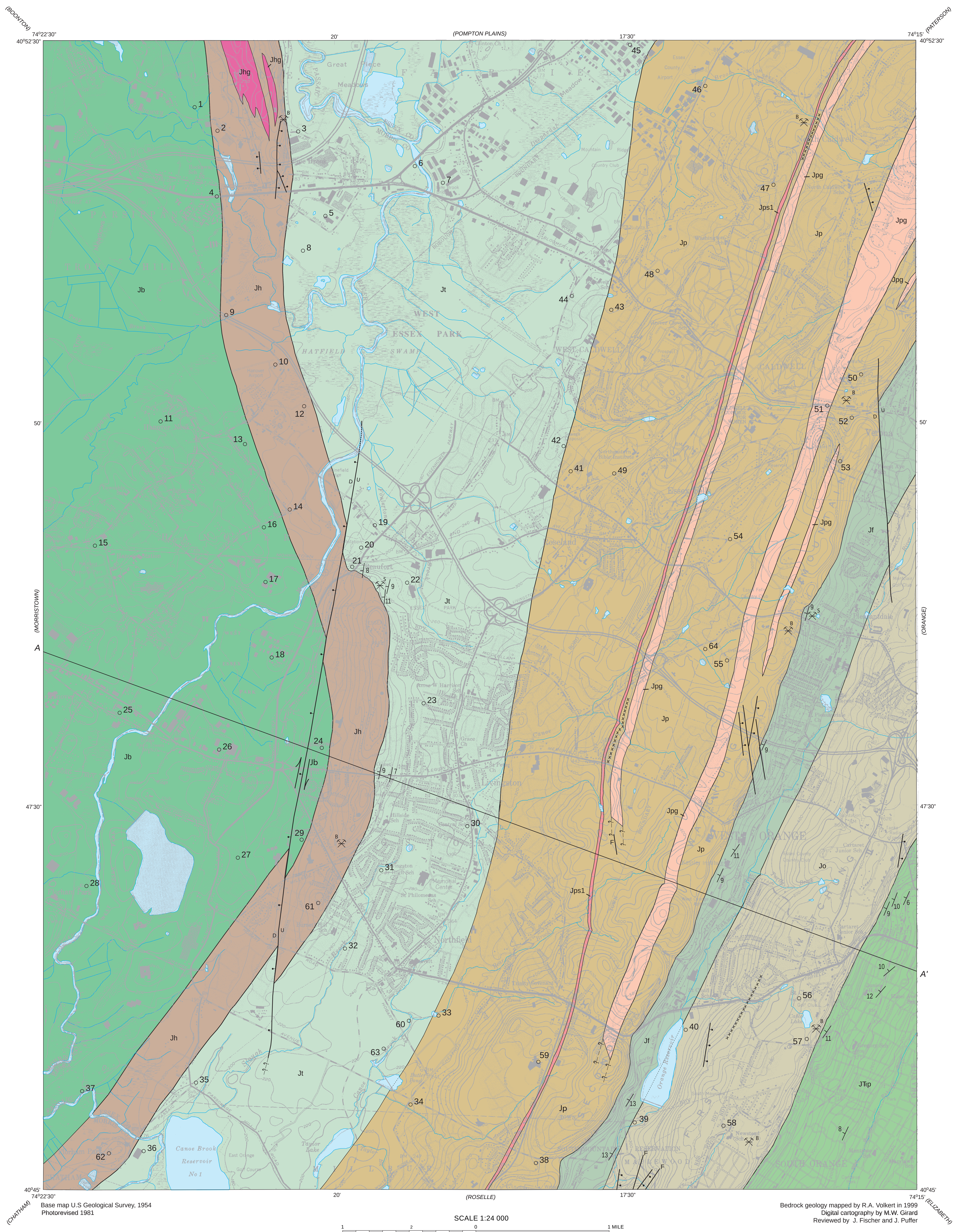
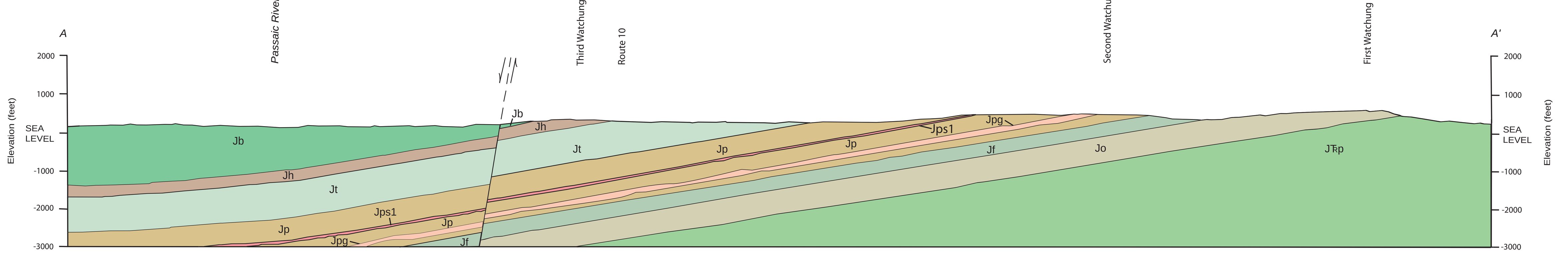
DEPARTMENT OF ENVIRONMENTAL PROTECTION
LAND USE MANAGEMENT
NEW JERSEY GEOLOGICAL SURVEY

