Geology of the Upper Cretaceous and Tertiary Coal-Bearing Rocks in the Western Part of the Wind River Basin, Wyoming

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By NELSON L. HICKLING, RALPH C. WARLOW, and JOHN F. WINDOLPH, Jr.

A subsurface and surface study of **Upper** Cretaceous and Tertiary coal-bearing rocks with emphasis on the relation between depositional environments and the distribution, thickness, and quality of coal

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				* .

Geology of the Upper Cretaceous and Tertiary Coal-Bearing Rocks in the Western Part of the Wind River Basin, Wyoming

By Nelson L. Hickling, Ralph C. Warlow, and John F. Windolph, Jr.

Abstract

Upper Cretaceous coal-bearing rocks of the Frontier Formation in the western part of the Wind River basin record the earliest accumulation of peat in swamps overlying a system of linear shoreline and delta lobe sand bodies formed during marine regressive cycles.

The Upper Cretaceous Mesaverde Formation contains numerous coal beds that formed from peat accumulations over thick sand bodies related to distributary channels, coastal barrier bars, and prograding delta systems. Thick coal beds such as the Signor represent still-stands of long duration, and many of them contain tonsteins indicating synchronous volcanic events.

The Upper Cretaceous Meeteetse Formation contains the very thick Welton coal bed, which formed from peat accumulating in an intermontane basin. Its high silica and ash content results from rapid basin subsidence and increased influx of volcanogenic sediments.

The nearly flat-lying beds of the basal Eocene Indian Meadows Formation were deposited on an erosional surface and are unconformable with steeply dipping strata of the Mesaverde, Meeteetse, Lance, and Fort Union Formations. Early Eocene volcanic activity is recorded by numerous thin tuff beds.

INTRODUCTION

Thirty-three stratigraphic sections of coal-bearing rocks of Late Cretaceous to Tertiary age were measured in the western part of the Wind River basin (fig. 1). The study was conducted from June 1978 to August 1981 and was part of an investigation of coal beds, their extent and distribution, and their stratigraphic relations to coal-forming environments (Windolph and others, 1982). Investigations included geologic mapping, core drilling, sampling of coal beds, and establishment of stratigraphic, sedimentologic, and structural relationships.

GEOLOGIC DISCUSSION

The thickness of the composite of 33 measured sections exceeds 41,000 feet (ft). An Abney level was used

to correct for dip. See table 1 for thicknesses of formations measured in sections. Locations of measured sections are shown in figure 2. Exposures of coal-bearing strata are limited to several isolated outcrops of gently dipping rocks (10°-15°) in the south and southwest and steeply dipping to overturned folded and faulted rocks in the north and northwest parts of the area.

The coal-bearing rocks studied include the following, from oldest to youngest: the Frontier Formation, Cody Shale, Mesaverde Formation, Meeteetse Formation, and Lance Formation, all of Late Cretaceous age; the Paleocene Fort Union Formation; and the lower Eocene Indian Meadows Formation. A generalized stratigraphic column for the western portion of the Wind River basin is shown in plate 1.

The oldest coal-bearing strata measured are in the upper part of the Upper Cretaceous Frontier Formation in the north and northwest parts of the study area (fig. 2, sections 22, 23, 24). These rocks record the earliest accumulation of peat in swamps overlying a system of linear shoreline and delta lobe sand bodies formed during marine regressive cycles.

Coal beds in the Frontier Formation were formed in a broad near-coastal swamp that developed on a system of prograding deltas. The Wilderness coal bed (Windolph, 1982; pl. 1) locally ranges from 12 to as much as 32 inches (in) in thickness. A near-surface sample had a calculated rank of Bituminous C, but that rank is not considered reliable.

Portions of the marine regressive Upper Cretaceous Cody Shale are described, including the chalk and tuffaceous zone at the base (section 22) and marine regressive sandstone tongues in the upper part (sections 1, 9, 11, 13, 15–18, 26).

The most important coal beds in the Mesaverde Formation, from base to top of the section, are in the Maverick Spring coal zone and include the overlying Signor, Beaver, and Shipton coal beds (pl. 1). These coals also formed from peat accumulation over thick sand bodies related to distributary channels, coastal barrier bars, and prograding delta systems (Warlow, Hickling, and Win-

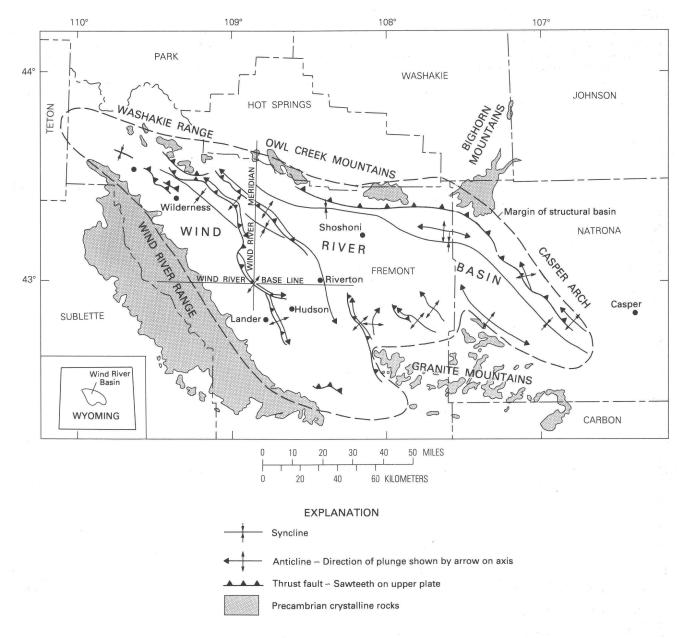


Figure 1. Index map of the Wind River basin.

dolph, 1986). Thick coal beds such as the Signor represent widespread stillstands of long duration. Many of these coals contain tonsteins, indicating synchronous volcanic events.

The Maverick Spring coal zone includes 2 to 10 coal beds ranging from several inches to more than 42 inches in thickness, and it has been correlated over the entire study area. Nineteen samples from the Maverick Spring coal zone showed the following calculated ranks: 11 samples, Bituminous C; 5 samples, Subbituminous A; and 3 samples, Subbituminous B (Windolph and others, 1982).

The Signor coal bed is approximately 225 ft above the Maverick Spring coal zone and ranges from 36 to 240 inches in thickness. Seven samples showed the following

calculated ranks: 2 samples, Subbituminous A; 2 samples, Subbituminous B; and 3 samples, Subbituminous C. The Beaver coal bed, approximately 225 ft above the Signor, ranges from 12 to 30 inches in thickness and is not as widely distributed. A single sample of the Beaver showed a calculated rank of Subbituminous A. The Shipton coal bed, approximately 250 ft above the Beaver, ranges from 12 to 34 inches in thickness. This bed includes numerous tonsteins and silicified fossil tree stumps. Three samples of this bed had the following calculated ranks: 1 sample, Subbituminous A; and 2 samples, Subbituminous B.

Coal beds in the Frontier and Mesaverde Formations are generally low in ash content, but are slightly elevated in

Table 1. Thickness of formations measured in sections

[In feet-inches. Numbers in brackets are total formation thicknesses measured; solid lines indicate formations missing because of unconformity. Abbreviations—Upper Cretaceous: Kf, Frontier Formation; Kc, Cody Shale; Kmv, middle plus lower member of Mesaverde Formation; Kmvs, upper white sandstone member of Mesaverde Formation; Kme, Meeteetse Formation; Kl, Lance Formation. Paleocene: Tfu, lower member of Fort Union Formation; Tfus, Shotgun Member of Fort Union Formation. Lower Eocene: Tim, Indian Meadows Formation]

Section	Tim	* Kf	Kc	Kmv	Kmvs	Kme	Kl	Tfu	Tfus	Tim
1 2 3 4			79–3 50–0	[1,583–2] [1,292–5]	[189–8] [237–0]	99–8 165–0 300–7 287–2	[2,272–8]	[971–6]	862–5	
5			181–0	[1,955-1]	345–5	20. 2				
6 7 8 8a 8b 9			128–10 113–10	826–3 1,363–5 141–3 78–2 314– ¹ / ₂	349–9½ 203–0 123–10					46–0
10			75–0	[1,842–1]	[294-0]	11–10				
11 11a 12 13			301–3 376–5	131–7 ³ / ₄ 54– ³ / ₄ [2,060–2 ¹ / ₂]	[206–6]	[621–8]	[762–8]		1,889–0 [810–9]	30-0
14 15			111–10 234–6	165–11 366–4½						125-0
16 17 17a 18			240–8 495–8 155–1	209-2 941-3 623-2 1,110-5			184–7	-		10–0 224–2
19 20			119–11	1,571–5 [1,726–0]	50–0 [346–2]	[932–3]	[164–3]	[703–9]		161–2
21 22		151–7	74–0		200–0	[944–11]	545-0			101 2
23 24 25	16–0	173–6 * 349–6	500-0	694–6						111–4
26 26a 26b 27			378–10 574–10 50–0	4-0 417-10 622-8 219-8						35-0 6-0
Totals	16-0	674–7	4,240–11	20,314–2	$\overline{2,545-41/2}$	3,363–1	3,929–2	1,675–3	3,562-2	748-8
Grand	l total	41,069-	41/2							

^{*} Thrust fault places Frontier Formation on top of Indian Meadows Formation.

total sulfur content owing to their proximity to areas that underwent marginal marine depositional processes.

Section 7 includes an unusual sequence of red shale beds, conglomerate and smectitic clay, and impure coal that represents a portion of a sediment transport and depocenter that was subject to subaerial oxidation and biodegradation (Windolph, 1984).

Strata in the upper part of the Mesaverde Formation appear to have been deposited on an upper delta plain or alluvial plain, as suggested by the absence of significant coal beds, discontinuity of units, and lenticular distributary channel sandstones. Measured sections of the Mesaverde Formation range in thickness from 1,530 to 2,300 ft (sections 2, 5). The upper member of the Mesaverde

Formation, the white sandstone member of Troyer and Keefer (1955), consists of a white to very light gray tabular sandstone as much as 450 ft thick. This high-energy, winnowed, marine transgressive sandstone unconformably overlies the main body of the Mesaverde Formation. The unconformity is most prominent in the northwestern part of the study area, where the Mesaverde Formation thins as much as 410 ft in a westerly direction from section 1 to section 2 to section 8 (Windolph and others, 1986).

The Meeteetse Formation of Late Cretaceous age conformably overlies the Mesaverde Formation. The Meeteetse Formation varies widely in outcrop thickness and is absent in many areas owing to erosional beveling, changes in the depositional environment, and tectonic deformation.

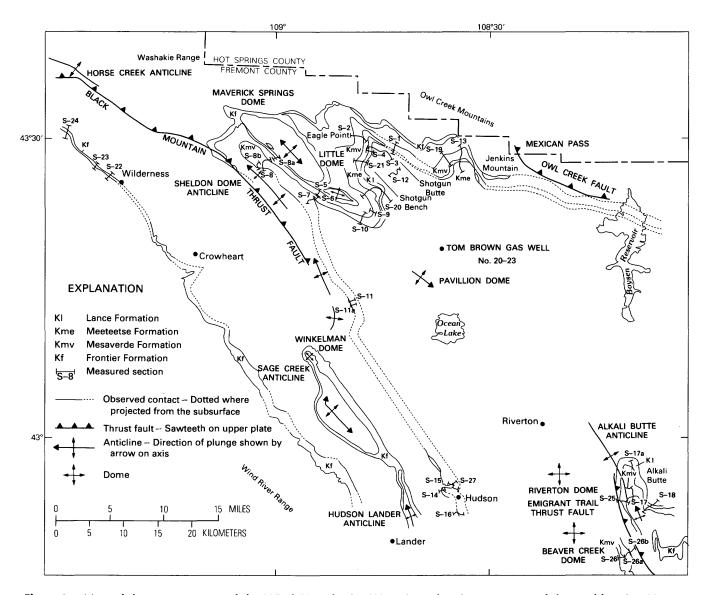


Figure 2. Map of the western part of the Wind River basin, Wyoming, showing outcrops of the coal-bearing Upper Cretaceous Frontier, Mesaverde, Meeteetse, and Lance Formations and locations of measured stratigraphic sections. The folded structures of the area are clearly outlined by these outcrops and, for map clarity, the other formations were omitted.

Exposures of the Meeteetse Formation are thickest near Shotgun Bench, where sediments accumulated in the rapidly subsiding trough of the Shotgun Butte syncline (Warlow and others, 1988). Measured Meeteetse sections range from 0 to 944 ft in thickness and include 24 coal beds (sections 20, 21).

The Welton coal bed in the Meeteetse Formation was formed in an intermontane basin. Its higher silica and ash content is due to rapid basin subsidence and increased influx of volcanogenic sediments. Further restriction from marine influences accounts for its lower total sulfur content (Windolph and others, 1986). The Welton crops out approximately 800 ft above the base of the Meeteetse Formation and ranges from 36 to more than 120 inches in thickness. Three samples of the Welton had a calculated rank of Subbituminous A.

Section 13, near Jenkins Mountain, includes 620 ft of Meeteetse Formation and contains six coal beds. Southeast of Little Dome the Meeteetse Formation is truncated by an unconformity at the base of Eocene strata. As many as 100 coal beds have been identified from well logs in the deeper part of the basin, where the Meeteetse Formation thickens to as much as 4,500 ft and coals reach as much as 240 inches in thickness (Windolph and others, 1986).

Upper Cretaceous strata of the Lance Formation are divided here into a lower sandstone member, a middle ridge- and cliff-forming resistant sandstone member, and an upper nonresistant member. The lower member is lenticular and consists of yellowish-brown, fine- to coarse-grained sandstone units which are thick bedded to massive and locally contain high-angle crossbeds. The basal 10 ft of this member contains abundant fragments of petrified wood,

dinosaur bones, and lenses of lag gravel as much as 4 in thick (sections 3, 13, 20, 21,). The middle member is well exposed and consists of white to very light gray, fine- to coarse-grained sandstone with a few scattered thin mediumgray shale beds. It ranges from 100 to 900 ft in thickness.

The upper member is easily eroded, is poorly exposed, and consists of medium-gray smectitic shale which includes several impure coal beds less than 1 ft thick (section 3). This member coarsens upward to light-gray sandstone, then grades from gray to olive-gray shale and becomes less smectitic toward the top. The upper member is approximately 1,050 ft thick near Shotgun Butte (section 3). Measured thicknesses of the Lance Formation range from 0 to 2,272 ft.

The Paleocene Fort Union Formation is restricted in outcrop to the north-central part of the study area in a structural trough aligned with the Shotgun Butte and Shotgun Bench synclines (Warlow and others, 1988). Fort Union Formation thicknesses range from 0 to 1,833 ft in measured sections (section 3). Near the center of the Wind River basin, east of the study area, electric well logs indicate as much as 4,500 ft of Fort Union Formation in the subsurface. The Fort Union Formation is divided into two members: the unnamed lower member and the Shotgun Member (Keefer, 1961). The lower member consists of coarse conglomerate and sandstone which are medium gray to light yellowish brown and lenticular and contain rounded quartz pebbles, chert, and petrified wood. Sandstone units are medium light gray, fine to coarse grained, and thin to thick bedded. East of Shotgun Butte the lower member grades upward into finer grained thin-bedded sandstones and shale and wedges out entirely south of Jenkins Mountain. The basal contact of the lower member in most places is angularly unconformable with underlying strata, but locally parallel dips may be similar, making this contact difficult to locate. Most contacts are marked by a thick zone of conglomerate with dark-brown to black manganiferous and ferruginous cement and thick bands of siderite (section 3).

The Shotgun Member consists of medium-gray to light-greenish-gray shale with intervals of slightly carbonaceous bentonitic shale, several thin beds of medium-gray calcareous sandstone and siltstone, and occasional thin beds of lignite.

The nearly flat lying beds of the basal Eocene Indian Meadows Formation were deposited on an erosional surface and are unconformable with steeply dipping strata (in order of increasing age) of the Fort Union, Lance, Meeteetse, and Mesaverde Formations. Strata of the Indian Meadows Formation consisting of as much as 4,500 ft are herein divided informally into a lower and an upper member. The lower member consists of medium-gray to grayish-red to dark-reddish-brown conglomerate, arkosic sandstone, silt-stone, and shale, a few thin-bedded freshwater limestone beds, and light- to medium-gray bentonitic shale beds. In

the northwestern part of the Wind River basin, conglomerate beds consist of rounded boulders of Precambrian crystalline, Paleozoic, Mesozoic, and earliest Tertiary rocks, some of which exceed 15 ft in diameter (Warlow and others, 1986). Early Eocene volcanic activity is recorded by numerous thin, white to light-gray tuff beds. The westernmost tuff beds occur in the southeast corner of the Eagle Point Quadrangle near the Armstrong coal mine (Warlow and others, 1988). Two tuff beds are present near Hudson, and at least five are exposed near Alkali Butte. Thicknesses of the tuff beds range from a few inches to as much as 5 ft, and the beds generally contain fossil root impressions.

The upper member of the Indian Meadows Formation consists of distinct layers of grayish-red to variegated silty shale, smectite, and tuff; thin, dark-gray to purple, lignitic, carbonaceous shale beds; and several lenticular conglomerate beds. Only basal portions of the Indian Meadows Formation in the study area were measured.

Numerous coal beds were described in the Lance, Fort Union, and Indian Meadows Formations, but none of them reached resource thickness (30 in) in the study area.

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	•	,	
	•		

Measured section 1: Cody Shale through Mea	eteetse	•			Thickr	
Location: Shotgun Butte Quadrangle, Wyoming (7.5 min) Start: NW-NW-SE sec. 14, T. 6 N., R. 1 E. Presented		dest to		eter, topset and foreset bedding, indicative of deltaic distribution	Ft 90	in
youngest End: SW-SW-NE sec. 23, T. 6 N., R. 1 E. Described by: N.L. Hickling, R.C. Warlow, and J.F. Wir			13.	Siltstone, medium-gray, very fine grained, sandy, thin and evenly bed-	90	0
Strike 270°, Dip 30° S.	uo.p.n,	•••		ded	6	0
Upper Cretaceous:	Thick	ness	14.	Shale, medium-gray, thin and evenly bed- ded	6	0
Cody Shale:	Ft	in	15.	Shale, dark-gray to grayish-black, car-		
Shale, medium-gray, thin and evenly bed- ded, weathered	1	0		bonaceous to canneloid; includes 1/2-		
2. Sandstone, medium-light-gray, very fine	1	U		in-thick coalified stem at base, gypsum		
to fine-grained, thin-bedded, crossbed-				crystals ± 1 inch in diameter; 2 in coal 6 in below top, bright to dull with		
ded, very calcareous, weathered	6	0		fusain, on 6 in of underclay, grayish		
3. Shale, medium-dark-gray, thin and evenly bedded, carbonaceous; gypsum				brown to brownish black with fossil		_
crystals on surface	13	0	16	rootlets	3	0
4. Limestone, medium-gray, very fine			10.	Shale, medium-gray, sandy to silty, cal- careous, thin and evenly bedded	3	7
grained, grading to mudstone		4	17.	Sandstone, medium-light-gray, very fine		•
5. Shale, medium-gray to medium-dark- gray, slightly carbonaceous, few thin				grained, thin- to thick-bedded, dark		_
limestone beds ± 1 in thick; few thin,			10	and light mineral grains	3	6
very fine grained sandstone beds with			18.	Shale, grayish-brown, thin-bedded, very carbonaceous, few fossil roots and		
crossbeds up to 6 in thick, slightly silty	17	0		plant fragments		7
6. Sandstone, medium-light-gray, very fine	17	U	19.	Shale, medium-gray to light-grayish-		
grained, thin-bedded, crossbedded,				brown, abundance of fossil plant frag- ments, stems, and roots (underclay)	2	0
silty to shaly, very calcareous; few thin			20.	Coal, bright, few thin bony partings, resin	_	Ü
limestone beds, scattered weathered pyrite nodules, 1/4 inch in diameter; few				blebs and gypsum grains weathered		10
resistant sandstone beds ±8 in thick-	14	0	Bot	tom of Maverick Spring coal zone		
7. Shale, medium-gray, silty, sandy; 1-in			21.	Shale partings, light-grayish-brown with		
calcareous beds and ±1-in sandstone				resin blebs		1
beds, basal 6 in medium-dark-gray, carbonaceous	3	0	22.	Coal, impure, bright, sulfur stains, resin blebs, mud balls up to 3 inches in		
8. Sandstone, medium-light-gray, very fine				diameter with parting	1	1
grained, silty; few shale interbeds	2	0	23.	Shale, medium-gray, thin and evenly bed-		
Shale, medium-gray, very fine grained, sandy, poorly bedded; sharp, locally			24	ded, 2 in of limestone 1 ft below top-	3	6
slumped with convoluted bedding; cal-			24.	Sandstone, medium-light-gray, very fine grained, silty and shaly with pyrite		
careous beds up to 3 in thick		5		nodules ½ inch in diameter	3	0
10. Sandstone, medium-light-gray, very fine			25.	Shale, medium-gray, thin and evenly bed-		•
to fine-grained, calcareous, massive contorted bedding, 40–45 percent				ded Underclay, light-grayish-brown, carbo-	1	0
quartz; light and dark mineral grains,			20.	naceous, fossil roots		3
pyrite nodules in top 1 ft, convoluted	10	•	27.	Coal, impure, bony, resin blebs, gypsum		
bedding fills channels in unit 9 11. Sandstone, medium-light-gray, very fine	13	0	20	crystals		11/2
grained, thin-bedded at base, thick-			28.	Siltstone, light-grayish-brown to medium- gray, thin and evenly bedded, silty to		
bedded at top, silty to shaly, slightly		_		sandy, few coal fragments and fossil		
Carbonaceous	9	_6		trunks ±1 inch in diameter	1	8
Total measured thickness of Cody Shale	79	<u>3</u>	29.	Shale, medium-dark-gray, carbonaceous, bony		1
-		=	30.	Shale, medium-gray to light-grayish-		1
Mesaverde Formation:				brown, few fossil plant fragments and-		
12. Sandstone, medium-light-gray, very fine			21	rootlets at base	1	8
grained to medium-grained but mostly fine-grained, thick-bedded to massive,			31.	Sandstone, medium-light-gray to medium- gray, very fine grained, silty, crossbed-		
45 percent quartz; few fractures filled				ded, pyrite nodules and bands	6	0
with quartz, thinning to NW.; upper			32.	Shale, medium-gray, thin- to poorly bed-	0	0
±2 ft very calcareous with siderite; few			22	dedSandstone, medium-light-gray, very fine	- 8	8
crossbeds and calcareous beds 3–10 ft thick on top. Top part thin bedded with			<i>JJ</i> .	grained, silty, thin and irregularly bed-		
weathering cavities up to 1 ft in diam-				ded	9	0

		Thickr	ness			Thick	ness
		Ft	in			Ft	in
34.	Underclay, medium-gray to light-grayish- brown, nonbedded, fossil rootlets, very carbonaceous; upper 1 in fissile, carbo-			59.	Sandstone, medium-light-gray, very fine grained, silty, fossil roots and plant fragments		6
35.	naceous dark-gray shale	3	0	60.	Underclay, medium-gray, fossil roots, silty; upper 6 in light-grayish-brown, carbonaceous	1	6
36.	middle of unit Underclay, medium-gray to light-grayish-	1	9		Coal, bright, abundant resin, gypsum, medium		8
37.	brown, nonbedded, fossil rootlets Coal, bright to dull, abundant resin blebs, some gypsum crystals, fossil plants,	2	6	63.	Bone, with blebs of resin Underclay, light-grayish-brown Coal, impure		3 4 2
38.	fine to medium cleatsShale, medium-gray, carbonaceous, fossil	1	3	65.	Shale (underclay), silty, fossil plant frag- ments and roots	1	4
39.	plant fragments Siltstone, medium-gray, interbeds of very fine grained sandstone	1	2		Coal, impure	1	3
	Underclay, medium-gray, nonbedded Shale, carbonaceous, thin and evenly bed-	3	0	68.	Shale, medium-gray, thin and evenly bed- ded, pyrite nodules, gypsum	5	6
	ded, fossil plant fragmentsShale, medium-gray, thin and evenly bed-		6		Underclay, medium-gray, fossil roots, nonbedded	3	0
43.	ded, silty	1	0		Coal, bright, banded, amber, gypsum Shale, medium-gray to light-grayish- brown, poorly bedded, silty	1	4
	locally sideritic Underclay, medium-gray, fossil rootlets -	1 1	0 0	72.	Sandstone, medium-light-gray, very fine grained, thin-bedded, crossbedded,	-	·
	Shale, medium-dark-gray to dark-gray, carbonaceous Under clay, medium-gray to light-grayish-		6	73	silty, pyrite nodules, slightly calcare- ous, fossil roots	1	4 7
	brown, carbonaceous, fossil rootlets Coal, bony	1	0 2		Shale, carbonaceous, light-grayish- brown, thin and evenly bedded, fossil		
48.	Sandstone, medium-light-gray, very fine to fine-grained, abundant large solution			75.	plants		2
	cavities in basal 6 ft; basal part thin bedded, crossbedded, pyrite nodules, 40–45 percent quartz, dark and light mineral grains; central part is massive; upper 6–12 ft thin bedded and very fine			76.	ded, fossil plants		9
	grained with crossbeds, few calcareous beds	32	0	77.	part fills channels in unit 75 Shale, medium-gray, silty, sandy lens 6+	5	6
	Shale, medium-gray to medium-dark- gray, carbonaceousSandstone, medium-light-gray, very fine		6	78.	in thick	2	0
	grained, siltstone laminations Shale, medium-dark-gray, thin and		6		ule bands, shale laminations; upper 3 ft thin bedded, fossil roots in upper 6 in-	5	0
52.	evenly bedded, carbonaceous Sandstone, medium-light-gray, very fine grained, silty, thin-bedded; fossil roots	1	0		Coal, bloom Underclay, medium-gray, poorly bedded, fossil roots	3	1/8 6
	in upper ±1 ft, shaly to silty, nonbedded	4	0		Coal, bloom, impure Tonstein, very light grayish red to medium-	3	3
	Coal, bright, weathered Underclay, light-grayish-brown to medium-gray, fossil roots, slightly		2	83.	pinkCoal, mostly shale, volcanic ash, or carbonaceous layers, detritus, sandstone		3
55.	silty Coal, weathered, bright to dull with fusain; resin, gypsum, and sulfur		7	84.	above, irregular and channels Sandstone, medium-light-gray, very fine to fine-grained to medium-grained, thin-		8
56.	stains; cleats Underclay, light-grayish-brown to medium-gray, fossil roots		6 7		bedded to massive, pyrite nodules very calcareous; 1 ft of shale chip conglom- erate 5 ft above base; abundant weath-		
57.	Coal, dull to bright with fusain, gypsum crystals, sulfur stains, resin blebs,		A1/		ering cavities Underclay, medium-gray, fossil roots	25 3	0
58.	weathered	1	4½ 0	80.	Sandstone, medium-dark-gray, very car- bonaceous, very fine grained, silty, abundance of carbonaceous material		7

		Thickn	ess			Thickr	ness
		Ft	in			Ft	in
	Shale, medium-gray, poorly beddedSandstone, medium-light-gray, weathers	1	2		to fine-grained, thin-bedded to massive, few medium grains, fossil roots in	20	0
	yellow brown; thin bedded, very fine to	5	0		upper 6 in	20	0
89.	fine grained, very calcareous Underclay, medium-gray, fossil rootlets,			111.	Shale, medium-dark-gray, carbonaceous, fossil plant fragments, thin and evenly		2
00	pyrite nodules	11	2	110	bedded	•	2
	Coal, bloom, under shale		3		Shale, medium-gray, poorly bedded	3	0
	of Maverick Spring coal zone			113.	Sandstone, medium-light-gray, very fine	2	0
91.	Shale, medium-gray, weathered, thin and				grained, silty, thin-bedded	3	0
	evenly bedded, possibly slump-	1	0	114.	Shale, medium-gray, thin- to poorly bed-		^
00	bedded	1	0		ded	1	0
92.	Sandstone, medium-light-gray, fine- to			115.	Siltstone, dark-brown; very fine grained		^
	medium-grained, massive, pyrite nod-			116	sandstone, very calcareous	1	0
	ules 1/4 inch in diameter, crossbedded;			116.	Shale, medium-gray, thin and evenly bed- ded	10	0
	upper half of unit thin bedded; contains			117		10	U
	few thin calcareous siltstone and sand- stone interbeds; friable, fractures filled			117.	Sandstone, medium-light-gray, weathered		
	with quartz	28	0		brown, very fine grained, thin- to thick-	2	0
03	Limestone, yellow-brown, weathered,	20	U	110	Shale medium gray poorly hadded:	2	U
93.	brittle, very fractured, top channeled			110.	Shale, medium-gray, poorly bedded; upper 1 ft carbonaceous, thin and		
	and filled by unit 94	8	0		evenly bedded	9	0
94	Sandstone, medium-light-gray, very fine	U	U	110	Sandstone, medium-light-gray, very fine	,	Ū
J ⊤.	to fine-grained, massive, pyrite nod-			117.	grained, thin-bedded, silty, very cal-		
	ules up to 1 inch in diameter; solution				careous	1	0
	cavities lens-shaped in upper 5 ft; very			120	Shale, medium-gray, poorly bedded	2	Õ
	calcareous	9	0		Sandstone, medium-light-gray, very fine	-	Ū
95.	Sandstone, medium-light-gray, very fine		·	121.	grained, thin-bedded, fossil roots in		
,,,,	grained, silty, thin-bedded	10	0		upper 6 in	1	0
96.	Shale, medium-dark-gray in basal 1 ft;			122.	Underclay, medium-dark-gray, silty, fos-		
	upper part medium gray, nonbedded	4	5		sil rootlets	1	5
97.	Siltstone, weathered yellow brown, very			123.	Coal, bloom		1
	calcareous, brittle, broken pyrite nod-				Shale, medium-gray to medium-dark-		
	ules	4	0		gray, slightly carbonaceous, silty;		
98.	Sandstone, medium-light-gray, very fine				upper 1 ft very fine grained sandstone,		
	to fine-grained, thin-bedded, calcare-				thin-bedded with pyrite nodules	4	0
	ous, pyrite nodules	3	0	125.	Sandstone, medium-light-gray, very fine		
99.	Underclay, medium-gray, fossil rootlets				to medium-grained, massive, fills		
	with coal fragments	5	0		channels in unit 124, lens-shaped, thin-		
100.	Sandstone, medium-light-gray, very fine				bedded, crossbedded	33	0
	to fine-grained, calcareous, lens-	_	_	126.	Underclay, medium-gray, fossil roots		
	shaped	2	0		(coalified roots), 6-in-thick thin-		
101.	Shale, medium-gray, silty, thin and				bedded sandstone 2 ft 5 in below top;		
	evenly bedded; pyrite nodules and scat-				upper 4 in contains sandy detrital coal	10	
	tered bands of pyrite in central part			107	fragments	10	0
	with very fine grained sandstone,	8	0	127.	Sandstone, medium-light-gray, fine-		
102	slightly carbonaceous at top Sandstone, medium-light-gray to light-	0	U		grained, thick-bedded to massive, scat-	5	0
102.	gray, very fine grained, silty	3	0	129	tered pyrite nodules, solution cavities- Shale, medium-gray, poorly bedded,	3	U
103	Underclay, medium-gray, nonbedded,	3	U	120.	sandy	7	0
105.	silty, few fossil roots, 3 in of carbona-			120	Sandstone, medium-light-gray, very fine	•	Ū
	ceous laminations at top	2	0	127.	grained, thin-bedded, ¼-in-diameter		
104	Sandstone, medium-light-gray, fine-		Ů		pyrite nodules	1	0
20.,	grained, thin- to thick-bedded, cross-			130.	Underclay, medium-gray, fossil roots,	_	_
	bedded, very calcareous; upper ±5 ft			1001	carbonaceous streaks	1	0
	very fine grained, silty, thin bedded	11	0	131.	Coal, impure, shaly, bright bands		2
105.	Underclay, medium-gray, fossil rootlets -	2	0		Underclay, medium-gray, fossil roots	2	0
106.	Coal, bloom		3		Sandstone, medium-light-gray, very fine		
107.	Shale, medium-gray, poorly bedded, few				grained, thin-bedded, silty	1	0
	calcareous zones	9	0	134.	Underclay, poorly bedded, silty, fossil		
108.	Sandstone, medium-light-gray, very fine		_		roots; upper 6 in very carbonaceous	3	5
100	grained, thin-bedded, crossbedded	4	0	135.	Coal, bright, gypsum grains, sparse resin		_
109.	Shale (underclay), medium-gray, lower 1	A	Λ	125	blebs		5
110	in carbonaceous	4	0	136.	Shale, light-grayish-brown, carbona-		
110.	Sandstone, medium-light-gray, very fine				ceous, abundance of bright coal streaks		

