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MINERAL RESOURCE STATUS OF STATE-OWNED LANDS IN MALHEUR COUNTY, OREGON.

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by Norman S. Wagner

1972

MINERAL RESOURCE STATUS OF STATE-OWNED LANDS IN MALHEUR COUNTY, OREGON

Metallic and Nonmetallic Minerals Section *1

Foreword: The lands covered in this report include 298 separate tracts diversly located throughout nearly the whole of Malheur County. These were processed individually during the course of this study with the objective of determining which tracts could be deemed to have noteworthy mineral resource potential and which did not.

For processing purposes each tract was numbered and indexed on an individual record form duly identified by both the number and the tracts' location by township, range and section. All subsequent references to these tracts will be by the assigned number, the key to which appears in the section labelled Tract Index, appended hereto.

Processing consisted of checking each tract individually against available mineral occurrence records to determine if it did, or did not, embrace terrain in which a known prospect was situated and to determine which, if any known prospects were located nearby. The minerals thus screened for include gold and silver, cinnabar, scheelite, chromite, stibnite, iron, chrysotile asbestos, diatomite, pumicite, perlite, sodium chloride brine, optical calcite, uranium, zeolites and fluorite since these constitute the principal mineral resources of the sort covered by this report known of in the County with a record of having been mined or seriously prospected for to any significant extent in the past. The distribution of these various mineral occurrences throughout the County is shown in a generalized manner on Figure 1, appended herewith.

Additional processing of a fact-finding nature included the comparing of each tract location with its corresponding location on available geologic maps in order to establish (1) what bedrock environment, or combination of bedrock environments, prevailed within its boundaries, (2) what the general setting of the tract was in relation to the geologic scene on a regional scale from the standpoint of formational distribution and equivalency, and (3) whether or not the tract encompassed, or was situated close to, any mapped structure of apparent significance. The many references used in this connection are duly listed in appendix item 2 which includes maps identifying the terrain covered by each.

Tract classification consisted of evaluating each of the tract records thus compiled. This was done in stages with those tracts that could be assigned a final classification weeded out early in all instances where this proved possible while those that couldn't be processed satisfactorily were set aside for subsequent review and additional research. Tract records requiring more sophisticated attention were thus up-graded progressively through several

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* 1. Natural gas, oil and geotherm potentials are covered in separate reports by other investigators; hence are not included in this report. Likewise excluded from this report by Land Office directive are occurrences of sand and gravel, common rock and building stone, clays and semi-precious gemstone materials such as petrified wood, agate, etc.

such sortings as circumstances indicated. Individual tract records were also up-graded and coordinated by being cross-checked with other tract records involving relating geologic factors in instances when doing so seemed expedient.

During the whole of the classification process certain standardized proceedures were followed as rigorously as practicable in order to ensure a high level of consistency in the nature of the classificational assignments made. Nevertheless, generous amounts of personal discretion entered the picture in this respect in the final stages when dealing with different minerals. Thus reported occurrences of low unit value bulk delivery nonmetallic resources such as diatomite, for example, were systematically evaluated as being of negligible consequence when described as being "ashey" or were otherwise known to be sub-marginal in grade for commercial development because of being too abundantly interbedded with contaminating strata to warrant any attempted commercial development. Other occurrences were simply disregarded entirely when so remotely located with reference to electric power sources and bulk transport facilities as preclude development in the foreseeable future in comparison with other comparable grade deposits more advantageously located in the sense of proximity to the facilities needed for processing and bulk product deliveries to distant markets. Similarly, the lack of reported prospects of high unit value minerals such as cinnabar, for example, was deemed to outweigh an otherwise logical bedrock environment in the instance of tracts located far from the known mining districts while the same bedrock situation alone was considered as reason enough to catalogue a tract as meriting a positive classification when located within, or close to, districts containing known mines with histories of past productivity.

Conversely, since the geologic factors pertaining to the genesis and county-wide distribution of massive-type zeolite and associating micro-fluorite occurrences are so imperfectly known, all tracts containing significant-sized exposures of tuffaceous lacustrine sediments comparable to those now recognized as the host formation for these minerals in the recently discovered Rome-Jordan Valley area were deemed to have potential until authoritatively demonstrated to be otherwise. This is consistent with the fact that (1) the very existence of occurrences of this sort was recognized for the first time so very recently that much yet remains to be learned about them, with the fact that (2) identification of occurrences of this type entails an abundance of sampling and ultra-sophisticated laboratory testing beyond the means and/or know-how of the average prospector to cope with, and finally with the fact that (3) the great abundance of diversified researches now being carried out in connection with the zeolites indicate that numerous important industrial uses will materialize for these minerals in the near future.

