DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF- 670-D

SHEET 1 OF 2

BASE BY U.S. GEOLOGICAL SURVEY, 1966

SCALE 1:24000

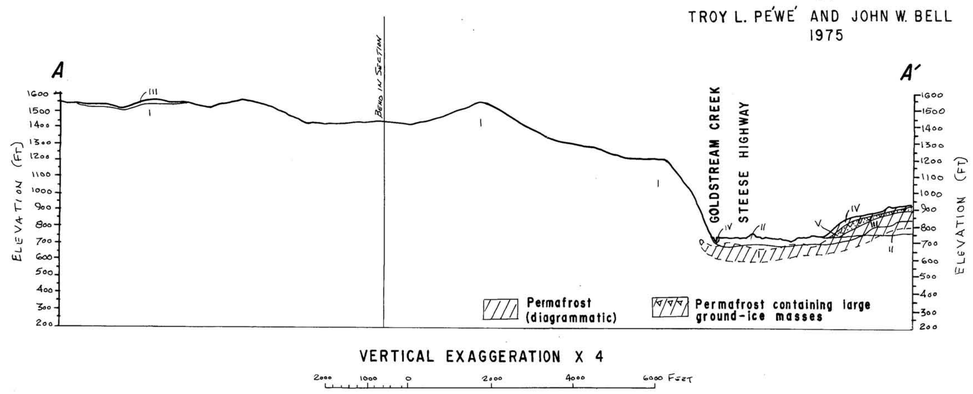
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

UTM GRID AND 1966 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

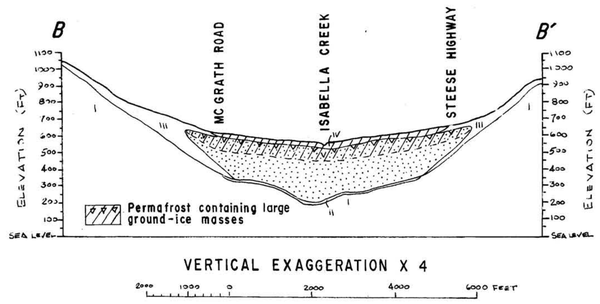
QUADRANGLE LOCATION

MAP SHOWING FOUNDATION CONDITIONS IN THE FAIRBANKS D-2 NE QUADRANGLE, ALASKA

BY
TROY L. PÉWÉ AND JOHN W. BELL
1975



VERTICAL EXAGGERATION X 4



VERTICAL EXAGGERATION X 4

GENERALIZED CROSS SECTIONS

SELECTED SUBSURFACE DATA[1]

Selected data from borehole and well logs are presented below. Numbered items correspond to numbered circles on map. An asterisk (*) indicates that permafrost persisted to bottom of hole.

