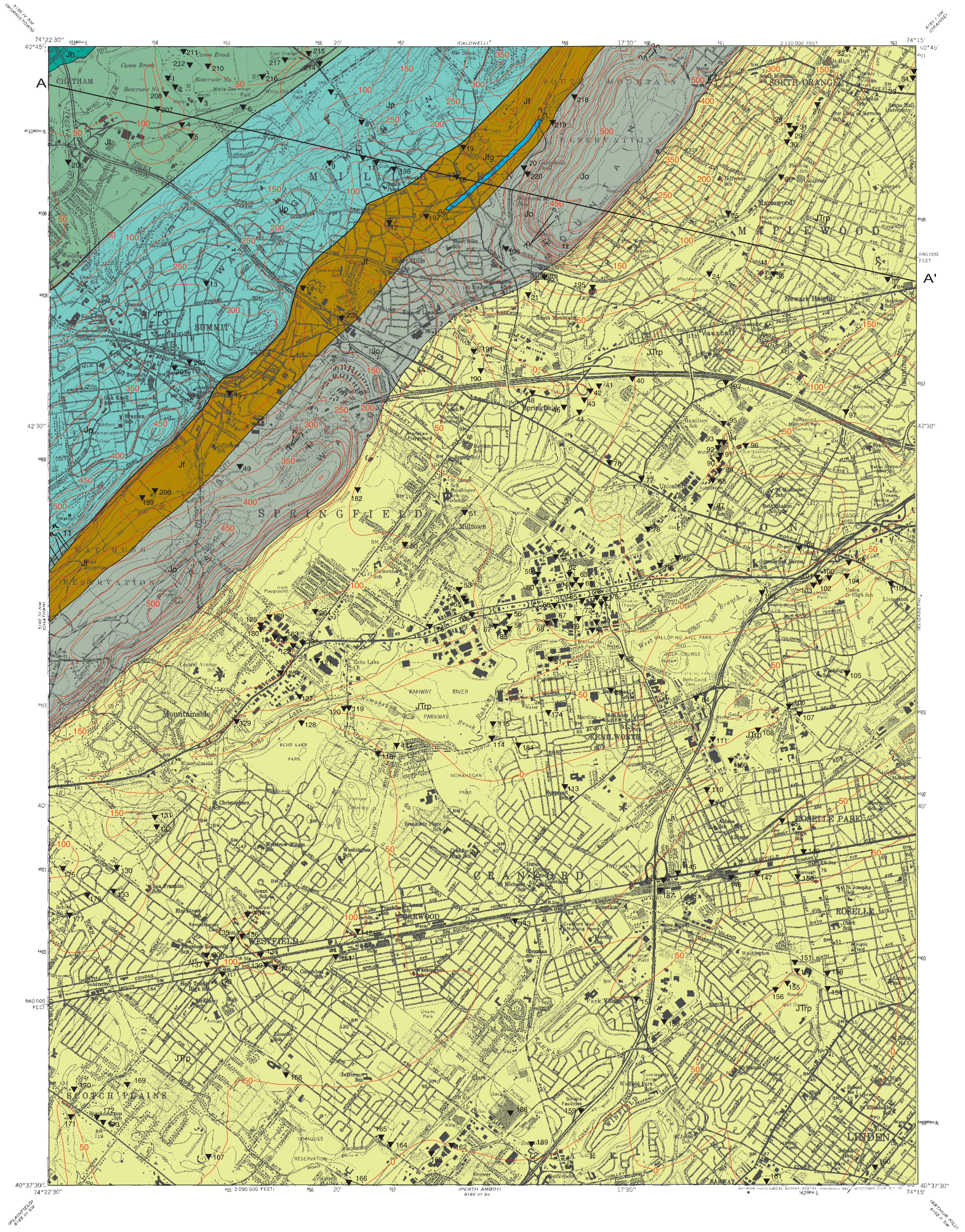
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF SCIENCE, RESEARCH AND TECHNOLOGY
NEW JERSEY GEOLOGICAL SURVEY

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

BEDROCK GEOLOGY OF THE ROSELLE QUADRANGLE,
UNION, ESSEX AND MORRIS COUNTIES, NEW JERSEY
OPEN-FILE MAP OFM-34



Base from U.S. Geological Survey, Roselle, N.J. 7 1/2-minute quadrangle 1955
Photorevised 1981
GIS application and digital cartography by:
Donald H. Monteverde