Tables 1, 2 and 3 represent the final result of this screening in that they are tabulations of the classificational decisions arrived at for each individual tract during the course of evaluation process just described. Table 1 covers a total of 137 tracts deemed to have little or no intrinsic value from the standpoint of mineral resource potentials insofar as the particular kinds of minerals being screened for is concerned. Conversely, Tables 2 and 3 cover

a total of 161 tracts which did classify as having some definite minerals-related potential of sorts that couldn't justifiably be ignored. Since these potentials relate to two different sorts of mineral resources situations, each was tabulated separately for convenience sake. Otherwise Table 2 and 3 are extensions of one another in that they both represent tabulations of tracts which do identify with mineral resource potentials of one sort or another as is duly noted on each of the Tables.

All in all it is felt that the tract classifications as thus tabulated are on the whole about as comprehensive, consistent and meaningful as it is possible to make them on the basis of any analysis of available published data undertaken without the benefit of supplemental first-hand field inspections. In other words, modifications of comparitively minor nature are all that can be conceived of by way of reducing the number of Table 2 and 3 tracts as a consequence of continued evaluation of available data at this time and even this would entail stretching the evaluational standards used thus far. Continued evaluation on this level is therefore not recommended. Instead, Tables 1, 2 and 3 are submitted as the final classification obtainable at the present time with the data currently available.

N. S. WAGNER, geologist

November 21st, 1972

MINERAL RESOURCE STATUS OF STATE-OWNED LANDS IN MALHEUR COUNTY, OREGON

Metallic and Nonmetallic Minerals Section *1

Conclusions: Overall it is the writer's opinion that the most desirable action would be to hold out for the retention of all mineral rights, natural gas, oil and geothermal steam inclusive, in the instance of all tracts traded so as to maintain the checker board pattern of coverage the State now enjoys throughout most of the County as a consequence of the distribution of its present holdings. However, should this be impossible to negotiate, the one hundred thirty-seven (137) tracts itemized in Table 1 class as tracts which can be traded off completely, mineral rights and all, with a minimal amount of apprehension relative to minerals resource questions. These tracts class thusly because (1) they contain no known occurrences of the kinds of mineral deposits covered by this report and because (2) there is no precedent for finding any prospects of said minerals in some of the particular kinds of bedrock environments mapped as present and predominant in some of the listed tracts and little or no immediate reason to anticipate any impending discovery in the others as a consequence of past prospecting experience and the overall neutral character of the ground.

All of the remaining one hundred sixty-one (161) tracts out of the total of 298 screened during the course of this study do, however, identify with some definite minerals-related situation to one extent or another. This is not meant to imply that each such tract contains a known prospect of commercial significance, or, for that matter, to imply that they contain any prospects at all. Nevertheless, each such tract does embrace either (1) bedrock environments having noteworthy characteristics in common with those prevalent in recognized near-by mining districts, or (2) other minerals-related affinities of geologic import to such extents that they simply can not be catalogued for unrestricted across-the-board swap in the same manner and with the same degree of assurance that prevails in the instance of the tracts listed in Table 1. Instead, the weight of available data indicative of tangible or implied mineral potential in connection with these tracts affords virtually no alternative to a tentative "hold" classification at the present time regardless of the number of tracts involved.

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*1. Covering hardrock minerals only and not natural gas, oil or geothermal steam which are the subjects of separate reports by other authors.

From a cataloging standpoint these remaining 161 tracts subdivide into two catagories (Tables 2 and 3) as follows:

Table 2 contains a list of another one hundred twenty-one tracts (121) which could be classed for across-the-board swap in the same manner as the tracts listed in Table 1 were it not for the fact that these Table 2 tracts identify with significant-sized exposures of the same kinds of tuffaceous lacustrine strata that are today universally accepted as being one of the prime host formations for the newly recognized massive-type of occurrences of the zeolite family of minerals and micro-crystalline fluorite, concerning each of which industrially interesting prospects are now known to exist in the vicinity of Rome and Jordan Valley.

The significant situation in this connection is that recognition of the very existence of such occurrences as these in association with bedrocks of this kind took place for the first time so very recently (world-wide) that no authoritative data is yet available regarding the presence or absence of other prospects of either of these minerals in the potential host strata so abundantly present in the county at locations outlying from the established Rome-Jordan Valley areas. For this reason the Table 2 tracts can not be classified for unconditional swap without an over-riding restriction relative to the zeolite-fluorite factor even though they otherwise appear to qualify readily enough for swap insofar as prospects of all other minerals go (natural gas, oil and geotherm steam excepted).

Table 3 includes the residue of forty (40) tracts not covered by the listings in Tables 1 and 2. Like the Table 2 tracts, however, they rate a tentative "hold" classification. They do so because they are located within, or in close proximity to established mining districts or other recognized minerals potential situations under circumstances that would render any hasty classification to the contrary foolhardy. The mining districts and/or mineral situations to which these tracts relate include the known zeolite-fluorite occurrences in the Rome-Jordan Valley area as is duly indicated on Table 3.