		Thickr	ness			Thick	ness
		Ft	in			Ft	in
	and fossil plant detritus		7		grained, thin-bedded, silty	3	0
	Coal, bright, gypsum grains, resin blebs-		5	169.	Shale, medium-gray to medium-dark-		
138.	Shale, medium-gray, poorly bedded	2	5		gray, thin and evenly bedded, carbon-		
139.	Siltstone, medium-gray, very fine				aceous in upper 1 ft	3	5
	grained	1	2	170.	Sandstone, medium-light-gray, very fine		
140.	Underclay, medium-gray to medium-dark-				to fine-grained, thin and irregularly		
	gray with carbonaceous shale, fossil	_	_	171	bedded with shale chip conglomerate -	7	0
1.4.1	roots and plant fragments	6	5	1/1.	Shale, medium-gray, thin and evenly bed-	2	•
141.	Coal, bright, resin, gypsum grains,		2	172	ded	2	0
142	closely spaced cleats Shale, medium-gray, thin and evenly bed-		3		Underclay, silty, sandy, fossil roots Shale, medium-gray, thin and evenly bed-	3	U
172,	ded; 3-in-thick calcareous siltstone in			175.	ded	2	6
	middle of unit	3	0	174.	Siltstone, medium-gray, thin and evenly	2	U
143.	Sandstone, medium-light-gray, very fine	3	Ü	2,	bedded, very calcareous		9
	grained, thin-bedded, silty	3	0	175.	Shale, medium-gray, thin and evenly bed-		
144.	Underclay, medium-gray, poorly bedded,	_	-		ded; basal 2 in very carbonaceous,		
	upper 6 in carbonaceous shale, thin and				fossil plant fragments	1	8
	evenly bedded, fossil plant fragments-	3	0	176.	Sandstone, medium-light-gray, very fine		
145.	Sandstone, medium-light-gray, very fine				grained, thin-bedded, silty	3	0
	grained, silty, thin-bedded at base,			177.	Shale, medium-gray to medium-dark-		
	thick-bedded at top with 1-ft-thick				gray, thin and evenly bedded, fossil	_	•
	medium-gray shale, thin and evenly			170	plant fragments	5	0
	bedded, carbonaceous in middle of unit	,	^	1/8.	Sandstone, medium-light-gray, very fine		
146	Siltstone, medium-gray, very fine	6	0		grained, thin-bedded, silty, pyrite nod- ules ³ / ₄ inch in diameter		8
140.	grained, sandstone	3	0	179	Shale, medium-gray to medium-dark-		0
147	Shale, medium-gray, poorly bedded	3	0	177.	gray, very carbonaceous in basal 1 ft		
148.	Sandstone, medium-light-gray, very fine	3	U		and top 1 ft, slightly silty in central		
	grained, thin-bedded	1	5		part	4	0
149.	Underclay, medium-gray, poorly bedded,	•	_	180.	Sandstone, medium-light-gray, very fine	•	
	fossil roots	2	0		grained, thin- to thick-bedded, iron-		
150.	Coal, bright, weathered		2		stone band at base		11
	Shale, medium-gray, poorly bedded	2	0	181.	Shale, medium-dark-gray, thin and		
152.	Sandstone, medium-light-gray, very fine				evenly bedded, very carbonaceous		7
1.50	grained, thin-bedded, silty	1	6	182.	Sandstone, medium-light-gray, very fine		_
	Shale, medium-gray, poorly bedded	1	8	103	grained, thin-bedded, silty		5
154.	Sandstone, medium-light-gray, weathered				Underclay, medium-gray, fossil rootlets -	1	6
	light-brown, very fine grained, thin-	2	0		Coal, impure, shaly		2
155	bedded, silty, very calcareous Shale, medium-gray, poorly bedded	2 2	0 0	165.	Shale, medium-gray, thin and evenly bed- ded, fossil plants	1	2
	Sandstone, medium-light-gray, very fine	2	U	186	Sandstone, medium-light-gray, fine- to	1	2
2001	grained, thin-bedded, silty		4	100.	medium-grained, pyrite nodules 1 inch		
157.	Shale, medium-gray, poorly bedded	- 1	ò		in diameter, crossbedded, thin and		
	Sandstone, medium-light-gray, very fine				irregularly bedded, shale chips and silt-		
	grained, thin-bedded, silty, lens-				stone fragments up to 5 inches in diam-		
	shaped	1	0		eter, solution cavities	17	0
159.	Shale, medium-gray, thin and evenly bed-			187.	Siltstone, medium-gray, very fine		
160	ded	2	2	100	grained, thin-bedded, sandstone	5	0
160.	Sandstone, medium-light-gray, very fine		_	188.	Sandstone, medium-light-gray, very fine		
161	grained, silty, calcareous		5		grained, crossbedded, thin-bedded,	,	4
	Shale, medium-gray, poorly beddedSandstone, medium-light-gray, very fine	1	5	190	Shale medium gray thin hedded year	1	4
102.	grained, thin-bedded, silty, calcareous-	1	7	109.	Shale, medium-gray, thin-bedded, very silty, upper part graded	4	0
163.	Shale, medium-gray to medium-dark-	1	1	190.	Sandstone, medium-light-gray, very fine	7	U
100,	gray, thin and evenly bedded, top 6 in			170.	to fine-grained, thin-bedded, ripple		
	very carbonaceous	1	5		bedding, mica flakes; basal half of unit		
164.	Sandstone, medium-light-gray, very fine	-	-		friable, upper part very calcareous,		
	to fine-grained, thin- to thick-bedded -	5	0		sparse pyrite nodules	2	0
165.	Shale, medium-gray, poorly bedded	9	0	191.	Siltstone, medium-gray, very fine		
	Sandstone, medium-light-gray, weathered				grained, sandy	1	0
	brown, very fine grained, silty, very			192.	Shale, medium-gray, thin and evenly bed-	_	_
167	calcareous	11	0	102	ded, slightly fissile	8	0
	Shale, medium-gray, poorly bedded	8	0	193.	Siltstone, medium-gray, thin-bedded,		
108.	Sandstone, medium-light-gray, very fine				pyrite nodules, very calcareous, brittle		

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		Thickn	ess			Thickr	ness
		Ft	in			Ft	in
194.	fracture		5	214.	Sandstone, medium-light-gray, very fine to fine-grained, thick-bedded to massive, crossbedded, solution cavities, pyrite nodules	6	0
	base, very friable in basal 6 in, cross- bedded, thin and evenly bedded, top 2 ft channeled; shale chips in basal ± 2 ft,			215.	Shale, medium-gray, thin and evenly bed- ded	14	0
	solution cavities, fine- to medium- grained where massive	12	3	216.	Underclay, medium-gray, nonbedded, fossil rootlets	1	4
	Shale, medium-dark-gray, thin and evenly bedded, very carbonaceous	2	6	217.	Shale, medium-dark-gray, thin and evenly bedded, carbonaceous, coaly,		61 /
	Siltstone, medium-gray, very fine grained sandstone, very calcareous Shale, medium-gray, thin and evenly bed-	3	4	218.	fossil plant material	5	61/2 2
	ded; upper 6 in slightly carbonaceous- Sandstone, medium-light-gray, very fine to fine-grained, dark and light mineral grains, thin- to thick-bedded, crossbed- ded, carbonaceous fragments, friable, top ±1 ft; scattered pyrite nodules 1½ inches in diameter, base undulates, sparse mica flakes; 1-ft-thick medium-	3	0	219.	Sandstone, medium-light-gray, very fine to fine-grained, dark and light mineral grains, thin-bedded, solution cavities, fractures filled with quartz, few scattered pyrite nodules ± 1/4 inch in diameter; 22-in silty lens 8 ft above base, crossbedded, ripple beds, top ±2 ft very calcareous with 4-in-thick calcar-		-
	gray shale lens with 4-in-diameter pyrite nodules, I ft below top; upper I ft very calcareous	12	3	220.	eous siltstone 2 ft below top of unit Sandstone, medium-light-gray, very fine grained, silty with shale laminations,	50	0
	Shale, medium-dark-gray, slightly carbonaceous at baseSiltstone and very fine grained sandstone,	1	9		thin-bedded, friable, dark and light mineral grains, micaceous solution cavities, carbonaceous laminations,		
	medium-gray Underclay, poorly bedded to nonbedded,	3	0	221.	crossbedded	4	0
	fossil roots, upper 1 ft medium-dark-				fossil roots, shaly	15	0
202.	gray carbonaceous shale	3	0		Coal, impure, shaly Shale, medium-dark-gray, thin and evenly bedded, carbonaceous, gyp-sum	2	2
203.	pyrite nodules		7		Limestone, light-gray, very fine grained, very silty	-	10
204.	ulesSandstone, medium-light-gray, very fine		6		dedSandstone, medium-light-gray, very fine	5	4
205.	grained, thin-bedded, silty Underclay, medium-gray, nonbedded,	1	5		grained, silty, sparse mica, dark and light mineral grains, thin- to irregularly		
206	silty, fossil rootlets	2	6 1	227	bedded, iron-stained	2	4
207.	Coal, impure, weathered	1	2	221.	Underclay, medium-gray, nonbedded, shaly, 1-ft-thick calcareous zone 1 ft above base, fossil roots, upper 4 in thin		
	Shale, light-brownish-gray, carbonaceous, fossil plant fragments Coal, bright, abundance of resin blebs	2	1 4	228.	and evenly bedded, carbonaceous shale, medium-dark-graySandstone, medium-light-gray, very fine	10	0
210.	Bone, shaly		5		to fine-grained, silty, dark and light mineral grains, thick-bedded; basal ±2 ft thin bedded, very calcareous, brown-	. 8	6
	thick ironstone band 4 ft above base, 2-in-thick ironstone bands 1 ft and 3 in below top; top contact sharp and undu-	9	2	229.	Shale, medium-dark-gray, silty, carbonaceous, fossil plant fragments and coaly laminations, top grades upward into unit 230	J	8
212.	lating, base channeled	15	8	230.	Sandstone, medium-light-gray, very fine grained, slightly silty with pyrite nodules, thin- to thick-bedded; irregularly bedded 6-in-thick shale lens 2 ft below top, top thin bedded, very calcareous-	15	0
213.	Shale, medium-dark-gray, thin and evenly bedded, carbonaceous fossil	13		231.	Underclay, medium-gray to medium-dark- gray, fossil rootlets, very carbona-	13	
	plant fragments	3	0		ceous, coal laminations, silty	4	2

		Thick	ness			Thick	ness
		Ft	in			Ft	in
232.	Sandstone, medium-light-gray, weathered		4	257.	Shale, medium-dark-gray, thin and		
222	light gray, very fine grained	1 1	4 10		evenly bedded, carbonaceous, fossil plant fragments, top sharp	2	0
	Shale, medium-gray, poorly beddedSandstone, medium-light-gray, very fine	1	10	258.	Sandstone, medium-light-gray, very fine	_	
254.	grained, crossbedded, dark and light				grained, silty, thin-bedded; contains 4-		
	mineral grains, very calcareous, thin				in-thick shale lens 8 in below top,		
	and irregularly bedded	2	0		medium dark gray, carbonaceous, top sharp	2	10
235.	Shale, medium-gray, thin- to poorly bed-	_	0	259.	Shale, medium-dark-gray to medium-	2	10
236	ded, top grades into unit 236Sandstone, medium-light-gray, very fine	5	U		gray, slightly carbonaceous, thin and		
250.	grained, silty, dark and light mineral				evenly bedded	6	0
	grains, thin and irregularly bedded	1	4	260.	Siltstone, medium-gray, very fine grained		0
237.	Sandstone, medium-light-gray, very fine			261	sandstone, calcareous Underclay, medium-dark-gray, carbona-	1	8
	grained, pyrite nodules crossbedded,	4.0		201.	ceous with coal lamination and frag-		
220	shaly at base, very calcareous	10	0		ments, fossil roots	3	0
238.	Sandstone, medium-light-gray, very fine grained, dark and light mineral grains,			262.	Coal, bright, abundance of resin blebs,		
	silty, thin-bedded	4	0		gypsum crystals		4
239.	Shale, medium-dark-gray, carbonaceous,			263.	Siltstone, medium-gray, thin and evenly bedded		6
	fossil plant material	1	0	264	Sandstone, medium-light-gray, very fine		6
240.	Sandstone, medium-light-gray, very fine		_	201.	grained, very silty, thin and irregularly		
241	grained, silty, thin-bedded	2	2		bedded	3	8
241.	Shale, medium-gray to medium-dark- gray, carbonaceous in upper 2 ft	4	10	265.	Shale, medium-gray, slightly carbona-		
242	Sandstone, medium-light-gray, very fine	4	10	266	ceous, thin and evenly bedded	2	0
272.	to fine-grained, dark and light grains,			266.	Sandstone, medium-light-gray, very fine		
	pyrite nodules, thin-bedded, crossbed-				grained, dark and light mineral grains, silty, thin-bedded, mica	1	2
	ded, solution cavities	2	3	267.	Underclay, medium-gray, fossil rootlets -	1	6
243.	Shale, medium-dark-gray, carbonaceous,				Coal, impure		2
	thin and evenly bedded, fossil plant fragments	3	0	269.	Shale, medium-gray to medium-dark-		
244	Siltstone, medium-gray, thin-bedded,	3	U		gray, basal 6 in very carbonaceous with	2	_
277.	very fine grained sandstone	1	0	270	coal laminations Sandstone, medium-light-gray, very fine	3.	5
245.	Shale, medium-gray to medium-dark-			270.	grained, silty, thin-bedded, mica	. 1	10
	gray, thin and evenly bedded, fossil		•	271.	Shale, medium-gray, thin and evenly bed-	_	
246	plant fragments	3	0		ded, pyrite nodules, top sharp	12	0
	Limestone, medium-gray, silty, brittle Shale, medium-dark-gray, carbonaceous,	1	6	272.	Sandstone, medium-light-gray, very fine		
241.	medium-gray, top grades into unit 248-	2	0		to fine-grained, massive, pyrite nod- ules, very calcareous, solution cavities,		
248.	Sandstone, medium-light-gray, very fine	_	Ū		mica	4	0
	grained, very silty, thin-bedded, solu-			273.	Shale, medium-dark-gray, thin and	•	· ·
•	tion cavities	1	2		evenly bedded, silty, carbonaceous; at		
249.	Shale, medium-gray to medium-dark-	2	0	074	top coal and fossil plant fragments	1	8
250	gray, thin and evenly bedded Sandstone, medium-light-gray, very fine	2	U	214.	Sandstone, medium-light-gray, very fine grained, silty, dark and light mineral		
250.	grained, silty, dark and light mineral				grains, thin-bedded, crossbedded,		
	grains, sparse mica, thin-bedded,				irregularly bedded	9	0
	pyrite nodules	1	1		Underclay, medium-gray, fossil rootlets -		3
251.	Shale, medium-gray to medium-dark-		2		Coal, impure		1/2
252	gray, thin and evenly bedded	1	3	277.	Shale, medium-gray to medium-dark-gray, carbonaceous	3	6
232.	Sandstone, medium-light-gray, very fine grained, silty, thin-bedded, very cal-			278	Sandstone, medium-light-gray, very fine	3	U
	careous		9	270.	grained, silty, thin-bedded	1	6
253.	Shale, medium-gray to medium-dark-			279.	Bentonite, light-olive-gray, gypsum,		
	gray, thin and evenly bedded, fossil		Δ		bright	2	0
25/	plant fragments Limestone, medium-gray, silty, brittle	4	0 10	280.	Shale, medium-gray to medium-dark-		2
	Shale, medium-dark-gray, gypsum,	1	10	281	gray, thin and evenly beddedSandstone, medium-light-gray, very fine	2	3
200.	coaly	7	0	201.	grained, silty, thin-bedded	1	0
256.	Sandstone, medium-light-gray, very fine			282.	Shale, medium-dark-gray, thin and		
	grained, very silty, thin and irregularly	_	•		evenly bedded, very carbonaceous,		10
	bedded	1	9		fossil roots, coal fragments	1	10

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		Thick	ness			Thick	ness
		Ft	in			Ft	in
283.	Coal, bright to dull		2	309.	Shale, medium-light-gray, 6-in-thick silt-		
284.	Shale, medium-gray, thin and evenly bed-				stone band 2 ft above base, top grades		
	ded	5	0		into unit 310	5	9
285.	Sandstone, medium-light-gray, very fine			310.	Underclay, medium-gray, silty, fossil	_	
	grained, silty, thin-bedded, iron-	•		211	roots	1	0
286	stained Shale, medium-gray, thin and evenly bed-	3	1	311.	Shale, carbonaceous, fossil plant frag- ments		4
200.	ded	2	6	312.	Sandstone, medium-light-gray, very fine		7
287.	Sandstone, medium-light-gray, weathered	_	ŭ		to fine-grained, dark and light mineral		
	brown, very calcareous, very fine				grains, thick- to thin-bedded, solution		
	grained	6	0		cavities, pyrite nodules, crossbedded;		
288.	Shale, medium-gray, thin and evenly bed-				2-ft-thick shale lens 2 ft above base	25	
	ded, slightly carbonaceous, pyrite nod-		^	313	grades laterally Underclay, medium-gray, sandy in basal	25	0
289	ulesSandstone, medium-light-gray, very fine	4	0	313.	1 ft, fossil roots, very silty	2	0
207.	grained, silty, thin-bedded	8	6	314.	Shale, carbonaceous, fossil plant and coal	_	Ü
290.	Shale, medium-dark-gray to medium-gray,	Ů	Ŭ		fragments		5
	carbonaceous, fossil plant fragments	6	8	315.	Shale, dark-gray to black, very carbona-		
291.	Sandstone, medium-light-gray, very fine				ceous, scattered coal fragments and		_
	grained, silty, thin and irregularly bed-			216	resin doub group family		6
202	ded	1	4	310.	Shale, carbonaceous, dark-gray, fossil plants		3
292.	Shale, medium-dark-gray to medium-gray, carbonaceous	1	2	317.	Sandstone, light-gray, very fine grained,		,
293	Sandstone, medium-light-gray, very fine		2		thin and irregularly bedded, calcareous		
273.	grained, silty, thin and irregularly bed-				band at middle, top grades into unit		
	ded, pyrite nodules to ½ inch in diam-			• • •	318	1	8
	eter	1	3		Shale, medium-gray		6
294.	Shale, medium-dark-gray to medium-			319.	Underclay, light- to medium-gray, hard,		
	gray, thin and evenly bedded; lower	•			silty and sandy, scattered carbonaceous fragments, fossil roots	1	6
205	±1 ft carbonaceous Siltstone, medium-gray, very fine grained	2	9	320.	Shale, dark-gray, carbonaceous coal frag-	•	v
2)5.	sandstone, silty		3		ments, fossil plants	2	3
296.	Shale, medium-gray; 4-in-thick ironstone		,	321.	Underclay, medium-light-gray, silty,		
	band 3 ft below top	5	10		hard, fossil roots, very sandy in top 1 ft	•	•
297.	Sandstone, medium-light-gray, very fine			322	2 inSandstone, medium-light-gray, very fine	2	0
	grained, silty, pyrite nodules, thin- to			322.	grained, dark and light mineral grains,		•
200	thick-bedded, very calcareous	3	0		thick-bedded, solution cavities, pyrite		
298.	Underclay, medium-light-gray, fossil	2	6		nodules	1	6
299	roots, shaly at base, silty Siltstone, medium-gray, sparse fossil	2	O	323.	Underclay, medium-dark-gray, fossil		
	plant stems	1	6	224	roots and plant fragments	1	6
300.	Shale, carbonaceous, very silty, some			324.	Shale, medium-gray, carbonaceous bands in basal 1 ft 4 in	2	6
	pyrite nodules, scattered fossil plants -		4	325	Sandstone, very fine-grained, silty, thin	2	U
301.	Siltstone, medium-gray, top grades into	_			and irregularly bedded, scattered fossil		
202	unit 302, fossil plant fragments	2	2		plants	1	6
	Shale, medium-gray, fair fissility Underclay, medium-gray, fossil plants	1 2	6 6		Shale, medium-gray	1	6
	Shale, medium-dark-gray, carbonaceous	2	O	327.	Siltstone, medium-gray, fossil plant frag-	2	^
304.	in basal 2 in, scattered carbonaceous			328	mentsShale, light- to medium-gray, sandstone	2	0
	zones	1	10	320.	lens 1½ ft above base, 4 in thick	5	0
305.	Sandstone, medium-light-gray, very fine			329.	Sandstone, medium-light-gray, very fine	J	Ü
	grained, dark and light mineral grains,				to fine-grained, mostly fine-grained,		
	silty, slightly calcareous, thin and	•	^		light and dark mineral grains, silty,		
306	irregularly beddedShale, medium-gray, fossil plant frag-	2	0		thin- to thick-bedded, crossbedded,		
200.	ments		6		fossil plant fragments, solution cavities, pyrite nodules; 2-in-thick shale		
307.	Siltstone, medium-light-gray, iron-		•		lens 2 ft above base; base sharp; iron		
	stained in lower half, scattered fossil				stained in top half of unit	8	0
222	plants	1	8		Underclay, medium-gray	2	0
<i>3</i> 08.	Sandstone, medium-light-gray, fine-			331.	Shale, medium-gray, carbonaceous lami-		_
	grained, dark and light mineral grains, iron-stained, thin-bedded, crossbed-			221	nations and coal fragments in top	1	6
	ded	3	6	334.	Sandstone, very fine to fine-grained, mostly fine-grained, dark and light		
		-	~		branco, com mic light		

		Thick	ness			Thick	ness
		Ft	in			Ft	in
	mineral grains, thin-bedded, slightly			361.	Sandstone, medium-gray, very fine		
222	silty	1	0	262	grained, very silty, irregularly bedded-	2	0
	Shale, carbonaceous, silty		10	362.	Shale, light- to medium-gray, carbona-	5	6
334.	Sandstone, very fine to fine-grained, mostly fine-grained, dark and light			363.	ceous zone in upper 1 ft, fossil plants- Sandstone, light-gray, very fine grained,	3	U
	mineral grains, silty, thin-bedded, non-			505.	silty, thin and irregularly bedded	3	0
	resistant	4	8	364.	Shale, medium-dark-gray, very carbona-		
335.	Shale, medium-dark-gray, carbonaceous,		•		ceous in top 1 ft 5 in, abundant coal		•
336	fossil plantsSandstone, very fine to fine-grained,	1	0	365	laminations and fragments Sandstone, light-gray, very fine grained,	4	0
330,	mostly fine-grained, nonresistant	1	4	303.	silty, massive to thin-bedded at top,		
337.	Shale, medium-dark-gray, carbonaceous-	6	Ö		scattered pyrite nodules	4	7
338.	Sandstone, medium-light-gray, very fine			366.	Underclay, coal laminations and chips,		
	to medium- grained, mostly fine-				fossil plants and roots, silty in top 6 in;		0
	grained, thick-bedded to massive, pyrite nodules, solution cavities,			367	1-in-thick carbonaceous zone at top Sandstone, medium-light-gray, very fine	4	8
	coarsens to medium-grained upward,			507.	grained, thick-bedded to massive,		
	1-ft-8-in-thick shale lens 21/2 ft below				silty, scattered pyrite nodules, solution		
•••	top; abundant shale chips in basal 2 ft-	20	0	2.0	cavities	5	6
339.	Shale, medium-gray, very carbonaceous,			368.	Shale, medium-gray, silty, silty lamina-		
	coal fragments and laminations in top 6	2	0		tions in upper 1 ft, grades laterally into unit 367	5	5
340.	Siltstone, medium-gray, thin-bedded, cal-	-	Ü	369.	Sandstone, medium-light-gray, very fine		
	careous in top 1 ft	4	0		to fine-grained, mostly fine-grained,		
341.	Sandstone, very fine to fine-grained,				scattered pyrite nodules, thick-bedded		
	mostly fine-grained, light and dark				to massive, light and dark mineral grains	6	0
	mineral grains, thin and irregularly bedded	4	0	370.	Shale, medium-light-gray, silty	6 4	0
342.	Shale, medium-gray, fossil plants in basal	•	v		Sandstone, fine-grained, crossbedded,	•	ŭ
	portion	10	6		thin- to medium-bedded, ripple-		
343.	Sandstone, medium-light-gray, very fine	20	•		bedded, solution cavities, pyrite nod-	1.5	•
3//	to fine-grained, pyrite nodules	20	0 0	272	ules	15	0
	Shale, medium-graySiltstone, medium-gray, thin-bedded	1 2	0	312.	Shale, medium-gray, scattered fossil plants, some iron-stained	1	8
	Shale, medium-light-gray, 2-in-thick car-	_	Ü	373.	Sandstone, medium-light-gray, very silty,	-	•
	bonaceous zone 1 ft 4 in above base,				nonresistant	1	0
247	silty	2	6	374.	Shale, medium-dark-gray to brown, bed-		
347.	Siltstone, medium-light-gray, thin- bedded	1	2		ded, abundant fossil plants, scattered plant laminations	1	6
348.	Shale, medium-gray, carbonaceous lami-	•	2	375.	Underclay, fossil rootlets, silty	•	7
	nations in upper 1 ft	1	8		Shale, medium-dark-gray, carbonaceous,		
349.	Siltstone, medium-gray, thin-bedded		4		abundant coal chips, fossil plant frag-		_
350.	Underclay, medium-gray, fossil plant	1	4	277	ments, coaly laminations		5
351.	fragments, silty at topSiltstone, medium-light-gray, sandy, thin	1	4	311.	Shale, medium-light-gray, poorly bed- ded, fossil plants		5
	and irregularly bedded	3	0	378.	Siltstone, medium-light-gray, poorly bed-		
352.	Shale, light- to medium-gray, fossil				ded, fossil plants	1	2
252	plants	2	0	379.	Shale, medium-gray, poorly bedded, few		
	Underclay, fossil plantsShale, very carbonaceous, abundant coal		7		scattered fossil plants, 6-in silty lens 1 ft above base	2	1
334.	laminations and fragments		4	380.	Siltstone, medium-light-gray, poorly bed-	2	•
355.	Shale, light- to medium-gray, fossil				ded, scattered fossil plants		4
256	plants		3	381.	Shale, medium-light-gray, fossil plants,	_	
356.	Sandstone, medium-gray, very fine to			202	top sharp	2	6
	fine-grained, thin-bedded, solution cavities, pyrite nodules	1	0	382.	Sandstone, medium-light-gray, very fine grained, dark and light mineral grains,		
357.	Underclay, medium-gray, silty in lower	•	Ü		thick-bedded, scattered pyrite nodules-	2	2
	two-thirds of unit, fossil roots and			383.	Shale, medium-dark-gray, carbonaceous,		
250	plants, gypsum	6	0		abundant fossil plants and coal chips,	4	-
	Shale, dark-gray, gypsum, carbonaceous- Shale, medium-gray, thin and evenly bed-		6	384	poorly beddedSiltstone, light-gray, sandy, poorly bed-	1	7
557.	ded	1	0	JU -1 .	ded	1	0
360.	Siltstone, medium-gray, thin and irregu-	-	٠	385.	Shale, light-gray, poorly bedded, silty at		
	larly bedded		4		top	1	0

16

		Thick	ness			Thick	ness
		Ft	in			Ft	in
386.	Siltstone, medium-light-gray, poorly bed-			410.	Shale, medium-gray, poorly bedded; 1/2-		
	ded		4		in-thick layer of gypsum 11/2 ft from		
	Siltstone, light-gray, nonbedded, sandy -		10	411	top, carbonaceous in top 1 ft	2	10
388.	Sandstone, medium-light-gray, very fine			411.	Shale, dark-gray, carbonaceous, scattered	1	1
	to fine-grained, dark and light mineral grains, crossbedded, thin- to thick-			412	fossil plants	1	1
	bedded, scattered pyrite nodules; 1-ft-			412.	tered coal chips, abundant fossil root		
	thick silty zone at top	6	0		impressions		11
389.	Shale, medium-light-gray, few scattered	·	·	413.	Shale, carbonaceous, poorly bedded to		••
	fossil plants	1	3		nonbedded, very carbonaceous; about		
390.	Siltstone, very calcareous, thin and irreg-				30 percent bright coal laminations and		
	ularly bedded, iron-stained		8		chips		3
391.	Sandstone, medium-light-gray, very fine				Coal, bony, bright to dull, resin blebs		1
	grained, silty, interbedded with about			415.	Shale, dark-brown-gray, very carbonac-		
202	30 percent light-gray shale	2	4		eous, abundant coal laminations and		
392.	Siltstone, medium-light-gray, scattered		_	416	chips		5
303	fossil plants, poorly beddedShale, light-gray, silty, scattered fossil		6	410.	Shale, medium-gray, abundant fossil		11
373.	plants		9	417	plants, very silty to slightly sandy Sandstone, light-gray, very fine grained,		11
394	Sandstone, light-gray, fine-grained, fria-		,	717.	dark and light mineral grains, scattered		
	ble, dark and light mineral grains	1	1		small pyrite nodules, friable, poorly		
395.	Siltstone, medium-gray, nonbedded		2		bedded to medium-bedded, top sharp-	4	2
	Sandstone, light-gray, very fine to fine-			418.	Shale, medium-gray, scattered fossil		
	grained, silty in basal 2 ft, dark and				plants; 2-in carbonaceous shale units		
	light mineral grains, thin and irregu-				11/2 ft below top and 3 ft below top	18	- 6
	larly bedded, some ripple bedding, cal-			419.	Siltstone, light-gray, calcareous, poorly		
	careous toward top, 1-ft-2-in-thick silty		_	100	bedded		7
207	lens 2 ft from top	15	6	420.	Underclay, medium-gray, fossil roots,		_
397.	Shale, medium-light-gray, poorly bed-			401	silty, scattered small gypsum crystals-		3
	ded, scattered fossil plants, scattered silt laminations, becomes silty at top -	5	8		Coal, mostly brightShale, medium-gray, abundant fossil		1
398.	Siltstone, medium-light-gray, iron-	3	0	722.	plants		10
0,0.	stained, thin- to poorly bedded		10	423.	Sandstone, very fine grained, dark and		10
399.	Shale, light-gray, very silty	1	0		light mineral grains, thin- to poorly		
	Shale, dark-gray, carbonaceous, scattered				bedded, scattered pyrite nodules		8
	silt laminations about 15 percent; 2-in-				Shale, light-gray		5
	thick silt lamination 1½ ft above base;			425.	Sandstone, light-medium-gray, nonbed-		
	scattered coal chips and fragments in a	_	_		ded		7
401	2-ft-wide zone on bedding surface top-	6	0	426.	Shale, medium-gray, top grades into unit	,	•
401.	Siltstone, light-gray, thin- to poorly bed-	1	Λ	427	427	1	0
402	ded, sandy, top grades into unit 402 Shale, medium-dark-gray, silty, slightly	1	0	421.	Sandstone, light-gray, fine-grained, dark and light mineral grains, few scattered		
702.	carbonaceous, fossil plants	1	2		pyrite nodules, scattered shale lamina-		
403.	Sandstone, light-gray, fine-grained, dark	•	_		tions up to 5 in thick, lower half of unit		
	and light mineral grains, crossbedded-	1	2		massive, top half thin and irregularly		
404.	Sandstone, medium-light-gray, very fine				bedded	15	0
	grained, very silty, more silty at top	2	10	428.	Shale, medium-gray, slightly carbona-		
405.	Shale, medium-light-gray, poorly bed-				ceous at base, silty toward top	1	0
	ded, scattered small gypsum crystals,	_	_	429.	Sandstone, light-gray, nonresistant, non-		_
40.6	crossbeds, grades silty toward top	2	5	400	bedded	1	6
406.	Sandstone, light-gray, calcareous, very			430.	Shale, medium-light-gray, abundant fos-		
	fine to fine-grained, abundant light and			421	sil plants, nonbedded		6
	dark mineral grains, mostly dark, scat- tered shale chips, few pyrite nodules,			431.	plants	1	3
	irregularly bedded. Dip 30° SW., strike			432	Sandstone, light-gray, very fine grained,	1	3
	120°	2	6	132.	few dark mineral grains, friable, non-		
407.	Sandstone, light-gray, very fine grained,	-			resistant	15	0
	very silty, dark and light mineral			433.	Sandstone, sandy-light-gray, nonbedded,		
	grains, abundant dark grains	2	0		nonresistant	1	4
408.	Shale, medium-dark-gray, carbonaceous,		_	434.	Underclay, light-gray, scattered fossil	_	_
400	few coal fragments		7	425	plants and roots	1	1
409.	Sandstone, medium-light-gray, very fine				Sandstone, light-gray, nonbedded		3
	grained, very silty, abundant pyrite nodules		6	430.	Shale, medium-gray, slightly carbona- ceous	1	7
	nounce		J			1	,