SCALE 1:24 000

1 1/2 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER

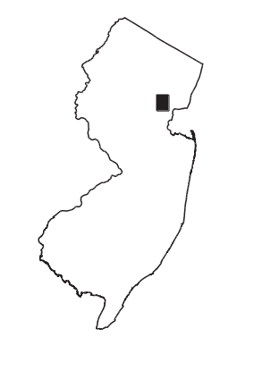
Surficial geology by S.D. Stanford, 1991
Bedrock geology by D.H. Monteverde, 1999-2000
Review of these interpretations is limited to the New Jersey Geological Survey

BEDROCK GEOLOGY OF THE ROSELLE QUADRANGLE, UNION AND ESSEX COUNTIES, NEW JERSEY

by

Donald H. Monteverde

2000


LOCATION IN
NEW JERSEY

Introduction

The Roselle 7.5-minute topographic quadrangle lies within the Piedmont Physiographic Province in north central New Jersey. Union County covers the majority of the quadrangle while Essex County occupies the northern third. The quadrangle is highly urbanized with large open space parcels restricted to the northwestern side of the Watchung Mountains.

The surficial sediments cover almost 90% of the quadrangle (Stanford, 1991). Ridges underlain by igneous units delineating a strong northeast trend are the only areas where bedrock emerges from the surficial cover sediments (fig. 1). Rare sedimentary rock exposures occur near the contact with the first basalt ridge. The remaining areas remain blanketed under Pleistocene to Recent unconsolidated sediments.

Stratigraphy

Surficial cover dominates the quadrangle geology. Detailed surficail geologic interpretations have been done by Stanford (1991). The well log data (table 1, simplified from Stanford, 1991) supplemented by gravity measurements (Ghatge and Hall, 1991) allowed the contouring of the bedrock surface beneath these recent sediments (Stanford, 1991). A Pleistocene aged, deep glacially scoured basins (current elevation is 0) downcuts through the First and Second Watchung Mountains creating Millburn Gap and connects with second basin (outlined be -50 feet elevation trends) trending ENE-WSW (fig. 1).

The bedrock units, all of Meszoic age, developed during initial rifting that just predates breakup of the Pangea supercontinent. A western boundary of southeast-dipping normal faults controlled the Newark rift basin formation. Continued episodic fault motion directed the sediment input, both from the Highlands to the north and west and from an eastern source. Intra-basinal faulting was also active during deposition (Schlische, 1992, 1993). Bedrock units encompass the Early Jurassic to Late Triassic time (Olsen, 1980). They consist of interbedded fluvial and lacustrine sediments separated by three basalt units. From youngest to oldest, the sediments consist of the Booton, Towaco, Feltville and Passaic Formations. They incorporate alternating, thick red brown, and thinner gray to olive, dominantly lacustrine and minor fluvial sediments(Van Houten, 1969; Olsen, 1980; Olsen and others 1996). Olsen and others (1996) show Milankovitch orbital cyclicity controlling the fluvial and lacustrine sediment deposition. Fedosh and Smoot (1988) suggested a lower fluvial gradient and deeper lake levels from the Passaic upwards through the Feltville deposition. Drier climatic conditions persisted during the Towaco and Booton deposition. Gray bed cycles, important formation member markers define the deeper lacustrine units. Parker and others (1988) and Parker (1993) divided the Passaic into several facies according to a coarsening grain size moving from southeast to northwest across the Newark Basin. Those authors designated a sandstone facies in the Millburn area. Limited exposure does show more silty/clayey units, south of the mapped area to more sandy/silty units here, at least along Orange Mountain Basalt contact. But insufficient Passaic exposures hindered the sediment grain size characterization thereby not allowing further subdivision. Each of the basalt units, from youngest to oldest the Hook Mountain, Preakness and Orange Mountain, contain multiple flows. The internal structure commonly contains a lower and upper colonnade separated by an entablature zone (Van Houten, 1969). A basal massive basalt grading upward through a platy zone and into regular columns forms the lower colonnade. Curvilinear columnar structures define the entabulature (Van Houten, 1969; Faust, 1978). The upper colonnade is marked by a lower pseudo-columnar zone capped by massive basalt and locally scoria. The development of the three parts varies within each flow (Olsen, 1980; Olsen and others, 1989). Pillow lavas are present locally (Van Houten, 1969).

