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# IMPORTANT ROCK UNITS OF NORTHEASTERN OREGON

By
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## Introduction

The rock units described in this report, and shown on the accompanying map, represent the dominant types of material comprising the bedrock in northeastern Oregon. Since the map units are based largely on lithology, their age relationships are treated very broadly. Three time units are recognized. These are pre-Tertiary, Tertiary, and Pleistocene to Recent. The distinction between Tertiary and pre-Tertiary rocks is considered to be of special importance; hence all known outcrops of pre-Tertiary rocks are shown on the map (p. 65).

## Pre-Tertiary Rocks

### Metamorphosed sedimentary and igneous rocks

The rocks of this group include a thick and varied series of marine sediments, minor amounts of other sediments which may have been deposited in fresh or brackish waters, lavas, volcanic tuffs, and igneous intrusives, principally gabbro. The intrusive occurrences, although fairly numerous, are too small to be shown on a map of this scale.

All of these rocks have been subjected to the tremendous pressures and distortions that characterize some types of mountain building, and most of them display varying amounts of both regional and contact metamorphism. As a consequence the sedimentary formations are so profoundly folded and faulted that the fossil evidence needed for determining their age has been largely obliterated. Such fossil evidence as has been found, however, shows that the bulk of the sediments and their associated volcanics were formed during the Permian and Triassic periods. There is meager evidence that some Jurassic and pre-Permian Paleozoic sediments may also be present. All of the associated intrusives have been dated as pre-Cretaceous and most of them early Mesozoic. Considering their small size and wide distribution, it is probable that intrusion of individual occurrences took place at many different times.

### Diorite and related intrusives

Rocks of this group are commonly called "granites" but from a technical standpoint they are not true granites. They comprise several closely related crystalline types known as tonalites, diorites, granodiorites, and quartz diorites. For the most part these rocks formed at depth by cooling of magma which intruded the country rock. Some of them, however, are believed to be the result of granitization (recrystallization of existing rocks). Contact pegmatites and tactites are frequently found around the margins of the intrusions.

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Most of the crystalline rocks of the area originated some time during the Cretaceous period. Those in the Elkhorn range, west of Baker, are known to be of early Cretaceous age. All of the pre-Tertiary rocks of the region underwent folding, faulting, and erosion late in the Cretaceous period, so that by the beginning of Tertiary time mountain ranges composed of these rocks existed in parts of the map region.

## Tertiary Rocks

### Rhyolite and related volcanics

Rocks of this group are chiefly lavas, tuffs, tuff breccias, and agglomerates with compositions that are predominantly acidic. The lavas include rhyolites, dacites, andesites, and their related porphyries. Some of the clastic volcanic rocks are waterlaid. Some interbeds of basalt and lake-bed sediments also occur with the rocks of this group. Where these basalts and sediments are extensive enough to be separately mapped, they are included in other lithologic units on the accompanying map and described later in this report.

Many of the individual rock members of this group appear fresh and glassy. Others, particularly the tuffs, show the effects of weathering and devitrification, and some are locally altered by hot spring activity. Tilting and brecciation and greater-than-normal fracturing are characteristic of the rocks of this group. As a whole, they show a greater amount of structural shattering than do the later basalts and lake beds.

The rhyolites and related volcanic rocks range in age from Eocene to Miocene. The celebrated Clarno and John Day formations make up the bulk of the mapped occurrences shown in the western portion of the area.