In summation it can be stated that all Table 1 tracts can be considered as clear for unconditional across-the-board swap while all Table 2 and 3 tracts rate as having inherent value for one reason or another as outlined heretofore. Additional screening can result in some lessening in the number of Table 2 and 3 tracts but by not more than an estimated ten percent and probably less. In any event, the decision to proceed in this respect will necessarily hinge on the amount of risk the Lands Department elects to authorize as any decrease in the number of Table 2 and 3 tracts can be achieved only by arbitrarily eliminating certain of the listed tracts on the basis of some rather weak criteria. The way it stands, however, it is felt that Tables 1, 2 and 3 approximate about the ultimate in sophistication that can be accomplished in the way of tract classification at this time on the strength of a strictly desk-side review of available data.

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Norman S. Wagner

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November 21st, 1972

Table 1. Tracts with mineral rights having minimal to no apparent value in terms of the kinds of minerals covered in this report.

tract	location	tract	location		
3	14S-41E-16	126	28S-38E-36	203	35S-[illegible]-36
6	15S-39E-36	127	28S-39E-16	205	35S-37E-36
7	15S-41E-36	128	28S-39E-36	206	35S-38E-16
10	16S-40E-16	129	28S-40E-16	209	35S-39E-36
11	16S-40E-17	130	28S-40E-36	213	35S-41E-36
12	16S-41E-16	132	28S-41E-36	215	35S-42E-36
13	16S-41E-36	136	28S-43E-36	216	36S-37E-16
15	16S-42E-19	137	28S-44E-36	224	36S-43E- 4
16	16S-42E-20	139	29S-37E-36	225	36S-43E-24
21	17S-37E-36	140	29S-38E-16	230	37S-40E- 4
22	17S-38E-16	141	29S-38E-36	235	37S-42E-36
23	17S-38E-24	142	29S-39E-16	236	37S-43E-16
28	17S-42E- 2	[illegible]	29S-39E-36	238	37S-44E-16
36	18S-37E-16	[illegible]	29S-40E-16	239	37S-44E-36
38	18S-38E-16	145	29S-40E-36	240	38S-39E- 4
41	18S-39E-36	146	29S-41E-16	241	38S-39E-24
43	18S-40E-36	147	29S-41E-36	242	38S-40E-16
46	19S-37E-36	148	29S-42E-16	247	38S-43E-16
47	19S-38E-16	150	29S-43E-16	249	38S-44E-16
48	19S-39E-16	151	29S-43E-36	250	38S-44E-36
52	20S-38E-36	152	29S-44E-36	251	39S-39E-16
53	20S-40E-36	153	29S-45E-16	253	39S-40E-16
58	21S-39E-36	155	30S-37E-16	254	39S-40E-36
61	21S-43E-16	156	30S-37E-36	257	39S-42E-16
66	21S-45E-36	157	30S-38E-16	259	39S-43E-16
68	22S-41E- 1	158	30S-38E-36	261	39S-44E-16
74	22S-44E-36	159	30S-39E-16	262	39S-44E-36
75	22S-45E-16	160	30S-39E-36	263	39S-45E-16
78	23S-38E-25	161	30S-40E-16	264	39S-45E-36
79	23S-44E-16	168	31S-37E-16	265	39S-46E-16
81	23S-45E-16	169	31S-37E-36	266	39S-46E-36
85	24S-37E- 6	170	31S-[illegible]	267	39S-47E-16
86	24S-37E-16	171	31S-38E-36	268	39S-47E-36
87	24S-37E-36	172	31S-39E-16	269	39S-48E-16
95	24S-46E-36	174	31S-40E-16	270	39S-48E-36
102	26S-37E-10	175	31S-40E-36	276	40S-42E-16
103	26S-37E-16	176	32S-37E-16	281	40S-45E-16
104	26S-37E-36	178	32S-38E-16	282	40S-45E-36
105	26S-38E-36	180	32S-39E-16	283	40S-46E-16
113	27S-37E-16	182	32S-40E-16	285	40S-47E-16
115	27S-38E-16	186	33S-37E-36	286	40S-47E-36
117	27S-39E-36	191	33S-40E-16	287	40S-48E-16
119	27S-40E-36	197	34S-38E-16	288	40S-48E-36
123	27S-46E-36	198	34S-38E-36	295	41S-45E-16
124	28S-37E-16	199	34S-39E-16	298	41S-48E-16
125	28S-38E-16	202	34S-40E-36		

Table 2. Tracts corresponding to those in Table 1 but with an overriding "hold" classification due to potential in terms of possible zeolite and/or fluorite occurrences.