		Thick	ness			Thick	ness
		Ft	in			Ft	in
437.	Sandstone, light-gray, very fine grained, weathered dark-brown to black owing to high iron content, thin- to poorly			462.	Shale, upper 6 in medium-brownish-gray, carbonaceous, lower half medium-		0
	bedded		4	163	gray		0
438.	Shale, medium- to dark-gray, slightly carbonaceous; gray silt at top	2	3	403.	Sandstone, light-gray, fine- to medium- grained, thin-bedded, crossbedded, solution cavities, scattered pyrite nod-		
439.	Sandstone, light-gray, very fine grained,				ules		0
	very silty, scattered light and dark min-				Shale, light- to medium-gray		0
	eral grains, thin- to poorly bedded,				Siltstone, sandy		4
	very calcareous, scattered pyrite nod-	•		466.	Shale, light- to medium-gray, carbona-		
440	ules up to 4 inches in diameter	2	1		ceous in basal 6 in		0
440.	Shale, medium-gray, becomes silty	3	4	467.	Sandstone, light-gray, fine- to medium-		
441.	toward top	3	4		grained medium- to poorly bedded, pyrite nodules, solution cavities, light		
442	Shale, medium-light-gray, poorly bed-		6		and dark mineral grains, mineral-filled		
772.	ded, scattered fossil plants	1	2		joints with iron carbonate; fossil inver-		0
443	Sandstone, light-gray, friable, thin and		2	160	tebrate shells in basal portion		0
	irregularly bedded		9	400.	Shale, light- to medium-gray, carbonaceous at top		8
444.	Shale, medium-gray, poorly bedded	1	9	460	Sandstone, light-gray, fine- to medium-		o
	Sandstone, light-gray, iron-stained,	_	-	402.	grained, iron-stained, thick-bedded,		
	poorly bedded		6		nonresistant, light and dark mineral		
446.	Shale, light-gray, silty	1	0		grains toward top		0
447.	Sandstone, light-gray, fine-grained, dark				Total measured thickness of white		
	and light mineral grains, friable, scat-				sandstone member of Mesaverde		
	tered pyrite nodules, thin crossbeds,				Formation	189	_8
	thick-bedded	5	0		Total measured thickness of Mesa-		=
448.	Shale, medium-gray, carbonaceous in top	_			verde Formation	1,772	10
440	4 in	1	0	Meete	eetse Formation:		=
449. 450	Sandstone, light-gray, very fine grained- Shale, light-gray		8 6		Shale, light-medium-gray, carbonaceous,		
	Sandstone, light-gray, friable		8	170.	crossbedded	7	0
452.			6	471.	Sandstone, medium-grained, dark and	-	Ü
	Sandstone, light-gray, very fine to fine-		U		light mineral grains, thin- to poorly		
	grained		8		bedded, scattered pyrite nodules		8
454.	Sandstone, light- to medium-gray, thinly		•	472.	Shale, medium-gray, highly weathered,		
	bedded, iron-stained in upper 1 ft	3	0		silty		0
455.	Sandstone, very fine grained, friable,				Shale, medium-gray, carbonaceous		0
	medium-bedded, crossbedded, pyrite			474.	Sandstone, very light gray, fine- to		
	nodules, scattered sharp, massive beds				medium-grained, dark and light min-		
4=-	on top	8	6		eral grains, crossbedded, medium- to		
456.	Shale, light- to medium-gray, carbona-	_			poorly bedded, scattered pyrite nod- ules	11	0
	ceous, 1-ft sandstone band at base Total measured thickness of main	5	_0	475	Shale, medium-gray, deeply weathered, 2		U
	body of Mesaverde Formation	1 583	2	175.	ft of shale 4 ft above base		0
	body of Mesaverde Formation	1,303	<u>2</u>	476.	Sandstone, very light gray, fine- to		
					medium-grained, dark and light min-		
White	sandstone member of Mesaverde Formation	n:			eral grains, medium-bedded, crossbed-		
457.	Sandstone, light-gray with scattered pink				ded, solution cavities		_0
	grains, fine- to medium-grained, light				Total measured thickness of Mee-		
	and dark mineral grains, pyrite nod-				teetse Formation	99	8
	ules, thin-bedded in basal portion,		•	Top o	f section		
450	quartz-filled joints	56	0	•			
438.	Shale, light- to medium-gray, sandstone						
	band 1 ft above base; 2-in-thick silt- stone band 1 ft from top	7	0				
459	Sandstone, light-gray, fine- to medium-	,	U				
-137,	grained, light and dark mineral grains,				ed section 2: Cody Shale through Me	eteetse	•
	thin-bedded, solution cavities	1	4	Formati			
460.	Shale, medium-gray; 6-in-thick carbonac-	•	•		Eagle Point Quadrangle, Wyoming (7.5 min)	16	4
	eous shale, medium-gray; 2-in-thick				-NE-NE sec. 13, T. 6 N., R. 1 W. Presented	ı trom ol	aest to
	siltstone, sandy; fossil plant fragments-	2	0	younge End: SW-	-SW-NE sec. 18, T. 6 N., R. 1 E.		
461.	Sandstone, light-gray, very fine grained,				by: N.L. Hickling, R.C. Warlow, and J.F. W	indolph,	Jr.
	solution cavities		4	Strike 175	5°, Dip 22° NE.	_	

pper C	retaceous:	Thickne	ess			Thickn	ess
Cody	Shale:	Ft	in			Ft	in
-	Shale	50+		24. Sandstone, light-gray, fin			
	Total measured thickness of Cody			grained, dark and light			
	Shale	50+		thick-bedded to massiv			
	•			8-in-thick very calcare	ous zone 2 ft		
	verde Formation:			below top; solution of	avities, pyrite		
2.	Sandstone, light-medium-gray, very fine			nodules		75	7
	to fine-grained, dark and light mineral		_	25. Sandstone, white, very			
2	grains, iron-stained, thin-bedded		6	grained, dark and light	nineral grains,	20	^
	Shale, medium-dark-gray, fissile		4	noncalcareous		32	0
7.	Sandstone, light-gray, very fine grained, thin and irregularly bedded		7	26. Shale, dark-gray, carbon			10
5.	Shale, medium-gray		3	plants, scattered gypsun 27. Sandstone, medium-gray,	•		10
	Sandstone, very fine grained, thin-		5	fine-grained, silty, thin			
	bedded	1	4	plants			10
7.	Shale, medium-gray		3	Base of Maverick Spring coal a			
	Sandstone, light-gray, very fine grained,			28. Underclay, medium-gray,			
	thin-bedded	2	0	crystals, carbonaceous to	oward top, fos-		
9.	Sandstone, medium-light-gray, fine- to			sil roots			4
	medium-grained, dark and light min-			29. Coal, bright, bony at base			5
	eral grains, massive, friable, calcare-		_	30. Shale, medium-gray; 1-in			
10	ous, pyrite nodules, solution cavities -	11	6	band 6 in above base;			
	Shale, medium-gray	2	8	fine grained silty sands		1.0	•
11.	Shale, medium-gray, interbedded with			below top		16	0
	very fine grained sandstone lamina-	3	0	31. Sandstone, light-gray to w			
12	Sandstone, light-gray, very fine to medium-	3	U	to fine-grained, thin-be		1	8
12.	grained, dark and light mineral grains,			32. Underclay, dark-brownis		1	0
	massive, solution cavities, scattered			abundant fossil plants a			3
	pyrite nodules, grades into medium-			33. Coal, bright, medium clea			11
	grained sandstone toward top, iron-			34. Underclay, dark-brownish-			
	stained	15	0	bonaceous, abundant fo			3
13.	Sandstone, light-gray, very fine grained,			35. Coal, bright, resin, few m		1	2
	silty, scattered pyrite nodules, 50 per-			36. Underclay, light-brownis	h-gray, very		
	cent siltstone interbeds	5	8	silty, fossil root impress			2
14.	Sandstone, light-gray, very fine to fine-			37. Coal, bright, resin, few cl		1	0
	grained, scattered pyrite nodules, solu-	_	_	38. Siltstone, light-brownish			_
1.5	tion cavities	2	9	scattered coal fragments			2
15.	Sandstone, light-gray, fine-grained, thin-	1	2	39. Siltstone, light-brownish		2	0
16	bedded, iron-stained	1	2	thin and irregularly bed		2	0
10.	Shale, medium-dark-gray; 2-in-thick sand- stone lamination 8 in below top; scat-			40. Sandstone, medium-light-grained, very silty, thin			
	tered gypsum crystals	2	4	bedded		3	6
17.	Sandstone, light-gray, fine- to medium-	_	•	41. Shale, dark-brownish-gray			Ū
	grained, dark and light mineral grains,			laminations, carbonaced			1
	thick-bedded, solution cavities, pyrite			42. Shale, light-brownish-gr			
	nodules	4	0	plant fossils and carbo			
18.	Sandstone, light-gray, fine-grained, thin-			rial			3
	bedded	2	0	43. Shale, medium-gray		2	0
19.	Sandstone, light-medium-gray, fine-			44. Sandstone, light-medium-g			_
	grained, iron-stained, thin- to thick-			grained, thin-bedded		1	8
	bedded, solution cavities, pyrite nod-			45. Shale, medium-brownish-			•
20	ules	1	10	ceous, fossil plants			3
20.	Sandstone, light-gray, fine- to medium-			46. Underclay, medium-light-g	ray, siny, ios-		6
	grained, dark and light mineral grains, nonresistant, massive	4	6	47. Shale, medium-gray, carbo			U
21	Sandstone, light-gray, fine-grained, thin-		U	tered fossil plants in up		1	0
-1.	bedded, silty, scattered pyrite nodules			48. Shale, medium-gray		•	6
	up to 3 inches in diameter	4	10	49. Shale, medium-brownish-			-
22.	Sandstone, light-gray, fine-grained, scat-	-	_	ceous, fossil plants			8
	tered pyrite nodules up to 6 inches in			50. Bone, coal laminations and			6
	diameter, solution cavities	12	6	51. Coal, mostly bright, resin,	fine to medium		
23.	Sandstone, light-gray, very fine to fine-			cleats			4
	grained, thin-bedded, silty, pyrite nod-	•	_	52. Underclay, dark-brownish-			•
	ules, nonresistant	3	0	bonaceous, fossil plant a	na root prints-		8

		Thickr	ness			Thick	iness
		Ft	in			Ft	in
53.	Shale, dark-brownish-gray, carbona-			82.	Shale, medium-gray		1
	ceous		8		Shale, medium-gray, silty		10
54.	Shale, medium-gray		4		Shale, medium-grayish-brown, carbona-		
	Shale, medium- to dark-brownish-gray	1	2		ceous		5
	Underclay, medium- to dark-brownish-			85.	Coal, weathered, bright laminations,		
	gray, very carbonaceous, fossil plant				bony		7
	and root prints		2	86.	Shale, medium-brownish-gray, carbona-		_
57.	Coal, highly weathered, mostly bright,				ceous, fossil plants		2
	resin		5	87.	Shale, medium-gray, 5 percent fibrous		0
58.	Shale, medium-dark-brownish-gray, car-		_	00	gypsum	1	0
	bonaceous		2	88.	Sandstone, light-gray, fine-grained, dark		
59.	Shale, light- to medium-gray, silty, upper		0		and light mineral grains, silty, iron-		
60	2 in carbonaceous	1	0 8		stained, thin and irregularly bedded, solution cavities, pyrite nodules	5	0
	Shale, medium-gray, coal laminations		0	89.	Shale, medium-gray, fossil plants	2	4
01.	Siltstone, light-gray, thin-bedded; 30 percent very fine grained sandstone, sand-				Shale, medium-dark-brownish-gray, car-	-	•
	stone laminations up to 3 in thick, very			,,,	bonaceous		5
	calcareous	6	0	91.	Sandstone, very light gray, very fine to		
62.	Shale, light-medium-gray	2	ŏ		fine-grained, dark and light mineral		
	Siltstone, medium-gray, scattered fossil	_			grains, thin-bedded	2	2
	plants		4	92.	Sandstone, light-gray, very fine grained,		
64.	Shale, carbonaceous	1	10		very silty, calcareous, massive, highly		
65.	Sandstone, light-gray, very fine to fine-				iron stained	3	10
	grained, light and dark mineral grains,				Siltstone, light-gray, thin-bedded		6
	massive, iron-stained, pyrite nodules -	3	4		Shale, light-gray	1	8
66.	Shale, medium-gray, scattered pyrite nod-			95.	Underclay, dark-brownish-gray, carbo-		_
	ules, top sharp and undulatory	2	1	06	naceous, fossil plants and roots		. 7
67.	Sandstone, light-gray, very fine to fine-				Coal, bright		1
	grained, dark and light mineral grains,			97.	Shale, dark-gray, abundant coal lamina-		0
	massive, solution cavities, scattered			00	tions, poorly bedded, fossil plants		9
	pyrite nodules up to 6 inches in diam-		0	70.	Siltstone, light-gray, sandy, thin-to thick- bedded, iron-stained	1	9
6 0	eter, top 1–2 in very calcareous	55	0	90	Shale, light-medium-gray, scattered car-		,
	Shale, medium-gray, weathered	6	0	,,,	bonaceous laminations	3	0
09.	Sandstone, light-gray to white, very fine			100.	Shale, carbonaceous, abundant fossil		·
	to fine-grained, dark and light mineral grains	5	0		plants, coaly material		7
70	Shale, light-gray	3	6	101.	Sandstone, very light gray, very fine to		
	Underclay, dark-brownish-gray, silty,		U		fine-grained, dark mineral grains, thin-		
	very carbonaceous, fossil plant and				to thick-bedded	1	3
	root prints		4	102.	Shale, medium-brownish-gray, carbona-		
72.	Coal, weathered, bony, scattered resin				ceous, poorly bedded, abundant fossil		
	blebs	1	2		plants	1	7
73.	Underclay, medium-brownish-gray, car-			103.	Shale, dark-gray, carbonaceous, fossil		10
	bonaceous, abundant fossil plant and			104	plants		10
	root prints		4	104.	Shale medium-gray, silty, scattered gyp-	1	1
74.	Coal, bony		1	105	sum crystals	1	1
	Shale, medium-gray		9	. 105.	Sandstone, light-gray, very fine grained, very silty, thin and irregularly bedded-	2	2
Top	of Maverick Spring coal zone			106	Shale, dark-gray, silty, carbonaceous,	2	2
76	Sandstone, light-gray, very fine grained,			100.	scattered fossil plants, poorly bedded-	1	0
70.	dark and light mineral grains, thick-			107.	Sandstone, light-gray, very fine grained,	•	Ū
	bedded to massive, crossbedded, silty,				silty, thin and irregularly bedded, scat-		
	pyrite nodules up to 8 inches in diam-				tered pyritic nodular layers up to 1 in		
	eter, solution cavities	44	0		thick	2	8
77.	Siltstone, medium-gray, thin- to poorly			108.	Shale, medium-gray		6
	bedded, iron-stained, sandy, scattered			109.	Siltstone, medium-gray, sandy, scattered		
	pyrite nodules	3	0		fossil plants		3
	Shale, light-medium-gray		7	110.	Underclay, dark-gray, silty, carbona-		
79.	Siltstone, medium-gray, fossil plants,		_		ceous, fossil rootlets		9
00	sandy		2	111.	Coal, highly weathered		3
	Shale, medium-dark-grayish-brown		6	112.	Shale, light-gray		2
81.	Sandstone, light-medium-gray, very fine			113.	Sandstone, light-gray, very fine to fine-		
	to fine-grained, light and dark mineral		4		grained, scattered dark and light min-		
	grains		4		eral grains, thick-bedded to massive,		

		Thick	ness			Thick	ness
		Ft	in			Ft	in
	crossbedded, solution cavities, scat-			145.	Shale, medium-gray, silty, thin- to poorly		
	tered pyrite nodules, iron-stained	15	0		bedded, basal 4 in medium-dark-gray,		
114.	Siltstone, light-gray, poorly bedded, top				slightly carbonaceous	2	8
	grades into unit 115	1	0	146.	Sandstone, medium-light-gray, very fine		
115.	Sandstone, light-gray, very fine grained,				to fine-grained, silty, thin- to thick-		
	silty, scattered mica, thin- to poorly				bedded, crossbedded, few pyrite nod-		
	bedded, scattered pyrite nodules, solu-				ules 1/4 inch in diameter, top grades		
	tion cavities	2	4		into unit 147	2	6
116.	Shale, dark-gray	3	0	147.	Shale, medium-gray, silty, thin- to poorly		
117.	Siltstone, light-gray, silty, sandy, poorly		_		bedded; upper 7 in thin sandstone and		
	bedded		5		siltstone laminations	1	4
118.	Shale, medium-gray, silty, poorly bed-			148.	Sandstone, light-gray, very fine grained,		
110	ded	_	10		thin- to thick-bedded, base undulating,	•	
	Siltstone, light-gray, sandy	1	3	1.10	scattered pyrite nodules	2	0
120.	Shale, medium-dark-gray, scattered car-		10	149.	Shale, medium-gray, thin and evenly bed-		_
101	bonaceous laminations	1	10	150	ded		5
121.	Underclay, dark-brownish-gray, carbo-		,		Shale, medium-dark-gray, carbonaceous-		2
100	naceous		6	151.	Coal, bright attritus, fine to medium		_
	Coal, weathered, impure	1	4	150	cleats, resin		5
	Shale, dark-gray, poorly bedded	1	4	132.	Shale, medium-dark-gray to light-grayish-		
	Siltstone, light-gray		9		brown, silty to sandy, coal lamina- tions, thin-bedded	3	0
123.	Shale, dark-gray, carbonaceous, poorly bedded		7	152		3	U
126	Siltstone, medium-gray, nonresistant	1	1	155.	Sandstone, medium-gray to medium-light- gray, silt and shale laminations, thin		
_	Sandstone, very fine grained, scattered	1	1		and irregularly bedded, top grades into		
127.	dark and light mineral grains, silty,				unit 154	2	6
	thin-bedded to massive, scattered			154	Siltstone, medium-gray, shaly to sandy	1	ő
	pyrite nodules	2	0		Gypsum vein, right angle to bedding	•	1
128.	Siltstone, light-gray, sandy, very calcare-	-	Ü		Sandstone, medium-gray to grayish-red		•
120.	Ous		10	150.	and light-olive-green in top part, very		
129.	Shale, medium-gray	1	3		silty, scattered gypsum crystals; silty		
	Shale, medium- to dark-gray, slightly car-				spheroidal weathering shale at base	7	0
	bonaceous	1	6	157.	Conglomerate, shale chips, medium-gray,		
131.	Underclay, medium-brownish-gray, car-				and pyrite nodules		8
	bonaceous, fossil plants		5	158.	Sandstone, medium-light-gray, very fine		
132.	Shale, carbonaceous, fossil plants		5		to fine-grained, silty, massive, cross-		
133.	Shale, light-olive-gray, poorly bedded		9		bedded, scattered pyrite nodules up to		
	Siltstone, light-gray, thin-bedded	2	3		4 inches in diameter; solution cavities;		
135.	Sandstone, light-gray, very fine grained,				2-in-thick detrital coal bed locally at		
	silty, thin- to poorly bedded, crossbed-				base	30	4
	ded, grades to fine-grained in top 6 in-	2	0	159.	Shale, medium-gray, silty, thin- to poorly	_	_
136.	Shale, medium- to medium-dark-gray,	_		1.60	bedded	1	8
107	thin- to poorly bedded, slightly silty	3	0	160.	Sandstone, medium-light-gray, very fine		•
137.	Sandstone, medium-light-gray, very fine			161	grained, silty, thin-bedded		9
	to fine-grained, dark and light mineral			101.	Shale, medium-dark-gray, thin and	1	٥
	grains, thick-bedded, top surface of		~	160	evenly bedded	1	0
120	unit ripple-bedded, very calcareous Shale, medium-gray, silty		6 10	102.	Sandstone, medium-light-gray, very fine grained, silty, thick-bedded, lens-		
			10		shaped		7
139.	Sandstone, medium-light-gray, very fine- grained, silty, thin-bedded, top grades			163	Shale, medium-dark-gray, thin and		,
	into unit 140	1	6	105.	evenly bedded, slightly carbonaceous,		
140	Shale, medium-dark-gray to medium-	•	Ū		top grades into unit 164	1	0
140.	gray, poorly bedded	1	8	164	Sandstone, medium-light-gray, very fine	•	Ū
141.	Sandstone, medium-light-gray, very fine	-	Ü	10	grained, silty, thin and irregularly bed-		
	grained, silty, thin-bedded, crossbed-				ded, crossbedded, contains few shale		
	ded	1	2		laminations, slightly calcareous	3	0
142.	Shale, medium-gray, thin- to poorly bed-	-		165.	Shale, medium-dark-gray, thin and		
	ded	1	0	•	evenly bedded, carbonaceous, fossil		
143.	Underclay, medium-gray, very fine-				plant fragments, slightly silty at top	3	0
	grained, silty to sandy, abundant fossil			166.	Sandstone, medium-light-gray, fine-		
	roots, carbonaceous		9		grained, crossbedded, thin- to thick-		
144.	Coal, bright to dull attritus, resin, fine to				bedded, contains few shale and silt-		
	medium cleats, iron-stained, gypsum				stone laminations, shale chips up to 6		
	crystals, fusain in upper part	1	1		inches in length, pyrite nodules,		

		Thick	ness			Thick	iness
		Ft	in			Ft	in
	thick-bedded at top, calcareous in top 10 ft	45	0		ules, solution cavities, fossil root impressions 1 ft above base	2	2
167.	Shale, medium-gray to medium-dark- gray, with siltstone laminations 1 ft			183.	Shale, medium-gray, thin and evenly bed-		-
	thick; calcareous siltstone band 6 ft above base, thin and evenly bedded at				ded, carbonaceous at top with upper 1 in impure coal		6
	top; scattered sandstone lenses; non- bedded in top 2 ft	11	0	184.	Siltstone, medium-light-gray, thin and irregularly bedded, calcareous		8
168.	Sandstone, medium-light-gray, very fine to fine-grained, iron-stained, pyrite nodules, thick-bedded at base; 5-in- thick siltstone laminations 10 in below	11		185.	Sandstone, medium-light-gray, very fine to fine-grained, light and dark mineral grains, massive, crossbedded, pyrite nodules, iron-stained, solution cavi-		Ü
160	top; basal 2 ft very calcareous Siltstone, medium-light-gray; basal third	3	4	186	tiesShale, medium-gray, thin and evenly bed-	3	4
10).	of unit contains fossil plant fragments				ded	1	2
	and carbonaceous material; middle third of unit very fine grained sand- stone containing fossil leaves; top third			187.	Sandstone, medium-light-gray, very fine grained, dark and light mineral grains, silty, massive	1	4
	of unit thin and irregularly bedded and very fine grained	1	8	188.	Shale, medium-gray, thin and evenly bed- ded	1	4
170.	Shale, medium-gray; 2-in-thick siltstone	1	0	189.	Shale, medium-dark-gray to light-grayish-	1	7
	lens 4 in above base; shale thin and evenly bedded above siltstone lens;				brown, carbonaceous, thin and evenly bedded, abundant carbonaceous mate-		
	1-in-thick carbonaceous shale at top, poorly bedded at base	1	8	190	rialSiltstone, medium-gray, very calcareous,		5
171.	Sandstone, medium-light-gray, fine-	1	Ü		poorly bedded	1	0
	grained, dark and light mineral grains, mostly massive, crossbedded, pyrite				Sandstone, medium-light-gray, very fine grained, silty	1	1
172.	nodules, solution cavities Siltstone, medium-gray to medium-light-	25	6	192.	Shale, medium-gray, thin and evenly bed ded, carbonaceous, 2-in-thick medium-	1	6
	gray, very fine grained, sandy, thin and irregularly bedded	2	4	193.	dark-gray zone 4 in below top Sandstone, medium-light-gray, very fine	1	U
173.	Shale, medium-gray, thin and evenly bed- ded; 8-in-thick carbonaceous shale at				grained, silty, thick-bedded at base, top half massive, pyrite nodules, iron-	•	
174.	top with abundant fossil plant detritus- Siltstone, medium-light-gray, very fine	4	10		stained, solution cavities; 8-in-thick shale bed 5 ft above base, medium-		
	grained sandstone, thin-bedded, fossil plant fragments		0		dark-gray, carbonaceous fragments,		
175.	Sandstone, medium-light-gray, fine-		8		coaly; 5-ft-thick very calcareous layer 10 ft above base	17	6
	grained, massive, solution cavities, iron-stained, pyrite nodules	6	0	194.	Siltstone, medium-light-gray, very fine- grained sandstone, thin and irregularly		
176.	Shale, medium-gray, lower half of unit poorly bedded, upper half of unit thin			105	beddedShale, medium-gray, thin and evenly bed-		10
	and evenly bedded	3	0		ded	1	8
1//.	Siltstone, medium-light-gray, very fine grained sandstone, thin and irregularly			196.	Siltstone, medium-light-gray, very fine grained sandstone, thin and irregularly		
178	bedded, fossil plant fragments Shale, light-brownish-gray to medium-	1	4	197	beddedShale, medium-gray, very silty, thin and	1	0
170.	dark-gray, carbonaceous, thin and		_		evenly bedded	2	0
179.	evenly bedded, fossil plant fragments- Sandstone, medium-light-gray, very fine		6		Siltstone, medium-gray, thin and irregularly bedded	1	0
	to fine-grained, crossbedded, massive, iron-stained, calcareous, solution cavi-				Shale, medium-gray, silty, thin and evenly bedded	1	0
	ties, pyrite nodules, irregularly bedded	_	2		Siltstone, medium-gray, thin-bedded		10
180.	at topShale, medium-gray, thin and evenly bed-	5	2		Shale, medium-gray, thin and evenly bed- ded		10
	ded, top slightly carbonaceous in upper 1 ft	2	4	202.	Siltstone, medium-gray, thin and evenly bedded		8
181.	Siltstone, medium-light-gray, very fine grained, sandy	1	6	203.	Shale, medium-gray, thin and evenly bed- ded, few siltstone laminations at base-	2	6
182.	Sandstone, medium-light-gray, very fine	1	J	204.	Sandstone, medium-light-gray, very fine	2	U
	to fine-grained, light and dark mineral grains, thin and irregularly bedded at				grained, silty, iron-stained, thin and irregularly bedded, pyrite nodules,		
	top, thick-bedded at base, pyrite nod-				base very silty	2	0

		Thickn	ess			Thick	kness
		Ft	in			Ft	in
205.	Shale, medium-gray, thin and evenly bed-			226.	Shale, medium-gray, thin and evenly bed-		
	ded	2	0		ded, locally carbonaceous	2	0
206.	Underclay, medium-gray, very sandy,			227.	Siltstone, medium-gray, sandy, poorly		_
	fossil roots		8	220	bedded	1	6
207.	Shale, medium-dark-gray to light-grayish-			220.	Sandstone, medium-light-gray, very fine grained, thick-bedded, solution cavi-		
	brown, carbonaceous, abundant fossil				ties, scattered pyrite nodules, iron-		
	plant fragments		10		stained, calcareous	2	6
208.	Underclay, medium-gray, sandy, fossil			229.	Sandstone, medium-light-gray, very fine	_	-
	roots, base silty		10		to fine-grained, dark and light mineral		
209.	Shale, light-brownish-gray, carbona-		4.0		grains, thin-bedded, upper 8 in calcar-		
210	ceous, abundant fossil plant fragments-		10		eous, fossil roots, grades upward into	•	•
210.	Coal, fine cleats, mostly bright attritus, resin		8	220	unit 230	2	0
211	Shale, medium-gray to medium-dark-		0	230.	Underclay, medium-gray to light-		
211.	gray, carbonaceous, thin and evenly				brownish-gray, silty, thin-bedded to nonbedded, shaly, upper 4 in very		
	bedded	1	2		carbonaceous	5	2
212.	Sandstone, medium-light-gray, very fine			231.	Coal, fine cleats, mostly bright, gypsum	J	-
	grained, silty, thin and irregularly bed-				crystals, resin blebs		6
	ded		10	232.	Sandstone, medium-light-gray, fine-		
213.	Shale, medium-gray, thin and evenly bed-	_	_		grained, dark and light mineral grains,		
214	ded	2	0		massive-bedded in basal 3 ft 2 in,		
214.	Siltstone, medium-gray, thin-bedded,	1	4		upper part thin-bedded, solution cavi-		•
215	very calcareous, fossil plant fragments- Sandstone, medium-light-gray, very fine	1	4	222	ties	4	0
215.	to fine-grained, silty, fossil plant frag-			233.	Shale, medium-gray, silty in lower half of unit, thin-bedded	2	10
	ments, basal two-thirds of unit massive			234	Sandstone, medium-light-gray, very fine	2	10
	and calcareous, upper third of unit thin			2 54.	grained, silty, thin- to thick-bedded	1	9
	bedded, pyrite nodules, solution cavi-			235.	Shale, medium-gray, thin-bedded, fossil	-	
	ties	4	0		plants	1	0
216.	Shale, medium-dark-gray to light-			236.	Siltstone, medium-light-gray, calcareous,		
	brownish-gray, carbonaceous, fossil		_		irregularly bedded		4
217	plant fragments, coal fragments		5		Shale, medium-gray, thin-bedded	1	0
217.	Coal, impure, bright, resin, gypsum crystals		2	238.	Underclay, crossbedded, fossil roots and	4	0
218.	Shale, light-grayish-brown, carbona-		2	230	plants, gypsum crystalsShale, medium-dark-gray, upper 10	4	0
	ceous, silty, sandy, crossbedded, thin-			239.	in carbonaceous, abundant fossil		
	bedded to thin and irregularly bedded,				plants	2	0
	abundant fossil plant fragments	2	6	240.	Sandstone, very fine grained, silty, iron-		
219.	Sandstone, medium-light-gray, fine-to				stained, thick-bedded to massive,		
	medium-grained, light and dark min-				slightly calcareous	4	0
	eral grains, massive, crossbedded, cal-			241.	Mudstone, calcareous, silty, concretion-		
	careous concretion 4 ft long; solution cavities; pyrite nodules, few silty			242	ary	4	0
	± 1 –2-ft-thick shale beds 22 ft above			242.	Sandstone, light-gray, very fine grained, very silty, thin- to medium-bedded	1	0
	base, lenticular; scattered shale chips;			243	Underclay, medium-dark-gray, thin and	1	U
	few shale and siltstone interbeds in top			2.5.	irregularly bedded, slightly silty, fossil		
	± 15 ft of unit, fossil root impressions-	86	0		roots and plants	1	6
220.	Shale, medium-gray, silty, thin and			244.	Coal, bony, impure, bright bands, abun-		
	evenly bedded	1	4		dant resin blebs		5
221.	Siltstone, medium-gray, very fine grained		_		Shale, medium-dark-gray, nonbedded	1	4
222	sandstone, fossil plant fragments		6	246.	Shale, light-grayish-brown, irregularly		4
<i>LLL</i> .	Shale, medium-gray, thin and evenly bed- ded	1	2	247	bedded Underclay, medium-gray, slightly silty,		4
223.	Siltstone, medium-gray, very fine grained	1	2	241.	scattered fossil plants and roots		7
	sandstone		4	248.	Coal, impure, bony, some light bands,		•
224.	Shale, medium-gray, thin and evenly bed-				mostly dark bands		7
	ded, slightly carbonaceous in upper 1 ft				Bentonite, light-olive-gray	1	0
-	of unit	1	4		Shale, medium-gray, nonbedded	1	0
225.	Sandstone, medium-light-gray, very fine			251.	Underclay, medium-brownish-gray, car-		
	to fine-grained, dark and light mineral				bonaceous, abundant fossil roots and		4
	grains, massive, solution cavities, iron- stained in lower two-thirds of unit,			252	Coal, light to dark bands, finely cleated,		6
	calcareous, crossbedded	5	4	<i>LJL</i> .	scattered resin		6
		-	•				

