

State Department of Geology and Mineral Industries

702 Woodlark Building
Portland 5, Oregon

Preliminary Report on McCaleb Chromite, Sourdough Flat Area

Curry County
Chetco District

Owner: R. E. McCaleb, Selma, Oregon.

1. Sourdough No. 1

Location: NW $\frac{1}{4}$ sec. 12, T. 38 S., R. 10 W., elevation 3650 feet.

This claim consists of an open cut, 20 by 40 feet, located just above the end of the first road (1/8 mile) to the right, 100 yards after entering Curry County by way of the Forest Service road up Rancherie Creek. The area is inaccessible during the winter and early spring due to snow and rain.

A 3-foot wide, nearly vertical band of dunite with disseminated chromite which trends N. 35° E. was exposed in the cut. The surrounding rock is a weathered, tan colored peridotite in which small crystals of talc are common.

Work had not proceeded beyond surface weathering. The maximum depth at the upper end of the cut was 10 feet. A 3-foot channel sample taken across the mineralized zone ran 14.59 percent Cr₂O₃ and 8.31 percent Fe (P-13491).

2. Sourdough No. 2

Location: NWSW $\frac{1}{4}$ sec. 12, T. 38 S., R. 10 W., elevation 3250 feet.

The mine consisted of a fairly large open cut just below Sourdough Flat near the head of a small tributary of Slide Creek. Ore was being hauled, on temporary basis, to Bowser's mill located at the Peck mine (sec. 14, T. 38 S., R. 10 W.). Previously ore had been taken to the Hayes mill near the mouth of Rancherie Creek. McCaleb stated that he intended to purchase the Bowser mill and construct a mill on the flat near the location of his camp, SW/NW sec. 12, T. 38 S., R. 10 W.

The ore being mined was largely a low-grade disseminated variety. It was taken from a stringer of chromite at the face of the upper bench nearly 100 feet long and varying from a few inches to 4 feet in width (see sketch map). Mining was being done with the aid of a bulldozer and small wheel tractor with a scoop attachment. Some chromite was also exposed in the old workings, an open cut above the upper bench.

From its broken appearance, the area must have suffered landsliding or surface creep. The rock is predominantly serpentine.

A composite sample of chromite taken at various points along the main stringer of chromite assayed 30.70 percent Cr₂O₃ and 10.75 percent Fe. The ore was being concentrated to around 50 percent Cr₂O₃ with a good chrome:iron ratio.

3. Uncle Sam Claim

Location: NESE $\frac{1}{4}$ sec. 11, T. 38 S., R. 10 W., 150 yards west of Sour-dough Creek at about 3425 feet elevation.

Little time was spent at the claim and it was not mapped at this time. The workings consisted of a caved tunnel and an open cut just north of it. A sample from the ore pile of the cut assayed 34.84 percent Cr₂O₃ and 15.85 percent Fe. The ore is granular and disseminated in talc. According to McCaleb, it falls slightly under the required 42 percent - 2 to 1 requirements when concentrated. Therefore, in order to be marketed it would have to be mixed with higher grade ore. The claim was not being worked.

4. Lost-is-Found Claim

Location: SE $\frac{1}{4}$ sec. 11, T. 38 S., R. 10 W., about 300 yards south of the Uncle Sam claim.

This claim was visited hurriedly also. No work was being done at the time. A caved tunnel has been partly cleaned out and considerable bulldozer work has been done on the slopes just below the tunnel for over 100 yards distance. At the end of a narrow road which follows approximately the 3150 contour, below the bulldozed area, to the northeast for approximately 200 yards, there is a small cut exposing a little chromite. The chromite consisted of a narrow stringer just under a fault which strikes N. 15° W. and dips 43° west. A picked sample from the ore stringer assayed 31.52 percent Cr₂O₃ and 12.75 percent Fe.

Visited: October 2 & 3, 1952.
Informant: R. E. McCaleb
Report by: L. R.

SOURDOUGH CHROME MINE

Chetco area

J. K. Remsen has four men under Ben Baker working the Sourdough chrome mine, on Baldface Creek, in Curry County. Remsen's first shipments amounted to 66 tons of low-iron ore running about 45 percent Cr_2O_3 which was shipped to the Metals Reserve depot at Grants Pass. He expects to produce a higher grade ore. This property was formerly owned and operated by Rustless Mining Corp.

.....from the Engineering and Mining Journal,
September 1944.

Baker reported (3-1947) that he put down a 35-foot incline on an outcrop at the upper workings, with a drift to the north, 100 feet long from a station at the foot of the raise. Baker estimated that he shipped approximately \$5000 worth of ore.

..... From letter dated March 30, 1947
to R.S.M.

RECORD IDENTIFICATION

RECORD NO..... M061569
RECORD TYPE..... X1M
COUNTRY/ORGANIZATION. USGS
DEPOSIT NO..... DDGR1 93-11
MAP CODE NO. OF REC..

REPORTER

NAME..... JOHNSON, MAUREEN G.
DATE..... 76 05
UPDATED..... 81 03
BY..... FERNS, MARK L. (BROOKS, HOWARD C.)

NAME AND LOCATION

DEPOSIT NAME..... MC CALEB MINE
SYNONYM NAME..... SOURDOUGH NO. 2

COUNTRY CODE..... US
COUNTRY NAME: UNITED STATES

STATE CODE..... OR
STATE NAME: OREGON

COUNTY..... CURRY
DRAINAGE AREA..... 17100312 PACIFIC NORTHWEST
PHYSIOGRAPHIC PROV..... 13 KLAMATH MOUNTAINS

QUAD SCALE QUAD NO OR NAME
1: 62500 PEARSOLL PEAK

LATITUDE LONGITUDE
42-16-42N 123-50-06W

UTM NORTHING UTM EASTING UTM ZONE NO
4680820. 431150. +10

TWP..... 38S
RANGE..... 10W
SECTION.. 11 12
MERIDIAN. W.M.