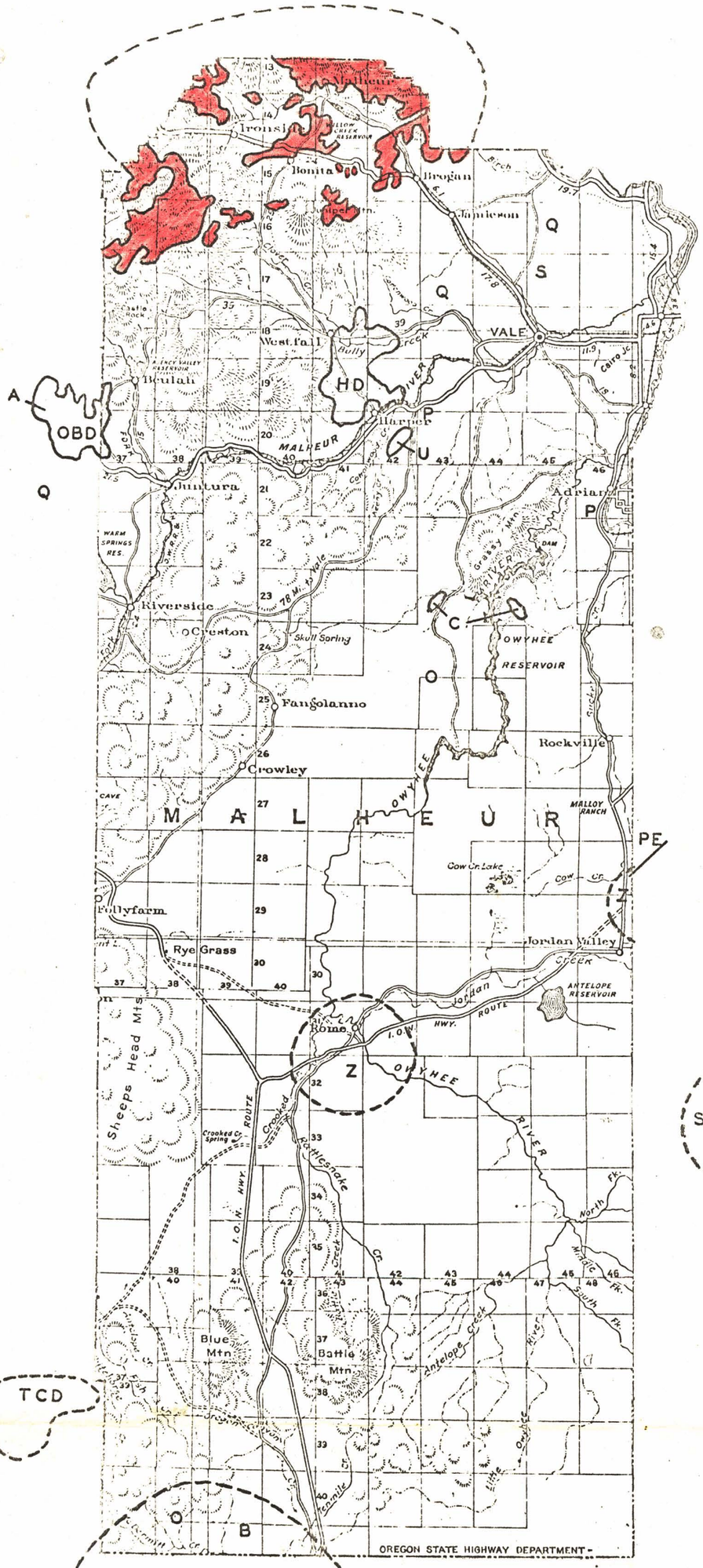
tract	location	tract	location	tract	location
2	14S-38E-16	84	23S-46E-36	189	33S-39E-16
8	15S-42E-16	88	24S-44E-16	190	33S-39E-36
9	15S-42E-27	89	24S-44E-36	192	33S-40E-36
14	16S-42E- 1	90	24S-45E-16	193	33S-41E-16
17	16S-42E-36	91	24S-45E-36	194	33S-42E-16
18	16S-44E-16	92	24S-46E- 7	195	34S-37E-16
24	17S-38E-36	93	24S-46E-16	196	34S-37E-36
25	17S-39E-19	94	24S-46E-20	200	34S-39E-36
26	17S-41E-16	96	25S-37E-16	201	34S-40E-16
29	17S-43E-36	97	25S-38E-16	204	35S-37E-16
31	17S-45E-36	98	25S-44E-36	207	35S-38E-36
32	17S-46E-22	99	25S-45E-16	208	35S-39E-16
33	17S-46E-23	100	25S-45E-36	210	35S-40E-16
34	17S-46E-26	101	25S-46E-36	211	35S-40E-36
35	17S-46E-34	106	26S-43E-16	212	35S-41E-16
37	18S-37E-36	107	26S-44E-16	214	35S-42E-16
39	18S-38E-36	108	26S-44E-36	217	36S-37E-36
40	18S-39E-16	109	26S-45E-16	218	36S-40E-16
45	18S-42E-36	110	26S-45E-36	219	36S-40E-36
50	19S-43E-16	111	26S-46E-16	220	36S-41E- 4
51	20S-37E-36	112	26S-46E-36	221	36S-41E-24
54	20S-43E-36	114	27S-37E-36	222	36S-42E- 4
55	20S-44E-16	116	27S-38E-36	223	36S-42E-24
56	20S-44E-36	118	27S-40E-16	226	36S-44E- 4
57	20S-45E-16	120	27S-42E-36	227	36S-44E-24
59	21S-41E- 1	121	27S-43E-16	228	37S-37E-16
60	21S-42E-36	122	27S-44E-16	229	37S-37E-36
62	21S-43E-36	131	28S-41E-16	231	37S-40E-24
63	21S-44E-16	133	28S-42E-16	232	37S-41E-16
64	21S-44E-36	134	28S-42E-36	233	37S-41E-36
65	21S-45E-16	135	28S-43E-16	234	37S-42E-16
67	21S-46E-16	138	29S-37E-16	237	37S-43E-36
69	22S-42E- 1	149	29S-42E-36	243	38S-41E-16
70	22S-42E-36	154	29S-46E-36	244	38S-41E-36
71	22S-43E-16	162	30S-40E-36	245	38S-42E-16
72	22S-43E-36	173	31S-39E-36	246	38S-42E-36
73	22S-44E-16	177	32S-37E-36	248	38S-43E-36
76	22S-45E-36	179	32S-38E-36		
77	22S-46E-16	181	32S-39E-36		
80	23S-44E-36	185	33S-37E-16		
82	23S-45E-36	187	33S-38E-16		
83	23S-46E-16	188	33S-38E-36		