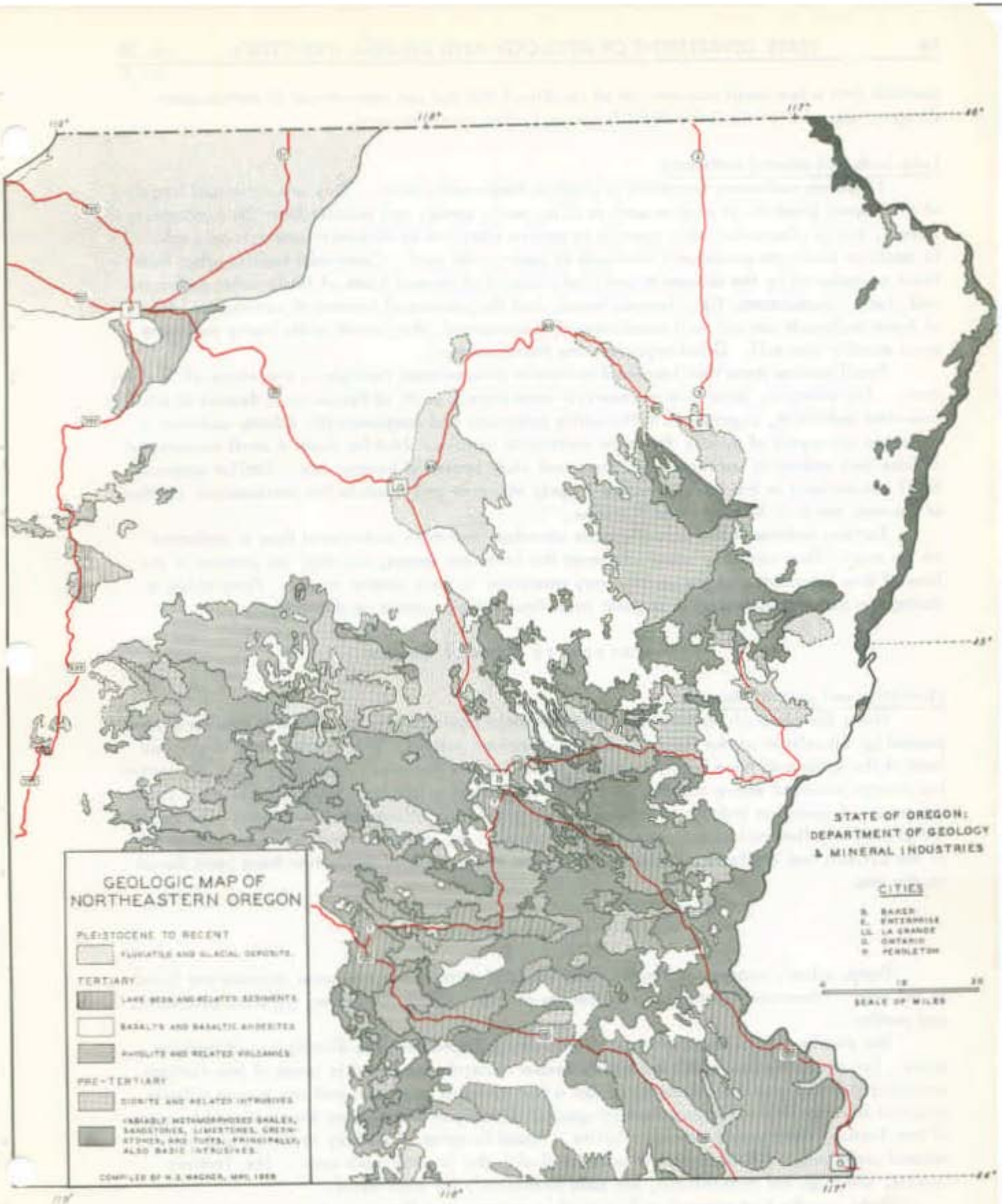
### Basalts and basaltic andesites

Basaltic lavas are perhaps the most impressive and distinctive type of rock in the area and certainly the most widespread. These rocks occur in three ways: first, as a tremendously thick series of lava flows; second, as isolated occurrences involving only two or three flows and sometimes only a single flow; and third, as dikes representing channels from which the surface flows originated. Of these modes of occurrence the thick series of flows is by far the most prevalent and the dikes the least.

The thick series of flows is part of the great northwestern shield known as the Columbia River lavas. The formation blankets large portions of Washington, Oregon, and Idaho and is one of the major examples of lava flooding in the world. This shield is represented in northeastern Oregon by the basalts shown in the northern and western portions of the map. Generally speaking, the shield feathers out against the Blue Mountains, some of the higher portions of which were probably never completely buried under lava. The aggregate thickness of the shield amounts to several thousands of feet. The lowest flows exposed in the map area are in the extreme northwest corner along the bank of the Columbia River, while the upper flows of the series occur on some of the highest portions of the mountain ranges situated to the south and east of Pendleton. In addition, the base of the series is not known to have been penetrated by any well yet drilled in the portion of the Columbia Basin occurring within the mapped area. Other striking examples of the enormous thickness of the series are to be seen in the canyons of the Snake and Imnaha rivers east of Enterprise.