Structure

Bedrock structure consists of a gentle monoclinal dip towards the Ramapo Fault in the northwest. Small faults mapped within the basalt units showed two trends, approximating due north and 040°. The faults are of limited lateral extent and more commonly show horizontal slickenlines indicating strike slip movement. The strike slip movement direction was not determined because indicators were poorly developed. Similar features were observed in the Bernardsville quadrangle where the faults did not penetrate the underlying sedimentary units. Faults showed gouge zones that commonly influence ground water flow. Many other smaller scale slip zones (20-30 feet in length)were observed in the basalts. Most of these structures displayed horizontal movement while less common dip slip lineations also occurred. Fault movement predates surficial cover. Joint trends are shown in figure 2.

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Description of map units

Jh 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. Unit consists of at least two, and possibly as many as three major flows. Base of lowest flow is intensely vesiculated. Tops of flows are weathered and vesiculated. Maximum thickness is about 361 ft.

Jt Towaco Formation (Lower Jurassic) (Olsen, 1980a) - Unit is covered by surficial deposits but identified through well logs (Stanford, 1991). Elsewhere unit is 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. Irregular mudcracks, symmetrical ripple marks present. Sandstone is often hummocky to trough cross-laminated and siltstone commonly planar laminated or bioturbated, indistinctly laminated to massive. Several inches of unit have been thermally metamorphosed along contact with Hook Mountain Basalt. Maximum thickness is about 1,250 ft.

Jp 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. Unit consists of at least three major flows, the tops of which are marked by prominent vesiculated zones up to 8 ft. thick. Radiating slender columns 2 to 24 in. wide, due to shrinkage during cooling are abundant near the base of the lowest flow and well developed along Interstate Route 78. A thin, 6 to 25 ft.- thick bed of reddish-brown siltstone separating the first two flows has been identified elsewhere but not within this mapped area. Maximum thickness of unit is about 1,040 ft.

Jf
Jfg Feltville Formation (Lower Jurassic) (Olsen, 1980a) - Unit is covered by surficial deposits but identified through well logs (Stanford, 1991). Elsewhere unit is 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. 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 (Jfg), each up to 10 ft. thick of dark-gray to black, carbonaceous limestone, light-gray limestone, and medium-gray calcareous siltstone, and gray or olive, desiccated shale to silty shale occur near the base. Several inches of unit have been thermally metamorphosed along contact with Preakness Basalt (Jp). Thickness ranges from 450 to 483 ft.

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 small spherical to tubular gas-escape vesicles, some filled by zeolite minerals or calcite, 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. Individual flow contacts characterized by vesiculated zones up to 8 ft thick. Thickness of unit is about 415 ft.

JTrp Passaic Formation (Lower Jurassic and Upper Triassic) (Olsen, 1980) - 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 as much as 15 ft. thick. Several inches of unit have been thermally metamorphosed along contact with Orange Mountain Basalt (Jo). Unit is barely exposed in southwestern part of the map area, but regionally is as much as 11,480 ft. thick.

Explanation of map symbols

——— Contact - Queried where uncertain

—0— Contours of bedrock surface elevation, 50 foot interval

Faults - Queried where uncertain

———? High-angle fault of uncertain movement

Planar features

11 Strike and dip of inclined beds

Other features

⚒ Abandoned rock quarry

▼160 Well numbers and locations used to define bedrock geology from Stanford (1991). See Table 1.

Correlation of Map Units

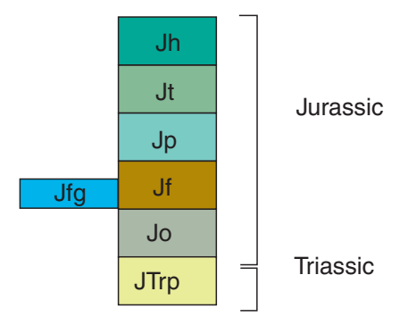


Table 1. Well information from Stanford (1991).

