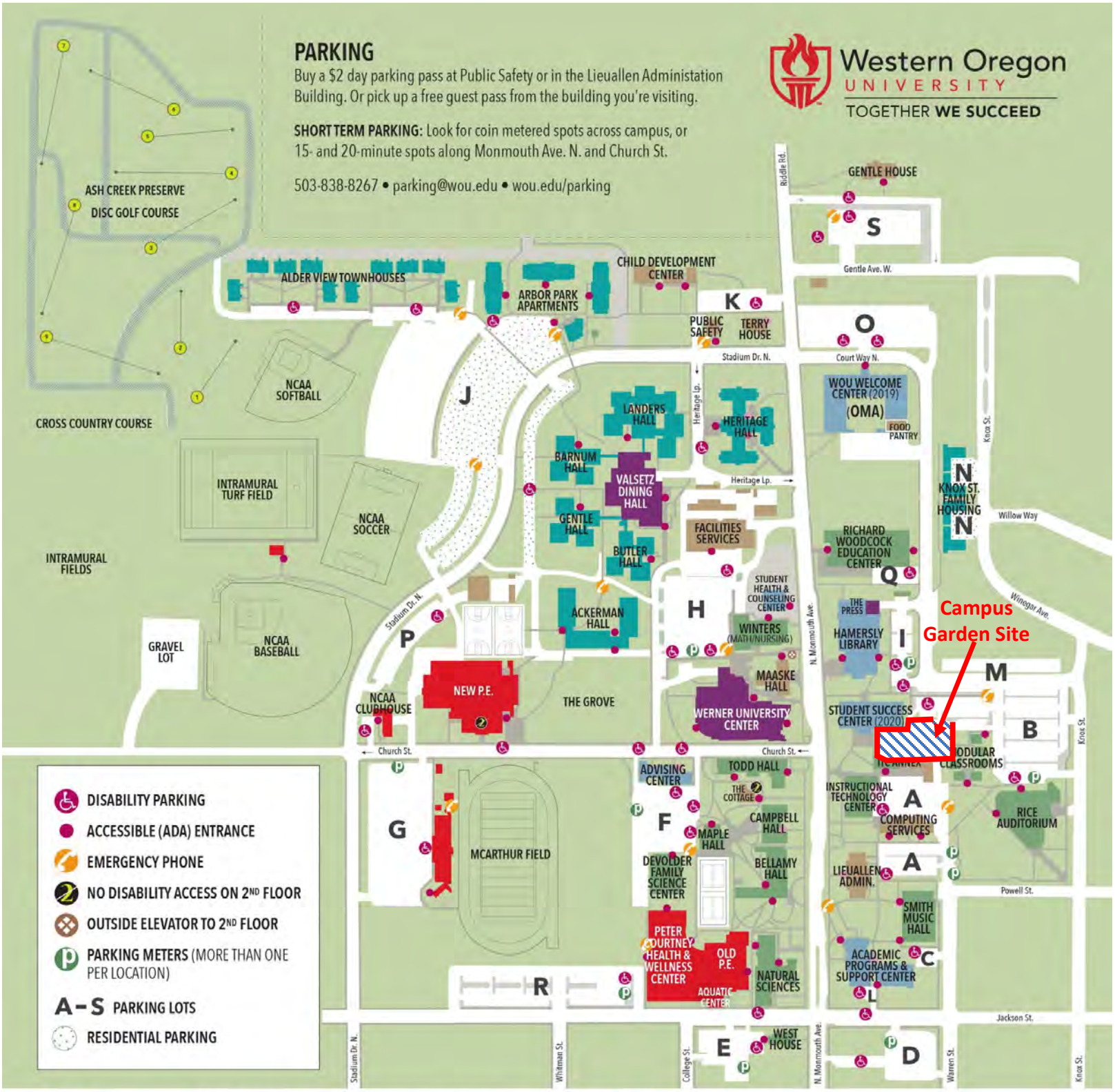


ATHLETIC FACILITIES
Aquatic Center
McArthur Field
NCAA Clubhouse
New P.E.
Old P.E.
Peter Courtney Health and Wellness Center

FOOD SERVICE
Hamersly Library *(The Press)*
Valsetz Dining Hall
Werner University Center

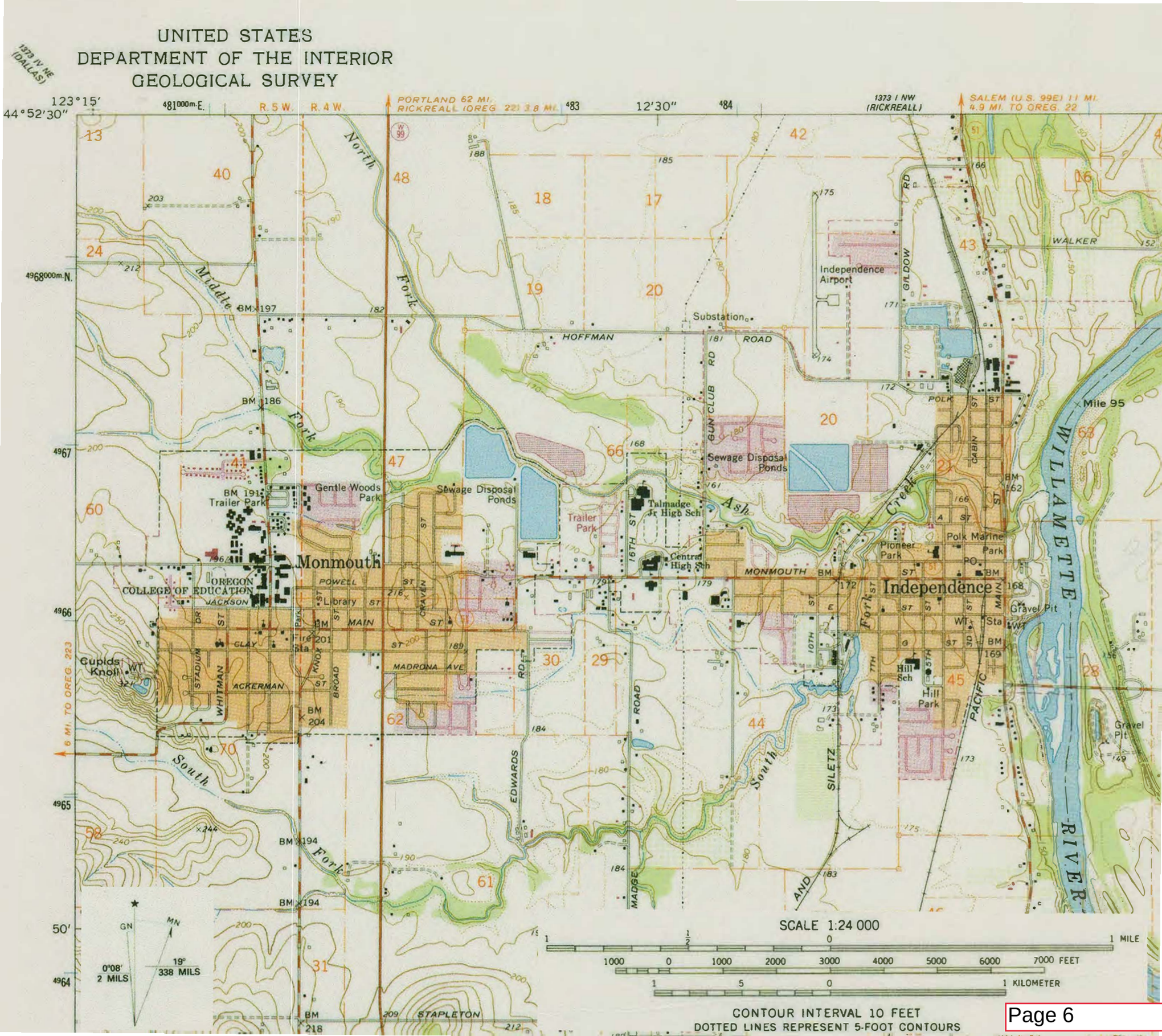
CLASSROOMS
Bellamy Hall *(HSS)*
Campbell Hall
DeVolder Family Science Center
Instructional Technology Center
Maple Hall
Maaske Hall
Modular Classrooms
Natural Sciences
Rice Auditorium
Richard Woodcock Education Center
Smith Music Hall
West House
Winters (Math/Nursing)

RESIDENCE HALLS
Ackerman Hall
Alder View Townhouses
Arbor Park Apartments
Barnum Hall
Butler Hall
Gentle Hall
Heritage Hall
Knox St. Family Housing
Landers Hall

STUDENT SUPPORT
Academic Programs & Support Center
Advising Center
Student Health & Counseling Center
*WOU Welcome Center (2019)