In the southeastern section of the map area the flows are much less numerous and give rise to "table tops" capping softer rock.

The basalts range in age from Eocene to Pleistocene. Some of those northwest of Ontario are dated as Plio-Pleistocene in age, whereas others in the same area are recognized as Pliocene and Mio-Pliocene. The great plateau basalt series (Columbia River basalt) is generally accepted as predominantly Miocene.. Some basalts are known to have been extruded in central Oregon during the Eocene in association with the other members of the Clarno formation. It is


GEOLOGIC MAP OF
NORTHEASTERN OREGON
PLEISTOCENE TO RECENT
FLUVIATILE AND GLACIAL DEPOSITS
TERTIARY
LAKE BEDS AND RELATED SEDIMENTS
BASALTS AND BASALTIC ANDESITES
RHYOLITE AND RELATED VOLCANICS
PRE-TERTIARY
DIORITE AND RELATED INTRUSIVES
UNDIVIDED METAMORPHOSED SHALES, SANDSTONES, LIMESTONES, GREENSTONES, AND TUFFS, PRINCIPALLY; ALSO BASIC INTRUSIVES.
COMPILED BY N.S. WAGNER, APR. 1958
STATE OF OREGON:
DEPARTMENT OF GEOLOGY
& MINERAL INDUSTRIES
CITIES
B. BAKER
E. ENTERPRISE
LG. LA GRANDE
O. ONTARIO
P. PENDLETON
SCALE OF MILES

possible that a few small occurrences of basalts of this age are represented in northeastern Oregon, especially where the rhyolite group is abundantly present.

Lake beds and related sediments

These are sediments deposited in shallow fresh-water lakes. They are composed largely of the normal products of erosion such as silts, muds, sands, and pebbles from the surrounding terrain, but in places they also contain extensive interbeds of diatomite and volcanic ash. In addition there are occasional interbeds of poor-grade coal. Contained fossils, other than those represented by the diatomite and coal, consist of several kinds of fresh-water gastropods and clams, crustaceans, fish, leaves, wood, and the remains of terrestrial vertebrates. Most of these sediments are not well consolidated; consequently they erode quite easily and some slack readily into soil. Good exposures are therefore rare.

Fossil studies show that lake-bed sediments accumulated throughout the whole of Tertiary time. For example, near McKay reservoir immediately south of Pendleton a deposit of shallow lake-bed sediments, together with fluviatile sediments and fanglomeratic rubble, contains a veritable graveyard of middle Pliocene vertebrate remains. Not far south a small occurrence of lake-bed sediments contains fossil ferns and other leaves of Eocene age. Similar scattered fossil occurrences in the Baker area are largely Miocene and those in the southeastern portion of the map are both Miocene and Pliocene.

Tertiary sediments are actually more abundant and more widespread than is indicated on the map. They probably occur wherever the lavas are shown, but they are present in the form of thin interbeds and are usually very restricted in their lateral extent. Their value in dating the associated volcanics is great even though they cannot be shown here.

## Pleistocene to Recent Rocks

Fluviatile and glacial deposits

Since the close of Tertiary time, the dominant geologic process has been erosion accompanied by deposition on the floors of the larger stream valleys. It is perhaps safe to say that most of the sediments have been carried to points outside the area. However, local deposition has always occurred where streams have been confronted with a temporary base-level. Such deposition is going on today to a limited extent and will continue into the future. The deposits are principally fluviatile sands, gravels, and clays in the major valleys, and glacial moraines in the Elkhorn and Wallowa mountains. Only the major areas of deposition have been shown on the map.

## Mineral Deposits

Gold, silver, copper, and many other kinds of metalliferous mineral deposits are found in the area. Nonmetallic mineral occurrences of note include limestone, gypsum, diatomite, and perlite.

