STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
Head Office: 1069 State Office Bldg., Portland 1, Oregon
Telephone: COlumbia 2161, Ext. 488

****

QUALITY OF OREGON WATERS

In a recent report entitled "The industrial utility of public water supplies in the United States," 1/ the U.S. Geological Survey has published chemical analyses of the water furnished to residents of 1,315 cities in the United States. Fifteen Oregon cities are represented, namely, Albany, Astoria, Baker, Bend, Coos Bay, Corvallis, Eugene, Klamath Falls, La Grande, Medford, Pendleton, Portland, Roseburg, Salem, and Springfield. Results of these analyses demonstrate that the value of water as a natural resource in the State is greatly enhanced by the quality of the municipal supplies.

A brief review of the report is given below together with a summary of the analyses of 15 public water supplies in Oregon.

Chemical character of water

Hardness: Knowledge of the chemical character of the water is an important factor in the selection of sites for most industrial plants. Of particular importance is information about the hardness of water, for hardness is a characteristic that affects both domestic and industrial use. In domestic use, hardness of water results in excessive consumption of soap and the formation of scale in vessels in which the water is boiled. In industrial use, hardness causes scale to be deposited in hot-water pipes, heaters, and steam boilers, resulting in economic loss through increased fuel consumption and breakdown of equipment. Moreover, hard water used in manufacturing can adversely affect both the process and the product, as, for example, in the dyeing of textiles.

Hardness is caused chiefly by the presence of calcium and magnesium in the water, and is expressed in the analyses as parts per million (ppm) calcium carbonate. Hardness is a relative quantity. Portland's very soft water has a hardness of only 9 ppm calcium carbonate, while Pendleton's water has a hardness of 95. A resident of Portland might consider the Pendleton water hard, while a resident of Sioux City, Iowa, who uses water with a hardness of 472, would probably consider the Pendleton water rather soft. The average hardness of the Oregon waters analyzed is 34. Only two other states, Maine and South Carolina, have, on an average, softer water. The water supplies of 25 states have an average hardness of more than 100 ppm calcium carbonate, while ten of these have an average hardness of more than 200. However, the water supplies of almost every state in the union show a range in hardness -- sometimes a very wide range. In Florida, for example, the hardness of untreated water samples varied from 12 to 1,060. For purpose of comparison with Oregon waters, the hardness of some of the public water supplies in Washington and California are shown as follows:

Washington	(Source)	Hardness (ppm $CaCO_3$)
Pasco	Columbia River	70
Seattle	Cedar River impounded in Lake Youngs	18
Spokane	13 wells	157
Tacoma	Chiefly from Green River	18
Vancouver	Wells and springs	55

1/ Part 1, "States east of the Mississippi River," Water-Supply Paper 1299; Part 2, "States west of the Mississippi River," Water-Supply Paper 1300. For sale by Superintendent of Public Documents, Government Printing Office, Washington 25, D.C. Price $1.75 each.

California	(Source)		Hardness (ppm $CaCO_3$)
Fresno	45 wells		72-163
Los Angeles	Owens Valley Aqueduct		84
	Los Angeles River		274
	Local wells		210
	Colorado River[1]	untreated	315
		treated	125
San Diego	San Diego River and Colorado River[1]		231
San Francisco, various sources, chiefly:			
	Tuolumne River impounded in Hetch Hetchy reservoir		9
	Calaveras Creek and Arroyo Hondo impounded in Calaveras reservoir		99

Dissolved minerals: All natural waters contain dissolved minerals, for water in contact with soils and rocks, even for only a few hours, will dissolve some mineral matter. Ground water (wells and springs) usually contains more dissolved mineral matter than surface runoff (rivers and lakes), for it remains in contact with soils and rocks for longer periods of time. As shown in the table on opposite page, Pendleton water from springs and deep wells contains 203 ppm dissolved solids, while Bend water from Tumalo Creek contains only 37 ppm. The concentration of dissolved minerals in river water may, however, be increased by drainage from irrigated areas, mines, and discharge from industrial and municipal wastes. Dissolved mineral constituents that affect the value of water for most purposes are: silica (SiO_2), iron (Fe), manganese (Mn), calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), carbonate (CO_3), bicarbonate (HCO_3), sulfate (SO_4), chloride (Cl), fluoride (F), and nitrate (NO_3). These are expressed in the analyses in parts per million, and their total amounts are designated as "dissolved solids." Analyses of the dissolved solids in Bend and Pendleton water supplies are as follows:

	SiO_2	Fe	Mn	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	NO_3	Total Dis. Sol.
Bend	19	.03	--	3.5	.6	2.0	.8	0	8	.8	.9	.0	.1	37
Pendleton	44	.2	--	25	8.0	26		0	146	15	12	.2	.1	203

Color: Color in water analysis refers to the appearance of water that is free of suspended material. Material in suspension may cause water to appear yellow, red, or brown, but this water may be colorless after the suspended matter has been removed. Color is due to roots, stems, leaves, and other organic matter in water. Swamp waters may have as much as 200-300 units of color. A color of 10 units or less us usually not noticed. Coos Bay water untreated has an undesirable color of 100 (see table on opposite page). Treatment reduces the color to 6, but at the same time increases the hardness.