ALTITUDE.. 3280 FT

POSITION FROM NEAREST PROMINENT LOCALITY: 2 MILES SOUTH PEARSOLL PEAK

COMMODITY INFORMATION

COMMODITIES PRESENT..... CR PT PD RH

COMMODITY SPECIALIST INFORMATION:
 PGM OCCUR

ORE MATERIALS (MINERALS, ROCKS, ETC.):
 CHROMITE

ANALYTICAL DATA (GENERAL)

COMPOSITE SAMPLE ASSAYED 30.70% CR₂O₃, 10.75% FE, BULK OF ORE PROBABLY LESS; CONCENTRATES ASSAYED ABOUT 50% CR₂O₃ WITH A 2.5:1 CR:FE RATIO; PT 0.019 PPM, PD 0.011 PPM, RH 0.011 PPM

EXPLORATION AND DEVELOPMENT
 STATUS OF EXPLOR. OR DEV. B

DESCRIPTION OF DEPOSIT

DEPOSIT TYPES:

DISSEMINATED; MASSIVE CHROMITE

FORM/SHAPE OF DEPOSIT: LINEAR BANDS, LENSES BANDS, LENSES

SIZE/DIRECTIONAL DATA

SIZE OF DEPOSIT..... SMALL
 MAX LENGTH..... 200 FT.
 MAX WIDTH..... 8 FT.
 STRIKE OF OREBODY.... NORTHEAST
 DIP OF OREBODY..... 45-65

COMMENTS (DESCRIPTION OF DEPOSIT):
 ORE IN ZONE OF DUNITE

DESCRIPTION OF WORKINGS
 SURFACE

PRODUCTION

YES
 MEDIUM PRODUCTION

CUMULATIVE PRODUCTION (ORE, COMMOD., CONC., OVERBUR.)

ITEM	ACC	AMOUNT	THOUS. UNITS	YEAR	GRADE, REMARKS
15 ORE EST		2.240	TONS	1951-1958	43% CR ₂ O ₃ AND 51% CR ₂ O ₃ TO 54% CR ₂ O ₃ CONC.
21 TOTAL		2.240	TONS	52.98	% CR ₂ O ₃ (WEIGHTED AVERAGE GRADE)

PRODUCTION COMMENTS..... LARGEST PRODUCER OF LOW-GRADE CHROMITE

GEOLOGY AND MINERALOGY

IGNEOUS ROCK TYPES..... DUNITE

LOCAL GEOLOGY

SIGNIFICANT LOCAL STRUCTURES:
HIGH ANGLE FAULTING & LANDSLIDES

GENERAL COMMENTS

RECORD NUMBER (M013616) HAS BEEN MERGED WITH THIS RECORD AND DELETED FROM THE OREGON FILE.

GENERAL REFERENCES

- 1) RAMP, LEN, 1961, CHROMITE IN SOUTHWESTERN OREGON: OREGON DEPT. GEOLOGY AND MINERAL IND. BULL. 52, 169 P.
- 2) THAYER, T. P., 1974, UNPUBL. DATA
- 3) PAGE, N.J, JOHNSON, M.G., HAFFTY, JOSEPH, AND RAMP, LEN, 1975, OCCURRENCE OF PLATINUM GROUP METALS IN ULTRAMAFIC ROCKS OF THE MEDFORD-COOS BAY 2 DEGREE QUADRANGLE, SOUTHWESTERN OREGON: U.S. GEOL. SURVEY MISC. FIELD STUDIES MAP MF-694
- 4) RAMP, L. AND OTHERS, 1977, GEOLOGY, MINERAL RESOURCES AND ROCK MATERIAL OF CURRY COUNTY, OREGON; ODGMI BULL. 9 P.31

RECORD IDENTIFICATION

RECORD NO..... M013622
RECORD TYPE..... X1M
COUNTRY/ORGANIZATION. USGS
FILE LINK ID..... CONSV
MAP CODE NO. OF REC..

REPORTER

NAME..... LEE, W
DATE..... 74 01

NAME AND LOCATION

DEPOSIT NAME..... MCCAILEB'S SOURDOUGH NO. 1

MINING DISTRICT/AREA/SUBDIST. PEARSOLL PEAK

COUNTRY CODE..... US
COUNTRY NAME: UNITED STATES

Chetco

STATE CODE..... OR
STATE NAME: OREGON

COUNTY..... CURRY

QUAD SCALE QUAD NO OR NAME
1: PEARSOLL PEAK

LATITUDE LONGITUDE
42-16-55N 123-50-04W

UTM NORTHING UTM EASTING UTM ZONE NO
4681200. 431200. +10

TWP..... 38S
RANGE..... 10W
SECTION.. 12
MERIDIAN. W.M.

POSITION FROM NEAREST PROMINENT LOCALITY: W1/2 NW1/4

COMMODITY INFORMATION

COMMODITIES PRESENT..... CR

ORE MATERIALS (MINERALS, ROCKS, ETC.):
CHROMITE

EXPLORATION AND DEVELOPMENT

STATUS OF EXPLORATION AND DEVELOPMENT

RECORD IDENTIFICATION

RECORD NO..... M061570
 RECORD TYPE..... X1M
 COUNTRY/ORGANIZATION. USGS
 DEPOSIT NO..... DDGMI 93-10
 MAP CODE NO. OF REC..

REPORTER

UPDATED..... 81 03
 BY..... FERNS, MARK L. (BROOKS, HOWARD C.)