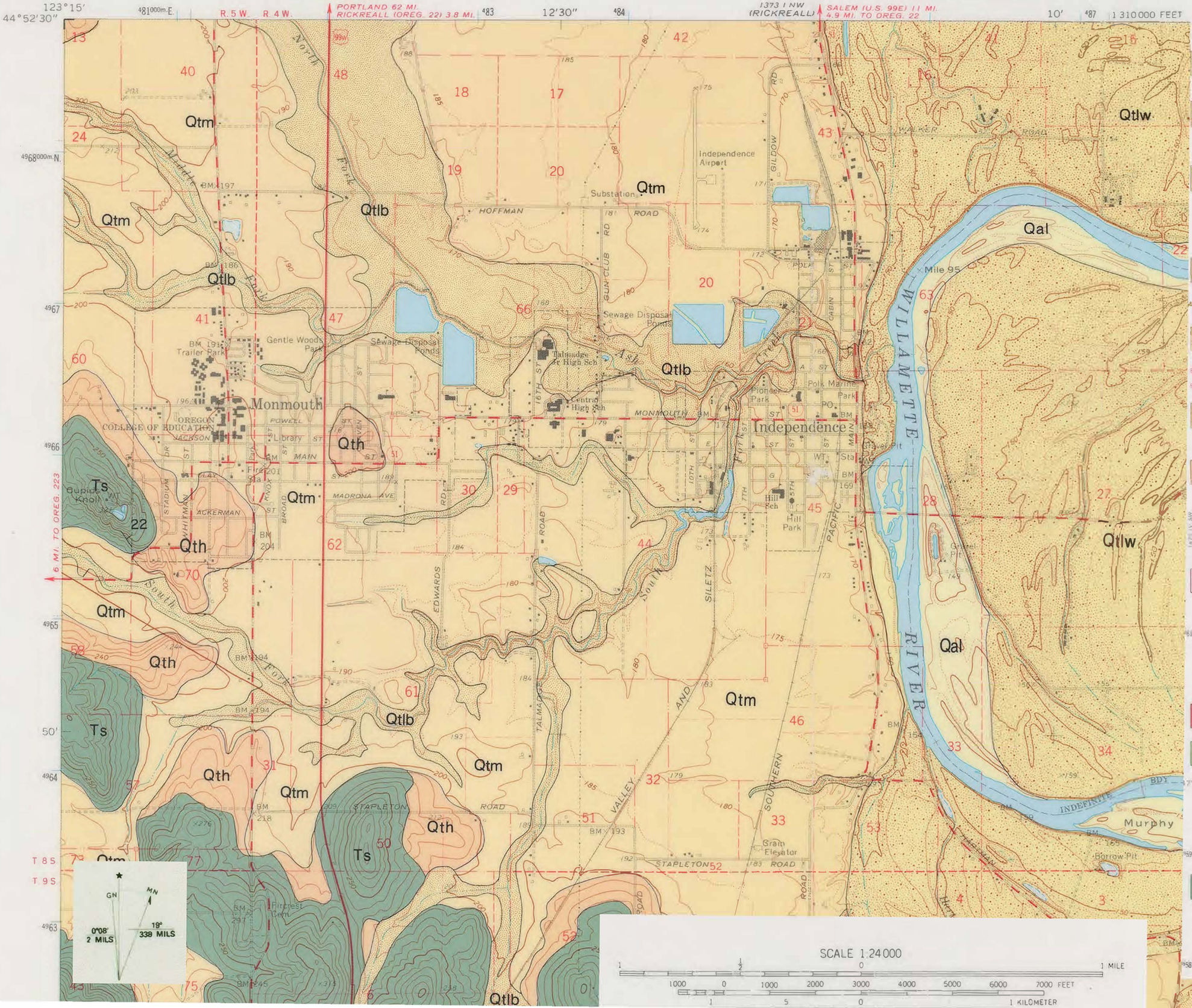
**Previously known as OMA (Oregon Military Academy)*

OTHER
Child Development Center
Computing Services
The Cottage
Facilities Services
Food Pantry
Gentle House
Lieuallen Administration
Parking Services
Public Safety
Terry House


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
1373 IV NE (DALLAS)
123°15'
44°52'30"
481000m.E.
R. 5 W.
R. 4 W.
PORTLAND 62 MI.
RICKREALL (OREG. 22) 3.8 MI.
483
12'30"
484
1373 I NW (RICKREALL)
SALEM (U.S. 99E) 11 MI.
4.9 MI. TO OREG. 22
4968000m.N.
4967
4966
4965
4964
50'
6 MI. TO OREG. 223
Monmouth
Independence
OREGON COLLEGE OF EDUCATION
Gentle Woods Park
Trailer Park
Talmadge Jr High Sch
Central High Sch
Pioneer Park
Polk Marine Park
Hill Park
Gravel Pit
Cupids Knoll
Independence Airport
Substation
Sewage Disposal Ponds
Mile 95
WILLAMETTE RIVER
North Fork Ash Creek
Middle Fork
South Fork
HOFFMAN ROAD
MONMOUTH
MAIN
POLK
WALKER
GUN CLUB RD
GILDOW RD
EDWARDS RD
MADGE ROAD
SILETZ AND PACIFIC
16TH ST
10TH ST
7TH ST
5TH ST
MADRONA AVE
ACKERMAN
POWELL
JACKSON
GLAY
BM 186
BM 197
BM 191
BM 204
BM 194
BM 218
BM 162
BM 169
STAPLETON
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
0°08'
2 MILS
19°
338 MILS
Page 6

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
DONALD A. HULL, STATE GEOLOGIST

GEOLOGIC MAP OF THE MONMOUTH



EXPLANATION

SURFICIAL GEOLOGIC UNITS

Qal — **Recent river alluvium:** Unconsolidated cobbles, coarse gravel, sand, and some silt and clay within active channels of Willamette River. Generally 15-45 ft thick, consisting of stratified sands and well-rounded pebbles, gravels, and cobbles of primarily basaltic and andesitic composition; often overlain by 3-15 ft of light-brown sand and silt overbanks. Characterized by low-relief, point-bar and channel-bar deposits; many areas unvegetated, others support dense stands of brush and phreatophytes, such as willows and cottonwoods. Subject to major flooding, critical stream-bank erosion, and lateral channel migration; includes many areas located between 1852 meander line and present channel that illustrate possible extent of future changes.

Qtlw — **Lower terrace deposits of the Willamette River (Quaternary):** Unconsolidated to semiconsolidated cobbles, gravel, sand, silt, clay, muck, and organic matter of variable thickness (30-50 ft) on the flood plain and lowland terraces immediately above the Recent river alluvium (Qal); typically 5-20 ft of light-brown silt and clay or clay fine sand overlying 10-45 ft of moderately well-sorted sand and locally cemented gravel. Surface topography characterized by a low, undulating, fluvial surface with abandoned channels, meander scrolls, oxbow lakes, and sloughs; subject to major and local flooding, some catastrophic channel migration of major scale, ponding, and high ground water. Flood-plain soils are predominantly well drained and somewhat excessively drain ed silty clay loams, silt loams, and sandy loams; good ground-water yields generally of 100-500 gallons per minute.

Qtlt — **Lower terrace deposits of tributary rivers and streams (Quaternary):** Unconsolidated to semiconsolidated gravel, sand, silt, clay, and organic matter generally 15-30 ft thick on lowland terraces and flood plains immediately above major tributary rivers of the Willamette River. Gravel deposits are very thin to variable in thickness, according to tributary drainage course, generally limited to active stream beds or former meander channels, and located at or near bed rock beneath 20-30 ft of sand, silt, and clay. Somewhat tortuous meandering streams entrenched 15-45 ft often flowing on Tertiary sedimentary bed rock or semiconsolidated older valley fill alluvium. Surface topography characterized by a low, undulating fluvial surface of swell and swale relief, abandoned meander loops, and oxbow lakes, subject to high ground water and ponding and major and local flooding; flood-plain soils are predominantly well drained and somewhat excessively drained silty clay loams, silt loams, and sandy loams. Some soft, compressible organic soils of low shear strength may occur locally, particularly within abandoned channels and oxbows. Major stream-bank erosion commonly occurs at outer bends of meander loops by shallow earthflow and slump due to undercutting. Ground-water yields generally small.

Qtlb — **Lower terrace deposits of alluvial bottomlands (Quaternary):** Flat, moderately to poorly drained areas with soft, organic compressible soils of low shear strength locally; characterized by low relief, ponding, and high ground water. Deposits typically consist of commonly stratified very fine sands, silts, sandy clays, silty clays, and silty clay loams, with slight to moderate plasticity (ML-CL) 4-12 ft thick along bottomlands of interior drainages of low, rolling sedimentary bedrock units. Deposits locally may represent somewhat thicker accumulations of silt and silty clay materials of fluvial and/or local origin derived in part from Willamette Silts. Similar deposits along creeks are associated with deposits of units Qtrn and Qth and are often modified by ditching and field drainage for agriculture; typical examples are deep (more than 80 in.) clay (CH), silty clay (CH), and silty clay loam (CL or ML) Black Bonham clay soils of Rickreall Slough (Rickreall quadrangle). Similar thicknesses of reddish-brown sandy silty material (ML-CH) on basaltic terrain (Tcr).

Qtrn — **Middle terrace deposits (Quaternary):** Semiconsolidated gravel, sand, silt, and clay forming very flat terraces of major extent along the Willamette River. Generally 10-30 ft of light-brown silty clay and interbedded very fine sand and silt (ML or CL-CH) of fluvial material, believed primarily related to Willamette Silts, including associated glacial terraces consisting of tiny fragments and pebbles up to boulders greater than 4 ft in diameter. Soils somewhat poorly drained and poorly drained silt loams and silty clay loams to moderately well-drained and well-drained silt loams subject to seasonal high ground water and ponding. Sand and gravel (GP-SM), where present, usually occur below 30 ft depth, locally more abundant near Monmouth Independence and in the lower part of Ash Creek. Total thickness 0-85 ft, but often only 40-50 ft within Rickreall 7½ minute quadrangle; 15-35 ft of brown clay or silt generally occurs above 30 ft of gravelly clay, black sands, and gravels. Generally small ground-water yields, except near Monmouth-Independence, where sand and gravel may yield up to 300 gallons per minute.

