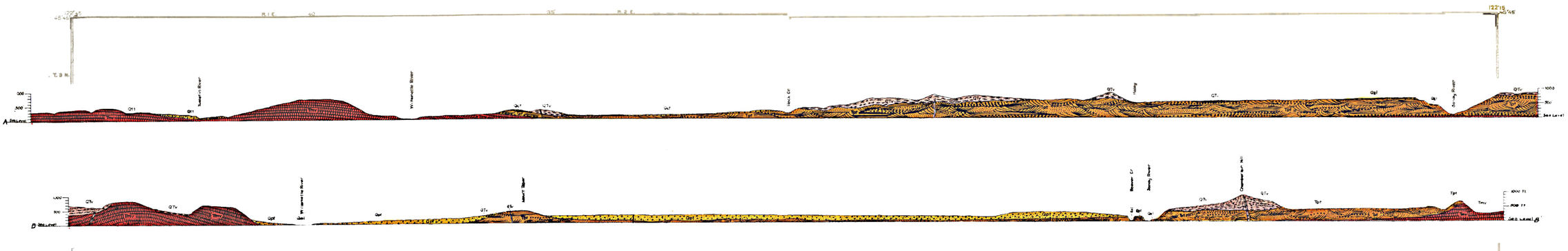
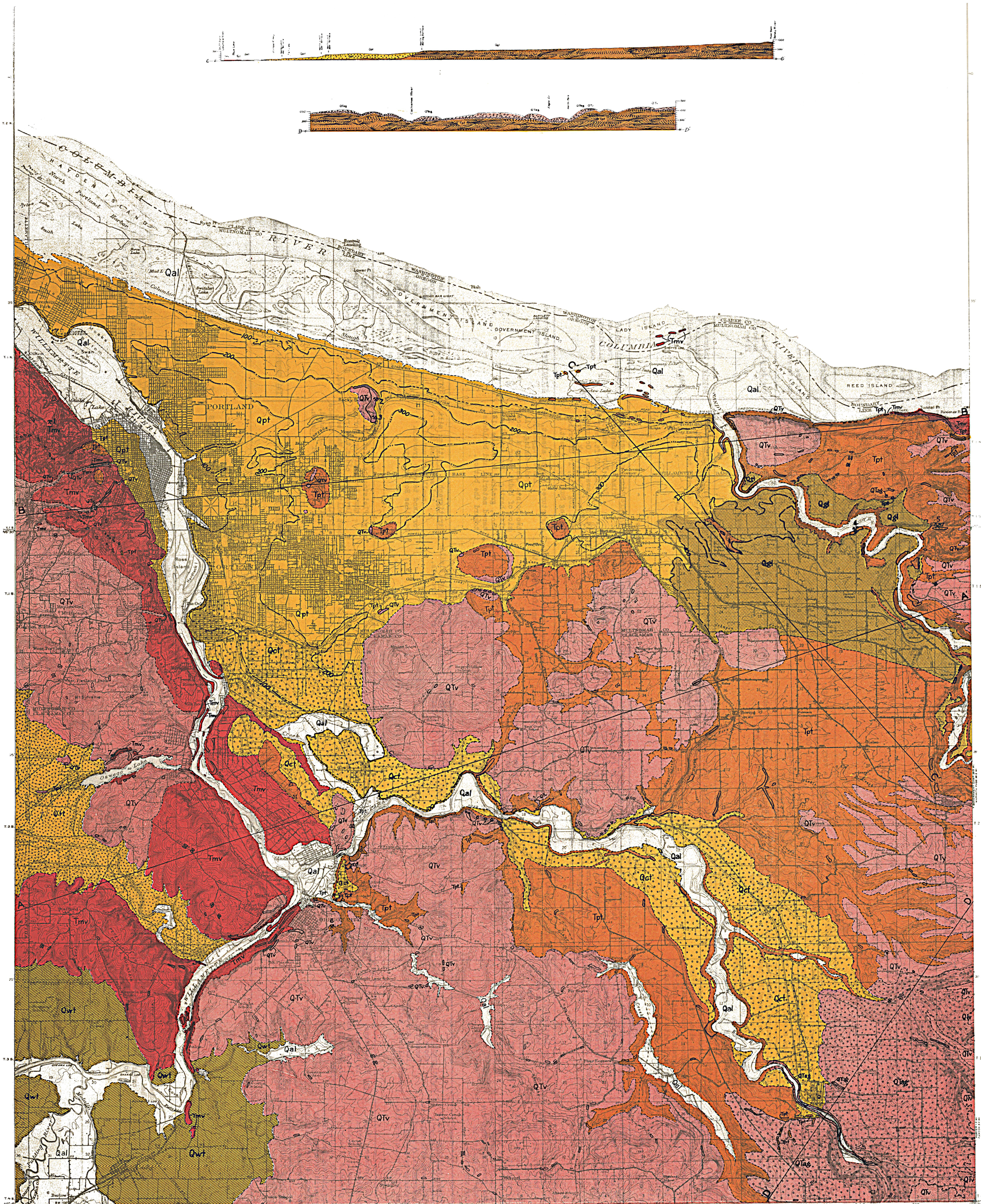
GEOLOGIC MAP
OF THE
PORTLAND AREA
OREGON