NAME AND LOCATION

DEPOSIT NAME..... SOURDOUGH NO. 1

COUNTRY CODE..... US
 COUNTRY NAME: UNITED STATES

STATE CODE..... OR
 STATE NAME: OREGON

COUNTY..... CURRY
 DRAINAGE AREA..... 17100312 PACIFIC NORTHWEST
 PHYSIOGRAPHIC PROV..... 13 KLAMATH MOUNTAINS
 LAND CLASSIFICATION..... 41

QUAD SCALE QUAD NO OR NAME
 1: 62500 PEARSELL PEAK

LATITUDE LONGITUDE
 42-16-55N 123-50-04W

UTM NORTHING UTM EASTING UTM ZONE NO
 4681200. 431200. +10

TWP..... 0385
 RANGE..... 010W
 SECTION.. 12
 MERIDIAN. W.M.

ALTITUDE.. 3620

COMMODITY INFORMATION

COMMODITIES PRESENT..... CR

OCCURRENCE(S) OR POTENTIAL PRODUCT(S):
 POTENTIAL.....
 OCCURRENCE..... CR

ANALYTICAL DATA(GENERAL)

3-FOOT CHANNEL SAMPLE ASSAYED 14.59% CR2O3, 8.31% FE - IS 14% CR ATY%?

EXPLORATION AND DEVELOPMENT

STATUS OF EXPLOR. OR DEV. 1

DESCRIPTION OF DEPOSIT

DEPOSIT TYPES:

DISSEMINATED

FORM/SHAPE OF DEPOSIT:

SIZE/DIRECTIONAL DATA

SIZE OF DEPOSIT.....	SMALL	
MAX WIDTH.....	3	FT
STRIKE OF OREBODY....	N 35 E	
DIP OF OREBODY.....	VERTICAL	

DESCRIPTION OF WORKINGS

SURFACE

PRODUCTION

NO PRODUCTION

GEOLOGY AND MINERALOGY

AGE OF HOST ROCKS.....	JUR
HOST ROCK TYPES.....	PERIDOTITE
IGNEOUS ROCK TYPES.....	DUNITE BAND
PERTINENT MINERALOGY.....	TALC CRYSTALS
IMPORTANT ORE CONTROL/LOCUS..	ORE IN 3 FT. DUNITE BAND

GENERAL COMMENTS

RECORD NUMBER (M013622) HAS BEEN MERGED WITH THIS RECORD AND DELETED FROM THE OREGON FILE.

GENERAL REFERENCES

- 1) RAMP, LEN, 1951, CHROMITE IN SOUTHWESTERN OREGON: OREGON DEPT. GEOLOGY AND MINERAL IND. BULL. 52, 169 P.
- 2) RAMP, L. AND OTHERS, 1977, GEOLOGY, MINERAL RESOURCES AND ROCK MATERIAL OF CURRY COUNTY, OREGON; ODCMI BULL. 93 79. P

RECORD IDENTIFICATION

RECORD NO..... M060684
 RECORD TYPE..... XIM
 COUNTRY/ORGANIZATION. USGS
 DEPOSIT NO..... DDGMI 93-83
 MAP CODE NO. OF REC..

REPORTER

UPDATED..... 81 04
 BY..... FERNS, MARK L. (BROOKS, HOWARD C.)

NAME AND LOCATION

DEPOSIT NAME..... SOUR DOUGH
 SYNONYM NAME..... BALDFACE

COUNTRY CODE..... US
 COUNTRY NAME: UNITED STATES

STATE CODE..... OR
 STATE NAME: OREGON

COUNTY..... CURRY
 DRAINAGE AREA..... 18010101 CALIFORNIA
 PHYSIOGRAPHIC PRDV..... 13 KLAMATH MOUNTAINS
 LAND CLASSIFICATION..... 41

QUAD SCALE QUAD NO OR NAME
 1: 62500 CHETCO PEAK

LATITUDE LONGITUDE
 42-02-27N 123-56-57W

UTM NORTHING UTM EASTING UTM ZONE NO
 4654536.3 421442.7 +10

TWP..... 040S
 RANGE..... 011W
 SECTION.. 36
 MERIDIAN. W.M.

ALTITUDE.. 1500

COMMODITY INFORMATION

COMMODITIES PRESENT..... CR

PRODUCER(PAST OR PRESENT):
 MAJOR PRODUCTS.. CR

DESCRIPTION OF DEPOSIT

DEPOSIT TYPES:

MASSIVE CHROMITE; DISSEMINATED
 FORM/SHAPE OF DEPOSIT: LENS, LAYER

SIZE/DIRECTIONAL DATA

SIZE OF DEPOSIT..... MEDIUM
 DEPTH TO BOTTOM..... 965 FT
 MAX LENGTH..... 2400 FT
 MAX WIDTH..... 12 FT
 STRIKE OF DREBODY.... NORTHWEST
 DIP OF DREBODY..... 45 NE

COMMENTS(DESCRIPTION OF DEPOSIT):

CONTINUITY DISRUPTED BY SHEARING, FAULTING

DESCRIPTION OF WORKINGS

SURFACE AND UNDERGROUND

PRODUCTION

YES
 MEDIUM PRODUCTION

ANNUAL PRODUCTION (ORE, COMMOD., CONC., OVERBURD.)

ITEM	ACC	AMOUNT	THOUS. UNITS	YEAR	GRADE, REMARKS
1 ORE EST	0000.313	TONS		1918	40. % CR2O3 - 42. % CR2O3, PRDB. FROM 625 T. MINED
2 ORE EST	0000.286	TONS		1918	50. % CR2O3, FROM 500 T. MINED.
3 ORE EST	0000.348	TONS		1942	42. % CR2O3 - 47. % CR2O3, 2.8 CR - 2.9 CR, FE
4 ORE EST	0000.155	TONS		1944	38. % CR2O3 - 46. % CR2O3, 2.6 CR - 3.0 CR, FE
5 ORE EST	0000.011	TONS		1941	45. % CR2O3

CUMULATIVE PRODUCTION (ORE, COMMOD., CONC., OVERBUR.)

