BEFORE THE DIRECTOR OF THE WATER RESOURCES DEPARTMENT

Morrow and Umatilla Counties

ON THE QUESTION OF DETERMINATION OF A CRITICAL GROUND WATER AREA IN THE ORDNANCE AREA, MORROW AND UMATILLA COUNTIES, OREGON	FINDINGS, CONCLUSIONS, AND ORDER

INTRODUCTION

1

Notices of hearing on the question of the determination of a critical ground water area in the Ordnance area of Morrow and Umatilla Counties, Oregon were published in the Hermiston Herald and the East Oregonian, newspapers of general circulation, as defined by ORS 193.010 and 193.020, for 2 successive and consecutive weeks in the January 1, 1976 and the January 8, 1976 issues of the Hermiston Herald; and the January 6, 1976 and January 13, 1976 issues of the East Oregonian in Umatilla County, Oregon. Written notices were also mailed to all claimants or appropriators of ground water of record in the Ordnance ground water area and all water well contractors and drilling machine operators whose addresses were within Morrow or Umatilla Counties, Oregon. Notices of hearing were also mailed to the following:

(1) Senators: Senator Michael G. Thorne of Umatilla County
Senator Kenneth A. Jernstedt of Morrow County

(2) Representatives: Representative Wallace W. McCrae of Umatilla County
Representative Jack Sumner of Morrow County

(3) Federal Agencies:
(a) Stanley Kapustka, Chief, Portland District, U. S. Geological Survey, Portland, Oregon
(b) Robert Fery, Federal Land Bank, Spokane, Washington
(c) Mr. Fields, Bonneville Power Administration, Walla Walla, Washington

(d) Irvin Williams, Maintenance Engineer, U. S. Army Depot, Ordnance, Oregon
(e) U. S. Army Corps of Engineers, Walla Walla, Washington
(f) U. S. Army Engineer District, Seattle, Washington

(4) County Officials:
(a) Darrell Maxwell, Extension Service, Hermiston, Oregon
(b) Umatilla County Planning Commission, Hermiston, Oregon
(c) Morrow County Planning Commission, Heppner, Oregon
(d) Umatilla County Planning Commission, Pendleton, Oregon.
(e) Jim R. Stephenson, East Central Oregon Association of Counties, Pendleton, Oregon
(f) Port of Umatilla, Hermiston, Oregon
(g) Port of Morrow, Boardman, Oregon
(h) Forrest K. Starrett, Chairman, Umatilla County Commission, Pendleton, Oregon
(i) Judge Paul W. Jones, Chairman, Morrow County Commission, Heppner, Oregon.

(5) Cities:
(a) City of Hermiston, Mayor L. D. Grey
(b) City of Hermiston, Tom Harper, City Manager
(c) City of Umatilla, Mayor A. L. Draper
(d) City of Irrigon

(6) Others:
(a) Stanfield Irrigation District, Don Wilson, Stanfield, Oregon
(b) The Eastern Oregonian, Hermiston, Oregon
(c) The Tri-City Herald, Hermiston, Oregon
(d) Umatilla Electric Cooperative Association, Hermiston, Oregon
(e) Kottkamp and O'Rourke, Attorneys at Law, Pendleton, Oregon
(f) Peterson and Peterson, Attorneys at Law, Pendleton, Oregon
(g) Owen Panner, Attorney at Law, Bend, Oregon
(h) Donald Morrison, Attorney at Law, Hermiston, Oregon
(i) Manager, Gaschler and Associates, Hermiston, Oregon
(j) Irrigation Engineering, Pasco, Washington
(k) Oregon Drilling Association, Gladstone, Oregon
(l) Oregon, Washington Railroad and Navigation Company, Portland, Oregon
(m) Sabre Corporation, Boardman, Oregon
(n) Herman Winters, Morrow County District Attorney, Heppner, Oregon

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The notice of hearing invited all interested persons to be present at the hearing to present oral or documentary evidence pertaining to the following subjects:

(a) Whether ground water levels in the areas in question are declining or have declined excessively;

(b) Whether the wells of two or more ground water claimants or appropriators within the areas in questions interfere substantially with one another;

(c) Whether the available ground water supply in the areas in question is being or is about to be overdrawn;

(d) Whether the purity of the ground water supply in the areas in question has been or reasonably may be expected to become polluted to an extent contrary to the public welfare, health, and safety.

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A public hearing in connection with the above entitled subjects was held before Chris L. Wheeler, Deputy Director of the Water Resources Department on Wednesday, February 18, 1976 at 9:30 a.m. in Thompson Hall at the Umatilla County Fairgrounds in Hermiston, Oregon in accordance with the Notice given. The Water Resources Department's studies and recommendations as contained in Exhibit No. 1 were presented and pertinent testimony and evidence pertaining to the determination of a critical ground water area were received as provided in ORS 537.730, 537.735 and 537.740.

The following appeared as witnesses and testified at the hearing:

(a) William B. McCall, Hydrogeologist, Water Resources Department
(b) Luther W. Cramer, Well owner and operator
(c) Dwight Hulet, Well owner and operator
(d) Julius Szabo, Landowner
(e) Troy Griffin, Water well contractor and driller
(f) John Robison, Engineer
(g) William Penney, Manager, Port of Umatilla
(h) J. V. Aylett, Well owner and operator
(i) Dennis Logan, Well owner and operator
(j) Malcolm Skinner, Well owner and operator
(k) Chester A. Wilson, Mayor of Irrigon
(l) Dwayne Carroll, Well owner and operator
(m) LaVerne Boylan, Businessman
(n) Ervin C. Williams, Maintenance engineer, U. S. Army Depot

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It now appearing that all evidence and testimony has been taken in the above entitled matter, the Director of the Water Resources Department, being fully advised in the premises, makes and orders to be entered in the records of his office the following Findings, Conclusions, and Order:

FINDINGS

1

The Ordnance ground water area, as used in these findings, lies within the Umatilla lowlands bordering the Columbia River in north-central Oregon within the northeast corner of Morrow County and the northwest corner of Umatilla County. The Ordnance basalt ground water area includes all of Township 3 North, Range 26 East; all of Township 3 North, Range 27 East except that part draining directly into Butter Creek; all of Township 4 North, Range 26 East and Township 4 North, Range 27 East; and that part of Township 5 North, Range 26 East and Township 5 North, Range 27 East lying south of the Columbia River.

2

The Ordnance gravel ground water area includes Sections 1, 2, 3, 10, 11, 12, 13, 14, and 15 of Township 3 North, Range 26 East; Sections 10, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 34, 35, and 36 of Township 4 North, Range 26 East; the north one-half of Township 3 North, Range 27 East; all but Sections 1 through 6 of Township 4 North, Range 27 East; Sections 6, 7, and 18 of Township 3 North, Range 28 East; and Sections 7, 18, 31, and those areas of Sections 8, 9, 16, 17, 19, 20, and 30 of Township 4 North, Range 28 East, lying west of the Umatilla River. The boundary lines of the proposed critical ground water area are shown on the topographic map on Plate 1 (attached).

3

GEOLOGIC SETTING

A. Physiography

The Ordnance area occupies the north central portion of a broad, gently rolling, slightly dissected, lowland plain which rises along gentle slopes from the Columbia River to the rounded hills and small valleys of the Blue Mountains to the south. The elevations within the report area rise from an altitude of about 250 feet near the Columbia River at Irrigon to about 1,000 feet near the southern border of the report area along the

south base line of Township 3 North. The majority of lands irrigated from wells within the area lie between elevations of 500 to 650 feet above mean sea level. The Ordnance basalt ground water area encompasses approximately 175 square miles; the Ordnance gravel ground water area occupies approximately 82 square miles (see Plate 1, attached).

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B. Stratigraphy

The broad plain of the Ordnance ground water area is everywhere underlain by a thick sequence of basaltic lava flows known as the Columbia River Group. At most places in the area, these rocks lie buried beneath sedimentary deposits of fanglomerate and older alluvium. Above an elevation of about 750 feet, near the southern boundary of the area, Pliocene fanglomerate directly overlies the basaltic lavas (see Plate 2, attached). These sediments are composed of a heterogeneous mixture of tightly cemented sand, silt, and clay with embedded basaltic rock debris derived as slope wash from the weathering of basaltic rocks on upland slopes to the south. Below the 750 foot elevation, the older alluvium (glaciofluviotile deposits), consists of lenticular, poorly sorted deposits of sand, gravel, silt, and clay laid down by the ancestral Columbia River during various flood stages in Pleistocene time. Some of the clay and silt deposits at or near the base of the alluvial sediments are probably lacustrine in origin, laid down in shallow lakes that were formed during periods of downstream damming of the river by ice and debris. The thickness of the stream and lake deposits in the area averages approximately 50 to 100 feet and attains a maximum of about 200 feet.

5

Basalt of the Columbia River Group underlies all of the Ordnance ground water area. However, except for a small area along the Columbia River in Sections 15 and 16, Township 5 North, Range 27 East, the basalt is completely covered by alluvium. The Columbia River Group is a series of accordantly layered basaltic lavas. The basalt is known to

exceed 2,500 feet in thickness in nearby areas, although only about 1,500 feet has been penetrated by wells locally. Individual lava flows in this formation vary from about 10 to 150 feet in thickness and commonly extend laterally for about 1 to 12 miles. Typically, the flows are a hard, dense, non-porous, olivine basalt near the base grading upward to coarser grained, vesicular, and scoriaceous zones near the top. The flows commonly display columnar jointing patterns consisting of polygonal or hexagonal shaped, roughly vertical, columns that developed along cooling joints. Rectangular or diced jointing is also common to some flows in the area. Almost all of the jointing patterns within the basalts are relatively tight and are only rarely open and well developed. Vertical permeability, therefore, is believed to be quite low.

6

The basalts making up the Columbia River Group issued forth as a very fluid lava from numerous fissures that opened up in the Columbia basin. Individual out pourings of lava spread out as streams and lakes of molten rock which eventually cooled to form broad lava plains. At times, soil zones, stream channels, and lakes formed by impounded streams developed on the lava plains only to be buried by successive flows of lava. Sediments deposited upon the lava surface include clay, silt, and sand and gravel which now occur as local interbeds, as much as 100 feet thick, between flows of basalt. Where penetrated by wells drilled into the basalt below the regional water table, the coarser grained sediments form extremely good water yielding zones.

7

C. Structure

The topography of the Ordnance area is largely controlled by the tectonic structure of the underlying basaltic rock. The basalt dips almost imperceptibly along gentle slopes from the uplands of the Blue Mountain anticline, several miles to the southeast of the area, to the east-west trending, 160-mile-long, Dalles-Umatilla syncline at the north boundary

of the report area. The Columbia River lies in the axial trough and follows the axis of the syncline. The Ordnance ground water area occupies part of the gently dipping south limb of the syncline. Structural dips trend to the northwest within the basalts of the report area and average approximately 30 feet to the mile.

8

The Service anticline, shown on Plate 2 (attached), lies approximately 3 miles to the east, and generally parallels the eastern boundary of the Ordnance ground water area. The anticline is an up-turned structural fold in the basaltic rocks extending northward from Service Buttes to Sillusi Butte in Washington across the Columbia River from Umatilla. It is believed that the structure serves as a barrier to the movement of ground water from up-slope areas to the southeast.

9

OCCURRENCE OF GROUND WATER

A. Stream and Lake Sediments

Ground water within the stream and lake deposits overlying the basalt of the Columbia River Group has been extensively developed by shallow wells in the report area. The amount of acreage irrigated by wells developing water from these alluvial aquifers is more than double the acreage irrigated from deep basalt wells in the overall Ordnance ground water area.