Qlg — **Linn gravel (Quaternary–upper Pleistocene):** Stratified fine to coarse fluvial gravels deposited as an alluvial fan in the Stayton-Turner-Salem areas during an early stage of the Santiam River; formerly extended eastward within the map area; uppermost few feet of gravels extensively oxidized and weathered; often shaley; thickness ranges from 30-40 ft so possibly as much as 300 ft. Regionally, the upper four or so of gravel is cemented by an impermeable clay pan locally, which restricts drainage. Composition of gravels mostly basalt, but also andesite, dacite, rhyolite, quartz, and diorite; essentially uniform. Within map area near Salem, soils are well drained and somewhat poorly drained, generally silt loam and gravelly loam, extensively utilized as source of sand and gravel. Good ground-water yields; greater than 100 gallons per minute.

Qth — **Higher terrace deposits (Quaternary–middle Pleistocene):** Generally semiconsolidated light-brown sand, silt, and clay of variable thickness (3-15 ft) on higher terraces and remnants of old higher terraces adjacent to and sedimentary bedrock foothills, mantled by moderately well-drained and well-drained silt loam soils. Includes colluvium, slope wash, and alluvial fan deposits near sedimentary bedrock foothills, deposits thin where transitional with pediments. Material generally similar to unit Qltn, particularly in West Salem, containing glacial erratics related to Willamette Silt but also some gravelly alluvium. Some higher terrace deposits on east side of Salem Hills between Salem and Hiahe Hill not shown due to scale. Also includes weathered (decomposed) cobbles and gravels which extend beyond the study area east of Rickreall (8-10 ft thick) and at southeastern margin of Sidney quadrangle (10-50 ft thick), where they are equivalent to the Loffler gravels of Allison (1953). These deposits also mantled by 3-15 ft of light-brown silt loam and silty clay loam soils. Generally little or no ground-water yield.

BEDROCK GEOLOGIC UNITS

Tcr — **Columbia River Basalt Group (Miocene):** Medium-gray to black, fine-grained, commonly sparsely porphyritic basalt; uncemented flows generally dense, fairly crystalline, exhibiting massive columnar jointing near base to dicey or luckily jointing in entablature. Unit consists of weathered and unweathered basaltic lava flows with interflow zones characterized by vesicular flow-top breccia, ash, and baked soils. Maximum thickness generally ranges 400-800 ft, with thickness greatly modified by erosion and weathering in many places; individual flows range from 40 ft to more than 100 ft in thickness.

Formations recognized within the Yakima Basalt Subgroup (Beeson, 1980, personal communication) include the Grande Ronde Basalt, two to four "low Mg" N flows, including one to two "Winter Water" flows at or typical exposure at Dairy Queen, West Salem; one to two thick "low Mg" flows, 100-150 ft thick, extensively quarried throughout map area, one to two flows of "high Mg" N basalt, generally deeply weathered, occurring above the "Winter Water" flow(s), and (2) a thinner layered younger Wanapum Basalt, represented by one to three flows of the Frenchman Springs Member, observed only in South Salem within the study area, although it also occurs outside the map area in the vicinity of Turner.

Weathered flows consist of reddish-brown to grayish-brown, crumbly to medium-dense basalt. Weathering is variable and believed related to individual basalt flows; some exposures are altered to red clay (laterite) to depths of 30 ft, and occasionally as deep as 60-175 ft, while others are only slightly weathered at surface. Some locations in Salem Hills generally between 300-900 ft elevation within area bounded by Pringle School-Prospect Hill-Jackson Hill where extensive laterization which has resulted in deposits of bauxite (Corcoran and Libbey, 1956). Soils are reddish-brown, well drained silty clay loams and gravelly silty clay loams. Unit yields small to large quantities of ground water from permeable rubbly zones between flows.

Ti — **Intrusive rocks (Oligocene):** Dense basalt, andesite, and gabbro dikes and sills of very limited extent within the map area (Roby Hill, Sidney quadrangle). Roby Hill quarry geochemically a part of Columbia River Basalt Group (Beeson, 1980, personal communication). Another limited exposure of porphyritic intrusive or possibly flow rock, with vertical columns 1-2 ft in diameter in contact with claystone along east bank of Luckiamute River near Buena Vista Road (near mile 3.2). Presumed post-Eocene (Oligocene?) age (Helm and Leonard, 1977).

Toe — **Eocene-Oligocene sedimentary rock (middle and lower Oligocene and upper Eocene):** Equivalent to tuffaceous marine sedimentary rocks (Tmt of Baldwin and others (1965), Illahe Tuff of Mundorff (1939), Illahe Formation (Ti) of Thayer (1939), Eocene-Oligocene marine sedimentary rocks (Tm) of Prave (1967), and undifferentiated Tertiary rocks (Tu) of Gonthier (in press). Consists of two lithologic and faunal units west of Willamette River (Baldwin and others, 1965) but undifferentiated in this map due to poor exposures. Older unit light-gray to tan sandy tuffaceous siltstone equivalent in age to early Oligocene Keasey Formation, thickest section near border of Falls Rickreall 7½-minute quadrangles, is here approximately 1,000 ft thick; other known Oligocene strata well exposed in Yamhill River near Yamhill locks, where steeply dipping and complexly faulted. Younger unit is fine- to coarse-grained tuffaceous sandstone equivalent in age to middle Oligocene Pittsburg Bluff Formation; basal stratum approximately 150 ft of dark-gray, coarse-grained, calcareous cemented lithic sandstone, chiefly composed of detrital igneous rock fragments. White, fine-grained, massively bedded phase of pumiceous volcanic glass approximately 250 ft thick exposed for 3 mi along hillside south of Fuller Station West quadrangle; good exposures of pebbly tuff, tuffaceous conglomerate, and fine-grained platy tuff along Bunker Hill local in Sidney 7½-minute quadrangle.

Tuffaceous marine sandstone and siltstone of Oligocene sedimentary rock correspond to Oligocene Eugene Formation described by Hickman (1968), which contains early to mid-Oligocene molluscan fauna. Recent foraminiferal analyses (McKeel, 1980) of oil and gas wells within the study area indicate unit contains almost 2,000 ft of upper Refugian and Refugian strata (Reichhold-Merrill #1, Sidney quadrangle) and 200-4,000 ft of basal siltstone, claystone, and shale of late Narizian (provincial West Coast late Eocene) age (Reserve River #1 and Reichhold-Merrill #1).

Ts — **Upper Eocene sandstone:** Equivalent to Helmick beds (Tbh) of Mundorff (1939) and Spencer (Ts) of Gonthier (in press). Very fine to medium-grained, thinly laminated fissile to thin-bedded, as well as prominently more massive, tightness to yellowish-brown moderately well-sorted, calcareous, tuffaceous sandstones, frequently interbedded with fine-grained marine tuffaceous siltstone, thinly laminated clay shale, and claystone; composed of almost equal proportions of quartz, feldspar, and rock fragments cemented with calcite (in concretions), minor constituents include approximately 2% glauconite, 1% mica (biotite, muscovite, and chlorite), and less than 1% authigenic garnet, well compacted, carbonaceous material consisting of plant stems, leaves, and other organic fragments common, calcareous concretions, fossiferous or containing carbonaceous material, prominent along Willamette River south of Buena Vista (Monmouth quadrangle); pebble lenses, abundant organic matter, and paleoecology indicate strandline environment; provenance from chiefly volcanic terrain. Weathered outcrops of massive, very fine- to medium-grained sands, generally friable, ranging in color from white to yellowish-brown, pale-brown, or yellowish-orange.

According to McKeel (1980), this unit is bracketed by upper Narizian strata in the Reichhold-Finn #1 well (Amity quadrangle), by upper Narizian and Narizian strata in the Reserve River #1 well (Amity quadrangle), and by upper Narizian strata in the Reichhold-Merrill #1 well (Salem West quadrangle). Average thickness about 800 ft.