ITEM	ACC	AMOUNT	THOUS. UNITS	YEAR	GRADE, REMARKS
15 ORE EST	0001.151	TONS		1952-1958	44% CR2O3 TO 52% CR2O3 CONC. & ORE
21 TOTAL	2.264	TONS		46.66 % CR2O3	(WEIGHTED AVERAGE GRADE)

SOURCE OF INFORMATION (PRODUCTION) .. THAYER FILES & RAMP

PRODUCTION COMMENTS..... RAMP SAYS .312 TONS OF 50% CR2O3 W/2.7 CR:FE & .100 TONS OF 48% CR2O3 W/3.0 CR:FE (LUMP ORE)

RESERVES AND POTENTIAL RESOURCES

1 ORE EST 50-100.0 TONS 1940 35 % CR203

SOURCE OF INFORMATION (POT RESOURCES).. WELLS (1940)

GEOLOGY AND MINERALOGY

AGE OF HOST ROCKS..... JUR
HOST ROCK TYPES..... DUNITE

LOCAL GEOLOGY

SIGNIFICANT LOCAL STRUCTURES:
EAST LIMB OF NORTHWEST - PLUNGING ANTICLINE

COMMENTS (GEOLOGY AND MINERALOGY):

DISSEMINATED AND BANDED CHROMITE OCCUR IN A NARROW DUNITE ZONE IN HARZBURGITE.

GENERAL COMMENTS

RECORD NUMBERS (W013198) AND (W017046) HAVE BEEN MERGED WITH THIS RECORD AND DELETED FROM THE OREGON FILE.

GENERAL REFERENCES

- 1) RAMP, LEN, 1961, CHROMITE IN SOUTHWESTERN OREGON: OREGON DEPT. GEOLOGY AND MINERAL IND. BULL. 52, 169 P.
- 2) THAYER, T. P., 1974, UNPUBL. DATA
- 3) RAMP, L. AND OTHERS, 1977, GEOLOGY, MINERAL RESOURCES AND ROCK MATERIAL OF CURRY COUNTY, OREGON; ODGMI BULL. P.31
- 4) WELLS, F.G. AND OTHERS, 1940, CHROMITE DEPOSITS IN THE SOURDOUGH AREA, CURRY COUNTY AND THE BRIGGS CREEK AREA, JOSEPHINE COUNTY, OREGON; USGS BULL. 922-P, P.475

Sourdough (Baldface) mine: Disseminated and banded chromite occur in a narrow dunite zone in harzburgite (both are largely serpentized). The ore zone has been traced over a horizontal length of about 3,000 ft and to a vertical depth of about 1,000 ft. Thickness varies from less than a foot to more than 20 ft, and the zone is probably discontinuous. Average thickness may be about 3 ft. The chromite-bearing dunite zone strikes from N. 45° W. to N. 55° W. and dips from 30° to 45° NE. Average grade of the ore zone may be about 35 percent chromite. More massive layers and streaks of chromite, sometimes as thick as 1 ft, when hand-sorted, assay about 48 percent Cr_2O_3 with a Cr:Fe ratio of 3:1. The ore zone lies on the east limb of a northwest-plunging anticline about 600 to 800 ft from the thrust contact with the underlying (younger) Dothan Formation. Chromite in the west flank of the folded zone may be represented by the Irene (92) and Winton Mountain (90) occurrences. A total of about 1,567 long tons were produced from intermittent operations during the period from 1918 to 1958. The average grade of all shipments was about 44 percent Cr_2O_3 with a Cr:Fe ratio of about 2.8:1. Estimated reserves in 1940 were 50,000 to 100,000 tons of milling-grade ore (Diller and others, 1921; Wells and others, 1940; Allen, 1941; Ramp, 1961).

Bristol-Baker Mill

Production of chromite concentrates has begun at the concentrating mill installed at the Sourdough mine on Baldface Creek in southern Curry County earlier this summer by Ben Baker. F. I. Bristol, Ben Baker, and T. T. Leonard are owners of the mine and mill. The equipment includes an 8 x 16 jaw crusher, a ball mill and screen, and 2 concentrating tables. The capacity of the mill is about $1\frac{1}{2}$ tons an hour.

Ore-bin, Oct. 1952

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UNITED STATES DEPARTMENT OF THE INTERIOR

CHROMITE DEPOSITS IN THE
SOURDOUGH AREA, CURRY COUNTY
AND THE ~~BRIGGS CREEK~~ AREA
JOSEPHINE COUNTY, OREGON

GEOLOGICAL SURVEY BULLETIN 922-P

PROPERTY OF
STATE DEPT OF GEOLOGY &
MINERAL INDUSTRIES.

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary
GEOLOGICAL SURVEY
W. C. Mendenhall, Director

Bulletin 922-P

CHROMITE DEPOSITS IN THE
SOURDOUGH AREA, CURRY COUNTY
AND THE BRIGGS CREEK AREA
JOSEPHINE COUNTY, OREGON

BY

F. G. WELLS, L. R. PAGE, AND H. L. JAMES

Strategic Minerals Investigations, 1940
(Pages 461-496)



PROPERTY OF
STATE DEP'T OF GEOLOGY &
MINERAL INDUSTRIES.

UNITED STATES
GOVERNMENT PRINTING OFFICE
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CHROMITE DEPOSITS IN THE SOURDOUGH AREA, CURRY COUNTY,
AND THE BRIGGS CREEK AREA, JOSEPHINE COUNTY, OREGON

By F. G. Wells, L. R. Page, and H. L. James

ABSTRACT

The Sourdough, or Baldface, area is on Baldface Creek, in secs. 35 and 36, T. 40 S., R. 11 W., Curry County, Oreg., 31 miles west of U. S. Highway 199. The chromite occurs in a large body of peridotite near its contact with slates, sandstones, and pyroclastic rocks, which are probably Jurassic. The peridotite is partly saxonite, partly dunite, and is largely serpentized. It is cut by diorite dikes of both north-easterly and northwesterly strike. The peridotite is also cut by two fissure systems, of which one strikes N. 50° W. and has an average dip of 50° NE. and the other strikes about N. 20° E. and dips 60° SE.