PH: By pH is meant the hydrogen-ion concentration. The pH range is from 0 to 14. A solution with a pH of 7 is said to be neutral. Decreasing values denote increasing acidity, and values increasing above 7 denote increasing alkalinity. The pH value of most natural waters ranges between 6 and 8. Waters of low pH have corrosive properties.

---

[1] An increasing amount of treated water from the Colorado River is being supplied by the Metropolitan Water District of Southern California to 5 counties in the southern part of that state.

SUMMARY OF ANALYSES OF 15 PUBLIC WATER SUPPLIES IN OREGON*

City	Source	Treatment	Dissolved solids ppm	Hardness ppm $CaCO_3$	Color	pH	Temp.	Date collected
Albany	South Santiam River	Coagulation with alum and lime	76	42	---	---	---	April 12, 1945
Astoria	Bear Creek and tributaries impounded in artificial lakes	Chlorination and occasional $CuSO_4$ for algae control	73	27	10	7.0	---	June 7, 1950
Baker	Goodrich Lake, Marble, Pine, and Elk creeks	Chlorination and occasional ammoniation	56	37	3	7.4	49	June 19, 1951
Bend	Tumalo Creek	Chlorination	37	11	7	6.7	46	June 18, 1951
Coos Bay	Pony Creek	(before treatment)	57	9	100	6.1	58	May 7, 1947
	Pony Creek	Prechlorination, color removal by coagulation with alum and lime, filtration, and aeration	73	37	6	7.1	66	June 15, 1951
Corvallis	Rock Creek	Filtration, chlorination, and ammoniation	76	37	5	7.5	64	June 14, 1951
	Willamette River	(before treatment)1/	54	20	---	---	---	Nov. 27, 1950
Eugene	McKenzie River	Prechlorination, coagulation, and filtration	48	17	7	7.5	59	June 14, 1951
Klamath Falls	4 flowing wells	Chlorination	141	52	---	8.2	67	March 22, 1949
La Grande	Beaver Creek	Chlorination	68	21	5	6.8	55	June 19, 1951
Medford	Big Butte Spring	None	99	35	---	6.9	42	April 21, 1947
Pendleton	Springs and wells	Chlorination	203	95	---	7.2	---	January 1949
Portland	Bull Run River2/	Chlorination and ammoniation	30	9	15	7.0	59	Sept. 19, 1947
Roseburg	North Umpqua River	Prechlorination, coagulation, sedimentation, and filtration	80	43	---	7.6	53	March 10, 1949
Salem	North Santiam River	Chlorination and ammoniation	45	17	5	7.3	64	June 14, 1951
Springfield	Willamette River3/	Filtration and chlorination	61	36	---	---	---	April 12, 1951

*Complete analyses given in Water-Supply Paper 1300, p. 327-336.

1/ Treatment of water by new plant will include coagulation, sedimentation, filtration, and chlorination.

2/ Bull Run River impounded in Lake Ben Morrow Reservoir on river, and in Bull Run Lake near summit of Cascades. Water diverted from Bull Run River through 3 steel conduits for 24 miles to 4 reservoirs on Mount Tabor and 2 reservoirs in Washington Park. Distribution mainly by gravity.

3/ Analysis is for untreated water.

Industrial requirements

Quality of process water for industrial uses must meet specific requirements for each product. For instance, water used for baking has to be free of substances that might produce undesirable tastes, odors, and colors. Too much hardness retards fermentation, although some calcium is necessary for yeast action, and too little softens the gluten, resulting in soggy bread. The quality of water used in brewing affects considerably the final product. Waters low in alkalinity and comparatively high in calcium sulfate are desirable. Process water for canning and freezing of foods should be free of tastes, odors, color, iron, and manganese. Hardness causes toughening of certain vegetables such as peas and beans. Water used in the manufacture of ice should be free of iron, manganese, tastes, and odors, and should be low in dissolved solids. Process water used in the manufacture of textiles and fine paper should be practically free of suspended matter, color, iron, and manganese. Iron and manganese cause staining, while hardness interferes in washing operations, dyeing of fabrics and sizing of paper.

