MEASURED SECTIONS OF THE MORRISON FORMATION AND RELATED ROCKS IN NORTHWESTERN NEW MEXICO

E.S. Santos & R.H. Moench

1971

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Measured Sections of the Morrison Formation and Related Rocks in Northwestern New Mexico

By

E. S. Santos and R. H. Moench

Open-file report

1971

Contents

Illustration

Table

MEASURED SECTIONS OF THE MORRISON FORMATION AND RELATED ROCKS IN NORTHWESTERN NEW MEXICO

By E. S. Santos and R. H. Moench

INTRODUCTION

This report presents 19 measured sections of the Morrison Formation and other sedimentary rock units mostly of Late Jurassic age in Valencia, Bernalillo, and Sandoval Counties of northwestern New Mexico (fig. 1). Table 1 gives the locations and thickness of units that were measured but are not described herein. The sections were measured by U.S. Geological Survey personnel in connection with geologic studies in the area.

Sections 1-6 and the data in table 1 will be used in a comprehensive report on the strata of Jurassic age in Sandoval County. Sections 7-19 are the complete data used to make plate 1 in U.S. Geol. Survey Prof. Paper 519, 1967, "Geology and Uranium Deposits of the Laguna District, New Mexico," by R. A. Moench and J. S. Schlee. Sections 7-13 appear from left to right in fence A-A'; 14, 15, and 19 in fence B-B'; and 16, 17, and 18 in fence C-C'. There is no description of the third section from the left in fence B-B'.

Rock colors are from the "Rock-Color Chart" of the National Research Council, Goddard, E. N., Chm., and others, published in 1948.

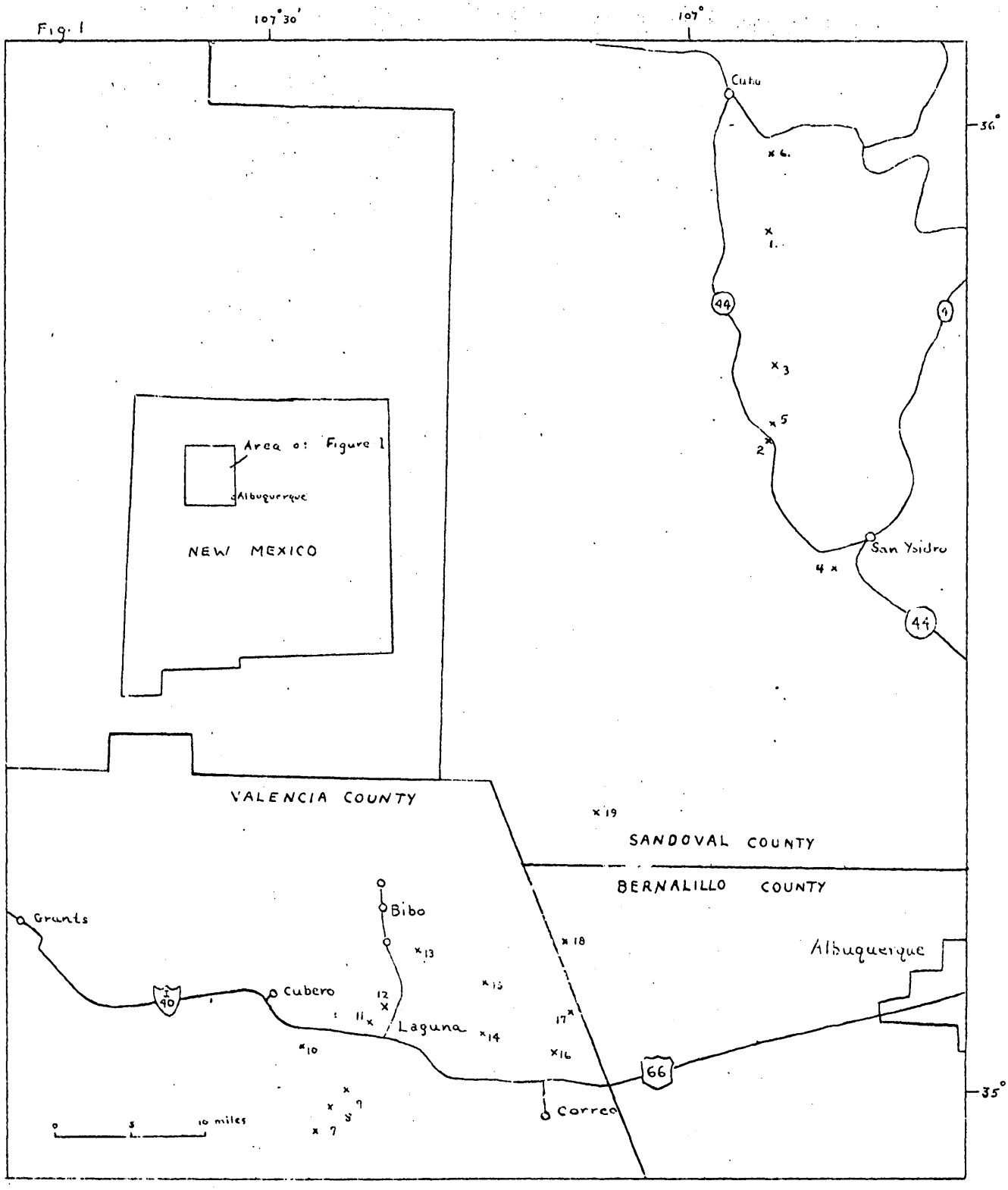

Figure 1.--Index map of New Mexico showing the location of 19 described measured sections

Table 1.--Thickness of Jurassic units in the San Ysidro-Cuba area, Sandoval County, N. Mex., measured but not described.

[Measured by E. S. Santos, 1967-68. Leaders (---) indicate not measured.]

Locality	Morrison Formation				Summerville Formation	Entrada Sandstone
	Jackpile sandstone of economic usage	Brushy Basin Member (excluding the Jackpile sandstone)	Westwater Canyon Member	Recapture Member		
	Thickness (feet)					
T. 15 N., R. 1 E.						
NE 1/4 sec. 1	60.0+	-------	------	-----	-----	-----
C sec. 17	-------	272.0	------	-----	-----	-----
CE 1/2 sec. 20	84.0	287.0	92.0	-----	-----	-----
SE 1/4 sec. 20	-------	252.0+	124.0	1/314.5	-----	-----
SE 1/4 sec. 21	57.0	268.0	105.0	-----	-----	-----
NW 1/4 sec. 23	-------	------	59.0	-----	-----	-----
NE 1/4 sec. 28	43.0	326.0	-----	-----	-----	-----
CS 1/2 sec. 29	-------	------	157.0	-----	-----	-----
NE 1/4 sec. 30	-------	------	88.0	-----	-----	-----
NE 1/4 sec. 31	72.0	------	-----	-----	-----	-----
CW 1/2 sec. 32	98.0	------	-----	-----	-----	-----
T. 15 N., R. 1 W.						
CE 1/2 sec. 12	-------	------	155.0	-----	-----	-----
NE 1/4 sec. 15	41.0	263.5	-----	-----	-----	-----
SE 1/4 sec. 16	55.0	------	-----	-----	-----	-----
NE 1/4 sec. 36	35.0	------	-----	-----	-----	-----
T. 16 N., R. 1 E.						
SW 1/4 sec. 30	-------	------	-----	-----	-----	136.0
CE 1/2 sec. 32	-------	------	221.0	340.0	36.0	-----
T. 16 N., R. 1 W.						
SW 1/4 sec. 3	-------	264.0	52.0	-----	-----	-----
NE 1/4 sec. 3	-------	------	60.0	192.0	-----	-----
SW 1/4 sec. 4	104.0	------	-----	-----	-----	-----
SE 1/4 sec. 16	64.0	------	-----	-----	-----	-----
SE 1/4 sec. 23	-------	------	84.0	-----	-----	-----
CW 1/2 sec. 24	-------	------	-----	-----	-----	97.5
SW 1/4 sec. 27	95.0	------	-----	-------	-----	-----
T. 17 N , R. 1 E.						
SE 1/4 sec. 30	-------	------	-----	-----	-----	146.0
NW 1/4 sec. 31	-------	------	77.5	-----	-----	-----
T. 17 N., R. 1 W.						
SW 1/4 sec. 1	60.0	------	-----	-----	-----	-----
SE 1/4 sec. 1	78.5	------	-----	-----	-----	-----
SE 1/4 sec. 11	55.0	------	-----	-----	-----	-----
SW 1/4 sec. 12	-------	305.0	116.0	-----	-----	-----
NE 1/4 sec. 12	-------	288.0	------	-----	-----	-----
NW 1/4 sec. 13	-------	------	42.0	-----	-----	-----
SE 1/4 sec. 13	-------	------	40.0	297.0	50.0	-----
SE 1/4 sec. 24	-------	------	60.0	294.0	-----	-----
SE 1/4 sec. 25	-------	------	83.0	-----	-----	-----
NW 1/4 sec. 25	88.0	348.0	-----	-----	-----	-----
SE 1/4 sec. 35	-------	------	-----	220.0	-----	-----
NE 1/4 sec. 36	-------	------	117.0	-----	-----	-----
T. 18 N., R. 1 E.						
SW 1/4 sec. 31	140.0	193.0	-----	-----	-----	-----
T. 18 N., R. 1 W.						
SW 1/4 sec. 12	105.0	252.0	-----	-----	-----	-----
C sec. 13	95.0	330.0	80.0	-----	-----	-----
NE 1/4 sec. 24	-------	------	-----	208.0	-----	-----
CE 1/2 sec. 24	-------	356.0	105.0	-----	-----	-----
SE 1/4 sec. 24	135.0	------	-----	-----	-----	-----
NE 1/4 sec. 36	113.0	317.0	-----	-----	-----	-----
T. 19 N., R. 1 W.						
NW 1/4 sec. 1	115.0	------	126.0	185.0	-----	-----
SW 1/4 sec. 1	-----	------	-----	-----	-----	98.0+
NE 1/4 sec. 14	163.0	284.0	142.0	-----	-----	179.5
SW 1/4 sec. 25	144.0	------	-----	-----	-----	-----
SW 1/4 sec. 36	154.0	248.0	25.0	-----	-----	-----
T. 20 N., R. 1 W.						
SE 1/4 sec. 2	98.0	260.0	-----	-----	-----	116.0
SW 1/4 sec. 13	110.0	268.0	25.0	292.0	-----	-----
SW 1/4 sec. 24	80.0	------	51.0	350.0	-----	-----

1/ Includes Summerville Formation.