The distribution of these minerals is definitely linked with the distribution of bedrock types. For example, nearly all the metalliferous minerals are found in areas of pre-Tertiary metamorphics and granites. Exceptions are a few cinnabar prospects and one known stibnite prospect in rocks of the Tertiary rhyolite group. Limestone and gypsum are restricted to areas of pre-Tertiary metamorphic rocks. Perlite is found in areas of Tertiary rhyolites and their related sediments. All diatomite is associated with the Tertiary lake beds. The Tertiary basalts, although not mineralized, are used extensively for road metal.

Gold was the first mineral to be mined in northeastern Oregon. Its production began in Griffith Gulch, a few miles west of Baker, in 1861. From then until the mines were closed by a so-called "defense" order issued at the commencement of United States participation in

World War II, gold mining constituted the most important mining activity in the area. The area has produced an estimated two-thirds of the State's total gold production, which according to the U.S. Bureau of Mines (Minerals Year Book for 1943) amounted to 5,668,118 ounces for the period 1848 through 1943. Practically all the gold mines are inactive today. This is due to the fact that gold is still priced at its pre-Pearl-Harbor level. Under these circumstances, there are very few gold mines that can be operated successfully even though their productive capacities are still essentially as good as they were during the pre-war period. The condition of enforced idleness will doubtless continue until such time as the economic dilemma is resolved.

Limestone is being quarried at four places. Three of these are in Baker County; the other is in Wallowa County. The rock produced from these operations is being used for sugar refining, paper processing, and the manufacture of cement and carbide. Production for cement manufacture has been going on since the 1920's but production for all the other uses comes from operations which have been established since 1950.

Sand and gravel deposits, although not mineral resources in the same sense of the word as gold and limestone, show a yearly production that is high in both amount and value. Furthermore, the availability of sand and gravel suitable for aggregate use is of great importance to the communities in which they occur. The Pleistocene to Recent deposits in the Columbia River basin area northwest of Pendleton and along the Snake River in the vicinity of Ontario support some important aggregate-producing operations.

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## MINERAL BILLS IN CONGRESS

As Congress is looking forward to adjournment sometime in August, action on several bills that may furnish assistance to domestic mineral producers is being speeded up. Prospects for passage of the bills into law are unknown. Of interest to mineral producers in Oregon are the following:

S. 4036 - the Domestic Minerals Stabilization Plan introduced by Senator James E. Murray of Montana. This bill provides price supports for lead, zinc, tungsten, and acid grade fluorspar, and a purchase program for 150,000 tons of refined copper. The bill, which has passed the Senate, has been reported out of the House Interior Subcommittee for consideration on the House floor. The House Subcommittee cut out that portion of the Senate-passed bill allowing the Secretary of the Interior to borrow from the Treasury to finance the five-year price support program in favor of financing through annual appropriations from Congress. Added to the Senate bill by the House Subcommittee was a section to provide incentive payments for chromite, beryl, and columbium-tantalum. For chrome, the bill calls for Federal purchase of $46 per ton with a yearly maximum of 50,000 long dry tons over a period of 5 years.

S. 4146 - the Incentive Payment Plan introduced by Senator James E. Murray of Montana. Title 1 of the bill provides for production incentive payments for beryl, metallurgical chromite, columbium-tantalum concentrates, metallurgical manganese, mercury, antimony, cobalt, and metallurgical-grade fluorspar. Title 2 of the bill directs the Office of Defense and Civilian Mobilization to initiate and execute a program for upgrading chromite and manganese ores now in the stockpile. Upgrading is defined as the conversion of these materials "to a state of immediate usefulness to defense essential industry." Contracts for the upgrading of the ores are to be negotiated through normal commercial channels. The proposed incentive payments for chromite and mercury production are given as follows:

> "For commercial grade, metallurgical chromite, $1 per long dry ton unit, for not to exceed an aggregate of four million six hundred thousand long dry ton units annually. No incentive payment shall be made in any calendar year on a quantity in excess of six hundred and ninety thousand long dry ton units produced by any one producer and originating in any one mining district from properties controlled by such producer.
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> "For mercury, $50 per flask (a 'flask' meaning a steel container holding 76 pounds of prime virgin mercury 99.95 per centum pure or better), for not to exceed an aggregate of thirty-three thousand flasks annually. No incentive payments shall be made in any calendar year on a quantity in excess of two thousand flasks produced by any one producer and originating in any one mining district from properties controlled by such producer."