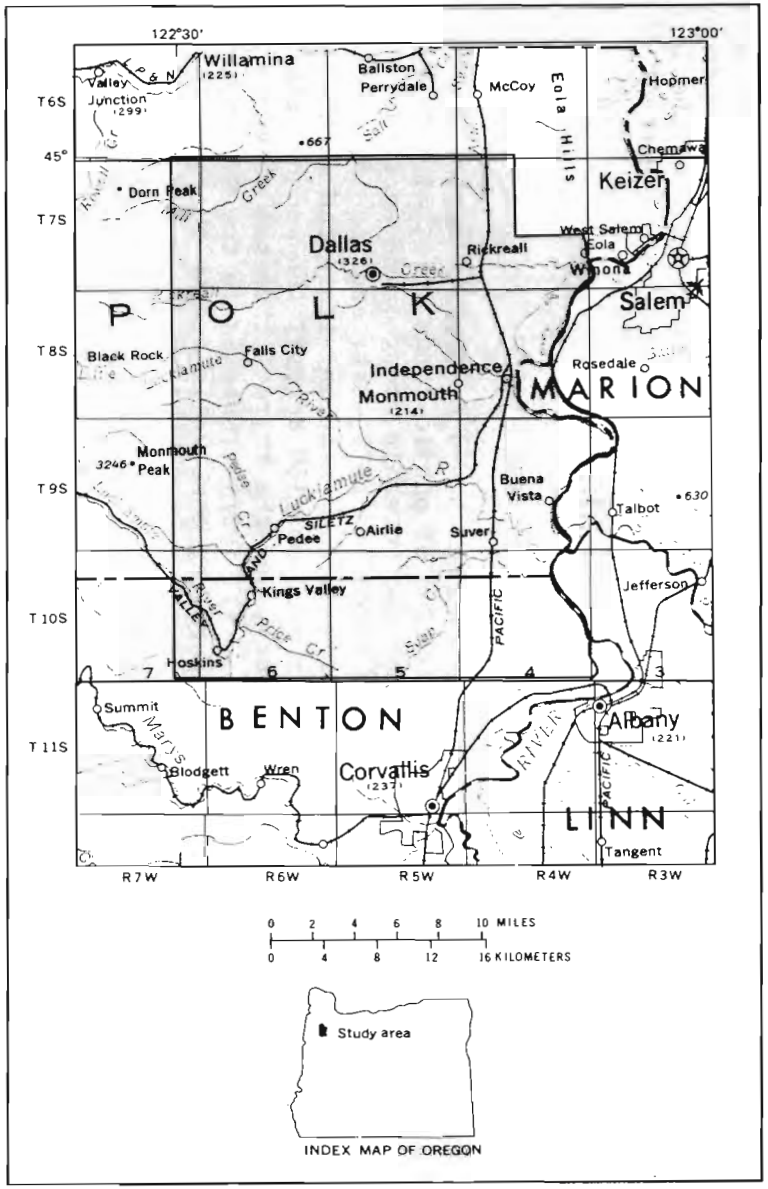


Figure 1. – Location of the Dallas-Monmouth study area.

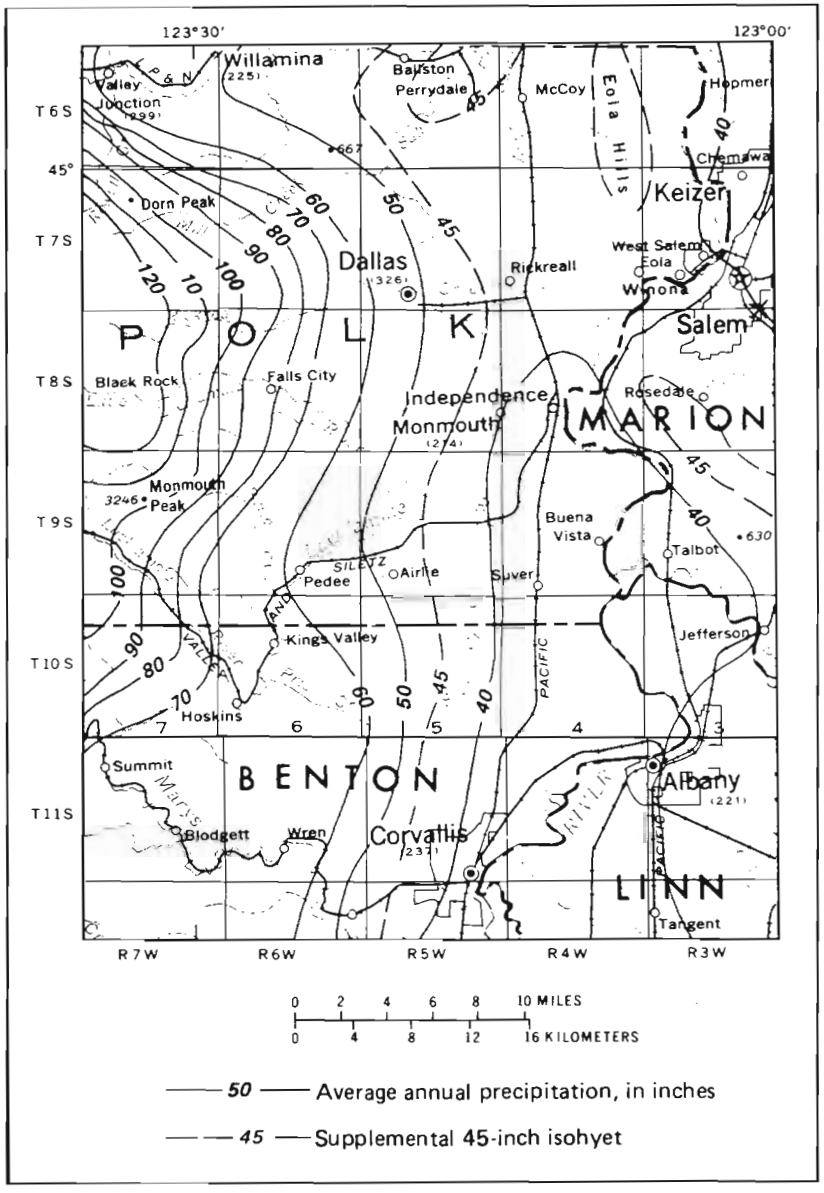


Figure 2. – Annual precipitation, Dallas-Monmouth study area.

DALLAS - MONMOUTH GROUND WATER SUMMARY

Problems and Solutions

The major ground-water-related problems in the Dallas-Monmouth area are low well yield and poor-quality ground water. These problems commonly occur together in individual wells, and they occur most frequently in wells drilled into the consolidated rocks. The problems occur because the consolidated rocks consist chiefly of low-permeability formations that generally contain water having increasing concentrations of dissolved minerals with depth below the land surface. Commonly, several wells are drilled into the consolidated rocks before an adequate domestic freshwater supply is obtained. Unsuccessful wells generally are backfilled and abandoned. Records indicate that as many as five unsuccessful wells have been drilled on a given property. Other solutions have been to develop water supplies from nearby springs, obtain water from neighbors, collect water in cisterns, connect into existing public water supplies, or to form a new public water-supply system utilizing a distant but dependable source of supply.

Excessive pumping of sand is a significant problem associated chiefly with wells completed in sand and gravel. The sand enters the well through casing perforations and causes excessive wear of pumping equipment, clogging of pipes, and sometimes results in the destruction of the well through the collapse of the unsupported casing. The problem is caused by high turbulence around the well bore due to excessive ground-water velocities. It can be controlled by reducing the pumping rate of an affected well; it is prevented through good well design, operation, and maintenance.

Excessive declines of ground-water levels resulting from heavy pumping of wells is a potential problem in the Dallas-Monmouth area. These declines could become a significant problem in the area's most productive sand and gravel because sand and gravel will continue to supply much of the area's increasing water needs. The problem will occur if pumping wells are spaced too closely and if they extract water at rates that exceed the sand and gravel local hydraulic capacity. Future development of the sand and gravel therefore should be planned with care so as to minimize the adverse effects.

Ground-water pollution is not a major or widespread problem in the Dallas-Monmouth area, but local occurrences have been reported. Pollution of ground water will occur if facilities for the disposal of wastes or for application of other degrading substances are poorly designed, operated, and maintained for the type of soil conditions existing at a disposal site or if the potential pollutants are handled carelessly. The risk of pollution is higher in sand and gravel in the younger alluvium because of their high porosity and permeability and shallow depth. These soil characteristics may allow a potential pollutant to reach the water table and to move downgradient toward a discharge area more quickly than in other water-bearing formations in the area.

Locally, ground water from sand-and-gravel aquifers contains concentrations of iron and (or) manganese that may be excessive for some types of uses. Prediction of the occurrence of excessive concentrations of iron or manganese is not feasible with the data presently available.

SUMMARY AND CONCLUSIONS

Ground water is the principal source of water for most of the rural population of the Dallas-Monmouth area. Water-bearing formations include consolidated rocks consisting of basalt, marine siltstone, sandstone, shale, and tuff and unconsolidated deposits consisting of clay, silt, sand, and gravel. Consolidated rocks are exposed in about 70 percent of the area, and they are chiefly low-permeability formations that yield less than 10 gal/min to wells. Commonly these rocks yield quantities of water that are inadequate even for household use. Ground water in the consolidated rocks is of suitable quality for most uses in most localities; however, the water contains concentrations of dissolved minerals that increase with depth in the rocks. Locally, wells may intercept water that contains excessive concentrations of dissolved minerals and is too saline for most uses. The depth at which saline water occurs is highly variable, and determination of that depth in each locality was beyond the scope of this study.

Movement of unconfined ground water in the project area is from topographically high areas toward lowlands where the water may be discharged as springs, as seepage to surface-water bodies, or as evapotranspiration to the atmosphere. The depth to unconfined ground water generally is greater beneath hills and hillsides than beneath lowlands. The potentiometric-surface contour map for the sand and gravel in the east-central part of the Dallas-Monmouth area (pl. 1) indicates a general eastward flow of ground water toward the Willamette River. Potentiometric-surface contours were not prepared for other

parts of the project area because water-level data are inadequate and because the formations elsewhere yield only small to moderate supplies of ground water.