Well No.	Permit No.	Depth (feet)	Driller's Log Description
1	25-3276	0-130 130-135	surficial bedrock
2	25-22481 through 25-22487	seven borings, typical log: 0-31	surficial
3	25-4100	0-140 140-143	surficial red rock
4	25-2690	0-155 155-165	surficial red sandstone rock
5	25-12993	0-146 146-150	surficial red shale
6	25-2577	0-154	surficial
7	25-3354	0-180 180-190	surficial trap rock
8	26-6211	0-192 192-273	surficial trap rock
9	26-1415	0-285 285-307 307-400	surficial hard similar to trap rock trap rock
10	26-4065	0-211 211-315 315-405	surficial trap rock red sandstone
11	25-21861	0-250 250-340 340-500	surficial trap rock shale
12		0- 235 235-276	surficial shale
13	25-21904	0-150	surficial
14	25-5893	0-147 147-175 175-185 185-430	surficial red clay and shale soft red shale red shale and sandstone
15	25-27073	0-30	surficial
16	26-1468	0-12 12-202 202-645	surficial trap rock red rock
17	26-4274	0-12 12-186 186-500	surficial trap rock red shale and sandstone
18	26-1772	0-200 200-340 340-376 376-400 400-402 402-415 415-450	surficial red shale brown sandstone trap rock red shale gray slate shale and sandstone
19	26-972	0-265 265-330	surficial red sandstone
20	26-2262	0-98 98-106	surficial rock
21	26-4029	0-64 64-300	surficial red shale
22	26-5040	0-30 at 30	surficial basalt
23	26-4434	0-127	trap rock
24	26-2808	0-47 47-298	surficial rock
25	26-443	0-56 56-230	surficial red sandstone
26	26-4546	0-15 15-36 36-200	surficial red hardpan and hard shale red shale
27	25-17141	0-37 37-200	surficial red shale
28	26-242	0-34 34-115	surficial brown shale
29	26-241	0-35 35-182	surficial red shale
30	26-243	0-37 37-156	surficial red rock
31	26-245	0-45 45-122	surficial brown shale
32	26-1305	0-42 42-350	surficial red sandstone
33	26-1354	0-19 19-343	surficial red sandstone
34	26-2401	0-21 21-304	surficial brownstone
35	26-2369	0-15 15-207	surficial red shale
36	on file at NJGS	0-35 35-125	surficial red rock
37	26-3854	0-40 40-205	surficial red sandstone
38	26-5726	0-92 92-200	surficial shale
39	26-1145	0-40 40-330	surficial Newark group
40	26-4083	0-61 61-304	surficial shale
41	26-4082	0-67 67-301	surficial shale
42	26-4081	0-86 86-296	surficial shale
43	26-4080	0-74 74-301	surficial shale
44	26-4084	0-55 55-302	surficial shale
45	26-4086	0-46 46-297	surficial shale
46	26-1810	0-75 75-90	surficial red rock
47	26-3893	0-80 80-210	surficial red sandstone
48	26-225	0-85 85-230	surficial red sandstone
49	25-14785	0-71 71-140	surficial trap rock
50	26-3061	0-30 30-150	surficial red shale
51	26-93	0-16 16-25 25-108	surficial sandstone red shale
52	26-991	no log, 58 feet of casing	
53	26-4458	0-40 40-254	surficial shale
54	26-510	0-48 48-380	surficial red rock
55	26-596	0-30 30-40 40-404	surficial soft red rock red rock
56	26-189	0-75 at 75	surficial rock
57	26-664	0-70	surficial
58	26-666	0-75	surficial
59	26-6863	0-80 80-170	surficial shale
60	26-4814	0-85 85-300	surficial shale
61	26-4432	0-75 75-300	surficial red shale
62	26-7328	0-78 78-105	surficial red-brown shale and sandstone
63	26-7075	0-33	surficial
64	26-6955	0-31	surficial
65	26-6953	0-21	surficial
66		0-90	surficial
67	26-2774	0-90 90-198	surficial red shale
68	26-4596	0-133 133-250	surficial red shale
69	26-9078	0-65 65-300	surficial mixed shale and sandstone
70	26-4160	0-80 80-250	surficial red shale
71	26-3711	0-80 80-200	surficial red shale
72	26-5134	0-78 78-300	surficial shale
73	26-11097	0-36	surficial