QM-9

ISSUED BY
STATE DEPARTMENT OF GEOLOGY
AND MINERAL RESOURCES
EARL K. NIXON, DIRECTOR
PORTLAND, OREGON





EXPLANATION

Qal — Recent Alluvium
Recent stream deposits

Qpt — Portland Terrace Gravels
Basic lava grit, silt, Boring lava pebbles; occasional foreign boulders; all lenticularly bedded. Originated from Sandy River drainage basin

Qct — Clackamas Terrace Gravels
Largely reworked Troutdale formation gravels, except in South Portland where they intermingle with Portland Terrace gravels. Originated from Clackamas River drainage basin.

Qtt — Tualatin Terrace Gravels
Silt, grit, and gravel, from Tualatin River drainage basin.

Qwt — Willamette Terrace Deposits
Silts, sands, and occasionally gravels, originating from Willamette River drainage basin.

Qgl — Glacial Outwash

UNCONFORMITY

QTv — Boring Lava
Highly inflated gray basalts containing abundant olivine phenocrysts.

QTag — Boring Agglomerate
Tuffaceous matrix with rounded to subangular cobbles and boulders of Columbia River lava. Occasionally some interbedded lava.

UNCONFORMITY

Tpt — Troutdale formation
Indurated conglomerate composed largely of Columbia River lava pebbles with some lenses containing up to 30% metamorphic pebbles; basic-lava grit; micaceous quartzose sand; fine grained silt.

UNCONFORMITY

Tmv — Columbia River lava
Dense, fine grained, dark basalt; diabasic texture common.

RECENT
PLEISTOCENE
PLIOCENE-PLEISTOCENE
PLIOCENE
MIOCENE

400′ Terrace
300′ Terrace
200′ Terrace
100′ Terrace
Inferred Contact
Outcrops

SPECIAL

1. Quicksilver prospect.
2. Stone Quarry.
3. Multnomah County Quarry.
4. Camp Collins Leaf Locality.
5. Buck Creek Leaf Locality.
6. Terrill Silica Mine.
7. Oswego Iron Mine.

Base by U. S. Geological Survey, Portland, Troutdale, and Oregon City Quadrangles; War Department Boring Quadrangle.

