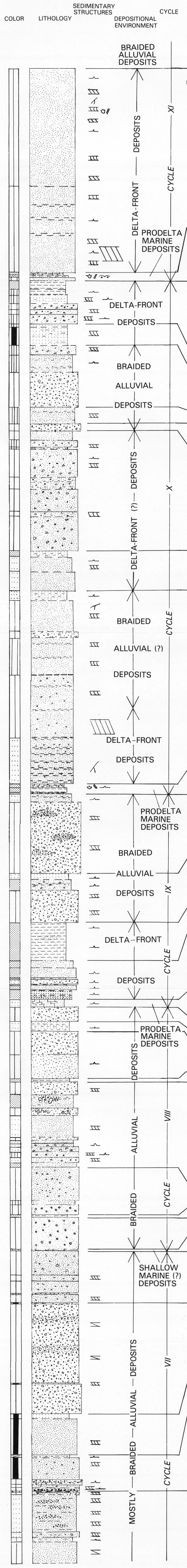
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1622-C
SHEET 1 OF 2



DESCRIPTION OF UNITS

[Compound units described in descending order; total thickness of each compound unit and cumulative thickness (cum) from base of formation to top of unit given in parentheses after description]

SANGRE DE CRISTO FORMATION
Red sandstone, siltstone and shale; conformably overlies Minturn Formation

MINTURN FORMATION (top)

Unit 105 Crossbedded sandstone and siltstone member: Sandstone, coarse-grained, pink, medium-bedded; trough and planar crossbedding; grades down into sandstone; lenses of gray siltstone having marine invertebrate fossils along strike; 40.2 m. Sandstone, coarse-grained, locally pebbly, pink, thin-bedded; trough crossbedding, ripple marks; contains interbedded siltstone having ripple marks in middle part; large deltaic foresets along strike; 23.8 m (64.0 m; cum 1987.5 m). Summit of Eureka Mountain

Unit 104 Limestone (marker limestone), silty, gray; weathers light brown; contains crinoid columnals, brachiopods, and stromatolites; contains conodonts of Middle Pennsylvanian age (B. R. Wardlaw, written commun., 1981; 1983); grades down into siltstone; 0.8 m. Siltstone, shaley, gray-brown; 0.6 m. Sandstone, coarse-grained, locally pebbly, light-red, thin-bedded; 1.1 m (2.5 m; cum 1923.5 m)

Unit 103 Shale, gray-brown; contains thin siltstone beds; 2.0 m. Shale, silty, red; contains siltstone beds and ripple marks; grades down into siltstone; 1.7 m. Siltstone, red, thin-bedded; contains ripple marks and thin crossbedded sandstone beds; grades down into sandstone; 3.7 m. Sandstone, conglomeratic, light-red, thin-bedded; 1.2 m. Sandstone, conglomeratic, light-red, weakly stratified, and crossbedded; contains lens of pebble and cobble conglomerate; 1.4 m. Sandstone, conglomeratic, red, thin-bedded, crossbedded; contains ripple marks; 3.2 m (13.2 m; cum 1921.0 m)

Unit 102 Siltstone, red; grades down into siltstone; 0.9 m. Siltstone, shaley, dark-red; contains lenses of crossbedded sandstone; 6.2 m (7.2 m; cum 1907.8 m)

Unit 101 Sandstone, coarse-grained and pebbly, red, thick-bedded, crossbedded; 3.0 m. Sandstone and siltstone, interbedded, red; sandstone is thin bedded; siltstone is platy; contains ripple marks; grades down into sandstone; 5.3 m. Sandstone, conglomeratic, gray-pink, thick-bedded; contains lenses of pebble conglomerate, magnetite laminae, and red silty partings; 11.3 m (19.6 m; cum 1900.7 m)

Unit 100 Sandstone, red, thin-bedded, crossbedded; interbedded silty sandstone; 5.7 m (cum 1881.1 m)

Unit 99 Conglomerate, gray-pink matrix; contains pebbles and cobbles of granite, gneiss, schist, vein quartz, and sparse red porphyry; sorted and stratified; magnetite paleoplacers at top; 1.7 m (cum 1875.4 m)

Unit 98 Sandstone, coarse-grained, gray-pink, thick-bedded; 3.1 m. Sandstone, conglomeratic, red; contains lenses of granule conglomerate; thin-bedded in upper part; weakly stratified, crossbedded; 2.4 m. Siltstone, shaley, red; grades down into sandstone; 0.3 m. Sandstone, conglomeratic, pink, thin-bedded, crossbedded; contains ripple marks; grades down into sandstone; 9.3 m. Sandstone, conglomeratic, pink, thin-bedded; contains interbedded siltstone; grades down into sandstone; 4.0 m. Sandstone, conglomeratic, pink, thin- to thick-bedded, weakly laminated; 7.3 m. Sandstone, conglomeratic, pink, thin-bedded, crossbedded; grades down into sandstone; 1.5 m. Sandstone, conglomeratic, gray-pink, thick-bedded; massive beds; 10.8 m (38.7 m; cum 1873.7 m)

Unit 97 Siltstone, shaley, gray-brown; grades down into sandstone; 2.1 m. Sandstone, gray-green, rusty-weathering, thin-bedded; small crossbedding, contains ripple marks; grades down into sandstone; 4.8 m. Sandstone, coarse-grained, gray, medium- to thick-bedded, coarse-grained; 5.3 m (12.2 m; cum 1835.0 m)