Prepared in cooperation with the
U.S. GEOLOGICAL SURVEY
NATIONAL GEOLOGIC MAPPING PROGRAM

Table 1. Selected well and boring records

Well number	Permit number	Bedrock unit	Depth	Abbreviated log with depth and description
1	25-13808		0-8	clay
			8-27	boulders, gravel
		Jb	27-164	gray and red shale
		Jh	164-175	trap rock
2	25-11345		0-4	fill
			4-18	sandy
			18-33	clay
			33-41	silty sand
		Jh	41-54	fractured rock
		do	54-130	trap rock
3	25-22195		0-29	sand, some gravel
			29-64	gray clay
		Jt	64-99	brownstone
		do	99-125	black, gray, red shale
4	25-22543		0-22	brown sand, gravel, some large stones
			22-38	brown silty fine sand, small clay layers
		glacial erratic	38-44	slab of gray trap rock
			44-61	light brown silty sand, gravel
		Jb	61-125	red, gray, brown shale
5	25-12953		0-11	sand
			11-33	clay
			33-41	hardpan, stones
		Jt	41-99	shale with red sandstone
6	26-02071		0-11	fill
			11-19	clayey sand
			19-52	clay
			52-81	hardpan
		Jt	81-89	soft shale
		do	89-191	gray, red shale
7	26-03030		0-3	fill
			3-18	sand
			18-52	clay
			52-74	hardpan and stones
		Jt	74-130	gray, red shale with sandstone
8	25-13057		0-42	fine sand
			42-158	clay, layers of silty sand
			158-169	silty sand
		Jt	169-372	gray and red shale
9	25-26385		0-8	fill
			8-13	gray clayey silty sand
			13-14	gray clay and gravel
			14-26	dark brownish-gray silty clay
			26-43	grayish-brown silty clay
			43-46	dark reddish-gray silty sand
			46-96	sand and gravel
		Jh	96-98	basalt
10	25-12425		0-8	sand
			8-23	clay
			23-41	hardpan with stones
			41-51	silty sand and gravel
		Jh	51-57	fractured trap rock
11	25-14144		0-10	brown clayey sand
			10-20	slightly silty, sandy gray clay
			20-80	brown sand with some silt, gravel
			80-114	brown to rust-clayey till
			114-118	coarse sand
		Jb	118-125	red, brown shale
12	25-13383		0-8	sand
			8-19	clay
			19-37	Hardpan with gravel, large stones
			37-42	sand, gravel
		Jh	42-53	trap rock
13	25-14143		0-10	clayey silt, some sand and fine gravel
			10-50	sand
			50-62	clay, sandy in part
			62-90	sand, clayey in part
			90-112	clayey till
		Jb	112-119	gray shale
14	25-12183		0-37	clay, hardpan, and stones
			37-52	sand and gravel
		Jh	52-185	trap rock
15	25-13436		0-15	hardpan
			15-20	sand
			20-60	hardpan and boulders
			60-80	sand
			80-90	red hardpan
		Jb	90-150	red sandstone
16	25-11053		0-45	hardpan, some boulders
			45-125	sand
			125-135	red hardpan
		Jb	135-178	red sandstone
17	25-14708		0-15	gumbo
			15-35	clay
			35-45	small gravel fragments
			45-60	clay and gravel
			60-70	coarse sand, some clay and gravel
			70-111	clay, some sand
			111-115	gravel
			115-120	sand
		Jb	120-387	red, gray shale
		Jh	387-494	trap rock
		Jt	494-643	red shale and sandstone
18	25-25959	Jb	0-80	decomposed red shale
		do	80-400	red shale
19	26-04942		0-1	topsoil
			1-30	clay, some boulders
			30-40	sandy hardpan with large rocks
		Jt	40-472	red, gray, black shale, some sandstone
		do	472-485	sandstone
		do	485-500	gray shale
20	26-08037		0-2.5	fill
			2.5-12.5	silt and clay, some fine sand
			12.5-31.5	gravel and sand, some clayey silt
		Jt	31.5-33	red sandstone
21	25-30670		0-9	fill
			9-25	silt and clay with boulders throughout
			25-30	sand
			30-45	silt and clay, trace sand and gravel
			45-55	sand, little silt
			55-60	silt, trace sand
			60-61	sand, little silt
		Jt	61-104	reddish-brown siltstone
22	90-00145		0-60	sand, some silt and gravel
			60-66	silty clay
		Jt	66-86	decomposed red shale
		do	86	unweathered rock
23	45-00340		0-2	topsoil
			2-36	clay and gravel
			36-50	red hardpan
		Jt	50-372	sandstone
24	25-13619		0-26	clay and sandy clay
			26-32	hardpan and boulders
			32-53	cemented sand and gravel, some clay
			53-109	clay, silty clay, sandy clay
			109-114	red clay
			114-123	red hardpan
		Jb	123-140	red shale
25	25-14012		0-10	overburden
			10-60	sand and gravel
		Jb	60-400	red, blue, brown, gray shale
26	25-02177		0-3	fill
			3-11	black muck
			11-78	clay, silty clay
			78-83	brown hardpan
			83-87	red silty clay
			87-128	red hardpan
		Jb	128-506	red and gray shale
27	25-13677		0-16	sandy clay
			16-82	sand, gravel, hardpan
		Jb	82-95	red clay
		do	95-99	red shale
28	25-14167		0-5	fill
			5-29	clay and silt
			29-50	sand, silt, gravel till with some clay
		Jb	50-55	reddish-brown shale and sandstone
29	25-13631		0-41	clay, sandy clay
			41-57	red hardpan
		Jb	57-161	shale
30	26-01039		0-36	
			36-100	fine sand
			100-126	red hardpan
		Jt	126-183	red sandstone
31	25-16303		0-5	clay
			5-18	sand, gravel, clay
			18-32	reddish-brown hardpan
		Jt	32-48	arenaceous shale
		do	48-456	shale





