map Series, Map No. 4.

Nelson, C.A., 1962, Lower Cambrian-Precambrian succession, White-Inyo Mountains, California: Geol. Soc. America Bull., v. 73, no. 1, p. 139-144.

- Noble, L. F. and L. A. Wright, 1954, Geology of the central and southern Death Valley Region, California, in R. H. Jahns (ed.), Geology of southern California: California Div. Mines Bull. 170, ch. 2, pt. 10, p 143-160.
- Nolan, T. B., 1943, The Basin and Range province of Utah, Nevada, and California: U.S. Geol. Survey Prof. Paper 197-D, p. 141-196.
- Norman, L. A., Jr., and Stewart, R. M., 1951, Mines and mineral resources of Inyo County (California): California Jour. Mines and Geology, v. 47, no. 1 p. 17-223. Brief descriptions of occurrences and plants of many mines, tabulation with less information about many others.
- North American Aviation, Inc., 1967, authors and title unknown, Technical Report T6-2906-020, report on study of the Cerro Gordo Mining District from August, 1965 through October, 1966 by Strategic Resources Development Group of North American Aviation, Inc. Reference is from Davis, 1983.
- Pakiser, L. C., 1960, Transcurrent faulting and volcanism in Owens Valley, California: Geol. Soc. America Bull., v. 71, no. 1, p. 153-159.
- Page, B. M., 1951, Talc deposits of steatite grade, Inyo County, California: California Div. Mines Spec. Report 8, 35 p.
- Pestana, H. R., 1960, Fossils from the Johnson Spring Formation, Middle Ordovician, Independence quadrangle, California: Jour. Paleontology, v. 34, no. 5, p. 862-873.
- Phleger, F. B., Jr., 1933, Notes on certain Ordovician faunas of the Inyo Mountains, California: Southern California Acad. Sci. Bull., v. 32, p.t 1, p. 1-22.
- Reed, R. D., 1933, Geology of California: American Assoc. Petrol. Geologists, 24:1-355.
- Riggs, E. A., 1961, Fusulinids of the Keeler Canyon Formation, Inyo County, California: Unpublished Ph.D. thesis, Univ. of Illinois.
- Ross, D. C., 1962, Preliminary geologic map of the Independence quadrangle, Inyo County, California: U. S. Geol. Survey Mineral Inv. Field Studies Map MF-254. Preliminary edition of below.
- Ross, D. C. 1963, New Cambrian, Ordovician, and Silurian Formations in the Independence quadrangle, Inyo County, California, in Geological Survey Research 1963: U. S. Geol. Survey Prof. Paper 475-B, p. B74-B85.
- Ross, D. C., 1964, Middle and Lower Ordovician formations in southernmost Nevada and adjacent California: U. S. Geol. Survey, Bull. 1180-C.

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1895

Ross, D. C., 1965, Geology of the Independence quadrangle, Inyo County, California: U. S. Geol. Survey Bull. 1181-0. Good geology, little application to most of New York Butte GRA.

Ross, D. C., 1967, Generalized geologic map of the Inyo Mountains region, California: U. S. Geol. Survey Misc. Geological Investigations Map I-506. Useful for coverage in quadrangles such as New York Butte where no published geology is available. Flawed by lack of land grid or even internal latitude and longitude ticks for location.

Russell, I. C., 1887, Notes on the faults of the Great Basin and of the eastern base of the Sierra Nevada: Philos. Soc. Washington Bull., v. 9, p. 5-8.

Streitz, R., and Stinson, M. C., 1974, Geologic map of California, Death Valley sheet: California Div. of Mines and Geology.

Strong, M. F., 1964, Gem Valley in the Inyo Mountains: Gems and Minerals, No. 317.

Thompson, M. L., H. E. Wheeler, and J. C. Hazzard, 1946, Permian fusulinoids of California: Geol. Soc. America Memoir 17.

Ver Planck, W. E., 1966, Quartzite in California: California Div. Mines and Geology, Bull. 187.

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*X denotes one or more claims per section

New York Butte GRA CA-10

New York Butte GRA CA-10

EXPLANATION

- Mining District, commodity
- △ Mine, commodity
- Land Classification Boundary
- WSA Boundary

EXPLANATION

- Uranium Occurrence
- Land Classification Boundary
- WSA Boundary

EXPLANATION

- Mining District, commodity
- Occurrence, commodity
- Land Classification Boundary
- WSA Boundary

EXPLANATION

- Thermal Spring
- Land Classification Boundary
- WSA Boundary

LEVEL OF CONFIDENCE SCHEME

- 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 QUANTITATIVELY MINIMAL TO SUPPORT TO 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.

 

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.

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**MAJOR STRATIGRAPHIC AND TIME DIVISIONS IN USE BY THE
U.S. GEOLOGICAL SURVEY**

Erathem or Era	System or Period		Series or Epoch	Estimated ages of time boundaries in millions of years
Cenozoic	Quaternary		Holocene	
			Pleistocene	2-3 ¹
	Tertiary		Pliocene	12 ¹
			Miocene	26 ²
			Oligocene	37-38
			Eocene	53-54
			Paleocene	65
Mesozoic	Cretaceous *	Upper (Late) Lower (Early)	136	
	Jurassic	Upper (Late) Middle (Middle) Lower (Early)	190-195	
Paleozoic	Carboniferous Systems	Permian *	Upper (Late) Lower (Early)	225
				280
		Pennsylvanian *	Upper (Late) Middle (Middle) Lower (Early)	
	Mississippian *	Upper (Late) Lower (Early)	345	
	Devonian	Upper (Late) Middle (Middle) Lower (Early)	395	
	Silurian *	Upper (Late) Middle (Middle) Lower (Early)	430-440	
Ordovician *	Upper (Late) Middle (Middle) Lower (Early)	500		
Cambrian *	Upper (Late) Middle (Middle) Lower (Early)	570		
Precambrian *			Informal subdivisions such as upper, middle, and lower, or upper and lower, or younger and older may be used locally.	3,600 + ³

¹ Holm, Arthur, 1965, Principles of physical geology, 2d ed., New York, Ronald Press, p. 360-361, for the Pleistocene and Pliocene, and Obradovich, J. D., 1965, Age of marine Pleistocene of California: Am. Assoc. Petroleum Geologists, v. 49, no. 7, p. 1987, for the Pleistocene of southern California.

² Geological Society of London, 1964, The Phanerozoic time-scale: a symposium: Geol. Soc. London, Quart. Jour., v. 120, suppl., p. 260-262, for the Miocene through the Cambrian.

³ Stern, T. W., written commun., 1968, for the Precambrian.

⁴ Includes provincial series accepted for use in U.S. Geological Survey reports.

Terms designating time are in parentheses. Informal time terms early, middle, and late may be used for the eras, and for periods where there is no formal subdivision into Early, Middle, and Late, and for epochs. Informal rock terms lower, middle, and upper may be used where there is no formal subdivision of a system or of a series.