MEASURED SECTIONS

1. LOS PINOS section - Sandoval County, N. Mex.

[Measured by E. S. Santos, May 1967. NW 1/4 sec. 13 and NE 1/4 sec. 14, T. 19 N., R. 1 W. Most of the Recapture Member and Todilto Limestone is covered and only a partial description and total thickness are given]

	Feet
Mancos Shale (incomplete):	
29. Sandstone, very pale orange (10YR 8/2) and mottled grayish-orange (10YR 7/4); very fine grained, well sorted, flaggy----------	30.0
28. Shale, dark-gray (N4); interbedded with thin coal seams and silty carbonaceous trash----------	90.0
Total Mancos Shale (incomplete)----------	120.0
Dakota(?) Sandstone:	
27. Sandstone, light-gray (N8) and grayish-orange-pink (5YR 7/2); fine, medium, and coarse grained; contains carbonaceous trash seams near base; top 1-2 ft is very hard, siliceous----	22.0
Morrison Formation:	
Brushy Basin Member:	
Jackpile(?) sandstone of economic usage:	
26. Sandstone, very pale orange (10YR 8/2); fine, medium, and coarse grained, with conglomeratic lenses at base. Speckled with yellow limonite spots----------	50.0
A sandstone-on-sandstone contact occurs here, and the exact boundary between the Dakota Sandstone and Morrison Formation is arbitrarily chosen at the zone of carbonaceous trash in unit 27.	
25. Mudstone, light-olive-gray (5Y 5/2); very sandy----------	5.0
24. Sandstone, very pale orange (10YR 8/2); medium grained; several 1-foot-thick green mudstone lenses; hard siliceous red-stained top----------	48.0

1. LOS PINOS section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

Jackpile(?) sandstone of economic usage--Continued

		Feet
23.	Sandstone, grayish-orange (10YR 7/4 and very pale orange (10YR 8/2); very coarse grained with conglomeratic lenses at top and bottom of unit and pebbles as large as 1 in. in diameter; forms massive cliff----------	65.0
	Total Jackpile(?) sandstone of economic usage----------	168.0
22.	Mudstone and siltstone, grayish-yellow-green (5GY 7/2) and moderate-brown (5YR 4/4), with zones of hard silicified siltstone which is moderate reddish brown (10R 4/0); red and green colors alternate----------	123.0
21.	Sandstone, very pale orange (10YR 8/2); fine grained----------	8.5
20.	Mudstone, grayish-yellow-green (5GY 7/2)----------	5.0
19.	Sandstone, grayish-yellow (5Y 8/4), with some mottling of moderate-yellow (5Y 7/6); mostly medium grained with some fine- and coarse-grained lenses----------	30.0
18.	Covered slope; weathered material is pale orange and green, probably mudstone and siltstone--------	35.0
17.	Sandstone, very pale orange (10YR 8/2); fine grained, with some medium-grained strata----------	31.0
16.	Covered slope, like unit 19----------	62.0
	Total Brushy Basin Member----------	462.5

1. LOS PINOS section--Continued

Morrison Formation--Continued	Feet
Westwater Canyon Member:	
15. Sandstone, various shades of grayish-orange (near 10YR 7/4 with some pinkish-gray (5YR 8/1) near top; medium, fine, and coarse grained, abundant white clay spots; crossbedded, massive to blocky; forms cliffs and ledges----------	60.0
14. Mudstone and siltstone, grayish-yellow-green (5GY 7/2), pale-olive (10Y 6/2), grayish-red (10R 4/2), and grayish-brown (5YR 3/2)---------	20.0
13. Sandstone, grayish-orange (10YR 7/4); medium and fine grained; forms steep slope----------	22.0
12. Sandstone, grayish-orange (10YR 7/4); medium and fine grained, soft, friable, in contrast with the more indurated unit above.	40.0
Total Westwater Canyon Member----------	142.0
Recapture Member:	
11. Mudstone; grayish-brown (5YR 3/2), some green mottling----------	3.0
10. Sandstone, grayish-orange-pink (5YR 7/2), abundant black and orange grains; fine-grained, soft, friable; bedding obscure--------	42.0
9. Remainder of Recapture Member is mostly covered, but small patches of bedrock are exposed. These are mostly sandstone, like unit 11, and sandy siltstone which is moderate reddish brown (10R 4/6). The Summerville Formation, if it is present here, is covered, and is included in the thickness below unit 9----------	315.0
Total Recapture Member (plus Summerville(?) Formation)----------	360.0
Total Morrison Formation----------	964.5

1. LOS PINOS section--Continued

	Feet
Todilto Limestone:	
8. Gypsum, very light gray (N8) to white (N9), underlain by limestone, pale-yellow-brown (10YR 6/2); gypsum has sugary texture, limestone is platy----------	138.0
Entrada Sandstone:	
Upper sandy member:	
7. Sandstone, grayish-yellow (5Y 8/4) to dark-yellowish-orange (10YR 6/6); fine-grained, with scattered medium-size grains----------	22.0
6. Sandstone, yellowish-gray (5Y 8/1) and grayish-yellow (5Y 8/4); fine-grained; zone of color change between units 5 and 7----------	30.0
5. Sandstone, yellowish-gray (5Y 8/1), some orange and sparse black grains; medium and fine grained	23.0
4. Sandstone, light-brown (5YR 6/4) and very light gray (N8); fine grained----------	5.0
3. Sandstone, light-brown (5YR 6/4), sparse black and abundant orange grains; bottom 3-6 in. is bleached nearly white; fine grained with scattered medium-size grains, weathers to slick rim----------	90.0
Total upper sandy member----------	170.0
Medial silty member:	
2. Siltstone and sandstone; siltstone is moderate brown (5YR 4/4), sandstone is light brown (5YR 6/4); very fine grained; the two lithologies are irregularly mixed, producing color and texture mottling----------	7.0
1. Sandstone, light-brown (5YR 6/4), bottom 3 in. bleached very light gray; very fine grained-----	2.5
Total medial silty member----------	9.5
Total Entrada Sandstone----------	179.5

1. LOS PINOS section--Continued

Chinle Formation (incomplete):

Mudstone, moderate-brown (5YR 4/4), top 6 in. bleached pale green; not measured, about 17 ft exposed here.

2. WARM SPRING SECTION - Sandoval County, N. Mex.

[Measured by E. S. Santos, October 1968. SW 1/4 sec. 36, T. 17 N., R. 1 W. (unsurveyed land, location approximate)]

	Feet
Todilto Limestone:	
Limestone, light-olive-gray (5Y 5/2) at base, overlain by gypsum, light-gray (N8); not measured.	
Entrada Sandstone:	
Upper sandy member:	
4. Sandstone, grayish-yellow (5Y 8/4) with streaks of brighter yellow; fine grained; bedding mostly obscure, some crossbeds discernible; forms steep slope	24.0
3. Sandstone, pinkish-gray (5YR 8/1); weathers nearly white; fine grained; forms steep slope	24.5
2. Sandstone, light-brown (5YR 6/4); medium and fine grained, some white streaks near top, color grades into unit 3 above	67.5
Total upper sandy member	116.0
Medial silty member:	
1. Siltstone, moderate-brown (5YR 4/4); sandy, slightly fissile at base; top 15 feet weathers to hoodoo shapes	59.0

3. GHOST SPRING section - Sandoval County, N. Mex.

[Measured by E. S. Santos, May 1968. SE 1/4 sec. 1, T. 17 N., R. 1 W. (unsurveyed land, location approximate)]

	Feet
Mancos Shale:	
Shale, black and dark-brown; coaly; not measured.	
Morrison Formation:	
Brushy Basin Member:	
Jackpile sandstone of economic usage:	
13. Sandstone, pinkish-gray (5Y 8/1) mottled with grayish-orange (10YR 7/4); conglomeratic, coarse and very coarse grained, with minor medium- and fine-grained beds; pebbles as large as 1/2 in. in diameter; abundant interstitial white clay----------	14.5
12. Sandstone, streaked and mottled with equal parts of pinkish-gray (5Y 8/1) and grayish-orange (10YR 7/4); medium and fine grained, with few lenses of coarse-grained and conglomeratic sandstone; crossbedded; forms cliffs and benches----------	20.5
11. Claystone, grayish-olive (10Y 4/2)----------	2.0
10. Sandstone, grayish-orange (10YR 7/4) to moderate-brown (5YR 3/4); conglomeratic, with coarse-, medium-, and fine-grained matrix; abundant green mudstone fragments; chert pebbles to 1/4 in. in diameter----------	4.0
9. Sandstone, yellowish-gray (5Y 8/4) mottled with grayish-orange (10YR 7/4); fine and medium grained, friable; forms slope----------	6.5
8. Claystone, grayish-olive (10Y 4/2)----------	2.0
7. Sandstone, various shades of brown (near 5YR 4/4); ferruginous----------	0.5

3. GHOST SPRING section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

Jackpile sandstone of economic usage--Continued

		Feet
6.	Sandstone, pinkish-gray (5YR 8/1) mottled and streaked with grayish-orange (10YR 7/4); medium and fine grained, with 2-3 in. of conglomerate at base; crossbedded; abundant white clay spots; forms cliffs and benches----------	16.0
5.	Claystone, dusky-yellow-green (5GY 5/2); very sandy----------	1.0
4.	Sandstone, yellowish-gray (5Y 8/1) speckled with grayish-orange (10YR 7/4); fine grained, few small white clay spots----------	6.0
3.	Sandstone, light-gray (N7) and dark-yellowish-brown (10YR 4/2); carbonaceous----------	0.5
2.	Claystone, grayish-olive (10Y 4/2)----------	0.5
1.	Sandstone, very pale orange (10YR 8/2) with streaks and mottling of grayish-orange (10YR 7/4); medium and fine grained, friable; forms slope---	4.5
	Total Jackpile sandstone of economic usage---	77.5

4. WHITE MESA section - Sandoval County, N. Mex.

[Measured by E. S. Santos, October 1967. SW 1/4 sec. 15, T. 15 N., R. 1 E.]

	Feet
Morrison Formation:	
Brushy Basin Member (incomplete)	
19. Mudstone and siltstone, pale-olive (10Y 6/2), moderate-reddish-orange (10R 6/6), and dark-yellowish-brown (10YR 4/2); forms slope	50.0
Westwater Canyon Member:	
18. Sandstone, light-brown (5YR 7/4); medium and coarse grained, grading to very coarse grained and conglomeratic at base; massive; abundant white kaolinite spots	12.0
17. Mudstone, pale-olive (10Y 6/2) and reddish-orange (10R 6/6); forms slope	10.0
16. Sandstone, grayish-orange (10YR 7/4); mostly medium and coarse grained but very coarse grained and conglomeratic at base; contains green mudstone pebbles and abundant white kaolinite spots; forms ledge	8.0
15. Siltstone, pale-olive (10Y 6/2); and grayish-red (10R 4/2); forms slope	7.0
14. Sandstone; like unit 16	18.0
13. Siltstone; like unit 15	31.0
12. Sandstone, very pale orange (10YR 8/2); medium and coarse grained	10.0
11. Siltstone; like unit 15	6.5
10. Sandstone, grayish-orange (10YR 6/4); mostly medium grained, with some coarse- and fine-grained beds; massive; nodular limestone at base	50.0
Total Westwater Canyon Member	152.5
Recapture Member:	
9. Siltstone, olive (10Y 5/2) and moderate-brown (5YR 3/4); sandy	5.0
8. Sandstone, pale-olive (10Y 5/2); medium to fine grained; abundant interstitial green clay	6.0

10. SOUTH CASA BLANCA MESA section--Continued

Morrison Formation:

Brushy Basin Member:

	Feet
10. Sandstone, very pale orange (weathered), white (fresh); fine to medium grained, poorly sorted; in coarser portions, strongly calcareous, friable to firmly cemented----------	13.5
9. Sandstone, very fine grained, and siltstone, yellowish-gray to light-greenish-gray (5GY 8/1); poorly cemented----------	9.0
8. Mudstone, grayish-red----------	3.0
7. Limestone, massive, dense----------	1.0
6. Mudstone, grayish-yellow-green to grayish-green (10GY 5/2); silty----------	7.0
5. Sandstone, very pale orange; medium grained, poorly sorted; a lenticular bed----------	1.2
4. Mudstone, grayish-red to grayish-yellow-green; silty; 6-in. bed of dense limestone in middle----	4.0
Total Brushy Basin Member----------	93.7

Westwater Canyon Member:

3. Sandstone, very pale orange; fine to coarse grained, locally pebbly; contains abundant feldspar; poorly sorted where coarse; firmly cemented----------	8.5

Recapture Member:

2. Siltstone and very fine grained sandstone, pale-red (5R 6/2) to grayish-red (5R 4/2) and grayish-green; calcareous, firmly cemented----------	5.5
Total Morrison Formation----------	107.7

Bluff Sandstone (not measured):

1. Sandstone, pale-greenish-yellow to pale-yellowish-orange; 20 ft from top of 5-ft bed of grayish-green and grayish-red siltstone.