Senator Richard L. Neuberger (Oregon) informed the Department July 22 that this bill was favorably reported from the Senate Interior Committee for action by the Senate. Senator Neuberger's office reported that they were hopeful of early Senate action.

H.R. 13280 - the Domestic Minerals Exploration Stabilization Plan introduced by Congressman Clair Engle of California. This bill, referred to by Engle as a "one package" bill, would combine Secretary Seaton's stabilization and copper stockpiling plan as approved by the Senate, give extension to a DMEA type exploration program, provide for production bonus payments on beryl and columbium-tantalum, and establish government purchase of ferrochrome produced from a domestic chrome ore producers cooperative association. This bill has been considered by the House Subcommittee on Mines and Minerals and reported to the House Interior and Insular Affairs Committee. The provisions for chrome and the ferrochrome plant were struck from the bill.

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## ANNUAL ASSESSMENT DATE MAY CHANGE

Senator Church (Idaho) has prepared a bill that would change the traditional deadline for annual assessment work on unpatented mining claims. The bill, S. 3199, originally contained a moratorium on assessment work for the assessment year 1958-59. Congressman Al Ullman (2nd District, Oregon) has written the Department on this bill as follows:

> "I know you will be pleased to learn that the House Interior Committee Mines and Mining Subcommittee, of which I am a member, yesterday (June 26) approved similar legislation (to Senator Church's bill, S. 3199). Under the terms of the amended legislation the assessment date will be moved to September 1, although this change will not go into effect until next year (1959). The moratorium provision was not approved and it is highly doubtful that any legislation which is enacted into law will contain a moratorium provision."

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## PERMANENT EXPLORATION LOAN PROGRAM TO BE ESTABLISHED

A bill to establish a domestic minerals exploration loan program similar to the Defense Minerals Exploration Administration program, which expired June 30, is showing good indications of becoming law before this session of Congress adjourns. This bill would authorize the Secretary of Interior to establish an exploration program for such minerals, excluding organic fuels, as he may designate and provide for Federal financial assistance as is deemed in the national interest on a participating basis to private industry. Other provisions would (1) limit Government participation in any single contract to not more than $250,000; (2) require inclusion in each contract of terms and conditions for the repayment of Federal funds with interest thereon as a royalty on the value of the production from the area described in the contract; (3) require that interest at average Treasury rates, plus 2 percent to cover administrative costs, be calculated from the date the funds are made available to the private contractor; and (4) require applicants to furnish evidence that funds from commercial sources are unavailable on reasonable terms. "Exploration" would be defined as "the search for new or unexplored deposits of minerals, including related development work . . . whether conducted from the surface or underground, using recognized and sound procedures including standard geophysical and geochemical methods for obtaining mineralogical and geological information."

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## DMEA LOAN GRANTED TO OREGON MINE

The Spokane field office of the Defense Minerals Exploration Administration announced earlier this month that three new mine exploration contracts had been granted, one each to properties in Oregon, Idaho, and Montana. Cost of the three projects will total an estimated $101,114 and government financial participation will amount to $58,707, the announcement showed. The Oregon contract is in the amount of $15,624 to the Moneta-Porcupine Mines, Ltd., for mercury exploration at the Elkhead mine in Douglas County. Cost sharing is on a fifty-fifty basis. The Idaho project was for cobalt at the Long Dike property in Lemhi County. The Montana project was for monazite-columbium-tantalum in the Sand Basin placer area of Granite County.

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## LATE NEWS ON STATUS OF LEGISLATION

The Department received the following telegram from Congressman Al Ullman on the status of the mineral legislation in Congress as of July 24.

JULY 24

HOLLIS M. DOLE, DIRECTOR
DEPT. OF GEOLOGY AND MINERAL INDUSTRIES STATE OF OREGON
1069 STATE OFFICE BLDG.