Unit 96 Siltstone, shaley, gray-green, thin-bedded; contains ripple marks; grades down into sandstone; 2.7 m. Sandstone, pink, thin-bedded, crossbedded; contains plant fragments; grades down into sandstone; 9.0 m. Sandstone, conglomeratic, pink, thick-bedded, massive; contains abundant granule-sized clasts, grades down into sandstone; 2.2 m. Sandstone, light-red, thin-bedded, crossbedded, and massive; contains abundant detrital mica; interbedded with siltstone; grades down into sandstone; 11.2 m. Sandstone, granule-bearing, gray-pink, thick-bedded, crossbedded; contains interbedded siltstone; 13.0 m. Sandstone, coarse-grained, gray-pink; contains deltaic foresets; grades down into sandstone and siltstone; 13.0 m. Sandstone and siltstone, interbedded, gray; contains plant fragments; 8.0 m (59.1 m; cum 1822.8 m)

Unit 95 Brown limestone: Limestone, gray; weathers brown; calcarenite at top; contains crinoid columnals, brachiopods, ripple marks; 0.6 m. Shale, gray-brown; 1.6 m. Limestone, gray; weathers light brown; no fossils; 0.3 m (2.5 m; cum 1763.7 m)

Unit 94 Sandstone and siltstone, gray, thin-bedded; contains ripple marks and lesser interbedded shale; grades down into conglomerate; 2.8 m. Conglomerate, pebble and granule, gray-pink, sorted and stratified, thick-bedded, crossbedded; contains scattered lenses of sandstone and siltstone; 22.7 m (25.5 m; cum 1761.2 m)

Unit 93 Siltstone, gray, thin-bedded; contains ripple marks; grades down into sandstone, siltstone, and shale; 1.8 m. Sandstone, siltstone, and silty shale, gray-brown; sandstone, conglomeratic; contains ripple marks and abundant detrital mica; 3.3 m. Sandstone, conglomeratic, pink; pebbles of granitic rock and vein quartz to 3 cm; thick-bedded, laminated, and crossbedded; 9.9 m (15.0 m; cum 1735.7 m)

Unit 92 Shale and siltstone, interbedded, gray, brown, and black; lenticular beds, ripple marks; contains sparse lenses of brown sandstone; 12.5 m (cum 1720.7 m)

Unit 91 Sandstone, gray-brown, laminated; grades down into sandstone; 2.0 m. Sandstone, medium- to coarse-grained, gray-brown, thin-bedded, massive to laminated; contains ripple marks; 3.3 m. Shale, silty, gray-brown; 0.5 m. Sandstone, conglomeratic, gray, thin-bedded; contains ripple marks; 1.5 m. Shale, silty, gray-brown; 0.3 m. Sandstone and siltstone, gray-brown, thin-bedded; sand is coarse-grained; contains ripple marks; 1.8 m. Shale, gray-black, siltstone, gray, and sandstone, gray-brown, interbedded, thin-bedded; contains ripple marks; 3.1 m (12.5 m; cum 1708.2 m)

Unit 90 Limestone (top) and shale; both silty, gray, and weather tan; contains ripple marks, no fossils; 2.4 m (1695.7 m). Limestone at same stratigraphic level on Hermit Pass, 1.8 km north of reference section, contains marine invertebrate fossils

Unit 89 Sandstone, conglomeratic, gray-pink, medium-bedded, laminated; 4.3 m (cum 1693.3 m)

Unit 88 Siltstone, shaley, gray, thin-bedded; ripple marks; 3.1 m (cum 1689.0 m)

Unit 87 Sandstone, granule-rich, pink; 7.4 m. Sandstone, conglomeratic, gray-pink, thick-bedded; contains granules and pebbles of quartz and feldspar; contains ripple marks and siltstone partings; 7.4 m (14.8 m; cum 1685.9 m)

Unit 86 Shale and siltstone, gray-brown; 1.0 m (1671.1 m)

Unit 85 Sandstone, conglomeratic, gray-pink, thick-bedded; trough crossbedding; 4.4 m. Sandstone, silty, gray-brown, thin-bedded; contains scattered lenses of pebble conglomerate; 4.4 m. Sandstone, conglomeratic, gray-pink, medium- to thick-bedded, laminated; contains scattered lenses of conglomerate; 1.7 m. Sandstone, gray, thin- to medium-bedded, crossbedded; grades down into sandstone; 7.3 m. Sandstone, conglomeratic, gray-pink, laminated; 0.9 m. Sandstone, gray, thin-bedded, laminated; 0.9 m. Sandstone, silty, gray, thin-bedded; contains ripple marks; 0.9 m. Sandstone, conglomeratic, gray, laminated; 1.7 m. Sandstone, conglomeratic, red-brown, thin-bedded; contains ripple marks; small trough crossbedding; 1.8 m. Sandstone, conglomeratic, gray; contains pebble-conglomerate lens; crossbedded; 2.0 m. Sandstone, coarse-grained, gray-brown, thin- to medium-bedded, massive; red silty partings; 1.5 m (27.5 m; cum 1670.1 m)

Unit 84 Sandstone, conglomeratic, gray-pink, thick-bedded; 10.3 m. Sandstone, red-brown, thin-bedded; 1.1 m. Sandstone, conglomeratic, light-red, thick-bedded; 3.3 m (14.7 m; 1642.6 m)

Unit 83 Shale, gray-brown, silty; 0.9 m (cum 1627.9 m)

Unit 82 Sandstone, conglomeratic, pink, thick-bedded, massive to laminated; 9.8 m (cum 1627.0 m)

Unit 81 Limestone, silty, gray; weathers tan; contains wavy lamination, no fossils; 0.6 m (cum 1617.2 m)