Water used in steam boilers for the production of power and heat must meet exacting standards, particularly under conditions of high temperature and pressure. The most objectionable quality of water used for such purposes is hardness. As mentioned above, hardness of water results in the deposition of scale on boiler surfaces. Scale is composed of compounds of calcium and magnesium with generally smaller amounts of iron and silica.

Treatment of public water supplies

Most public water supplies are treated in such a way as to make the water safe to drink, but not necessarily satisfactory for industrial uses. Additional treatment such as filtration, softening, and corrosion control may be required. The installation of municipal water-softening plants in areas of extremely hard water is becoming more prevalent. The softening treatment removes only part of the hardness, but makes the water more satisfactory for domestic use. The softening process involves the removal by chemical precipitation or cation exchange of those substances, chiefly calcium and magnesium, that cause hardness.

The more common methods of treating public water supplies to make them suitable for drinking are as follows:

1. Natural purification: Waters impounded in artificial lakes and reservoirs improve in quality from storage. Suspended matter settles out, while color and bacteria decrease. But because conditions are favorable for growth of algae and other micro-organisms, chlorine is regularly applied as a safety measure.

2. Filtration: Waters are cleared of suspended material by filtration through sand and gravel. Prior to filtration, the raw water is allowed to stand in reservoirs long enough for most of the suspended matter to settle out; then a coagulant, generally aluminum sulfate, is added to settle out the finer particles, colloidal material, and micro-organisms.

3. Disinfection: Chlorine is the chief reagent used in the disinfection of water supplies. Chlorination does not normally affect the industrial value of water except as it may affect the taste or odor.

4. Removal of tastes, odors, and colors: Tastes, odors, and colors seriously reduce the quality of drinking water and affect the industrial use of water in the food and beverage industries. These three characteristics are usually caused by either plant growth or by pollution from industrial plants. If treatment by aeration is not sufficient, then some method such as coagulation, chlorination, or ammoniation must be applied. M.L.S.

****

Water Resources

NEW SCHEELITE PROSPECT

A new scheelite deposit has been discovered by Lester E. Thornton in the Greenhorn district, Grant County. Some development work has been done since its location last summer and application has been made for a DMEA exploration loan. The property is located near the southwest corner of sec. 15, T. 10 S., R. 34 E., near the head of Lemon Creek at an elevation of 5400 feet.

****

DEPARTMENT RECEIVES HENDRYX PAPERS

This Department is the recipient of a rare and unique assemblage of early-day mining records donated by Mrs. H. E. Hendryx of Baker, Oregon.

These records include a partial set of bound copies of the Sumpter News and its successor, the Blue Mountain American published between August 1897 and January 1914. Many of the older residents of eastern Oregon will recall these leading newspapers published weekly in Sumpter during much of the period when eastern Oregon lode mining activity was at its peak, especially in the Bourne, Cable Cove, Granite, and Greenhorn mining districts in the mountains above Sumpter.

Also included in the donation are several large scrapbooks containing approximately 7000 selected and itemized articles of mining interest clipped from a wide assortment of newspapers and early-day mining magazines. These clippings range in their coverage from February 1899 to and including a part of 1909. While the articles center for the most part on eastern Oregon mining subjects, many relate to mining activity in southwest Oregon and neighboring mining districts of Idaho.

The assembling of these scrapbooks reflects the efforts and interests of Mr. H. E. "Ed" Hendryx, pioneer newsman in northeastern Oregon and late member of the Governing Board of the State Department of Geology and Mineral Industries.

Mr. Hendryx' experience in publishing a newspaper about eastern Oregon mining began when he organized the Lawton Standard in 1900. Lawton is now merely a wide place on a desolate forest road but in 1900 the town was an important contender for the mining trade of the area. Publication of the Lawton Standard was followed by purchase of the Granite Gem at nearby Granite in 1902 and by purchase in 1908 of the Blue Mountain American at Sumpter. On Friday the 13th in August 1917 the publication of the Blue Mountain American was terminated when fire wiped out the heart of what then remained of the Sumpter business district. This accounts for the incomplete coverage of the bound newspaper file acquired by the Department, as the fire also destroyed the newspaper.

Subsequent years saw Ed still actively associated with the newspaper business with no diminution of his personal sideline interest in mining. One of his special ventures was the editing of the Oregon Mining Review, a monthly magazine dedicated to the best interests of the Oregon miner and aimed at carrying a maximum of news and a minimum of promotion. This magazine was published from December 1938 to March 1941. Two sets of the Oregon Mining Review, one complete and the other lacking one issue, were included with the records given us by Mrs. Hendryx.