Table 3. Tracts with mineral rights having sufficient indications of diverse values to warrant a tentative "hold" classification.

tract	location	setting
1	13S-40E-14	Mercury Basin Mining District
4	14S-42E- 7	" " " "
5	14S-42E- 9	" " " "
19	16S-44E-36	Sodium Chloride Brine Area
20	16S-45E-36	" " " "
27	17S-41E-36	Harper Bixbyite Area
30	17S-45E-16	Sodium Chloride Brine Area
42	18S-40E-16	Harper Bixbyite Area
44	18S-41E- 1	" " "
49	19S-42E-16	" " "
163	30S-41E-16	Jordan Valley - Rome zeolite-fluorite area
164	30S-41E-36	" " " " " "
165	30S-42E-16	" " " " " "
166	30S-43E-16	" " " " " "
167	30S-45E-16	" " " " " "
183	32S-41E-16	" " " " " "
184	32S-41E-36	" " " " " "
252	39S-39E-36	Opalite Quicksilver District & environs
255	39S-41E-16	" " " "
256	39S-41E-36	" " " "
258	39S-42E-36	" " " "
260	39S-43E-36	" " " "
271	40S-39E-16	" " " "
272	40S-40E-16	" " " "
273	40S-40E-36	" " " "
274	40S-41E-16	" " " "
275	40S-41E-36	" " " "
277	40S-42E-36	" " " "
278	40S-43E-16	" " " "
279	40S-43E-36	" " " "
280	40S-44E-36	" " " "
284	40S-46E-36	" " " "
289	41S-39E-16	" " " "
290	41S-40E-16	" " " "
291	41S-41E-16	" " " "
292	41S-42E-16	" " " "
293	41S-43E-16	" " " "
294	41S-44E-16	" " " "
296	41S-46E-16	" " " "
297	41S-47E-16	" " " "

APPENDIX

Figure 1



ESTABLISHED MINING DISTRICTS

Morman Basin (northernmost): Chiefly gold and silver but with asbestos, cinnabar, iron, scheelite, chromite, stibnite, and talc prospects also.

Opalite (southernmost): Quicksilver only.

South Mountain (Idaho): Gold and Silver chiefly.

MISCELLANEOUS SYMBOLS

HD, OBD, TCD - Harper Basin, Otis Basin, Trout Creek diatomite areas, respectively.

PCU, U -- Pike Creek uranium area and isolated Malheur County prospect, respectively.

Z-- Known zeolite-fluorite areas.

Q -- Known cinnabar prospects.

P -- Noteworthy pumicite occurrences.

PE -- Perlite occurrence.

C -- Optical calcite prospects.

S -- Sodium Chloride brine

O -- Opalite occurrence.

Appendix item 2

BEDROCK REFERENCES

Virtually all of the terrain surface in Malheur County has been investigated geologically during the past two and a half decades by professional geologists on various governmental agency staffs and by graduate level students seeking Phd and/or Master of Science degrees in geology from various universities. As a consequence there are numerous maps in existence today covering the identity and distribution of most major lithologic units and recognized stratigraphic formations occurring in the county. Even so, only a few of these maps have been published; chiefly those issued by governmental agencies. The remainder are either student maps contained in theses that are highly restricted in distribution and available for reference in only a few places or else advance copies of project mapping that is still in progress but scheduled for eventual publication.