4. WHITE MESA section--Continued

Morrison Formation--Continued

Recapture Member--Continued

		Feet
7.	Sandstone, pale-orange (10YR 8/2) and light-brown (5YR 7/4); fine to medium grained, some orange and black grains; forms steep slopes and benches----------	21.0
6.	Siltstone, sandy, and sandstone, silty, in alternating color-banded layers, 65 percent red hues, 35 percent gray hues with minor green streaks; red is 10R 5/4-10R 4/2, gray is 5YR 8/1, pinkish gray; forms steep slope------	102.0
5.	Sandstone, pinkish-gray (5YR 8/1); weathers nearly white; fine-grained, with abundant orange and black grains; forms steep slope----------	22.0
4.	Sandstone and siltstone, pinkish-gray (5YR 8/1), pale-brown (5YR 5/2), and grayish-red (10R 4/2), in alternating bands; fine grained; weathers to dark-brown slope----------	20.0
3.	Sandstone, pale-red (10R 6/2); fine to very fine grained, with abundant black and orange grains---	12.0
2.	Sandstone, silty, and siltstone, sandy, interbedded and color-banded; sandstone is pinkish gray (5YR 8/1) and pale red (10R 6/2), very fine to fine grained; siltstone is pale reddish brown (10R 5/4), light olive gray (5Y 6/1), and minor grayish red purple (5RP 4/2); forms slope--------	31.0
1.	Sandstone and sandy siltstone; sandstone is pinkish gray (5YR 8/1), fine-grained, with some orange and sparse black grains; siltstone is reddish brown between 10R 5/4 and 10R 4/2, in color bands 2-3 ft thick; forms slope----------	15.0
	Total Recapture Member----------	234.0

5. CACHANA SPRING section - Sandoval County, N. Mex.

[Measured by E. S. Santos, May 1968. SE 1/4 to NW 1/4 sec. 25, T. 17 N., R. 1 W. (unsurveyed land, location approximate)]

	Feet
Morrison Formation:	
Brushy Basin Member:	
Jackpile sandstone of economic usage (incomplete, top eroded):	
19. Sandstone, very light gray (N8), very pale orange (10YR 8/2), grayish-orange (10YR 7/4), and pale-red (10R 6/2); fine, medium, and coarse grained, crossbedded; forms vertical cliffs and benches----	88.0
18. Siltstone and mudstone, mostly shades of grayish-green (5Y 7/2-10Y 6/2) with some brown hues (5YR 4/2-10YR 6/2); forms slope----------	56.0
17. Sandstone, grayish-orange (10YR 7/4); fine grained friable; forms slope----------	20.0
16. Conglomerate, grayish-orange (10YR 7/4) to dark-yellowish-orange (10YR 6/6), with pebbles to 2 in. in diameter; forms bench----------	7.0
15. Claystone and siltstone, shades of orange (10R 7/4-10R 6/6) and green (5Y 7/2-10Y 6/2), in about equal parts----------	69.0
14. Sandstone, very pale orange (10YR 8/2) and grayish-orange (10YR 7/4); medium, fine, and coarse grained; luster mottled; abundant calcite cement--	24.0
13. Claystone, mainly pale-olive (10Y 6/2), with some pale-red (5R 6/2); scattered sand grains----------	30.5
12. Sandstone, grayish-orange (10YR 7/2); medium and fine grained, abundant white kaolinite spots------	15.0
11. Covered slope; some green mudstone in places--------	18.0
10. Sandstone, very pale orange (10YR 8/2); fine grained; forms hard ledge----------	5.5

5. CACHANA SPRING section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

Jackpile sandstone of economic usage (incomplete, top eroded)--Continued

	Feet
9. Claystone and siltstone, color-banded, mainly in shades of green (5Y 7/2-10Y 6/2) and red (5YR 3/2-10YR 4/2)----------	45.0
Total Brushy Basin Member ----------	378.00

Westwater Canyon Member:

8. Sandstone, pale-orange (10YR 8/4) with streaks of grayish-orange (10YR 7/4); medium, fine, and coarse grained----------	18.0
7. Claystone, grayish-yellow-green (5GY 7/2); scattered sand grains----------	3.0
6. Sandstone, grayish-orange (10YR 7/4); medium, fine, and coarse grained, massive----------	13.0
5. Sandstone, grayish-yellow-green (5GY 7/2); medium and fine grained, friable----------	.5
4. Sandstone, yellowish-gray (5Y 8/1); medium and fine grained, abundant green mudstone fragments--	3.5
3. Claystone, mainly pale-greenish-yellow (10Y 7/2), with pods and lenses of silty sandstone----------	4.0
2. Sandstone, yellowish-gray (5Y 8/1) and pale-yellowish-orange (10YR 8/4); fine and medium grained----------	22.5
1. Sandstone, very pale orange (10YR 8/2) and pale-olive (10Y 6/2); medium and fine grained, locally silty----------	12.0
0. Conglomerate, very pale orange (10YR 8/2); calcareous, abundant angular fragments of green and red siltstone, fine-grained sandstone matrix-	0.5
Total Westwater Canyon Member----------	77.0

5. CACHANA SPRING section--Continued

Morrison Formation--Continued

Westwater Canyon Member:

Unit O above rests on an irregular erosion surface cut on the underlying Recapture Member which here is thinly interbedded siltstone and sandstone, grayish red (10R 4/2), grayish yellow green (5GY 7/2), and yellowish gray (5Y 8/1). Beds are as much as 1 ft thick.

6. SENORITO section - Sandoval County, N. Mex.

[Measured by E. S. Santos, October 1967. NE 1/4 sec. 14, T. 20 N., R. 1 W.]

	Feet
Morrison Formation:	
Brushy Basin Member (incomplete):	
9. Siltstone, pale-olive (10Y 6/2), and sandy siltstone, moderate-reddish-brown (10R 6/4), with color gradation between shades of near pale-brown (5YR 6/2)----------	50.0
Recapture Member:	
8. Siltstone, moderate-brown (5YR 3/4), some pale-green mottling; slightly fissile; few 1-ft beds of silty sandstone----------	105.0
7. Sandstone, mostly grayish-orange-pink (5YR 7/2), with some very pale orange (10YR 8/2); moderate-brown (5YR 3/4) siltstone laminae; fine and very fine grained----------	80.0
6. Siltstone; same as unit 8----------	37.0
5. Sandstone; same as unit 7----------	65.0
4. Siltstone; same as unit 8----------	31.0
3. Sandstone, grayish-orange-pink (5YR 7/2); fine grained, abundant black grains, friable----------	11.0
2. Siltstone, moderate-brown (5YR 3/4), interbedded with pinkish-gray sandstone (5YR 7/1), color banded; fine and very fine grained, soft, friable----------	76.0
1. Covered slope, with yellowish-green debris----------	11.0
Total Recpature Member----------	416.0
Total Morrison Formation (incomplete)----------	466.0
Todilto Limestone:	
Gypsum, very light gray (N8); not measured.	

7. SOUTH BUTTE section, Valencia County, N. Mex.

[Measured by R. H. Moench and S. S. Moench, May 1956. South Butte quadrangle--NE 1/4 NE 1/4 sec. 10, T. 8 N., R. 6 W.]

	Feet
Dakota Sandstone (incomplete?):	
11. Sandstone, grayish-orange to pale-yellowish-orange; medium grained; quartz pebble conglomerate near base; mostly well sorted, well cemented, crossbedded; forms mesa cap----------	30.0
Morrison Formation:	
Brushy Basin Member:	
10. Mudstone, very light gray, with sparse siltstone; 9-in. bed of sandstone at base, dusky-yellow-green, very well cemented, poorly sorted, noncalcareous; contains mud clots----------	10.0
9. Mudstone, very light gray; local siltstone----------	10.0
8. Sandstone, grayish-orange (10YR 7/4); fine grained to very coarse grained, poorly sorted, well cemented; trough crossbedded----------	12.5
7. Mudstone, very light gray, locally grayish-red near top; sparse limestone nodules----------	36.0
6. Mudstone and siltstone, mixed dusky-yellow-green to pale-green, in lower half grayish-red, in upper half pale-green mixed with pale-purple to grayish-purple----------	12.0
Total Brushy Basin Member----------	80.5
Westwater Canyon Member:	
5. Sandstone, very light gray to yellowish-gray; fine grained, moderately well sorted, well cemented; forms ledge; upper 1 ft is finer grained, light greenish gray to yellow green----------	7.0

7. SOUTH BUTTE section--Continued

Morrison Formation--Continued

	Feet
Recapture Member:	
4. Siltstone, grayish-red----------	4.0
3. Sandstone, very pale orange; fine grained, well sorted----------	2.5
2. Sandstone, mixed pale-olive and grayish-red to pale-reddish-brown; very fine grained----------	11.0
Total Recapture Member----------	17.5
Total Morrison Formation----------	105.0

Bluff Sandstone (not measured):

1. Sandstone, yellowish-gray; fine grained, well sorted, with abundant white specks (possibly kaolinized feldspar in upper part), local slabs of moderate-yellow-brown to dark-yellow-orange, calcareous, strongly cemented knobby sandstone protrude horizontally from the predominantly smoothly rounded outcrop; crossbeds are planar; 5 ft below Morrison contact sandstone is weathering light brownish gray to grayish orange pink, very fine grained.

8. NORTH BUTTE section - Valencia County, N. Mex.

[Measured by R. H. Moench and S. S. Moench, June 1956. South Butte quadrangle--SE 1/4 SW 1/4 sec. 35, T. 9 N., R. 6 W.]