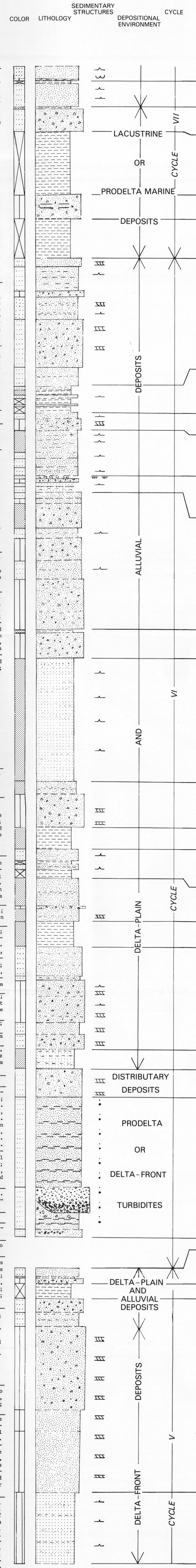
Unit 80 Sandstone, conglomeratic, gray-pink; contains scattered pebbles and cobbles; 7.5 m. Sandstone, conglomeratic, gray-pink; contains pebbles and cobbles, trough crossbedding, red siltstone partings; 2.1 m. Sandstone, conglomeratic, pink, thick- to thin-bedded, laminated; red silty partings; 4.0 m. Siltstone, micaceous, gray; 0.6 m. Sandstone, conglomeratic, pebbly, gray-pink, crossbedded; 2.8 m (17.0 m; cum 1616.6 m)

Unit 79 Sandstone, silty, red; 0.6 m. Conglomerate and conglomeratic sandstone, gray-pink; contains subround granules and pebbles; sorted and stratified; contains silty partings, low-angle crossbedding; iron oxide paleoplacers in upper part; pebble count: granitic rocks, 34 percent (pct.) mafic igneous rocks, 5 pct., red syenite, 1 pct., red felsic porphyry, 5 pct., gneiss and schist, 45 pct., quartzite, 3 pct., vein quartz 7 pct.; 24.0 m. Sandstone, dark-red, crossbedded; 0.3 m. Conglomerate, gray-pink; contains granules and pebbles to 10 cm; sorted and stratified, thick-bedded; 9.5 m (34.4 m; cum 1599.6 m)

Unit 78 Siltstone, dark-red, thin-bedded, laminated; grades down into sandstone; 1.4 m. Sandstone, coarse-grained, pink to dark-red, medium- to thick-bedded, massive to crossbedded; 13.0 m (14.4 m; cum 1565.2 m)

Unit 77 Siltstone, shaley, gray-black, cross-laminated; contains ripple marks; grades down into sandstone; 0.6 m. Sandstone, conglomeratic, pink to dark-red, medium- to thick-bedded; scour-and-fill structures, trough crossbedding, shaley partings; 8.3 m. Conglomerate, granule and pebble, gray-pink, sorted and stratified, lenticular; massive beds; contains thin-bedded sandstone having ripple marks; 1.6 m. Sandstone, conglomeratic, gray-pink, thin-bedded, crossbedded; contains lenticular silty sandstone beds having ripple marks; grades down into sandstone; 1.0 m. Sandstone, gray-pink, thin- to thick-bedded, pebbly, sorted and stratified; trough crossbedding; contains conglomerate in lower part; 1.5 m (13.0 m; cum 1550.8 m)

Unit 76 Shale, dark-gray, lenticular; 0.3 m. Sandstone, conglomeratic, gray-pink, medium-bedded, crossbedded; grades down into sandstone; 1.6 m. Sandstone, coarse-grained, gray; contains lenses of granule and pebble conglomerate; thick-bedded, small trough crossbedding, shaley partings; 9.8 m. Sandstone, conglomeratic, gray, medium-bedded, crossbedded; silty partings; 1.5 m. Sandstone, thin-bedded, gray; contains ripple marks, lesser interbedded siltstone and shale; grades down into sandstone; 1.2 m. Sandstone, coarse-grained, gray-pink, thick-bedded, laminated; low-angle crossbedding; grades down into sandstone; 6.5 m. Sandstone, gray, medium-bedded; thin-bedded in lower part; massive beds having load casts at base, ripple marks, siltstone and shale partings; 3.5 m. Sandstone, silty, gray, thin-bedded; 0.6 m (25.0 m; cum 1537.8 m)



DESCRIPTION OF UNITS

Unit 75 Shale, silty, brown-black; grades down into sandstone; 0.9 m. Sandstone, gray, thick-bedded, laminated; contains ripple marks; 6.8 m (7.7 m; cum 1512.8 m)

Unit 74 Shale and siltstone member (units 74-71): Shale, silty, brown, 0.9 m. Sandstone, pebbly, gray, thin- to medium-bedded, lenticular; siltstone and shale partings; 6.7 m (7.6 m; cum 1505.1 m). Offset section 500 m south along top of unit 74

Unit 73 Shale, silty, brown-black; weathers blocky in upper part; 19.7 m (cum 1497.5 m)

Unit 72 Sandstone, pebbly, gray-pink, thin- to thick-bedded; interbedded shale; 7.5 m (cum 1477.8 m)

Unit 71 Shale, brown-black; interbedded thin-bedded siltstone and sandstone; 12.3 m (cum 1470.3 m)

Unit 70 Sandstone, coarse-grained, gray, thin-bedded, crossbedded; 2.5 m. Sandstone, siltstone, and shale, gray, interbedded, thin-bedded; contains ripple marks; poorly exposed; 8.0 m. Sandstone, conglomeratic, gray-pink; contains pebbles of granitic gneiss and vein quartz to 4 cm; thick-bedded, interbedded with gray-green siltstone; 1.8 m. Sandstone, gray, thin-bedded; trough crossbedding, ripple cross-lamination; interbedded with siltstone and shale; 7.0 m. Sandstone, conglomeratic, gray, medium-bedded, crossbedded; silty partings; 15.3 m. Sandstone, gray, medium- to thin-bedded; shaley partings; 5.9 m (40.5 m; cum 1458.0 m)