S. 3199 - (Change of Assessment Date) AWAITING FULL HOUSE CONSIDERATION.

S. 3817 - (Exploration Loan Program) PASSED BY HOUSE INTERIOR COMMITTEE TODAY. FLOOR CONSIDERATION NEXT WEEK.

S. 4036 - (Domestic Minerals Stabilization Plan) PASSED BY HOUSE MINING SUBCOMMITTEE, FULL COMMITTEE ACTION EXPECTED NEXT WEEK. BILL CONTAINS $46 PER LDT INCENTIVE PAYMENT, 50,000 LDT ANNUALLY FOR FIVE YEARS. STRONG OPPOSITION ON FLOOR EXPECTED.

H.R. 13280 - (House "One Package" Plan) TABLED, AS CHROME PROVISION INCORPORATED IN S. 4036.

AL ULLMAN, MEMBER OF CONGRESS

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## TURKISH CHROME COOPERATIVE TO FORM

Some chrome ore producers in Turkey are getting together in a cooperative of which Eti Bank, the government mining bank, holds 25%. The object is to develop and finance chrome ore mines. So far 8-million Turkish lira, about $2.7-million at the official exchange rate, has been subscribed. Some feel this is a significant amount for Turkey and that more systematic development may result and that transport to railroads, a great difficulty in Turkey, may be aided. ( From E&MJ Metal & Mineral Markets, June 19, 1958.)

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## WITHDRAWAL OF PUBLIC LANDS PROPOSED

The U.S. Bureau of Land Management, Portland, Oregon, has notified the Department of a proposed withdrawal of 6,020 acres in an area common to the Gilliam-Morrow-Umatilla county border. The proposed withdrawal is for the Corps of Engineers, U.S. Army, and is related to the John Day dam project on the Columbia River. The Bureau notes that the withdrawal of the land is subject to valid existing rights and, if consummated, would prevent all forms of appropriation including grazing leases or permits, mineral leases, and location of mining claims. Persons wishing to submit comments, suggestions, or objections in connection with the proposed withdrawal may present their views in writing to the Bureau of Land Management, Department of the Interior, 809 N.E. 6th Avenue, Portland 12, Oregon. All comments should be in by the middle of August.

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## GOLD MINERS LOSE L-208 CASE

Gold mine owners required by the Government to shut down operations during World War II lost their last chance to be compensated for the losses they suffered when the U. S. Supreme Court recently reversed, 7 to 2, a 1956 Court of Claims decision that six companies were entitled to compensation.

The case stemmed from War Production Board Order L-208, issued in 1942, which required closing of gold mines deemed nonessential to the war effort, with the object of conserving scarce equipment and materials and encouraging the voluntary relocation of skilled miners to the more vital copper mining industry.

In appealing for reversal of the Court of Claims decision, the Justice Department said that similar claims could boost the Government's total liability to more than $40 million. The Supreme Court majority opinion said that the "damage to the mine owners was incidental to the Government's lawful regulation of matters reasonably deemed essential to the war effort."

(From Mining Congress Journal, July 1958.)

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## BAKER COUNTY MINING NEWS

The Evening Star Consolidated group of lode gold claims is now owned by Mr. Francis Murphy, Oak Run, California. The property consists of three patented and two unpatented claims and is located near the head of Gimlet Creek in the Greenhorn area of Baker County. Mr. Murphy, in association with Richard E. Bixley, Carmel, California, plans to reopen some of the old workings and do some new exploratory development this year. Some equipment has already been moved to the property.

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## PHILIPPINES SUBSIDIZE GOLD PRODUCTION

The July 14 issue of Barron's, a national financial weekly, contains an article describing the operation of Benguet Consolidated, Inc., a Philippine mining organization. The article notes that Benguet would not be able to operate profitably without benefit of the substantial subsidy granted Philippine gold producers by that country's government. Under the program, according to Barron's, gold producers are permitted to offer their bullion to sale on the open market for the equivalent in pesos of $60 to $65 per ounce. The purchasers can then sell the bullion for dollars to the Central Bank at the statutory price of $35 per ounce. The situation reflects the depreciation of the Philippine peso. Costs of production of Benguet's operation are given as $49.50 per ounce, with overall costs (including depreciation and depletion) as $56.50 an ounce.

United States gold miners not only face higher labor and material costs than foreign producers but they are deprived of the opportunity to sell on the open market as foreign miners are able to do. Add to this currency manipulations by foreign countries and it is little wonder that domestic mining is in the doldrums.

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