	Feet
Dakota Sandstone (incomplete):	
7. Sandstone, pebbly sandstone, and quartz-pebble conglomerate, very pale orange to grayish-orange; well cemented with calcite; crossbedded----------	30.0
Morrison Formation:	
Brushy Basin Member:	
6. Mudstone, light-greenish-gray (5G 8/1) to light-brownish-gray (5YR 6/1), with sparse thin beds of dense massive limestone; 1 ft of dark-greenish-gray noncalcareous sandstone 68 ft above base, and 2 ft of pale-greenish-yellow friable calcareous siltstone 84 ft above base----	92.0
Westwater Canyon Member:	
5. Sandstone and pebble conglomerate, very pale orange; firmly cemented, poorly sorted, feldspathic, calcareous; trough crossbedded----------	4.5
Recapture Member:	
4. Siltstone, light-brownish-gray, dusky-red, and yellowish-gray; sandy, calcareous; contains 3-in. bed of dense limestone----------	10.0
3. Sandstone, pale-greenish-yellow and pale-yellowish-orange; very fine grained, noncalcareous----------	0.9
2. Sandstone, light-brownish-gray; very fine grained, weakly calcareous----------	1.0
Total Recapture Member----------	11.9
Total Morrison Formation	108.4
Bluff Sandstone (not measured):	
1. Sandstone, pale-greenish-yellow to very pale orange; fine grained, well sorted, in upper few feet.	

9. TIMIA BUTTE section - Valencia County, N. Mex.

[Measured by R. H. Moench and S. S. Moench, June 1956. South Butte quadrangle--NW 1/4 SW 1/4 sec. 25, T. 9 N., R. 6 W.]

	Feet
Dakota Sandstone (incomplete):	
14. Sandstone, pale-yellow-orange to very pale orange; well cemented, well sorted, noncalcareous; local layers of pebble conglomerate; basal 3-4 ft is pale-yellow-brown sandstone and local quartz-cobble conglomerate----------	25.0
Morrison Formation:	
Brushy Basin Member:	
13. Mudstone, grayish-yellow-green (5GY 7/2)----------	1.0
12. Siltstone, greenish-gray (5GY 6/1); calcareous, poorly cemented; two beds of very pale orange, calcareous, very fine grained sandstone, each about 6 in. thick----------	29.0
Total Brushy Basin Member----------	30.0
Westwater Canyon Member:	
11. Sandstone, very pale orange; fine grained, strongly cemented, moderately to poorly sorted, calcareous; locally pebbly----------	8.5
10. Sandstone, yellowish-gray (5Y 7/2); fine grained, poorly cemented, calcareous----------	14.0
9. Sandstone, very fine grained, and pebble conglomerate, very light gray; friable, poorly sorted; sparse pale-olive ledges of well-cemented noncalcareous fine-grained sandstone----------	10.0
8. Sandstone, yellowish-gray (5Y 8/1); very poorly cemented, fine grained, well sorted, calcareous; basal 1.5 ft is medium-grained, very pale orange, well cemented, moderately well sorted, calcareous, bench-forming sandstone----------	15.0
Total Westwater Canyon Member----------	47.5

9. TIMIA BUTTE section--Continued

Morrison Formation--Continued

	Feet
Recapture Member:	
7. Mudstone, grayish-yellow-green; sandy----------	1.0
6. Sandstone, yellowish-gray (5Y 8/1); very fine grained, noncalcareous----------	9.0
5. Limestone, light-gray; massive----------	1.0
4. Sandstone, yellowish-gray (5Y 8/1); very fine grained, noncalcareous----------	5.5
3. Sandstone, grayish-blue, grading downward to pale-reddish-brown; very fine grained; 2-in. layer of dark-yellowish-orange siltstone at top--	2.0
2. Sandstone, pale-reddish-brown, local patches very pale orange near base; very fine grained, calcareous----------	10.5
Total Recapture Member----------	29.0
Total Morrison Formation----------	106.5

Bluff Sandstone (not measured):

1. Sandstone, fine-grained, well sorted, poorly cemented, calcareous; upper part is mostly very pale orange; lower part is grayish yellow green (5GY 7/2) to yellowish gray (5Y 7/2) and planar crossbedded; 10 ft below top is a 1-ft bed of pale-reddish-brown siltstone; contact with Morrison is marked by an abrupt upward color change from very pale orange to pale reddish brown.

10. SOUTH CASA BLANCA MESA section - Valencia County, N. Mex.
[Measured by R. H. Moench and S. S. Moench, July 1956. South Butte quadrangle--N 1/2 SE 1/4 sec. 23, T. 9 N., R. 6 W.]

		Feet
Dakota Sandstone:		
20.	Sandstone, grayish-orange-pink (weathered), very pale orange (fresh); fine grained, well cemented, noncalcareous; bench-forming unit----------	8.0
19.	Shale, brownish-black; local thin beds of light-gray siltstone----------	6.0
18.	Sandstone, yellowish-gray (5Y 7/2); very fine grained, noncalcareous; very coarse sand and granules at top----------	1.5
17.	Shale, brownish-gray to brownish-black----------	4.0
16.	Sandstone, grayish-orange; medium grained, well sorted, noncalcareous; planar crossbedding in sets 4 in. high near base, wedge type near top; abundant carbonized plant remains; bench-forming unit----------	11.0
15.	Sandstone, pale-yellowish-brown to medium-light-gray; medium to coarse grained, moderately well sorted to poorly sorted; locally pebbly----------	2.0
14.	Shale, dark-gray to black----------	1.0
	Total Dakota Sandstone----------	33.5
Morrison Formation:		
Brushy Basin Member:		
13.	Siltstone, grading upward into silty bentonitic mudstone, yellowish-gray (5Y 7/2) and grayish-red (10R 4/2)----------	30.0
12.	Sandstone, very pale orange; fine to coarse grained, poorly sorted, calcareous, firmly cemented; abundant mud balls----------	11.0
11.	Mudstone, grayish-red (5R 4/2) and greenish-gray; silty----------	14.0

11. CLAY MESA section - Valencia County, N. Mex.

[Measured by R. H. Moench and W. P. Puffett, July 1955. Laguna quadrangle--NW 1/4 SW 1/4 and SW 1/4 NW 1/4 sec. 32, T. 10 N., R. 5 W.

	Feet
Basalt flow capping mesa----------	15.0
Mancos Shale (incomplete)	
Lower sandstone unit:	
21. Sandstone, very pale orange; firmly cemented, fine grained, well sorted----------	20.0
20. Siltstone; brown weathering, calcareous, fossiliferous; subordinate shale----------	17.0
19. Sandstone, siltstone, and shale, interbedded-------	22.0
18. Sandstone, grayish-orange; firmly cemented, fossiliferous----------	26.0
Total lower sandstone unit----------	85.0
Lower shale unit:	
17. Siltstone, dark-gray; abundance of carbonaceous matter increases downward----------	54.0
16. Shale, black----------	16.0
Total lower shale unit----------	70.0
Total Mancos Shale (incomplete)----------	155.0
Dakota Sandstone:	
15. Sandstone, gray; carbonaceous----------	5.0
Diabase sill 10 ft thick.	
14. Sandstone and siltstone, gray; carbonaceous; flat bedded in lower 6 ft----------	23.0
Diabase sill 13 ft thick.	
13. Sandstone, tan; flat bedded, firmly cemented-------	15.0
Total Dakota Sandstone----------	43.0

11. CLAY MESA section--Continued

	Feet
Morrison Formation:	
Brushy Basin Member:	
Jackpile sandstone of economic usage:	
12. Sandstone, white to light-gray in upper part, tan, locally calcite cemented, in lower part; local granule-and-pebble conglomerate with clasts of chert, quartz, and feldspar; local lenses of greenish-gray mudstone	52.0
11. Mudstone, greenish-gray	10.0
10. Sandstone, feldspathic; local granule-and-pebble conglomerate	34.0
Total Jackpile sandstone of economic usage	96.0
9. Mudstone, greenish-gray; subordinate siltstone and sandstone; 6-in. bed of dense gray limestone 47 ft below top	75.5
8. Sandstone and local granule-and-pebble conglomerate, with clasts of chert, quartz, potassium feldspar, and mud balls	28.5
7. Siltstone, interbedded with dense limestone	11.0
Diabase sill 9 ft thick.	
6. Limestone, gray, dense	15.0
5. Limestone	2.5
4. Sandstone, calcareous	2.5
Diabase sill 3 ft thick.	
3. Siltstone and mudstone, greenish-gray to grayish-red; calcareous	9.0
Total Brushy Basin Member	240.0
Westwater Canyon Member:	
2. Sandstone, fine- to medium-grained, well-sorted to poorly sorted, firmly cemented; local granule-and-pebble conglomerate	31.0
Diabase sill 3 ft thick.	

11. CLAY MESA section--Continued

Morrison Formation--Continued

Westwater Canyon Member--Continued

	Feet
1. Pebble conglomerate, with rounded fragments of red quartz, limestone, and mudstone----------	2.0
Total Westwater Canyon Member----------	33.0
Recapture Member (not exposed; outcrops of Bluff Sandstone are nearby)----------	~15.0
Total Morrison Formation----------	~288.0

12. LAGUNA section - Valencia County, N. Mex.

[Measured by R. H. Moench and W. P. Puffett, July 1955; and V. L. Freeman and L. S. Hilpert. Laguna quadrangle, about 2 1/2 mi. north-northeast of Laguna--NW 1/4 sec. 28, T. 10 N., R. 5 W.]

	Feet
Dakota Sandstone:	
15. Sandstone, very pale orange to white; weathers grayish orange (10YR 7/4); fine to medium grained, well sorted, well cemented; thin to medium bedded; conglomerate exposed near base; pebbles largely chert; locally carbonaceous; cliff-forming unit----------	13.0
Morrison Formation:	
Brushy Basin Member:	
Jackpile sandstone of economic usage:	
14. Sandstone, very pale orange, locally white near top; mostly fine to medium grained, with lenses of granule-pebble conglomerate particularly near base; well sorted to poorly sorted, friable to firmly cemented; cement is kaolinite, which is most abundant in white sandstone; sand grains are quartz and pink feldspar; coarse sand, granules, and pebbles are quartz feldspar, granite, and chert; medium-scale trough crossbedding; unit forms ledgy slope, and cliff near top----------	68.0
13. Mudstone, grayish-red (10R 4/2) and light-greenish-gray (5GY 8/1); sandy, soft; forms steep slope----	6.0
12. Sandstone, very pale orange; fine to medium grained, local lenses of granule conglomerate, some pebbles near base, fairly well sorted; pink feldspar abundant; friable, local small spots of interstitial kaolinite; partly structureless, local medium-scale trough crossbedding; forms steep slope----------	34.0
Total Jackpile sandstone of economic usage-----	108.0

12. LAGUNA section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

		Feet
11.	Mudstone, light-greenish-gray (5GY 8/1), locally grayish-red (10R 4/2); sandy; limestone in discontinuous lenses as much as 2 ft thick, gray, fine grained, dense; sandstone in beds 2 ft thick, shades of grayish green, fine grained, massive, well cemented, noncalcareous----------	27.0
10.	Sandstone, grayish-yellow (5Y 8/4) to white; medium to coarse grained, poorly to moderately sorted; pink feldspar grains abundant; sandstone is friable to well cemented, calcareous, with sand crystals to 1/2 in. in diameter; unit forms ledgy slope----------	22.0
9.	Mudstone (dominant), limestone, and sandstone (subordinate); mudstone is light greenish gray (5GY 8/1), locally grayish red (10R 4/2), sandy, silty; limestone is very light gray, very fine grained, dense, in beds 2 ft thick; sandstone is shades of grayish green, fine grained, well cemented, noncalcareous, massive, in beds 6 in.-1 ft thick; unit forms steep slope, with small ledges of limestone and sandstone----------	42.0
8.	Sandstone; grades to mudstone and thin zone of pebble conglomerate at base; sandstone is very pale orange, very fine grained, friable, bedding not obvious; mudstone is light greenish gray (5GY 8/1), weathers to frothy surface; conglomerate contains pebbles of pink feldspar, chert, and mud balls; calcite-cemented unit----------	32.0
7.	Sandstone, very pale orange; fine to coarse grained, pebble conglomerate at base; firmly cemented; small- to medium-scale trough and planar wedge crossbedding; forms ledge----------	9.0