Unit 69 Siltstone and shale, gray, thin-bedded; grades down into shale; 0.8 m. Shale, silty, brown; contains interbedded siltstone; 1.4 m. Sandstone, silty, gray, thin-bedded; contains ripple marks; grades down into shale; 0.9 m. Shale, brown-black; 1.8 m. Sandstone, gray, thin-bedded; 0.7 m. Shale, silty, brown-black; 1.8 m (7.4 m; cum 1417.5 m)

Unit 68 Sandstone, gray, thin-bedded; contains ripple marks; grades down into sandstone; 1.8 m. Sandstone, granule-bearing, gray-pink, thick-bedded, crossbedded; 3.7 m (5.5 m; cum 1410.1 m)

Unit 67 Sandstone, siltstone, and shale, brown, interbedded, thin-bedded; contains ripple marks; 6.0 m. Sandstone, gray, thin-bedded; contains ripple marks; grades down into sandstone; 1.7 m. Sandstone, gray, medium-bedded; grades down into sandstone; 2.8 m. Sandstone, gray, thin-bedded; interbedded with siltstone; contains ripple marks; 2.4 m (12.9 m; cum 1404.6 m)

Unit 66 Siltstone and silty limestone, gray; weathers brown; massive to wavy-laminated (paleocaliche?); no fossils; 0.6 m. Sandstone, conglomeratic, gray-pink; contains abundant granules and shale partings; 1.1 m. Siltstone, thin-bedded, gray; contains ripple marks; grades down into siltstone and shale; 1.1 m. Siltstone and shale, interbedded, gray; 1.9 m (4.7 m; cum 1391.7 m)

Unit 65 Sandstone, coarse-grained, gray, thin-bedded; grades down into sandstone; 1.9 m. Sandstone, coarse-grained, gray-pink; contains abundant granules; medium-bedded; grades down into sandstone; 2.1 m. Sandstone, conglomeratic, gray-brown; contains pebbles to 10 cm; thick-bedded; 7.3 m. Sandstone, coarse-grained, gray, and siltstone, thin-bedded, gray; contains ripple marks; grades down into sandstone; 2.7 m. Sandstone, conglomeratic, gray-pink; contains pebbles to 3 cm; thick-bedded; grades down into sandstone; 6.7 m. Sandstone, coarse- to medium-grained, gray, thick-bedded; lesser interbedded siltstone, ripple marks; grades down into sandstone; 6.1 m. Sandstone, conglomeratic (pebbles), gray-pink, medium- to thick-bedded; siltstone partings; 16.1 m (42.9 m; cum 1387.0 m)

Unit 64 Shale, gray-brown; 1.1 m. Sandstone, conglomeratic (granules), gray-pink, thin-bedded; thick-bedded in lower part; massive beds; 8.7 m (9.8 m; cum 1344.1 m)

Unit 63 Shale and sandstone member (units 63-58): Siltstone and sandstone, brown, thin-bedded, platy; contains ripple marks and interbedded, gray-brown silty shale; 38.1 m (cum 1334.3 m)

Unit 62 Sandstone, silty, brown, thin-bedded; 4.3 m. Sandstone, conglomeratic, pink, thick- to medium-bedded; trough crossbedding; 10.0 m (14.3 m; cum 1296.2 m)

Unit 61 Shale, silty, brown, poorly exposed; 6.7 m (cum 1281.9 m)

Unit 60 Sandstone, gray, thin-bedded, laminated, cross-laminated; 3.5 m. Shale, brown-black, poorly exposed; 1.4 m. Sandstone, medium- to coarse-grained, gray, thin-bedded; contains ripple cross-lamination, siltstone partings; 2.0 m. Shale, brown-black, poorly exposed; 2.9 m (9.8 m; cum 1275.2 m)

Unit 59 Sandstone, gray-brown, thin-bedded; contains interbedded siltstone; 8.4 m. Sandstone, conglomeratic (granules), pink; 0.9 m. Sandstone, gray-brown, thin-bedded, lenticular, crossbedded; contains interbedded siltstone; 3.8 m (13.1; cum 1265.4 m)

Unit 58 Shale, gray-brown, poorly exposed; 7.9 m (cum 1252.3 m)

Unit 57 Sandstone, coarse-grained, gray, thin-bedded, massive; contains interbedded siltstone; poorly exposed; 8.8 m. Sandstone, gray, siltstone, gray-brown, and shale, black, interbedded; 1.2 m. Sandstone, conglomeratic, gray-pink, thin- to thick-bedded, massive and crossbedded; contains ripple marks and ripple cross-lamination; contains interbedded siltstone and gray-black shale; grades down into sandstone; 14.4 m. Sandstone, medium-grained, gray, thin-bedded, crossbedded; contains interbedded siltstone; grades down into sandstone; 3.3 m. Sandstone, conglomeratic, gray, thick-bedded, massive to crossbedded; 4.7 m (32.4; cum 1244.4 m)

Unit 56 Siltstone, shaley, gray-brown, fissile; 6.3 m (cum 1212.0 m)

Unit 55 Sandstone, coarse-grained and pebbly, gray, thin- to thick-bedded, crossbedded; siltstone partings; 10 m (cum 1205.7 m)