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1. Lost Lake-Depot Area

Shallow wells producing from the alluvium are concentrated mostly in the north half of Township 3 North, Range 27 East and in the south half of Township 4 North, Range 27 East, herein termed the Lost Lake-Depot area. Here, the gravel interbeds in the alluvium are moderately thick and are in places highly permeable. The capacities of wells in this particular area range from 400 to 3,000 gallons per minute and average about 1,800 gallons per minute. The occurrence of permeable

gravel lenses in the alluvial sediments, however, is irregular in both horizontal and vertical distribution. A number of wells with yields of less than 100 gallons per minute have been constructed in the area. The alluvium in this highly developed area ranges in thickness from approximately 80 feet to 170 feet with an average thickness of about 100 to 125 feet. The saturated portion of the alluvial sediments, or that part lying below the water table, is about 25 feet thick throughout the developed area. However, because of structural or erosional features in the underlying basalt, the saturated alluvium ranges from a low of approximately 15 feet to a high of 125 feet in some areas (see Plate 4, attached). To the north, south, and to the west of the Lost Lake-Depot area, the saturated alluvium becomes progressively thinner and finer grained with a noteable horizontal discontinuance of permeable lenses of gravel. In parts of Townships 3 and 4 North, Range 26 East, and in parts of Township 4 North, Ranges 27 and 28 East, the stream and lake sediments stand above the water table and are not a source of water. Along the Columbia River, in the northern part of the Ordnance ground water area, and especially in Township 5 North, Range 26 East, the ground water in the alluvial sediments is partly in hydraulic connection with the river and is generally free to rise and fall with fluctuations of the pool level of Lake Umatilla behind John Day Dam.

11

2. Westland Road Area

Another area of major development of ground water in the stream and lake sediments is in Township 4 North, Range 28 East, west of the Umatilla River, and along the east range line of the northeast quarter of Township 4 North, Range 27 East, and part of the west half of Township 3 North, Range 28 East, termed the Westland Road area (see Plate 1). Here, the alluvium is approximately 100 to 150 feet thick and contains thick lenses of permeable gravel. In general, the lower one-half of the alluvium in this area is saturated with water. Large quantities of ground

water have been developed from shallow wells in the area for agricultural and for industrial purposes. The relative thick and highly permeable lenses of open gravel that underlie the Westland Road area apparently lens out within short lateral distances and do not extend into the finer grained sediments lying between this developed area and the Lost Lake-Depot area. Wells constructed into alluvial deposits between the two highly productive areas have encountered only fine-grained sediments of clay, silt, and sand with relatively minor amounts of gravel. The hydraulic conductivity between the two areas is believed to be very low.

12

The ground water table within the stream and lake sediments in the overall Ordnance gravel ground-water area slopes rather gently in a general northwesterly direction. The ground-water gradient averages about 50 feet per mile in areas where the sediments are poorly permeable. In areas of greater permeability, containing abundant gravel deposits, the gradient flattens to approximately 12 feet per mile (see Plate 3, attached).

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B. Ordnance Basalt Aquifers

The basalts of the Columbia River Group contain the most wide-spread aquifers in the Ordnance ground water area. These aquifer units are often capable of yielding 1,000 gallons per minute or more to most properly constructed wells. Ground-water aquifers in the basaltic rocks are in the form of thin tabular bodies, usually in the broken and rubbly contact zones between individual flows of basalt. The contact zones are at places porous and permeable in a horizontal direction. The compact center parts of most flows are relatively impermeable and under natural conditions do not permit water to move freely between aquifers. Ground water in the horizontal porous zones, therefore, is confined.

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In addition to the vertical separation, the tabular ground-water bodies generally are not continuous over great horizontal distances. Interruptions

of the permeability in the horizontal water-bearing zones by structural faults and folds and by stratigraphic features, such as the lensing out of individual flows, has produced an areal compartmentation of the hydrologic system in the basalt rocks. As a result, the potentiometric head relationships among the various water bearing zones in the area are varied and complex with each zone having its own potentiometric head. For this reason, water level elevations in the basaltic aquifers cannot be realistically depicted in graphic map form.

15

The overall porosity of the basalt formation is low. The percent of open space available for the storage of water in the formation is probably less than one percent, or only about 1/20th that of the overlying gravels. On the basis of the reported specific capacities (gallons per minute per foot of drawdown), of the deep basalt wells in the area, the transmissivity of the basalt is estimated to range from 10,000 feet^2 to 50,000 feet^2 per day. Because of the relatively high transmissivities and low storage coefficients of the basalt in the area, the hydraulic effects from the pumping of wells can extend over great distances within individual aquifers.

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RECHARGE

A. Alluvial Sediments

Recharge to the alluvial sediments is derived partly from precipitation infiltrating directly into the sediments and percolating downward to the water table. Precipitation averages about 8.5 inches per year, and occurs mainly during the late fall, winter, and spring months. Pan evaporation rates as measured during past years in Hermiston are high, averaging about 45 inches per year. This is the equivalent of about 31.5 inches of field evaporation. These periods of high evaporation, however, occur in the hot dry summer months and in the early fall when measurable precipitation is extremely rare. Evaporation during the winter months

is assumed to be very low, probably less than 4 inches per year. It is estimated that less than one-fourth of the total annual precipitation is able to recharge the ground-water body within the alluvial sediments after soil moisture deficiencies have been replaced. Recharge to the alluvial aquifers may greatly exceed this amount during those years when extremely heavy periods of precipitation occur over relatively short periods of time. For example, during the months of November and December, 1973, over 7 inches of precipitation fell over the area. Water level measurements of shallow gravel wells obtained during February 1975 showed that the water levels in some of the wells had not declined as in past years. In other shallow wells, a rise in water levels of 1 to 3 feet was measured. A few of the wells in the area experienced slight water level declines during this same period which may be due to a variance in horizontal permeability or to heavy pumping just prior to water level measurements.

17

Irrigation water imported into the Lost Lake-Depot area by the High Line Canal of the Westland Irrigation District is a source of moderate recharge to the alluvial aquifers in this area. Some recharge also undoubtedly occurs in years when there is surface runoff from the hills lying to the south. Moderate recharge to the alluvial sediments in the Westland Road area occurs as ditch leakage from surface water imported into the area, and as percolating water from flood irrigation in a few local areas.

18

Recharge to the alluvial sediments within the Lost Lake-Depot area from all sources is estimated to be less than 6,000 acre feet per year.

19

Graphs of U. S. Weather Bureau precipitation records for Hermiston and cumulative departure curves (Figure 1, Page 13, Exhibit No. 1) show a rising trend in precipitation between the years of 1940 and 1964, a

falling trend from 1964 to 1969, and another rising trend that began in 1969. Representative hydrographs of gravel wells in the area show an increase in the rate of decline of water levels in the stream and lake deposits during this last rising trend. Therefore, excessive pumpage of ground water and not comtemporary precipitation patterns is responsible for the decline of water levels.

20

B. Basalt Aquifers

There appears to be very little recharge to the deep basalt zone in the area. Carbon-14 dating of the ground water in the deep basalt zone, in the shallow basalt zone, and in the shallow gravel aquifer by the United States Geological Survey (Robison, 1971) indicated an age of at least 27,000 years since water in the deep basalt zone last made contact with the atmosphere. Water from the shallow basalt zone showed an age of 6,700 years, while the water obtained from the shallow gravel aquifer had a very recent age (1950). These reported ages, along with known aquifer characteristics, indicate that the water in the aquifer units in the basalt is largely or entirely ancient water and that the aquifers do not receive substantial recharge from local precipitation or from sources outside the area. In addition, the vertical separation and compartmentation of the aquifer units in the basalt, and the continual decline of water levels in wells producing from the basalt, further suggest that the water withdrawn by deep wells in the area is not being substantially replenished. Minor recharge to the basalt, however, does occur in the form of cascading water from the overlying gravel aquifer in a few improperly cased wells. Uncased wells that penetrate more than one aquifer unity may also permit the movement of water between aquifers to some degree although this has not been demonstrated by actual current meter tests conducted by staff members of the State Engineer's office in two of the deep wells. Hydrographs of wells in the area show a seasonal fluctuation of water levels and indicate a lateral movement

of water in the basalt. This lateral movement of water is in response to temporary pumping cones surrounding pumping wells and to reduced potentiometric pressures in confined aquifers caused by the withdrawal of water. The continued overdraft of ground water from the aquifer units in the basalt and the continual decline of water levels will not result in a significant increase in the rate of natural recharge to the ground water body.

21

WATER LEVEL DECLINE

A. Alluvial Sediments

Beginning in the early 1960's, water level data have been collected on a quarterly basis from four wells constructed into the alluvium, (Hydrographs of wells No. 1, 3, 16-B, and 33, Water Resources Department Ground Water Report No. 23, Exhibit No. 1). In addition, the water levels in 27 shallow wells in the Lost Lake-Depot and the Westland Road areas, and 16 wells in the shallow gravels near the Columbia River have been measured yearly since 1971. The water level measurements in gravel wells in the Lost Lake-Depot and the Westland Road areas show an average water level decline of slightly over 1.6 feet per year. Shallow wells in the lowland areas near the Columbia River generally have not experienced a decline in water levels.

22

The hydrographs of observation wells numbers 1, 3, and 16-B show a significant change in the rate of water level decline in the early months of 1972. The rate of decline prior to this time was in the order of 0.5 to 1.0 feet per year; therafter, the decline rate increased to about 3.0 feet per annum in wells No. 1 and 3, and to approximately 7.0 feet per annum in well No. 16-B. Well No. 33 showed a decrease in the rate of decline during this same period, probably because of decreased use of the well. (Hydrographs of the above listed wells are shown in Ground Water Report No. 23, Exhibit No. 1).

23

A serious water level problem has developed in the wells producing water from the alluvial sediments in the Lost Lake-Depot and the Westland Road areas. The continual decline of water levels over a long period of time has considerably reduced the amount of water in storage in the alluvial aquifers. Water levels in the alluvial aquifer underlying the Lost Lake-Depot area have declined in the order of 12 to 29 feet during the past 10 years. The majority of these wells have less than 25 feet of saturated alluvium remaining. The seriousness of the matter is further compounded by the fact that lenses of permeable gravel are haphazardly distributed throughout the area. Some wells have gravel lenses only in the upper vertical section of the saturated sediments, and have considerably less than 25 feet of permeable aquifer remaining (Well reports of wells number 5, 15, 33, 33-A, 42-C, 42-D, Ground Water Report No. 23, Exhibit No. 1).

24

It is evident that the decline of water levels in the alluvial sediments is the result of a ground water overdraft by shallow wells in the area. Continued excessive withdrawal of ground water will result in the ultimate failure of some wells developing water from the alluvial aquifer. In order to prevent further depletion of the ground water reservoir, it will be necessary to substantially reduce the amount of ground water withdrawals by shallow gravel wells or to replenish the aquifer by importing water into the area from the Umatilla River or the Columbia River for direct recharge.

25

Water level measurements of representative wells in the Westland Road area during the past 3 to 4 years have shown an average rate of water level decline of 1.6 feet per year, similar to the declines observed in shallow wells in Township 4 North, Range 27 East. These wells however, have approximately 50 feet of saturated alluvium remaining

and have a much longer life expectancy then most of the wells to the southwest.

26

B. Basalt Aquifers

A serious water level decline has occurred in most of the deep wells in the Ordnance area during the past several years. This decline has been in the order of 5 to 7 feet per year. (See hydrographs of wells No.'s 72, 75, 78, 80, 81, 83, 87, 91, and 92, Exhibit No. 1.) The decline of water levels in shallow basalt wells, or those wells less than 400 feet deep, has been much less. These wells have shown a rate of water level decline of about 1.6 to 2.0 feet per year, similar to the decline of water levels in the shallow wells producing from the overlying alluvial sediments. The difference in the rates of water level decline between the shallow wells developing water from the upper zones in the basalt and the deep basalt wells indicates low permeability between zones. Some recharge to the upper basalt zones probably occurs by the slow downward leakage of water into weathered and fractured zones of the basalt from the overlying alluvial sediments.