12. LAGUNA section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

	Feet
6. Mudstone (dominant), limestone, and sandstone (subordinate); mudstone, light-greenish-gray (5GY 8/1), sandy, frothy weathering; limestone, very light gray, very fine grained, massive in one bed 2 ft thick; sandstone, shades of grayish-green, fine-grained, well cemented, weakly calcareous, massive, in one bed 6 in. thick; unit forms slope with two ledges----------	22.0
5. Sandstone, yellowish-gray (5Y 8/1); fine to medium grained, moderately sorted, well cemented, calcareous, with small calcite sand crystals near base; unit contains thin bed of light-greenish-gray (5GY 8/1) mudstone in middle; forms ledge----------	13.0
4. Mudstone, dominantly light-greenish-gray (5GY 8/1) to yellowish-gray (5Y 8/1), containing thin beds of grayish-purple (5P 4/2) and grayish-red-purple (5RP 4/2) near base; sandy, locally calcareous, weathers to frothy surface; limestone bed 3 ft thick exposed near middle of unit; limestone is very light gray, very fine grained, silty, massive; unit forms steep slope----------	33.0
Total Brushy Basin Member----------	308.0

Westwater Canyon Member:

3. Sandstone, yellowish-gray (5Y 7/2) to grayish-yellow (5Y 8/4); medium to coarse grained, with sparse lenses of pebble conglomerate, poorly sorted, composed of quartz and pink feldspar; well cemented, calcareous; medium-scale crossbedding----------	55.0

12. LAGUNA section--Continued

Morrison Formation--Continued

	Feet
Recapture Member:	
2. Sandstone, siltstone, and mudstone, interbedded; sandstone is dominant near top of unit, clayey, greenish gray (5GY 6/1), very fine to medium grained, poorly sorted, calcareous; mudstone and siltstone are dark(?) reddish brown (10R 3/4), dominant near base of unit; zone of nodules (1 ft in diameter) of radiating calcite at top of unit----------	30.0
Total Morrison Formation----------	393.0

Bluff Sandstone (not measured):

1. Sandstone, grayish-yellow (5Y 8/4) to light-greenish-gray (5GY 8/1); medium grained, moderately to well sorted, calcareous; becomes clayey upward; local limonite specks, and hematite concretions after pyrite.

13. JACKPILE MINE section - Valencia County, N. Mex.

[Diamond drill hole no. 111, Jackpile mine; Nx size, 2 1/8-in. diameter core Anaconda coordinates 5648.55 N., 3949.59 E.; collar el. Anaconda datum 6101.07 ft. Logged by V. L. Freeman and L. S. Hilpert, June 1954; modified by L. S. Hilpert, November 1954; reinterpreted by R. H. Moench, 1956. Moquino quadrangle--NW 1/4 NE 1/4 sec. 2, T. 10 N., R. 5 W.

		Feet
Dakota Sandstone (incomplete):		
127.	Top of exposure. Sandstone, white (N9) to yellowish-gray (5Y 7/2); medium to coarse grained, calcareous cement; some medium-gray (N6) clay flecks and some carbonaceous material (50 percent core recovery)----------	7.5
126.	Claystone, light-greenish-gray (5G 8/1); sandy, some limonite stain (2 in. recovered)----------	1.5
125.	Sandstone, light-yellowish-gray (5Y 8/2) to dark-yellowish-orange (10YR 6/6); medium grained, calcareous cement; some carbonaceous layers----------	0.5
124.	Claystone, dark-gray (N3); sandy, very carbonaceous-	1.0
	Total Dakota Sandstone (incomplete)----------	10.5
Morrison Formation:		
Brushy Basin Member:		
Jackpile sandstone of economic usage:		
123.	Sandstone, yellowish-orange (10YR 7/6) to white (N9) near base; medium to medium coarse grained; abundant light-greenish-gray blebs and carbonaceous blebs. Common limonite stain----------	7.5
122.	Sandstone and claystone; claystone, light-greenish-gray (5G 8/1); silty, abundant limonite stain (poor recovery)----------	2.0
121.	Sandstone, pale-yellowish-orange (10RY 8/6); fine to coarse grained, abundant carbonaceous material along bedding and in interstitial clay and blebs; some siliceous cement; some limonite stain--------	9.5

13. JACKPILE MINE section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

Jackpile sandstone of economic usage--Continued

		Feet
120.	Claystone, light-greenish-gray (5G 8/1); sandy, some limonite stain----------	0.5
119.	Clay, sandy, to sandstone, clayey, light-greenish-gray (5G 8/1); some limonite stain; few specks of carbonaceous material----------	4.0
118.	Claystone, light-greenish-gray (5G 8/1); sandy, some limonite stain----------	7.0
117.	Sandstone, yellowish-orange to pale-orange (10YR 7/6-8YR 8/2); medium to coarse grained, abundant clay blebs; some siliceous cement; some black specks of possibly carbonaceous matter-----	5.0
116.	Sandstone, grayish-yellow (5Y 8/4); medium coarse grained, very friable----------	2.0
115.	Sandstone, light-yellowish-gray (5Y 8/2); medium to coarse grained; abundant beds of light-greenish-gray (5GY 8/1) claystone, abundant limonite stain, siliceous cement; some carbonaceous material along bedding----------	2.0
114.	Claystone, greenish-gray (5GY 6/1); sandy----------	15.0
113.	Sandstone, light-greenish-gray (5G 8/1); very fine to very coarse grained, with some granules and some chert pebbles; very poor sorting, coarser toward base; abundant interstitial clay, clay flecks----------	15.0
112.	Claystone, light-greenish-gray (5G 8/1); silty, some limonite stain (poor recovery)----------	4.5
111.	Sandstone; like unit 113; at base grades into unit below----------	2.0

13. JACKPILE MINE section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

Jackpile sandstone of economic usage--Continued

		Feet
110.	Sandstone, yellowish-gray (5Y 7/2) to light-greenish-gray (5G 8/1); fine to coarse grained, some granules and small pebbles of chert; poorly sorted, and in beds 1 mm to several inches thick; some thin beds of mudstone, and some siliceous cement----------	3.5
109.	Sandstone, white (N9) to light-greenish-gray (5G 8/1); very coarse grained; interstitial kaolinite; some weak siliceous cement; very friable at base----------	4.5
108.	Sandstone, pale-greenish-yellow (10Y 8/2); medium grained, some limonite stain, some interstitial clay; somewhat friable----------	1.5
107.	Sandstone, pale-greenish-yellow (10Y 8/2); medium grained, very friable, some limonite stain (poor recovery)----------	7.0
106.	Sandstone, yellowish-gray (5Y 7/2) to pale-greenish-yellow (10Y 8/2); fine grained at top, grades to coarse grained at base; sparse small pebbles; friable, abundant interstitial clay, limonite stain; carbonaceous material at 12.0 ft from top of unit----------	12.0
105.	Sandstone, white (N9) to yellowish-gray (5Y 7/2); medium to coarse grained, much feldspathic and kaolinic interstitial material, some blebs of greenish-gray (5GY 6/1) clay, friable, noncalcareous----------	3.5

13. JACKPILE MINE section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

Jackpile sandstone of economic usage--Continued

		Feet
104.	Sandstone; similar to unit 105 except that it contains dark-greenish-gray (5G 4/1) layers and much interstitial carbonaceous material; mineralized----------	3.0
103.	Claystone, light-olive-gray (5Y 6/1); sandy, baked. A 1-in. layer of sandstone at base in contact with sill----------	0.5
102.	Diabase sill 4 ft thick.	
101.	Sandstone, yellowish-gray (5Y 8/1); medium coarse grained; mineralized, with disseminated dark-greenish-gray (5G 4/1) and yellow uranium minerals; some carbonaceous material along bedding, and some limonite stain----------	2.0
100.	Claystone, light-greenish-gray (5G 8/1); slightly silty, carbonaceous blebs and seams, and some yellow uranium minerals along bedding----------	0.5
99.	Sandstone, light-yellowish-gray (5Y 8/2); medium to coarse grained; ore-bearing throughout, with dark-green layers and some yellow uranium minerals. Low grade at base; some limonite stain and some carbonaceous material in seams and in blebs----------	6.5
98.	Claystone and sandstone, greenish-gray (5G 6/1), with much limonite stain and some carbonaceous material----------	1.0
97.	Sandstone; similar to unit 99 but has considerable interstitial light-greenish-gray (5G 8/1) claystone near base----------	4.0

13. JACKPILE MINE section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

Jackpile sandstone of economic usage--Continued

		Feet
96.	Sandstone, very pale-orange (10YR 8/2); fine to coarse grained, in separate beds 1-2 ft thick; many yellowish-green (10GY 7/3) and grayish-red (5R 4/2) blebs and chips of claystone; light greenish gray (5G 8/1) near lower part with yellow uranium mineral specks; friable, no carbonaceous material----------	3.5
95.	Sandstone, light-greenish-gray (5G 8/1); mostly fine grained, but some coarse grains near base; very argillaceous; abundant claystone blebs, some limonite stain----------	3.5
94.	Claystone, greenish-gray (5GY 6/1); silty, massive-	10.0
93.	Sandstone, grayish-yellow (5Y 8/4); fine to medium fine grained, noncalcareous; gradational from unit 94; locally kaolinic----------	3.0
92.	Sandstone, light-greenish-gray (5GY 8/1), fine grained; otherwise same as unit 93----------	2.0
91.	Sandstone; same as unit 93----------	1.0
90.	Sandstone, light-yellowish-green (10GY 7/4); medium to coarse grained, poorly sorted, limonite stain; abundant green clay blebs and interstitial clay; kaolinic interstitial material; friable----	6.0
89.	Sandstone, light-greenish-gray (5GY 8/1); noncalcareous, medium fine grained; some interstitial clay and rare blebs----------	3.5
88.	Sandstone, yellowish-gray (5Y 7/2); medium to coarse grained, kaolinic interstitial material, some limonite stain, friable----------	1.5
87.	Claystone, greenish-gray (5G 6/1); sandy, sparse limonite specks----------	0.5

13. JACKPILE MINE section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

Jackpile sandstone of economic usage--Continued

		Feet
86.	Sandstone, pale-greenish-yellow (10YR 8/2); fine grained at top, gradational to very coarse grained at base; coarse grains of quartz, feldspar, and chert, and clay particles; interstitial kaolinite; noncarbonaceous, some limonite stain, calcareous cement----------	10.0
	Total Jackpile sandstone of economic usage----	170.0
85.	Claystone, greenish-gray (5G 6/1); some silt-------	4.5
84.	Limestone and claystone, in beds 1/2-2 ft thick; limestone is light greenish gray (5GY 8/1), dense, with grains or pieces of dark-green (5G 4/2) claystone or recrystallized limestone; claystone is light greenish gray (5G 8/1), silty, limy----------	4.5
83.	Claystone, light-greenish-gray (5GY 8/1), with a few thin sandstone and limestone beds; silty; two 1-in.-thick pink (5RP 7/2) beds of claystone; clay is calcareous locally----------	14.5
82.	Sandstone, pale-greenish-yellow (10Y 8/2); fine grained, with small light-greenish-gray (5G 8/1) clay flecks and blebs; good calcareous cement, some limonite stain----------	5.0
81.	Claystone, greenish-gray (5G 6/1), with dark-green chips near base; becomes sandy near base---------	7.0
80.	Sandstone, light-greenish-gray (5G 8/1) and yellowish-gray (5Y 2/2); fine to medium grained, with some coarse grains near base; locally calcareous cement, otherwise friable; some limonite stain----------	12.0