Unit 54 Sandstone, coarse-grained, gray, medium- to thin-bedded; massive and graded beds deposited by turbidity flows; siltstone and shale partings; grades down into conglomerate; 27.5 m. Conglomerate, pebbly, gray, massive; fills channel; 7.9 m. Sandstone, gray, medium-bedded, pebbly in upper part; massive and graded beds deposited by turbidity flows; shale partings; grades down into sandstone; 5.1 m. Sandstone, medium- to coarse-grained, gray, medium-bedded, massive to laminated; contains layers of granules; possibly deposited by turbidity flows; siltstone partings; 5.4 m (45.9 m; cum 1195.7 m). Located strike south from east shore, Eureka Lake

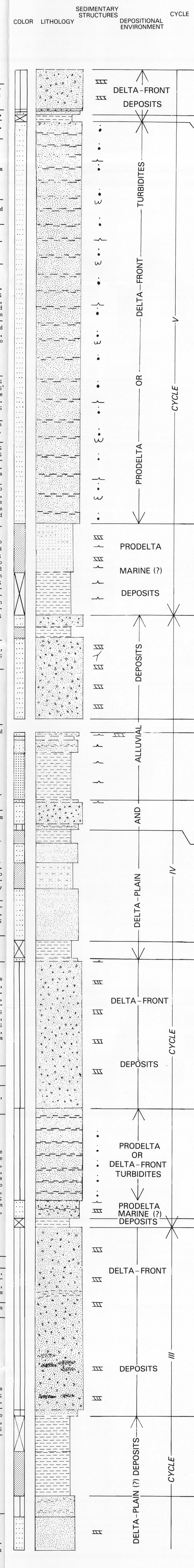
Unit 53 Covered, probably shale; 10.7 m (cum 1149.8 m)

Unit 52 Conglomeratic sandstone member (units 52-47): Sandstone, gray, thin-bedded; grades down into siltstone; 2.6 m. Siltstone, red-gray, thin-bedded; grades down into sandstone; 0.5 m. Sandstone, conglomeratic, gray-pink, thick-bedded; 2.0 m (5.1 m; cum 1139.1 m)

Unit 51 Shale and siltstone, brown-black, poorly exposed; 4.9 m (cum 1134.0 m)

Unit 50 Sandstone, conglomeratic, gray, massive to crossbedded; grades down into sandstone; 4.5 m. Sandstone, gray, thin-bedded; contains interbedded siltstone; grades down into sandstone; 4.5 m. Sandstone, conglomeratic (pebbles), gray-pink, medium- to thick-bedded, crossbedded; siltstone partings; grades down into sandstone; 25.9 m. Sandstone, gray-pink, medium- to thick-bedded, crossbedded; siltstone partings; grades down into sandstone; 7.0 m. Sandstone, fine- to medium-grained, gray-pink, thin-bedded; trough crossbedding; 18.7 m (60.6 m; cum 1129.1 m)

Unit 49 Siltstone, sandy, red-gray, thin-bedded; abundant ripple cross-lamination; contains interbedded shaley siltstone; 22.3 m (cum 1068.5 m)



DESCRIPTION OF UNITS

Unit 48 Sandstone, conglomeratic (granules), gray-pink, massive; trough crossbedding; 12.5 m. Sandstone, pebbly, gray-pink, laminated; 0.6 m. Sandstone, medium-grained, gray, finely laminated; 1.2 m (14.3 m; cum 1046.2 m)

Unit 47 Shale, silty, black-brown; 1.8 m (cum 1031.9 m)

Unit 46 Main turbidite member: Sandstone, medium-grained to granule-rich, gray, medium- to thick-bedded; graded to massive beds; ripple cross-lamination and ripple marks at tops of beds, load casts at base of beds; interbedded dark-gray siltstone and shale, generally as thin beds and partings; 3-m-thick black shale 39 m below top; sand beds deposited by turbidity flows; 123.8 m (cum 1030.1 m)

Unit 45 Siltstone, shale, and sandstone, interbedded; sandstone, gray-brown, contains trough crossbedding and ripple marks; siltstone, gray-brown, laminated and cross-laminated; shale, gray-black; 14.8 m. Shale, gray-black; contains minor interbedded brown siltstone and sandstone and ripple marks; 13.0 m (27.8 m; cum 906.3 m). Plant fragments at this stratigraphic level 1.6 km north along strike; articulated pelecypod valves on ridge 1.5 km south; offset 200 m north along strike to cliffs above Eureka Lake

Unit 44 Sandstone, conglomeratic, gray, thick-bedded; 4.0 m. Shale, gray-brown; minor interbedded siltstone; poorly exposed; 3.0 m. Sandstone, conglomeratic, gray, thick-bedded, massive to laminated; contains trough crossbedding, plant stems, shaley partings; 25.2 m (32.2 m; cum 878.5 m)

Unit 43 Covered, 4.0 m (cum 846.3 m)

Unit 42 Sandstone and siltstone, gray, thin-bedded, laminated, crossbedded; contains ripple marks; grades down into siltstone; 1.1 m. Siltstone, gray-green, fissile, wavy-laminated; brown-black shale in lower part; grades down into sandstone; 1.1 m. Sandstone, gray, thin- to medium-bedded; contains ripple marks and interbedded black shale; grades down into shale, sandstone, and siltstone; 4.0 m. Shale, sandstone, and siltstone, interbedded, gray-brown; abundant ripple marks, detrital muscovite; contains trace red mudstone drapes; 14.5 m (20.7 m; cum 842.3 m)

Unit 41 Sandstone, gray, thin-bedded, laminated; contains ripple marks; grades down into sandstone; 0.5 m. Sandstone, conglomeratic, gray, thick-bedded, massive to laminated; grades down into sandstone; 7.1 m. Sandstone, gray, thin-bedded; pale-red siltstone partings containing conspicuous detrital muscovite; 1.4 m (9.0 m; cum 821.6 m)