Base map U.S Geological Survey, 1954
Photorevised 1981

Bedrock geology mapped by R.A. Volkert in 1999
Digital cartography by M.W. Girard
Reviewed by J. Fischer and J. Puffer

SCALE 1:24 000

LOCATION IN NEW JERSEY

BEDROCK GEOLOGIC MAP OF THE CALDWELL QUADRANGLE, ESSEX AND MORRIS COUNTIES, NEW JERSEY

by

Richard A. Volkert

2006

DESCRIPTION OF MAP UNITS

Jb Boonton Formation (Lower Jurassic) (Olsen, 1980a) - Reddish-brown to brownish-purple, fine-grained, commonly micaceous sandstone, siltstone, and mudstone, in fining-upward sequences mostly 5 to 13 ft. thick. Red, gray, and brownish-purple siltstone and black, blocky, partly dolomitic siltstone and shale are common in the lower part of unit. Irregular mud cracks, symmetrical ripple marks, hummocky and trough cross-laminated beds, burrows, and evaporite minerals are abundant in red siltstone and mudstone. Gray, fine-grained sandstone may have carbonized plant remains and reptile footprints in middle and upper parts of unit. Maximum thickness of unit regionally is about 1,640 ft.

Jh, Jhg Hook Mountain Basalt (Lower Jurassic) (Olsen, 1980a) - Dark-greenish-gray to black, generally fine-grained and very locally medium- to coarse-grained, amygdaloidal basalt composed of plagioclase, clinopyroxene, and iron-titanium oxides. Contains small spherical to tubular gas-escape vesicles, some filled by zeolite minerals or calcite, typically above flow contacts. Domal tumuli structures described by Manspeizer (1980) are well exposed at Pine Brook. Hook Mountain Basalt consists of at least two, and possibly as many as three major flows. Base of lowest flow is intensely vesicular. Tops of flows are weathered and vesicular. Unit contains dark-gray, coarse-grained gabbroid (Jhg) composed of clinopyroxene and plagioclase grains up to 0.5 in. long that occurs at several stratigraphic intervals in the unit but is most abundant in the lowest flow. Gabbroid has sharp upper contacts and gradational lower contacts with more typical finer-grained basalt. Type section of unit occurs in the quadrangle along Interstate 80 west of Pine Brook. Maximum thickness regionally is 361 ft. Levels of natural radioactivity measured from outcrops range from 5 to 8 (mean=6) Micro R/Hr. and show no variability between basalt and gabbroid.