74	26-11096	0-38	surficial
75	26-11099	0-38	surficial
76	26-915	0-25 25-450	surficial shale
77	26-8482	0-15	surficial
78	26-1884	0-55 55-345	surficial red shale
79	26-48	0-30 30-344	surficial shale and sandstone
80	26-4416	0-25 25-140	surficial red rock
81	26-1934	0-110 110-135 135-140 140-300	surficial soft red rock red sandstone rock red shale rock
82	26-1073	0-180 180-522	surficial red shale rock
83	26-4694	0-165 165-190	surficial red shale
84	6-9479	0-15	surficial
85	26-7539	0-28 28-30	surficial reddish-brown decomposed shale
86	26-7542	0-30 30-33	surficial reddish-brown shale
87	26-3877	0-14 14-200	surficial red shale
88	26-2537	0-5 5-245	surficial red shale
89	26-598	0-10 10-48 48-340	surficial soft red shale red shale
90	26-7326	0-56 at 56	surficial bedrock
91	46-4	0-60 60-405	surficial red shale
92	26-7322	0-58 at 58	surficial bedrock
93	26-7324	0-50 at 50	surficial bedrock
94	26-7323	0-63 at 63	surficial bedrock
95	26-8402	0-22	surficial
96	26-135	0-60 60-185	surficial rock
97	26-5814	0-18	surficial
98	26-1176	0-4 4-485	surficial red shale
99	26-4830	0-94 94-99 99-109	surficial weathered rock red rock
100	26-4807	0-87 87-105	surficial red shale, sandstone
101	26-4808	0-78 78-82	surficial rock
102	26-4829	0--97 97-98 98-99 99-104 104-112	surficial hard rock softer rock weather zone hard rock
103	26-4926	0-117	surficial
104	26-4109	0-40 40-210	surficial red sandstone
105	26-728	0-25 25-155	surficial red hard sand rock
106	26-11303	0-13 13-15	surficial fractured red sandstone
107	26-6733	0-20	surficial
108	26-5849	0-38 38-500	surficial shale
109	26-4813	0-30 30-300	surficial red shale
110	26-5442	0-40 40-270	surficial red shale
111	26-6103	0-40 40-270	surficial red shale
112	26-2634	0-38 38-200	surficial red shale
113	26-224	0-36 36-117	surficial rock
114	26-780	0-90 90-557	surficial red shale
115	26-1396	0-90 90-556	surficial red rock
116	26-161	0-42 42-200	surficial red rock
117	25-22012	0-65 65-150	surficial red shale
118	26-1225	0-38 38-115	surficial red sandstone
119	26-4189	0-80	surficial
120	25-26865	0-92	surficial
121	25-834	0--60 60-65 65-400	surficial soft red shale rock shale and sandstone
122	25-9206	0-50 50-60 60-315	surficial red rock and broken rock solid red rock
123	25-13805	0-58 58-590	surficial red rock
124	25-11011	0-30 30-456	surficial red shale
125	25-872	0-50 50-175 175-454	surficial red rock red sandstone
126	25-510	0-38 38-85	surficial red rock
127	25-14684	0-100 100-105 105-475	surficial broken shale sandstone
128	25-14548	0-79 79-500	surficial red shale and sandstone
129	25-21863	0-90 90-170	surficial shale
130	25-12960	0-80 80-500	no log, well cased to 80 feet shale
131	25-5083	0-88 88-511	surficial red rock
132	25-4639	0-108 108-506	surficial red rock
133	25-14787	0-64 64-152	surficial red sandstone
134	25-12169	0-17 17-246	surficial red shale
135	25-23941	0-18 18-24	surficial red-brown shale
136	25-392	0-30 30-250	surficial red rock
137	25-10521	0-20 20-40 40-600	surficial soft red shale red shale rock
138	25-1035	0-29 29-205	surficial red shale rock
139	26-11510	0-15 15-17	surficial red shale
140	25-22540	0-23 23-35	surficial decomposed red shale
141	25-23165	0-13	surficial
142	26-7424	0-9	surficial
143	26-9776	0-35	surficial
144	26-11420	0-25 25-45	surficial red shale
145	26-9905	0-16 16-38	surficial siltstone
146	26-9386	0-30 30-35 at 35	surficial weathered shale shale