1. 0-.5 ft organic material, .5-1.5 ft sandy silt, 1.5-5.5 ft sandy gravel 5.5-8.5 ft weathered bedrock. No permafrost.
2. 0-.5 ft organic material, .5-5 ft silt, sand and gravel, 5-7.5 ft weathered bedrock, 7.5-13 ft bedrock. No permafrost.
3. 0-5 ft loess with sand, 5-20.5 ft weathered bedrock. No permafrost.
4. 0-2.5 ft loess, schist at 2.5 ft. No permafrost.
*5. 0-20 ft silt, 20-48 ft creek gravel. Did not reach bedrock. Permafrost 2-48 ft.
*6. 0-13 ft silt, 13-53 ft creek gravel. Did not reach bedrock. Permafrost 2-53 ft.
*7. 0-17 ft silt, 17-68 ft creek gravel. Did not reach bedrock. Permafrost 2-68 ft.
8. 0-.5 ft organic material, .5-5 ft silty sand, 5-20 ft weathered bedrock, 20-26 ft bedrock. No permafrost.
*9. 0-8 ft silt, 8-16 ft creek gravel. Bedrock at 16 ft. Permafrost 2-20 ft.
*10. 0-48 ft silt, 48-58 ft creek gravel. Bedrock at 58 ft. Permafrost 2-58 ft.
*11. 0-54 ft silt, 54-90 ft creek gravel. Bedrock at 90 ft. Permafrost 2-94 ft.
12. 0-10 ft silt, 10-31 ft creek gravel. Bedrock at 31 ft. No permafrost recorded.
13. 0-13 ft silt, 13-31 ft creek gravel. Bedrock at 31 ft. Permafrost present.
14. 0-68 ft silt, 68-165 ft bedrock. No permafrost recorded.
*15. 0-17 ft silt, 17-19 ft creek gravel. Did not reach bedrock. Permafrost 2-19 ft.
16. 0-50 ft sand and gravel tailings, 50-148 ft bedrock. No permafrost.
17. 0-35 ft sand and gravel tailings, 35-53 ft bedrock. No permafrost.
*18. 0-15 ft silt, 15-24 ft creek gravel. Bedrock at 24 ft. Permafrost 2-24 ft.
*19. 0-14 ft silt, 14-27 ft creek gravel. Did not reach bedrock. Permafrost 2-27 ft.
*20. 0-16 ft silt, 16-22 ft creek gravel. Bedrock at 22 ft. Permafrost 2-24 ft.
21. 0-.5 ft loess, .5-8 ft weathered granite. No permafrost.
*22. 0-67 ft silt, 67-84 ft creek gravel. Did not reach bedrock. Permafrost 2-84 ft.
23. 0-18 ft sand and gravel tailings, 18-24 ft organic silt, 24-261 ft schist. No permafrost recorded.
24. 0-25 ft sand and gravel tailings, 25-168 ft bedrock. Permafrost 20-25 ft.
25. 0-26 ft sand and gravel tailings, 26-215 ft schist. Permafrost 16-26 ft.
26. 0-17 ft sand and gravel tailings, 17-25 ft organic silt, 25-233 ft schist with quartz veins. Permafrost 17-140(?) ft.
27. 0-3 ft silty sand, 3-21 ft weathered bedrock, 21-25 ft bedrock. No permafrost.
28. 0-3 ft sandy silt, 3-6.5 ft weathered bedrock, 6.5-10 ft bedrock. No permafrost.
*29. 0-12.5 ft silt. Did not reach bedrock. Permafrost 8-12.5 ft.
*30. 0-12.5 ft silt. Did not reach bedrock. Permafrost 9-12.5 ft.
*31. 0-6 ft silt, 6-22.5 ft ice. Did not reach bedrock. Permafrost 3-22.5 ft.
32. 0-19 silt, 19-23.5 ft weathered bedrock. Permafrost 2-19 ft.
33. 0-1 ft organic material, 1-8 ft silty, sandy gravel, 8-23.5 ft silt, 23.5-40 ft weathered bedrock. Permafrost 2-16 ft.
34. 0-56 ft silt, 56-163 ft creek gravel, 163-172 ft bedrock. Permafrost present.
*35. 0-113 ft silt, 118-131 ft creek gravel. Bedrock at 131 ft. Permafrost 2-134 ft.
*36. 0-77 ft silt, 77-100 ft creek gravel. Bedrock at 100 ft. Permafrost 2-111 ft.
*37. 0-103 ft silt, 103-137 ft creek gravel. Bedrock at 137 ft. Permafrost 2-139 ft.