13. JACKPILE MINE section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

		Feet
79.	Sandstone, light-greenish-gray (5G 8/1); medium coarse to very coarse grained, poorly sorted, some granules near base; greenish-gray (5G 8/1) clay blebs and flecks; generally friable, but locally calcareous cement----------	15.5
78.	Siltstone, greenish-gray (5G 6/1); argillaceous----	1.5
77.	Claystone, light-greenish-gray (5G 8/1); silty; at 1.5-1.8 ft a 2-in. bed of hard greenish-gray siltstone; noncalcareous----------	5.5
76.	Sandstone, light-greenish-gray (5G 8/1); medium to fine grained, some beds coarse grained; very friable----------	8.5
75.	Sandstone, light-greenish-gray (5G 8/1); medium grained, friable, some calcareous cement, and a few flecks of greenish-gray (5G 6/1) clay--------	3.0
74.	Sandstone, light-greenish-gray (5GY 8/1); medium to coarse grained, friable, very little calcareous cement, few clay flecks, kaolinic interstitial material, slight limonite staining; crossbedded--	18.5
73.	Sandstone, light-greenish-gray (5GY 8/1); medium to very coarse grained, poorly sorted, with abundant granules and small pebbles and clay blebs; abundant interstitial kaolinite----------	2.0
72.	Sandstone, light-greenish-gray (5GY 8/1); medium grained, noncalcareous but not friable; grades into units above and below----------	2.0
71.	Sandstone, light-greenish-gray (5GY 8/1); medium to very coarse grained, poorly sorted, friable, very little calcareous cement, abundant clay blebs----------	7.5

13. JACKPILE MINE section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

		Feet
70.	Sandstone, greenish-gray (5G 6/1); medium fine grained, well sorted, friable; lower 8 ft contains some interstitial kaolinic material and green clay flecks; some calcareous cement near base	13.0
69.	Claystone, greenish-gray (5G 6/1) and grayish-green (10GY 6/2); locally limy	3.0
68.	Limestone, greenish-gray (5G 6/1); thinly laminated, dense	1.0
67.	Claystone, greenish-gray and gray-yellowish-green (5GY 7/2); sandy, locally limestone lenses and lenses of fine-grained sandstone	12.5
66.	Sandstone, light-greenish-gray (5G 6/1); fine grained, well cemented (calcareous), locally argillaceous, local limestone pods a few inches thick	4.5
65.	Sandstone, light-greenish-gray (5G 6/1); fine to very fine grained, with numerous limestone lenses a few inches to 1 ft thick; much interstitial argillaceous material suggestion of thin bedding-	16.0
64.	Sandstone, light-greenish-gray (5G 6/1); medium grained, friable	1.0
63.	Claystone, greenish-gray (5G 6/1); limy and sandy, with some grains of granule size	4.5
62.	Sandstone, greenish-gray (5G 6/1); clayey, limy along seams or veinlets; grades into sandy claystone at base	6.5

13. JACKPILE MINE section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

		Feet
61.	Claystone, light-greenish-gray (5G 8/1) and greenish-gray (5GY 7/1), with reddish-brown (10R 4/4) specks along joints and bedding; light-red (5R 6/6) at 2.5-3.0 ft; few limy lines a few inches thick; locally grades into a very fine grained clayey sandstone in units as much as several feet thick; thin bedded locally; grades from grayish orange pink (7YR 7/2) to pink (5R 6/4) at 31.5-32.0 ft, and at 33.0 ft the color is mottled grayish red (5R 4/2); locally flecks of carbonaceous material----------	86.0
60.	Claystone and sandstone in layers several inches thick, light-greenish-gray (5G 8/1) and mottled grayish-red (5R 4/2); sandstone is very fine grained----------	3.0
59.	Sandstone, light-greenish-gray (5G 8/1); fine grained, some interstitial clay, noncalcareous but well cemented, some light-greenish-gray (5G 8/1) clay flecks----------	5.0
58.	Sandstone, white (N9) to light-greenish-gray (5G 8/1); medium coarse grained, somewhat friable, some calcareous cement----------	5.0
57.	Claystone, dark-reddish-brown (10R 3/4) and pale-yellowish-brown (10YR 6/2); silty (poor recovery)----------	2.5
56.	Claystone, light-greenish-gray (5GY 8/1), sparsely mottled grayish-red (5R 4/2); silty----------	2.5
55.	Siltstone, light-greenish-gray (5GY 8/1); calcareous; grades to silty claystone at base----	3.0

13. JACKPILE MINE section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

		Feet
54.	Limestone, and some limy claystone; limestone is argillaceous, light greenish gray (5GY 8/1), dense, with calcite specks; claystone is same color and slightly silty----------	3.0
53.	Sandstone, yellowish-gray (5Y 8/1); medium grained, friable, calcareous, with light-greenish-gray (5GY 8/1) claystone partings----------	1.5
52.	Claystone, light-greenish-gray (5GY 8/1); calcareous, with some thin (2-in.-thick) clayey limestone lenses----------	2.0
	Total Brushy Basin Member----------	457.0

Westwater Canyon(?) Member:

51.	Sandstone, light-greenish-gray (5GY 8/1); medium fine grained, well sorted, firmly cemented-------	1.5
50.	Sandstone, grayish-red (5R 4/2); medium fine grained; some flecks of claystone; noncalcareous, firmly cemented----------	1.0
49.	Claystone, dark-grayish-red (5R 3/2)----------	2.0
48.	Sandstone, light-greenish-gray (5GY 8/1); medium fine grained; some clay blebs, grayish-red (5R 4/2), at 125-126 ft; slightly calcareous----------	8.0
47.	Sandstone, grayish-red (5R 4/2); medium fine grained, some claystone at base; thin bedded-----	2.0
46.	Sandstone, light-greenish-gray (5GY 8/1); clayey, slightly calcareous----------	3.0
45.	Mudstone, dark-grayish-red (5R 3/2); sandy---------	0.5
44.	Sandstone, light-greenish-gray (5GY 8/1); medium fine grained, noncalcareous, firmly cemented-----	1.0

13. JACKPILE MINE section--Continued

Morrison Formation--Continued

Westwater Canyon(?) Member--Continued

		Feet
43.	Sandstone, grayish-red (5R 4/2); medium fine grained; interstitial clay increases to abundant at base----------	3.5
42.	Sandstone, light-greenish-gray (5GY 8/1); medium grained, slightly friable and slightly calcareous, clean----------	9.0
41.	Sandstone, light-greenish-gray (5GY 8/1); medium fine grained, calcareous----------	4.0
40.	Sandstone, grayish-red (5R 4/2); medium fine grained; grades to grayish-red (5R 4/2) claystone at base; slightly calcareous at top----------	6.0
39.	Sandstone, very pale orange (10YR 8/2); medium coarse grained, friable; some light-gray (N7) bands near base----------	8.0
38.	Sandstone, moderate-yellowish-brown (10YR 5/4); medium fine to medium grained, very calcareous, with claystone fragments----------	0.5
	Total Westwater(?) Member----------	50.0

Recapture(?) Member:

37.	Limestone, with local thin claystone beds and claystone chips, light-olive-gray (5Y 6/1); calcite veinlets----------	1.5
36.	Claystone, light-greenish-gray (5GY 8/1); slightly silty to locally very silty beds; slightly calcareous----------	7.0
35.	Siltstone, light-greenish-gray (5GY 8/1); clayey, locally calcareous----------	3.0
34.	Claystone, grayish-red (5R 4/2) and light-greenish-gray (5GY 8/1); sandy; several thin lenses of fine-grained sandstone and a lens of coarsely crystalline limestone at 9.5-9.8 ft----------	11.5

13. JACKPILE MINE section--Continued

Morrison Formation--Continued

Recapture(?) Member--Continued

		Feet
33.	Sandstone, dark-yellowish-orange (10YR 6/6), olive-gray (5Y 3/2), and grayish-purple (5P 4/2), varicolored; medium fine grained, very calcareous, thin bedded----------	0.5
32.	Sandstone, grayish-red (5R 4/2); medium fine grained, interstitial clay, calcareous----------	1.8
31.	Sandstone, very light greenish gray (5GY 9/1); fine grained, massive, calcareous cement---------	7.7
30.	Sandstone, grayish-red (5R 4/2); medium fine grained, slightly clayey, noncalcareous; grades into mottled zone at base----------	3.5
29.	Sandstone, very light greenish gray (5GY 9/1), some grayish-red (5R 4/2) mottling; medium fine grained, slightly calcareous; grades to medium grained at base----------	17.0
28.	Claystone, light-greenish-gray (5GY 8/1) and some grayish-red (5R 4/2); sandy, local thin friable sandstone beds (very poor recovery)----------	11.0
27.	(No recovery)----------	10.0
	(BX-size, 1 5/8-in.-diameter core below this point.)	
26.	Sandstone, grayish-red (5R 4/2); medium-grained, friable, calcareous (30 percent recovery)--------	4.0
25.	Sandstone, light-greenish-gray (5GY 8/1); fine-grained, interstitial clay, friable, locally calcareous----------	16.5
24.	Sandstone, light-greenish-gray (5GY 8/1) and grayish-red (5R 4/2); very clayey, friable (about 20 percent recovery)----------	4.5

13. ACKPILE MINE section--Continued

Morrison Formation--Continued

Recapture(?) Member--Continued

		Feet
23.	Claystone, grayish-red (5R 4/2); silty (20 percent recovery)----------	5.0
	Total Recapture(?) Member----------	104.5
	Total Morrison Formation----------	611.5

Bluff Sandstone

22.	Sandstone, very light greenish gray (5GY 9/1), but locally slight color change to light-yellowish-gray (5Y 9/1); medium fine grained, very friable, locally thin calcareous zones; few specks of pyrite; sandstone very clean (15 percent core recovery--all lost at 15.6-20.6 ft)----------	60.0
21.	Sandstone, very light greenish gray (5GY 9/1); medium to fine grained, somewhat friable, fairly uniform calcareous cement; local clayey lenses near top----------	77.0
20.	Sandstone, very light greenish gray (5GY 9/1); fine to medium fine grained, well indurated, slightly calcareous--may be cemented by secondary silica--	39.5
19.	Sandstone, very light greenish gray (5GY 9/1); fine grained, well cemented (calcareous; local spots of finely disseminated pyrite)----------	1.5
18.	Sandstone, very light greenish gray (5GY 9/1); fine-grained, slightly calcareous, well indurated, local rare spots of pyrite. Lower 5 ft shows faint bands marked by fine grains of magnetite and by interstitial clay----------	22.5
17.	Sandstone, grayish-orange-pink (5YR 7/2), grayish-orange (10YR 7/4), and dark-reddish-orange(?); slightly to very calcareous, indurated, locally kaolinic and medium grained; at 51.5-56.0 ft dark seams of manganese(?) stain cut the bedding-	56.0