27

Continued withdrawal of water from deep wells in the area in amounts presently being withdrawn will result in the continual decline of water levels at approximately the same or perhaps increased rates in future years. At present, the pumping levels in the deep production wells are relatively low and range from approximately 175 feet in Well No. 78 to about 275 feet below land surface in Well No. 80. Most of the deep wells in the area have pumping lifts of approximately 220 to 240 feet.

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GROUND WATER DEVELOPMENT

A. Stream and Lake Sediments

Water Resources Department records show that the first irrigation well drilled in the Ordnance area to develop ground water from the stream and

lake sediments was constructed in 1950. The development of ground water in the alluvial sediments progressed rapidly until 1973 with the construction of approximately sixty drilled shallow irrigation and industrial wells and three dug wells or sumps. Of the drilled wells, approximately forty-seven are presently in use or are available for use.

29

B. Basalt

The development of ground water in the Ordnance basalt area began in 1941 with the construction of three wells tapping the upper basalt ground water aquifers when the Umatilla Army Depot was built at Ordnance. The first deep basalt well was constructed during the following year by the Umatilla Housing Autority to supply water for the community of Ordnance. In 1945, a well penetrating the shallow basalt reservoir was constructed by the Oregon-Washington Railroad for general railroad use. Two additional wells were drilled into the deep basalt at the Army Depot in 1950 for fire protection, which were followed by another in 1954. The first deep well for irrigation use (Well No. 75, Exhibit No. 1) was constructed in 1956. In the late 1950's and early 1960's, the area developed rapidly with the construction of seven deep irrigation wells and one deep fire protection well. In 1966 the State Engineer, after a hearing in the potential critical area, closed the area to further well development.

30

At the present time there are eight wells developing ground water from the deep basalt reservoir for agricultural purposes in the area. Three deep basalt wells and three wells tapping the upper basalt aquifers have water right certificates for fire protection use at the Umatilla Army Depot. In addition, one deep well and one shallow basalt well in the depot compound are used to supply water for general domestic purposes. A total of twelve wells of record have been constructed in the deep basalt aquifers at Ordnance.

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GROUND WATER USE

A. Alluvial Aquifers

1. Lost Lake-Depot Area

There are approximately thirty-nine wells in the Lost Lake-Depot area developing ground water from the shallow gravel aquifer. The State Engineer records show that fourteen water right certificates have been issued covering 1070.4 acres of irrigated land. Seventeen permits have been issued for the irrigation of 3849.0 acres and eight applications for the appropriation of ground water to irrigate an additional 2073.5 acres have been received. Permits for the appropriation of ground water in the area have not been issued since December 6, 1971. For the past three to four years prospective applicants have been advised of the pending investigation and advised that additional permits for the appropriation of ground water for the area may not be approved by the State Engineer.

32

2. Westland Road Area

Approximately sixteen drilled wells and three dug wells or sumps develop water for irrigation or industrial purposes from the shallow gravel aquifer in the Westland Road area. Eight water right certificates covering the irrigation of 750.1 acres in the area have been issued and eight permits for the irrigation of 794.9 acres have been approved. In addition, two permits for the combined appropriation of 6.6 cubic feet per second for industrial use have been issued. At present, ten applications have been received for the irrigation of 378.2 acres in the area.

33

B. Basalt Aquifers

Thirty ground water certificates have been issued for industrial, irrigation, and municipal use in the Ordnance basalt ground water area for the appropriation of ground water from wells tapping the upper and

the deep basalt flows; four water right permits have been issued. Subsequent to the State Engineer's Ordnance Critical Ground Water Area hearing in Hermiston on June 3, 1966, the State Engineer has not accepted any new applications for the appropriation of ground water from the deep basalt aquifers in the area. Since the date of the hearing, nine applications for the appropriation of ground water from the upper basalt flows have been received and six permits have been issued. Permits for the use of shallow basalt wells in the area have not been issued since April 26, 1971. The total number of acres under permits and certificates of water right for the appropriation of water for irrigation purposes from the deep basalt aquifers in the area is 2336.7 acres. Irrigated acreage under permits and certificates of water right from wells tapping the shallow basalt aquifers totals 915.5 acres. In addition, the City of Irrigon shallow basalt well has a permit for diversion of 1.0 cubic foot per second for municipal use and well No. 83 has a certificate of water right for the use of 2.0 cubic feet per second for stock raising purposes.

34

The Umatilla Army Depot holds certificates of water rights for wells authorizing the diversion of 6.19 cubic feet per second from the deep basalt aquifers for fire protection and 0.5 cubic foot per second for domestic use. The wells in the compound deriving water from the upper basalt units have water rights for the appropriation of 2.02 cubic feet per second for fire protection, 0.78 cubic feet per second for domestic use, and 0.34 cubic feet per second for irrigation use. The use for fire protection in the Depot area is limited to maintaining the fire suppression systems and to periods of actual fire emergency.

35

The capital investment in irrigation facilities for each ranch varies substantially with the type and time of installation. In all cases the systems are quite extensive and cost many thousands of dollars for just those facilities (wells, pumps, meters, pipelines, and

sprinklers) directly related to applying water to the lands. Some estimates of losses are set forth by Hadley Akin's as Representative for the U. S. National Bank in Exhibit No. 5. For purposes of this order the detailed dollar amounts are not material but it does show relative figures and the relationship to the economy of the community. The economic loss to any rancher who must cease use of his irrigation system will be very substantial. In addition, substantial economic loss can occrue to the community from the secondary business effects in equipment fertilizers, etc, as well as additional employment.

36

The planning commissions of Morrow County and Umatilla County have developed comprehensive plans for development of the areas included within the Ordnance ground water area. Each county does have the legal mechanism to control the overdevelopment of the area for residential use with the possible resulting overdevelopment of the available ground water supply.

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Evidence and testimony made a part of the record indicates that the irrigation season in the Ordnance ground water areas generally extends from early March until mid October of each year.

CONCLUSIONS

1

Water levels in wells developing water from the alluvial sediments overlying the basalts in the Ordnance gravel ground water area have declined at an average rate of approximately 1.6 feet per year. The decline of water levels in shallow gravel wells in the area has developed into a serious decline problem. The long term decline of water levels clearly indicates that artificial discharge from the alluvial aquifer system by withdrawals of ground water by wells is greatly exceeding natural recharge to the aquifer.

2

As the result of the decline of water levels within the alluvial sediments, only about 25 feet of the alluvium remains in a saturated condition for use by the majority of wells in the Lost Lake-Depot area (Sections 2, 3, 4, 5, and 6 of Township 3 North, Range 27 East, W.M., and Sections 19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33, 34, and 35 of Township 4 North, Range 27 East, W.M.). Some wells in the area have less than 15 feet of saturated alluvium remaining.

3

Without some curtailment of withdrawals of ground water from the alluvial sediments in the Lost Lake-Depot area to effectuate a balance of withdrawals of water with recharge to the alluvial aquifer system water levels in the gravel wells will continue to decline with the ultimate failure of many of the wells in the area in the very near future.

4

The water levels in the shallow gravel wells in the Westland Road area (Sections 12, 13, 24, 25, and 36 of Township 4 North, Range 27 East, W.M.; and Sections 7, 18, 19, and 31 of Township 4 North, Range 28 East, W.M.; and those parts of Sections 8, 9, 16, 17, 20, and 30 of Township 4 North, Range 28 East, W.M., lying west of the Umatilla River) have displayed average rates of water level decline similar to those in the shallow gravel wells in the Lost Lake-Depot area. The remaining saturated alluvium underlying the Westland Road area, however, is approximately 50 feet thick. Wells in the area are not subject to failure or substantial reduction in yield at this time. It may become necessary to impose restrictions on withdrawals of water based on relative priorities from these wells at some future date.

5

The withdrawals of water from the shallow gravel wells in the Westland Road area in quantities presently being used have not shown

a significant hydraulic influence upon shallow wells in the Lost Lake-Depot area. It further appears that continued use at the present rate will not significantly change this influence. The slope of the water table and the lensing out of permeable units in the alluvial sediments between the Lost Lake-Depot and the Westland Road area indicates that the hydraulic conductivity between the two areas is very low. However, additional development of ground water in the Westland Road area by additional wells with resulting increased pumpage from the aquifer system could ultimately produce a change in the hydraulic gradient and result in increased depletion in the quantity of ground water in the Lost Lake-Depot area.

6

Wells producing from the shallow gravel aquifer near the Columbia River in Township 5 North, Ranges 26 and 27 East, W. M., have not shown appreciable water level declines. The withdrawals of water from these wells have no hydraulic effect upon the shallow gravel wells in the Lost Lake-Depot and the Westland Road areas.

7

To properly provide for the public welfare, safety, and health, the rights to appropriate ground water and priority therefrom must be acknowledged and protected and reasonably stable ground water levels must be determined and maintained. To accomplish this, further development of the alluvial aquifer system must be prohibited within the Ordnance gravel ground water area by additional wells except for those which are exempt from filing for water rights in accordance with ORS 537.545:

> " * * * for stockwatering purposes, for watering any lawn or noncommercial garden not exceeding one-half acre in area, for single or group domestic purposes in an amount not exceeding 15,000 gallons a day or for any single industrial or commercial purpose in an amount not exceeding 5,000 gallons a day. * * * * "

To prevent the ultimate and almost immediate failure of many of the wells producing from the alluvial aquifer system within the Lost Lake-Depot

area, it will be necessary to substantially reduce the amount of ground water withdrawals by shallow gravel wells in the area to balance overall pumping withdrawals with recharge.

8

Toward this end it will also be necessary to reject the following pending applications for permits to appropriate ground water from shallow gravel wells within the Ordnance Gravel Critical Ground Water Area: G-5761, G-5932, G-5936, G-6023, G-6040, G-6058, G-6196, and G-6225.

9

Application G-5598 in the name of Hansell Brothers, Inc., for permit to appropriate ground water for the supplemental irrigation of 1724.2 acres proposes manifolding five wells together by a common pipeline for supplemental irrigation of various acreages with no increase in withdrawals of ground water. This could best be achieved by an application for change in points of diversion. The present application should not be approved but the applicant should be permitted to amend his application to cover the proposed change in points of diversion and place of use that may be desirable in view of other provisions of this order. In view of these changes he should be permitted six months in which to make such amendments. Similarily, application G-5449 in the name of Georgia Belle Holzapfel for permit to appropriate ground water for the supplemental irrigation of 160.0 acres proposes manifolding four wells together by a common pipeline for supplemental irrigation of various acreages with no increase in withdrawals of ground water. This application should be treated in a like manner with six months in which to amend said application to cover the necessary changes in points of diversion and place of use.

10

Application G-5947 is for the appropriation of 0.4 cubic feet per minute from a shallow dug well near the Umatilla River in the

NW¼ SW¼ of Section 20, Township 4 North, Range 28 East, W.M., for the irrigation of 31.7 acres. Ground water in this particular location is in hydraulic connection with surface water within the river. The use of this well will not harm existing ground water rights. The application should be approved providing the application is completed in the form and contents as set forth in ORS 537.615 within a reasonable length of time as provided by ORS 537.620.