Historical data about Oregon's older mining properties, even for the more noted mines, are often very meager if not entirely lacking in the Department's files. This is because there was no organized mining agency in Oregon engaged to keep orderly records of activity. Therefore the information represented by these early-day mining records in the Sumpter newspapers and in the Hendryx scrapbooks is invaluable. Some of the information that can be anticipated when the records have been carefully studied, will be the names of the early operators, the exact years during which they had active control of the property, something of the nature of the work done, size of the mills, and depths of workings. Possibly, also, Ore.-Bin readers can look forward to occasional anecdotes from the pages of the past as a result of the forethought and interest of this man with his scrapbooks and paste pot, and the generosity and thoughtfulness of Mrs. Hendryx in turning these records over for safekeeping to this Department.

N.S.W.

****

NEW DRILLING PERMIT ISSUED

The first drilling permit of the year was issued February 16, 1955, to Charles A. Stone & Associates. The application to drill stated that the well will be known as Shelley No. 3. The drilling site was given as sec. 20, T. 39 S., R. 19 E., Lake County. The new permit is the sixth to be issued since the gas and oil conservation law was passed.

****

BILLS AFFECTING THE MINERAL INDUSTRY IN THE STATE LEGISLATURE

The Forty-eighth Oregon State Legislature, now in its second month, has before it several bills which would affect the mineral industry if passed in their present form. Highlights of each bill are given below along with the bills' status as noted in the legislative calendars of February 21. If anyone wishes copies of the bills, he should write the mailing clerks of the House or Senate, State Capitol Building, Salem, Oregon. It should be mentioned that the Oregon Department of Geology and Mineral Industries is introducing no bills in this session.

Ed.

House Bill No. 158 - This is a new bill that would require all mining operations to take control measures on their waste water to prevent silting any body of water "to an extent that materially lessens its utility for agricultural or recreational purposes." Silting is designated as "pollution" and silt as "waste." Representative Charles Tom (Rufus) introduced the bill January 26, and after its second reading on January 27 it was referred to the Committee on Forestry and Mining. At the present time it is in Sub-Committee No. 3 and will be up for hearing soon. (Tabled Feb. 24)

House Bill No. 159 - This is a new bill that would require the owners and managers of any type of surface mining operation to "restore as far as is reasonably possible the pre-existing topography and surface soil conditions." Provisions detailing the restoration are to be inserted in all leases on State-owned land, and provisions are made for recovering the cost of making the restoration if the operator fails to do so. This bill was also introduced by Representative Tom and its status is the same as House Bill No. 158. (Tabled Feb.24)

House Bill No. 295 - This is a new bill that would impose a severance tax on all minerals, including oil, gas, coal, sand and gravel, and other nonmetallics obtained from the ground or waters of the State. The tax would be based on the market value of the product at the time and point of severance and, as presently written, will be 3 percent on oil and gas and 2 percent on all other products. Eighty percent of the net revenue will go to the State and 20 percent to the county in which the taxed product was obtained. Tax payments would be due the 20th of each month. Administration and enforcement of the act is to be placed in the State Tax Commission. This proposed tax would be in lieu of an ad valorem tax on minerals but would not affect the existing personal property or improvement taxes. The bill was introduced by the Committee on Taxation and read the first time February 3. After the second reading on February 4 it was sent to the Committee on Ways and Means. On February 16 the bill was taken from the Ways and Means Committee and re-referred to the Committee on Taxation. It is understood that hearings will be held soon.

****

OIL AND GAS PUBLICATION ISSUED

"Oil and Gas Exploration in Oregon" is the title of Miscellaneous Paper No. 6, just issued by the State Department of Geology and Mineral Industries. Its publication was prompted by the increasing demand for information about oil and gas prospecting in Oregon, particularly for records of drilling. The information for the report was compiled by R. E. Stewart, geologist with the Department.

Miscellaneous Paper No. 6 has 53 pages incorporating nearly 200 well records tabulated alphabetically by counties, 25 of which are represented. Included in the paper is a bibliography of 224 references. The location of each test drilling is shown on an index map of the State. Tests in Columbia and Malheur counties, where drilling was more concentrated, are shown on separate maps. Even though many of the records are incomplete and not wholly reliable, all recorded oil and gas prospect holes together with a few water wells that offer pertinent information are listed. The new pamphlet may be purchased from the offices of the Department at 1069 State Office Building, Portland, or the field offices at Grants Pass and Baker. The price is $1.00.

****