38. 0-105 ft silt, 105-158 ft creek gravel, 158-162 ft bedrock. Permafrost 3-143 ft.
39. 0-98 ft silt, 98-175 ft creek gravel, 175-230 ft bedrock. Permafrost 3-130 ft.
40. 0-.5 ft loess, .5-225 ft schist. No permafrost.
41. 0-.5 ft loess, .5-8 ft weathered bedrock, 8-245 ft bedrock. No permafrost.
42. 0-3 ft loess. Bedrock at 3 ft. No permafrost.
43. 0-.5 ft loess, .5-198 ft schist. No permafrost.
44. 0-.5 ft loess, .5-250 ft schist. No permafrost.
45. 0-.5 ft loess, .5-310 ft schist. No permafrost.
46. 0-3 ft loess, 3-20 ft weathered bedrock. No permafrost.
47. 0-20 ft loess, 20-30 ft weathered bedrock. No permafrost.
48. 0-31 ft organic silt, 31-41 ft silt, 41-50 ft weathered bedrock. Permafrost 3.5-42 ft.
*49. 0-66 ft silt, 66-70 ft creek gravel. Bedrock at 70 ft. Permafrost 2-74 ft.
*50. 0-57 ft silt, 57-112 ft creek gravel. Bedrock at 112 ft. Permafrost 2-115 ft.
*51. 0-99 ft silt, 99-111 ft creek gravel. Bedrock at 111 ft. Permafrost 2-119 ft.
*52. 0-59 ft silt. Bedrock at 59 ft. Permafrost 2-70 ft.
*53. 0-16 ft sand and gravel tailings, 16-50 ft sand. Did not reach bedrock. Permafrost 17-50 ft.
54. 0-54 ft silt, 54-100 ft creek gravel. Bedrock at 100 ft. Permafrost 2-109 ft.
*55. 0-106 ft silt, 106-111 ft creek gravel. Bedrock at 111 ft. Permafrost 2-114 ft.
*56. 0-145 ft silt, 14.5-28 ft ice, 28-48 ft silt. Did not reach bedrock. Permafrost 11-48 ft.
*57. 0-6 ft fill, 6-15 ft silt, 15-20 ft ice, 20-43 ft ice with silt. Did not reach bedrock. Permafrost 8-43 ft.
58. 0-3 ft loess, 3-13 ft schist. No permafrost.
59. 0-2.5 ft loess. Schist at 2.5 ft. No permafrost.
60. 0-1 ft loess, 1-347 ft schist. No permafrost.
61. 0-4 ft loess and weathered bedrock, 4-335 ft schist. No permafrost.
62. 0-3 ft loess, 3-255 ft schist. No permafrost.
63. 0-35 ft loess, 35-223 ft schist. No permafrost.
64. 0-14 ft loess, 14-285 ft schist. No permafrost.
65. 0-1 ft loess, 1-450(?) ft schist. No permafrost.
66. 0-36.5 ft loess, 36.5-125 ft organic silt, 125-183 ft tan silt, 183-184 ft schist. No permafrost.
67. 0-129 ft organic silt, 129-149 ft bedrock. Permafrost 9-28 ft.
68. 0-160 ft silt, 160-163 ft bedrock. No permafrost recorded.
69. 0-205 ft silt, 205-396 ft bedrock. No permafrost recorded.
70. 0-242 ft silt, 242-298 ft silt and rock fragments, 298-340 ft schist. No permafrost.
71. 0-132 ft silt, 132-160 ft schist. Permafrost 19-60 ft.
72. 0-65 ft loess, 65-122 ft organic silt, 122-316 ft schist. No permafrost recorded.
73. 0-179 ft loess. Did not reach bedrock. No permafrost.
74. 0-195 ft weathered schist with yellow clay, 195-200 ft hard schist. No permafrost.
75. 0-78 ft tan silt, 78-98 ft silt with rock fragments, 98-128 ft alternating silt and clay, 128-130 ft schist. No permafrost.
76. 0-72 ft loess, 72-209 ft schist. No permafrost.
77. 0-113 ft silt, 113-126 ft creek gravel. Did not reach bedrock. Permafrost 5-113 ft.
78. 0-268 ft silt. Weathered bedrock at 268 ft. Permafrost 2-176 ft.
79. 0-108 ft silt, creek gravel at 108 ft. Permafrost 2-108 ft.
80. 0-168 ft silt. Did not reach bedrock. Permafrost 2-168 ft.