11

Application G-5026, Marvin and Frances McDole; G-5209, Hansell Bros., Inc.; G-5362, Thurman Martin; G-5397, LeRue Pollock; G-5449, Georgia Belle Holzapfel; G-5567, Fred Haskins, Jr.; and G-5684, Elroy F. McDole, for the proposed irrigation of additional acreages were filed in the office of the State Engineer and held without approval for a variety of reasons. Subsequently a number of applications were approved. These applications that were held and the ones with later priorities that were approved were filed at the time decisions were being made on withholding further approvals. Since these pending applications have earlier dates of filing than those that were approved, the applicants should be given the opportunity to withdraw the application or have them approved by the issuance of a permit even though other provisions of the final critical ground water order may require them to be shut off. In view of the other provisions, these applicants should be afforded 60 days in which to determine which course of action should be followed.

12

Application G-6069, Lamb-Weston, Inc., for the appropriation of ground water from the shallow alluvial aquifer system for industrial purposes should be considered for approval for emergency stand-by purposes only. If it is desired to operate it on a continuous basis, then an application for a change in point of diversion from well No. 1 or 2 should be submitted.

13

Recharge to the alluvial aquifer system within the Lost Lake-Depot area from all sources is estimated to average approximately 6,000 acre feet of water per year. To effectuate a balance of discharge to recharge within the system it would theoretically be necessary to limit pumping withdrawals to this same amount. Until estimates of recharge are further refined, pumping withdrawals from wells producing ground water from the alluvial sediments in the area should be limited to an actual diversion not to exceed 9,000 acre feet per year. Water levels and pumping records should be evaluated at the end of each year of imposed restriction to determine the effectiveness of the limitation of water use and to determine if additional reductions should be made. It is estimated that in an average year a total diversion of 9,000 acre feet would cover all rights up to Item No. 24 and would partially cover Item No. 25 as listed on Table No. 1.

14

It was requested during the hearing that restrictions of pumpage withdrawals from wells in the Ordnance gravel ground water area not be imposed until after an investigation and evaluation of the effect of possible recharge to the alluvial aquifers by continued sprinkler irrigation of acreages by existing irrigation systems presently importing surface water by pipeline from the Columbia River. Records of the Water Resources Department show that such irrigation is principally within Townships 3 and 4 North, Range 26 East, W. M., and partly within the NW¼ of Township 3 North, Range 27 East, W. M. Altitudes of water levels as shown on Plate 3 (attached) indicate that continued irrigation by imported surface water in most of the areas presently being irrigated will not directly recharge the shallow aquifer system and will not appreciably affect the ground water within the Lost Lake-Depot and Westland Road areas. The application of surface water imported into an area witin the NW¼ of Township 3 North, Range 27 East, W.M. for

irrigation purposes could possibly contribute small quantities of water to recharge the alluvial aquifer in the Lost Lake-Depot area provided that flood irrigation methods were used. Sprinkler irrigation, however, as presently used is not expected to contribute appreciable quantities of recharge waters to the aquifer system.

15

B. Basalt Aquifers: Ordnance Basalt Ground Water Area

Water levels in wells developing water from deep basalt zones within the Ordnance basalt ground water area have shown an annual decline of 5 to 7 feet per annum over the past several years. Pumping lifts in these wells are relatively high. These conditions do not justify a reduction in diversion rights from the deep basalt wells in the area at this time. There is no evidence to indicate the present water level declines in deep basalt wells have substantially harmed existing rights or have unduely affected pumping yields of wells in the area. Some curtailment of withdrawals of water, may become necessary in the future.

16

To properly provide for the public welfare, safety, and health, the rights to appropriate ground water from the deep and shallow ground water zones within the basalt formation within the Ordnance basalt ground water area as delineated in Plate 1 must be acknowledged and protected and reasonably stable ground water levels must be determined and maintained. To accomplish this further development of the shallow or deep aquifer system must be prohibited within the basalts of the delineated area by additional wells which are not exempt from filing for water rights in accordance with ORS 537.545.

17

Application G-5437 in the name of Avery Taylor covers a development made in 1971 of a well 173 feet deep into the upper basalt zone in the

northern part of the area. The amount of water used has not substantially effected any other water users. Continued use of this well at its present rate will not significantly effect other rights and should therefore be approved.

18

Application G-5565 for the appropriation of ground water from the upper basalt aquifer system in the NW¼ SW¼ of Section 26, Township 5 North, Range 26 East, W.M., was withdrawn in 1974 because of insufficient water. The well has been capped for possible future use for stock water or domestic purposes.

19

During the hearing many witnesses observed that the recommendations proposed in Ground Water Report No. 23 to restrict the construction of additional wells to lot sizes of 10 acres or more in area within the aforesaid ground water area for stock watering purposes and for single family domestic purposes only were too severe and would produce an unnecessary economic hardship for many individuals in the area. The Umatilla and Morrow County governments have the legal authority to properly plan and zone the Ordnance ground water area to control land use development including the recommendations that wells for individual domestic use should normally be restricted to homesites of 10 acres or more.

20

Economic losses or additional costs will accrue to the community and certain individuals in the area as a result of the overdevelopment. This will be true whether use of water under junior rights is curtailed for protection of prior rights, an alternate system importing water from outside sources is constructed, or the ground water supply is exhausted. The last alternative, which would result from failure to take any corrective action is probably the most costly since it would detrimentally affect all users and ultimately stop virtually all irrigation use. Pertinent parts of the law relating to policy reads as follows:

ORS 537.525 (2) "Rights to appropriate ground water and priority thereof to be acknowledged and protected, except when, under certain conditions, the public welfare, safety and health require otherwise.

"(3) Beneficial use without waste, within the capacity of available sources, be the basis, measure and extent of the right to appropriate ground water.

"(7) Reasonably stable ground water levels be determined and maintained.

"(8) Depletion of ground water supplies below economic levels, impairment of natural quality of ground water by pollution and wasteful practices in connection with ground water be prevented or controlled within practicable limits".

The order declaring a critical ground water area is provided for in ORS 537.735. Corrective control provisions which may be included are set forth in subsection 3:

ORS 537.735 (3) "The order of the State Engineer may include any one or more of the following corrective control provisions:

(a) A provision closing the critical ground water area to any further appropriation of ground water, in which event the State Engineer shall thereafter refuse to accept any application for a permit to appropriate ground water located within such critical area.

(b) A provision determining the permissible total withdrawal of ground water in the critical area each day, month or year, and, in so far as may be reasonably done, the State Engineer shall apportion such permissible total withdrawal among the appropriators holding valid rights to the ground water in the critical area in accordance with the relative dates of priority of such rights.

(c) A provision according preference, without reference to relative priorities, to withdrawals of ground water in the critical area for domestic and livestock purposes first, and thereafter other beneficial purposes, including agricultural, industrial, municipal other than domestic and recreational purposes, in such order as the State Engineer deems advisable under the circumstances.

(d) A provision reducing the permissible withdrawal of ground water by any one or more appropriators or wells in the critical area.

(e) Where two or more wells in the critical area are used by the same appropriator, a provision adjusting the total permissible withdrawal of ground water by such appropriator, or a provision forbidding the use of one or more of such wells completely.

(f) A provision requiring the abatement, in whole or in part, or the sealing of any well in the critical area responsible for the admission of polluting materials into the ground water supply or responsible for the progressive impairment of the quality of the ground water supply by dispersing polluting materials that have entered the ground water supply previously.

(g) A provision requiring and specifying a system of rotation of use of ground water in the critical area.

(h) Any one or more provisions making such additional requirements as are necessary to protect the public welfare, health and safety in accordance with the intent, purposes and requirements of ORS 537.505 to 537.795.

It is very clear from a reading of the entire Ground Water Act that the legislature intended that the State of Oregon's system of appropriation in accordance with relative dates of priority, which has been firmly established for surface water, be the guiding principle to be followed in administering the Ground Water Law. However, it appears that the overall public benefit would justify some loss to prior rights in order to phase in the curtailments of use. In virtually all instances crops have been planted and fertilizers applied for the current year. To prevent any use during this (1976) season would cause unreasonable hardships. Provisions curtailing use of water to less than that authorized by respective water rights should not be made effective until after the 1976 irrigation season.

21

Accurate pumpage data on total ground water withdrawals from the alluvial aquifer system and timely water level data, from all non-exempt wells within the overall Ordnance gravel ground water area and the overall Ordnance basalt ground water area as delineated on Plate 1 (attached), are necessary to finalize quantitative determinations of the storage capacity of these ground water bodies. All wells authorized to continue use under their ground water rights within each of the aforesaid ground water areas should be equipped with totalizing water meters of a type approved by the Water Resources Department and should be provided with adequate,

measuring ports or systems so that accurate water level measurements can be made at any time.

22

All meters, measuring systems, and control valves installed for use should be subject to inspection and approval by the Water Resources Department. Such approval should be not only a requirement of the initial installation but should also be required when such meters, measuring systems, and control valves are replaced or repaired.

23

The withdrawals of ground water from all wells authorized to continue use under their ground water rights in the overall Ordnance gravel ground water area and the overall Ordnance basalt ground water area should be monitored and regulated closely by the Water Resources Department throughout each pumping season.

24

An irrigation season beginning March 10th and ending October 15th of each calendar year should be established since water can be applied to beneficial use for irrigation during this period. The withdrawal of ground water for irrigation purposes prior to the beginning and after the closing date of this season should be prohibited.

ORDER

1

NOW THEREFORE, IT IS ORDERED that the Ordnance shallow alluvial aquifer is herewith declared a critical ground water area and is to be known as "The Ordnance Gravel Critical Ground Water Area". The area of the critical ground water area, which is shown on Plate 1, is declared as follows:

> All of Sections 1, 2, 3, 10, 11, 12, 13, 14, and 15 of Township 3 North, Range 26 East; Sections 10, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 34, 35, and 36 of Township 4 North, Range 26 East; the north one-half of Township 3 North, Range 27 East; all but Sections 1 through 6 of Township 4 North, Range 27 East; Sections 6, 7, and 18 of Township 3 North, Range 28 East; and Sections 7, 18, 31, and

those areas of Sections 8, 9, 16, 17, 19, 20, and 30 of Township 4 North, Range 28 East, lying to the west of the Umatilla River.

It shall include all water contained in the ground water reservoir of the alluvial sediments overlying the basalt formation in the area and regulation shall be imposed on all users therefrom.

2

It is FURTHER ORDERED that the Ordnance Gravel Critical Ground Water Area is closed to further appropriation of ground water. Applications for permits to appropriate ground water from the shallow alluvial aquifer system within the boundaries of the critical ground water area will not be accepted.

3

It is FURTHER ORDERED that the appropriation of ground water from the alluvial aquifer system within the Lost Lake-Depot sub-area of the Ordnance Gravel Critical Ground Water Area, is hereby restricted to an average annual appropriation of 9,000 acre feet per year. The distribution of water from wells in the sub-area is to be based on the relative date of priority of the water rights of the appropriators. The aforesaid withdrawal limitation within the sub-area shall become effective at the end of the 1976 irrigation season but in any event not later than October 15, 1976.

4

It is FURTHER ORDERED that pending applications numbers G-5026 in the name of Marvin and Frances McDole; G-5209, Hansell Bros. Inc.; G-5362, Thurman Martin; G-5397, LeRue Pollock; G-5567, Fred Haskins, Jr.; G-5684, Elroy F. McDole be given the opportunity to withdraw the aforesaid applications or request within 60 days of the date of this order that they be approved even though other provisions of this order may subsequently require them to be shut off.

5

It is FURTHER ORDERED that pending applications G-5449 in the name of Georgia Belle Holzapfel and G-5598 in the name of Hansell Bros., Inc.

will be held for six months during which the applicants may file amendments to request changes in points of diversion and/or changes in places of use. If the applications are not so amended, they will be rejected.