Chromite crystals are disseminated through most of the dunite and locally the crystals are aggregated in streaks or layers separated by barren layers. Some layers or lenses of massive chromite range from a few inches to several feet in thickness. Where undisturbed, they strike about northwest and dip about 45° NE.

The chromite that might possibly be mined is all in one zone, which has been shown by prospecting to be at least 2,400 feet long and 965 feet deep. The rapid changes in the tenor of the rock makes any estimate of tonnage without systematic sampling and exploration a guess, but the district may contain between 50,000 and 100,000 tons of milling ore.

The Briggs Creek chromite deposits are on Chrome Ridge, in secs. 11, 14, and 23, T. 36 S., R. 9 W., Josephine County, Oreg. There was considerable activity in this area during the World War.

The known deposits are all in the southern part of a sill-like peridotite mass, which has been intruded into a group of hornblende schists or gneisses and thin-bedded quartzites that may be regionally metamorphosed equivalents of the Jurassic (?) rocks in the Sourdough area.

At least 95 percent of the peridotite in the Briggs Creek area is saxonite. The remainder is dunite, which occurs as small clots scattered through the saxonite. The chromite occurs in the dunite. The peridotite has been sheared and displaced along faults that trend N. 20°-45° W.

The ore is mainly of the disseminated type, with some fairly high grade streaks, but some consists of pods and masses of chromite along fissures in dunite. No significant trend of the ore bodies has been recognized. The dunitic layers, which contain the disseminated chromite, seem originally to have ex-

tended northward but to have been offset by strong northwest-southeast shearing. The chromic-oxide content of the chromite ranges from about 39 to 55 percent. The deposits are so numerous and widely scattered as to give a misleading impression of their value and size. The high-grade lenses contain considerable ore, but the horizontal and vertical extensions of individual ore masses are small.

No large tonnage has been developed of ore assaying as much as 10 to 20 percent of Cr_2O_3 , which grade would be required to warrant concentration on a large scale under present conditions.

INTRODUCTION

Chromite occurs at many places in the Klamath Mountains of southwestern Oregon and northwestern California. In most districts in this region the chromite that is likely to prove worth mining is mainly massive ore in pods, "kidneys," and lenses, most of which contain less than 50 tons, though a few pods are known to contain 1,000 tons or more. In some districts, however, such large masses of rich ore are lacking and the chromite is mainly disseminated, though it also forms nodules and layers, in more or less altered intrusive rocks that originally consisted mainly of olivine. Even though such rocks may contain less than 20 percent of chromite, in sufficient tonnage they might produce commercial quantities of ore that could be concentrated to yield 45 to 50 percent of chromic oxide. Two such deposits, the Sourdough, or Baldface, and the Briggs Creek, or Sordy, were studied in the fall of 1939 by a field party in charge of F. G. Wells and including L. R. Page, H. L. James, Robert Yates, W. M. Furnish, and Martin Koenig.

Only a small part of the Klamath Mountains has been geologically mapped, but the rocks of the region are known to consist in general of highly folded and faulted sedimentary and volcanic rocks, most of which have been metamorphosed, and younger intrusive rocks. The oldest rocks are crystalline schists. Paleozoic argillites, quartzites, and marbles, interlayered with metavolcanics, crop out over large areas, and Jurassic (?) sandstones and slates are present. The intrusive rocks range

from granite to peridotite. All the chromite deposits are in peridotite.

SOURDOUGH, OR BALDFACE, AREA

Geography

The Sourdough chromite deposits, as they are now usually called, were described by Allen ^{1/} as the Baldface deposits. They are in a rugged unsettled mountainous area in the southwestern corner of the Kerby quadrangle, just north of the California line, in Curry County, Oreg. This area is 31 miles west of O'Brien, which is on U. S. Highway 199 (see fig. 68). It is on a spur of the Wimer Road which, like the spur itself, is a dirt road with steep grades and is impassable in wet weather. Most of the exposed chromite is on the north side of Baldface Creek, in secs. 35 and 36, T. 40 S., R. 11 W. Baldface Creek flows in a narrow valley, intrenched about 1,700 feet below the neighboring crests. The steepness of the valley walls has resulted in extensive landsliding just north of the claims. Baldface Creek, as well as the North Fork of Smith River, which it joins a mile downstream from the deposit, has a large flow.

Geology

The chromite of the Sourdough area is concentrated in thin layers of dunite, many of which are enclosed in a mass of serpentized and sheared saxonite. These ultrabasic rocks form the margin of a large heterogeneous body intrusive into tuffaceous sandstones, shales, and pyroclastic breccias of Jurassic (?) age. They in turn are cut by diorite dikes and have been faulted and serpentized apparently after the injection of the dikes.

^{1/} Allen, J. E., Chromite deposits in Oregon: Oregon Dept. Geology and Min. Ind. Bull. 9, pp. 34-35, 1938.

The chromite is in part disseminated and in part forms massive streaks and lenses in both fresh and altered dunite, of which it is an original constituent. Shearing along the contacts between massive chromite and dunite, which is visible in most of the pits and exposures, indicates either that the chromite has been concentrated along shear zones or that the shearing has been localized by chromite layers. The ore zone has not been sufficiently explored to determine its limits or even its trend. Its ore, on the whole, is of low grade.