The best water-bearing materials in the study area are beds of sand and gravel in the unconsolidated deposits. The thickest, most extensive, and most productive sand and gravel deposits are in the younger alluvium underlying the flood plain of the Willamette River. The largest yielding wells completed in sand and gravel in the younger alluvium generally yield 100-500 gal/min. In the east-central part of the Dallas-Monmouth area, sand-and-gravel beds in the younger alluvium are continuous and are hydraulically connected with sand and gravel in adjacent older alluvium. When either unit is heavily pumped, the two units respond as a single aquifer. Although large quantities of ground water are being withdrawn from this aquifer, additional large quantities can be developed if adequate well spacing is maintained. Outside the Willamette River flood plain and the east-central area, sand and gravel beds in older alluvium or in terrace deposits are too thin and too small in extent to support wells of large yield.

The quality of water in the unconsolidated deposits is adequate for most uses; however, it may contain excessive concentrations of iron or manganese in some localities.

About 9,500 acre-ft of ground water was withdrawn from all sources in the Dallas-Monmouth area in 1975. Of this total, about 7,200 acre-ft was pumped from sand and gravel in unconsolidated deposits for irrigation. Most ground water for irrigation was pumped from wells completed in younger alluvium. About 1,200 acre-ft was pumped from unconsolidated deposits for public-supply use, and the remainder, or about 1,100 acre-ft, was for domestic, stock, and industrial uses.

Principal ground-water-related problems are low well yield, poor-quality ground water, and sand pumping by wells. Low well yield and poor-quality ground water occur most frequently in wells tapping the low-permeability consolidated rocks. Because the consolidated rocks are the only source of ground water in much of the area, these problems will continue to persist as long as people are attracted to build in the area's rural setting. Sand pumping by wells is a common problem, occurring most frequently in large-capacity wells completed in the unconsolidated deposits. The sand causes excessive wear of pumping equipment, clogging of irrigation systems, and caving around pumping wells.

Potential ground-water problems include pollution and excessive water-level decline. Excessive water-level declines result from spacing pumping wells too closely for the local hydraulic conditions or simply from heavy pumping. Excessive declines could be a problem, especially in the productive sand-and-gravel deposits in younger and older alluvium where the water table is shallow and the water-bearing sand and gravel are highly permeable. Particular caution is needed in these areas in the use and disposal of potential pollutants.

Table 1.--Summary of stratigraphy and hydrogeology of the Dallas-Monmouth area

System	Series	Geologic unit	Lithology	Estimated thickness range (ft)	Location and extent	Well characteristics: Mean: Depth (ft)	Well characteristics: Mean: Static water-level depth (ft)	Well characteristics: Mean: Yield (gal/min)	Well characteristics: Median: Yield (gal/min)	Well characteristics: Median: Specific capacity ((gal/min)/ft)	Aquifer hydraulic properties: Hydraulic conductivity median (ft/d)	Aquifer hydraulic properties: Coefficient of storage range	Estimated annual recharge range (in.)
Unconsolidated Quaternary rocks	Holocene and Pleistocene	Younger alluvium	Silt and very fine sand 5 to 50 feet thick overlying well-sorted sand and gravel 10 to 45 feet thick	0-55	Willamette River flood plain	45	19	100	--	40	170	0.2	8-15
		Older alluvium	Silt and clay 0 to 45 feet thick overlying poorly sorted sand and gravel interbedded with clay and silt	0-85	Underlies terraces above Willamette River flood plain and valleys of principal tributaries to the Willamette River	70	19	30	15	.59	19	.001-0.2	2-5
		Terrace deposits	Poorly sorted, deeply weathered sand and gravel, silt, clay, and cobbles	0-125	Crops out in two principal areas--near Dallas and near Adair Village								
Consolidated Tertiary rocks	Miocene	Columbia River Basalt Group	Basalt lava flows	0-150	Caps two hills in northeastern part of area	--	--	--	--	--	--	--	--
	Oligocene	Tertiary intrusive rocks	Gabbro and diorite dikes and sills	0-500	In foothills in western one-third of area	--	--	--	--	--	--	--	--
	Eocene	Tertiary rocks, undifferentiated	Tuffaceous sandstone and shale and volcanic ash	500-1,000	Exposed in northeastern part of area; may underlie unconsolidated deposits on east side of area	186	39	10	5.4	.10	.3	.00001-0.001	2-5
		Spencer Formation	Sandy, micaceous marine siltstone	0-2,000	Crops out in east half of area and underlies younger formations in same area								
		Yamhill Formation	Thin-bedded marine sandstone and siltstone	0-3,000	Crops out in west-central and northwest foothills; slopes eastward and underlies younger formations in northeastern part of area								
		Tyee Formation	Micaceous, arkosic marine sandstone and sandy siltstone	0-1,500	Crops out on west-central and southwest foothills; probably underlies younger formations in southeastern part of area								
		Siletz River Volcanics: Kings Valley Siltstone Member	Tuffaceous marine siltstone, shaly siltstone, and tuff	0-3,000	Crops out in Kings Valley in southwestern part of area								
		Siletz River Volcanics	Basalt flows, breccia, pillow lava, and tuffaceous sedimentary rocks	?-10,000	Crops out in northwestern and south-central parts of the area; may underlie entire area at great depths	192	44	13	7	.11	.2	.00001-0.001	

EXPLANATION

- Qyal — YOUNGER ALLUVIUM
- Qoal — OLDER ALLUVIUM
- Tu — TERTIARY ROCKS, UNDIFFERENTIATED
- Ts — SPENCER FORMATION
- CONTACT – Approximately located

SCALE: 0 1 2 MILES; 0 1 2 3 KILOMETRES

— 130 — STRUCTURE CONTOUR – Shows altitude of bottom of sand and gravel. Contour interval 10 feet. National Geodetic Vertical Datum

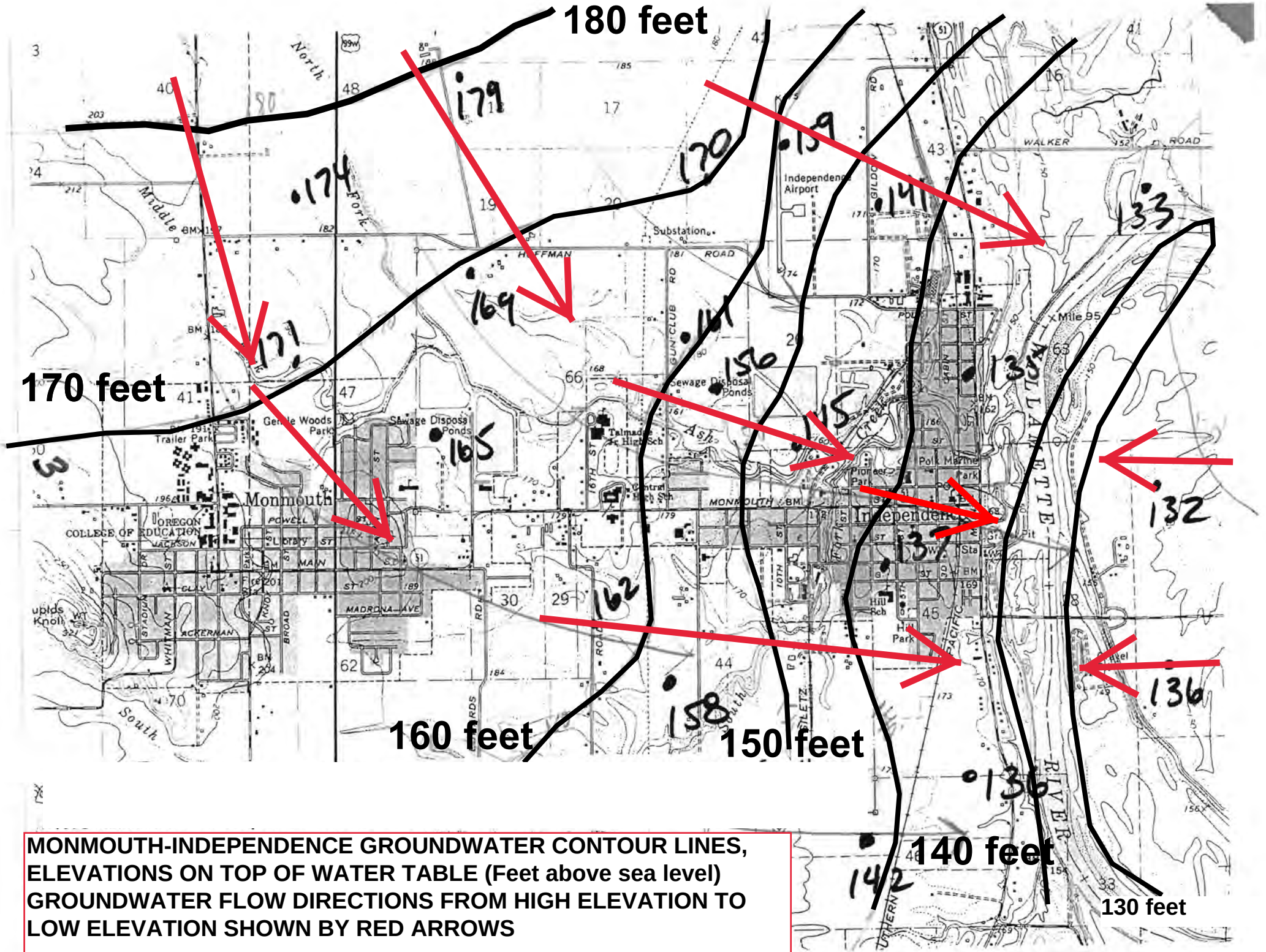
— 20 — LINE OF EQUAL SATURATED THICKNESS OF ALLUVIAL AQUIFER – Interval 10 feet