Unit 40 Shale and siltstone, interbedded, gray-brown; 4.8 m. Sandstone, gray, thin- to medium-bedded, laminated, poorly exposed; 6.0 m. Siltstone, gray-green, and shale, gray-brown, interbedded, poorly exposed; 8.1 m. Sandstone, gray, thin-bedded, poorly exposed; 15.5 m (34.4 m; cum 812.6 m)

Unit 39 Shale, gray-black, poorly exposed; 5.6 m (cum 778.2 m)

Unit 38 Sandstone and siltstone, gray, thin-bedded, laminated; contains ripple marks; grades down into sandstone; 1.1 m. Sandstone, conglomeratic (granules), gray-pink, thick-bedded, massive to crossbedded(?); sheared by small fault; 45.0 m (46.1 m; cum 772.6 m). Leaf impressions of *Neuropteris* sp. (identified by R. M. Kosanke, oral commun., 1982) in sandstone at about same stratigraphic level on ridge 2.0 km north

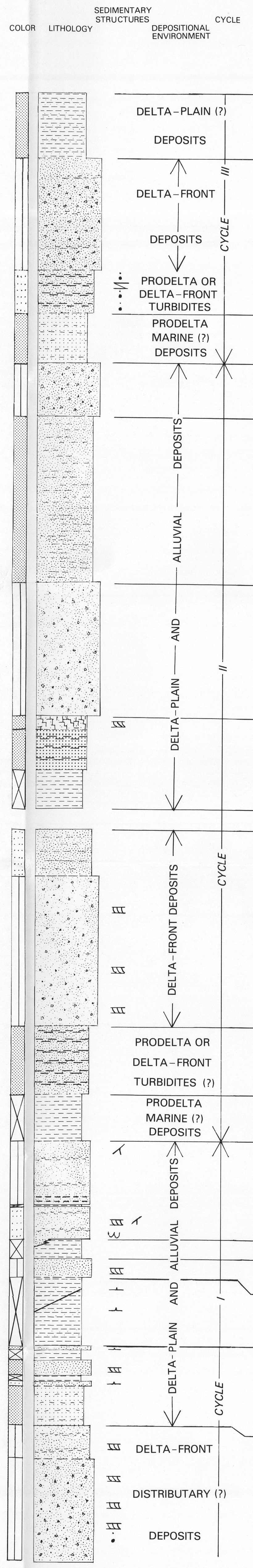
Unit 37 Sandstone, coarse-grained, granule-bearing, gray-pink, thin- to medium-bedded; graded, massive, and laminated beds deposited by turbidity flows; gray shale partings; 29.5 m. Sandstone, locally pebbly, gray, medium-bedded, massive to crossbedded; ripple cross-lamination; 5.0 m (34.5 m; cum 726.5 m)

Unit 36 Shale, gray-black, poorly exposed; 3.4 m (cum 692.0 m)

Unit 35 Sandstone, conglomeratic, gray-pink, thin-bedded; thick-bedded in lower part, trough crossbedding; contains local lenses of granitic pebble conglomerate, siltstone, and shale; grades down into sandstone; 56.0 m. Sandstone, gray-pink, medium-bedded; 2.2 m (58.2 m; cum 688.6 m). Forms ridge passing downhill to southeast shore, Hermit Lake

Unit 34 Shale, gray-black; contains interbedded gray-brown siltstone; poorly exposed; grades down into shale; 10.8 m. Shale, gray-brown, poorly exposed; 13.6 m (24.4 m; cum 630.4 m)

Unit 33 Sandstone and siltstone, interbedded, gray-pink, poorly exposed; 6.7 m. Sandstone, gray, thin-bedded, laminated; trough crossbedding; poorly exposed; 9.6 m (16.3 m; cum 606.0 m)



DESCRIPTION OF UNITS

Unit 32 Shale, gray-brown; interbedded siltstone; 15.0 m (cum 589.7 m). Abundant *Calamites* trunks and branches near this stratigraphic level on ridge 1.8 km north

Unit 31 Sandstone, conglomeratic, gray-pink, medium- to thick-bedded, massive; contains interbedded gray-green siltstone; grades down into sandstone; 25.5 m. Sandstone, gray, medium-grained, thin-bedded, massive to laminated; low-angle crossbedding; graded beds, possibly deposited by turbidity flows; contains interbedded gray-green siltstone; 10.4 m (35.9 m; cum 574.7 m). Offset 50 m uphill

Unit 30 Siltstone and shale, brown, thin-bedded, poorly exposed; 11.3 m (cum 538.8 m)

Unit 29 Sandstone, conglomeratic, pink, thick-bedded; 12.3 m (cum 527.5 m)

Unit 28 Sandstone, siltstone, and shale, interbedded, gray-brown, thin-bedded, laminated, poorly exposed; 38.1 m (cum 515.2 m)

Unit 27 Sandstone, conglomeratic, gray-pink, thick-bedded, massive; contains pebbles of granitic rock; 30.2 m (cum 477.2 m)

Unit 26 Siltstone and sandstone, calcareous, brown, thin-bedded; small-scale trough crossbedding; sandy limestone containing fish scales(?) in lower part; grades down into siltstone; 6.0 m. Siltstone, some calcareous and shaley, brown, thin-bedded, poorly exposed; 8.5 m. Shale, brown-black, poorly exposed; 8.3 m (22.8 m; cum 446.9 m)

Unit 25 Covered, 5.1 m (cum 424.1 m)

Unit 24 Sandstone and siltstone, interbedded, shaley, gray, thin-bedded, poorly exposed; grades down into sandstone; 10.5 m. Sandstone, conglomeratic (granules and pebbles), pink, thick-bedded; trough crossbedding; 33.9 m (44.4 m; cum 419.0 m). Foresets 5 m thick, containing ripple marks parallel to strike of foresets, at same stratigraphic level above Hermit road