Jurassic (?) sedimentary rocks

The supposedly Jurassic rocks, which crop out in the western part of the area mapped (see pl. 70) are unresistant, poorly exposed, and much overgrown with brush, except along their contacts with the intrusive rocks, where metamorphism has made them more resistant. Only near these contacts have they been attentively studied. The rocks exposed at the contact are in part dense, hard light-gray to greenish fine-grained hornfels. In part they are breccias which, in a matrix of similar hornfels, contain fragments of recrystallized, medium-grained rocks that are apparently dioritic. In places the fragments are slightly serpentized or otherwise altered. Banding is visible here and there in the breccias, but it is so indistinct that its precise attitude was observed only at the northwest corner of the Come and Get It claim, where it strikes N. 40° W. and dips 85° NE.

The dense hornfels shows no bedding and little of its original texture, but its association with the breccia, which looks like a pyroclastic rock, and its gradation into fine-grained tuffaceous beds in the unmetamorphosed parts of the formation suggest that it also is pyroclastic in origin.

The width of the zone of intense metamorphism averages about 25 feet and reaches a maximum of at least 100 feet. Beyond this zone is one in which the Jurassic (?) rocks are mica schists or phyllites, which grade westward into white, gray, greenish and greenish-brown feldspar-rich shales and tuffaceous sandstones. The schistose rocks are exposed where the contact is crossed by the road and by Baldface Creek, and also in an inlier on the southeast side of this creek. Along the road feldspar-quartz schist is interbedded with chlorite-mica schist, in which a poorly developed foliation parallels the bedding. These rocks might well be derived from tuffaceous sandstones and shales.

Dark-gray to black phyllitic schists, interbedded with thin layers of brownish, green-weathering, limy chert, crop out where Baldface Creek crosses the contact. They are separated from the serpentine by 10 feet of hornfels. Float of unaltered tuffaceous sandstone and shale observed within 25 feet of slightly serpentized saxonite, about 700 feet south of this point, suggests that the foliation in these schists may be the result of shearing.

The inlier southeast of the creek is composed of gray quartz-mica schist. The moderately well developed but rather widely spaced planes of foliation may be a false cleavage due to shearing, for the nearest dunite and saxonite have a similar structure; however, it is difficult thus to explain the variation in dip from vertical to 10° SE. in such a small area. The absence of visible contacts makes it impossible to determine whether this inlier is a thin veneer of schist faulted onto the igneous rocks or an actual inclusion or roof pendant.

Intrusive rocks

Saxonite.--Saxonite, a rock composed of olivine and enstatite, is the predominant rock of the area. It shows all stages of alteration to serpentine. The freshest, in the southeast part of the area, is greenish black and medium- to coarse-grained. Enstatite crystals or pseudomorphs after them, the largest of which are about three-eighths of an inch long, are conspicuous on the weathered surface, where they are white to gray and contrast with the matrix, which is brownish when weathered. Nearly all of the saxonite has been serpentized to some degree. Where serpentization has been rather intense the weathered surface is light gray and the altered pyroxene crystals are dark.

The saxonite grades, by decrease in the proportion of pyroxene, into dunite, and field relations indicate that the two rocks were differentiated from a single magma. The rock in the southeast half of the Black Cub No. 1 claim is predominantly of an intermediate facies, which might be called dunitic saxonite. It has the texture of saxonite but assumes on weathering the yellow-brown or buckskin color that is characteristic of dunite. Thin layers and small irregular masses of true dunite are common in this facies.

Very small grains of chromite occur throughout the olivine of the typical saxonite and are more abundant in the dunitic saxonite.

Dunite.--The dunite masses, in which the chromite is concentrated, are almost wholly enclosed in saxonite. The dunite where fresh is a fine-grained dark greenish-black rock; its weathered surfaces are smooth and of yellow-brown or buckskin color. It has been serpentized, like the saxonite, and where the alteration is complete is usually gray on the weathered surface.

The layers or irregular masses of dunite that occur in the saxonite have gradational boundaries. They range in thickness from 2 inches to 55 feet, but poor exposures make it impossible to determine their length. The thickest layer may be traced through the line of test pits, but its apparent trend is probably a resultant of steplike offsetting by many cross faults, although only one of these faults was definitely observed, and that one offsets a diorite dike in the northern part of the Old Diggings claim.

Another layer at least 20 feet thick is fairly well exposed on the east side of Baldface Creek, 100 feet east of the boundary of the intrusive mass. It is probably continuous with a layer striking N. 20° W. and dipping 25° NE. that is exposed for a distance of 350 feet between the 1,300- and 1,500-foot contours. A little disseminated chromite was noted in the exposures, and float of high-grade chromite occurs in the dry gulch to the northeast.

Many thin layers of dunite (designated by d's on the map, pl. 70) crop out in the Old Diggings and Come and Get It claims. These layers are poorly exposed and have an average thickness of only about 5 feet.

Inasmuch as serpentinization decreases the difference in appearance between the dunite and the saxonite, it is not everywhere possible to trace the boundaries of sheared and serpentinized dunite, and some serpentine derived from dunite has doubtless been mapped as saxonite. Serpentine rich in chromite is likely to have been derived from dunite.

Serpentine rock.--Throughout large areas the ultrabasic rocks are so completely altered that no trace of their original texture has been preserved. Marked alteration has taken place mainly along the contact with the Jurassic (?) rocks, and it reaches its extreme along zones of intense shearing that strike

about N. 60° W. and N. 20° E. Where the shear-zones cross it, the intrusive contact is sharply jagged and probably faulted. The serpentine rock here is thoroughly shattered and slickensided, but both the alteration and the shearing decrease in intensity to the northeast, where the rock, though completely serpentinized, is more or less massive and shows some traces of its original texture. This facies grades into rock showing little serpentinization except along the walls of fractures. Such rock is cut by cross-fibered grains of chrysotile. Highly fractured and completely altered zones a few feet wide are common along the eastern boundaries of the chromite ore bodies.