Maps deemed pertinent to this project are identified and described in the two charts which follow. Most have been used as source references to one extent or another, and as circumstances have warranted, for the bedrock status of the state-owned lands cited in the section of blue-page indexes covering individual tracts. Those included in List 1 are primarily the published, or publication pending, products of the governmental mapping agencies. Conversely, those included in List 2 are for the most part the unpublished theses.

REFERENCES TO BEDROCK GEOLOGY USED IN TRACT SCREENING: LIST 1

REFERENCES TO BEDROCK GEOLOGY USED IN TRACT SCREENING: LIST 1

1. Brown & Thayer - Geologic Map of the Canyon City Quadrangle, Northeastern Oregon; U.S.G.S. Misc. Geologic Investigations Map, I-447, published 1966.

2. Brooks & McIntyre - Geologic Map of the Baker Quadrangle, Eastern Oregon --- an in-progress DOGAMI project with publication pending.

3. Greene, Walker & Corcoran - Geologic Map of the Burns Quadrangle, U.S.G.S. Misc. Geologic Investigations Map, I-680, published 1972.

4. West Half Boise AMS Quad - Mapped by George Walker, U.S.G.S. in the 1960's but not scheduled for publication. Special release of manuscript map for use on this project, courtesy Walker.

5. Walker & Repenning - Reconnaissance Geologic Map of the Adel Quadrangle, Lake, Harney and Malheur Counties; U.S.G.S. Misc. Geologic Investigations Map I-446, published 1965.

6. Walker & Repenning - Reconnaissance Geologic Map of the Jordan Valley Quadrangle, Malheur County, Oregon; U.S.G.S. Misc. Geologic Investigations Map I-457, pubished 1966.

7. Lowry & Wray - Geologic Map of the Ironside Mountain Quadrangle, Oregon; an unpublished DOGAMI map.

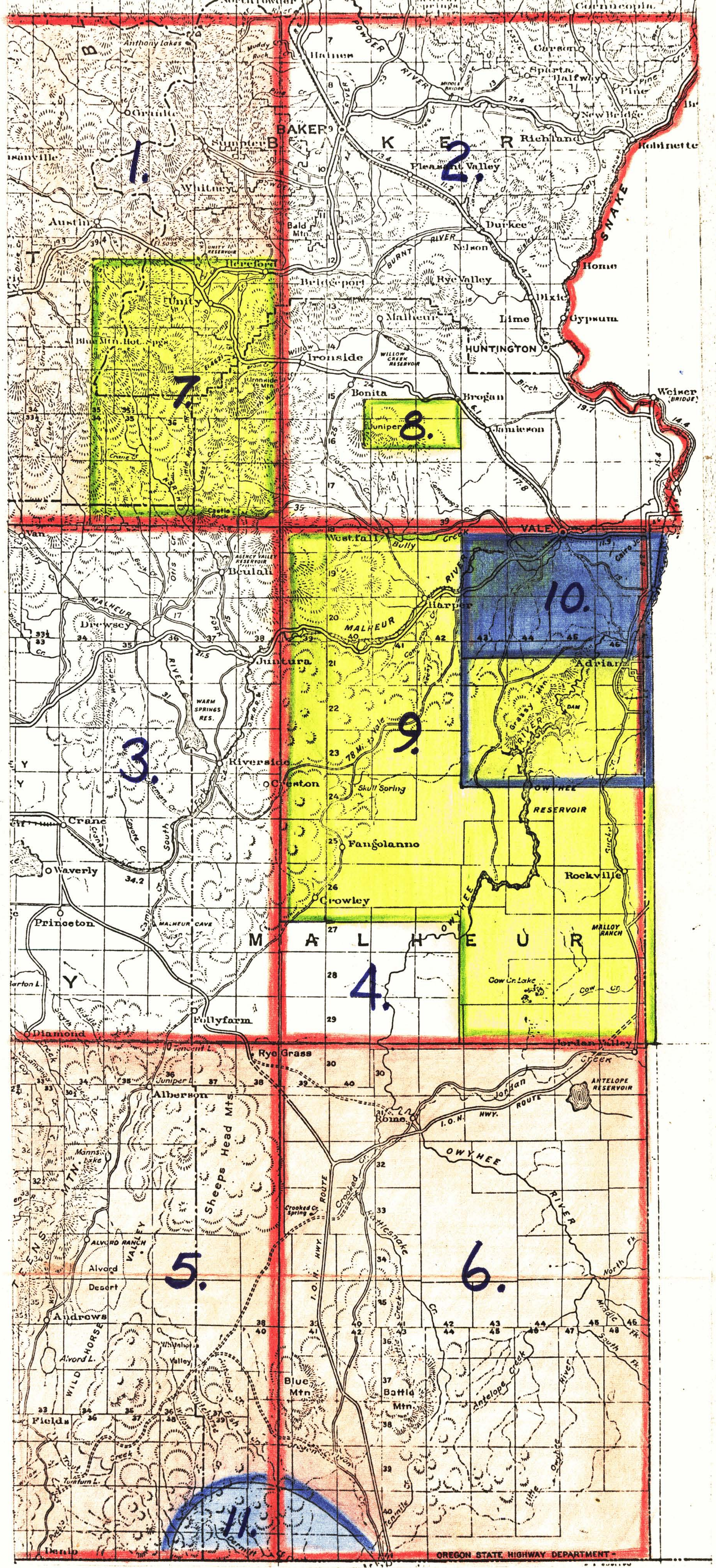
8. Wagner, Brooks & Imlay - Marine Jurassic Exposures in the Juniper Mountain Area of eastern Oregon; American Association of Petroleum Geologists, Bulletin, April 1963.