6

It is FUTHER ORDERED that applications G-5761 in the name of John L. King; G-5932, Lyle and Jane K. Smith; G-5936, Bert H. Quick; G-6023, LeRue W. Pollock; G-6040, George H. Barton; G-6058, Edgar S. and Elmo C. Bloom; G-6196, Mrs. John W. Rice; and G-6225, Woodrow Walker are rejected effective October 15, 1976.

7

It is FURTHER ORDERED that pending application G-6069 in the name of Lamb-Weston, Inc. be approved with a priority as of the date of filing for use for industrial purposes for stand-by emergency use only providing the application is completed in the form and contents as set forth in ORS 537.615 within a reasonable length of time as provided by ORS 537.620.

8

It is FURTHER ORDERED that pending application G-5947 in the name of Benjamin Newman shall be approved with a priority as of the date of filing providing the application is completed in the form and contents as set forth in ORS 537.615 within a reasonable length of time as provided by ORS 537.620.

9

It is FURTHER ORDERED that the Ordnance basalt aquifer is herewith declared a critical ground water area and is to be known as "The Ordnance Basalt Critical Ground Water Area". The boundary of the critical ground water area, which is shown on Plate 1, is described as follows:

> Beginning at the township line common to Township 5 North, Range 27 East, W.M., and Township 5 North, Range 28 East, W.M., and its intersection with the south bank of the Columbia River thence south along said common township line and south along the township line common to Township 4 North, Range 27 East, W.M., and Township 4 North, Range 28 East, W.M., to the intersection with the northeast corner

of Section 1, Township 3 North, Range 27 East, W.M., and the northwest corner of Section 6, Township 3 North, Range 28 East, W.M., thence south along the Section line common to said sections to the intersection with the southeast corner of said Section 1 and the southwest corner of said Section 6, thence southwesterly to the southeast corner of Section 34, Township 3 North, Range 27 East W.M., thence west along the township line common to Townships 2 and 3 North, Ranges 26 and 27 East, W.M., to a corner in common with Section 1, Township 2 North, Range 25 East, W.M.; Section 6, Township 2 North, Range 26 East, W.M.; Section 36, Township 3 North, Range 25 East, W.M., and Section 31, Township 3 North, Range 26 East, W.M., thence north along township lines in common with Townships 3, 4, and 5 North, Ranges 25, and 26 East, W.M., to its intersection with the south bank of the Columbia River, thence east along the south bank of the Columbia River to the point of beginning.

It shall include all water contained in the shallow or deep ground water zones of the basalt aquifer system and regulation shall be imposed on all uses therefrom.

10

It is FURTHER ORDERED that the Ordnance Basalt Ground Water Area is closed to further appropriation of ground water. Applications for permits to appropriate ground water from the basalt aquifer system within the boundaries of the critical ground water area will not be accepted.

11

It is FURTHER ORDERED that pending application number G-5437 in the name of Avery Taylor to appropriate ground water from the upper basalt aquifer system shall be approved with a priority as of the date of filing providing the application is completed in the form and contents as set forth in ORS 537.615 within a reasonable length of time as provided by ORS 537.620 and further providing that the depth of the well be limited to a depth of not more than 173 feet.

12

It is FURTHER ORDERED that pending application G-5565 in the name of Desert Farms, Inc. and application G-4510 in the name of Jane Miller for the appropriation of ground water from the basalt aquifer system are rejected.

13

It is FURTHER ORDERED that the owners or operators of all wells within the Ordnance Gravel Critical Ground Water Area and the Ordnance

Basalt Critical Ground Water Area other than wells used for exempted purposes as set forth in ORS 537.545 (Paragraph 7, Conclusions), shall equip their wells with totalizing water meters, control valves and adequate water level measuring facilities, prior to any withdrawal of ground water after June 1, 1976. Any well not equipped with the required meter, control valve and water level measuring facilities shall be regulated by the watermaster and taken out of service until the required works are installed and operating properly. The type and installation of said meters, control valves and water level measuring facilities shall be subject to authorized meter specifications and approval of the Director. Each well owner or operator shall maintain an accurate monthly record of the amount of ground water withdrawn from each well. A copy of these water use records shall be forwarded to the Water Resources Department prior to December 1 of each calendar year on forms furnished by the Director.

14

It is FURTHER ORDERED that the irrigation season in the Ordnance Basalt Critical Ground Water Area and in the Ordnance Gravel Ground Water Area shall extend from March 10th to October 15th of each calendar year.

15

It is FURTHER ORDERED that the watermaster shall regulate the control works on all wells in the above described Ordnance Gravel Critical Ground Water Area and the above described Ordnance Basalt Critical Ground Water Area other than those wells whose use of ground water is specifically exempted under ORS 537.545, so that the rate and total quantity of ground water withdrawn does not exceed that allowed under their ground water right certificates or permits. At all times the system shall be operated to prevent the waste of water. The procedure for regulating and posting such changes shall be as set forth in ORS 540.040.

16

It is FURTHER ORDERED that all unlawful diversions of ground water within each of the aforesaid critical ground water areas shall cease.

To this end, the watermaster shall investigate all known or reported violation of ORS 537.535 and shall regulate the control works of all wells found to be operating in violation of ORS 573.535 so as to prevent such violation.

17

It is FURTHER ORDERED that an annual evaluation of the ground water supply in the Ordnance Gravel Critical Ground Water Area and the Ordnance Basalt Critical Ground Water Area be made by the Water Resources Department for the purpose of evaluating the effectiveness of the control provisions set forth in this order. If it is found that the control provisions set forth in this order are not sufficient and that additional reductions in the annual withdrawal of ground water from the alluvial ground water system or from the basalt ground water system are necessary to maintain a reasonably stable ground water level, such reductions shall be ordered in accordance with the relative dates of priority of the water rights of the appropriators from each ground water aquifer system.

Dated at Salem, Oregon this 2nd day of April, 1976.

JAMES E. SEXSON
Director

ORDNANCE GROUND WATER AREA
BASALT AQUIFERS

TABLE II

No.	Record Holder	Priority Date	Appli. No.	Permit No.	Cert. No.	Well Location	Permitted Diversion cfs	Acreage	Max. Allow. ac. ft.	Cum. Rights ac. ft.	Well Depth
90.	Umatilla Army Depot	1/5/65	G-3007	G-2826	33779	4N/27E-22cad	2.00 Fire Protec.				327
							0.34	27.0	81.0	7296.9	
91.	Umatilla Army Depot	1/5/65	G-3008	G-2827	33988	4N/27E-18cdb	1.11 Fire Protec.				618
92.	Umatilla Army Depot	1/5/65	G-3009	G-2828	33765	4N/27E-19abb	1.11 Fire Protec.				600
93.	Umatilla Army Depot	1/5/65	G-3010	G-2829	33766	4N/27E-5baa	1.72 Fire Protec.				682
94.	Umatilla Army Depot	1/5/65	G-3011	G-2830	33989	4N/27E-8dad	10 GPM Fire Protec.				453
23.	Clark & Bernice Key	4/27/65	G-3092	G-2823	42526	3N/27E-4add	2.43	312.1	960.0	8233.2	80
23-A						3N/27E-4acc					88
23-B						3N/27E-4bdc					108 (Dr
23-C						3N/27E-4bcc					112 (Dr
23-D						3N/27E-5adc					400
23-E						3N/27E-5acc					200
23-F						3N/27E-5bdc					145
23-G						3N/27E-5bcx					(Dr
28.	Dwight H. Hulet	10/4/67	G-3945	G-3702		4N/27E-36abb	1.86	149.8			117
28-A						4N/27E-36abb					187
28-B						4N/27E-36aab					213
28-C						4N/27E-36adc					185
95.	C. E. Newquist	12/18/67	G-4162	G-3913	42842	5N/27E-30ccc	0.16	12.5	360.0	8720.1	400
96.	City of Irrigon	8/5/68	G-4534	G-4269	42328	5N/27E-19ccb	0.27				317
97.	Vern K. Evans	12/27/68	G-4744	G-4478	42252	5N/27E-20add	0.04	3.2	13.1	8729.7	300
98.	R. W. Reppert	2/18/69	G-4795	G-4520		5N/26E-26bcd	0.46	36.5	109.5	8839.2	235
99.	Fred Andrews	4/29/70	G-5099	G-4833		4N/27E-31aab	8.0	640.0	1920.0	10759.2	200
100.	Avery Taylor	3/1/71	G-5437			5N/26E-25cdb	0.5	26.0	78.0	10837.2	173
101.	Desert Farms, Inc.	7/6/71	G-5565			5N/26E-26cba	1.51	120.6	361.8	11199.0	250
102.	Wayne H. Schnell	7/2/73	G-6201	G-5248		5N/27E-30cac	1.44	118.0	354.0	11553.0	300

ORDNANCE GROUND WATER AREA
BASALT AQUIFERS

TABLE II

No.	Record Holder	Priority Date	Appli. No.	Permit No.	Cert. No.	Well Location	Permitted Diversion cfs	Acreage	Max. Allow. ac. ft.	Cum. Rights ac. ft.	Well Depth
71.	Oregon-Washington RR	4/17/46	U-199	U-181	15174	4N/27E-20cbc	0.67				457
72.	Umatilla Army Depot	12/19/52	U-571	U-522	30524	4N/27E-5abb	2.26				710
5.	Georgia B. Holzapfel	3/16/53	U-572	U-523	22888	4N/27E-32aca	0.61	49.0	147.0	147.0	123
5-A						4N/27E-32dxx					310
6.	Roy Gail Holzapfel	3/16/53	U-573	U-524	22889	4N/27E-32aca	0.61	49.0	147.0	294.0	123
6-A						4N/27E-32dxx					310
73.	Leota Nell Martin	4/3/53	U-580	U-530	31097	3N/27E-8aad	0.25	20.0	60.0	354.0	725
74.	Ernest R. Cramer	4/27/53	U-596	U-549	31194	3N/26E-10cca	0.25	20.0	60.0	414.0	666
75.	Waldo H. Cramer	4/28/53	U-600	U-551	31195	3N/26E-10aca	0.25	20.0	60.0	474.0	544
76.	G. W. Redwine	8/9/54	U-736	U-649	23740	4N/27E-36bca	0.50	40.0	120.0	594.0	194
77.	Ernest J. Royster	8/3/55	G-94	G-48	26170	3N/27E-4ddb	0.93	74.6	223.8	817.8	185
78.	Umatilla Army Depot	1/27/58	G-848	G-1017	30525	4N/27E-5baa	0.50				682
79.	Waldo H. Cramer	8/27/58	G-1224	G-1070	34382	3N/26E-10aca	1.89	151.2	453.6	1271.4	544
80.	Luther W. Cramer	3/2/59	G-1402	G-1319	41879	3N/26E-4cac	1.19 (3/2/59) 1.75 (4/7/59)	219.5	960.0	1778.0	623
80-A						3N/26E-4dbc					Not Drilled
81.	Mildred F. Cramer	3/6/59	G-1411	G-1284	41878	3N/26E-4aad	1.19	283.5 Prim. 4.5 Supp.	960.0	2276.7	680
81-A						3N/26E-4bad					No Log
82.	Ernest Cramer	3/11/59	G-1413	G-1322	34276	3N/26E-[illegible]cca	2.68	274.8	824.4	3101.1	666
83.	Hansell Bros.	6/28/60	G-1778	G-1671	35395	4N/27E-27dad	2.02	1.8	5.4	3106.5	543
84.	Frank L. Warren	12/19/60	G-1896	G-1738	34282	3N/26E-14acd	4.0	320.0	960.0	4066.5	551
85.	Leota Nell Martin	10/2/61	G-2125	G-1965	34280	3N/27E-8aad	2.68	300.0	900.0	4966.5	725
86.	Sabre Corporation	2/8/62	G-2229	G-2049	31196	3N/26E-5cbd	3.5	322.8	968.4	5934.9	950
87.	Sabre Corporation	8/9/63	G-2678	G-2489	33864	3N/26E-5cbd	2.0	160.0	480.0	6414.9	950
88.	Hansell Bros.	6/5/64	G-2881	G-2672	35396	4N/27E-27cad	3.34	267.0	801.0	7215.9	543
89.	Umatilla Army Depot	1/5/65	G-3006	G-2825	33778	4N/27E-22dbc	0.78				360