147	26-1696	0-29 29-345 345-506	surficial red shale hard red rock
148	26-1812	0-36 36-200	surficial red rock
149	26-10990	0-11 11-17	surficial red-brown shale
150	25-9395	0-18 18-404	surficial red shale
151	on file at NJGS	0-12 12-321	surficial red rock
152	26-2302	0-10 10-350	no log rock
153	26-2463	0-16 16-325	no log shale
154	26-2360	0-26 26-348	no log red sandstone, shale
155	26-4395	0-320	red shale, sandstone
156	26-4042	0-18 18-400	surficial red shale
157	26-8117	0-37	surficial
158	26-2805	0-12 12-300	surficial red shale
159	26-6697	0-18	surficial
160	26-1979	0-30 30-550	surficial shale
161	26-3983	0-25 25-219	surficial red shale
162	26-1682	0-50 50-250	surficial red rock
163	26-5589	0--67 67-70	surficial red shale rock
164	26-6	0-54 54-116	surficial shale
165	26-15	0-44 44-111	surficial shale
166	26-4724	0-44 44-207	surficial shale
167	25-3550	0-22 22-301	no log, cased to 22 feet red shale
168	26-10986	0-50 50-200	surficial shale
169	25-13	0-30 30-110	surficial red shale
170	25-2485	0-50 50-150	surficial red shale
171	25-7750	0-72 72-118	surficial red shale
172	25-2628	0--55 55-100	surficial hard red sand rock
173	25-2196	0-57 57-110	surficial red sand rock
174	26-843	0-138 138-300	surficial red sandstone
175		0-134 134-524	surficial red shale, sandstone
176		0-80 80-416	surficial red shale, sandstone
177		0-72 72-400	surficial red shale, sandstone
178		0-52 52-523	surficial red shale
179		0-50 50-454	surficial red shale and sandstone
180		0-75 75-572	surficial red shale
181		0-58 58-590	surficial red shale
182		0-91 91-204	surficial red shale
183	26-3015	0-58 58-60	surficial red shale
184		0-105 105-532	surficial red shale
185		0-55 55-278	surficial red shale
186		0-30 30-404	clay and pebbles red shale
187		0-23 23-271	surficial red shale
188		0-28 28-505	surficial shale, sandstone
189		0-46 46-505	surficial shale
190		0-78 at 78	surficial red sandstone
191		0-85 85-87	surficial red shale
192		0-56 56-402	surficial red shale and sandstone
193		0--93 at 99	surficial rock
194	on file at NJGS	typical log from 45 wells 0-103 at 103	surficial rock
195	on file at NJGS	0-43 at 43	surficial red shale
196	on file at NJGS	0-30 30-235 235-285	surficial blue trap rock white sandstone
197	on file at NJGS	0-202 202-305	surficial red shale and sandstone
198	on file at NJGS	0-200	surficial
199	on file at NJGS	0-58 58-370	surficial rock
200	on file at NJGS	0-55 at 55	surficial rock
201	on file at NJGS	0-49 49-530 530-750	surficial trap rock red shale, sandstone
202	on file at NJGS	0-60 60-80	surficial trap rock
203		0-150 150-155	surficial rock
204	on file at NJGS	three wells with similar logs: 0-70 at 70	surficial sandstone, shale
205	on file at NJGS	0-36 36-210	surficial red shale
206		0138 138-146	surficial red siltstone
207		0--85 85-105	surficial red sandstone
208		0-165 165-180 180-335	surficial black shale and clay red shale
209		0-140 140-300	surficial rock
210		0-125 125-145	surficial shale, sandstone
211		0-145 145-150	surficial shale
212		0-135 135-260	surficial shale
213		0-145 145-310	surficial shale
214		0-158 at 158	surficial red sandstone rock
215		0-142 at 142	surficial red sandstone
216		0-96 96-107 107-114	surficial red shale red sandstone
217		0-78 78-85 85-104	surficial soft shale red sandstone
218	26-3701	0-75 at 75	surficial rock
219	26-3701	0-113 at 113	surficial sandstone
220	26-3701	0-48 at 48	surficial trap rock
221	25-27352	0-38	surficial