9. Kittleman, et. al. - Geologic Map of the Owyhee Region, Malheur County, Oregon; University of Oregon; Museum of Natural History, Bulletin 8, published 1967.

10. Corcoran, et. al. - Geology of the Mitchell Butte Quadrangle, Oregon DOGAMI geological Map Series #2, published 1962.

11. Yates - Quicksilver Deposits of the Opalite District, Malheur County, Oregon & Humboldt County, Nevada; U.S.G.S. Bulletin 931 N - published 1942.

LIST 1


1.
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BAKER
MALHEUR
SNAKE
Anthony Lakes
Granite
Sumpter
Whitney
Austin
Unity
Hereford
Bridgeport
Rye Valley
Malheur
Ironside
Bonita
Juniper
Brogan
Jamieson
Huntington
Lime
Dixie
Gypsum
Home
Durkee
Pleasant Valley
Richland
New Bridge
Halfway
Sparta
Carson
Cornucopia
Robinette
Weiser
Vale
Westfall
Harper
Beulah
Drewsey
Juntura
Riverside
Crestone
Crane
Waverly
Princeton
Diamond
Follyfarm
Skull Spring
Fangolanno
Crowley
Adrian
Owyhee Reservoir
Rockville
Malloy Ranch
Cow Cr. Lake
Jordan Valley
Rye Grass
Alberson
Rome
Antelope Reservoir
Sheeps Head Mts.
Alvord Ranch
Alvord Desert
Andrews
Blue Mtn
Battle Mtn
Fields
Denio
Owyhee River
Malheur River
OREGON STATE HIGHWAY DEPARTMENT

REFERENCES TO BEDROCK GEOLOGY USED IN TRACT SCREENING: LIST 2

REFERENCES TO BEDROCK GEOLOGY USED IN TRACT SCREENING: LIST 2

1. Wolf, E. N. - Geology of the northern half of the Caviness Quadrangle, Oregon; University of Oregon PhD thesis, 1965.

2. Beeson, John H. - Geology of the southern half of the Huntington Quadrangle, Oregon; University of Oregon Master's thesis, 1955.

3. Fouch, Thomas D. - Geology of the northwest quarter of the Brogan Quadrangle, Malheur County, Oregon; University of Oregon Master's thesis, 1968.

4 a. Calkins, James A. - Geology of the northeastern half of the Jamieson Quadrangle, Oregon; University of Oregon Master's thesis, 1954.

4 b. Carlat, James E. - Geology of the southwestern portion of the Jamieson Quadrangle, Malheur County, Oregon; University of Oregon Master's thesis, 1954.

5. Bowen, Richard G. - Geology of the Beulah Area, Malheur County, Oregon; Oregon State College Master's thesis, 1956.

6. Gray, Wilfred L. - Geology of the Drinking Water Pass Area, Harney & Malheur Counties, Oregon; University of Oregon Master's thesis, 1956.

7. Haddock, Gerald H. - Dinner Creek Welded Ash Flow Tuff of the Malheur Gorge Area, Malheur County, Oregon; University of Oregon PhD thesis, 1967.