NO-FLOW BOUNDARY, 0 SATURATED THICKNESS LINE – Linked circles indicate where boundary and contact coincide

Note: The Willamette River is probably a constant-head boundary

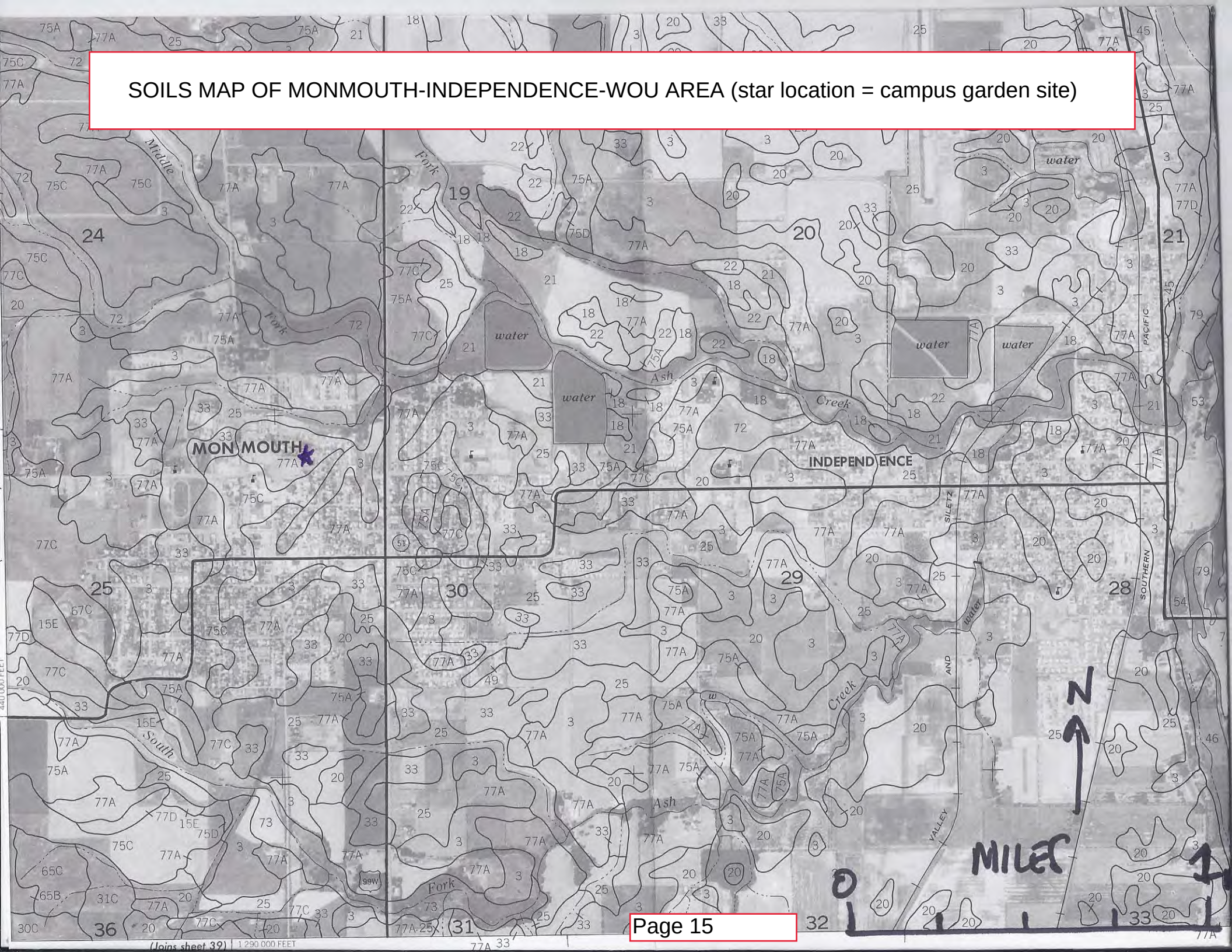
A. — CONTOURS ON BOTTOM OF THE SAND AND GRAVEL IN THE EAST-CENTRAL PART OF THE DALLAS-MONMOUTH PROJECT AREA

B. — SATURATED THICKNESS AND HYDROLOGIC BOUNDARIES OF THE SAND AND GRAVEL IN THE EAST-CENTRAL PART OF THE DALLAS-MONMOUTH PROJECT AREA



MONMOUTH-INDEPENDENCE GROUNDWATER CONTOUR LINES, ELEVATIONS ON TOP OF WATER TABLE (Feet above sea level) GROUNDWATER FLOW DIRECTIONS FROM HIGH ELEVATION TO LOW ELEVATION SHOWN BY RED ARROWS

SOILS MAP OF MONMOUTH-INDEPENDENCE-WOU AREA (star location = campus garden site)



Soil Unit 3 - Amity Silt Loam

areas that are close to water. Grouse, band-tailed pigeons, and mountain quail are not common. Gophers, ground squirrels, moles, nutria, and opossum are common pests. Planting along roadways, using grassed waterways, and preserving fence row, woodlots, and brushy areas improve the cover and food for wildlife.

This soil is limited for use as homesites and commercial buildings because of low strength and shrink-swell potential. It is limited for septic tank absorption fields because of the moderately slow permeability. Local roads and streets are limited by low strength. Some areas of this soil are connected to community water and sewage systems. The hazard of flooding is a major limitation.

This soil is in capability subclass IIw.

3—Amity silt loam. This somewhat poorly drained soil is on terraces of the Willamette River and its major tributaries. It formed in mixed silty alluvium. Slopes are 0 to 3 percent and average about 2 percent. Elevation is 170 to 300 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52 to 54 degrees F, and the frost-free period is 165 to 210 days.

In a representative profile, the surface layer is dark brown silt loam about 16 inches thick. The subsurface layer is dark grayish brown, mottled heavy silt loam about 9 inches thick. The subsoil is brown and dark grayish brown, mottled silty clay loam about 23 inches thick. The substratum is olive brown, mottled silty clay loam that extends to a depth of 63 inches or more.

Included with this soil in mapping are areas of Woodburn, Holcomb, Concord, and Dayton soils, which make up about 15 percent of this map unit.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is 9 to 12 inches, and the water-supplying capacity is 20 to 25 inches. Runoff is slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 6 to 18 inches in winter and spring.

This soil is used for small grain, hay, pasture, and grass seed. Drained areas are suited to a wider range of crops. Irrigated areas are used for pole beans, corn, and other row crops. Returning all crop residues to the soil and using a cropping system in which grasses, legumes, or grass and legume mixtures are grown at least 25 percent of the time help to maintain fertility and tilth. Small grain and grasses respond to nitrogen; row crops commonly respond to nitrogen; and phosphorus and legumes respond to phosphorus, sulfur, and lime.

The soil is irrigated by sprinkler, furrow, or border irrigation, and sprinklers mainly are used. Irrigation water needs to be applied carefully at rates low enough to prevent runoff. Adequate water for irrigation can generally be obtained from wells.

Drainage is the major concern, but if outlets are available the soil responds readily to open or closed drainage systems. The soil generally requires improved outlets to increase the subsurface drainage and lower the seasonal high water table. For maximum use and production, the soil needs a drainage pattern.

This soil is poorly suited to commercial timber production.

The natural vegetation is grass, shrubs, and scattered Oregon white oak. A seasonal high water table limits the use of this soil to ducks and geese late in fall, in winter, and early in spring. Seeds and tubers from water plants and crop residues are food for waterfowl. The rest of the year, ring-necked pheasant, valley quail, bobwhite quail, mourning doves, and black-tailed deer move into this area for food and cover. This soil is used by some fur-bearing animals.

This soil has some limitations for roads and streets and major limitations for homesites, commercial buildings, and other community uses because of the seasonal high water table.

This soil is in capability subclass IIw.

4D—Apt silty clay loam, 3 to 25 percent slopes. This well drained soil is on mountainous, lower side slopes of the Coast Range. It formed in residuum and colluvium weathered from sedimentary rock. Slopes average about 15 percent. Elevation is 700 to 1,400 feet. The average annual precipitation is 60 to 120 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 160 to 190 days.

In a representative profile, the surface layer is very dark grayish brown silty clay loam about 8 inches thick. The subsoil is dark yellowish brown silty clay about 58 inches thick. Fractured siltstone is at a depth of 66 inches.

Included with this soil in mapping are areas of Honeygrove, Peavine, Cumley, and Astoria soils, which make up about 15 percent of this map unit.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is 7.5 to 10 inches, and the water-supplying capacity is 20 to 26 inches. Runoff is medium, and the hazard of erosion is moderate.

Most areas of this soil are used for timber production. Other uses are water supply and wildlife habitat. The soil is well suited to the production of Douglas-fir. Red alder is common. The site index for Douglas-fir on this soil ranges from 155 to 180, and the average site index is about 165. Based on the average site index, this soil is capable of producing about 13,300 cubic feet, or 74,200 board feet (International rule, one-fourth inch kerf), of merchantable timber from a fully stocked, even-aged stand of 80-year old trees.

Limitations to the use of equipment are major. When wet, this soil is sticky and plastic; this limits trafficability. It is severely compacted by equipment. Cable logging is desirable because tractor logging causes excessive disturbance. Roads and landings may need to be protected

Soil Unit 25 - Dayton Silt Loam

moderately slow permeability, the high shrink-swell potential, and the seasonal high water table are the major limitations to homesites.
This soil is in capability subclass VIe.