81. 0-151 ft loess, 151-195 ft schist. No permafrost.
82. 0-180 ft loess, 180-199 ft schist. No permafrost.
*83. 0-28 ft silt. Did not reach bedrock. Permafrost 13-28 ft.
84. 0-450(?) ft silt. Did not reach bedrock. Permafrost 2-126 ft.
85. 0-300 ft silt, 300-350 ft schist. Permafrost 35-95 ft.
86. 0-255 ft silt, 255-285 ft schist. Permafrost 2-30 ft.
87. 0-267 ft organic silt, 267-270 ft creek gravel. Bedrock at 270 ft. Permafrost 4-90 ft.
88. 0-265 ft organic silt, 265-280 ft weathered schist, 280-286 ft schist. Permafrost 2-110 ft.
89. 0-70 ft loess, 70-83 ft weathered igneous rock. No permafrost.
90. 0-93 ft silt, 93-113 ft creek gravel. Bedrock at 113 ft. No permafrost recorded.
91. 0-124 ft silt. Did not reach bedrock. Permafrost 15-28 ft.
92. 0-125 ft organic silt, 125-170 ft creek gravel. Bedrock at 170 ft. Permafrost 18-84 ft.
93. 0-83 ft silt, 83-128 ft creek gravel. Bedrock at 128 ft. No permafrost recorded.
94. 0-313 ft organic silt. Did not reach bedrock. Permafrost 2-100 ft.
95. 0-150 ft organic silt. Did not reach bedrock. Permafrost 4-120 ft.
96. 0-40 ft loess, 40-146 ft fractured schist and quartz. No permafrost.
97. 0-227 ft silt, 227-245 ft schist. Permafrost 2-61 ft.
98. 0-110 ft silt, 110-197 ft schist. Permafrost present.
99. 0-175 ft silt, 175-176 ft schist. No permafrost recorded.
100. 0-98 ft silt, 98-145 ft bedrock. Permafrost 5-15 ft.
101. 0-101 ft silt, 101-133 ft schist. Permafrost 2-6 ft; 25-55 ft.
102. 0-445 ft loess, 45-53 ft weathered bedrock, 53-100 bedrock. No permafrost.
103. 0-67 ft organic silt, 67-82 ft weathered bedrock, 82-142 ft bedrock. Permafrost 8-43 ft.
104. 0-60 ft silt, schist at 60 ft. Permafrost 15-30 ft.
105. 0-20 ft loess, 20-240 ft bedrock. No permafrost.
106. 0-105 ft loess, 105-176 ft schist. No permafrost.
107. 0-85 ft loess, 85-190 ft schist. No permafrost.
108. 0-54 ft loess, 54-65 ft weathered schist, 65-112 ft schist. No permafrost.
109. 0-78 ft loess, 78-130 ft schist. No permafrost.
110. 0-65 ft loess, 65-110 ft bedrock. No permafrost.
111. 0-30 ft loess, 30-160 ft schist. No permafrost.
112. 0-45 ft loess, 45-68 ft weathered bedrock, 68-107 ft bedrock. No permafrost.
113. 0-105 ft silt. Bedrock at 105 ft. Permafrost at 80 ft.
114. 0-51 ft silt, 51-80 ft creek gravel. Bedrock at 80 ft. No permafrost recorded.
115. 0-47 ft loess, 47-75 silt with schist fragments, 75-83 ft weathered schist, 83-85 ft schist. No permafrost.
116. 0-18 ft loess, 18-320 ft schist. No permafrost.
117. 0-8 ft loess, 8-419 ft schist. No permafrost.
118. 0-7 ft loess, 7-290 ft schist. No permafrost.
*119. 0-28 ft silt. Did not reach bedrock. Permafrost 8-28 ft.
120. 0-105 ft silt, 105-117 ft clay with schist fragments, 117-123 ft weathered schist, 123-230 ft schist. Permafrost 25-105 ft.
121. 0-140 ft silt, 140-146 ft bedrock. Permafrost 28-65 ft.
122. 0-3 ft loess, 3-48 ft weathered bedrock with quartz lenses. No permafrost.
123. 0-4 ft loess, 4-18 ft weathered schist, 18-267 ft schist. No permafrost.
124. 0-65 ft loess. Bedrock at 65 ft. No permafrost.