ORDNANCE GROUND WATER AREA
ALLUVIAL AQUIFERS

TABLE I

No.	Record Holder	Priority Date	Appli. No.	Permit No.	Cert. No.	Well Location	Permitted Diversion cfs	Acreage	Max. Allow. ac. ft.	Cum. Rights ac. ft.	Well Depth
52.	Arnold Braat	8/3/71	G-5590	G-4932		4N/27E-20ccc	6.58	526.6	1579.8	25001.0	173
52-A						4N/27E-20cdc					Not Drilled
53.	Hansell Bros., Inc.	8/12/71	G-5598			4N/27E-28acd	21.6	1724.2 Supp.			126
53-A						4N/27E-28ddc					127
53-B						4N/27E-28dad					107
54.	J. W. Aylett	11/16/71	G-5549	G-4929		4N/27E-28bab	0.90	72.18	216.6	25217.6	110
54-A		for 0.68 cfs				4N/27E-28bdb					119
		12/3/71									
		for 0.25 cfs									
55.	Elroy F. McDole	12/13/71	G-5684			4N/27E-28cdd	4.0	310.0	930.0	26147.6	124
56.	Lamb-Weston, Inc.	1/21/72	G-5681	G-4947		4N/28E-19caa	3.3				110
57.	Ronald Baker	1/25/72	G-5710	G-4944		4N/27E-24aca	0.48	39.4	118.2	26265.8	151
58.	Lamb-Weston, Inc.	2/3/72	G-5720	G-4948		4N/28E-19cac	3.02				137
59.	Malcolm Skinner	2/25/72	G-5734	G-5034	42273	4N/28E-19bcd	0.125	10.0	30.0	26295.8	126
60.	Bert H. Quick	3/1/72	G-5738	G-4972		4N/28E-20bbc	1.0	80.0	240.0	26535.8	
61.	John L. King	3/24/72	G-5761			4N/27E-26ddx	0.91	72.5	217.5	26753.3	
62.	Lyle W. & Jane K. Smith	11/2/72	G-5932			4N/27E-26acb	1.44	115.0	345.0	27098.3	
63.	Bert H. Quick	11/7/72	G-5936			4N/28E-20bbc	0.5	26.0	78.0	27176.3	
64.	Benjamin J. Newman	11/29/72	G-5947			4N/28E-20cab	0.4	31.7	95.1	27271.4	20
65.	LeRue W. Pollock	3/9/73	G-6023			4N/28E-31abb	0.5	18.0 Prim.	29.0	27496.6	
								114.1 Supp.	183.85		
66.	George H. Barton	3/15/73	G-6040			4N/28E-31bca	1.6	127.86	383.58	27880.2	Proposed 191
67.	Lamb-Weston, Inc.	4/12/73	G-6069			4N/28E-30bad	2.67				98
68.	Edgar S. & Elmo C. Bloom	6/12/73	G-6058			4N/28E-19dda	0.35	16.6 Prim.	49.8	27930.0	90
								10.4 Supp.			
69.	Mrs. John W. Rice	6/29/73	G-6196			4N/28E-17bbd	0.84	67.0	201.0	28131.0	Proposed 115
70.	Woodrow Walker	7/12/73	G-6225			4N/28E-18dbd	0.7	55.0	165.0	28296.0	102

ORDNANCE GROUND WATER AREA
ALLUVIAL AQUIFERS

TABLE I

No.	Record Holder	Priority Date	Appli. No.	Permit No.	Cert. No.	Well Location	Permitted Diversion cfs	Acreage	Max. Allow. ac. ft.	Cum. Rights ac. ft.	Well Depth
35.	Malcolm Skinner	3/25/68	G-4291	G-4039	38482	4N/27E-13dbd	0.17	13.8	41.4	14350.1	97
36.	Tom Quick	3/28/68	G-4306	G-4067	42339	4N/28E-20bdd	0.21	16.4	49.2	14399.3	14
37.	E. T. Johnson	6/3/68	G-4427	G-4171		4N/27E-25dab	0.50	47.7	143.1	14542.4	88
38.	Francis F. McDole	6/21/68	G-4452	G-4395		4N/27E-33aac	4.92	393.3	1179.9	15722.3	120
38-A						4N/27E-33bab					Not Drilled
38-B						4N/27E-33bdb					Not Drilled
39.	Howard Gass	11/21/68	G-4694	G-4413		4N/28E-17cbb	1.35	36.5 Prim. 71.8 Supp.	109.5 215.4	15939.5	105
40.	Marvin & Frances McDole	10/31/69	G-5026			4N/27E-33aac	3.0	239.0	717.0	16656.5	120
40-A						4N/27E-33bab					Not Drilled
40-B						4N/27E-33bdb					Not Drilled
41.	Thurman Martin	12/30/69	G-5065	G-4775		4N/28E-19caa	1.25	60.0	180.0	16836.5	99
42.	Hansell Bros., Inc.	1/9/70	G-5209			4N/27E-26bcb	19.88	697.0 Prim. 893.8 Supp.	2091.0	18927.5	108
42-A						4N/27E-27bcd					121
42-B						4N/27E-27cab					135
42-C						4N/27E-27bda					104
42-D						4N/27E-26bca					105
43.	Elroy F. McDole	2/20/70	G-5112	G-4821		4N/27E-33dba	0.88	70.0	210.0	19137.5	113 (Abn)
44.	W. M. Huddleston	3/10/70	G-5123	G-4861		4N/27E-13aad	0.96	77.0	231.0	19368.5	101
45.	Donald Clark Key	3/31/70	G-5145	G-4878		4N/27E-30ddd	6.68	313.7 Prim. 312.1 Supp.	941.1	20309.6	115
45-A						4N/27E-30ddd					121
46.	Thurman Martin	11/16/70	G-5362			4N/28E-19caa	0.5	40.0	120.0	20429.6	99
47.	LeRue W. Pollock	1/12/71	G-5397			4N/28E-30dcc	0.33	26.0	78.0	20507.6	40
48.	Georgia B. Holzapfel	3/8/71	G-5449			4N/27E-32aca	2.0	160.0 Supp.			123
49.	Lyle W. Smith	3/12/71	G-5460	G-4844		4N/27E-26acb	1.4	112.0	336.0	20843.6	No Log
50.	Clarence W. Ruddell	5/11/71	G-5413	G-4931		4N/27E-19ccb	2.7	219.2	657.6	21501.2	112
50-A						4N/27E-19cda					Not Drilled
51.	Fred Haskins, Jr.	7/9/71	G-5567			4N/27E-29aac	8.0	640.0	1920.0	23421.2	Not Drilled
51-A						4N/27E-29bac					Not Drilled
51-B						4N/27E-29cac					Not Drilled
51-C						4N/27E-29dac					Not Drilled

ORDNANCE GROUND WATER AREA
ALLUVIAL AQUIFERS

TABLE I

No.	Record Holder	Priority Date	Appli. No.	Permit No.	Cert. No.	Well Location	Permitted Diversion cfs	Acreage	Max. Allow. ac. ft.	Cum. Rights ac. ft.	Well Depth
21.	Frances F. McDole	4/10/64	G-2831	G-2822		4N/27E-33adc	4.82	393.3	1179.9	8976.6	96
21-A						4N/27E-34bbb					97 (Abn)
21-B						4N/27E-34bac					125 (Abn)
22.	E. F. McDole	2/4/65	G-3029	G-2782	34281	4N/27E-33cba	1.00	80.0	240.0	9216.6	97
23.	Clark & Bernice Key	4/27/65	G-3092	G-2823	42526	3N/27E-4add	2.23	312.1	936.3	10152.9	80
23-A						3N/27E-4acc					88
23-B						3N/27E-4bdc					108 (Abn)
23-C						3N/27E-4bcc					112 (Abn)
23-D						3N/27E-5adc					400
23-E						3N/27E-5acc					200 (Abn)
23-F						3N/27E-5bdc					145
23-G						3N/27E-5bcx					(Abn)
24.	Hansell Bros., Inc.	5/16/66	G-3408	G-3197		4N/27E-28acd	2.60	136.8	410.4	10563.3	126
24-A						4N/27E-28ddc					127
25.	Roy Gail Holzapfel	3/20/67	G-3853	G-3629		4N/27E-32aab	2.0	160.0	480.0	11043.3	106
25-A						4N/27E-32aba					104
26.	David C. Ralston	7/13/67	G-3991	G-3745	38390	4N/28E-8acc	0.06	4.7 Supp.	14.1	11050.4	
27.	Edgar Bloom	9/13/67	G-4077	G-3868	41941	4N/28E-19ddb	0.145	11.6 Supp.	34.8	11067.8	
28.	Dwight H. Hulet	10/4/67	G-3945	G-3702		4N/27E-36abb	1.86	149.8	449.4	11517.2	117
28-A						4N/27E-36abb					187
28-B						4N/27E-36aab					213
28-C						4N/27E-36adc					185
29.	Woodrow Walker	10/9/67	G-4103	G-3851	39464	4N/28E-18dbd	2.88	230.0	690.0	12207.2	102
30.	Roy Gail Holzapfel	11/22/67	G-4140	G-3889		4N/27E-32baa	2.0	160.0	480.0	12687.2	111
31.	Marvin & Frances McDole	11/28/67	G-4144	G-3892		4N/27E-34bbb	4.85	389.5 Supp.			97 (Abn)
32.	Thomas E. Huddleston	1/23/68	G-4201	G-3966	38737	4N/28E-18cba	0.30	24.0	72.0	12759.2	93
33.	Hansell Bros., Inc.	2/15/68	G-4231	G-3822		4N/27E-27dad	5.0	320.0 Prim.	960.0	13791.2	140
								260.7 Supp.			
33-A						4N/27E-27bcd					121
33-B						4N/27E-27cab					135
33-C						4N/27E-35cxx					Not Drilled
34.	Malcolm Skinner	2/23/68	G-4246	G-4006	38481	4N/28E-19bcd	2.46	196.5	589.5	14308.7	126