35—Dayton silt loam. This poorly drained soil is on areas of the Willamette River and its tributaries. It formed in silty and clayey alluvium or lacustrine sediment. Slopes average about 1 percent. Elevation is 150 to 300 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52 to 54 degrees F, and the frost-free period is 165 to 210 days.
In a representative profile, the surface layer is grayish brown silt loam about 5 inches thick. The subsurface layer is grayish brown silty clay loam about 7 inches thick. The subsoil is gray and grayish brown clay about 23 inches thick. The substratum is grayish brown silty clay that extends to a depth of 60 inches or more.
Included with this soil in mapping are areas of Amity and Concord soils, which make up about 5 percent of the map unit.
Permeability is very slow. Effective rooting depth is 30 to 40 inches. Available water capacity is 2 to 5 inches, and the water-supplying capacity is 20 to 26 inches. Runoff is slow to very slow or the soil is ponded, and the hazard of erosion is slight. A seasonal high water table is at a depth of less than 24 inches in winter and spring.
This soil is used for grass seed, hay, pasture, and some spring grain. Properly managing crop residue and using a cropping system that includes grasses and legumes or grass and legume mixtures at least 25 percent of the time help to maintain and increase productivity and workability and, in some areas, to prevent erosion. Moderate to high applications of lime are needed to correct acidity.
If this soil is irrigated, care must be taken to prevent overirrigation and drowning of crops. The soil needs drainage for maximum production and use. Drainage is difficult to establish because outlets are inadequate and the slowly permeable clay subsoil is at a shallow depth. Because of the shallow depth to clay, tiles need to be placed below the clay subsoil and at close intervals. Subsurface drainage is difficult to establish in areas where a thick clayey substratum underlies the clay subsoil. Unless adequate outlets can be provided, tile drainage in these areas is not very effective. Even with drainage, the control of the water table is difficult. If suitable outlets for tile cannot be established, drainage is confined to surface removal of excess water.
This soil is poorly suited for commercial timber production.
Native areas contain ash, willow, sedges, and grass and shrubs. The high water table and ponding limit the use of this soil to ducks and geese from late in fall to early in spring. Waterfowl feed on seeds and tubers from water plants and crop residue. The rest of the year, ring-necked pheasants, California quail, bobwhite quail, mourning dove, and black-tailed deer move into this area for food and cover. This soil is used by some fur-bearing animals.
This soil has major limitations for homesites, commercial buildings, roads and streets, and other community uses because of the high shrink-swell potential and the seasonal high water table.
This soil is in capability subclass IVw.

26C—Dixonville silty clay loam, 3 to 12 percent slopes. This well drained soil is on low foothills and the higher rolling uplands. It formed in colluvium weathered from basic igneous rock. Bedrock is at a depth of 20 to 40 inches. Slopes average about 8 percent. Elevation is 250 to 750 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 52 to 54 degrees F, and the frost-free period is 165 to 200 days.
In a representative profile, the surface layer is dark reddish brown silty clay loam and silty clay about 16 inches thick. The subsoil is dark reddish brown clay about 23 inches thick. Partly weathered basalt is at a depth of 39 inches.
Included with this soil in mapping are areas of Philomath soils, which make up about 10 percent of this map unit, and Nekia and Ritner soils, which make up 5 percent.
Permeability is slow. Effective rooting depth is 20 to 40 inches. Available water capacity is 4 to 7 inches, and the water-supplying capacity is 17 to 23 inches. Runoff is medium, and the hazard of erosion is moderate.
This soil is used mainly for forage crops and forest products. A small acreage is used for cereal grain, pasture, and grass seed. The soil is moderately productive for these crops. It is not so productive or so easily tilled as some soils on terraces or bottom lands.
This soil responds well to fertilizer and amendments. If residues are used, additional nitrogen is generally needed to prevent a decrease in yields. Management of crop residue and crop rotation are needed to maintain productivity and workability and to reduce runoff and erosion. A crop rotation system that includes grasses and legumes or a grass and legume mixture improves tilth and yields.
This soil is generally not irrigated. Irrigation water generally must be stored in reservoirs, and suitable reservoir sites are limited.
This soil produces fair stands of Douglas-fir trees. It is well suited to Christmas trees. Stands of Oregon white oak are mixed with Douglas-fir and grand fir on this soil. The site index for Douglas-fir on this soil ranges from 110 to 120. Based on the average site index of 115, this soil is capable of producing about 7,900 cubic feet, or 28,300 board feet (International rule, one-fourth inch kerf), of merchantable timber for a fully stocked, even-aged stand of 80-year-old trees.

SOIL UNIT 33 - HOLCOMB SILT LOAM

representative profile, the surface layer is dark brown gravelly silt loam about 10 inches thick. The subsoil is dark reddish brown and reddish brown silty clay loam about 44 inches thick. Basalt is at a depth of 54 inches.

Included with this soil in mapping are areas of Marty, Willakenzie, and Blachly soils, which make up about 10 percent of this map unit.

Permeability is moderate. Effective rooting depth is 40 inches or more. Available water capacity is 7 to 10 inches, and the water-supplying capacity is 22 to 24 inches. Runoff is rapid, and the hazard of erosion is high.

This soil is used for timber production. It is very well suited to the production of Douglas-fir. The site index for Douglas-fir on this soil ranges from about 160 to 180, and the average index is about 170. Based on this average site index, the soil is capable of producing about 8,000 cubic feet, or 78,400 board feet (International one-fourth inch kerf), of merchantable timber from a fully stocked, even-aged stand of 80-year-old trees.

Limitations to the use of equipment are slight; however, the slope limits most operations to cable logging and hand planting and weeding. Construction and maintenance of roads is difficult because of the slope and the hazard of slides. Roads and landings need water bars and cross seeding to prevent erosion.

Plant competition is a slight hazard, but it is a major problem on the lower areas and moist areas. In moist areas, vine maple, brackenfern, and vine maple are very aggressive and often prevent establishment of conifers. There is little danger of seedling mortality. The water-supplying capacity is good, and the climatic zone is favorable. Natural regeneration is generally good but may need to be supplemented with site preparation, seeding, and planting. Weeding and thinning are needed for good stand development. The hazard of windthrow is minimal. Reproduction is abundant and is a good source of greenery. Blue grouse, ruffed grouse, and black-tailed deer are numerous. Small herds of Roosevelt elk are in the extreme western part of the county. Areas of this soil are inaccessible to entry in summer and early in fall because of low humidity and high danger of fire. Except for a few intermittent creeks and springs, the drainageways are dry in July, August, and September. Cool sea breezes and fog provide soil moisture during this period. There are numerous draws and drainageways where small ponds could be developed.

The slope is the major limitation to homesites. Roads and streets are subject to slips and slides.

This soil is in capability subclass VIIe.

33—Holcomb silt loam. This somewhat poorly drained soil is on smooth terraces. It formed in silty and clayey mixed alluvium. Slopes are 0 to 3 percent but average about 1 percent. Elevation is 220 to 300 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52 to 54 degrees F, and the frost-free period is 165 to 210 days.

In a representative profile, the surface layer is very dark grayish brown, mottled silt loam about 12 inches thick. The subsurface layer is dark grayish brown, mottled silt loam about 6 inches thick. The upper 6 inches of the subsoil is grayish brown, mottled light silty clay loam, and the lower part is dark grayish brown, mottled clay that extends to a depth of 60 inches or more.

Included with this soil in mapping are areas of Willamette, Woodburn, Amity, Dayton, and Concord soils, which make up as much as 10 percent of this map unit.

Permeability is very slow. Effective rooting depth ranges from 20 to 30 inches. Available water capacity is 5 to 8 inches, and the water-supplying capacity is 20 to 26 inches. Runoff is slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 12 to 15 inches late in fall, in winter, and early in spring.

Most areas of this soil are cleared and used for grain, seed crops, hay, and pasture. Restricted drainage is a moderately severe limitation to crops. In undrained areas, the seasonal high water table limits the choice of crops. Deep-rooted crops do not grow well, and most crops are adversely affected by the excess moisture. This soil can be used, however, for many row crops; and it can be used for small grain, forage crops, and grass seed.

In dry summer months, irrigation is needed for vegetables. Irrigation water must be applied frequently. Drainage is needed to make these soils better suited to crops, and drainage is difficult because of the very slowly permeable layer in the subsoil and the lack of adequate outlets.

Properly managing crop residue and using a cropping system in which grasses and legumes or grass and legume mixtures are grown at least 25 percent of the time help to maintain fertility and workability.

Small grain and grasses respond to nitrogen, row crops commonly respond to nitrogen and phosphorus, and legumes respond to phosphorus and lime.

No commercial stands of timber grow on this soil.

Native areas contain ash, willow, sedges, and grasses. The seasonal high water table limits the use of the soil to ducks and geese and late in fall, in winter, and early in spring. Waterfowl feed on seeds and tubers from water plants and crop residues on well drained soils adjacent to this soil. During the rest of the year, ring-necked pheasant, California quail, bobwhite quail, mourning dove, and black-tailed deer move into the area for food and cover. This soil is used by fur-bearing animals.