Scale 1/96000

Contour interval 25 feet
Datum is mean sea level

Geology by Ray C. Treasher

1942

TROUTDALE FORMATION	PORTLAND GRAVELS	CLACKAMAS GRAVELS	TUALATIN GRAVELS	WILLAMETTE TERRACE DEPOSITS	GLACIAL OUTWASH	BORING AGGLOMERATE	SILT & SOIL COVER		COLUMBIA RIVER LAVA	BORING LAVA
Induration: good	Induration: poor	Induration: poor	Induration: poor	Induration: poor	Induration: poor	Induration: good	Induration: poor			
Color: characteristically dark gray to purplish in unweathered portions, to limonite yellow or tan in weathered portions.	Color: characteristically light gray	Color: tan, similar to weathered Troutdale	Color: principally gray, to tan.	Color: brown to dark gray.	Color: lighter shades of gray to buff.	Color: light to dark gray, becoming tan when weathered.	Color: usually brown or tan. May be red.		Color: Black to bluish-black when fresh. Light gray to tan when weathered.	Color: light gray to dark gray when fresh. Light gray to light tan when weathered.
Weathering: Many pebbles are sound and fresh. Others are "rotted" and break to grit with a slight hammer blow. Where exposed at the surface, the grit is softened and readily crushed to powder. Sometimes alters to clay. Weathered color is limonite yellow and the material is difficult to distinguish from weathered Boring Agglomerate matrix.	Weathering: pebbles have a 1/16 to 1/8 inch softened rim and slightly bleached interior. Grit is similarly softened and bleached. No "rotted" pebbles. Near the surface the structure is destroyed by weathering and by roots of plants.	Weathering: somewhat similar to Troutdale. Lacks the rotted pebbles.	Weathering: similar to Portland Gravels.	Weathering: weathers to clay	Weathering: in general, similar to Portland Gravels, although some of the matrix is altered to clay. Weathered Boring agglomerate boulders in the outwash have a clay matrix studded with fresh cobbles.	Weathering: tuffaceous matrix weathers to grayish or tan clay. Boulders and cobbles relatively unaltered. In some outcrops, this weathered material is very similar to weathered Troutdale grit that contains cobbles. In such cases it is identified by field relationships.	Weathering: weathers to clay and soil.		Weathering: lava is bleached and softened. Minerals that have gone into solution leave the mass with an appearance of once having been an inflated rock. Unless fresh rock can be found, identification is difficult in the field. Palagonite sometimes is found as an alteration product.	Weathering: lava is bleached and softened and is similar to weathered Columbia River lava. Fresh rock may be necessary for definite field identification. No palagonite is found.
Pebbles and cobbles: principally well-rounded Columbia River lava. Some lenses have up to 30 percent quartzite pebbles. Average size 5 inches.	Pebbles and cobbles: principally well-rounded Boring lava. Granite and metamorphic pebbles are not uncommon in the upper 10 ft. Average size 4 inches.	Pebbles: largely reworked Troutdale pebbles.	Pebbles: a very low percentage of Boring lava pebbles; mainly Columbia River lava. Pebble shape is subangular, to angular is some cases.	Pebbles: pebbles are not common.	Pebbles: about half and half Boring and Columbia River lava. Fresh and unaltered, well rounded; striae are absent.	Cobbles: principally round to subangular Columbia River lava with some Boring lava. Quite fresh and unaltered.			Texture: dense and fine-grained. Plagioclase phenocrysts usually lath shaped. Occasional porphories have large saffron-colored plagioclase not found in Boring lavas.	Texture: fine-grained but highly inflated so that megascopically the tiny crystals have a jack-straw appearance.
Boulders: principally rounded to subangular Columbia River lava. Few, if any foreign boulders.	Boulders: principally subangular to rounded Boring lava, and are more abundant in upper portions. Occasional foreign or "erratic" boulders within the formation.	Boulders: principally rounded to subangular Columbia River lava.	Boulders: subangular Columbia River lava.	Boulders: boulders are uncommon.	Boulders: Columbia River and Boring lava; Boring Agglomerate; subangular to rounded.	Boulders: principally fresh, subangular Columbia River lava.			Vesicles: usually are small, uniform in size, and heterogeneous in distribution. Vesicles sometimes filled with palagonite, spherosiderite, or zeolites.	Vesicles: large, frequently connected, and almond shaped. Sometimes zoned and strung out as if by flow structure. Seldom any cavity filling.
Matrix: Columbia River lava grit, granules average 3 mm. in size, well cemented. Cementing agent is principally iron oxide. Silt and sand lenses may be quartzose and have abundant mica. Some crystal lithic tuff. Leaf imprints are not uncommon.	Matrix: Boring lava grit, granules average 3 mm. in size, very poorly consolidated. Subordinate quartz grains. Occasional lenses of silt with little mica. No reported leaf imprints.	Matrix: sand, grit, and silt.	Matrix: higher percentage of silt than the Portland or Clackamas Gravels, otherwise, similar.	Matrix: loosely consolidated sand and silt.	Matrix: tuffaceous material, usually softened or altered to clay.	Matrix: indurated, tuffaceous material that weathers more readily than the cobbles.	Matrix: fine grained silt, largely quartz grains. Some sand.		Jointing: joint planes well developed and sometimes heavily iron and manganese-stained. Columnar jointing is common, columns well formed and average from 6"-24" in size. "Brickbat" structure is common, forming blocks from 2"-6" in size.	Jointing: blocky jointing, iron stained but seldom manganese stained. Columns are larger than Columbia River basalt and more rudely developed. Average size is in excess of 24". "Brickbat" structure is not common.