		Thick	ness			Thick	ness
		Ft	in			Ft	in
253.	Shale, dark-brownish-gray, carbonaceous, abundant bright coal lenses,			277.	Siltstone, medium-gray, nonbedded, sandy	1	2
	abundant fossil plants and roots, thin-			278.	Shale, medium-dark-gray, thin and	•	-
254	to irregularly beddedShale, medium-gray, thin-bedded, few		5		evenly bedded, slightly silty, few scat- tered fossil plants	5	0
254.	siltstone laminations up to 4 in thick -	9	0	279.	Shale, dark-grayish-brown, carbona-	J	Ū
255.	Underclay, medium-gray, silty, thin and				ceous, thin and irregularly bedded, abundant fossil plants	1	0
	irregularly bedded, abundant fossil roots and plants	1	6	280.	Shale, medium-gray, thin-bedded	2	0
256.	Shale, dark-grayish-brown, carbona- ceous, thin-bedded, scattered fossil			281.	Siltstone, medium-gray, thin and irregularly bedded, very calcareous	4	0
257	plants		8	282.	Shale, medium-gray, thin-bedded, silty,		
257.	Shale, light-medium-gray, thin- to irregularly bedded, scattered fossil plants;				carbonaceous in upper 3 in, scattered fossil plants, scattered siltstone lamina-		
	1/2-in-thick coal lens 9 in below top of unit	1	2	263	Sandstone light gray fine to medium	4	6
258.	Sandstone, very fine grained, very silty,	1	3	263.	Sandstone, light-gray, fine- to medium- grained, scattered light and dark min-		
	crossbedded, thin-bedded at base, mas-	2	_		eral grains, scattered pyrite nodules,		
250	sive toward top, silty, calcareous	3 1	2 3		grades laterally to thin-bedded silt- stone	6	6
	Shale, medium-gray, thin-bedded Shale, medium-dark-gray, silty, carbona-	1	3	284.	Shale, medium-gray, thin-bedded	3	6
200.	ceous, scattered fossil plants	1	4		Shale, carbonaceous, thin and irregularly		ŭ
261.	Underclay, dark-brownish-gray, very	•	•		bedded, scattered coal laminations,		
	silty, abundant fossil roots and plant				abundant fossil plants, slightly silty	2	0
	fragments	1	0	286.	Underclay, medium-dark-gray, very silty,	•	^
262.	Shale, medium-dark-gray, thin and		,	207	fossil roots	2	0 1
263	evenly bedded, scattered fossil plants- Sandstone, light-medium-gray, very fine	1	6		Coal, bright, scattered resin blebs Underclay, medium-dark-brownish-gray,		1
205.	grained, thin- to thick-bedded, very			200.	abundant coal fragments and lamina-		
	silty, scattered pyrite nodules	1	0		tions, fossil plant material, very silty,		
264.	Shale, medium-gray, thin and evenly bed-				slightly sandy	2	10
265	ded		6		Shale, light-brown-gray, carbonaceous		2
205.	Shale, dark-brownish-gray, carbonaceous, scattered bright coal laminations,			290.	Sandstone, very fine to fine-grained, silty, scattered pyrite nodules up to 3		
	abundant fossil plants		6		inches in diameter; interbedded with		
266.	Sandstone, medium-light-gray, very fine				light-gray siltstone, thin- to thick-		
	to fine-grained, abundant dark and				bedded, crossbedded, includes large	20	•
	light mineral grains, scattered pyrite		4	201	gypsum fault filling	30	0
267	nodulesShale, medium-gray, thin and evenly bed-	1	4	291.	Sandstone, light-gray, very fine to fine- grained, silty, crossbedded, few pyrite		
207.	ded		8		nodules, base sharp, top 6 ft thin-		
268.	Shale, dark-brownish-gray, carbona-		•		bedded	18	0
	ceous, thin and irregularly bedded,			292.	Siltstone, light-gray, nonbedded, shaly,	_	_
	abundant bright coal laminations, scat-	1	6	202	sandyShale, medium-gray, thin-bedded, scat-	6	0
269	tered fossil plant fragments Shale, medium-gray, thin-bedded	1	10	293.	tered coal fragments	5	0
	Underclay, medium-gray, thin-bedded,		10	294.	Sandstone, very fine grained, dark and	_	•
	fossil roots and plants		5		light mineral grains, silty, thick-		
	Coal, bright, finely cleated		1	•••	bedded	1	6
272.	Shale, medium-dark-gray, very silty,		•	295.	Shale, medium-gray, thin-bedded, few scattered fossil plants	1	3
273	poorly bedded, scattered fossil plants - Siltstone, medium-gray, nonbedded; 3-in-		8	296.	Sandstone, medium-light-gray, very fine	1	3
213.	thick grayish-red iron-stained band 10				grained, dark and light mineral grains,		
	in below top	5	0		thick-bedded, iron-stained, scattered		
274.	Underclay, medium-gray, very silty,	_			pyrite nodules, solution cavities, top 2	1	10
275	abundant gypsum crystals, fossil roots-	3	10	207	in calcareous Shale, medium-dark-gray, few fossil	1	10
413.	Claystone, medium-gray, scattered gyp- sum veins, irregularly bedded, silty,			271.	plants		3
	very sandy in basal 1½ ft	4	6	298.	Sandstone, very light gray, fine-grained,		-
276.	Sandstone, medium-gray, fine-grained,				nonresistant, scattered dark and light		
	few dark and light mineral grains, very			200	mineral grains		10
	silty, thin- to thick-bedded, scattered pyrite nodules	6	0	299.	Shale, medium-gray, thin and evenly bedded to poorly bedded, top 3 in grades		
	Plane Houses	U	•		aca to poorly occurre, top 5 in grades		

		Thick	ness			Thick	ness
		Ft	in			Ft	in
	into silty underclay with coal lamina-			321.	Shale, light-brownish-gray, carbona-		
200	tions	6	0		ceous, silty, scattered fossil plants		5
<i>3</i> 00.	Shale, light-brownish-gray, carbona-			322.	Shale, medium-gray, silty, thin- to irreg-		
	ceous, thin and evenly bedded, abundant coal laminations and fossil plants-		5		ularly bedded, few scattered siltstone	3	6
301	Sandstone, medium-light-gray, very fine		3	323	laminations Shale, light-brownish-gray, carbona-	3	6
501.	to fine-grained, dark and light mineral			323.	ceous, scattered fossil plants	1	6
	grains, some mica, friable, crossbed-			324.	Underclay, medium-gray, light-brownish-	•	•
	ded, thin- to thick-bedded, solution				gray, very silty, top 3 in contains		
	cavities, few scattered pyrite nodules -	5	0		abundant fossilized carbonaceous		
302.	Sandstone, medium-light-gray, very fine				roots	1	2
	grained, silty, thin and irregularly bed-			325.	Siltstone, medium-gray, grades sandy at		
	ded; 1-in-thick medium-gray shale	2	4		top, thin- to medium-bedded toward		
202	band 6 in above base	2	4		top, iron-stained, calcareous, scattered pyrite nodules to 2 inches in diameter-	4	6
303.	Shale, medium-gray, thin and evenly bed- ded	6	0	326.	Shale, medium-gray, thin- to poorly bed-	•	v
304.	Shale, light-brownish-gray, carbona-	-0	U		ded	3	0
	ceous, thin and irregularly bedded, scat-			327.	Underclay, light-brownish-gray, fossil		
	tered fossil plants		6		roots, few scattered fossil plants		9
305.	Sandstone, medium-light-gray, very fine			328.	Shale, dark-brownish-gray, scattered coal		
	grained, very silty, thin-bedded, fossil			220	laminations		4
206	root impressions in top 4 in	2	0	329.	Shale, medium-gray with 3-in-thick medium-dark-gray carbonaceous shale		
	Underclay, medium-gray, fossil rootlets -	2	10		1½ ft above base, scattered gypsum		
307.	Sandstone, medium-light-gray, very fine- grained, very silty, fossil roots	1	5		crystals	7	0
308	Underclay, medium-gray, very silty, fos-		3	330.	Siltstone, medium-light-gray, sandy, very		
500.	sil roots, scattered fossil plants; ½-in-				fine grained, iron-stained	1	8
	thick coal laminations 2 in below top-	1	10		Shale, medium-gray, thin-bedded	1	0
309.	Coal, bright, scattered resin blebs, few			332.	Shale, dark-brownish-gray, carbona-		_
	cleats		1	333	ceous, coal chips, fossil plants Siltstone, medium-gray, shaly, thin and		6
310.	Shale, light-brown-gray, carbonaceous,			333.	poorly bedded, some iron stains, basal		
	thin and irregularly bedded, fossil		,		contact undulating	2	6
311	plants		6	334.	Sandstone, medium-light-gray, very fine		
311.	Underclay, medium-gray, very silty, non- bedded, fossil roots, top grades into				to fine-grained, friable, silty, thick-		
	unit 312	2	6		bedded to massive, scattered pyrite		
312.	Sandstone, medium-light-gray, very fine			225	nodules at top	3	4
	grained, silty, thin and irregularly bed-			333.	Shale, dark-grayish-brown, carbona- ceous; 1½-in-thick bony coal 10 in		
	ded, shaly, few pyrite nodules	1	6		below top	1	6
313.	Shale, medium-gray, silty, thin and	_		336.	Sandstone, medium-light-gray, very fine	•	·
21.1	evenly bedded	2	10		to fine-grained, dark and light mineral		
314.	Siltstone, medium-light-gray, thin and				grains, thick-bedded to massive; top 2		
	irregularly bedded, grades sandy upward	1	0		ft contains many carbonaceous frag-		
315.	Shale, medium-gray, thin and evenly bed-	1	U		ments; few silty shaly beds approxi-		
	ded; 4-in-thick pyrite nodular band 3 ft				mately 3 in thick; basal 1 ft silty, very carbonaceous, fossil plant fragments;		
	below top; top 2 ft silty, top grades into				top 2 ft very silty, friable	8	10
	unit 316	6	0	337.	Sandstone, medium-light-gray, very fine	·	
316.	Sandstone, medium-light-gray, very fine				to fine-grained, few shale chips, mas-		
	grained, very silty, thin- to thick-				sive, solution cavities, pyrite nodules,		
	bedded; 3-in-thick medium-gray shale bed 6 in below top	2	4		few crossbeds, calcareous, calcareous		•
317	Shale, medium-gray, thin and evenly bed-	_	•	220	concretions up to 3 ft in diameter	10	0
317.	ded	2	0	338.	Shale, medium-gray to medium-dark- gray, thin and evenly bedded, silty,		
318.	Shale, light-brownish-gray, carbona-	-=	-		sandy, fossil plant fragments, carbo-		
	ceous, thin and evenly bedded, scattered				naceous	1	3
	fossil plants		6	339.	Sandstone, medium-light-gray, fine-		
319.	Shale, medium-gray, thin- to poorly bed-	_	0		grained, thin-bedded		10
220	ded	5	0	340.	Siltstone, medium-gray, poorly bedded,		
320.	Underclay, medium-gray to light-grayish- brown, thin and irregularly bedded,				very sandy, upper half thin-bedded, few pyrite nodules	4	6
	fossil roots, scattered fossil plants,			341.	Shale, medium-dark-gray to light-grayish-	7	J
	resin blebs		9		brown, thin-bedded, abundant fossil		

		Thickr	ness			Thick	ness
		Ft	in			Ft	in
	plant fragments, carbonaceous; few coal				crossbedded, fossil roots, solution cav-		
	fragments and fusain bands up to 1 inch	_		262	ities, massive, upper 4 in thin-bedded-	3	5
242	in length, upper half of unit light gray-	2	2	362.	Shale, medium-gray, thin and evenly bed- ded, top channeled and filled by sand-		
342.	Sandstone, medium-light-gray, very fine grained, silty, thin and irregularly bed-				stone unit 363		11
	ded, calcareous, iron-stained	1	6	363.	Sandstone, medium-light-gray, very fine		
343.	Shale, medium-gray, thin- to poorly bed-	_	_		grained, silty, basal 7 in thin-bedded,		
	ded	3	0		upper 1 ft 5 in thick-bedded, calcare-	_	•
344.	Underclay, medium-gray, fossil roots,		,	261	ous, shaly, crossbedded	2	0
215	slightly carbonaceousShale, carbonaceous, medium-dark-gray	1	6	304.	Shale, medium-gray, thin and evenly bed- ded, few fossil roots, channel in upper		
J 4 J.	to light-grayish-brown, abundant fossil				part of unit filled by unit 365	1	2
	plant and coal fragments, thin and			365.	Sandstone, medium-light-gray, very fine		
	evenly bedded		4		to fine-grained, few medium grains,		
346.	Shale, medium-gray, thin- to poorly bed-				few siltstone laminations, crossbedded;		
	ded, slightly carbonaceous in upper 1		,		calcareous and thin-bedded in top 2 ft;		
247	ftSandstone, medium-light-gray, very fine	4	6		friable, solution cavities, scattered shale chips, scattered pyrite nodules	27	6
347.	grained, thin and irregularly bedded,			366.	Shale, medium-gray, thin- to poorly bed-	2,	Ü
	slightly calcareous	2	8	500.	ded	4	0
348.	Shale, medium-gray, thin and evenly bed-	_	Ū	367.	Bentonite, light-olive-gray	4	0
	ded, slightly carbonaceous, few fossil			368.	Shale, medium-gray to medium-dark-		
	roots in upper 6 in	1	10		gray, slightly calcareous, thin- to		
349.	Shale, medium-dark-gray to dark-grayish-				poorly bedded, fossil plant fragments,	9	4
	brown, very carbonaceous, gypsum		2	360	grades into unit 369Sandstone, medium-light-gray, silty, very	9	4
350	crystals, coal laminations, silty Shale, medium-gray, thin and evenly bed-	1	2	309.	fine grained, massive at top, basal 1 ft		
330.	ded	1	3		4 in very silty, few fossil roots	3	4
351.	Sandstone, medium-light-gray, very fine	•		370.	Shale, medium-gray, poorly bedded	1	4
	grained, thin and irregularly bedded,			371.	Sandstone, medium-light-gray, very fine		
	silty, pyrite nodules	1	6		grained, silty, thin and irregularly bed-		•
352.	Shale, medium-dark-gray to medium-			272	Shele medium area thin to morely had	1	0
	gray, very carbonaceous; basal 4 in,			312.	Shale, medium-gray, thin- to poorly bed- ded	1	8
	fossil plants and coal fragments; 8-in- thick carbonaceous zone 3 ft above			373.	Sandstone, light-gray, very fine to fine-	•	Ū
	base; upper 2 ft poorly bedded	5	10	5,51	grained, thick-bedded to massive, 5-ft		
353.	Siltstone, medium-gray, thin and irregu-	_			calcareous concretions, crossbedded,		
	larly bedded, sandy	1	1		friable, few solution cavities	6	6
354.	Underclay, medium-gray to light-grayish-			374.	Shale, medium-gray, thin and evenly bed-	2	,
	brown, fossil roots; 2-in-thick × 10-in-			275	ded, few fossil roots Shale, medium-dark-gray to dark-grayish-	3	6
	long detrital coal lens 1 ft above base; very silty, 3-in-thick bone lens 4 ft			373.	brown, carbonaceous, very silty, thin		
	below top, upper 3 in thin and evenly				and evenly bedded, coal and fossil		
	bedded, carbonaceous shale	2	6		plant fragments	1	6
355.	Sandstone, medium-gray, very fine			376.	Shale, medium-gray, thin and evenly bed-		
	grained, silty, thin and irregularly bed-			0.77	ded		11
256	ded	1	6	377.	Sandstone, medium-light-gray, thin and		
<i>3</i> 36.	Shale, medium-gray to medium-dark-				evenly bedded to thick-bedded, gyp- sum in fractures; 5-in-thick medium-		
	gray, poorly bedded, upper 2 ft 2 in thin and evenly bedded, slightly carbo-				gray shale lens 7 in below top	1	10
	naceous	4	8	378.	Shale, medium-gray, nonbedded, basal 4		
357.	Sandstone, medium-light-gray, very fine				in very silty, top uneven	2	0
	grained, silty, thin- to thick-bedded,			379.	Sandstone, medium-light-gray, fine-		
	4-in silty bed 1 ft above base, fossil	_			grained, thin and irregularly bedded,		
250	roots in upper 6 in	2	8		pyrite nodules, basal 4 in contains	2	2
338.	Shale, medium-gray, thin- to poorly bed- ded		7	380	detrital coal fragments Shale, medium-gray, silty, sandy, thin	2	2
359.	Sandstone, medium-light-gray, very fine		,	500.	and evenly bedded, siltstone and sand-		
•	grained, silty, thin- to thick-bedded	1	1		stone laminations up to 3 in	3	0
360.	Shale, medium-gray to medium-dark-			381.	Sandstone, light-gray, very fine to fine-		
	gray, few coal fragments, top chan-		•		grained, silty, thin- to thick-bedded,		
261	neled and filled by unit 361	1	2	202	few solution cavities	1	8
301.	Sandstone, medium-light-gray, very fine grained, silty, thin- to thick-bedded,			362.	Shale, medium-gray, thin and evenly bed- ded, silty		4
	gramos, one, ann- w unex-bedded,				-		•

		Thick				cness .
202	Siltatona madium gray thin to nearly	Ft	in	407 Sandstone light array to white fine	Ft	in
	Siltstone, medium-gray, thin- to poorly bedded, few fossil roots, top undulates-Sandstone, medium-light-gray, very fine	2	5	407. Sandstone, light-gray to white, fine- grained, few medium-grained, silty, crossbedded, friable, solution cavities,		
	to fine-grained, crossbedded, basal 2 ft			pyrite nodules		_8
	contains pyrite nodules and shale chips; very calcareous, massive at top; several 2-ft-thick calcareous zones, thin bed-			Total measured thickness of main body of Mesaverde Formation	1,292	<u>_5</u>
	ded	13	0	White sandstone member of Mesaverde Form	ation:	
	Shale, medium-gray, thin-bedded	1	0	408. Sandstone, light-gray to white, fine-		
	Sandstone, light-gray, very fine grained, silty	1	2	grained, some medium-grained, dark and light mineral grains, thick-bedded		
387.	Shale, medium-gray, poorly bedded, few fossil roots, slightly carbonaceous in			to massive, crossbedded, scattered pyrite nodules, solution cavities; 4 ft of		
388	top 1 in Ironstone, dark-reddish-brown, weath-		8	medium-gray shale laminations 125 ft		
500.	ered		8	above base; shale chips 135 ft above base; coarsens upward; 10-ft quartzose		
389.	Shale, medium-dark-gray, thin and			ledge 15 ft below top		0
	evenly bedded, very carbonaceous,		_	Total measured thickness of white		_
390	few fossil plant fragments Sandstone, medium-light-gray, very fine	1	2	sandstone member of Mesaverde		0
570.	grained, silty	1	6	Formation Total measured thickness of Mesa-		$\stackrel{0}{=}$
391.	Shale, medium-dark-gray, thin and			verde Formation		_5
202	evenly bedded	1	2			=
394.	Shale, medium-dark-gray to light-grayish- brown, abundance of plant fragments			Meeteetse Formation:		
	and prints, thin and evenly bedded,			409. Shale, medium-gray, thin and evenly bed-		
	carbonaceous	1	2	ded, thin- to thick-bedded at top, fria- ble		6
393.	Sandstone, medium-light-gray, very fine grained, silty	1	0	410. Shale, medium-brownish-gray, thin and	•	Ü
394.	Shale, medium-gray, thin and evenly bed-	1	U	evenly bedded		8
	ded	1	2	411. Shale, medium-brownish-gray, carbona-		
395.	Sandstone, medium-light-gray to light-			ceous, thin and irregularly bedded, abundant fossil plants; 1½-in-thick		
	gray, very fine grained, silty, fossil		10	sandstone lens 10 in below top		0
396.	Shale, medium-dark-gray to dark-grayish-		10	412. Shale, medium-brownish-gray, carbona-		•
	brown, carbonaceous, silty, poorly			ceous, thin and evenly bedded 413. Underclay, medium-brownish-gray, car-		2
205	bedded, ½-in coal bed at base		9	bonaceous, silty, fossil plants and		
397.	Sandstone, medium-light-gray, very fine grained, silty	2	10	roots	1	4
398.	Shale, medium-gray to medium-dark-	2	10	414. Shale, medium-gray, thin and irregularly bedded, sandstone lens 10 in below		
	gray, thin-bedded, scattered fossil			top	1	10
	plants; 6-in-thick carbonaceous zone 2 ft above base; upper 1 ft very carbon-			415. Shale, dark-brownish-gray, carbona-		
	aceous	4	6	ceous, silty, poorly bedded, fossil		2
399.	Siltstone, medium-gray, very fine grained sandstone laminations, thin and irregu-			416. Siltstone, medium-gray, thin- to poorly bedded		6
400	larly bedded, calcareous	1	0	417. Sandstone, light-medium-gray, very fine		ŭ
400.	Sandstone, light- to medium-gray, very fine grained, thin-bedded, pyrite nod-			to fine-grained, dark and light mineral		
	ules	3	6	grains, thick-bedded to massive; 10- in-thick siltstone with thin-bedded lam-		
401.	Shale, medium-gray	1	0	inations 1½ ft above base, crossbed-		
	Sandstone, light-gray, very fine grained,	-	4.5	ded, pyrite nodules, solution cavities,		
403	Shale, medium-gray, thin and evenly bed-	- 2	10	medium-grained at top	30	0
-1 03.	ded		5	418. Shale, medium-brownish-gray, carbonaceous, thin and irregularly bedded	3	0
404.	Shale, medium-dark-gray, very calcare-			419. Shale, medium-brownish-gray, carbona-	-	-
	ous, silty, nonbedded; 7-in-thick			ceous, thin and irregularly bedded, fos-		_
	medium-dark-gray shale 7 in above base	3	0	sil plant fragments420. Shale, medium-grayish-brown, carbona-	1	2
405.	Siltstone, light-gray, thin-bedded, iron-	3	J	ceous, thin and evenly bedded	3	4
	stained	1	0	421. Shale, medium-brownish-gray, carbona-		
406.	Shale, medium-dark-gray, slightly carbonaceous	1	10	ceous, thin and irregularly bedded, fos- sil plants in lower half of unit	2	2
	Conuccous	1	10	on plants in lower half of unit	2	2

		Thickness		Upper Cretaceous:		ness
		Ft	in	Meeteetse Formation: (Units 1–33 not described	Ft	in
422.	Sandstone, medium-light-gray, fine- to			in detail)		
	medium-grained, scattered dark and			1. Sandstone	10	0
	light mineral grains, iron-stained, thin-			2. Shale 3. Sandstone	6 10	0
	to thick-bedded, solution cavities, scat-			3. Sandstone 4. Shale	10	0
	tered pyrite nodules, becomes silty at top	3	4	5. Sandstone	1	6
423	Shale, lower 1½ ft medium-gray, thin and	3	7	6. Shale, carbonaceous	3	0
423.	irregularly bedded, top carbonaceous,			7. Shale	1	6
	thin and evenly bedded	3	4	8. Sandstone, massive with shale chips	15	0
424.	Sandstone, light-gray, very fine grained,			9. Shale	8	0
	light and dark mineral grains	1	2	10. Sandstone, calcareous	5	0
425.	Shale, medium-brownish-gray, carbona-			11. Sandstone, massive 12. Underclay	27 1	0
	ceous, abundant fossil plants, thin and	2	0	12. Underclay	1	0
426	evenly bedded in top 1 ftSandstone, light-medium-gray, medium-	2	U	14. Shale	2	ŏ
420.	grained, dark and light mineral grains,			15. Sandstone	1	6
	iron-stained		8	16. Shale with underclay	5	0
427.	Shale, medium-brownish-gray, thin-			17. Coal	2	0
	bedded, weathered	16	0	18. Bone		8
428.	Sandstone, light-gray, fine- to medium-			19. Coal 20. Sandstone	12	10 0
	grained, crossbedded, thick-bedded,			20. Sandstone 21. Shale	13 15	0
	iron-stained, solution cavities, scat- tered pyrite nodules	15	10	22. Sandstone, massive	30	ő
429	Shale, medium-gray, weathered	6	0	23. Shale	20	0
	Sandstone, medium-gray, very fine	·	ŭ	24. Coal	1	6
	grained, dark and light mineral grains,			25. Shale	9	0
	silty	1	6	26. Sandstone	3	0
431.	Shale, medium-gray, thin and evenly bed-			27. Shale	9	0
	ded, slightly bentonitic, carbonaceous	_	,	28. Sandstone 29. Sandy bentonite	3 4	0
422	in top 1 ft	5	6	29. Sandy bentonite	2	0
	Bentonite, light-olive-grayShale, medium-gray, weathered	1 9	4 6	31. Shale	5	ő
	Sandstone, light-gray, fine grained, cross-	,	Ü	32. Sandstone	3	0
	bedded, weathered, scattered pyrite			33. Shale, carbonaceous	10	0
	nodules, calcareous and thin-bedded in			34. Underclay, upper part very carbonaceous		_
	top 3 ft	15	0	with bone 7 in thick	4	0
435.	Shale, medium-gray to medium-dark-			Welton coal bed		
	gray, poorly bedded, weathered, top 1			35. Coal, bright; 7-in-thick bony zone 21/2 ft		
	ft carbonaceous and coal fragments, very fissile at top	6	0	below top; upper 2 ft impure; fine-		
436.	Sandstone, medium-light-gray, very fine	U	U	to-medium cleats (Woodruff and Win-		_
	to fine-grained, dark and light mineral			chester, 1912, pl. L, no. 71)	15	2
	grains, thick-bedded to massive, scat-			36. Shale, medium-dark-gray to light-grayish-		
	tered pyrite nodules	16	0	brown, carbonaceous, bony, silty to sandy	1	4
	Shale, light-medium-gray, carbonaceous-	1	0	37. Shale, medium-gray to medium-dark-	•	-
438.	Sandstone, light-medium-gray, very fine- grained, scattered dark and light min-			gray, nonbedded, few fossil roots	9	0
	eral grains, silty, weathered	6	0	38. Sandstone, medium-light-gray, very fine		
	Total measured thickness of Mee-	<u>-</u>		grained, thin-bedded, silty	1	0
	teetse Formation	165	_0	39. Shale, medium-gray, silty, thin- to poorly		
	ial Cover		=	bedded, upper part contains a few		
End o	f section			lenses of sand grains	2	6
				40. Sandstone, medium-light-gray, very fine	1	7
				grained, few fossil roots	1	′
41. Siltstone, medium-gray, abundant f						
Measur	ed section 3: Meeteetse Formation th	rough	Fort	42. Shale, medium-dark-gray to medium-	1	8
Union Formation				gray, basal 1 ft slightly carbonaceous,		
Location: Eagle Point Quadrangle, Wyoming (7.5 min)				few thin, calcareous, silty bands	5	0
Start: SW-SE-NW sec. 17, T. 6 N., R. 1 E. Presented			idest to	43. Sandstone, medium-light-gray, thin-		
youngest End: SW-NE-NE sec. 21, T. 6 N., R. 1 E.				bedded, very fine grained, silty, calcar-		-
Described by: J.F. Windolph, Jr.				eous, ripple-bedded		5
Strike 17	0°, Dip 25° E.			44. Shale, medium-gray, nonbedded	4	6

		Thickn	iess			Thic	kness
		Ft	in			Ft	in
45.	Sandstone, medium-light-gray, fine- grained, very calcareous, ripple- bedded and crossbedded	2	0	64.	Sandstone, medium-light-gray, fine-to medium-grained, few shale chips, mas-		
46.	Sandstone, medium-light-gray, very fine grained, silty, shaly, friable, two thin	3	0		sive, crossbedded, slump structures, few solution cavities, few thin-bedded sandstone and shale lenses, pyrite nod-		
47.	calcareous bedsShale, medium-gray, thin- to poorly bed-	3	6		ules 2 ft above base; upper 2 ft calcareous, very thin bedded	52	0
48.	ded, few fossil rootlets Shale, medium-dark-gray to light-grayish-brown, thin-bedded, very carbonac-	5	6		Shale, medium-gray, poorly beddedShale, medium-dark-gray to light-grayish-brown, thin and evenly bedded, very	9	6
49.	eousCoal, bright, fine to medium cleats, gyp-	2	0	67.	carbonaceous Underclay, medium-gray, fossil roots,		10
50.	sum crystalsCoal, bony	1	8 <u>3</u>		slightly shaly, bentonitic with few car- bonaceous zones, few sandy shale		
	Total measured thickness of Meeteetse Formation	300	_ _ <u>7</u>	68.	chips, top unevenSandstone, medium-light-gray to light-	26	0
Uncor	enformity		=		gray, fine- to medium-grained, few		
	Formation:				coarse grains, dark and light mineral		
					grains, massive, slump-bedded, solution cavities; upper half of unit thin-		
51.	Sandstone, medium-light-gray, fine- to				bedded and contains light-yellow iron-		
	medium-grained, dark and light min- eral grains, friable, massive, few scat-				stained lenses; few calcareous zones 1		
	tered pyrite nodules, solution cavities,				ft thick, crossbedded; upper 1 ft very		
	calcareous concretions up to 7 ft long,			60	fine grained, very calcareous	50	0
	petrified wood fragments 85 ft above			09.	Sandstone, medium-light-gray, very fine to fine-grained, silty, thin-bedded, few		
	base, petrified log 6 inches in diameter, 155 ft above base; few thin shale				very calcareous 1-ft-thick zones	10	0
	lenses	208	0	70.	Sandstone, medium-light-gray to light-		
52.	Shale, medium-gray to medium-dark-		Ū		gray, fine- to medium-grained, few		
	gray, thin and evenly bedded, gypsum,				very coarse-grained lenses, dark and		
	crystals, few sandstone and siltstone				light mineral grains, crossbedded, thin- bedded to massive	46	0
	interbeds up to 6 in thick; upper part	10	^	71.	Sandstone, medium-light-gray, very fine	70	U
53	slightly carbonaceousSandstone, medium-light-gray, very fine	19	0		to fine-grained, thin-bedded, very cal-		
55.	grained, silty, thin-bedded, crossbed-	-			careous, basal 4 in forms resistant		
	ded, few thin shale interbeds up to 4 in			70	ledge	4	0
	thick	6	6	12.	Siltstone, medium-gray, very fine grained, sandy, thin and evenly bed-		
54.	Shale, medium-gray to medium-dark-	0	_		ded, very calcareous	12	0
55	gray, poorly beddedSandstone, medium-light-gray, very fine	9	6		Shale, medium-gray, poorly bedded	7	0
33.	to fine-grained, thin- to thick-bedded -	1	0	74.	Sandstone, medium-light-gray, very fine		
56.	Shale, medium-gray, silty, poorly bed-	•	Ü		grained, silty, very calcareous, thin-	2	^
	ded	1	6	75	Shale, medium-gray to medium-dark-	3	0
57.	Sandstone, medium-light-gray, very fine			75.	gray, poorly bedded	5	6
5 0	grained, silty, thin-bedded	1	4	76.	Sandstone, medium-light-gray, fine-		
38.	Shale, medium-gray to medium-dark-gray, poorly bedded	5	4		grained, thin- to thick-bedded, few		
59.	Sandstone, medium-light-gray, very fine	3	7		massive beds, crossbedded, upper 25 ft thin-bedded and very calcareous	125	Λ
	grained, silty, few fossil roots, top 4 in			77.	Siltstone, medium-gray, very fine	135	0
	thin-bedded	1	8	.,,	grained, very calcareous, thin-bedded-	12	0
60.	Shale, medium-dark-gray to grayish-			78.	Shale, medium-dark-gray, nonbedded,		
	brown, very carbonaceous, thin and evenly bedded, abundant fossil plant			70	slightly bentonitic	7	6
	fragments	2	5	79.	Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded, conglom-		
61.	Shale, medium-dark-gray, poorly bedded,				eratic, pyrite nodules, rounded quartz		
	slightly carbonaceous; upper 8 in thin-				and chert pebbles, and fossil bone frag-		
60	bedded	6	2		ments up to 1 ft in diameter, contains		
02.	Sandstone, medium-light-gray, very fine to fine-grained, thick-bedded; few fos-			00	shale and sandstone lenses	4	0
	sil impressions in upper 6 in	4	0	80.	Sandstone, fine- to medium-grained, few		
63.	Shale, medium-dark-gray to medium-	,	J		coarse grains, contain 1-ft-thick con- glomerate lens and a few shale lenses-	12	0
	gray; 1-ft-thick carbonaceous zone 9 in			81.	Sandstone, medium-light-gray, fine-to		Ü
	above base	3	0		medium-grained, thin-bedded to mas-		