Jt Towaco Formation (Lower Jurassic) (Olsen, 1980a) - Reddish-brown to brownish-purple, buff, olive-tan, or light-olive-gray, fine- to medium-grained, micaceous sandstone, siltstone, and silty mudstone in fining-upward sequences 3 to 10 ft. thick. Unit consists of at least eight sequences of gray, greenish-gray, or brownish-gray, fine-grained sandstone, siltstone, and calcareous siltstone, and black microlaminated calcareous siltstone and mudstone with diagnostic pollen, fish, and dinosaur tracks. Irregular mud cracks and symmetrical ripple marks are present. Sandstone is often hummocky and trough cross-laminated, and siltstone commonly planar laminated or bioturbated and indistinctly laminated to massive. As much as 2 ft. of unit have been thermally metamorphosed along the contact with the Hook Mountain Basalt. Maximum thickness is about 1,250 ft. Levels of natural radioactivity measured from outcrops of reddish-brown sandstone and siltstone range from 12 to 13 MicroR/Hr.

Jp, Jpg, Jps1 Preakness Basalt (Lower Jurassic) (Olsen, 1980a) - Dark-greenish-gray to black, fine-grained, dense, hard basalt composed mainly of intergrown calcic plagioclase and clinopyroxene. Contains small spherical tubular gas-escape vesicles, some filled by zeolite minerals or calcite, just above scoriaceous flow contacts. Dark-gray, coarse- to very coarse-grained gabbroid (Jpg) composed of clinopyroxene grains up to 0.5 in. long and plagioclase grains up to 1.0 in. long occurs at several stratigraphic intervals but is thickest in the middle to upper part of the first flow (not shown in cross-section). Described in detail by Puffer and Volkert (2001) from exposures in the Chatham quadrangle. Gabbroid has sharp upper contacts and gradational lower contacts with more typical finer-grained basalt. The Preakness Basalt consists of at least three major flows, the tops of which are marked by prominant vesicular zones up to 8 ft. thick. The first flow ranges in thickness from 415 to 475 ft. in the area, but is as much as 514 ft. thick regionally. It is overlain by a thin, 6 to 25 ft.-thick sequence of interbedded reddish-brown siltstone, shaly siltstone, and shale (Jps1). It is well exposed in North Caldwell and is known elsewhere from water-well-record data. The second flow is about 192 ft. thick in the area. It is overlain by 2.5 ft. or more of thin-bedded, reddish-brown sandstone to siltstone (Jps2) known only from drill-core in this quadrangle (table 1) and the Paterson quadrangle (Fedosh and Smoot, 1988; Volkert, 2001). Radiating slender columns 2 to 24 in. wide, due to shrinkage during cooling, are abundant near the base of the lowest flow. Maximum thickness of unit is about 1,040 ft. Levels of natural radioactivity measured from outcrops of basalt range from 4 to 6 Micro R/Hr and have a mean of 5.5.

Jf Feltville Formation (Lower Jurassic) (Olsen, 1980a) - Reddish-brown, or light-grayish-red, fine- to coarse-grained sandstone, siltstone, shaly siltstone, and silty mudstone, and light- to- dark-gray or black, locally calcareous siltstone, silty mudstone, and carbonaceous limestone. Upper part of unit is predominantly thin- to medium-bedded, reddish-brown siltstone and locally cross-bedded sandstone. However, in the Bernardsville area it contains beds of light-gray, fine-grained calcareous sandstone interbedded with light-gray, reddish-brown, or light-greenish-gray, fine-grained quartzose sandstone that contains locally abundant carbonized plant remains (Volkert and Monteverde, 1997). Reddish-brown sandstone and siltstone are moderately well sorted, commonly cross-laminated, and interbedded with reddish-brown, planar-laminated silty mudstone and mudstone. Two thin, laterally continuous sequences, each up to 10 ft. thick, of dark-gray to black, carbonaceous limestone, light-gray limestone, medium-gray calcareous siltstone, and gray or olive, desiccated shale to silty shale occur near the base and, along with the red beds between, comprise the Washington Valley Member of Olsen (1980b). Gray beds contain fish, reptiles, arthropods, and diagnostic plant fossils. Although exposed regionally, this member is not seen in outcrop in the map area. As much as 2 ft. of Feltville have been thermally metamorphosed along the contact with the Preakness Basalt (Jp). Thickness of unit ranges from 450 to 483 ft. regionally, but thins to about 400 ft. in the map area. Levels of natural radioactivity measured from outcrops of reddish-brown sandstone and siltstone range from 11 to 14 Micro R/Hr and have a mean of 12.5.