Diorite dikes.--Gray, medium-grained, more or less altered diorite is seen in many places to cut the saxonite. Individual areas of such rock are less than 100 feet wide but evidently much longer, and although it has been impossible to trace any one of them very far they obviously represent dikes.

Terrace gravel

Coarse gravel consisting of large pebbles, cobbles, and boulders is found on the east side of the canyon of Baldface Creek as high as 400 feet above the stream, and a patch of similar material lies on the west side. The gravel is of unknown thickness. It consists mainly of ultrabasic rocks and contains fragments of massive chromite.

Structure

As only a small part of the ultrabasic body was mapped, its structural relation to the older rocks is uncertain. Judging, however, from the strike of the Jurassic (?) rocks along the contact, the body is rudely conformable and sill-like. The streaky distribution of the chromite, assuming it to be a primary structure, supports this assumption. The layers rich in

chromite, where undisturbed, strike northwestward and dip about 45° NE.

Two main systems of shearing are recognized in the area, and many minor trends are recognizable. Roughly speaking, the dominant system strikes N. 50° W. and dips 50° NE., and the other main system strikes N. 20° E. and dips 60° SE. A dike and the main intrusive contact have been displaced by faults of northwesterly strike.

Chromite deposits

Most of the dunite contains disseminated chromite--chromite, that is, in rather evenly scattered separate crystals--but in the richer rock the crystals are mainly concentrated in streaks or layers, which are separated by barren layers. Layers of massive chromite from a few inches to several feet in width occur in places; elsewhere the chromite is not so highly concentrated. The layers dip, as said before, about 45° NE.

The following analyses were kindly furnished by the Rustless Mining Corporation.

Partial analyses of chromite from the Sourdough area

	1	6	9
Cr ₂ O ₃	53.62	48.96	54.33
Fe ₂ O ₃	15.85	14.34	13.42
SiO ₂	3.52	5.84	3.51
	72.99	69.14	71.26

1. Homogeneous, black, well-crystallized friable ore.

6. Dense, black, hard ore.

9. Same as 1.

The silica reported indicates that the chromite was not completely separated from the silicate gangue minerals before analysis. The ratio of metallic chromium to metallic iron in all three samples is more than 3 to 1.

about N. 60° W. and N. 20° E. Where the shear-zones cross it, the intrusive contact is sharply jagged and probably faulted. The serpentine rock here is thoroughly shattered and slickensided, but both the alteration and the shearing decrease in intensity to the northeast, where the rock, though completely serpentinized, is more or less massive and shows some traces of its original texture. This facies grades into rock showing little serpentinization except along the walls of fractures. Such rock is cut by cross-fibered grains of chrysotile. Highly fractured and completely altered zones a few feet wide are common along the eastern boundaries of the chromite ore bodies.

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A sample of disseminated ore from the Sourdough area that contained 18.75 percent of Cr_2O_3 was concentrated. Recovery was 74.5 percent of the contained chromite, and the concentrate assayed 52.97 percent of Cr_2O_3 .

Exploratory pits, trenches, and adits have been confined largely to the Old Diggings and Come and Get It claims, although small pits have been opened on all except the Owl claim. These workings show fair indications of chromite over a horizontal distance of about 2,400 feet and a vertical distance of 965 feet. If slighter showings are included, the horizontal distance would be increased by about 750 feet and the vertical distance by about 150 feet.

All statements in the following pages regarding grade of ore are based on visual estimates only.

Old Diggings claim

Chromite is exposed in most of the workings of the Old Diggings claim. Two large pits, a caved adit, and five smaller pits and trenches have been dug in the southeastern half of this claim, and two small pits, showing small amounts of chromite, in the northwestern half.

The best exposure of the ore body is in the large pit about 100 feet north of the middle of the southeastern end of the claim. The pit, which is badly caved, is 125 feet long and averages about 25 feet in width, although it is 45 feet wide in the widest place. Banded and disseminated chromite is well exposed for 20 feet across the banding and 10 feet vertically. The ore body, in the places where it is apparently undisturbed, strikes N. 45° W. and dips 45° NE., but it is cut by many fractures and has been rather strongly contorted. On the eastern edge of the ore body a strong shear zone strikes N. 60° W. and dips 35° NE., bringing saxonite in contact with dunite and ore.

It was estimated that over the entire width of the exposed surface chromite makes up from 35 to 40 percent of the ore and that at least half of this occurs in high-grade lenses or streaks from 6 to 8 inches thick.

On the dumps and ore piles there is at present about 25 or 30 tons of 35-percent chromite ore, and about 500 tons of similar ore is exposed in the pit. Stripping along the strike of the ore body and diamond drilling might well prove a considerably larger potential deposit.

The caved adit on the lower part of the sledge road is apparently on the same ore zone. High-grade ore occurs on the eastern edge of the dunite band, which is 55 feet wide. The exposures here are poor, but judging from the ore on the dump this adit was driven in a high-grade zone. The ore exposed is in lenticular masses that dip 45° NE., nearly parallel to the main shear zones, which strike N. 45° - 55° W. and dip 45° NE. On the western edge of the dunite band there is a pronounced shear zone with about the same strike and a dip of 35° NE.

Three small pits north and west of the caved adit are badly caved but show banded and disseminated ore similar to that noted in the big pit described above. The banding strikes N. 55° W. and dips 40° NE. Although no high-grade ore was noted in place here, the ore pile shows about 20 tons of high-grade chromite ore in pieces so large as to indicate that they came from layers or lenses as much as 12 inches thick. The location of these pits with respect to the caved adit and big pit, as well as the apparent sudden termination of the diorite dike to the east, probably indicates that the ore body is offset slightly to the southwest at this point.