13. JACK[illegible] MINE section--Continued

Bluff Sandstone--Continued

		Feet
16.	Sandstone, reddish-brown (10R 4/4); fine grained, abundant clay along bedding, locally white (N9) mottled, calcareous----------	16.5
15.	Sandstone, moderate-orange-pink (10R 7/4); fine-grained, calcareous----------	3.0
14.	Sandstone, moderate-orange-pink (10R 7/4); abundant grayish-red (5R 4/2) clayey laminae, calcareous----------	4.0
	Total Bluff Sandstone----------	280.0

Summerville Formation:

13.	Claystone, pale-reddish-brown (10R 5/4); very sandy, calcareous----------	0.5
12.	Sandstone, medium-orange-pink (5YR 8/4?); fine-grained, with thin beds of claystone and thin seams of manganese stain; calcareous----------	8.5
11.	Sandstone, very pale orange (10YR 8/2); fine grained, clean, very friable, calcareous---------	2.5
10.	Sandstone, medium-orange-pink (5YR 8/4?), with grayish-red (5R 4/2) claystone laminae; fine grained; two 1-in. beds of claystone; calcareous-	8.5
9.	Sandstone, grayish-orange (10YR 7/4) to very pale orange (10YR 8/2); fine grained, friable, calcareous; local laminae of magnetite grains; grades into unit below----------	2.0
8.	Sandstone, moderate-reddish-orange(?), with few to abundant grayish-red (4R 4/2) claystone laminae; locally some mottled red and gray colors to much mottling; fine and very fine grained, generally friable, claystone laminae less abundant near base and rock color lighter; fine laminae of magnetite(?) grains----------	92.5

13. JACKPILE MINE section--Continued

Summerville Formation--Continued

	Feet
(NOTE: Anaconda's log indicated that "petroliferous" gas was struck at a depth of 1,031 ft below the collar--or 4.5 ft above base of this unit and 10.0 ft above the base of the Summerville; the pressure "blew a water column 5 ft into the air"; the flow ceased after 5 min.)	
7. Sandstone, light-olive-gray (5Y 6/1) to light-gray (N7); fine to very fine grained, calcareous; anhydrite veinlets in lower part; fine bedding--	5.5
Total Summerville Formation----------	120.0

Todilto Limestone:

6. Anhydrite, with small amount of gypsum at top, medium-gray (N5); crystalline (crystals about 1 mm in diameter); bedding generally obscure, but locally near top of unit shows what may be a chip conglomerate. Lower 36 ft shows dark thin irregular laminae of limestone----------	74.0
5. Limestone, with some anhydrite, dark-gray (N3) crystalline, crystal size about same as in unit 6; is not fetid----------	2.0
4. Limestone, dark-gray (N3); dense, thinly laminated to laminated; is not fetid----------	8.0
Total Todilto Limestone----------	84.0

Entrada Sandstone (incomplete):

3. Sandstone, light-olive-gray (5Y 6/1); very fine grained, calcareous, thinly laminated----------	1.0
2. Sandstone, light-yellowish-gray (5Y 8/2)?; medium fine to medium grained, slightly friable, slightly calcareous; lower 5 ft is light greenish gray (5GY 8/1) with faint limonite stain--------	27.5

13. JACKPILE MINE section--Continued

Entrada Sandstone (incomplete)--Continued

	Feet
1. Sandstone, grayish-orange (10YR 7/1); medium fine grained, clean, homogeneous, friable, slightly calcareous----------	7.5
Total Entrada Sandstone drilled----------	36.0

(Base of logged section.)

14. SOUTHWEST MESA GIGANTE section - Valencia County, N. Mex.

[Measured by R. H. Moench and W. P. Puffett, August 1955. Mesa Gigante quadrangle--SE 1/4 sec. 3, T. 9 N., R. 4 W.]

		Feet
Dakota Sandstone:		
15.	Sandstone, light-tan or very pale orange; calcareous strongly cemented, medium grained, well sorted; dominantly even bedded, but locally crossbedded in 3- to 6-in. cosets; top near base of Mancos Shale----------	16.0
14.	Siltstone and subordinate sandstone----------	9.0
13.	Shale, black----------	3.0
12.	Siltstone and silty shale, gray, carbonaceous------	13.0
11.	Shale, black, with coalified plant remains---------	15.0
10.	Sandstone with thin zone of quartz-pebble conglomerate at base; very pale orange to gray; calcareous, strongly cemented, well sorted; sedimentation units 1-5 ft thick; some planar crossbedding----------	9.0
	Total Dakota Sandstone----------	65.0
Morrison Formation:		
Brushy Basin Member:		
9.	Mudstone, greenish-gray, with sparse lenticular beds of dark-green, noncalcareous, strongly cemented sandstone, and dense gray limestone-----	96.0
8.	Sandstone, very pale orange; trough crossbedded----	5.0
7.	Mudstone with subordinate siltstone, limestone, and sandstone; mudstone and siltstone are greenish gray, locally grayish red in lower 30 ft; limestone is dense, gray, commonly silty or sandy; sandstone is very pale orange, feldspathic, poorly sorted, forms sparse lenticular beds as much as 4 ft thick----------	84.0
	Total Brushy Basin Member----------	185.0

14. SOUTHWEST MESA GIGANTE section--Continued

Morrison Formation--Continued

	Feet
Westwater Canyon Member:	
6. Sandstone, gray to very pale orange; calcareous, strongly cemented, feldspathic, poorly sorted; dark grayish green, noncalcareous in lower 2 ft	23.0
5. Sandstone, gray to very pale orange; noncalcareous, fine grained in upper part; coarse-grained, poorly sorted, calcareous, strongly cemented, feldspathic, and trough crossbedded in lower part	7.5
Total Westwater Canyon Member	30.5
Recapture Member:	
4. Siltstone, sandstone, and subordinate limestone; siltstone is dark grayish red, calcareous; sandstone is yellowish, friable, fine or medium grained, well sorted; limestone is gray, dense, forms 1 1/2-ft bed about 7 ft below top of unit	16.5
3. Sandstone, yellowish; friable, medium grained	12.0
2. Siltstone, grayish-red	9.0
Total Recapture Member	37.5
Total Morrison Formation	253.00
Bluff Sandstone (not measured):	
1. Upper part is yellowish or very pale orange, friable, medium grained, well sorted; very large scale crossbedding.	

15. West side of MESA GIGANTE - Valencia County, N. Mex.

[Measured by R. H. Moench and W. P. Puffett, July 1955. Mesa Gigante quadrangle--NE 1/4 sec. 15, T. 10 N., R. 4 W.]

		Feet
Dakota Sandstone:		
19.	Sandstone, brownish-gray; strongly cemented with calcite; well sorted; in planar beds 3-18 in. thick; ripple marks----------	16.0
18.	Siltstone, sandy, thinly interbedded with carbonaceous siltstone----------	46.5
17.	Sandstone, with lenses of quartz-pebble conglomerate as much as 4 ft thick at base; crossbedded-------	29.0
	Total Dakota Sandstone----------	91.5
Morrison Formation:		
Brushy Basin Member:		
Jackpile sandstone of economic usage:		
16.	Sandstone, white to very pale orange; fine to medium grained, coarsening downward to local granule-and-pebble conglomerate near base; trough crossbedded; cemented with kaolinite and some calcite----------	85.0
15.	Mudstone, greenish-gray, with subordinate thin beds of sandstone in lower half----------	68.5
14.	Siltstone, grayish-red----------	3.0
13.	Mudstone, greenish-gray, with subordinate thin beds and nodules of dense gray limestone---------	12.0
12.	Siltstone, grayish-red----------	4.0
11.	Mudstone, greenish-gray----------	10.0
10.	Sandstone-and-pebble conglomerate, very pale orange; strongly cemented; pebbles are quartz, chert, potassium feldspar; lenticular unit-------	2.0
9.	Mudstone, greenish-gray, with one thin bed of sandstone----------	16.5

15. West side of MESA GIGANTE--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

Jackpile sandstone of economic usage--Continued

		Feet
8.	Sandstone-and-pebble conglomerate----------	3.0
7.	Mudstone, greenish-gray----------	27.0
6.	Sandstone, fine-grained, calcareous, feldspathic---	2.0
5.	Limestone, gray, dense----------	1.0
4.	Mudstone, greenish-gray, with lenses of dark-grayish-green noncalcareous sandstone near top---	28.0
3.	Sandstone, fine-grained, calcareous----------	7.0
2.	Mudstone, greenish-gray, with local nodules of limestone----------	66.0
	Total Brushy Basin Member----------	335.0

Westwater Canyon Member:

1.	Sandstone, very pale orange; fine to coarse grained, strongly cemented with calcite, trough crossbedded; forms prominant bench----------	66.0

Recapture Member (not measured; exposed nearby).

	Total Morrison Formation----------	401.0

16. SOUTHEAST MESA GIGANTE section - Valencia County, N. Mex.

[Measured by R. H. Moench and W. P. Puffett, August 1955. Mesa Gigante quadrangle--E 1/2 sec. 9, T. 9 N., R. 3 W.]

	Feet
Dakota Sandstone:	
16. Sandstone, light-brownish-gray, with quartz-granule conglomerate at base	9.0
15. Siltstone, thin-bedded	3.0
14. Sandstone, calcareous, strongly cemented	6.0
13. Sandstone, calcareous, crossbedded, grading downward to siltstone	11.0
12. Sandstone, fine-grained, calcareous, iron-stained; flecks of carbonaceous matter	8.0
11. Siltstone, gray, carbonaceous, grading downward to fissile carbonaceous shale	7.0
10. Sandstone, calcareous; in beds 4-11 in. thick; lowest bed is crossbedded	5.0
9. Siltstone, gray, carbonaceous; grades downward to gray shale	2.0
8. Sandstone, thin-bedded, calcareous; abundant iron and manganese stain	8.0
7. Shale	2.0
6. Sandstone, with thin layer of quartz conglomerate at base	21.5
Total Dakota Sandstone	82.5
Morrison Formation:	
Brushy Basin Member:	
5. Mudstone and subordinate siltstone and sandy siltstone, dominantly greenish-gray, locally grayish-red below about 75 ft from top (may include some Recapture Member)	89.5
Recapture(?) Member:	
4. Sandstone, dark-grayish-green; strongly cemented, noncalcareous	2.0

16. SOUTHEAST MESA GIGANTE section--Continued

Morrison Formation--Continued

Recapture(?) Member--Continued

	Feet
3. Limestone, greenish-gray, dense----------	2.0
2. Mudstone and siltstone, variegated greenish-gray and grayish-red----------	27.0
Total Recapture(?) Member (may include some Brushy Basin Member)----------	31.0
Total Morrison Formation----------	120.5

Bluff Sandstone (not measured):

1. Sandstone, yellowish or very pale orange, friable, well sorted, in upper 45 ft.

17. East side of MESA GIGANTE - Valencia County, N. Mex.

[Measured by R. H. Moench and W. P. Puffett, July 1955. Mesa Gigante quadrangle--West side sec. 26 and NE 1/4 sec. 27, T. 10 N., R. 3 W.]