ORDNANCE GROUND WATER AREA
ALLUVIAL AQUIFERS

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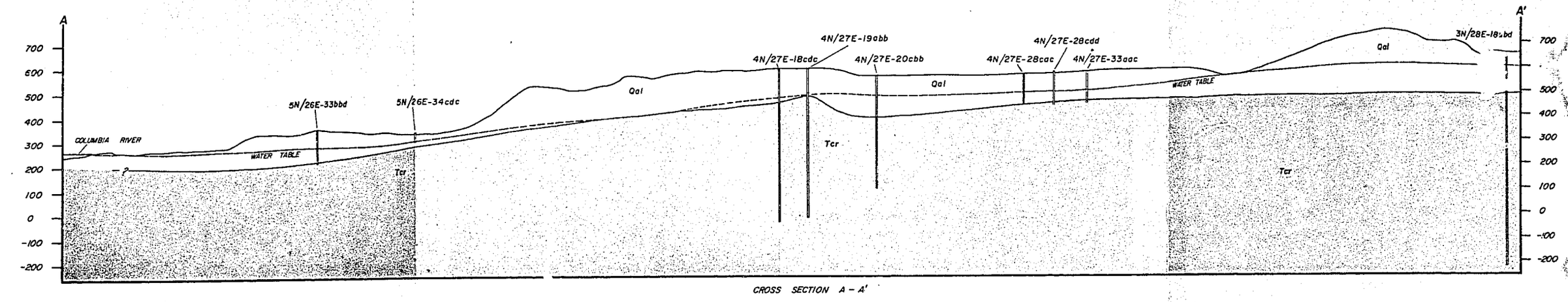
21.	Frances F. McDole	4/10/64	G-2831	G-2822		4N/27E-33adc	4.82	393.3	1179.9	8976.6	96
21-A						4N/27E-34bbb					97 (Abn)
21-B						4N/27E-34bac					125 (Abn)
22.	E. F. McDole	2/4/65	G-3029	G-2782	34281	4N/27E-33cba	1.00	80.0	240.0	9216.6	97
23.	Clark & Bernice Key	4/27/65	G-3092	G-2823	42526	3N/27E-4add	2.23	312.1	936.3	10152.9	80
23-A						3N/27E-4acc					88
23-B						3N/27E-4bdc					108 (Abn)
23-C						3N/27E-4bcc					112 (Abn)
23-D						3N/27E-5adc					400
23-E						3N/27E-5acc					200 (Abn)
23-F						3N/27E-5bdc					145
23-G						3N/27E-5bcx					(Abn)
24.	Hansell Bros., Inc.	5/16/66	G-3408	G-3197		4N/27E-28acd	2.60	136.8	410.4	10563.3	126
24-A						4N/27E-28ddc					127
25.	Roy Gail Holzapfel	3/20/67	G-3853	G-3629		4N/27E-32aab	2.0	160.0	480.0	11043.3	106
25-A						4N/27E-32aba					104
26.	David C. Ralston	7/13/67	G-3991	G-3745	38390	4N/28E-8acc	0.06	4.7 Supp.	14.1	11050.4	
27.	Edgar Bloom	9/13/67	G-4077	G-3868	41941	4N/28E-19ddb	0.145	11.6 Supp.	34.8	11067.8	
28.	Dwight H. Hulet	10/4/67	G-3945	G-3702		4N/27E-36abb	1.86	149.8	449.4	11517.2	117
28-A						4N/27E-36abb					187
28-B						4N/27E-36aab					213
28-C						4N/27E-36adc					185
29.	Woodrow Walker	10/9/67	G-4103	G-3851	39464	4N/28E-18dbd	2.88	230.0	690.0	12207.2	102
30.	Roy Gail Holzapfel	11/22/67	G-4140	G-3889		4N/27E-32baa	2.0	160.0	480.0	12687.2	111
31.	Marvin & Frances McDole	11/28/67	G-4144	G-3892		4N/27E-34bbb	4.85	389.5 Supp.			97 (Abn)
32.	Thomas E. Huddleston	1/23/68	G-4201	G-3966	38737	4N/28E-18cba	0.30	24.0	72.0	12759.2	93
33.	Hansell Bros., Inc.	2/15/68	G-4231	G-3822		4N/27E-27dad	5.0	320.0 Prim. 260.7 Supp.	960.0	13791.2	140
33-A						4N/27E-27bcd					121
33-B						4N/27E-27cab					135
33-C						4N/27E-35cxx					Not Drilled
34.	Malcolm Skinner	2/23/68	G-4246	G-4006	38481	4N/28E-19bcd	2.46	196.5	589.5	14308.7	126

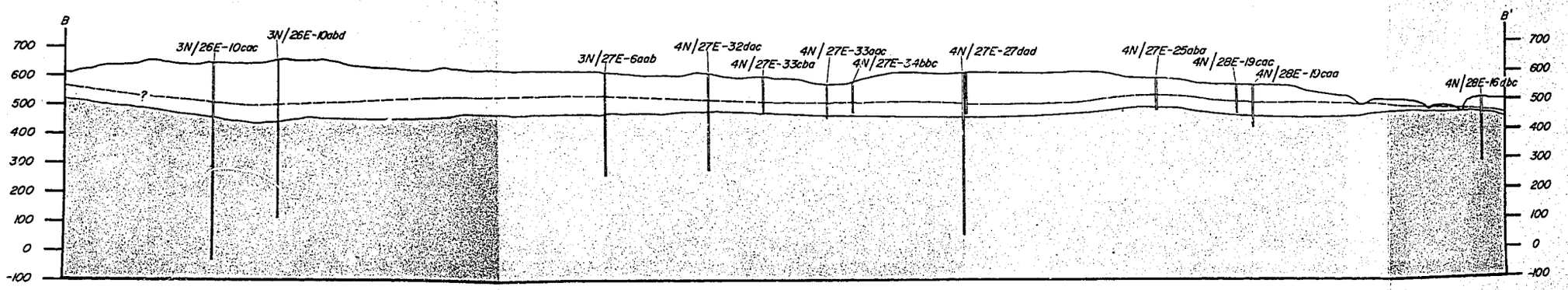
ORDNANCE GROUND WATER AREA
ALLUVIAL AQUIFERS

TABLE I

No.	Record Holder	Priority Date	Appli. No.	Permit No.	Cert. No.	Well Location	Permitted Diversion cfs	Acreage	Max. Allow. ac. ft.	Cum. Rights ac. ft.	Well Depth
1.	M. M. McDole	6/2/50	U-365	U-336	20685	4N/27E-33adc	1.0	79.9	239.7	239.7	96
2.	E. F. McDole	11/1/50	U-398	U-363	20686	4N/27E-33dba	0.987	79.0	237.0	476.7	No Log
3.	Scott Chapman	12/15/52	U-544	U-497	26073	4N/27E-28bdb	1.0	80.0	240.0	716.7	119
4.	Sylvanus F. Hoyt	12/15/52	U-545	U-498	26192	4N/27E-28acd	1.0	80.0	240.0	956.7	126
5.	Georgia B. Holzapfel	3/16/53	U-527	U-523	22888	4N/27E-32aca	0.61	49.0	147.0	1103.7	123
5-A						4N/27E-32dxx					310 (Abn)
6.	Roy Gail Holzapfel	3/16/53	U-573	U-524	22889	4N/27E-32aca	0.61	49.0	147.0	1250.7	123
6-A						4N/27E-32dxx					310 (Abn)
7.	Scott Chapman	5/2/55	U-819	U-725	30019	4N/27E-28bdb	2.25	180.3	540.9	1791.6	119
7-A						4N/27E-28cbd					107
8.	Georgia B. Holzapfel	7/5/55	U-858	U-750	22907	4N/27E-32aca	0.23	18.0	54.0	1845.6	123
9.	Ronald Baker	8/26/55	G-111	G-73		4N/27E-24aca	3.40	272.2	816.6	2662.2	151
10.	Sylvanus F. Hoyt	9/26/55	G-139	G-100	26193	4N/27E-28acd	0.81	64.6	193.8	2856.0	126
11.	E. F. McDole	3/26/56	G-279	G-190	37054	4N/27E-33cbd	1.0	80.0	240.0	3096.0	111 (Abn)
12.	Georgia B. Holzapfel	12/27/56	G-534	G-466	30119	4N/27E-32aab	0.54	43.4	130.2	3226.2	106
13.	Clarence W. Ruddell	6/19/58	G-1011	G-2952		4N/27E-30bca	4.19	335.25	1005.8	4232.0	79
13-A						4N/27E-30abd					85
14.	Enriqueta Ruddell	6/19/58	G-1012	G-2953		4N/27E-30cca	4.2	335.75	1007.3	5239.3	118
14-A						4N/27E-30dca					115
15.	Marvin M. McDole	8/28/58	G-1222	G-1069	30133	4N/27E-34bbb	0.95	76.2	228.6	5467.9	97 (Abn)
16.	Roy G. & Georgia B. Holzapfel	6/28/60	G-1777	G-1625	31098	4N/27E-32aca	3.08	111.0 Prim. 159.4 Supp.	333.0	5800.9	123
16-A						4N/27E-32aab					106
16-B						4N/27E-32aba					104
17.	Hansell Bros., Inc.	1/10/63	G-2520	G-2335		4N/27E-26bcb	1.32	105.5	316.5	6117.4	108
18.	Thomas E. Huddleston	1/21/64	G-2768	G-2592	34586	4N/28E-18cba	2.34	105.1 Prim. 82.1 Supp.	315.3	6555.9	93
19.	Malcolm Skinner	3/20/64	G-2809	G-2620	35784	4N/27E-13dbd	1.93	154.3	462.9	7018.8	97
20.	Hansell Bros., Inc.	3/31/64	G-2818	G-2694		4N/27E-26bcb	3.24	259.3	777.9	7796.7	108



CROSS SECTION A – A'



CROSS SECTION B-B'

GEOLOGIC CROSS SECTIONS A-A' AND B-B'

VERTICAL SCALE EXAGERATED X 15

PLATE 5

ORDNANCE GROUND WATER AREA

OREGON STATE ENGINEER

R.25 E R.26E R.27E R.28E

T.5N T.4N T.4N T.3N T.3N

LEGEND

- ○ IDENTIFY WELL LOCATION BY ORDER OF WATER RIGHTS-PERMITS, CERTIFICATES, OR APPLICATIONS.
- ○ WELLS DEVELOPING WATER FROM ALLUVIAL AQUIFERS.
- ◇ WELLS DEVELOPING WATER FROM BASALTIC AQUIFERS.
- ● ALLUVIAL WELLS UNDER PERMIT OR APPLICATIONS BUT NOT DRILLED.
- ◆ BASALTIC WELLS UNDER PERMIT OR APPLICATIONS BUT NOT DRILLED.

REFER TO TABLE I FOR A LISTING OF WATER RIGHTS.

- CONTROL BOUNDARY-ALLUVIAL AQUIFERS.
- CONTROL BOUNDARY-BASALTIC AQUIFERS.

WESTLAND ROAD SUBAREA

LOST LAKE-DEPOT SUBAREA

WELL LOCATION AND BOUNDARY MAP
PLATE I

ORDNANCE GROUND WATER AREA

OREGON STATE ENGINEER

R.25 E R.26E R.26E R.27E R.27E R.28E

T.5N T.4N

T.4N T.3N

T.3N.

R.25E R.26E R.27E R.27E R.28E.

N

A

B

A'

B'

EXPLANATION

Qal — Holocene Pleistocene

Alluvium — Poorly sorted sand, gravel, silt, and clay. Average thickness: 50–100 ft. Maximum 200 ft. Coarse facies moderately to highly permeable.

Tf — Pliocene

Conglomerate — Poorly sorted sand, silt and basaltic gravel: Poorly permeable.

Tcr — Miocene Pliocene

Basalt of Columbia River Group — Basaltic flows of the Columbia River Group. Flows to 100 ft thick. Interbeds of clay and/or tuffaceous sand layers to 100 ft. thick. Maximum thickness of unit several thousand feet. Yields large quantities of water to wells where jointed and porous.

Contact dashed where probable

Anticline in basalt dashed where probable

450 — Structure contours show altitude of top of basalt. Datum is mean sea level.

456 — Well penetrating basalt. Number is altitude of top of basalt above mean sea level.