The Holcomb soil exhibits many major soil limitations restricting its use for commercial and urban development. The main limitations are the high shrink-swell potential in the subsoil, limited ability to support a load, and seasonal high water table. Dwellings and roads need to be designed to offset the limited ability to support a load. Septic tank absorption fields are unsuited because of the

SOIL UNIT 75C - WILLAMETTE SILT LOAM

Increased population growth in the county has resulted in increased homesite construction on this soil. The primary limitations for urban development are the moderate shrink-swell potential and limited ability of the soil to support a load. Dwellings and road construction can be designed to offset the last limitation. Septic tank absorption fields will not function properly in some cases during rainy periods because of the restricted movement of water through the soil.

This soil is in capability class I.

75C—Willamette silt loam, 3 to 12 percent slopes. This well drained soil is on broad terraces above the flood plain. It formed in silty alluvial deposits. Slopes average about 7 percent. Elevation is 170 to 300 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52 to 54 degrees F, and the frost-free period is 165 to 210 days.

In a representative profile, the surface layer is very dark grayish brown and dark brown silt loam about 26 inches thick. The subsoil is dark yellowish brown and dark brown silty clay loam that extends to a depth of 69 inches or more.

Included with this soil in mapping are areas of Woodburn and Amity soils, which make up 10 percent of this map unit, and Concord, Dayton, and Holcomb soils, which make up 5 percent.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is 10 to 12 inches, and the water-supplying capacity is 20 to 26 inches. Runoff is slow, and the hazard of erosion is slight.

This soil is one of the most productive in the county. It is used mainly for grass seed, cereal grain, orchards, and forage crops. In irrigated areas, vegetable crops, strawberries, mint, hops, and pasture are grown.

This soil may be irrigated by sprinkler or furrow irrigation. Irrigation increases the hazard of erosion and water should be applied carefully, preferably by sprinkler, at rates low enough to control runoff and erosion. Water for irrigation may be available from dams and streams.

Properly managing crop residue and using a cropping system in which grasses and legumes or grass and legume mixtures are grown help to reduce runoff and erosion and maintain fertility and workability. The soil responds to fertilizers and amendments.

No commercial stands of timber grow on this soil. The soil is moderately well suited to Christmas tree production.

This soil supports a wide variety of grains, grasses, legumes, orchard, and vegetable crops as well as shrubs and trees, which furnish good feed and cover for ring-necked pheasant, California quail, bobwhite quail, and mourning dove. If sufficient cover is available, black-tailed deer are permanent residents. Ducks and geese also feed in areas of the soil that are close to water. Grouse, band-tailed pigeons, and mountain quail are not common. Gopher, ground squirrel, mole, nutria, and opossum are common pests. Planting along roadways, using grassed waterways, and preserving fence rows, woodlots, and brushy areas improve cover and food for wildlife. This soil has numerous drainageways that are often suitable for small ponds, many of which can be managed for game fish. Water from streams is available most of the year, but most of the small ditches and streams are dry late in summer. Burning fields and fence rows will destroy both cover and food for wildlife.

Increased population growth in the county has resulted in increased homesite construction on this soil. The primary limitations for urban development are the moderate shrink-swell potential and limited ability of the soil to support a load. Dwellings and road construction can be designed to offset the latter limitation. Slope and the restricted movement of water through the soil may limit septic tank absorption fields.

This soil is in capability subclass IIe.

75D—Willamette silt loam, 12 to 20 percent slopes. This well drained soil is on broad terraces above the flood plain. It formed in silty alluvial deposit. Slopes average about 16 percent. Elevation is 150 to 300 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52 to 54 degrees F, and the average frost-free period is 165 to 210 days.

In a representative profile, the surface layer is very dark grayish brown and dark brown silt loam about 26 inches thick. The subsoil is dark yellowish brown and dark brown silty clay loam that extends to a depth of 69 inches or more.

Included with this soil in mapping are areas of Woodburn and Amity soils, which make up 10 percent of this unit, and Concord, Dayton, and Holcomb soils, which make up 5 percent.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is 10 to 12 inches, and the water-supplying capacity is 20 to 26 inches. Runoff is medium, and the hazard of erosion is moderate.

The soil is used for small grain, legumes for seed, alfalfa, orchards, hay, and pasture. Berries and vegetable crops are grown in some places.

Tilling and planting across the slope and winter cover crops help to control sheet and rill erosion. Grassed waterways help remove runoff water. Irrigation water should be applied by sprinkler and at a rate low enough to be absorbed by the soil. Water for irrigation may be obtained from streams and ponds. A suitable cropping system provides soil-building crops. The soil responds to fertilizer and amendments.

No commercial stands of timber grow on this soil. It is poorly suited to Christmas tree production because moderately steep slopes interfere with harvesting and proper management.

SOIL UNIT 77A - WOODBURN SILT LOAM

mingled with cultivated soils. In wooded areas of Douglas-fir, Oregon white oak, snowberry, poison-oak, and grass, common birds include ruffed grouse, mountain quail, and band-tailed pigeons. These birds feed on the fruit and seeds of trees and shrubs. Black-tailed deer are common. Planting along roadsides, using grassed waterways, and maintaining fence rows and brushy areas improve the cover and food supply for wildlife.

This soil has major limitations for all community uses because of the shallow depth to bedrock and the slope.

This soil is in capability subclass VIIs.

77A—Woodburn silt loam, 0 to 3 percent slopes. This moderately well drained soil is on broad terraces above the flood plain in the Willamette Valley. It formed in silty alluvial deposit. Slopes average about 2 percent. Elevation is 150 to 300 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52 to 54 degrees F, and the frost-free period is 165 to 210 days.

In a representative profile, the surface layer is very dark grayish brown and dark brown silt loam about 17 inches thick. The upper 6 inches of the subsoil is dark brown silt loam, and the lower part is dark brown and brown silty clay loam that extends to a depth of 65 inches or more. Mottles are common in the lower part of the subsoil.

Included with this soil in mapping are areas of Willamette soils, which make up about 10 percent of this map unit, and Amity soils, which make up 5 percent.

Permeability is slow. Effective rooting depth is greater than 60 inches. Available water capacity is 11 to 13 inches, and the water-supplying capacity is 20 to 26 inches. Runoff is slow, and the hazard of erosion is none to slight. A seasonal high water table is at a depth of 24 to 36 inches in winter and spring.

This soil is well suited to pasture, hay, small grain, grass seed, and vegetable crops. Long-lived, deep-rooted deciduous fruit and nut trees, strawberries, caneberries, and alfalfa are adversely affected by the seasonal high water table unless the soil is drained. Properly managing crop residue and using a cropping system in which grasses and legumes or a grass and legume mixture are grown at least 25 percent of the time help to maintain fertility and workability.

Small grains and grasses respond to nitrogen; row crops respond to nitrogen and phosphorus; and legumes respond to phosphorus, sulfur, and, in many places, to lime. If residues are used, additional nitrogen generally is needed to prevent a decrease in yields.

The soil may be irrigated by sprinkler, furrow, or border irrigation; sprinkler irrigation is the most common and is very satisfactory. Irrigation water should be applied carefully at rates low enough to prevent runoff. Water for irrigation may be from reservoirs or streams.

The soil has moderate drainage concerns which respond to pattern drainage. Drainage is needed for maximum use and production. Seepage from higher soils can be controlled by interception and random drains. Runoff may be controlled by grassed waterways and vegetative cover.

No commercial stands of timber grow on this soil. It is well suited to Christmas tree production.

Native vegetation is grass, hazel, poison-oak, wild blackberry, Douglas-fir, and Oregon white oak, which furnish good food and cover for ring-necked pheasant, California quail, bobwhite quail, and mourning dove. Black-tailed deer are permanent residents, and ducks and geese also feed in areas that are near water. Gopher, ground squirrel, mole, nutria, and opossum are common pests. Planting along streambanks and roadways, using grassed waterways, and preserving fence rows, woodlots, and brushy areas improve cover for wildlife.

This soil has some limitations for homesites, commercial buildings, and local roads and streets because of wetness. It has major limitations for septic tank absorption fields because of slow permeability and the high seasonal water table.

This soil is in capability subclass IIw.

77C—Woodburn silt loam, 3 to 12 percent slopes. This moderately well drained soil is on broad terraces above the flood plain in the Willamette Valley. It formed in silty alluvial deposits. Slopes average about 7 percent. Elevation is 170 to 300 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is 52 to 54 degrees F, and the frost-free period is 165 to 210 days.

In a representative profile, the surface layer is very dark grayish brown and dark brown silt loam about 17 inches thick. The upper 6 inches of the subsoil is dark brown silt loam, and the lower part is dark brown silty clay loam that extends to a depth of 60 inches or more. Mottles are common in the lower part of the subsoil.

Included with this soil are areas of Willamette soils, which make up 10 percent of this map unit, and Amity soils, which make up 5 percent.

Permeability is slow. Effective rooting depth is restricted by the seasonal high water table. Available water capacity is 11 to 13 inches, and the water-supplying capacity is 20 to 26 inches. Runoff is medium, and the hazard of erosion is moderate (fig. 14). A seasonal high water table is at a depth of 24 to 36 inches in winter and spring.

This soil is best suited to small grain, grass seed, hay, and pasture. Long-lived, deep-rooted deciduous fruit and nut trees, strawberries, raspberries, and alfalfa may be adversely affected by the seasonal high water table unless this soil is drained. Properly managing crop residue and using a cropping system in which grasses and legumes or a grass and legume mixture are grown at least 50 percent of the time help to reduce runoff and erosion and to maintain fertility and workability.