	Feet
Dakota Sandstone:	
26. Sandstone, gray to very pale orange, with flecks of carbonaceous material; even bedded; ripple marks	7.0
25. Siltstone, gray; sparse carbonaceous matter	8.0
24. Sandstone, brownish-gray; sparse carbonaceous matter; lower 7 ft grades downward to gray carbonaceous siltstone and dark-gray shale	20.0
23. Sandstone, gray to very pale orange; noncalcareous, carbonaceous; in horizontal beds 2-10 in. thick	5.0
22. Shale, gray, carbonaceous	2.0
21. Sandstone, even-bedded	8.0
Total Dakota Sandstone	50.0
Morrison Formation:	
Brushy Basin Member:	
20. Sandstone-and-pebble conglomerate, white; feldspathic, kaolinite cement	7.0
19. Mudstone, greenish-gray	27.0
18. Sandstone, very pale orange; feldspathic, coarse grained to conglomeratic, trough crossbedded	35.0
17. Mudstone, greenish-gray	47.0
16. Limestone, gray, dense underlain by thin bed of clay	3.5
15. Mudstone, greenish-gray	11.5
14. Siltstone, grayish-red	3.0
Total Brushy Basin Member	134.0
Westwater Canyon Member:	
13. Sandstone, very pale orange in upper part, grayish-yellow in lower part; feldspathic, friable; abundant iron oxide concretions in lower part	53.0

17. East side of MESA GIGANTE--Continued

Morrison Formation--Continued

Westwater Canyon Member--Continued

		Feet
12.	Limestone, gray, dense	1.0
11.	Sandstone, dark-grayish-green	1.0
10.	Siltstone, grayish-red, calcareous	1.0
9.	Sandstone, greenish-gray; fine grained, feldspathic	33.0
	Total Westwater Canyon Member	89.0

Recapture Member:

8.	Siltstone, grayish-red	3.0
7.	Sandstone, "sickly pea soup green" to very pale orange	6.0
6.	Siltstone and sandstone, thinly interbedded	9.0
5.	Limestone	1.0
4.	Siltstone, grayish-red	0.5
3.	Sandstone, gray to pale-greenish-gray; calcareous in lower part; uranium-vanadium minerals disseminated along bedding, displayed in small prospect pit	7.5
2.	Siltstone and sandstone, greenish-gray and grayish-red; thinly interbedded	8.0
	Total Recapture Member	35.0
	Total Morrison Formation	258.0

Bluff Sandstone (not measured):

1. Upper 35 ft is very pale orange to grayish-yellow, friable.

18. PLATE MESA section - Bernalillo County, N. Mex.

[Measured by R. H. Moench and W. P. Puffett, September 1955. Arch Mesa quadrangle--NE 1/4 SE 1/4 and SE 1/4 NE 1/4 sec. 34, T. 11 N., R. 3 W.]

		Feet
Mancos Shale:		
23.	Sandstone; weathers dull reddish brown; fine grained, well sorted, well cemented; bench-forming unit; scattered nodules or concretions (6-15 in. in diameter) of fossiliferous calcareous material; lower 6 ft is gradational with unit below----------	63.0
22.	Siltstone, brownish-gray; grades downward to black shale; forms slope. Scattered fragments of fossils on slope, no fossils found in place; calcareous concretions 1-1.5 ft in diamter in upper 5-10 ft----------	75.5
21.	Sandstone, very pale orange; fine grained; bench-forming unit; grades downward to thin-bedded siltstone; scattered limonite stain; few wisps of carbonaceous matter----------	30.0
20.	Shale, light-gray; carbonaceous, noncalcareous-----	16.0
19.	Limestone, dark-brownish-gray; fossiliferous, dense; occurs as discontinuous lenses----------	2.0
18.	Shale, dark-brown to black; fissile, carbonaceous--	19.0
	Total incomplete Mancos Shale----------	205.5
Dakota Sandstone:		
17.	Sandstone, interbedded with subordinate siltstone; well sorted, slightly calcareous----------	16.0
16.	Sandstone; weathers light brownish gray; well sorted, noncalcareous, well cemented, massive; scattered thin bands of yellowish-green clay-----	2.5
15.	Sandstone, light-gray; thinly laminated, well sorted, noncalcareous----------	2.5

18. PLATE MESA section--Continued

Dakota Sandstone--Continued

	Feet
14. Siltstone, slightly calcareous, firmly cemented, poorly bedded; forms base of slope	2.5
13. Shale, light-gray; poorly bedded, carbonaceous	40.5
12. Shale, black to dark-gray; moderately cemented, scattered thin sheets of gypsum	8.0
Total Dakota Sandstone	72.0

Morrison Formation:

Brushy Basin Member:

11. Mudstone, greenish-gray; locally pebbly in lower 80 ft; clasts are rounded quartz, chert, and rocks	104.5
10. Sandstone, light-yellowish-gray; moderately cemented, locally calcareous, trough crossbedded; to the east the sandstone splits into two units with mudstone between	34.0
9. Sandstone, brownish-gray on weathered surface; locally firmly cemented with silica; pebble-and-green mud ball conglomerate at base; trough crossbedded	7.5
8. Mudstone, greenish-gray, locally grayish-red; local thin lenses of massive dark-green sandstone as much as 1 ft thick	49.5
Total Brushy Basin Member	195.5

Westwater Canyon Member:

7. Sandstone, fine- to medium-grained, noncalcareous, poorly sorted, feldspathic; trough crossbedded	7.0
6. Sandstone, medium- to coarse-grained, calcareous in lower part, strongly cemented, feldspathic; trough crossbedded; abundant sandstone pipes as much as 4 in. in diamter extend downward into mudstone and are buried by sandstone	10.5
Total Westwater Canyon Member	17.5

18. PLATE MESA section--Continued

Morrison Formation:

	Feet
Recapture Member:	
5. Mudstone, greenish-gray, interbedded with grayish-red siltstone----------	24.0
4. Sandstone, very pale orange; poorly sorted, calcareous, feldspathic; trough crossbedded; contains numerous green mud balls----------	3.5
3. Mudstone and siltstone, mottled greenish-gray and grayish-red; three or four beds of massive, dark-green, noncalcareous sandstone as much as 8 in. thick----------	30.0
2. Siltstone and sandstone, pale-green grading downward to grayish-red; fine-grained, calcareous; locally has deep-green spots; poorly sorted, feldspathic; trough crossbedded----------	5.0
Total Recapture Member----------	62.5
Total Morrison Formation----------	275.5

Bluff Sandstone (not measured):

1. Upper part is yellowish-gray to pale-green; well sorted, even bedded; spectacular crossbedding about 35 ft below top.

19. MESA COCINA section, Sandoval County, N. Mex.

[Measured by R. H. Moench and W. P. Puffett, September 1955. La Gotcna quadrangle--NE 1/4 NW 1/4 sec. 15, T. 12 N., R. 3 W.]

		Feet
Dakota Sandstone (incomplete):		
32.	Sandstone, interbedded with subordinate carbonaceous shale----------	6.5
31.	Sandstone and pebbly sandstone, grading downward to gray carbonaceous siltstone; sandstone contains flecks of carbonaceous matter----------	8.0
30.	Sandstone and black shale, interbedded----------	9.0
29.	Sandstone and conglomeratic sandstone; sandstone is well sorted, strongly cemented, crossbedded-------	4.0
28.	Conglomeratic sandstone, with thin lenses of carbonaceous shale----------	2.5
	Total Dakota Sandstone (incomplete)----------	30.0
Morrison Formation:		
	Brushy Basin Member	
	Jackpile sandstone of economic usage:	
27.	Sandstone, light-tan; feldspathic; trough crossbedded; top is conglomeratic and contains scattered mud balls; thin layer of light-gray carbonaceous mudstone at base----------	18.0
26.	Sandstone, light-gray; course grained to fine grained, feldspathic; crossbedded----------	53.0
25.	Mudstone----------	1.0
24.	Sandstone, pale-orange; noncalcareous, feldspathic; crossbedded----------	11.0
23.	Sandstone, friable, interbedded with greenish-gray mudstone----------	1.0
22.	Sandstone, feldspathic; trough crossbedded----------	11.0
21.	Sandstone, with lenses of greenish-gray mudstone 1-6 in. thick; sandstone is calcareous, poorly sorted----------	4.0
20.	Sandstone, white----------	1.0

19. MESA COCINA section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued

Jackpile sandstone of economic usage--Continued

		Feet
19.	Sandstone, poorly sorted, feldspathic; trough crossbedded, with scattered mud balls as much as 5 in. across	9.0
18.	Sandstone, noncalcareous, friable, well sorted; contains rounded grains of quartz and feldspar; parallel laminated, not crossbedded	6.0
17.	Sandstone, feldspathic, poorly sorted, crossbedded; contains rounded to angular grains of quartz and pink and white feldspars, and scattered balls and lenses of mudstone; kaolinite distributed along bedding surfaces	6.0
16.	Sandstone, noncalcareous, friable to firmly cemented, well sorted, laminated; forms bench	5.0
	Total Jackpile sandstone of economic usage	126.0
15.	Mudstone, greenish-gray, interbedded with siltstone and calcareous feldspathic sandstone	7.0
14.	Sandstone, noncalcareous, well sorted	6.0
13.	Mudstone, greenish-gray, with thin lenticular beds of siltstone and limestone; lower part contains sparsely scattered pink and black sand grains; 6-in. bed of limestone 10 ft below top	74.0
12.	Sandstone, very pale orange; fine grained, well sorted, noncalcareous, firmly cemented with silica; pinches out to north, converges to south with sandstone below the underlying mudstone	2.5
11.	Mudstone, greenish-gray	5.5

19. MESA COCINA section--Continued

Morrison Formation--Continued

Brushy Basin Member--Continued:

		Feet
10.	Sandstone, light-gray; weathers brownish gray in lower 25 ft; locally conglomeratic, noncalcareous, and friable except in widely separated lenses as much as 8 in. thick; trough crossbedded; very poorly sorted, feldspathic, calcareous; firmly cemented polymictic pebble conglomerate at lower contact----------	33.5
9.	Mudstone, greenish-gray----------	6.5
8.	Ash bed, brick-red in upper 6 in., greenish-gray in lower part; thin section shows broken angular crystals of feldspars of various compositions scattered through a matrix of altered shards(?); shards(?) replaced by hydrous iron oxide and interstices filled with fine-grained quartz(?)---	1.0
7.	Mudstone, greenish-gray----------	24.0
6.	Limestone; weathers brown----------	0.5
5.	Mudstone, greenish-gray----------	10.5
4.	Mudstone, gray and grayish-red; 3-in. bed of brown-weathering limestone 11 ft below top-------	38.5
3.	Siltstone, very pale orange; noncalcareous---------	2.5
2.	Mudstone interbedded with siltstone, variegated greenish-gray and grayish-red; 4-in. bed of limestone 8 ft below top----------	14.0
	Total Brushy Basin Member----------	352.0

Westwater Canyon Member (incomplete):

1. Sandstone, very pale orange; somewhat calcareous, firmly cemented, well sorted; weathers to rounded surfaces with polygonal jointing. Not measured.