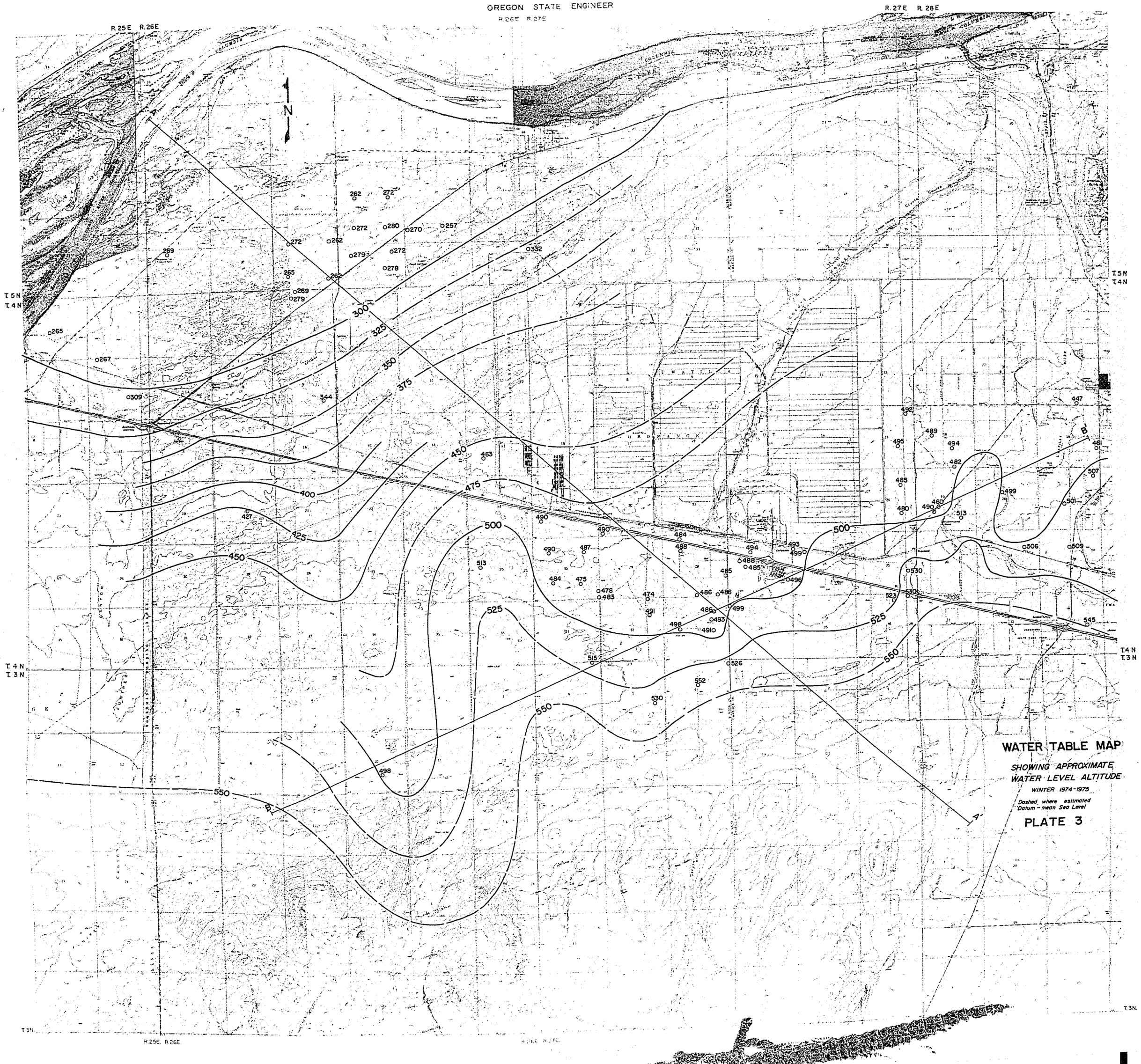
GEOLOGIC MAP OF ORDNANCE — UMATILLA GROUND WATER CRITICAL AREA

PLATE 2

SURFACE GEOLOGY COMPILED FROM U.S.G.S.
ATLAS HA 387 GEOLOGY BY JAMES ROBISON

ORDNANCE GROUND WATER AREA

OREGON STATE ENGINEER



WATER TABLE MAP

SHOWING APPROXIMATE WATER LEVEL ALTITUDE

WINTER 1974-1975

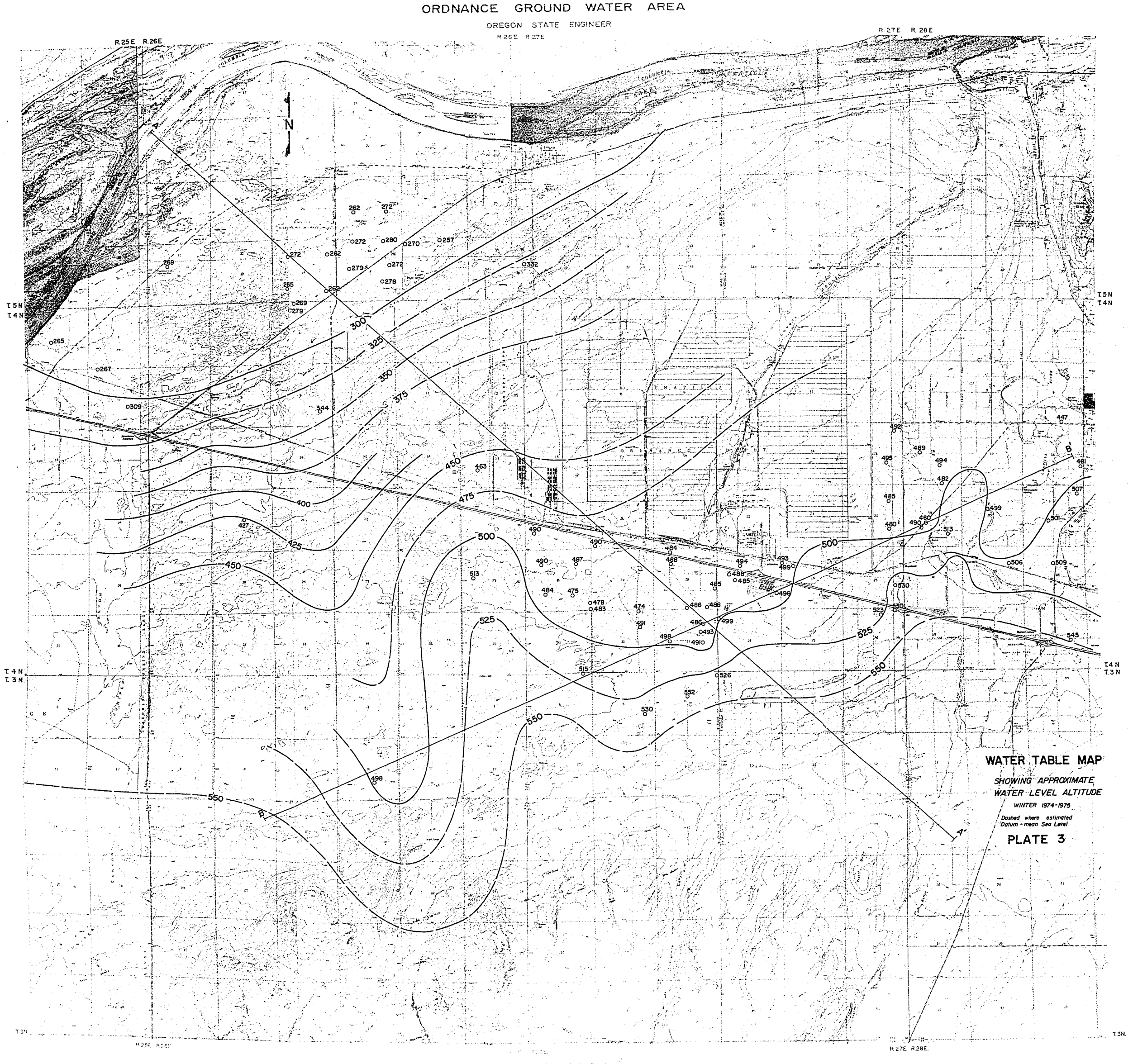
Dashed where estimated

Datum – mean Sea Level

PLATE 3

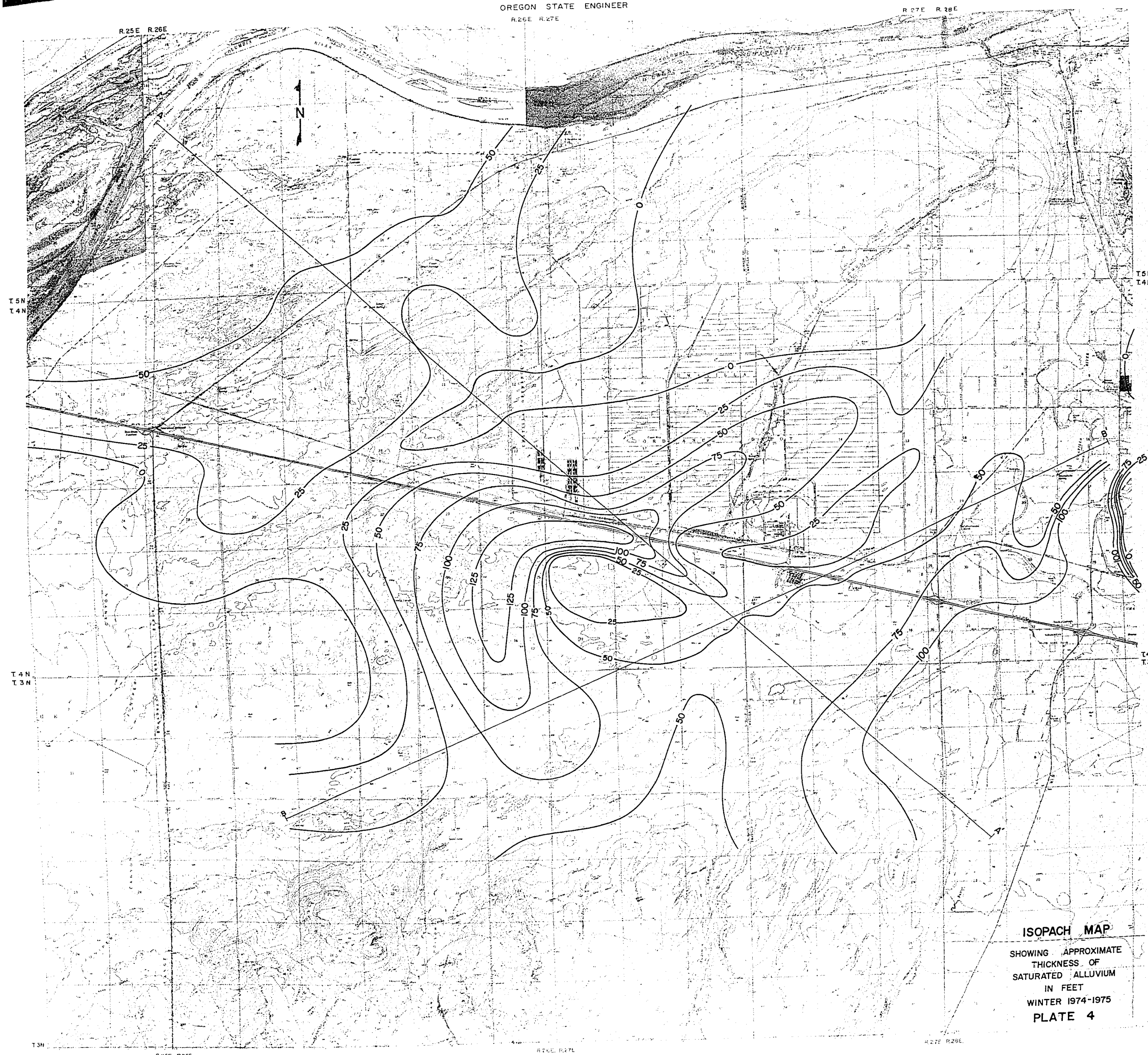
ORDNANCE GROUND WATER AREA

OREGON STATE ENGINEER



ORDNANCE GROUND WATER AREA

OREGON STATE ENGINEER



ISOPACH MAP

SHOWING APPROXIMATE THICKNESS OF SATURATED ALLUVIUM IN FEET WINTER 1974-1975

PLATE 4