Topographic position: Between 25 and 1200 feet in elevation. Not confined to terraces.	Topographic position: Between 25 and 350 feet in elevation. Forms terraces above present Columbia River alluvium.	Topographic position: east of Carver, forms a thin cover on terraces adjusted to Carver Dam. West of Carver, forms a thin cover on terraces to Clackamas. Northwest of Clackamas, forms valley fill.	Topographic position: between 25 ft. and 300 ft. in elevation. Forms terraces along the Tualatin River.	Topographic position: forms terraces along the Willamette River at elevations from 100 to 250 feet.	Topographic position: along rims and sides of Sandy River canyon between 100 ft. and 700 ft. in elevation. Occurs on rim above Dodge Park. From well log data, it underlies Boring Surface, in part.	Topographic position: along the crests and flanks of hillsides, and as intra canyon material.	Topographic position: caps most of the area at elevations from 25 to 1200 feet.		Topographic position: forms the bulk of the Portland Hills where it reaches an elevation of 1200'. Forms prominent cliffs above the river from Corbett Station to Rooster Rock.	Topographic position: caps Troutdale and Boring Hills east of Willamette River. Caps Portland Hills and covers the Oswego Lake depression. Intracanyon in three canyons in Portland Hills.
Structure: lenticular, cross bedded, with foresets 50-100 ft. long. Many horizontal lenses of conglomerate, or grit, or sand. In general the cross bedding is not as "short and stubby" as that of the gravels. There are no "key beds" to assist in determining structure.	Structure: lenticular, cross bedded, with short foresets. Few horizontal lenses. Represents piedmont fan deposition.	Structure: rudely bedded, poorly indurated conglomerate. This lack of structure is the principal feature distinguishing it from Troutdale formation.	Structure: lenticular, cross bedded, with short foresets. Few horizontal lenses. Represents piedmont fan deposition.	Structure: cross bedded, piedmont fan deposits.	Structure: almost absent, but has a suggestion of rude zoning. At two points there is a succession of beds; upper part is clay having a horizontal surface, grading into less altered material and boulders toward the bottom.	Structure: structureless, massive	Structure: massive, with loessial characteristics. Also finely laminated. Some massive material is residual.		Structure: flows may be separated by soil layers. Dips east of Willamette River are 1° - 5° S. W. West of Willamette River dips reach a maximum of 30° N. E.	Structure: flow structure within the rock is common. Such dips as may be determined are largely initial and vary widely even within short distances.
Stratigraphic position: it is underlain by Columbia River lava with which it is essentially parallel; and is overlain by Boring lava with which it is unconformable.	Stratigraphic position: lies above the Troutdale formation and Boring lavas and underlies recent silt and soil.	Stratigraphic position: similar to Portland Gravels.	Stratigraphic position: similar to Portland Gravels.	Stratigraphic position: similar to Portland Gravels.	Stratigraphic position: silt and soil, and in a small part underlies Portland terrace gravels. Overlies Boring lava.	Stratigraphic position: immediately above Troutdale on ridges and hillslopes except where it is intracanyon. It is immediately below Boring lava and represents an opening phase of Boring lava volcanism.	Stratigraphic position: overlies everything except recent alluvium.		Stratigraphic position: basal formation of Portland area.	Stratigraphic position: overlies Troutdale formation and the Boring Agglomerate. Older than the terrace gravels and glacial outwash.
Age: middle Pliocene. Post-late Miocene (Columbia River lava). Pre-Cascade folding; pre-late Pliocene or early Pleistocene Boring lava. Flora suggests middle Pliocene which compares favorably with the relations to the Dalles and Hood River formations.	Age: Pleistocene. Correlates in age with Clackamas, Tualatin, and Willamette terrace deposits, and glacial outwash.	Age: Pleistocene. Correlates in age with Portland, Tualatin, and Willamette terrace deposits and glacial outwash.	Age: Pleistocene. Correlates in age with Portland, Clackamas, and Willamette terrace deposits and glacial outwash.	Age: Pleistocene. Correlates in age with Portland, Clackamas, and Tualatin terrace deposits and glacial outwash.	Age: Pleistocene. Younger than Troutdale and Boring lavas but older than recent silt and soil. May be slightly older than the terrace gravels which have originated, in part, from glacial outwash.	Age: late Pliocene or early Pleistocene, but is preglacial and pre-Boring lava.	Age: late Pleistocene to early Recent.		Age: middle to late Miocene.	Age: late Pliocene or early Pleistocene.
Thickness: 0' - 1000'	Thickness: 0' - 400'.	Thickness: 0' - 100'	Thickness: 0' - 200'	Thickness: 0' - 150' (?)	Thickness: 0' - 50'	Thickness: 0' - 100'	Thickness: 0' - 100'		Thickness: 0' - 1200'	Thickness: 0' - 100'

DIFFICULTIES IN DISTINGUISHING BETWEEN THESE FORMATIONS

1. Weathered and bleached Columbia River lava looks very much like weathered and bleached Boring lava (see comparison above). Therefore, weathered outcrops of formations containing these materials are difficult to distinguish.

2. Weathered Boring agglomerate looks like weathered Troutdale grit which contains Columbia River lava cobbles and boulders.

3. Well logs are practically useless as the data are recorded by drillers as "gravel", "sand", etc. Thus, the contact of terrace deposits and Troutdale is difficult to pick out of a well log; and the nature of the gravels underlying heavy silt or soil is not determinable.

4. Clackamas gravels consist largely of reworked Troutdale gravels and they are identified particularly by the lack of bedding or induration.