		Thickn	ess			Thick	iness
		Ft	in			Ft	in
	sive, crossbedded, calcareous concre- tions 7 ft in diameter, few solution			101.	Shale, medium-dark-gray, thin and evenly bedded	1	10
	cavities, few pebbles 25 ft above base			102.	Sandstone, medium-light-gray, fine- to		
	and 45 ft above base; upper 2 ft very				medium-grained, dark and light min-		
	calcareous	108	0		eral grains, crossbedded, shale chips,		
82.	Shale, medium-gray to medium-dark-				pyritic nodules, contains 3-in-thick silt-		
	gray, thin and evenly bedded, contains				stone 1½ ft above base, upper 1½ ft		
	8-in-thick silty sandstone 8 ft above		_	102	calcareous	4	0
02	base	11	6	103.	Shale, medium-gray, silty, thin and	2	6
83.	Sandstone, medium-light-gray, very fine	1	4	104	evenly bedded Ironstone, weathered dark-brown	2 1	6 0
0.1	grained, silty, very calcareous	1	6		Shale, medium-gray, silty, bentonitic,	1	U
04.	Sandstone, medium-light-gray, very fine grained, silty, thick-bedded	8	0	105.	becomes medium-dark-gray to dark-		
95	Shale, medium-gray, poorly bedded	2	6		gray, nonbedded 10 ft above base	49	0
		2	U	106.	Sandstone, medium-light-gray, medium-	• • •	ŭ
80.	Sandstone, medium-light-gray, fine- to medium-grained, massive, slightly cal-			2001	to coarse-grained, massive, pyrite nod-		
	careous, few solution cavities, 3 ft in				ules, contains palm tree leaf impres-		
	diameter, calcareous concretions, few				sions	2	0
	1-ft-thick medium-gray shale lenses 25			107.	Shale, medium-dark-gray to dark-gray,		
	ft above base	50	0		nonbedded, bentonitic, carbonaceous -	88	0
87.	Shale, medium-gray to medium-dark-			108.	Siltstone, medium-gray, bentonitic,		•
	gray, poorly bedded to nonbedded,			100	grades sandy upward	6	0
	upper 2 ft slightly carbonaceous	20	0	109.	Sandstone, medium-light-gray, fine- to		
88.	Sandstone, medium-light-gray, very fine				medium-grained, dark and light min-	1	10
	to fine- to medium-grained, massive,			110	eral grains, thick-bedded	1	10
	upper 1 to 1½ ft very calcareous, very			110.	tonitic	4	6
	ferruginous, upper 5 ft contains few	1.5	^	111.	Sandstone, medium-light-gray, fine- to	•	·
90	shale chips	15	0		medium-grained, very silty, thick and		
89.	Shale, medium-gray, poorly bedded to				irregularly bedded lenses, few gran-		
	nonbedded, slightly bentonitic contains 5-ft siltstone lens	21	6		ules, shale chips	5	0
90.	Sandstone, medium-light-gray, very fine	21	U	112.	Shale, medium-gray to medium-dark-		
70.	to fine-grained, thin-bedded, very cal-				gray, nonbedded, bentonitic	17	0
	careous	3	0	113.	Sandstone, medium-light-gray to olive-		
91.	Sandstone, fine- to coarse-grained, thin-				green, fine- to medium-grained in light		
	bedded to massive, very friable, upper				portion, very fine grained to silty in		
	4 ft very calcareous	20	0		green portion, unit consist of several lenses, massive to nonbedded	3	0
92.	Siltstone, medium-gray, very fine			114	Shale, light-olive-gray to medium-dark-	3	U
	grained, sandy, poorly exposed	5	0	114.	gray, nonbedded, bentonitic, ash parti-		
93.	Shale, medium-gray to medium-dark-				cles, upper 3 ft grades into sandy shale-	15	0
	gray, poorly bedded to nonbedded,			115.	Sandstone, medium-light-gray, very fine		
	slightly bentonitic	48	0		grained, silty, thick-bedded to mas-		
94.	Sandstone, medium-light-gray, very fine				sive	3	6
	to fine-grained, thin-bedded, very cal-	20	^	116.	Shale, medium-dark-gray, nonbedded,		
05	Chala madium const to madium doub	20	0		carbonaceous	1	6
93.	Shale, medium-gray to medium-dark- gray, silty, basal 2 ft slightly bentoni-			117.	Siltstone and very fine grained sandstone,	1	0
	tic	10	0	110	thick-bedded	1	0
96.	Sandstone, medium-light-gray, fine- to	10	Ů	110.	Shale, medium-dark-gray, bentonitic, nonbedded, contains few light-olive-		
, , ,	medium-grained, thick-bedded, pyrite				green siltstone lenses up to 1 ft thick,		
	nodules	3+			upper 1 ft grades into sandy shale	25	0
97.	Covered	25	0	119.	Sandstone, medium-light-gray, fine- to		
98.	Sandstone, medium-light-gray, very fine				medium-grained, thick-bedded to mas-		
	to fine-grained, thick-bedded to mas-				sive, high-angle crossbedding, shale		
	sive, locally crossbedded; solution cav-				chips, pyrite nodules	22	0
	ities; upper 1 ft very calcareous	18	0	120.	Shale, light-olive-gray, silty, nonbedded,		
99.	Shale, medium-gray, thin and evenly bed-				contains few silty zones up to 1½ ft		
	ded, slightly bentonitic, nonbedded 6 ft	25	,		thick, few medium-gray zones, slightly	12	Λ
100	above base, medium-dark-gray	25	6	121	bentoniticSandstone, medium-light-gray, very fine	12	0
100.	Sandstone, medium-light-gray, fine- to medium-grained, dark and light min-			121.	to fine-grained, silty, thick-bedded to		
	eral grains, thick-bedded to massive,				massive, contains 9-in-thick sandy vol-		
	crossbedded, shale chips, friable	4	6		canic ash bed 2 ft 8 in above base	6	0
		•					

		Thick				Thick	ness
100	Chala madium and to light align	Ft	in			Ft	in
	Shale, medium-gray to light-olive-gray, bentonitic, silty, nonbedded	5	0	142.	Shale, medium-gray to light-brownish- gray, thin and evenly bedded, upper 1		0
123.	Sandstone, medium-light-gray, very fine to fine-grained, silty, thick-bedded to	•		143.	ft silty to sandySandstone, medium-light-gray, very fine	6	0
124.	massive Shale, medium-gray to medium-dark-	3	6	144.	grained, silty, very calcareous Underclay, medium-gray, bentonitic, poor-	2	6
	gray, contains 1 ft light-olive zone, medium-grained, silty sandstone 2 ft			145.	ly beddedShale, medium-dark-gray to light-grayish-	6	0
125.	above base, bentonitic	6	0		brown, slightly bony, very carbo- naceous, coal fragments, fossil plant fragments and leaves		10
	massive, crossbedded, noncalcareous, contains 1-ft-thick volcanic ash bed 2 ft	o	6		Coal, bright, impure, shaly, fusain Shale, dark-gray to black, very carbo- naceous, abundant coal laminations;		3
126.	below topShale, light-olive-brown to medium-gray,	8	6		upper 8 in becomes light-grayish-	1	
	thin-bedded, slightly bentonitic, pyrite nodules; 1-ft-thick siltstone bed 3 ft				brown to medium-dark-gray Shale, thin and evenly bedded	1	2 2
107	above base; includes two silty sandy beds	15	0	149.	Sandstone, light-gray to white, very fine to fine-grained, few medium grains,		
	Sandstone, light-gray, very fine grained, silty, thick-bedded		10	150	thin- to thick-bedded, pyrite nodules, few crossbeds, few thin shaly lenses-	20	0
128.	Shale, medium-gray to medium-dark- gray, thin- to poorly bedded, slightly	_	•	150.	Shale, medium-gray, thin and evenly bed ded, top part grades into bentonitic and	11	0
129.	bentonitic	6	0	151.	sandy shaleSandstone, light-gray, very fine grained,	11	U
	medium-grained, thick-bedded, cross- bedded, pyrite nodules	1	6		silty, thin-bedded, few white volcanic ash lens-shaped interbeds up to 3 in	_	_
130.	Shale, medium-gray to medium-dark- gray, thin- to poorly bedded, slightly			152.	thick, pyrite nodulesShale, medium-gray to light-olive-gray,	5	6
131	carbonaceous	6	0		nonbedded, contains 1-ft-thick silty ironstone 8 ft above base; top grades		
151.	grained, dark and light mineral grains, thin- to thick-bedded, crossbedded,			153.	into sandy shale	26	0
132.	lens-shaped beds, few pyrite nodules - Shale, medium-gray, nonbedded, bento- nitic	10	6		bedded, few crossbeds, few thin shale lenses, few volcanic ash layers up to 3		
133.	Sandstone, medium-light-gray to light-	15	0	154.	in thick Underclay, medium-gray, nonbedded	16 1	0 6
	gray, very fine grained, silty, thin- to thick-bedded, pyrite nodules	4	0		Shale, light-grayish-brown, thin-bedded, few coal fragments and fossil plant		
	Shale, medium-gray, silty, nonbedded Sandstone, light-gray, very fine to fine-	5	6	156	fragmentsCoal, impure, bony, shaly, resin blebs		5 9
136.	grained, thick-bedded, lens shaped Underclay, medium-gray, nonbedded,	4	0		Shale, dark-gray, thin and evenly bedded, slightly bony		
	few fossil roots	1	0		Coal, impure, shaly	1	3
	evenly bedded		2		Shale, medium-gray, poorly beddedSandstone, medium-light-gray to light-	1	0
	ded		7		gray, very fine grained, silty, few thin shale and volcanic ash lenses; 6-in-		
139.	Sandstone, light-gray, very fine grained, silty, thick-bedded, 1-ft-2-in-thick carbonaceous underclay 2 ft above base,			161	diameter pyrite nodules 4 ft above base	10	0
	few underclay lenses 1 ft thick with carbonaceous shale 4 ft below top, few				rootletsCoal, interbedded with shale and silt,	1	2
140.	pyrite nodules at top	21	0		fossilized flat-bladed reeds appear to have been completely charred, few		
	1-ft-thick ironstone bed 2 in above base; 1½-ft-thick fine-grained sand-stone with fossil plant and stem prints			163.	coaly fragments		7
1.4.1	10 ft above base; fossil roots in top of sandstone	11	6		medial part; top and basal 2 in thin bedded, very carbonaceous, fossil	2	0
141.	Coal, impure, shaly, sulfur, fusain, gyp- sum, basal part is a 4-in underclay with well-preserved fossil roots		6		plant fragments Coal and shale interbedded Shale, medium-gray, bentonitic, top sandy	2 5	0 7 6
	preserved rossii roots		U	105.	Share, medium-gray, bentonine, top sandy	5	U

166. Sandstone, light-gray to white, very fine to fine-grained, thin-to thick-bedded, few thin shake and still enses; 1-ft-thick very iron stained siltstone 17 ft above base, few pyrite nodules			Thick	ness			Thick	ness
166. Sandstone, light-gray to white, very fine to fine frame, thin- to thick-bedded, few thit shale and silt lenses; 1-fi-thick very iron stained sittsmost 17 above base, few pyrite nodules party, thin-bedded to nonbedded, bentonitic; 6-in-thick coaly carbonaecous shale at top— 167. Shale, medium-gray to light-gray introduction of fine-grained, shilt, white-bedded— 168. Sandstone, light-gray to white, very fine to fine-grained, shilt, white-bedded— 169. Undereilay, medium-gray poorly bedded, fossil rootlets— 170. Coal, impure, flat-bladed chared leaves, shale interbeds, flusting—shale interbeds, silty, slighty—shale shale lenses, flusting—shale interbeds,								
few this shale and silt lenses: 1-fr-thick very into stained siltstone 7 t above base, few pyrite nodules 27 0 167. Shale, medium-gray to light-brownish gray, thin-bedded to nonbedded, bentonitic; 6-in-thick coally acthoraceous 19 168. Sandstone, light-gray to white, very fine grained, silty, thin-bedded 1 6 169. Underclay, medium-gray poorly bedded 1 6 170. Shale, medium-dark-gray to light-gray, the medium-dark-gray to light-gray, the medium-gray, then onlice 1 1 171. Coal, impure, flat-bladed chared leaves, shale interbeds, fivs-silty 1 1 172. Coal, impure, shalp, flat-bladed chared fews 1 1 173. Coal, impure, shalp, flat-bladed chared fews 1 1 174. Underclay, medium-gray, bentonitic 1 1 175. Shale, dark-gray to dark-gray to light-gray, then onlice 1 1 176. Underclay, independent 1 1 177. Sandstone, light-gray, wery fine grained, silty, thin-bedded 1 1 178. Shale, medium-gray, thin and evenly bedded 1 1 179. Coal, bright 1 1 1 179. Sandstone, medium-light-gray, very fine grained, silty, thin-bedded 1 1 179. Sandstone, medium-gray, thin and evenly bedded 1 1 179. Sandstone, medium-light-gray, very fine grained, silty, thin-bedded 1 1 179. Sandstone, medium-gray, thin-bedded 1 1 179. Sandstone, medium-light-gray, very fine grained, silty, thin-bedded 1 1 179. Sandstone, medium-gray, thin-bedded 1 1 1 179. Sandstone, medium-light-gray, very fine grained, silty, thin-bedded 1 1 1 179. Sandstone, medium-light-gray, very fine grained, silty, thin-bedded 1 1 1 1 179. Sandstone, medium-light-gray, very fine grained, silty, thin-bedded 1 1 1 1 1 1 179. Sandstone, medium-light-gray, very fine grained, silty, thin-bedded 1 1 1 1 1 1 1 1 1	166.				193.			0
base, few pyrite nodules————————————————————————————————————		few thin shale and silt lenses; 1-ft-thick			194.	Shale, medium-gray to medium-dark-	J	Ū
gray, thin-bedded to nonbedded, bentonitis, c-in-thick colog carbonaceous shale at top- 168. Sandstone, light-gray to white, very fine to fine-grained, silty, thin-bedded to fossil rodlers 179. Underclay, medium-gray, poorty bedded 170. Shale, medium-gray, bentonitic 171. Coal, impure, flat-bladed charred leaves, shale interbeds, fussin 172. Underclay, medium-gray, bentonitic 173. Coal, impure, shalt, flat-bladed charred leaves, shale interbeds, fussin 174. Underclay, medium-gray, bentonitic 175. Shale, dark-gray to dark-brown, carbonaceous, coal fragments 176. Underclay, light-gray, very fine grained, silty, porty bedded 177. Sandstone, light-gray, thin and evenly bedded 178. Shale, medium-gray, thin and evenly bedded 179. Coal, hippure, shalt, flat-pray heronomic 170. Coal, impure, shalt, flat-pray heronomic 170. Underclay, light-gray, very fine grained, silty, porty bedded 170. Coal, proper flat-bladed charred leaves, shale flat interbeds upon to medium dark gray 170. Underclay, light-gray, thin and evenly bedded 170. Shale, medium-gray, thin and evenly bedded 171. Coal, impure, shalt, flat-bladed charred leaves, shale flat interbeds upon to medium dark gray 172. Underclay, light-gray, bentonitic 173. Coal, impure, shalt, flat-bladed charred leaves, shale interbeds, fushin to thick-bedded, shill, shalp gray, very sile, porty flat gray, every fine grained, sile, pray shale proving the ded 171. Coal, impure, shalt, flat-bladed charred leaves, shale flat interbeds upon to medium dark gray 174. Underclay, light-gray, tery fine grained, sile, pray shale proving the ded 175. Shale, medium-gray, thin and evenly bedded 176. Underclay, light-gray, very fine grained, sile, pray shale proving the ded 177. Sandstone, medium-light-gray to light-gray thin bedded 178. Shale, medium-gray to light-gray thin bedded 179. Shale, medium-gray to light-gray thin bedded 180. Shale, medium-gray to l			27	0			4	0
tonitic, 6-in-thick coally carbonaceous shale at top———————————————————————————————————	167.				195.			
168. Sandstone, light-gray to white, very fine to fine-grained, silty, thin-bedded to posandy bedded, fossil rouders, gray bentonitic provisib-gray, thin-bedded to hardel leaves, shale interbeds, fusain to be fossil fleaves fossil norder, fusain the fossil norder, fusain the fossil norder, fusain the fossil norder, fusain the fossil leaves fossil lea		tonitic; 6-in-thick coaly carbonaceous	7	6		lenses, few pyritic nodular beds; upper	19	0
169. Underclay, medium-gray, poorly bedded, fossis rodets 1	168.	Sandstone, light-gray to white, very fine			196.	Shale, medium-gray, fine-grained sand-	.,	Ū
170. Shale, medium-dark-gray to light-brownish-gray, thin-bedded 171. Coal, impure, flat-bladed charred leaves, shale interbeds, fusain	169.	Underclay, medium-gray, poorly bedded,				bedded, silty, slightly bentonitic; 1-ft-		
171. Coal, impure, flat-bladed charred leaves, shale interbeds, fusain————————————————————————————————————	170.		1	6				
Shale interbeds, fusain	171	<u> </u>	1	0	107		18	0
173. Coal, impure, shaly, flat-bladed charred fossil leaves	1/1.			6	197.			
fossil leaves ————————————————————————————————————			1	1				
175. Shale, dark-gray to dark-brown, carbonaceous, coaly fragements 1	1/3.		1	0		•	32	0
naceous, coaly fragments			1	10	198.			
ded, top sandy————————————————————————————————————	175.			4		thick, slightly bentonitic	10	0
177. Sandstone, light-gray, very fine grained, silty	176.	Underclay, light-grayish-brown, nonbed-	1	0	199.	•		
Shale, medium-gray, thin and evenly bedded ded, basal 2 in very carbonaceous and coaly; upper 11 in medium dark gray 1 10 201. Shale, medium-light-gray, fine- to medium-grained, dark and light mineral grains, thick-bedded	177.	Sandstone, light-gray, very fine grained,				crossbedded, upper 21/2 ft very calcar-	2	6
ded; basal 2 in very carbonaceous and coaly; upper 11 in medium dark gray 1 10 179. Coal, bright 4 medium-gray in to medium-grained, dark and light mineral grains, thick-bedded	178.		1	6	200.		3	Ü
179. Coal, bright 180. Shale, light-grayish-brown, thin and evenly bedded 181. Sandstone, medium-light-gray to light-gray, very fine to fine-grained, thin-bedded 183. Sandstone, medium-light-gray, very fine grained, silty, pyrite nodules 184. Shale, medium-gray to light-grayish-brown, thin-bedded, fissile, very carbonaceous 185. Sandstone, medium-light-gray, very fine grained, silty, thin-bedded 186. Shale, medium-gray to light-grayish-brown, very carbonaceous, coal fragments 187. Sandstone, gight-gray to grades into sandy shale, scattered coal gragments, few thin silt and sand lenses 187. Sandstone, light-gray, very fine grained, silty, thin-bedded 188. Shale, medium-gray, slightly bentonitic, thin-bedded, poorly bedded 189. Sandstone, light-gray, very fine grained, silty, friable; upper 1 ft heavily iron stained, grades upward into siltstone 190. Shale, medium-gray, thin-bedded, bento 190. Shale, medium-gray, thin-bedded 190. Shale, medium-gray, thin-bedded 190. Shale, medium-gray, thin-bedded 190. Shale, medium-gray, thin-bedded 190. Shale, medium-gray, thin-			1	10	201		3	0
evenly bedded ————————————————————————————————	179.	Coal, bright	•		201.	medium-grained, dark and light mineral	_	_
181. Sandstone, medium-light-gray to light-gray, very fine to fine-grained, thin-bedded	180.	Shale, light-grayish-brown, thin and		8	202.		2	0
182. Shale, light-grayish-brown, thin-bedded, fissile, very carbonaceous	181.	Sandstone, medium-light-gray to light-				gray, thin and evenly bedded	2	6
fissile, very carbonaceous			2	0	203.			
183. Sandstone, medium-light-gray, very fine grained, silty, pyrite nodules	182.		1	6				
184. Shale, medium-gray to light-grayish-brown, thin-bedded, fissile, very carbonaceous, coal fragments	183.	Sandstone, medium-light-gray, very fine				ties, slumped bedding, pyrite nodules-		
brwn, thin-bedded, fissile, very carbonaceous, coal fragments	184.		1	3			7	U
185. Sandstone, medium-light-gray, very fine grained, silty, thin-bedded	10	brown, thin-bedded, fissile, very car-		0	2001	grained, dark and light mineral grains,		
186. Shale, medium-gray to light-grayish-brown, very carbonaceous, fissile, top grades into sandy shale, scattered coal fragments, few thin silt and sand lenses	185.		2	U			6	0
brown, very carbonaceous, fissile, top grades into sandy shale, scattered coal fragments, few thin silt and sand lenses	106	•	1	6	206.			
fragments, few thin silt and sand lenses	100.					thick	17	0
lenses		•			207.			
grained, silty, thin-bedded	105	lenses	6	0		crossbedded, massive, solution cavi-		
thin-bedded, poorly bedded	187.		2	6				
189. Sandstone, light-gray, very fine grained, silty, friable; upper 1 ft heavily iron stained, grades upward into siltstone 190. Shale, medium-gray, silty	188.		2	0	208	-	25	0
stained, grades upward into siltstone- 190. Shale, medium-gray, silty	189.	Sandstone, light-gray, very fine grained,	3	U		ded, becomes light-olive-gray upward-	7	0
190. Shale, medium-gray, silty			5	0	209.			
grained, heavily iron stained, thin- bedded		Shale, medium-gray, silty				bedded, massive, crossbedded, calcar-	11	^
bedded	191.				210.		11	U
	102	bedded	2	0		grades into siltstone	9	0
	192.		6	6	211.			

		Thick	ness			Thick	ness
		Ft	in			Ft	in
212	mineral grains, massive, few thin shale lenses up to 1 ft thick, pyrite nodules-	14	0		unit grades to a medium gray; dark and light mineral grains, few shale chips;		
	Shale, medium-gray, thin and evenly bed- ded	1	8		moved 500 ft to south along top of unit 233 and began measuring unit 234	11	0
213.	Sandstone, medium-light-gray, fine-grained, thin-bedded	2	6		Shale, medium-gray, thin and evenly bed- ded	6	0
214.	Shale, medium-gray, thin and evenly bed- ded	2	6	235.	Sandstone, very fine grained, silty, thin- bedded, lens-shaped	1	0
215.	Sandstone, basal 5 ft medium-light-gray, thin-bedded, shaly, silty, very fine			236.	Shale, medium-gray, 1 ft of silty pyrite nodules 5 ft above base; slightly carbo-		
	grained; 1-ft-thick calcareous ledge 7 ft above base; 3-ft-thick shale zone 10 ft above base; 1-ft-thick shale 3 ft below			237.	Sandstone, medium-gray to medium-light- gray, very fine grained, silty, thick-	12	0
	top; part of unit calcareous, crossbed-	21	4	220	bedded, lens-shaped, pyrite nodules	1	6
216.	ded, shale chipsShale, medium-gray, poorly bedded,	21	6		Shale, medium-gray, poorly bedded, silty in upper 1 ft	12	6
217	siltySandstone, medium-light-gray, very fine	8	0	239.	Sandstone, medium-light-gray, weathers brown, very fine to fine-grained, thin-		
	grained, silty	1	4		bedded	2	0
218.	Shale, medium-gray to light-olive-gray,	_			Shale, medium-gray, poorly bedded	2	6
210	poorly bedded	6	6	241.	Sandstone, medium-light-gray, weathers brown, fine- to medium-grained, thin-		
217.	grained, thin- to thick-bedded, iron-				bedded, few shale lenses up to 1 ft		
	stained, pyrite nodules; few shale				thick	15	0
	lenses up to 3 ft thick, medium-gray;				Shale, medium-gray, poorly bedded	6	0
	2-ft-thick medium-gray shale bed 17 ft			243.	Sandstone, medium-light-gray, very fine		
	above base, few siltstone interbeds; 2-ft-thick shale lens, medium-gray, 25				grained, silty, thin-bedded, few shale interbeds	5	0
	ft above base	35	0	244.	Shale, medium-gray, thin- to poorly bed-	J	Ů
220.	Shale, medium-gray, poorly bedded, con-				ded	7	0
	tains siltstone and sandstone interbeds	•		245.	Sandstone, medium-light-gray, medium-		
221	up to 1 ft thick	21	0		to fine-grained, thin-bedded, few shale interbeds	3	6
221.	Sandstone, medium-light-gray to light- gray, grades from fine- to medium-			246	Shale, medium-gray, thin- to poorly bed-	3	6
	grained upward, massive, thin-bedded,			2.0.	ded	6	6
	pyritic nodules	6	0	247.	Sandstone, very fine to fine-grained, thin-		
	Shale, light-olive-gray, poorly bedded	11	6	• 40	bedded, poorly exposed	2	0
223.	Sandstone, light-gray, very fine to fine-	-	0		Shale, medium-gray, poorly bedded	12	0
224	grained, thin- to thick-bedded Shale, light-olive-gray, thin-bedded	5 7	0 6	249.	Sandstone, medium-light-gray, fine- to medium-grained, dark and light min-		
	Sandstone, very fine grained, silty, thin-	,	Ü		eral grains, thick-bedded to massive,		
	bedded	2	6		pyrite nodules, friable, irregularly bed-		
	Shale, medium-gray to light-olive-gray	15	0		ded, crossbedded, upper half of unit		
227.	Sandstone, medium-light-gray, fine- to			250	becomes light gray	33	0
	medium-grained, thin- to thick- bedded, heavily iron stained	2	6	250.	Shale, medium-gray to medium-light- gray, silty, slightly bentonitic, poorly		
228.	Shale, medium-gray, poorly bedded	26	0		bedded	10	0
	Sandstone, light-gray, very fine to fine-			251.	Sandstone, very fine grained, silty, mas-		
	grained, dark and light mineral grains,				sive	2	0
	massive, crossbedded; 2-ft-thick shale				Shale, medium-gray, poorly bedded	4	0
	lens 15 ft above base; friable; few	26	0	253.	Siltstone, medium-gray, very fine grained	1	4
230	resistant calcareous beds, iron stained- Shale, medium-gray, poorly bedded	36 10	0 0	254	sandstone, iron-stained Shale, medium-gray, thin-bedded	1 8	6 6
	Sandstone, light-gray, fine- to medium-	10	Ü		Sandstone, light-gray, fine- to medium-	Ū	Ů
	grained, dark and light mineral grains,				grained, dark and light mineral grains,		
	thin-bedded to massive, shale chips at				thin- to thick-bedded, few siltstone		
	base, crossbeds, few granules, few thin			256	lenses, pyrite nodules	15	0
	shale lenses; 2-ft-thick pebbly zone 15	25	Λ	256.	Shale, medium-gray, thin-bedded, few		
232	ft above base Shale, medium-gray, poorly bedded	35 10	0		thin, silty sandstone lenses, up to 6 in thick, slightly bentonitic; 1-ft-thick		
	Sandstone, light-gray, very fine to fine-	10	J		carbonaceous bentonite 13 ft above		
	grained, massive, irregularly bedded,				base	16	0
	abundant fossil imprints, probably			257.	Sandstone, medium-light-gray to light-		
	maple and sycamore leaves; top part of				gray, weathers brown, very fine to		

		Thick	ness			Thick	ness
		Ft	in			Ft	in
	medium-grained, thin- to thick-bedded,			271.	Shale, light-olive-green, poorly bedded,		
	crossbedded, pyrite nodules, few silty		_		slightly bentonitic, 1 ft siltstone 9 ft		
250	shale lenses, fossil animal tracks	10	0		above base	20	0
258.	Shale, medium-gray, silty to sandy,			272.	Sandstone, medium-light-gray, very silty,	_	
	poorly bedded, becomes light-olive- gray upward	4	6	272	shale interbeds	2	0
	Total measured thickness of Lance		<u>6</u>	273.	Shale, medium-gray, thin and evenly bed-		
	Formation	2,272	_8		ded; 1-ft-thick silty sandstone lens 3 ft above base; 1-ft-thick medium-dark-		
Uncor	nformity		=		gray, very fine grained, slightly carbo-		
Paleocen	ne:				naceous sandstone 10 ft above base;		
	Jnion Formation, lower member:				3-ft-thick sandstone 17 ft above base;		
259.	Sandstone, medium-light-gray, mostly				upper 10 ft light olive gray	33	0
	fine- to medium-grained, dark and light			274.	Sandstone, light-gray, fine- to medium-		
	mineral grains, thin-bedded, crossbed-				grained, thin-bedded to massive cross-		
	ded, contains granule and pebble lenses 3 ft above base; shale chips, shale and				bedded; 1-ft-thick light-grayish-brown,		
	silt laminations, slump bedded, trian-				fissile, carbonaceous shale 1 ft above		
	gular crossbeds; 9-ft-thick shale lenses				base; 1 ft of light-grayish-brown, fissile shale 3 ft above base	23	0
	30 ft above base, medium gray, few			275.	Shale, medium-gray to light-grayish-	23	U
	calcareous lenses 50 ft above base; unit			2751	brown, very silty and sandy, interbeds;		
	is very massive 55 ft above base, scat-				thin bedded	13	0
	tered pebbles 3/8 inch in diameter, solu-			276.	Sandstone, light-gray, fine- to medium-		
	tion cavities. Unit supports heavy pine and juniper growth	00	0		grained, dark and light mineral grains,		
260	Sandstone, medium-light-gray, very fine	90	U		massive, very friable, solution cavities,		
200.	grained, silty, thin-bedded, very cal-				crossbedded, lower 2 ft of unit contains		
	careous upper 2 ft; basal zone friable -	4	0		calcareous concretions; few silty shale		
261.	Conglomerate, medium-light-gray,				lenses 13 ft above base; ½-in-diameter quartz pebbles, shale chips 15 ft above		
	medium- to coarse-grained, shale				base; 1-ft-thick conglomerate 53 ft		
	chips, rounded quartz pebbles up to 1				above base	63	0
262	inch in diameter	1	0	277.	Shale, light-olive-gray to medium-gray,		
262.	Sandstone, light-gray, fine- to medium-				thin and evenly bedded	14	6
	grained, dark and light mineral grains, few quartz granules, crossbedded; 6-			278.	Sandstone, medium-gray, very fine		
	in-thick conglomerate 21 ft above base;				grained, silty, thin-bedded, iron-	_	
	conglomerate with 1-in quartz pebbles			270	stained	2	0
	becomes more abundant 25 ft above			279.	Shale, medium-gray to medium-dark-	21	0
	base; high-angle crossbedding 50 ft			290	gray, thin and poorly bedded Conglomerate, rusty-brown-weathering,	21	U
	above base; 60 ft above base mostly			280.	rounded quartz pebbles and cobbles up		
	fine- to medium-grained, nonconglom-				to 3 inches in diameter; petrified wood,		
	eratic; bedding is very massive at 90 ft				chert, quartzite, shale chips, coarse-		
	above base, contains calcareous concretions 5 to 10 inches in diameter;				grained sandstone, interbeds and		
	upper part mostly thin bedded	116	0		lenses, thick bedded, massive, cross-		
263.	Shale, medium-gray to medium-dark-	110	Ū		bedded, upper 70 ft becomes more		
2001	gray, thin and evenly bedded, slightly				sandy with few scattered pebbles and		
	carbonaceous	10	0		medium-dark-gray shale lenses. Upper		
264.	Sandstone, medium-light-gray, very fine				part of unit supports heavy cedar growth	155	0
	to fine-grained, thin-bedded	7	0	281	Sandstone, medium-light-gray, very fine	133	U
265.	Shale, medium-gray to light-olive-gray,	10	0	201.	to fine-grained, thin- to thick-bedded,		
266	thin-bedded, sandySandstone, medium-light-green, fine- to	13	0		very calcareous, basal part silty	13	0
200.	medium-grained, thin-bedded	2	6	282.	Shale, light-olive-gray to medium-gray,		
267.	Shale, medium-dark-gray, thin-bedded,	2	U		thin- to poorly bedded; 1-ft-thick		
	very carbonaceous		6		grayish-red bed 10 ft above base	21	6
268.	Sandstone, light-gray, fine- to medium-			283.	Sandstone, medium-light-gray, very fine		
	grained, dark and light mineral grains;				to fine-grained, silty, thin- to thick-		_
	few pebbles in basal 3 ft and 7 ft above				bedded	10	0
200	base; shale chips; top very friable	36	0	284.	Conglomerate, medium-gray, pebbles and		
269.	Shale, medium-dark-gray to light-olive-				cobbles up to 4 inches in diameter, abundant petrified wood and agate;		
	gray, poorly bedded, slightly bento- nitic	22	6		weathers to gravel rubble. [Note: This		
270.	Sandstone, very fine grained, silty, thin-	44			could be an Indian Meadows forma-		
2.3.	bedded, heavily iron stained	1	6		tional overlap]	25	0
	•				• =		