Jo Orange Mountain Basalt (Lower Jurassic) (Olsen, 1980a) - Dark-greenish-gray to black, fine-grained, dense, hard basalt composed mostly of calcic plagioclase and clinopyroxene. Locally contains spherical to tubular gas-escape vesicles, some filled by zeolite minerals or calcite lined with prehnite, typically above base of flow contact. Unit consists of three major flows that are separated in places by a weathered zone, a bed of thin reddish-brown siltstone, or by volcaniclastic rock. Lower part of upper flow is locally pillowed; upper part has pahoehoe flow structures. Middle flow is massive to columnar jointed. Lower flow is generally massive with widely spaced curvilinear joints and is pillowed near the top with the space between pillows lined with zeolite and prehnite. Individual flow contacts are characterized by vesicular zones up to 8 ft thick. Thickness of unit is about 591 ft. Levels of natural radioactivity measured from outcrops range from 3 to 7 Micro R/Hr and have a mean of 6.

JTRp Passaic Formation (Lower Jurassic and Upper Triassic) (Olsen, 1980a) - Interbedded sequence of reddish-brown, and less often maroon or purple, fine- to- coarse-grained sandstone, siltstone, shaly siltstone, silty mudstone, and mudstone. Reddish-brown sandstone and siltstone are thin- to-medium-bedded, planar to cross-bedded, micaceous, and locally mudcracked and ripple cross-laminated. Root casts and load casts are common. Shaly siltstone, silty mudstone, and mudstone are fine-grained, very thin- to- thin-bedded, planar to ripple cross-laminated, locally fissile, bioturbated, and contain evaporite minerals. They form rhythmically fining-upward sequences up to 15 ft. thick. As much as 2 ft. of unit have been thermally metamorphosed and locally mineralized with sulfides along the contact with the Orange Mountain Basalt (Jo). Unit is exposed only in the southeastern part of the map area. Thickness of unit regionally is as much as 11,480 ft. but only about 3,400 ft occur in the map area. Levels of natural radioactivity measured from outcrops of reddish-brown siltstone and silty shale range from 10 to 13 Micro R/Hr and have a mean of 11.5.

EXPLANATION OF MAP SYMBOLS

Contact - Dotted where concealed; queried where uncertain

Faults - queried where uncertain. U, upthrown side; D, downthrown side. Ball shows direction of dip; arrows show relative horizontal movement.

Fault - High-angle fault of unknown movement

PLANAR FEATURES

Strike and dip of inclined beds

OTHER FEATURES

Drill hole locations listed in table 1

Abandoned rock quarry - B, basalt; S, sandstone

Exposed basalt flow contact

CORRELATION OF MAP UNITS

Jb — Nonconformity — Jhg Jh — Extrusive Contact — Jt — Nonconformity — Jps2, Jps1, Jpg, Jp (Extrusive Contact, Nonconformity) — Extrusive Contact — Jf — Nonconformity — Jo — Extrusive Contact — JTRp

Jurassic; Triassic

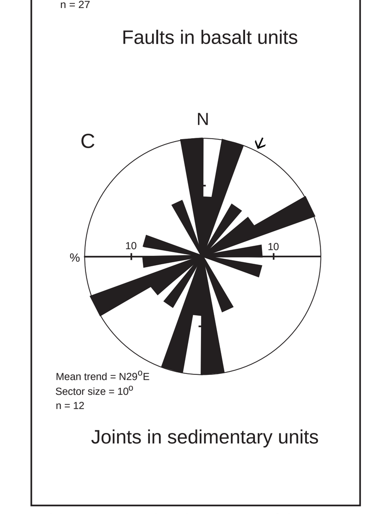


Figure 1. Bedrock structural features measured in outcrop (n=number of readings).