125. 0-110 ft silt, 110-116 ft creek gravel. Bedrock at 116 ft. No permafrost recorded.
126. 0-102 ft silt, 102-123 ft creek gravel. Bedrock at 123 ft. Permafrost 15-55 ft.
127. 0-58 ft loess. Bedrock at 58 ft. No permafrost.
128. 0-40 ft loess. Bedrock at 40 ft. No permafrost.
129. 0-120 ft loess, 120-150 ft schist. No permafrost.
130. 0-10 ft loess, 10-280 ft weathered micaceous schist and yellow clay. No permafrost.
131. 0-10 ft loess, 10-310 ft schist. No permafrost.
132. 0-1 ft loess, 1-7 ft weathered schist, 7-48 ft schist. No permafrost.
133. 0-5 ft loess, 5-300 ft schist. No permafrost.
134. 0-96 ft silt, 96-103 ft weathered schist, 103-108 ft schist. Permafrost 2-96 ft.
135. 0-46 ft loess, 46-98 ft schist. No permafrost.
136. 0-25 ft loess, 25-168 ft schist. No permafrost.
137. 0-25 (?) ft loess, 25-200 ft schist. No permafrost.
138. 0-16 ft loess, 16-35 ft weathered schist, 35-173 ft schist. No permafrost.
139. 0-20(?) ft loess, 20-180 ft schist. No permafrost.
140. 0-65 ft silt, 65-220 ft schist. Permafrost 20-50 ft.
141. 0-7 ft loess, 7-248 ft schist. No permafrost.
142. 0-3 ft loess, 3-254 ft schist. No permafrost.
143. 0-3 ft loess, 3-292 ft schist. No permafrost
144. 0-69 ft loess, 69-71 ft sand, 71-93 ft silt, 93-129 ft sand and schist fragments, 129-145 ft weathered sandy schist. Permafrost present (?).
145. 0-20 ft loess, 20-275 ft schist. No permafrost.
146. 0-82 ft loess, 82-144 ft bedrock. No permafrost.
147. 0-9 ft silt, 9-35 ft weathered bedrock. Permafrost 2-22 ft.
148. 0-2 ft loess, 2-198 ft bedrock. No permafrost.
149. 0-1 ft loess, 1-390 ft schist. No permafrost.
150. 0-1 ft organic silt, 1-6.5 ft silt with gravel, 6.5-17 ft weathered bedrock, 17-30 ft bedrock. No permafrost.
151. 0-3 ft loess, 3-295 ft schist. No permafrost.
152. 0-.5 ft loess, .5-270 ft schist. No permafrost.
153. 0-.5 ft loess, .5-174 ft schist. No permafrost.
154. 0-1.5 ft loess, 1.5-8 ft weathered bedrock, 8-20 ft bedrock. No permafrost.
*155. 0-16.5 ft silt, 16.5-27.5 ft ice, 27.5-48 ft interlayers of ice and silt, 48-76.5 ft silt. Did not reach bedrock. Permafrost 14-76.5 ft.
156. 0-49 ft loess, 49-102 ft weathered schist and yellow clay, 102-107 ft schist with quartz. No permafrost.
157. 0-130 ft silt, 130-170 ft schist fragments. Permafrost 15-35 ft.
158. 0-150 ft silt, 150-155 ft gravel, 155-190 ft silt, 190-205 ft gravel, 205-215 ft schist. Permafrost 2-102 ft.
159. 0-149(?) ft silt. Did not reach bedrock. Permafrost present (?).
*160. 0-1 ft organic silt, 1-14 ft silt, 14-22.5 ft ice, 22.5-36.5 ft silt, 36.5-42.5 ft ice, 42.5-50 ft silt. Did not reach bedrock. Permafrost 14-50 ft.
161. 0-194 ft loess, 194-196 ft weathered schist, 196-209 ft schist. No permafrost.
162. 0-60 ft loess, 60-240 ft schist. No permafrost.
163. 0-120 ft loess, 120-223 ft schist. No permafrost.
164. 0-128 ft loess, 128-145 ft schist. No permafrost.
165. 0-189 ft loess, 189-225 ft schist. No permafrost.
166. 0-130 ft loess(?). Did not reach bedrock. No permafrost.
*167. 0-2 ft organic silt, 2-9 ft silt, 9-14 ft organic silt, 14-52 ft silt. Did not reach bedrock. Permafrost 2-52 ft.