285. Shale, light-olive-green to medium-gray, poorly bedded, becomes light-grayish-brown upward and bentonitic; upper 5 ft medium dark gray			Thick	ness			Thick	ness
bown upward and bentomlice, upper 5 fit medium dark gray were from the fine-grained, they granutes, thin-bedded, crossbedded; basal if non-tains pebbles up to it inch in diameter from the fine-grained, they bedded, from the first part of in light brownish gray, very carbonaccous and the first part of in light brownish gray, very carbonaccous and the first part of in light brownish gray, very carbonaccous and the first part of in light brownish gray, very carbonaccous and the first part of in light brownish gray, very carbonaccous and the first part of in light brownish gray, very carbonaccous and the first part of in light brownish gray, very carbonaccous and the first part of in light brownish gray, very carbonaccous and the first part of in light brownish gray, very carbonaccous and the first part of in light brownish gray, very carbonaccous and the first part of in light brownish gray, very carbonaccous and the first part of in light brownish gray, very carbonaccous and the first part of in light brownish gray, very first of in light brownish gray, very first of in light brownish gray, very carbonaccous and the first part of in light provise first part of in light brownish gray, very first of in light brownish gray, very first gray in and evently bedded, slightly gray in and evently bedded, slightly gray in the following gray in the first part of in light provise first part of in light gray in the first part of in light gray			Ft	in			Ft	in
strown upware and relemburs, upper 3 fine edium dark grays. 282. Sandstone, medium-light-gray, very fine to fine-grained, fine to thick-bedded, crossbedded; basal 1 ft contains pebbles up to 1 inch in diameter, least and light mineral grains, thin-bedded. 283. Sandstone, medium-light-gray, very fine to fine-grained, dark and light mineral grains, thin-bedded. 284. Sandstone, medium-light-gray, very fine to fine-grained, dark and light mineral grains, thin-bedded. 285. Shale, medium-gray, poorly bedded. 286. Sandstone, medium-light-gray, very fine to fine-grained, thin-to thick-bedded, upper 1 ft light-olive-gray, thin and evenly bedded, slightly bentonitic. 290. Sandstone, medium-gray to medium-dark-gray, thin and evenly bedded. 291. Shale, medium-gray, slight candon to fine-grained, dark and light mineral grains, thin-bedded, slity, upper 2 ft light-olive-gray, thin-dedded in grains, thin-bedded. 293. Shale, medium-gray, poorly bedded. 294. Sandstone, wery fine to fine-grained, dark and light mineral grains, thin-bedded, slity, upper 2 ft light-olive-gray, thin-dedded, few slita days long to fine-grained and stone bedding slightly disrupted 25 ft above base. 295. Shale, medium-gray, poorly bedded. 296. Sandstone, medium-light-gray, very fine grained, thin-bedded, few slita days long the dark gray bebles up to 1 inch in diameter, least shaped beds, crossbedded, grades upward to fine-grained sandstone; bedding slightly disrupted 25 ft above base. 296. Sandstone, medium-light-gray, very fine grained, slity, thin-bedded to massive, crossbedded upward to fine-grained sandstone; bedding slightly disrupted 25 ft above base. 297. Shale, medium-gray, poorly bedded. 298. Shale, medium-gray, poorly bedded. 299. Sandstone, medium-light-gray, very fine grained, slity, thin-bedded to massive, crossbedded upward to fine-grained sandstone; bedding slightly disrupted 25 ft above base. 299. Covered probably shale to make the probable support to fine-grained solution-gray to fine-grained slity, thin-bedded to mas	285.	poorly bedded, becomes light-grayish-			305.	to fine-grained, thick-bedded, calcare-	1	0
to fine-grained, few granules, thin-bedded, crossbedded, basal I it contains pebbles up to Vi inch in diameter-gray, thin and evenly bedded. 6-in pyrite nodules 5 it above base; 2-ft-thick sand lens 30 ft above base; 2-ft-thick sand lens 30 ft above base; 2-ft-thick sand lens 30 ft above base; 3-ft-thick sand lens 30 ft above base; 2-ft-thick sand 2	286	ft medium dark gray	53	0	306.	Shale, light-grayish-brown to medium- gray, thin- to poorly bedded, upper 3		
Salae, medium-gray to medium-darkgray, thin and evenly bedded, fine grained, thin-bedded, silphy bentonitic with the bedded with t	200.	to fine-grained, few granules, thin- bedded, crossbedded; basal 1 ft con-	42	0	307.	Sandstone, medium-light-gray, fine- grained, thin- to thick-bedded, few		_
20 ft above base; 3-ft-thick sand lens 30 ft above base, bentonitic; upper 6 in light brownish gray, very carbonaccous ————————————————————————————————————	287.	Shale, medium-gray to medium-dark- gray, thin and evenly bedded; 6-in pyrite nodules 5 ft above base; 2-ft-	43	U		Shale, medium-gray, silty, thin-bedded-Sandstone, medium-light-gray, very fine grained, thin-bedded, very calcareous;		0
bedded: 288. Sandstone, medium-light-gray, very fine to fine-grained, thin- to thick-bedded of the period, thin- to thick-bedded of the period, thin- to thick-bedded of the period, thin- to the period, thin- to thick-bedded of the period, thin- to the period, think-bedded of the period of the period, the period of the per		20 ft above base; 3-ft-thick sand lens 30 ft above base, bentonitic; upper 6 in			310.	below top	2	6
to fine-grained, thin- to thick-bedded 289. Shale, medium-gray to medium-dark-gray, thin and evenly bedded, slightly bentontitic series, which is a discovered probably shale shale supward to fine-grained sandstone; bedden slightly disrobed to fine-grained sandstone; bedden slightly disrobed shase supward to fine-grained sandstone; bedden slight disrobedded silty dispray, poorly bedded solve and slight mineral graines, thin-bedded solve and to fine-grained sandstone; bedding slightly disrupted 25 ft above base compared to fine-grained, slity, thin-bedded supward to fine-grained sandstone; bedding slightly disrupted 25 ft above base compared to fine-grained silty, thin-bedded supward to fine-grained sandstone; bedding slightly disrupted 25 ft above base count should be supported by the support of the	288	ceous	54	0	311.	Sandstone, medium-light-gray, very fine		0
gray, thin and evenly bedded, slightly bentonitic ———————————————————————————————————		to fine-grained, thin- to thick-bedded -	3	0	312.	Shale, medium-gray to light-grayish-	1	6
290. Sandstone, medium-light-gray, fine-grained, thick-bedded		gray, thin and evenly bedded, slightly	3	0	313.	ceous	4	6
291. Shale, medium-gray, silty ————————————————————————————————————	290.		1	6		shale	2	0
shake, medium-gray, poorly bedded		Shale, medium-gray, silty			315		1	6
293. Shale, medium-gray, poorly bedded	292.	thin-bedded; 1-in-thick coal lens 6 in above base; abundant coal laminations,				abundant coal fragments, fossil root- lets		3
294. Sandstone, very fine to fine-grained, dark and light mineral grains, thin-bedded, silty	293				310.	3-in-thick light-grayish-brown carbo-		
Salty, medium-gray, thin and poorly bedded; 6-in pyrite nodules 2 ft above base ————————————————————————————————————		Sandstone, very fine to fine-grained, dark and light mineral grains, thin-bedded,	·		317.	partly covered	17	0
base ————————————————————————————————————	295.	Shale, medium-gray, thin and poorly bed-	5	6		grained, silty, thin-bedded, lens- shaped beds	2	0
shale 4 ft above base, medium-gray - 16 0 297. Shale, medium-gray, poorly bedded, silty, upper 2 ft light-olive-green - 6 6 298. Conglomerate, medium-light-gray, pebbles up to 1 inch in diameter, lensshaped beds, crossbedded, grades upward to fine-grained sandstone; bedding slightly disrupted 25 ft above base - 33 0 Total measured thickness of lower member of Fort Union - 971 6 Fort Union Formation, Shotgun Member: 299. Covered, probably shale - 25 0 300. Shale, medium-dark-gray, thin-bedded, top part grades to light-olive-green - 10 0 301. Sandstone, medium-light-gray, very fine to fine-grained, silty, thin-bedded - 10 0 302. Shale, light-olive to medium-gray, poorly bedded, few silt and sand laminations 25 0 303. Sandstone, medium-light-gray, very fine grained, silty 8 304. Shale, light-olive-gray, upper 1 ft medium-dark-gray, thin and poorly 328. Shale, medium-gray to light-olive-gray, shale interbeds 5 0	296.	base	13	6		siltstone lenses	7	0
298. Conglomerate, medium-light-gray, pebbles up to 1 inch in diameter, lensshaped beds, crossbedded, grades upward to fine-grained sandstone; bedding slightly disrupted 25 ft above base		shale 4 ft above base, medium-gray	16	0	317.	thick-bedded, fossil roots in top por-	1	8
298. Conglomerate, medium-light-gray, pebbles up to 1 inch in diameter, lensshaped beds, crossbedded, grades upward to fine-grained sandstone; bedding slightly disrupted 25 ft above base	297.		6	6		Shale, medium-gray, poorly bedded		
shaped beds, crossbedded, grades upward to fine-grained sandstone; bedding slightly disrupted 25 ft above base	298.	Conglomerate, medium-light-gray, peb-				grained, silty, thin-bedded		
Total measured thickness of lower member of Fort Union		shaped beds, crossbedded, grades upward to fine-grained sandstone; bed-				Sandstone, medium-light-gray, very fine grained, dark and light mineral grains,	3	U
Fort Union Formation, Shotgun Member: 299. Covered, probably shale		Total measured thickness of lower				bedded, pyrite nodules, few medium-		
Fort Union Formation, Shotgun Member: 299. Covered, probably shale		member of Fort Union	971	_6			20	0
300. Shale, medium-dark-gray, thin-bedded, top part grades to light-olive-green 10 0 green, very fine to fine-grained, silty, thin-bedded 10 0 326. Shale, light-olive-green to medium-gray, bedded, few silt and sand laminations 303. Sandstone, medium-light-gray, very fine grained, silty 8 304. Shale, light-olive-gray, thin and poorly 328. Shale, medium-gray to light-olive-gray to light-olive-gray, or 10 0 326. Shale, light-olive-gray, very fine grained, silty beds, slightly bentonitic			25		324.	Shale, medium-gray, upper 5 ft light-		
to fine-grained, silty, thin-bedded 10 0 326. Shale, light-olive-green to medium-gray, 302. Shale, light-olive to medium-gray, poorly bedded, few silt and sand laminations 25 0 slightly bentonitic 55 0 303. Sandstone, medium-light-gray, very fine grained, silty 8 grained, silty, thin-bedded, contains 304. Shale, light-olive-gray, upper 1 ft medium-dark-gray, thin and poorly 328. Shale, medium-gray to light-olive-gray,	300.	Shale, medium-dark-gray, thin-bedded, top part grades to light-olive-green	10	0	325.	green, very fine to fine-grained, silty,		
bedded, few silt and sand laminations- 303. Sandstone, medium-light-gray, very fine grained, silty		to fine-grained, silty, thin-bedded	10	0	326.	Shale, light-olive-green to medium-gray,	3	O
grained, silty		bedded, few silt and sand laminations-	25	0	דרכ	slightly bentonitic	55	0
medium-dark-gray, thin and poorly 328. Shale, medium-gray to light-olive-gray,		grained, silty		8	321.	grained, silty, thin-bedded, contains	5	0
		medium-dark-gray, thin and poorly	11	0	328.	Shale, medium-gray to light-olive-gray,		

		Thickr	ess			Thickr	2291
		Ft				Ft	in
329.	Sandstone, medium-light-gray, very fine	rt	in	353.	Shale, medium-gray, nonbedded, silty;	• • • • • • • • • • • • • • • • • • • •	***
	grained, silty, thin-bedded	2	6		1-ft-1-in-thick layer of cone-in-cone		
330.	Shale, light-olive-green, poorly bedded	6	0		structure 5 ft above base	24	0
	Sandstone, medium-light-brown, weath-	U	U	354.	Sandstone, medium-light-gray, very fine		J
001.	ered brown, very fine grained, silty,				grained, silty, thin-bedded	7	0
	thin-bedded, calcareous	4	0	355.	Shale, upper 2 ft grayish-brown, thin-	•	Ü
332	Shale, medium-gray, silty, poorly bed-	•	U		bedded, very carbonaceous	7	0
332.	ded; 6-in-thick fine-grained sandstone			356.	Sandstone, very fine grained, silty, thin-	·	Ū
	bed 10 ft above base; 4-in-thick fine-				bedded	12	0
	grained, silty sandstone bed 21 ft above			357.	Shale, medium-gray, thin-bedded, silty,		
	base; 1-ft-thick fine-grained sandstone				upper 7 ft light olive gray, very silty,		
	bed 48 ft above base; upper 1 ft light				sandy	17	0
	grayish brown, thin bedded	60	0	358.	Sandstone, medium-light-gray, fine- to		
333.	Sandstone, medium-light-gray, very fine	00	Ü		medium-grained, dark and light min-		
	to fine-grained, thin-bedded	3	0		eral grains, thin- to thick-bedded,		
334.	Shale, medium-gray, poorly bedded	7	6		crossbedded, silty, becomes massive		
	Siltstone, very fine grained, very sandy,		•		upward, slightly calcareous	6	0
	grades sandy upward, few coal lamina-			359.	Shale, medium-dark-gray, bentonitic,		
	tions	10	0		becomes light-olive-gray in top 5 ft	12	6
336.	Sandstone, medium-light-gray, very fine		-	360.	Sandstone, medium-gray, very fine		
	grained, silty, thin-bedded	5	0		grained, dark and light mineral grains,		
337.	Shale, light-olive-gray, thin-bedded,			2.1	silty	1	0
	silty, contains 6-in-thick siltstone lam-			361.	Shale, light-olive-gray to medium-dark-	_	_
	inations 15 ft above base; 4-in-thick			262	gray	5	0
	sandstone lens 32 ft above base	45	0	362.	Sandstone, medium-light-gray, fine- to		
338.	Sandstone, medium-light-gray, very fine				medium-gray, very fine grained at top,		
	to fine-grained, thin-bedded	4	0		few granules at base, thin-bedded,		
339.	Shale, medium-gray to light-olive-gray,				crossbedded; upper 2 ft calcareous,		
	nonbedded, partly covered	30	0		thin bedded, contorted in central part of		
340.	Sandstone, medium-light-gray, very fine				syncline [Note: Location in center of		0
	to fine-grained, silty, few shale inter-			363	syncline]Shale, medium-dark-gray to light-olive-	6	0
	beds, crossbedded, slightly calcareous,			303.	gray at top	12	0
	upper 5 ft light-gray	13	0	364	Sandstone, medium-light-gray, very fine	12	U
341.	Shale, medium-gray to light-olive-green,			504.	to fine-grained, thin-bedded, crossbed-		
	slightly bentonitic, nonbedded	22	0		ded, lens-shaped beds	3	0
342.	Sandstone, light-gray, very fine to fine-			365.	Shale, light-olive-gray, poorly bedded	17	Ö
	grained, thick-bedded to massive, fria-				Sandstone, medium-gray, very fine		Ū
2.42	ble	6	0		grained, very silty, thin-bedded	2	6
343.	Shale, light-olive-gray, bentonitic, poorly			367.	Shale, light-olive-gray, silty, poorly bed-		
	bedded; 2-ft-thick sandstone bed 7 ft	• •	_		ded	19	0
244	below top	30	0	368.	Siltstone, iron-stained, poorly bedded	1	0
344.	Sandstone, medium-light-gray, very fine	_	_	369.	Shale, light-olive-gray, slightly bento-		
2.15	grained, silty, thin-bedded	5	0		nitic, poorly bedded	10+	
	Shale, light-olive-gray, nonbedded	5	0	Alluvi	ial Cover		
346.	Sandstone, medium-gray to light-olive-	•			Total measured thickness of Shotgun		
247	gray, very fine-grained, silty	2	0		Member of Fort Union Formation	862	_5
347.	Shale, light-olive-green, silty, poorly	2=			Total measured thickness of Fort		_
2/10	bedded	37	0		Union Formation 1	,833	11
340.	Sandstone, medium-light-gray, very fine				=		==
	grained, silty, crossbedded, thin-						
	bedded, slump-bedded in basal 5 ft, calcareous	10	0				
340	Shale, light-olive-gray, poorly bedded	10 33	0				
		33	U				
550.	Sandstone, medium-light-gray, very fine						
	to fine-grained, thin-bedded, crossbed- ded	4	Λ				
351	Shale, light-olive-green, grades medium-	4	0				
551.	gray, poorly bedded; 5-ft-thick bento-			Measur	ed section 4: Meeteetse Formation (Pa	rt)	
	nitic zone 10 ft above base; 1-ft-thick				Eagle Point Quadrangle, Wyoming (7.5 min)		
	siltstone 27 ft above base	37	0		-NW-NW sec. 20, T. 6 N., R. 1 E. Presented	from old	lest to
352.	Sandstone, medium-light-gray, very fine	51	U	younge			
	grained, silty, thin-bedded, crossbed-				NE-NW sec. 20, T. 6 N., R. 1 E. by: J.F. Windolph, Jr.		
	ded	12	0		oy, J.P. windolph, Jr. 1°, Dip 23° NE.		
		-			· · · · •		

per C	Cretaceous:	Thick	ness			Thick	ness
Meet	eetse Formation (partial section):	Ft.	ln.			Ft	ir
1.	Sandstone, medium-light-gray, very fine to fine-grained, massive, abundant car-			25.	Shale, medium-gray, poorly bedded, carbonaceous		10
	bonaceous material, calcareous concretions up to 8 ft in diameter; pyrite			26.	Siltstone, medium-gray, thin and evenly bedded, very calcareous	1	4
	nodules; basal portion covered by alluvium; top grades into unit 2	17	6	27.	Sandstone, medium-light-gray, very fine grained, silty, thin-bedded	3	C
2.	Siltstone, medium-light-gray, very fine grained, thin-bedded, very sandy	4	0	28.	Shale, medium-gray to medium-dark-gray, carbonaceous, upper 6 in		
3.	Shale, medium-gray, thin and evenly bed- ded, silty, sandy, pyrite nodules		0	29.	medium-grayShale, medium-gray, very silty, unevenly	2	8
4.	Sandstone, medium-light-gray, very fine	2		30.	beddedSandstone, medium-light-gray, very fine	2	6
5.	grained, silty Shale, medium-dark-gray, very fine grained, very sandy, slightly carbona-	2	6	31.	grained, silty, thin-bedded Shale, medium-gray, thin- to poorly bed- ded	4	(
6.	ceousSandstone, medium-light-gray; basal 2 ft		9	32.	Underclay, medium-gray, nonbedded, fossil rootlets	2	ė
0.	very fine-grained, silty; upper part fine to medium grained; few shale chips,				Coal, impure, bony, shalyCoal, bright to dull, resin blebs, few bony	2	
	massive, few pyrite nodules, few calcite-rich nodules up to 4 ft in diam-	0		25	streaks, cleats 70° at vertical, and 155° at 65° SW		10
	Shale, medium-gray, poorly bedded	8	0 0	33.	Sandstone, medium-gray, very fine grained, silty, thin-bedded, basal 4 in		
8.	Sandstone, medium-light-gray, very fine grained, silty, thin-bedded, few fossil			36	medium-gray, carbonaceous shale lam- inations	1	10
0	roots, few pyrite nodules, pebbles at base	2	0	30.	upper 1 ft light-brownish-gray, very	3	
	Shale, medium-gray, poorly beddedSandstone, medium-light-gray, very fine	1	2	37.	carbonaceous, fossil rootlets Coal, bright resin blebs, fine- to medium-	3	
11.	grained, silty	1	6		cleats, upper 6 in slightly bony, gypsum crystals (Woodruff and Winchester, 1912, pl. L, no. 61)	3	
12.	dedSandstone, medium-light-gray, very fine	1	6		Bone, shaly	3 1	
	grained, silty, thin- to thick-bedded, few fossil roots	1	3	37.	grained, massive, silty, friable, basal 9 in medium-gray shale, two thin calcar-		
	Shale, medium-gray, thin and evenly bed- ded		5	40.	eous bedsBentonite, medium-gray to medium-dark-	13	
14.	Sandstone, medium-gray, very fine grained, thin-bedded, silty, shaly	2	0		gray, nonbedded, a few gypsum crystals, 1-ft-thick carbonaceous zones	13	1
	Underclay, medium-gray, nonbedded Shale, medium-dark-gray, carbonaceous,	2	9	41.	Sandstone, medium-light-gray, very fine grained, very calcareous, thin- to thick-	10	•
17.	fossil plant fragments Shale, medium-gray, thin and evenly bed-		2	42	bedded, lens-shaped	2	
	ded, few scattered calcareous siltstone interbeds	2	0		ded, silty		
18.	Sandstone, medium-light-gray, very fine to fine-grained, basal 2 ft friable; thin-				grained, silty Bentonite, medium- to medium-dark-	2	
	bedded with ripples; upper 3 ft very calcareous; base gradational into unit				gray, soft	2	
19.	17Sandstone, medium-light-gray, very fine	5	0		grained, sandstone Bentonite, medium-dark-gray, very fine	1	
	grained, massive, silty, friable Shale, medium-gray, thin and evenly bed-	3	0		grained, gypsum crystals Shale, light-grayish-brown, very carbo-		
	dedSandstone, medium-light-gray, very fine	1	6		naceous, contains bentonite particles	2	
	grained, silty, thin-bedded	2	6		Underclay, medium-gray, fossil roots Sandstone, medium-light-gray, very fine	1	
	and thin-bedded, upper part poorly bedded	9	6	50.	grained, silty, thin-bedded Shale, light-grayish-brown, very carbo- naceous, thin and evenly bedded, few	1	
23.	Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded, very cal-		~	51	fossil roots and plant fragments Coal, bright, resin blebs, slightly bony	1	
24	careous, crossbedded	3	0		Underclay, medium-gray, abundant fossil roots, few silty to sandy lenses, slightly		
~ ₹.	grained, silty, massive	3	0		carbonaceous in upper 2 in	4	

		Thick	ness		Thick	ness
		Ft	in		Ft	in
53.	Sandstone, medium-light-gray, fine- to medium-grained, crossbedded, thin-			84. Shale, medium-dark-gray to dark-gray, very carbonaceous, few fossil root and		
	bedded, calcareous concretions up to 2			plant fragments		9
	ft in diameter, basal 2 ft very silty with	_	_	Base of Welton coal bed		
	pyrite nodules	7	6	85. Coal weathered, bright to dull, fusain,		
	Underclay, medium-gray, fossil rootlets -	5	0	few scattered bony layers, partially		
55.	Shale, light-grayish-brown to medium-			covered (Woodruff and Winchester,		_
	dark-gray, thin-bedded		10	1912, pl. L, no. 66)	11	6
56.	Shale, medium-gray to medium-dark-			86. Bone, shaly, bright		4
	gray, poorly bedded, few siltstone			87. Coal, bright		8
	lenses up to 2 in thick	2	0	88. Underclay, medium-gray, shaly, silty,		_
57.	Shale, light-grayish-brown to medium-			abundant fossil rootlets		5
	dark-gray, carbonaceous, thin- to			89. Coal, bright to dull fusain, medium		
	poorly bedded, silty	1	2	cleats, 170° at 67° SW., and 80° at		_
58.	Shale, medium-gray to light-olive-gray	1	6	vertical	1	7
59.	Sandstone, medium-light-gray, very fine			Top of Welton coal bed		
	grained, silty, very thin bedded, fossil			90. Siltstone, medium-gray to light-grayish-		
	roots in upper 8 in	4	4	brown, very carbonaceous, fossil plant		_
60.	Underclay, medium-gray, fossil rootlets -		2	and coal fragments	1	2
	Coal, bright, gypsum crystals, resin			91. Shale, medium-gray, basal 4 in medium-		
01.	blebs	1	0	dark-gray, carbonaceous, thin and		
62.	Coal, impure, bony, upper 4 in detrital,	•	Ü	evenly bedded; upper 1 ft silty	5	2
٠	gypsum crystals, resin blebs		11	92. Sandstone, medium-light-gray, very fine		
63	Sandstone, medium-light-gray, very fine		11	grained, thin- to thick-bedded, cross-		
05.	to fine-grained, thin- to thick-bedded,			bedded, few scattered shale lenses; thin		
	crossbedded, very calcareous	12	0	calcareous zones; upper 3 ft very cal-		
61				careous	12	6
	Underclay, medium-gray, fossil roots	3	0	93. Shale, medium-gray, poorly bedded	6	0
	Coal, bright attritus		1	94. Sandstone, medium-light-gray, very fine		
66.	Shale, medium-gray to medium-dark-			grained, thin-bedded, silty, very cal-		
	gray, thin and evenly bedded, very		_	careous; basal 4 in very silty, calcare-		
	carbonaceous, fossil plant fragments		6	ous	2	_0
67.	Shale, medium-gray, thin and evenly bed-			Total measured thickness of partial		
	ded		3	Meeteetse section	287	_2
68.	Sandstone, medium-light-gray, very fine to fine- to medium-grained, massive	12	6			_
69.	Underclay, medium-gray, fossil rootlets,					
	upper 2 in very carbonaceous, light-					
	grayish-brown	1	3			
70.	Coal, bright, resin blebs	-	10			
	Bone		5			
	Shale, medium-gray, poorly bedded					
			8	Measured section 5: Cody Shale and Mesaver	rde	
13.	Sandstone, medium-light-gray, very fine			Formation	.ac	
	to fine- to medium-grained, massive,					
	solution cavities, calcareous concre-	12	0	Location: Maverick Spring Quadrangle, Wyoming (7.5 m: Start: NW-SE-SE sec. 7, T. 5 N., R. 1 W. Presented		dest to
74	tions up to 10 ft in diameter	12	0	youngest	110111 01	uesi io
	Underclay, medium-gray, rootlets	1	6	End: SE-NE-NW sec. 18, T. 5 N., R. 2 W.		
	Coal, impure, shaly		5	Described by: N.L. Hickling		
	Shale, medium-gray, poorly bedded	1	0	Strike 135°, Dip 85° NE.		
//.	Sandstone, medium-light-gray, very fine-	•	•			
70	grained, thin-bedded, silty, shaly	2	8	Upper Cretaceous:	Thickr	ness
78.	Shale, medium-gray, poorly bedded, 6-	_	•	Cody Shale:	Ft	In
	in-thick siltstone layer 5 ft above base-	7	0	1. Shale, medium-dark-gray, thin and		
79.	Sandstone, medium-light-gray, very fine			evenly bedded, contains interbeds of		
	to fine-grained, thin-bedded, very cal-		_	very thin bedded sandstone, light- to		
	careous	1	6	medium-gray, very fine grained, scat-		
80.	Shale, medium-gray, thin and evenly bed-			tered, dark and light mineral grains,		
	ded, silty	2	0	abundant mica flakes, very calcareous;		
	Underclay, medium-gray, fossil roots	2	6	sandstone interbeds are parallel bed-		
82.	Shale, medium-dark-gray to dark-gray,			ded, convoluted, and contain low-		_
	very carbonaceous, fossil plant frag-			angle crossbeds	181	_0
	ments	2	2	Total measured thickness of Cody	40:	^
83.	Shale, medium-gray, poorly bedded	1	4	Shale	181	_0_
				·		

		Thickn	ess			Thick	kness
Iesav	verde Formation:	Ft	in			Ft	in
2.	Sandstone, mostly light-gray, very fine to fine-grained, scattered iron-stained,			19.	Shale, medium-gray, thin and evenly bedded, silty	5	6
	solution cavities, very calcareous, thick-bedded to massive; sandstone in			20.	Underclay, highly weathered, fossil plant fragments	1	2
	basal 1 ft, light- to dark-gray, fine- grained, sparsely crossbedded, mas-			21.	Coal, finely cleated, mostly bright, few impure laminations, cleats, 35° at 85°		
	sive, fossil shells in lower half of unit, few scattered pyrite nodules and shale			22.	NW., and 140° at 80° NESandstone, light-medium-gray, fine-	1	0
	fragments. Contact with underlying Cody Shale is sharp	175	0		grained Coal, highly weathered		5 2
3.	Sandstone, medium-gray, fine-grained, thin to thick and irregularly bedded,	175	Ü		Coal, impure, few bright laminations Shale, medium-gray, thin and evenly bed- ded		1 11
	iron-rich calcareous resistant ledges about 1 ft thick at base and top	44	0	26.	Sandstone and limestone: Sandstone—medium-light-gray, very fine grained,		
	Shale, medium-gray, thin and evenly bed- ded	11	0		thin- to thick-bedded, silty, iron- stained, resistant, calcareous; lime-		
5.	Sandstone, medium-gray, very fine grained, thin-bedded, nonresistant,	6	0		stone—medium-gray, silty in basal 2 ft	4	8
	silty, iron-stainedse of Maverick Spring coal zone	6	0	27.	Shale, medium-gray, thin and evenly bedded, upper 2 in grades to carbonaceous		
υ.	Shale and coal: Shale—medium-gray, thin and evenly bedded, carbonaceous;	17	0		shaleCoal, impure	3	1 2
7.	coal—1-in-thick, bright	17	6	30.	Shale, light-medium-gray, carbonaceous-Coal, impure		1 1
8.	Shale and coal: Shale—medium-gray, thin and evenly bedded, upper 1 ft	17	U		Shale, medium-gray, thin and evenly bed- ded		8
	carbonaceous; coal — 1-ft-3-in-thick, bright	5	0		Underclay, carbonaceous, highly weathered	1	2
9.	Sandstone, medium-gray, fine-grained, nonresistant	3	6	33.	irregularly bedded, very carbonaceous, 1-in-thick impure coal lens at top	1	4
10.	Shale and coal: Shale—thin and evenly bedded, sandy in top 6 in; coal—8-				Underclay, highly weathered Coal, few scattered impure laminations	•	6
11.	in-thick, brightSandstone, light- to medium-gray, nonre-	3	6		Coal, bright, scattered resin blebs, finely cleated		4
	sistant	2 3	0	37.	Shale, medium-gray, thin and evenly bed- ded, upper half of unit interbedded		
13.	Shale, tonstein, and coal: Shale—carbonaceous, medium-brownish-gray, thin and evenly bedded; coal—2-ft-9-in-			38.	shale and siltstone	11	•
	thick, bright; tonstein—1½-in-thick, 5 in below top of coal	7	0	39.	resistant, very calcareous in upper 8 in- Shale and limestone: Shale—medium-	3	(
-	of Maverick Spring coal zone Sandstone, medium-gray, fine-grained,				gray, thin and evenly bedded; lime- stone—medium-gray, silty in basal 2		
15	iron-stained, thin and irregularly bed- ded, very calcareous	59	0	40.	ft	3	•
15.	thin and evenly bedded, sandy in basal 2 ft; coal—(3 beds) 4-in-thick, 6 ft			41.	rootletsCoal, bright, slightly impure	1	(
	above base; 10-in-thick, 13 ft above base; and 2-in-thick at top of unit;	22			Coal, mostly bright, finely cleated, few impure laminations		
16.	bright	22	6		Shale, medium-gray, carbonaceous in upper 1 inCoal, bright, few impure laminations		
	very calcareous, resistant, top 3 ft thin and irregularly bedded, remainder of		_	45.	Shale, medium-gray, thin and evenly bed- ded		
17.	unit highly weathered, nonresistant Shale, medium-gray, thin and evenly bed-	17	6	46.	Sandstone, medium-light-gray, very fine- grained, silty, thin to thick and irregu-		
18.	ded, very carbonaceous in upper 1½ ft-Sandstone, light-gray, very fine grained, silty, thin to thick and irregularly bed-	13	0 .		larly bedded, resistant, iron-stained, scattered pyrite nodules up to ¼ inch in diameter, calcareous	5	·
	ded, iron-stained, resistant, very cal-			477	Shale, medium-gray, thin and evenly bed-	-	

		Thickr	ness			Thick	ness
		Ft	in			Ft	in
48.	Sandstone, light-gray, fine-grained, scat- tered light and dark mineral grains,				sive, solution cavities, scattered pyrite nodules	5	6
	crossbedded, scattered pyrite nodules	-	10	69.	Shale, medium-gray, thin and irregularly bedded	4	10
49.	up to ¼ inch in diameter Shale, medium-brownish-gray, carbon-	5	10	70.	Siltstone, medium-gray, thick and irregularly bedded, very calcareous	3	0
50.	Shale, medium-gray, thin and evenly bed- ded, lower 2 in thin-bedded siltstone,		4	71.	Shale, medium-gray, thin and evenly bedded, thin siltstone laminations, carbonaceous in top 5 in	3	2
51.	laminated, calcareous	9	8	72.	Sandstone, medium-light-gray, fine- grained, iron-stained, resistant, cross- bedded, scattered pyrite nodules; top	3	-
52.	nodulesShale, medium-gray, thin and evenly bed-	7	6		50 ft calcareous, resistant interbeds of sandstone, calcareous, iron-stained		
53.	ded	6	4	73.	Sandstone, fine-grained, iron-stained, resistant, calcareous, thick and irregularly bedded	138 36	0
54.	calcareousShale, medium-gray, thin and evenly bed-	1	1		Shale, medium-gray, sandyShale, medium-brownish-gray, carbona-	8	2
55.	ded, top 10 in carbonaceous Sandstone, medium-light-gray, fine- grained, dark and light mineral grains,	3	0		ceous, fossil plant material Coal, impure Shale, medium-brownish-gray, carbona-	1	4 2
	thin to thick and irregularly bedded, locally iron-stained, scattered pyrite nodules	13	6	78.	ceous Coal, fine cleats, impure Shale, medium-brownish-gray, carbona-		3 7
56.	Shale and coal: Shale—medium-gray, thin and evenly bedded, silty, few silt-	13	Ü		ceousShale, medium-gray, sandy, thin and	26	2
57	stone laminations; coal -2 ft ½ in, bright, 2 ft below top	31	0	81.	irregularly bedded	26 6	10 0
	thin- to thick-bedded, resistant, scat- tered pyrite nodules	19	8	82.	Shale, medium-gray, thin and irregularly to regularly bedded, few siltstone lam-		
58.	Sandstone, light- to medium-gray, fine- to medium-grained, thin to thick and irregularly bedded, crossbedded, resis-			83.	inations	33	0
59.	tant, iron-stained, calcareousShale, medium-gray, thin and evenly bed-	33	8	84.	calcareousShale, thin and irregularly bedded,	14	0
60.	ded	7	0	85.	sandy, few sandstone laminations Sandstone, medium-gray, fine-grained, iron-stained, few resistant ledges in	43	6
61.	solution cavities, resistantShale, medium-gray, thin and evenly bed-	15	8	86.	middle part of unit, very calcareous Shale, medium-gray, sandy, thin and	33	0
62.	Sandstone, light- to medium-gray, fine- grained, thin- to thick-bedded, resist-	3	0	87.	irregularly bedded Sandstone, medium-gray, fine-grained, very calcareous, crossbedded, resistant	38	0
63.	ant	1	4		in middle part of unit, solution cavities- Shale, gray, thin and evenly bedded	69 2	0 10
64.	gray, thin and evenly bedded; limestone—medium-gray, 2-ft-thick Siltstone, light-gray, thin and irregularly	5	0		Shale, thin and irregularly bedded, few thin carbonaceous laminationsSiltstone, medium-gray, sandy, thin and	18	8
	bedded, resistant, noncalcareous Shale, medium-gray, thin and evenly bed-	1	0		irregularly bedded, nonresistant, few calcareous resistant laminations	28	8
66.	ded Underclay, medium-brownish-gray, much	3	10		Shale, thin-bedded, sandy, carbonaceous in basal 1½ ft	10	6
Unr	organic matter named coal bed		4		Sandstone, medium-gray, fine-grained, iron-stained, calcareous	1	6
67.	Coal, bony, bright laminations 30 percent, impure, dull, 70 percent; not	-	,		Shale, gray, thin and evenly bedded Sandstone, very fine to fine-grained, iron- stained, calcareous, thin- to thick-	4	2
-	resource quality of unnamed coal bed	2	6	95.	bedded, solution cavitiesShale, medium-gray, fine-grained, very	50	4
68.	Sandstone, light-gray, very fine grained, gray mineral grains, crossbedded, mas-				sandy, scattered calcareous siltstone and sandstone laminations	50	0