Unit 23 Sandstone and siltstone, coarse-grained in upper part, brown, thin- to medium-bedded, massive to laminated; possibly deposited by turbidity flows; interbedded gray-black shale abundant in lower part; 15.6 m (cum 374.6 m). Graded beds and flute casts at same stratigraphic level above Hermit road

Unit 22 Shale, gray-black; 10.7 m (cum 359.0 m)

Unit 21 Sandstone, coarse-grained, gray-pink, thin- to medium-bedded, massive to laminated; contains plant fragments; interbedded shale and siltstone in upper and lower part; 14.8 m. Shale, black; contains interbedded brown siltstone; 0.3 m. Sandstone, coarse-grained, gray, thin-bedded, laminated; trough crossbedding, plant fragments, load casts at base; intertongues with underlying shale; 7.1 m (22.2 m; cum 348.3 m)

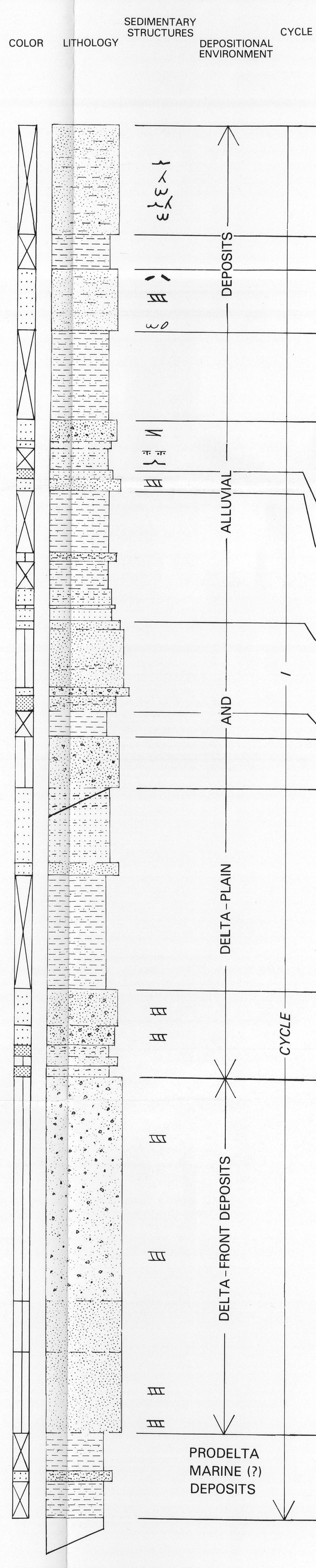
Unit 20 Shale, black, thin-bedded; contains interbedded light-brown calcareous siltstone; 4.5 m (cum 326.1 m)

Unit 19 Sandstone, coarse-grained, pebbly near base, gray-pink, lenticular; fills channels; laminated; trough crossbedding; 4.2 m (cum 321.6 m)

Unit 18 Shale, calcareous, gray-black, laminated; interbedded brown siltstone abundant in upper 3 m and sparse below; contains ripple marks; 14.1 m (cum 317.4 m). Branch of Spread Eagle Peak thrust cuts shale; offset probably small

Unit 17 Sandstone, calcareous, brown, lenticular, laminated, cross-laminated; 0.5 m. Shale, brown-black; grades down into sandstone; 2.1 m. Sandstone, gray-brown, lenticular, thin-bedded; massive to weakly laminated in upper part, trough crossbedding in lower part, load casts at base; 3.8 m. Shale, black; 1.5 m. Sandstone, coarse-grained, gray-green; contains ripple marks at top; massive to laminated; convolute lamination; plant stems; grades down into siltstone and shale; 1.1 m. Siltstone and shale, gray and brown, platy, laminated; 9.2 m (18.2 m; cum 303.3 m)

Unit 16 Sandstone, gray-pink, thin- to medium-bedded, crossbedded; shale partings; grades down into sandstone; 8.1 m. Sandstone, coarse-grained, conglomeratic (pebbles and granules) in upper part, gray-pink, thick-bedded, massive to crossbedded; some beds lenticular and graded in lower part; 23.3 m (31.4 m; cum 285.1 m)



DESCRIPTION OF UNITS

Unit 15 Sandstone, gray, siltstone, dark-gray, and shale, black, interbedded; sandstone beds massive to laminated, lenticular, having load casts on bottoms of beds and ripple marks on tops; *Calamites* branches or trunks; 19.7 m (cum 253.7 m)

Unit 14 Shale, silty, black; contains interbedded siltstone; 6.4 m (cum 234.0 m)

Unit 13 Sandstone, medium-grained, gray, thin-bedded; lenticular beds filling small channels; weakly crossbedded, contains ripple marks, mud chips, load casts, flute casts; contains interbedded siltstone and black shale; 11.1 m (cum 227.6 m)

Unit 12 Shale and siltstone, dark-gray-green to brown-black, poorly exposed; 16.1 m (cum 216.5 m)

Unit 11 Sandstone, locally pebbly, gray, thin-bedded, laminated; low-angle crossbedding; grades down into siltstone; 4.2 m. Siltstone, gray, thin-bedded; grades down into siltstone and shale; 1.3 m. Siltstone and shale, interbedded, gray-green to brown-black, laminated and cross-laminated; calcareous upper half, limestone nodules, ripple marks; contains two graded sandstone beds; 4.2 m (9.7 m; cum 200.4 m)

Unit 10 Sandstone and siltstone, gray-brown, thin-bedded; 1.5 m. Sandstone, gray, thin-bedded, lenticular; trough crossbedding in upper part; 2.5 m (4.0 m cum 190.7 m)