[1] Selected subsurface data were obtained from Péwé (1958); United States Smelting, Refining, and Mining Co.; Water Resources Division of the U.S. Geological Survey; R&M Engineering and Geological Consultants; Arctic Alaska Testing Laboratories; State of Alaska Department of Highways; local well drillers and residents.

I
BEDROCK

Igneous and metamorphic bedrock, exposed primarily on hilltops and steep slopes where loess cover is less than 3 feet thick, underlies surficial deposits in all the quadrangle. Upper part is weathered. Where permafrost is present, ice content is low or absent but may be higher in weathered bedrock. No subsidence upon thawing of unweathered bedrock but may be slight upon thawing of weathered material. Frost action absent in unweathered bedrock but may be moderate in decayed bedrock. Unweathered bedrock has high bearing strength

II
TAILINGS

Reworked creek gravel now exposed as placer-mine dredge tailings; 3 to more than 50 feet thick. Generally unfrozen but may be locally frozen with low ice content. No subsidence upon thawing; not susceptible to frost action. Material is loose but provides high bearing strength. Shown as undredged buried creek gravel in cross section

III
LOESS

Windblown silt present on middle and upper slopes and on low hilltops; 3 to more than 200 feet thick. Not mapped where less than 3 feet thick. Generally free of permafrost; north-facing slopes may contain permafrost with little or no ice content. Mildly susceptible to unsusceptible to seasonal frost action. High bearing strength when dry and in original position; very low when wet. Will stand in nearly vertical slopes. Extremely susceptible to gullying. On the map loess is not differentiated from muck (unit IV) where loess overlies peat muck (unit V); this relation is shown in cross section

IV
MUCK

Reworked silt in valley bottoms and on lower slopes; 3-30 feet thick. Perennially frozen; moderate to high ice content as seams and lenses; overlies unit V, which has high ice content as seams, lenses, and large foliated ice masses. Ice content may be low and permafrost sporadic near unfrozen loess zone upslope. Great differential subsidence upon thawing. Seasonal frost action intense. Permafrost causes poor drainage. High bearing strength when frozen or dry; very low when wet or thawed. Subject to sloughing and sliding upon thawing. Very susceptible to gullying

PEAT MUCK

Reworked organic silt in valley bottoms; 10 to more than 300 feet thick. Perennially frozen; high ice content as ice seams, lenses, and large foliated ice masses. Large ice masses near surface result in large polygonal pattern of trenches. Great differential subsidence upon thawing. Seasonal frost action intense. Permafrost results in poor drainage. High bearing strength when frozen; very low when thawed. Slopes in cuts subject to sloughing and landsliding upon thawing. Where peat muck overlain by loess unit, both deposits mapped as muck (unit IV)

SYMBOLS

Contact
Generally indefinite or gradational

Gravel pit

Pingo
Ice-cored mound formed as result of water trapped under permafrost developing hydraulic head, forcing its way to surface, and freezing

○98
Site of subsurface data

△B
Sample site

For sale by U.S. Geological Survey, price $1.00

*U.S. GOVERNMENT PRINTING OFFICE: 1975-0-690-036/57