		Thick	ness			Thick	ness
		Ft	in			Ft	in
96.	Sandstone, fine-grained, fossil plant material, solution cavities, iron-			120.	Sandstone, light-medium-gray, fine- grained, light and dark mineral grains, thin- to thick-bedded, slightly resistant-	8	0
97.	stained; calcareous, resistant ledges Shale, medium-gray, thin-bedded, silty,	9	2	121.	Shale, medium-gray, thin and irregularly bedded	9	5
00	thin carbonaceous laminations	13	4	122.	Siltstone, very calcareous, resistant, iron-		
	Sandstone, deeply weathered, silty	15	10		stained	7	21/2
99.	Shale, medium-gray, thin and irregularly		_		Shale, medium-gray, thin-bedded	2	6
100.	bedded	4	2	124.	Sandstone, light-medium-gray, fine- grained, thin irregularly bedded, solu- tion cavities	2	5
101.	and irregularly bedded to massive Shale, thin and evenly bedded, silty lam-	20	10	125.	Underclay, fossil roots, upper 5 in includes carbonaceous fragments	1	31/2
	inations, carbonaceous zone 1½ ft			126.	Shale, medium-gray, thin and evenly bed-		
400	thick at base of unit	12	10		ded		3
102.	Siltstone, medium-gray, deeply weathered, thin and resistant beds	9	6	127.	Shale, thin and evenly bedded, carbonaceous in lower 1 ft 3 in	1	7
103.	Shale, thin and evenly bedded, carbona-	•	_	128.	Sandstone, light-medium-gray, light and		
104.	ceousSandstone, lower 7 ft resistant, light-gray,	3	0		dark mineral grains, thin to thick and		
	fine- to medium-grained, thin and				irregularly bedded, solution cavities, few ledges of calcareous siltstone	17	0
	irregularly bedded; remainder deeply			129.	Shale, medium-gray, thin-bedded	6	5
	eroded, silty, nonresistant, mostly cov-				Sandstone, medium-gray, iron-stained,		-
40.	ered	27	6		pyrite grains, dark mineral grains, very		
105.	Shale, medium-gray, thin and evenly bed-	2	4		calcareous in bottom third of unit, thin		
106	dedSandstone, medium-gray, fine-grained,	2	4		to thick and irregularly bedded in upper		•
100.	silty, very calcareous, middle part of			121	14 ft, slightly resistant	21 8	0 2½
	unit iron-stained, resistant, thin- to				Shale, medium-gray, thin-bedded	0	242
	thick-bedded, largely covered, nonre-			132.	Sandstone, medium-gray, fine-grained, iron-stained, scattered pyrite nodules,		
	sistant	74	8		thin and irregularly bedded, calcare-		
107.	Shale, medium-gray, thin and evenly bed-	0	4		ous, resistant	4	0
108	dedSandstone, fine-grained, iron-stained,	9	4	133.	Shale, medium-gray, silty, siltstone lam-		
100.	resistant, solution cavities	2	10		inations and lenses	4	11
109.	Shale, medium-gray, thin and evenly bed-	_		134.	Siltstone, medium-gray, sandy, very cal-		
	ded	6	6		careous, iron-stained, thin-bedded, resistant	3	6
110.	Sandstone, light- to medium-gray, fine-			135	Shale, medium-gray, thin and evenly bed-	J	Ū
	grained, silty, solution cavities, resist-	16	2	100.	ded	3	7
111	ant, very calcareousShale, medium-gray, thin and irregularly	16	2	136.	Siltstone, gray, thick and irregularly bed-		
	bedded	11	2		ded, sandy	9	0
112.	Sandstone, light- to medium-gray, fine-			137.	Sandstone, medium-gray, very fine to		
	grained, thin to thick and irregularly				fine-grained, calcareous, iron-stained, solution cavities, massive-bedded	2	5
112	bedded, crossbedded, resistant	10	11	138.	Shale, medium-gray, thin-bedded, silty	12	21/2
	Shale, medium-gray, irregularly bedded - Sandstone, light- to medium-gray, fine- to	3	8		Sandstone, light-medium-gray, fine-		
117.	medium-grained, thick-bedded to mas-				grained, fossil plant fragments, mas-		
	sive, scattered pyrite nodules, solution				sive to thick-bedded, solution cavities,	_	
	cavities, crossbedded	23	10		calcareous, resistant ledges	8	11
	Shale, medium-gray, thin-bedded	9	0	140.	Shale, medium-gray, thin-bedded, few		
116.	Sandstone, light- to medium-gray, thick-				siltstone laminations, slightly carbo-	25	91/2
	bedded to massive, very fine to fine- grained, scattered pyrite nodules, very			141.	Sandstone, fine-grained, light and dark		,
	calcareous, three resistant ledges 1½ ft				mineral grains, thin to thick and irreg-		
	thick above nonresistant parts of unit,				ularly bedded, calcareous-rich resistant		
	solution cavities	49	6		ledges	13	11
117.	Shale, medium-gray, thin and evenly bed-	,	4	142.	Shale, medium-gray, thin and evenly bed-		
110	dedSandstone, very fine to fine-grained, thin-	6	4		ded, carbonaceous zone, siltstone lam- inations 1 ft above base	16	21/2
110.	to thick-bedded, calcareous, three			143.	Siltstone, medium-gray, thin and irregu-		· -
	resistant calcareous ledges above thin-			2.01	larly bedded, very calcareous	4	7
	bedded, noncalcareous part of unit	70	0	144.	Shale, medium-gray, thin and evenly bed-	_	_
119.	Shale, medium-gray, thin-bedded	16	6		ded	2	5

		Thickn	ness			Thickr	ness
		Ft	in			Ft	in
145.	Sandstone, medium-gray, very fine grained, very calcareous, thin-bedded-	4	11	5.	Shale, medium-brownish-gray, carbonaceous, thin and evenly bedded, olive-		
146.	Shale, medium-gray to light-greenish-			4	gray in bottom 7 in	2	0
147.	gray, silty, thin-bedded	4	5	0.	Siltstone, dark-gray, thin and irregularly bedded, non-calcareous in lower half	1	7
148.	and irregularly beddedShale, medium-gray to grayish-red, thin	3	0	7.	of unit, upper half light gray Shale, medium-dark-gray in bottom third,	1	7
149.	and evenly bedded	3	5		medium-brownish-gray in middle third, medium-gray in upper third, thin and evenly bedded	2	0
150	thin and irregularly bedded, some calcareous-rich resistant ledgesShale, medium-gray, thin and evenly bed-	23	7	8.	Sandstone, light-gray, massive, medium- to dark-gray streaks of heavy minerals,	2	Ü
	ded	9	0		thick-bedded, crossbedded, scattered pyrite nodules, iron-stained	32	0
	medium-grained, dark and light min- eral grains, very calcareous, scattered			9.	Shale, medium-gray, thin and evenly bed- ded, few sandstone lenses	2	0
	pyrite nodules, thin to thick and irregularly bedded	13	_0	10.	Sandstone, light-gray, medium- to coarse- grained, heavy mineral grains, includes		
	Total measured thickness of main body of Mesaverde Formation	1,955	<u></u>	1.1	two shale lenses, medium-gray, thin and evenly bedded, 2-ft-thick	45	0
	sandstone member:			11.	Sandstone, very light gray, light and dark mineral grains, thin to thick and irreg- ularly bedded, scattered pyrite nodules,		
	Sandstone, light-gray, medium-grained, light and dark mineral grains, thin and			12	slightly iron stained	39	0
153.	irregularly bedded, calcareousSandstone, light-gray, massive, fine- to	24	5		grained, light and dark mineral grains, solution cavities, thick-bedded to mas-		
	medium-grained, very clean, well- sorted light and dark mineral grains,				sive, crossbedded Total measured thickness of white	169	_0_
	scattered pyrite nodules, solution cavi-	330	_0	T 1'	sandstone member	349	91/2
	Total measured thickness of white		_		n Meadows Formation:		
	sandstone member	354	<u>5</u>		nformably overlies Mesaverde Conglomerate, medium-coarse-grained		
	Total measured thickness of			13.	sandstone, light and dark mineral		
	Mesa verde Formation	2,309	<u>6</u>		grains, brown ferruginous cement.		
					Interbeds of very coarse detrital mate-		
					rial and coarse brown sandstone. Upper		
					30 ft includes cobbles, and pebbles ½		
					to 3 inches in diameter	46	0
					Total measured thickness of Indian		_
Measur	ed section 6: Mesaverde Formation	and I	ndian		Meadows Formation	46	_0
Meadov	vs Formation			End o	of section		
Start: SW	Maverick Spring, Wyoming (7.5 min) -SW-NW sec. 18, T. 5 N., R. 2 W. Presented	from ol	ldest to				
	SE-NW sec. 18, T. 5 N., R. 2 W. by: N.L. Hickling						
	o°, Dip 40° NE.			Measu	red section 7: Mesaverde Formation		
Unner C	retaceous:	Thickr	3000		: Maverick Spring Quadrangle, Wyoming (7.5 mi	in)	
* *	sandstone member of Mesaverde Forma-	Ft	In		-SW-NW sec. 19, T. 5 N., R. 1 W. Presented		dest to
tion				young			
	Sandstone, light-gray, medium- to coarse- grained, dark and light mineral grains, scattered pyrite nodules, thick-bedded			Described	/-NE-NE sec. 19, T. 5 N., R. 1 W. d by: J.F. Windolph, Jr. 0°, Dip 30° NE.		
	to massive	50	0	Upper C	Cretaceous:	Thickn	ness
2.	Shale, medium-gray, thin and evenly bed-				verde Formation:	Ft	In
3	Shale corbonogous thin and imagularly	6	21/2	1.	Sandstone, medium-light-gray, very fine		
3.	Shale, carbonaceous, thin and irregularly bedded, upper 1 in medium-brownish-		_		grained, thick-bedded, crossbedded, silty	4+	
4	graySandstone, light-gray, thin and irregularly		7	2.	Shale, grayish-red, weathered light- yellowish-brown, thin and evenly bed-		
••	bedded, fine-grained		5		ded	4	6

		Thickr	ness			Thick	
3.	Sandstone, medium-light-gray, weathered	Ft	in	26.	Sandstone, medium-light-gray, very fine	Ft	in
	light-greenish-gray, very fine grained, thick-bedded, crossbedded, silty	15	0		grained, thin and irregularly bedded, crossbedded, convolutions, very silty-	5	0
4.	Shale, medium-dark-gray, basal 1 ft grayish-red, thin and evenly bedded,			27.	Shale, medium-gray to light-grayish-brown, thin- to poorly bedded, slightly		
5.	becomes poorly bedded toward top Underclay, medium-gray, nonbedded,	18	0	28.	carbonaceous in basal 1 ft	7	0
	scattered fossil rootlets	2	6		grained, thick-bedded, silty, scattered fossil roots	1	6
	ceous, abundant coal and carbonaceous fragments, scattered resin blebs and			29.	Shale, light-grayish-red to light-olive- gray, nonbedded, very silty	2	3
7	gypsum crystalsShale, medium-gray, thin and evenly bed-		10	30.	Sandstone, medium-light-gray, fine- grained, massive to thin-bedded,		
	ded, few fossil plant fragments		7		crossbedded, scattered thin silty inter- beds	26	0
0.	Sandstone, medium-light-gray, very fine grained, thin and irregularly bedded,	3	0	31.	Shale, medium-gray to medium-dark- gray, basal 1 ft light-olive-gray, thin		
9.	Shale, medium-gray to medium-dark-	3	U	32.	and evenly bedded, siltySandstone, medium-light-gray, very fine	7	0
	gray, thin and evenly bedded, contains siltstone and sandstone interbeds, scat- tered coal and carbonaceous lamina-				grained, thin-bedded, silty, scattered shale interbeds	1	0
10	tions in basal 4 in	3	0	33.	Shale, light-grayish-red to light-olive- gray, poorly bedded	2	1
	grained, thick-bedded, crossbedded Shale, light-olive-gray, poorly bedded,	2	6	34.	Sandstone, medium-light-gray, very fine grained, fine-grained in upper 1½ ft,		
11.	silty, upper 10 in medium-gray and thin-bedded	2	9		thin and irregularly bedded, scattered shale interbeds	5	10
12.	Sandstone, medium-light-gray, very fine	1	4		Shale, grayish-red, basal 7 in light-olive-gray, poorly bedded, silty	2	6
13.	grained, thin-bedded, silty Shale, medium-gray, grades from thin-	1	•		Limestone, medium-gray, brittle, frac- tured	1	6
14.	bedded at base to nonbedded at top, few fossil rootlets in top 2 inShale, dark-grayish-brown, thin-bedded,	1	0	37.	Sandstone, medium-light-gray, very fine grained, thin-bedded, silty; 2-in-thick		10
	very carbonaceous, silty, abundant coal fragments		7		reddish-gray lens at base	1	10
15.	Coal, bright, impure, with few shale laminations		5		grained, thin-bedded, silty Shale, medium-dark-gray to light-gray,	1	6
16.	Shale, medium-gray, thin and evenly bedded, slightly carbonaceous	1	4		grayish-red in basal 1 ft Sandstone, medium-light-gray, fine-	3	0
17.	Sandstone, medium-light-gray, very fine grained, thin and irregulary bedded,				grained, thin-beddedSandstone, light-gray, very fine to fine-	2	0
18.	silty, upper 1 ft very shaly to silty Limestone, medium-gray, very calcare-	2	0		grained, friable, thin-beddedShale, light-olive-gray to light-grayish-	7	6
	ous, brittle, fractured	1	1		red, thin-beddedSandstone, medium-light-gray, very fine	6	8
	dedSandstone, medium-light-gray, very fine	2	2		grained, thin-bedded, few ripple beds, crossbedded, silty	5	0
	grained, thin- bedded at base to thick- bedded at top, silty	1	10	45.	Shale, medium-gray, thin and evenly bedded, upper 1 in slightly carbonaceous-	2	10
21.	Shale, medium-gray to medium-dark- gray, thin and evenly bedded, upper 6			46.	Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded, crossbed-		
22.	in very fissileSandstone, medium-light-gray, very fine	1	10	47.	ded, upper 2 ft very calcareous Shale, medium-gray to grayish-red	7 16	0 4
	grained, silty, grades from thick- bedded at base to thin-bedded at top	2	0		Sandstone, very fine grained, grades to fine-grained upward, thin-bedded,		
23.	Shale, medium-gray to medium-dark-gray in basal 1 ft; thin and evenly bedded;		_		crossbedded, silty at base, scattered silty shale and light-gray sandstone		_
24.	top 1 ft slightly siltyLimestone, medium-gray, brittle, frac-	3	8	49.	lensesShale, medium-gray to grayish-red, lens-	6	0
25.	turedShale, medium-gray, medium-dark-gray	1	10	50.	shaped beddingSandstone, medium-light-gray, very fine	3	4
	in basal 1 ft, thin and evenly bedded, very silty and sandy	4	4		grained, thin- bedded, silty, calcare- ous	1	10

		Thickr	ness			Thick	ness
		Ft	in			Ft	in
51.	Shale, medium-gray, upper 2 ft grayish-red, thin and evenly bedded, slightly			73.	Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded	2	6
52	carbonaceous	5	0	74.	Shale, grayish-red, thin and evenly bed- ded	2	0
32.	gray, very fine to fine-grained, dark and light mineral grains, thin-bedded,			75.	Sandstone, medium-light-gray, very fine grained, thin-bedded, very calcareous-	4	0
52	crossbedded	7	6	76.	Shale, grayish-red, thin and evenly bed- ded	2	0
	Shale, medium-gray to grayish-red, thin and evenly bedded	8	4	77.	Sandstone, medium-light-gray, fine-		
54.	Sandstone, fine- to medium-grained, thick-bedded to massive, friable, lens-			78.	grained, thin-bedded Shale, grayish-red, thin and evenly bedded	9	0
55.	shaped bedsShale, grayish-red, thin and evenly bed-	9	0	79.	Sandstone, medium-light-gray, very fine	3	0
56.	dedSandstone, medium-light-gray, very fine	17	6	00	to fine-grained, thin-bedded, crossbed- ded	6	0
	to fine-grained, thin- to thick-bedded, crossbedded	10	0		Shale, grayish-red, thin and evenly bed- ded	6	0
57.	Shale, grayish-red, thin and evenly bed- ded	2	10	81.	Sandstone, medium-light-gray to light- gray, very fine to fine-grained, thin- to		
58.	Sandstone, medium-light-gray, very fine grained, very silty, convolutions	1	0	82.	thick-bedded	16	0
59.	Shale, grayish-red, thin and evenly bed- ded	4	0		ded, silty; 6-in-thick ironstone bed 5 ft above base; 10-in-thick light-gray very		
60.	Sandstone, medium-light-gray, very fine	1	6		fine grained silty sandstone lens 11 ft above base; 1½-ft-thick very fine		
61.	grained, thin and evenly bedded, silty- Shale, medium-dark-gray to light-olive-	1	O		grained sandstone lens 19 ft above base	26	0
60	gray, grayish-red in top 2 ft, thin and evenly bedded	15	0	83.	Sandstone, light-gray, very fine grained, thin- to thick-bedded, slightly calcare-		
62.	Sandstone, medium-light to light-gray, very fine to fine-grained, thin- to thick-bedded, crossbedded	6	0	84.	ous at topShale, grayish-red, thin and evenly bed-	6	0
63.	Shale, grayish-red, thin and evenly bed- ded	6	0	85.	dedSandstone, light-gray, very fine grained,	11	0
64.	Sandstone, medium-light-gray, fine- grained, thick-bedded, abundant fossil	U	U	86.	very calcareous, few fossil roots Shale, grayish-red, few medium-dark-	1	8
65	rootsShale, grayish-red, thin and evenly bed-	1	6		gray, thin and evenly bedded, scattered thin siltstone and very fine grained		
	dedSandstone, very fine grained, thin-	2	0		sandstone lenses, a 1-ft light-gray, silty sandstone lens 10 ft above base	17	0
	bedded, silty	1	6	87.	Sandstone, medium-light-gray, very fine grained, thin-bedded, silty	2	6
67.	Shale, grayish-red, thin and evenly bed- ded	13	0	88.	Shale, grayish-red, thin and evenly bed- ded, scattered lenses of very fine		
68.	medium-grained, thin-bedded to mas-				grained sandstone and siltstone up to 1 ft thick	7	0
	sive, crossbedded, calcareous concretions up to 2 ft in diameter; dark and			89.	Sandstone, light-gray, very fine to fine-grained, thin- to thick-bedded, dark		
	light mineral grains, friable; contains 2-ft-thick light-olive-gray siltstone		•	90.	and light mineral grainsShale, grayish-red, thin and evenly bed-	10	0
69.	lens, 10 ft above base	75 -	0	91.	dedSandstone, light-gray, fine-grained, thin-	10	0
70.	dedSandstone, medium-light-gray, weathered	7	0		bedded, high quartz content, calcareous in top 1 ft	4	0
	grayish-yellow, fine-grained, thin- bedded, crossbedded, very calcareous,				Shale, grayish-red, thin and evenly bed- ded	7	0
	contains scattered shale lenses up to 3 ft thick 18 ft above base	50	0	93.	Sandstone, light-gray, very fine grained, thin- to thick-bedded, thin-bedded at		
71.	Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded to mas-				top, very shaly, contains 1-ft-thick cal- careous zone 4 ft above base; 3-ft-thick		
	sive, basal 20 ft thin-bedded, friable, calcareous	65	0		silty zone 8 ft above base; and medium- dark to dark gray shale lens 3 ft above		
72.	Shale, light-olive-gray to grayish-red, thin- to poorly bedded; 1-ft-thick sand-			94.	baseShale, medium-dark-grayish-red, thin and	37	0
	stone bed 9 ft above base	16	0		evenly bedded	1	0

		Thick	ness		Thick	ness
		Ft	in		Ft	in
95.	Sandstone, very fine grained, thin and irregularly bedded, silty	2	6	115. Shale, light-gray, nonbedded Total measured thickness of white	3	_0
96.	Shale, grayish-red, grades to medium-	2	U	sandstone member of Mesaverde Formation	202	0
	gray in upper 1 ft thin and evenly bedded	4	0	Total measured thickness of	<u>203</u>	=
97.	Sandstone, medium-light-gray to light-gray, very fine grained, silty	1	0	Mesaverde Formation	1,029	<u>3</u>
98.	Shale, light-olive-gray to grayish-red	2	4			
99.	Sandstone, light-gray, fine-grained, thin-	2	0			
100.	bedded, calcareous in upper 1 ft Shale, grayish-red to medium-dark-gray, thin and evenly bedded, contains 1- ft-thick dark-grayish-purple carbona-	3	0			
	ceous zone 5 ft above base	9	0	Measured section 8: Cody Shale and Mesave	rde	
101.	Sandstone, medium-light-gray, very fine grained, crossbedded, scattered shale			Formation		
102.	interbeds, siltyShale, dark-grayish-red to olive-green,	1	2	Location: Crowheart NE. Quadrangle, Wyoming (7.5 min Start: NE-NE-NW sec. 31, T. 6 N., R. 2 W. Presented		ldest to
	thin and evenly bedded	3	6	youngest End: SW-SW-NW sec. 29, T. 6 N., R. 2 W.		
103.	Sandstone, light-gray, fine- to medium- grained, dark and light mineral grains,			Described by: R.C. Warlow and J.F. Windolph, Jr. Strike 85°, Dip 30° NW.		
104	thin- to thick-bedded, crossbedded Shale, medium-gray to medium-dark-	5	0	Upper Cretaceous:	Thick	ness
104.	gray; 2-ft-thick lens of grayish-red to			Code Shale:	Ft	In
	olive-green shale 5 ft above base;			1. Sandstone, medium-light-gray, very fine grained, thin and evenly bedded, cal-		
	becomes very silty and sandy in top 3 ft	24	0	careous	1	10
105.	Sandstone, medium-light-gray; very fine	27	U	2. Shale, medium-gray, silty, few scattered		
	to fine-grained, thin-bedded, silty,			very fine grained sandstone laminations, 3 to 4 in thick; 1-ft-thick very		
	light-brown shale interbeds in basal 1 ft	2	6	fine grained sandstone lens 16 ft above		
106.	Ironstone, yellow-brown to dark-red,	_	Ŭ	base; 3-ft-thick very fine grained sand-		
	irregular concretions, very fine band- ing	1	6	stone lens 31 ft above base; 1-ft-thick very fine grained sandstone lens 56 ft		
107.	Shale, light-olive-brown, thin and evenly	1	O	above base; 1½-ft-thick very fine		
	bedded	1	0	grained sandstone lens 61 ft above base; 1-ft-thick very fine grained sand-		
108.	Sandstone, light-gray, very fine to fine- grained, thin- to thick-bedded, dark			stone lens 77 ft above base; 10-ft-thick		
	and light mineral grains	3	0	sandy, silty zone 87 ft above base;		
109.	Shale, medium-dark-gray to grayish-red			1-ft-thick very fine grained calcareous sandstone lens 97 ft above base	127	_0
	to olive-green, thin and evenly bedded, very silty in upper 3 ft	12	0	Total measured thickness of Cody		
110.	Sandstone, light-gray, fine- to medium-	12	Ü	Shale	128	10
	grained, dark and light mineral grains,			Mesaverde Formation:		
	thin- to thick-bedded, crossbedded, fri- able	12	0	3. Sandstone, medium-light-gray, very fine		
111.	Shale, light-olive-gray to dark-grayish-			grained, thin- to thick-bedded, silty, variable resistant beds, crossbedded	55	0
	brown to grayish-red, 2-ft-thick grayish- green silty zone 9 ft above base	12	0	4. Siltstone, medium-gray, crossbedded,		Ü
112.	Sandstone, medium-light-gray, very fine	12	U	shaly, scattered thin, very fine grained	_	^
112	to fine-grained, thin-bedded		10	sandstone laminations, thin-bedded 5. Sandstone, medium-light-gray, thin- bed-	5	0
113.	Shale, grayish-red to light-greenish-gray, upper 6 in very silty	1	2	ded to massive, pyrite nodules, very		
Unco	onformity		_	silty, crossbedded, solution cavities, scattered ripple beds, very calcareous		
	Total measured thickness of main	926	_	at top, thinly bedded, pyrite nodules	98	0
117 L24	body of Mesaverde Formation	826	<u>3</u>	6. Sandstone, light-gray, fine-grained, cross-		
	sandstone member: Sandstone, light-gray to white; basal 3 ft			bedded, thin- to thick-bedded, solution cavities, scattered pyrite nodules, fossil		
''	light greenish gray, coarse grained,			roots at top	15	0
	conglomeratic; thick-bedded to mas-			Base of Maverick Spring coal zone		
	sive, crossbedded, scattered shale chips, friable, upper 1 ft calcareous			7. Coal, bright, in thin bands, weathered, basal ½ in sandstone interbeds, resin		
	with scattered pyrite nodules	200	0	blebs, fine cleats		6

		Thick	ness			Thick	ness
		Ft	in			Ft	in
8.	Tonstein, medium-yellow-brown, fossil roots, carbonaceous fragments, flat-			30.	Coal, bright, banded, resin blebs, gypsum crystals, fine to medium cleats	1	4
	tened volcanic ash particles		2	31.	Tonstein, light-brownish-gray, coal inter-		
9.	Coal, bright, banded, fusain at top		8		beds; sulfur-stained, flattened, volcan-		
	Shale, medium-gray, basal 1 in light-				ic ash fragments, coal fragments, and		
	grayish-brown and carbonaceous		10		tree trunks, resin blebs, gypsum crys-		_
11.	Siltstone, medium-light-gray, thin-				tals; top gradational		5
	bedded, very fine grained sandstone			32.	Shale, medium-gray, basal 2 in carbona-	•	•
	laminations, shale and carbonaceous	_	_	22	ceous, top gradational	2	0.
	laminations	1	6	33.	Sandstone, medium-gray, very fine grained, thin-bedded, silty	2	6
12.	Sandstone, light-gray, very fine grained,			34	Underclay, medium-gray, slightly silty,	2	U
	thin- to medium-bedded, silty, medium-			54.	fossil plants, ½-in coaly lens at top	1	0
	light-gray in basal 4½ ft, thick-bedded at top; 1-ft-3-in-thick medium-gray			35.	Shale, medium-gray, thin- to poorly bed-	-	Ū
	shale lens 7½ ft above base	14	6		ded	4	0
13	Underclay, medium-gray, poorly bedded,	14	v	36.	Sandstone, medium-light-gray, very fine		
10.	fossil roots, upper 5 in light-brownish-				grained, thin-bedded, silty	1	4
	gray, silty, carbonaceous, sulfur-			37.	Shale, medium-gray, 6-in pyrite nodule		
	stained; tonstein bed in upper 2 in	2	9		band 11 in above base, very bentonitic,	2	
14.	Coal, bright, banded, resin blebs	1	2	20	fossil roots at top	3	0
15.	Tonstein, light-grayish-brown, fossil			36.	Tonstein, medium-brown-gray, coal frag- ments		4
	plant fragments		2	39	Coal, impure, banded, resin blebs, fine		7
16.	Coal, gypsum crystals, resin blebs,				cleats		6
	weathered, bright, few impure thin			40.	Shale, medium-gray, poorly bedded	3	6
	partings, few thin shale laminations in lower 1 in	1	4		Sandstone, medium-light-gray, very fine		
17	Sandstone, medium-light-gray, very fine	1	-		grained, thin- to thick-bedded		11
1,,	grained, silty, thin-bedded	1	6	42.	Underclay, medium-gray, bentonitic, fos-	_	
18.	Shale, medium-gray, thin-bedded, silty,	_		42	sil roots	1	6
	scattered siltstone and sandstone lami-				Coal, impure, shalyShale, medium-gray to medium-dark-		4
	nations, top grades into unit 19	1	11		gray; 4-in-thick bentonitic shale at		
19.	Siltstone, medium-light-gray, thin-				base	6	0
20	bedded, sandy	1	1	45.	Siltstone, medium-light-gray, very fine		
20.	Sandstone, medium-light-gray, very fine grained, silty, thin-bedded, slightly				grained sandstone laminations	3	0
	calcareous	6	6	46.	Sandstone, medium-light-gray, very fine		_
21.	Shale, medium-gray, thin and evenly bed-	Ŭ	Ů	47	grained, calcareous, silty		.5
	ded, slightly carbonaceous, lens-				Shale, medium-gray Underclay, medium-gray, fossil roots	2	6 0
	shaped	1	10		Coal, bloom, weathered	2	2
22.	Sandstone, light-gray, fine-grained, thick-				Underclay, medium-gray, bentonitic, ton-		~
	bedded, lens-shaped, pyrite nodules,				stein fragments in top 1 in, fossil roots,		
	fossil roots in top part	2	0		coal fragments	2	6
23.	Underclay, medium-grayish-brown, car-		1.1		Coal, bloom, weathered		2
24	bonaceous, fossil roots, silty.		11		Shale, medium-gray		6
24.	Coal, resin blebs, bright, banded, fine cleats		6	53.	Siltstone, medium-gray, very fine grained		
25.	Underclay, medium-gray to medium-dark-		Ü		sandstone laminations, shaly, fossil leaf impressions	4	0 .
	gray, fossil roots, coal fragments,			54.	Shale, medium-gray, scattered siltstone		0.
	poorly bedded, upper 2 in hard and			٥	laminations	4	0
	silty	1	9	55.	Sandstone, medium-light-gray, very fine		
26.	Coal, gypsum, bright, thin bands, fine to				grained, very calcareous, thin- to thick-		
27	medium cleats, iron-stained	1	1		bedded, pyrite nodules	5	0
21.	Tonstein, light-brown-gray, granular, resin blebs, coal fragments, fossil plant			56.	Siltstone, very calcareous, lens-shaped bedding		^
	impressions		4	57	Shale, medium-gray, thin and evenly bed-	6	0
28.	Coal, bright, basal 1 in contains fusain		•	57.	ded, bentonitic in top 1 ft	2	6
	and shaly laminations, thin-banded,			58.	Sandstone, medium-light-gray, fine-	_	-
	very slightly impure, fine to medium				grained, some medium-grained, thin-		
_	cleats	1	7		to thick-bedded, very calcareous, iron-		
29.	Shale, light-grayish-brown, carbona-				stained, pyrite nodules, lens-shaped	_	^
	ceous, silty, flattened tree trunks, coal			5 0	bedding	2	0
	lenses, resin blebs, thin-bedded, few fossil roots		9	39.	Sandstone, medium-light-gray, fine- grained, some medium-grained, dark		
			-		o-mines, some modium gramou, dark		

		Thick	ness			Thick	kness
		Ft	in			Ft	in
	and light mineral grains, thin-bedded to			87.	Siltstone, medium-light-gray, thin- to poorly bedded, shaly	2	6
	massive, fractures filled with quartz, crossbedded, solution cavities; pyrite			88.	Underclay, medium-gray, fossil roots, silty	2	2
	nodules; calcareous at top; calcareous 20 ft above base	53	0	89.	Coal, shaly, impure	2	1
60.	Shale, medium-gray; 4-in-thick limy silt-			90.	Shale, medium-gray, thin- to poorly bed- ded, fossil plants, upper 8 in very		
61.	stone 5 in above baseSandstone, light-gray, very fine grained,	2	6	01	carbonaceous	1	7
	thin and unevenly bedded, dark and light mineral grains	2	0	91.	grained, thick-bedded, thin-bedded and		
	Underclay, medium-gray, bentonitic	. =	7	02	silty at top; calcareous at base	4	0
63.	Tonstein, medium-brownish-gray, flat- tened volcanic ash granules		2		Underclay, medium-gray, silty, fossil roots	2	6
64.	Coal, bloom, weathered		6		Coal, bright, impure		3
65.	Shale, medium-gray, poorly bedded	10	0	94.	Underclay, medium-gray, poorly bedded,		
66.	Sandstone, medium-light-gray, fine grained to medium-grained, calcare-				fossil roots, 1-in coaly carbonaceous shale at top	3	6
	ous, lens-shaped bedding	4	0	95.	Shale, medium-gray, thin and evenly bed-		2
67.	Underclay, medium-dark-gray, fossil		10	96.	ded, becomes silty at top Sandstone, medium-light-gray, very fine	1	2
68.	roots, carbonaceousCoal, dull, slightly bony, banded at top,		10		to fine-grained, silty, scattered pyrite		
	medium cleats, yellow resin blebs at			97	nodules, crossbeddedShale, medium-gray, nonbedded, 8-in-	2	0
60	base	1	4	<i>71</i> .	thick pyrite nodule band 8 in below		
	Shale, medium-gray, siltySandstone, medium-light-gray, very fine		6		top, slightly bentonitic, gypsum crys-		
,	grained, silty, thin and unevenly bed-			00	tals	12	0
	ded, fossil plant fragments	2	0	90.	Sandstone, medium-light-gray, very fine grained, thin- to thick-bedded, silty	5	0
71.	Shale, medium-gray, poorly bedded,		0	99.	Shale, medium-gray, thin and evenly bed-		Ů
72.	silty, few fossil roots		9 2		ded, 4-in-thick pyrite nodule band 5 ft		
	Coal, impure, top eroded, shaly		$\tilde{2}$	100	above base	12	0
	of Maverick Spring coal zone			100.	Sandstone, light-gray, very fine grained, thin-bedded, silty, solution cavities		11
74.	Sandstone, medium-light-gray, very fine			101.	Underclay, medium-gray, nonbedded,		
	to fine-grained, dark and light mineral	•	0	100	upper 7 in slightly carbonaceous	2	0
75.	grains, thin- to thick-bedded Shale, nonbedded, silty, slightly bento-	2	0		Coal, bony, impure, resin blebs, banded- Shale, medium-gray, silty, pyrite nod-		3
	nitic	3	0		ules	1	6
76.	Sandstone, medium-light-gray, fine- grained, dark and light mineral grains,			104.	Siltstone, medium-gray, thin-bedded, sandy	3	6
	thin- to thick-bedded, scattered pyrite			105.	Shale, medium-gray, thin and evenly bed-	, ,	Ū
	nodules, silty, calcareous toward top -	39	0	100	ded, iron-stained	2	6
//.	Siltstone, medium-light-gray, thin- to poorly bedded, sandy, 7-in sandstone			106.	Sandstone, medium-light-gray, dark and light mineral grains, crossbedded,		
	lens at top	4	3		solution cavities, pyrite nodules, basal		
78.	Shale, medium-dark-gray, silty, slightly	2	0	107	2½ ft very silty and friable	8	0
79.	carbonaceous Concealed, probably carbonaceous silty	3	0	107.	Underclay, medium-dark-gray, fossil roots, bentonitic in lower half, carbo-		
90	shale	9	0	100	naceous in upper half	5	0
80.	Siltstone, medium-light-gray, very fine grained sandstone; scattered shaly lam-			108.	Shale, dark-brownish-gray, thin-bedded, carbonaceous, silty, abundant fossil		
	inations	4	0		plant fragments, few coal laminations		
81.	Shale, medium-gray, slightly carbona-	2	0	100	at top Coal, bright, thin bands, resin blebs	2	7 1
82.	ceous in top 3 in with coal fragments- Sandstone, medium-light-gray, very fine	2	U		Shale, medium-gray, silty, carbonaceous	2	1
	grained		7		laminations	1	10
	Bone, sandy, detrital, resin blebs Shale, medium-gray, coal fragments,		3	111.	Sandstone, very fine grained, thin- bedded, crossbedded, silty	4	2
	silty	15	0	112.	Siltstone, medium-gray, thin-bedded,	-7	
85.	Siltstone, medium-light-gray, scattered shale and siltstone laminations	2	0	112	sandy, shaly	1	8
86.	Sandstone, medium-light-gray, very fine	2	U	115.	Shale, light-grayish-brown, thin-bedded, carbonaceous, coal fragments, bony		3
	grained, solution cavities, silty,		0	114.	Coal, upper 1 in impure, bright, banded,		<i>-</i> -
	slumped beds	1	0		abundant resin blebs		5