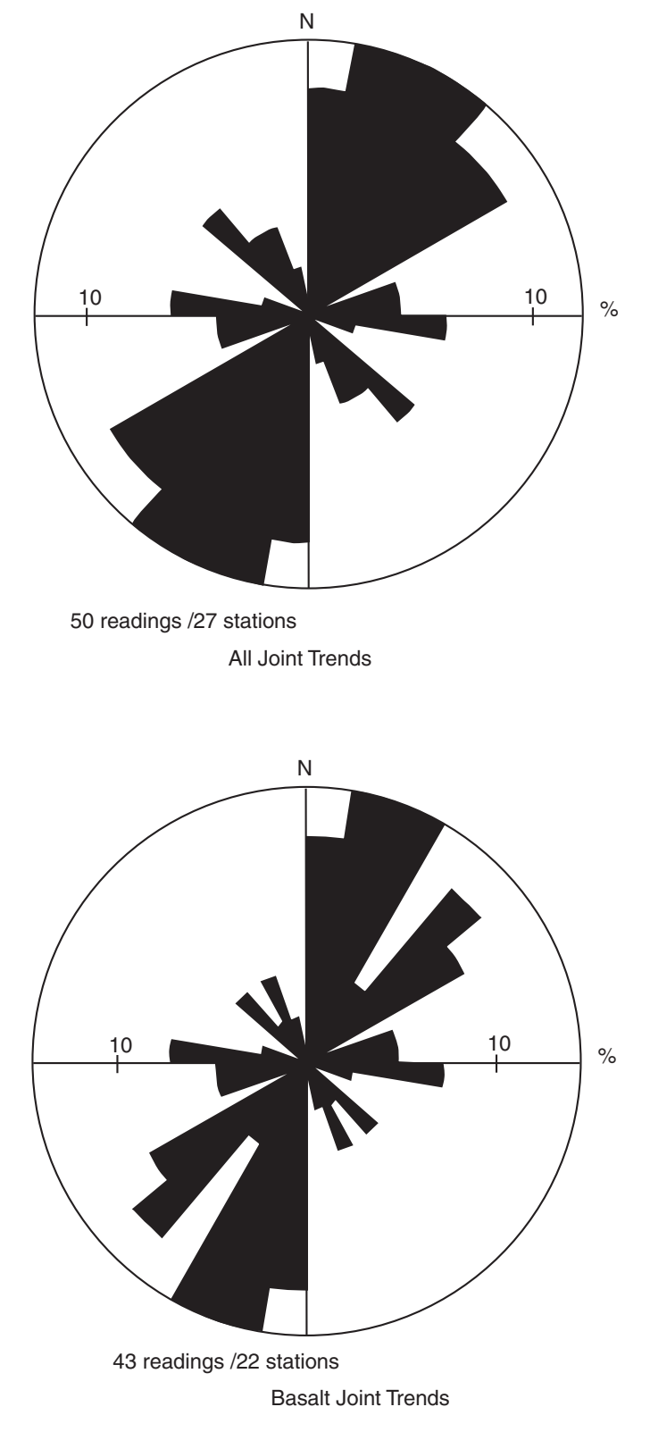


Figure 2. Rose diagrams of the dominant joint trends in all units and only within the basalt units. Joints measured within the basalts do not include cooling joints responsible for the columnar structures.