The largest pit on the Old Diggings claim is in the center of the claim, at the end of the sledge road. The pit is 175 feet long and, though very irregular in shape, averages about

30 feet in width and 10 feet in depth. The ore is dunite, faulted against saxonite along the northeastern edge of the pit, in a shear zone that strikes N. 20° W. and dips 30° NE. One exposure of chromite 4 feet long and 1 foot wide shows very high grade ore. About 50 tons of similar ore is piled up near the pit. Small exposures of banded ore show a strike of N. 40° W. and a dip of 30° NE. Very little ore was exposed in 1939, and it is impossible to give an accurate estimate of the reserves indicated by this pit.

Come and Get It claim

The workings on the Come and Get It claim consist of three groups of pits and an adit, concentrated at the ends and the middle of the claim. The adit, which is on the road at the northwest end of the claim, was 40 feet long when visited. It was being driven northwestward in dunite, along the dunite-saxonite boundary, to intersect the ore exposed in the pit 40 feet uphill from the portal of the adit. About a ton of high-grade ore is exposed near the entrance of the adit, but only widely scattered specks of chromite were observed in the last 20 feet. The ore in the surface pits is of low grade and contains about 35 percent of chromite, which is partly in layers and partly disseminated in dunite. The layers strike N. 45° W. and dip 30° NE., which is approximately the trend of the shear surface along which the adit was started. A well-developed shear plane in the adit 36 feet from the portal strikes N. 60° W. and dips 43° NE. It cuts the dunite and is relatively free from serpentine. The saxonite is much more highly altered along the shear planes than elsewhere. The adit and the pits together have proved a zone of 35-percent chromite ore with a minimum width of about 5 feet.

Five small pits and trenches on the terrace below the adit show relatively small amounts of chrome ore in sheared and serpentized dunite. The best exposure, which is in the largest of the two upper pits and between 1,700 and 1,720 feet in altitude, shows from 40 to 50 percent of chromite on a surface 5 feet high and 6 feet wide, at right angles to the trend of the ore bands. The chromite is partly of the disseminated variety and partly banded. The layers of ore strike N. 35° W. and dip 40°-45° NE. Some of them are as much as 6 inches wide and contain high-grade ore. Between 15 and 20 tons of ore has been taken from this pit. The pits 40 feet downhill from this one show similar ore, though it is poorly exposed, and the ore may be continuous between these two sets of pits.

Three pits near the southeastern end of the claim show dunite with disseminated, lenticular, and banded chromite. The layers rich in chromite strike N. 30° E. and dip 35° SE. The pits are in a strongly sheared serpentized zone, which trends about N. 60° E. and dips 50° SE. This attitude is very different from that of both ore and shear zones in other places, and it may be a result of slumping. In the largest pit a face 5 feet high and extending 10 feet across the structure shows 40 to 50 percent of chromite, 20 percent of which is in high-grade lenses as much as 10 inches thick.

Black Cub No. 1 and No. 2 claims

The Black Cub No. 1 adjoins the Come and Get It claim on the south and lies northeast of the Black Cub No. 2. Small amounts of very low grade ore have been exposed in pits at the northwest end of this claim.

In the Black Cub No. 2 claim, on the southeast side of Baldface Creek, small amounts of rather high grade ore are exposed. At the side of the creek a lens about 20 inches thick

in the center is exposed for 10 feet vertically and 5 feet horizontally. The lens is sheared on the edges and represents part of a much larger kidney-shaped body. The one small pit on the claim shows thin-layered and disseminated ore. Specks of chromite scattered along a serpentine veinlet appear to have been introduced with serpentine.

Reserves

Because of inadequate exposures no satisfactory estimates of probable tonnage and grade of ore can be made for the entire Sourdough deposit. The amount of chromite seen in the natural exposures and the workings on the southern half of the Old Diggings claim suggest that 50,000 to 100,000 tons of milling-grade ore may there be present. These figures are based on the assumption that the ore body is 20 feet wide and continuous throughout the length of the workings and that it extends to a depth at least equal to the vertical range of the exposures. No account was taken of probable offsets in the ore body, and chromite percentages can vary so much within a short distance that any estimates of them involve guesswork.

Recommendations for prospecting

Principles.--Prospecting and location of exploration pits in the Sourdough area should be undertaken only after careful consideration of the following facts:

1. Concentrations of chromite will be found only in dunite and in serpentine rock derived from dunite.
2. The ore will probably be of rather low grade, averaging less than 35 percent of chromite.
3. Although float is generally of great value in locating deposits, it may be unreliable in this area because of the presence of old river terraces, which are recognized by the red

soil that overlies them, between 1,520 and 1,700 feet above sea level. Accumulations of concentrated chromite float at such altitudes are likely to be the result of earlier stream action rather than ordinary downhill creep; and float found at lower levels may have come from these old terraces.

4. Chromite should especially be looked for along zones of shearing and serpentization; for the margins of layers especially rich in chromite are planes of weakness, along which much of the movement due to shearing occurs, and serpentization is especially marked along shear zones. The ore bodies are likely to be shattered by shearing movement.

5. It seems useless to attempt any mining in the area east of the claims because extensive landsliding has occurred there.

Procedure.--The extent of an ore zone might be pretty well determined by the following procedure.

1. Trenches at right angles to the trend of the ore zone should be dug at intervals of 100 feet or less between the adit and the southern end of the Come and Get It claim and also in the northern half of the Old Diggings claim. Stripping should be done between the trenches that show minable ore and at any other place where it is likely to reveal ore.

2. If a continuous ore body is revealed by this trenching and stripping, the richer portions should be tested to some depth by diamond drilling.

The showing in the two big pits on the Old Diggings claim could be tested to a depth of about 50 feet by four diamond-drill holes on the claim. If these holes showed that a thickness of 20 feet persisted to this depth, then reserves of about 20,000 tons might be regarded as probable and 10,000 tons more as possible.