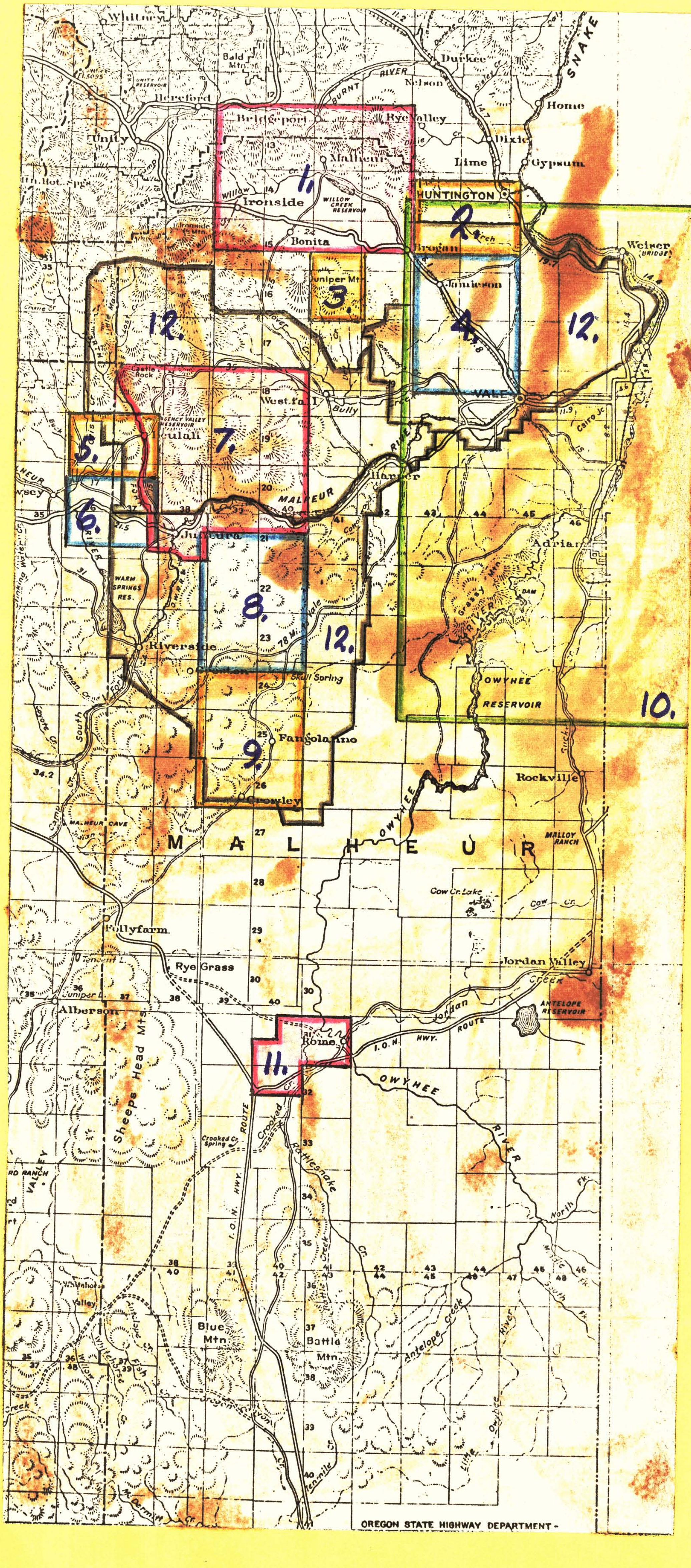
8. Hagood, Allen R. - Geology of the Monument Peak Area, Malheur County, Oregon; University of Oregon Master's thesis, 1963.

9. Green, Arthur R. - Geology of the Crowley Area, Malehur County, Oregon; University of Oregon Master's thesis, 1962.

10. Newton, V. C. and Corcoran, R. E. - Petroleum Geology of the Western Snake River Basin, Oregon - Idaho; DOGAMI Oil & Gas Investigations, No. 1, 1963.

11. Ellison, Bruce E. - Stratigraphy of the Burns Junction - Rome Area, Malheur County, Oregon; University of Oregon Master's thesis, 1968.

12. Paul, Roger - Stratigraphic compilations, including some new reconnaissance mapping; Soils Conservation Service open-file service maps, late 1960's.



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10.
11.
12.
SNAKE
Durkee
Nelson
Home
Dixie
Lime
Gypsum
HUNTINGTON
Bridgeport
Rye Valley
Malheur
Ironside
Bonita
Brogan
Jamieson
Juniper Mtn
Weiser
VALE
Westfall
Bully
Harper
Juntura
Riverside
Adrian
OWYHEE RESERVOIR
Rockville
Fangollano
Crowley
MALHEUR
Cow Cr. Lake
Jordan Valley
ANTELOPE RESERVOIR
Rome
Rye Grass
Follyfarm
Alberson
Sheeps Head Mts.
OWYHEE RIVER
Blue Mtn.
Battle Mtn.
Antelope Creek
Hereford
Unity
Whitney
Bald Mtn.
WARM SPRINGS RES.
Skull Spring
MALLOY RANCH
OREGON STATE HIGHWAY DEPARTMENT

I had planned to include a map of the County here with the state-owned tracts numbered in accordance with the indexing system used in the report and color-coded as to tract classification. However, the only suitable-sized base map I have been able to secure to date does not show the state-owned holdings separate from other non-federal lands. Under the circumstances it is not satisfactory for the intended use except in those instances when a state tract happens to be wholly surrounded by federal land.

Perhaps there is no map showing the state-owned holdings on a scale smaller than the one-half inch to the mile quads originally furnished us. But if there is and if the Lands Department can scare up three copies, I will gladly embellish them with the tract numbers and the color-coded classification described in the report in Tables 1, 2 and 3. This I feel is a necessary supplement to the report considering the variable size and shape of some of the state-owned tracts and the numerous instances of overlap into adjoining townships and ranges that is not adequately described by the abbreviated township, range and key section descriptions cited in the text.

N. S. WAGNER