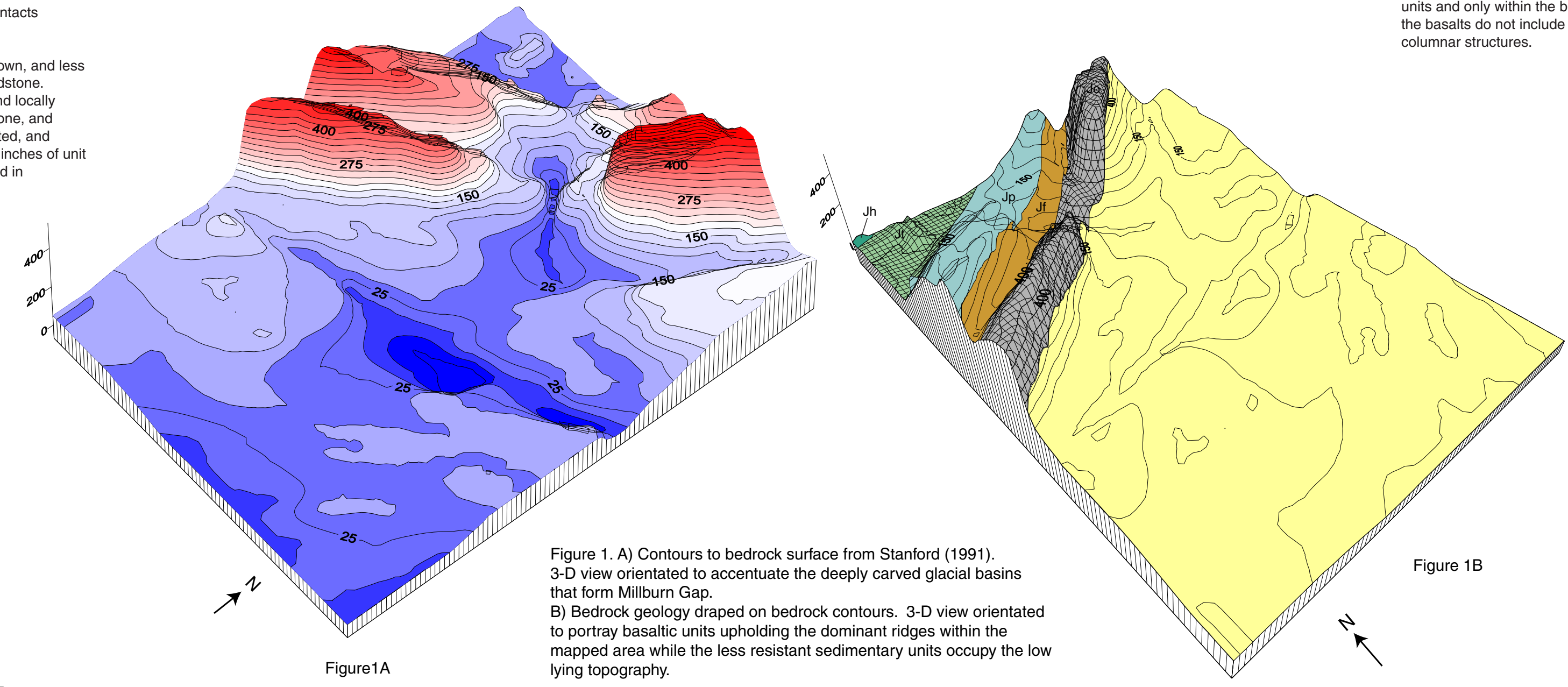
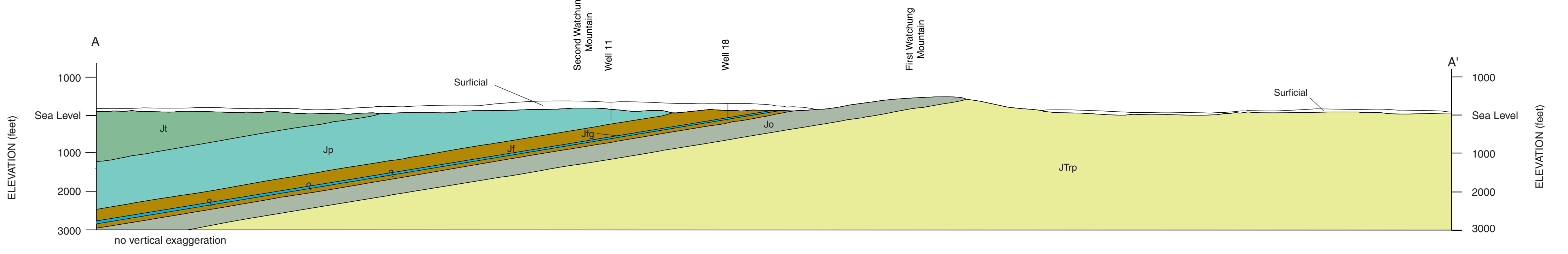


Figure 1. A) Contours to bedrock surface from Stanford (1991). 3-D view orientated to accentuate the deeply carved glacial basins that form Millburn Gap.
B) Bedrock geology draped on bedrock contours. 3-D view orientated to portray basaltic units upholding the dominant ridges within the mapped area while the less resistant sedimentary units occupy the low lying topography.



no vertical exaggeration