Unit 9 Shale, silty, gray-green to brown-black; contains interbedded platey siltstone; poorly exposed; 10.4 m. Sandstone, silty, gray-pink, thin-bedded, lenticular; 1.6 m. Shale and siltstone, interbedded, gray-brown to black; grades down into siltstone; 7.9 m. Siltstone, shaley, gray-green, platy, thin-bedded, poorly exposed; 3.3 m. Sandstone, gray-pink, weakly laminated; 0.5 m. Siltstone, dark-gray-green, platy; 2.0 m (25.7 m; cum 186.7 m)

Unit 8 Sandstone, medium-grained, gray, thin-bedded in upper part, laminated; grades down into sandstone; 1.5 m. Sandstone, coarse-grained, gray-pink, thick-bedded, massive; contains interbedded laminated gray-brown siltstone; 9.8 m. Sandstone, conglomeratic, gray, thick-bedded; 1.4 m. Sandstone, gray, thin- to medium-bedded; contains interbedded gray-brown siltstone; 2.8 m (15.5 m; cum 161.0 m)

Unit 7 Shale, brown-black; 4.2 m (cum 145.5 m)

Unit 6 Sandstone, conglomeratic, gray-pink, medium- to thick-bedded; contains granitic granules; 9.3 m (cum 141.3 m)

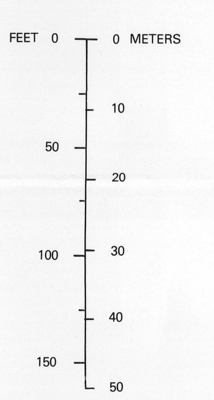
Unit 5 Siltstone and shale, silty, dark-gray, thin-bedded; grades down into sandstone; 13.6 m. Sandstone, gray, massive to laminated; 2.1 m. Shale, silty, gray-black, platy, sheared; 20.1 m (35.8 m; cum 132.0 m). Branch of Spread Eagle Peak thrust cuts top of unit 5

Unit 4 Sandstone, pebbly, gray, thick-bedded, crossbedded, fractured; grades down into sandstone; 6.1 m. Sandstone, gray, crossbedded, sheared and brecciated; 6.3 m. Siltstone and shale, dark-gray and brown; grades down into sandstone; 2.1 m. Sandstone, pebbly, pink; 1.1 m. Siltstone and shale, brown, platy; 2.1 m (17.7 m ; cum 96.2 m)

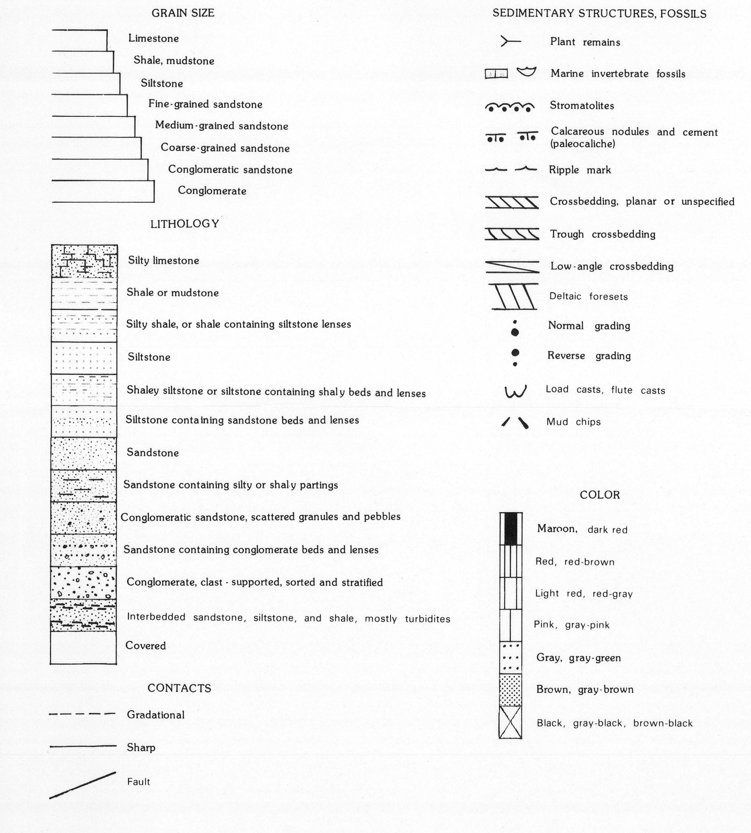
Unit 3 Sandstone, conglomeratic, gray-pink, thick-bedded, massive to crossbedded; contains abundant granules and pebbles of granitic rocks; grades down into sandstone; 40.7 m. Sandstone, coarse-grained, pink, medium-bedded, thin-bedded in lower part; grades down into sandstone; 9.4 m. Sandstone, coarse-grained, gray-pink, thin-bedded; planar crossbedding; 14.1 m (64.2 m; cum 78.5 m). Unit 3 crosses peak 12194

Unit 2 Shale, silty, brown-black, poorly exposed; 6.8 m. Sandstone, silty, gray, platy, laminated; 1.8 m. Shale, silty, brown-black, fissile; contains interbedded siltstone; 5.7 m (14.3 m; cum 14.3 m)

Unit 1 Covered. Spread Eagle Peak thrust



EXPLANATION



REFERENCE SECTION FOR THE MINTURN FORMATION (MIDDLE PENNSYLVANIAN) NORTHERN SANGRE DE CRISTO RANGE, CUSTER COUNTY, COLORADO

By
D. A. Lindsey, R. F. Clark, and S. J. Soulliere

1985

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1985

For sale by Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225