		Thick	ness			Thicl	kness
		Ft	in			Ft	in
115.	Shale, medium-gray, poorly bedded, top		_	140.	Shale, medium-gray, thin-bedded, silty,		
116.	gradationalSiltstone, medium-gray, crossbedded,		6		thin sandstone laminations at base; lens-shaped bedding	2.	0
	thin and irregularly bedded, sandy Sandstone, medium-light-gray, very fine	1	8	141.	Sandstone, medium-light to light-gray, fine-grained, dark and light mineral		
117.	to fine-grained, few medium grains,				grains, crossbedded, thin- to thick-	_	
	dark and light mineral grains, thin- to thick-bedded, crossbedded, friable,			142.	bedded, pyrite nodulesShale, medium-gray, poorly bedded,	2	0
	pyrite nodules	3	0		pyrite nodules, scattered siltstone and	10	•
118.	Underclay, medium-gray, shaly, slightly bentonitic	5	0	143.	sandstone laminations Sandstone, medium-light-gray, very fine	13	0
119.	Shale, light-brown-gray, carbonaceous		2		to fine-grained, crossbedded, shale		
	Coal, bloom, resin blebs, weathered		3		chips at base, slightly calcareous	18	0
121.	Siltstone, medium-gray, thin and irregu-			144.	Shale, medium-gray, slightly silty, scat-		
	larly bedded, slightly calcareous	6	6		tered siltstone laminations; carbonaceous zone 10 ft above base; upper 3 ft		
122.	Sandstone, very fine grained, thin- to	_	_		silty and thin bedded	18	0
102	thick-bedded, silty, calcareous	3	6	145.	Sandstone, light-medium-gray, very fine	10	U
	Shale, medium-gray, poorly bedded	2	10		to fine-grained, crossbedded, thin- to		
124.	Siltstone, medium-light-gray, very calcar-		10		thick-bedded, slumped bedding	3	0
125	Underclay, medium-gray, nonbedded, ben-		10	146.	Shale, medium-gray, nonbedded, few		
120.	tonitic	2	6		carbonaceous laminations	5	0
126.	Shale, carbonaceous, thin-bedded, weath-	-	Ū	147.	Sandstone, light-gray, very fine grained,	•	^
	ered, few coal fragments		4	140	thick-bedded, silty	3	0
127.	Shale, medium-gray, thin and evenly bed-			148.	Shale, light-brownish-gray, fossil plant fragments, few fossil roots	1	6
	ded, top grades into unit 128	1	4	149	Sandstone, medium-light-gray, very fine		U
128.	Sandstone, very fine grained, thin and		_	147.	grained, thin-bedded, calcareous, silty-	2	6
120	evenly bedded, silty, calcareous	1	6	150.	Shale, medium-gray, thin-bedded	2	0
129.	Underclay, medium-gray, nonbedded, bentonitic	7	0		Sandstone, medium-light-gray to light-		
130	Shale, dark-gray to black, coaly, thin and	,	U		gray, dark and light mineral grains,		
150.	irregularly bedded, resin blebs, silty,				fossil roots and fragments, silty, pyrite		
	bony lens	1	8	152	nodules	1	4
131.	Shale, medium-gray, thin and evenly bed-			132.	Siltstone, medium-gray to medium-dark- gray, thin-bedded, pyrite nodule bands;		
	ded, nonbedded in upper 1 ft, top				slightly carbonaceous	2	0
	grades into unit 132	4	0	153.	Sandstone, medium-light-gray, very fine	_	·
	Coal, bloom, weathered		4		grained, thin-bedded, silty, top grades		
133.	Shale, medium-gray, thin and evenly bed-				into unit 154	1	10
	ded, poorly bedded toward top, silty at	5	0	154.	Shale, medium-light-gray, thin-bedded,	_	
134	Sandstone, medium-light-gray, fine-	5	U	155	scattered siltstone laminations	5	0
154.	grained, dark and light mineral grains,			155.	Sandstone, medium-light-gray, very fine grained, calcareous, thick-bedded,		
	thin to thick and irregularly bedded,				grained, calcareous, thick-bedded, silty, burrowed		10
	pyrite nodules	5	0	156.	Shale, medium-gray to medium-dark-		10
135.	Sandstone, medium-light-gray, fine-				gray, thin and evenly bedded		9
	grained, some medium-grained, mas-			157.	Sandstone, medium-light-gray, very fine		
	sive, friable, pyrite nodules, silty, lens-			4.50	grained, thin-bedded, silty	1	4
	shaped beds, crossbedded, calcareous concretions up to 1 ft in diameter; few			158.	Shale, medium-gray, thin to poorly bed-	_	,
	siltstone and shale laminations in upper			150	Sandstone, medium-light-gray, fine-	5	6
	part; thin-bedded and calcareous at top;			139.	grained, crossbedded, thick-bedded,		
	resistant in upper 10 ft	30	0		silty, siltstone laminations	3	4
136.	Bentonite, light-yellowish-brown, upper			160.	Shale, medium-light-gray to medium-		
	4 in carbonaceous shale	7	0		gray, poorly bedded, top gradational -	8	0
137.	Coal, bloom, bright, shaly, impure, resin			161.	Sandstone, very fine to fine-grained, mas-		
120	Bentonite light vellewish brown for		3		sive, silty, pyrite nodules, solution		
138.	Bentonite, light-yellowish-brown, few				cavities, calcareous concretions up to 2 ft in diameter	52	0
	pyrite nodules, upper 2 ft thin-bedded, medium-gray shale	8	6	162	Shale, medium-gray, thin-bedded,	32	U
139.	Sandstone, medium-light-gray, very fine	J	J	102.	slightly carbonaceous, basal 5 in silty-	1	6
	to fine-grained, slightly silty, basal 1 ft			163.	Sandstone, light-gray, very fine grained,		
	resistant, thin- to thick-bedded, cross-				crossbedded, thin-bedded, pyrite nod-		
	bedded, pyrite nodules	1	6		ules	1	6

		Thick	ness			Thick	ness
		Ft	in			Ft	in
164.	Shale, light-brownish-gray, carbona-		•	189.	Underclay, medium-gray, fossil roots	3	6
165	ceous, siltyCoal, impure, resin blebs, shaly, weath-	1	2	190.	Shale, light-grayish-brown, carbona-		
105.	ered		3		ceous		4
166.	Shale, medium-gray, thin-bedded to		-	191.	Shale, medium-gray, thin and evenly bed-		
	poorly bedded	5	6		ded		4
167.	Sandstone, fine-grained and locally			192.	Sandstone, medium-light-gray, very fine		
	medium-grained, thick-bedded to mas-				grained, thin- to thick- bedded, cross-	2	0
	sive, crossbedded, scattered pyrite nodules, solution cavities, ripple-			103	bedded, siltyShale, medium-gray, thin and poorly bed-	2	8
	bedded at top and calcareous	25	0	175.	ded, upper 4 ft bentonitic	8	0
168.	Siltstone, medium-light-gray, scattered			194.	Sandstone, medium-light-gray, very fine		
	shale laminations	4	6		to fine-grained, dark and light mineral		
169.	Sandstone, medium-light-gray, very fine				grains, massive, very calcareous	6	6
	grained, thin and irregularly bedded,	2	^	195.	Shale, medium-gray to medium-dark-		
170	siltyShale, medium-gray, thin-bedded, few	2	0		gray, slightly carbonaceous 6½ ft above base, top thin- and evenly bed-		
170.	siltstone laminations, slightly carbo-				ded	9	0
	naceous	6	0	196.	Siltstone, medium-light-gray, thin and		Ū
171.	Sandstone, medium-light-gray, very fine				evenly bedded	1	4
	grained, crossbedded, thin and irregu-			197.	Shale, medium-gray, thin and evenly bed-		
	larly bedded, silty, very calcareous	2	2		ded	1	0
172.	Shale, medium-gray to medium-dark-			198.	Sandstone, medium-light-gray, very fine		
	gray, thin-bedded; 2-in-thick siltstone laminations 1 ft above base	5	2		grained, silty, thin- to thick-bedded, crossbedded, very calcareous, scat-		
173.	Underclay, medium-brownish-gray,	3	2		tered pyrite nodules	3	0
1,5,	sandy, fossil roots	1	6	199.	Shale, medium-gray, thin and evenly bed-		Ŭ
174.	Coal, bloom, weathered		4		ded	3	0
175.	Sandstone, medium-light-gray, fine-			200.	Sandstone, medium-light-gray, very fine		
	grained, some medium-grained, dark				grained, thin- to thick-bedded, calcar-	_	_
	and light mineral grains, thick-bedded			201	Shala madium gray to light alive gray	2	6
	to massive, calcareous, solution cavi- ties, scattered pyrite nodules	61	0	201.	Shale, medium-gray to light-olive-gray, poorly bedded	4	0
176.	Shale, medium-gray, nonbedded	5	ő	202.	Sandstone, medium-light-gray, very fine	•	Ū
	Sandstone, light-gray to medium-light-				grained, dark and light mineral grains,		
	gray, very fine to fine-grained, cross-				slightly calcareous, silty	1	10
	bedded, massive, scattered pyrite nod-			203.	Shale, medium-gray to light-olive-gray,	•	10
	ules, thin-bedded and calcareous in top	22	^	204	poorly bedded	3	10
178	3 ft, solution cavitiesSiltstone, medium-gray, thin-bedded	33 4	0 6	204.	Sandstone, medium-light-gray, very fine grained, very silty, dark and light min-		
	Shale, medium-gray, thin-bedded,	7	U		eral grains, thin-bedded to massive,		
	slightly carbonaceous	6	6		scattered pyrite nodules, lens-shaped		
180.	Sandstone, medium-light-gray, very fine				bedding	6	6
	grained, thin and irregularly bedded,			205.	Underclay, medium-gray, poorly bedded,		
101	nonresistant	2	2	206	fossil roots	1	6
181.	Shale, medium-gray, slightly silty, scat- tered carbonaceous laminations	3	6		Coal, impure, shalyShale, medium-gray to medium-dark-		1
182.	Siltstone, medium-light-gray, very fine	3	U	207.	gray, thin-bedded, slightly carbona-		
102.	grained, thin and irregularly bedded,				ceous in upper 1 ft, slightly silty	8	0
	sandy	3	6	208.	Sandstone, medium-light-gray, very fine		
183.	Shale, medium-gray, thin-bedded to				grained, very silty, thin and irregularly		
104	poorly bedded, becomes silty at top	3	0		bedded, massive in lower 8 in, very		
184.	Sandstone, very fine grained, silty, cross- bedded, thick-bedded to massive, scat-				calcareous, scattered plant fossils in		
	tered pyrite nodules, very calcareous in				basal 1 ft, 4-in medium-gray shale lens 2 ft above base	4	6
	top 1 ft	13	0	209.	Shale, medium-gray, thin and evenly bed-	•	Ü
185.	Shale, medium-gray, silty, scattered	-		· ·	ded		7
	pyrite nodule laminations	2	0	210.	Sandstone, medium-light-gray, very fine		
186.	Shale, light-grayish-brown, carbona-		^		grained, very silty, scattered pyrite	_	_
107	ceous, few coal fragments, silty	1	8	211	nodules, solution cavities, calcareous -	2 1	3 0
10/.	Shale, medium-gray, thin-bedded, upper 6 in slightly carbonaceous	2	2		Shale, medium-gray, poorly beddedSandstone, medium-light-gray, very fine	1	U
188.	Sandstone, medium-light-gray, very fine	-	-	212.	grained, silty, thick-bedded, very cal-		
7	grained, silty, thick-bedded	1	4		careous		10
	- ·						

		Thick	ness			Thick	ness
		Ft	in			Ft	in
213.	Shale, medium-gray to light-grayish-				1-ft-thick thin-bedded, very fine		
	brown, slightly carbonaceous, thin and evenly bedded	1	4		grained sandstone 6 ft above basal contact	10	0
214.	Sandstone, medium-light-gray, very fine			235.	Siltstone, medium-light-gray, thin and	10	U
215.	grained, silty		9		irregularly bedded, medium-gray shale laminations 10 percent; 4-in-thick shale		
	slightly carbonaceous	1	10		zone at top	3	0
216.	Sandstone, medium-light-gray, very fine grained, very silty, thin and irregularly			236.	Sandstone, medium-light-gray, very fine grained, very slightly calcareous, mas-		
	bedded	1	0		sive, crossbedded, few scattered pyrite		
	Shale, medium-gray, poorly bedded	2	10		nodules	1	2
218.	Sandstone, medium-light-gray, very fine grained, dark and light mineral grains,		_	237.	Shale, medium-gray to medium-dark- gray, thin and evenly bedded	1	6
210	slightly calcareous, thick-bedded Shale, medium-gray to light-olive-gray,	1	2	238.	Sandstone, medium-light-gray, very fine		
217.	basal, 3 ft 3 in poorly bedded, upper				grained, very silty, crossbedded, very		
	portion thin and evenly bedded	6	6		slightly calcareous, scattered pyrite	2	•
220.	Sandstone, medium-light-gray, very fine			220	nodules	3	0
221	grained, silty, thin-bedded		11	239.	Shale, medium-gray to medium-dark- gray, thin and evenly bedded, basal 1 ft		
221.	Shale, medium-gray, thin and poorly bed- ded	2	8		slightly carbonaceous, becomes silty at		
222.	Sandstone, medium-light-gray, very fine	_			top	12	6
	grained, very silty, thin-bedded to mas-			240.	Sandstone, medium-light-gray, very fine		
	sive, crossbedded, very calcareous,	,	10		grained, dark and light mineral grains,		
223	scattered pyrite nodules Underclay, medium-gray, poorly bedded-	6	10 8		thick-bedded to massive, crossbedded,		
	Shale, light-grayish-brown, carbona-		o		scattered pyrite nodules, calcareous,		
	ceous, silty, abundant fossil plant frag-				slightly silty, basal 1 ft thin-bedded and silty; 1-ft-thick shale lens 1 ft below		
	ments, few fossil roots	1	0		top	31	0
225.	Coal, bright attritus, banded, medium			241.	Underclay, medium-gray to light-olive-	0.1	Ū
	cleats, rosin, fusain, slightly carbonaceous, fossil plant fragments		7		gray, nonbedded	5	0
226.	Shale, medium-gray, thin and evenly bed-		,	242.	Shale, light-gray-brown, silty, thin and		
	ded, slightly carbonaceous, fossil plant				irregularly bedded, abundant fossil		
225	fragments		4	242	plant fragments and roots	2	8
227.	Sandstone, medium-light-gray, very fine grained, silty, calcareous, thin- to				Coal, bright, impure, bony, resin bleb Shale, light-gray-brown, carbonaceous		5
	thick-bedded, lens-shaped	1	6		Shale, medium-gray to medium-dark-		U
228.	Shale, medium-gray to light-olive-gray,	-			gray, thin and evenly bedded; basal 8		
	thin and poorly bedded, upper 1 ft				in medium dark gray, very carbona-	_	
220	grades silty, few fossil plants	9	6	246	Ceous	3	0
229.	Sandstone, medium-light-gray, very fine grained, slightly silty, very calcareous,			240.	Sandstone, medium-light-gray, very fine grained, dark and light mineral grains,		
	thin- to thick-bedded, crossbedded,				slightly silty, calcareous, thin- to thick-		
	scattered pyrite nodules	5	6		bedded, scattered pyrite nodules	8	0
230.	Shale, medium-gray, thin and evenly bed-			247.	Shale, medium-gray, thin- to poorly bed-		
	ded, few fossil plant fragments, upper 1 ft contains few fossil roots, nonbed-				ded, 8-in-thick very fine grained sand- stone 1 ft above base; upper 3 ft very		
	ded with coal fragments	6	8		fine bedded, slightly silty, ½ in of	• .	
231.	Sandstone, medium-light-gray, very fine		•		shaly coal at top	8	0
	grained, dark and light mineral grains,			248.	Sandstone, medium-light-gray, fine-		
	thin and irregularly bedded, silty, very	4	0		grained with few medium grains, abun-		
232	slightly calcareous Shale, medium-gray, thin-bedded, con-	4	0		dant dark and light mineral grains, thick-bedded to massive, pyrite nod-		
232.	tains 8-in-thick very fine grained sand-				ules, solution cavities, top 2 ft thin-		
	stone 2 ft above basal contact	5	0		bedded, iron-stained, resistant at cen-		
233.	Sandstone, medium-light-gray, very fine				ter	18	6
	to fine-grained, dark and light mineral				on offset 2,000 ft east Underclay, medium-gray to light-olive-		
	grains, thin-bedded to massive, very calcareous, lens-shaped bedding, scat-			∠ 4 7.	gray, fossil roots		8
	tered pyrite nodules, top 1 ft very silty-	13	0	250.	Shale, light-grayish-brown, thin and		-
234.	Shale, medium-gray to medium-dark-				evenly bedded, silty, coal fragments,		•
	gray, thin and evenly bedded; contains				fossil plant fragments		2

		Thickn	ess		Thickness
		Ft	in		Ft in
251.	Shale, medium-gray, silty, very fine grained sandstone, top gradational into			269. Sandstone, light-gray, very fine grained, silty, thin- to thick-bedded, scattered	
252.	unit 252 Sandstone, very fine-grained, dark and light mineral grains, thick-bedded,		4	pyrite nodules, very calcareous 270. Shale, medium-gray, thin and evenly bed- ded, few carbonaceous plant frag-	1 4
	slightly silty, noncalcareous, sparsely micaceous, scattered resin blebs, scat-			ments	3 0
252	tered pyrite nodules, fossil leaf impres-	1	6	fine to fine-grained, scattered dark mineral grains, very calcareous, thin-	
253.	Shale, medium-dark-gray to mostly medium-gray, thin and poorly bedded, few grayish-red laminations in central part of unit are light clive gray, and			to thick-bedded, scattered worm bur- rows, scattered pyrite nodules, iron laminations, calcareous iron-stained concretions 1 ft 2 inches in diameter	
254	part of unit are light-olive-gray and mostly poorly bedded	14	6	9 in above base	22 0
254.	Sandstone, medium-light-gray, silty, very fine grained, thick-bedded to massive,			272. Shale, medium-gray, poorly bedded, few fossil roots, pyrite nodules	2 8
	thin-bedded toward top, locally cross- bedded, scattered pyrite nodules, few resistant ledges, calcareous, very silty			 Sandstone, medium-light-gray, very fine grained, very silty, thin and irregularly bedded, noncalcareous 	4 6
255	in top 3 ft	28	0	274. Shale, medium-gray to medium-dark- gray, scattered carbonaceous material	7 0
	Shale, medium-gray to medium-dark-gray, thin-bedded	2	6	in basal 2 ft, pyrite nodules with plant	3 0
256.	Sandstone, light-gray, very fine grained, dark and light mineral grains, mica- ceous, crossbedded, base sharp and			275. Underclay, medium-gray to light-olive- gray, nonbedded, fossil rootlets,	3 0
	angular, noncalcareous, scattered pyrite nodules	3	0	locally silty276. Shale, light-grayish-brown, coal frag-	9 6
257.	Shale, medium-gray to light-olive-gray,	4	6	ments277. Shale, medium-gray to medium-dark-	2
258.	poorly bedded	4	0	gray, thin and evenly bedded278. Shale, medium-gray, poorly bedded, few	6 0
	roots, coal fragments, slightly bony to bright coal at top with resin blebs	1	4	coaly fragments at top 279. Sandstone, very fine grained, highly	6 0
259.	Shale, medium-gray, thin and evenly bed- ded, upper 4 in light-grayish-brown,	-	·	weathered	23 0
260.	carbonaceous Sandstone, light-gray, very fine grained,	5	0	verde Formation $\underline{\underline{1}}$ Unconformity—Upper part of Mesaverde	<u>363</u> <u>5</u>
	thin and irregularly bedded, very silty, slightly calcareous	1	9	Formation, and Meeteetse, Lance, and Fort	
261.	Underclay, medium-gray, nonbedded, few siltstone interbeds, fossil rootlets-	2	4	Union Formations not present. Indian Meadows Formation:	
262.	Shale, light-grayish-brown, thin-bedded, abundant coal laminations, very carbo-			Overlying unit contains coarse conglomerate-	Unit not measured
263.	naceous Coal, weathered, bright, resin blebs, banded		2	End of section	
264.	Shale, medium-gray, thin and evenly bed-	_			
265.	ded, basal 3 in very carbonaceous Sandstone, light-gray, very fine grained, dark and light mineral grains, calcare-	7	9	Measured section 8a: Mesaverde Formation	
266	ous, crossbedded, thin- to thick- bedded, iron-stained	1	2	Location: Crowheart NE. Quadrangle, Wyoming (7.5 min) Start: SE-SE-NW sec. 29, T. 6 N., R. 2 W. Presented fr	om oldest to
200.	Shale, medium-gray, slightly carbonaceous, thin and evenly bedded, 1-ft-thick silty zone 1 ft 3 in above base,			youngest End: NE-SE-NW sec. 29, T. 6 N., R. 2 W. Described by: R.C. Warlow and J.F. Windolph, Jr. Strike 90° Din 30° N	
267.	few fossil rootlets in silty zoneSandstone, light-gray, very fine grained,	7	6	Strike 90°, Dip 30° N. Upper Cretaceous:	Thickness
,,	dark and light mineral grains, thin- to thick-bedded, scattered pyrite nodules,			Mesaverde Formation:	Ft in
268	very calcareous, fossil roots in top 3 in- Underclay, medium-gray, fossil rootlets,	2	0	 Shale, medium-gray, poorly bedded, top in sandy and silty Sandstone, light-gray, very fine grained, 	3+
200.	upper 1 ft very carbonaceous and thin- bedded	2	2	silty, calcareous, thin and irregularly bedded	8

		Thickn	ess			Thick	ness
		Ft	in			Ft	in
3.	Shale, medium-gray, thin and evenly bed-	2	6	27.	Sandstone, medium-light-gray, very fine grained, thin-bedded, very silty		4
4.	ded, siltySandstone, light-gray, very fine grained,	2	O	28	Shale, medium-gray, irregularly bedded -	1	6 6
	very silty	1	0		Sandstone, light-gray, very fine grained,	1	O
3.	calcareous, thin- to thick-bedded, dark			30	thin- to thick-bedded, very siltyShale, medium-gray, thin-bedded to non-	2	0
6.	and light mineral grains Siltstone, medium-gray, thin and evenly		2	50.	bedded, grades to medium-dark-gray		•
•	bedded, sandy	1	0	31	toward topSiltstone, light-gray, thin-bedded, very	3	8
7.	Shale, medium-gray, thin and evenly bed- ded, few fossil plants	2	1		iron stained	2	0
8.	Siltstone, medium-gray, thin-bedded,				Shale, medium-gray, thin-beddedSandstone, medium-gray, fine-grained,	4	6
9.	sandy	1	0		few medium grains, thin- to thick- bedded, abundant dark mineral grains,		
	bedded, scattered thin siltstone and sandstone laminations	6	0	24	abundant pyrite nodules	1	6
10.	Sandstone, light-gray, very fine grained,			34.	Sandstone, light-gray to white, fine- grained, crossbedded, thin-bedded to		
	thin-bedded, very calcareous, dark and light min eral grains, scattered pyrite				massive, scattered shale chips and		
	nodules, base sharp	1	6		pyrite nodules, solution cavities, abun-		
11.	Shale, medium-gray, thin-bedded	2	6		dant dark and light mineral grains, few thin shale lenses toward top; 1-ft-thick		
12.	Siltstone, medium-light-gray, sandy, thin				shale lens 32 ft above base, fossil roots		
	and irregularly bedded, grades sandy upward, few carbonaceous fragments			25	in top 1 ft	35	0
	at base	3	0	35.	Underclay, medium-gray to medium-dark- gray, fossil rootlets	1	6
13.	Sandstone, light-gray, fine-grained, thin			36.	Shale, light-grayish-brown, very carbon-	•	Ŭ
	and irregularly bedded, abundant dark and light mineral grains, very calcare-				aceous, few fossil rootlets, abundant		•
	ous, silty in basal 1 ft	3	6	37	fossil plant material Coal, weathered, impure, scattered shale	1	0
14.	Shale, medium-gray, thin- to poorly bed-			37.	lenses		10
1.5	ded	2	6	38.	Sandstone, light-gray to white, fine- to		
	Sandstone, fine-grained, very silty Shale, medium-gray, silty, bentonitic in		4		medium-grained, abundant dark min- eral grains, crossbedded, scattered		
10.	top 2 ft, scattered sand lenses	5	0		pyrite nodules	7	0
17.	Sandstone, light-gray, very fine to fine-			39.	Shale, medium-gray, abundant sand		
	grained, abundant dark mineral grains,	4	6		grains, silty, lens-shapped bedding	3	_0
18.	irregularly bedded, slightly calcareous- Shale, medium-gray, nonbedded, very	4	U		Total measured thickness of main body of Mesaverde Formation	141	3
	silty and sandy in upper half	4	0	Uncor	aformity		
19.	Sandstone, medium-gray, very fine grained, very silty, slightly calcareous,				sandstone member:		
	slightly bentonitic	1	0		Sandstone, light-gray to white, fine- to		
20.	Shale, medium-gray, poorly bedded,			40.	medium-grained, mostly medium-		
21	slightly bentonitic 2 ft 3 in below top-	4	6		grained in upper half of unit; shale		
21.	Sandstone, light-gray, very fine grained, thin and irregularly bedded, slightly				chips and mineral grains in basal 1 ft; conglomeratic lens 3 ft above base,		
	silty, scattered carbonaceous material-	5	0		with quartz pebbles up to ½ inch in		
22.	Shale, medium-gray, thin and evenly bed-	2	0		diameter	11	0
23	ded, slightly carbonaceous Sandstone, light-gray, very fine to fine-	3	0	41.	Sandstone, light-gray to white, fine- to medium-grained, few coarse grains in		
20.	grained, few medium grains, abundant				basal 2 ft; thick-bedded to massive,		
	dark and light mineral grains, very				crossbedded, scattered pyrite nodules -	45	0
	slightly calcareous, thin- to thick- bedded, thin-bedded and silty in top 2			42.	Shale, medium-dark-gray to medium-		
	ft	13	6		gray, weathered, poorly bedded, car- bonaceous, fossil rootlets	5	0
24.	Shale, medium-gray, medium-dark-gray			43.	Sandstone, light-gray to white, weath-		
	in basal 1 ft; very fine grained, thin and			4.4	ered, very friable, fine-grained, silty -	12	0
	evenly bedded, silty, sandstone lami- nations in upper half of unit	4	0	44.	Shale, medium- to medium-dark-gray, unevenly bedded	3	0
25.	Sandstone, medium-light-gray, very fine	•	-	45.	Sandstone, light-gray to white, fine-	,	J
	grained, very silty	1	0		grained, abundant dark mineral grains,		
26.	Shale, medium-gray, poorly bedded, scattered fossil plants	1	0		thin- to thick-bedded, crossbedded, scattered pyrite nodules	4	6
	toto rossir pianto	•	J			•	-

	Thick	ness			Thick	cness
	Ft	in			Ft	in
46. Shale, medium-gray, thin-bedded47. Sandstone, light-gray to white, fine- to medium-grained, thick-bedded to massive, abundant dark mineral grains,	2	0		Coal, resin blebs, bright to dull, banded- Tonstein, light-grayish-brown, coal lami- nations up to ½ in thick; flattened volcanic ash particles, sulfur stained,	1	6
scattered carbonaceous fragments, iron-stained, scattered pyrite nodules -	2	4	8.	coal fragmentsCoal, bright to dull attritus, fine cleats,		5
48. Shale, medium-gray, thin-bedded, slightly bentonitic, fossil rootlets	1	10		gypsum crystals, sulfur-stained, iron- stained, resin blebs	1	0
 Sandstone, light-gray, fine- to medium- grained, thick-bedded to massive, very calcareous, abundant dark mineral 				Shale, light-grayish-brown, carbonaceous, silty, sandy		2
grains, scattered pyrite nodules 50. Shale, medium-gray to medium-dark-	1	6	10.	Sandstone, medium-light-gray to light- gray, very fine to fine-grained, thin and irregularly bedded, basal 6 in silty	1	0
gray, slightly bentonitic, scattered slightly carbonaceous shale lenses 51. Sandstone, light-gray to white, fine-	5	6	11.	Shale, medium-gray, thin and evenly bed- ded; 7-in-thick sandstone lens 4 in above base; few thin siltstone lamina-		
grained, thin- to thick-bedded, abundant dark mineral grains, noncalcare-		•	12.	tionsSiltstone, medium-light-gray, thin and	2	2
ous 52. Shale, medium-dark-gray, slightly car- bonaceous, poorly bedded to nonbed-	12	0		irregularly bedded, very sandySandstone, medium-light-gray, very fine	1	6
ded 53. Sandstone, light-gray to white, very fine	4	0		to fine-grained, thin- to thick-bedded, solution cavities, scattered pyrite nod-		
grained, thin- to thick-bedded, scat- tered dark mineral grains	<u>15</u> +		14	ules, calcareous at top, silty, crossbed- ded	4	6
Total measured thickness of white sandstone member of Mesaverde	100	10	14.	evenly bedded, pyrite nodules, grades to silty shale in upper 8 in	2	6
Formation Total measured thickness of Mesaverde Formation	$\frac{123}{265}$	10	15.	Sandstone, medium-light-gray, very fine grained, thin-bedded, calcareous,		
Unconformity		=		pyrite nodules	1	2
Indian Meadows Formation:			16.	Siltstone, medium-gray, sandy, thin- to		
Overlying unit contains coarse conglom- erate with abundant petrified wood frag-			17	poorly bedded, fossil plants Underclay, medium-light-gray, upper 6 in	1	0
ments		Unit not	17.	light-grayish-brown, silty, thin- to poorly bedded, fossil plant fragments-		7
	_		18.	Coal, thinly banded, upper 1 in bony		7
Measured section 8b: Mesaverde Formation			19.	Shale, medium-gray to light-grayish- brown, thin-bedded, carbonaceous in		7
Location: Crowheart NE. Quadrangle, Wyoming (7.5 mi	n)		20	basal 3½ in, top gradational	1	7 0
Start: SE-NE-SW sec. 30, T. 6 N., R. 2 W. Presented		ldest to		Siltstone, medium-light-gray, shaly Underclay, medium-gray, fossil roots	1	0
youngest End: SE-NE-SW sec. 30, T. 6 N., R. 2 W.				Shale, light-grayish-brown, carbonaceous, silty, poorly bedded	1	3
Described by: R.C. Warlow and J.F. Windolph, Jr.			23	Underclay, medium-gray, fossil roots	1	2
Strike 80°, Dip 26° NE.				Shale, carbonaceous, thin-bedded		3
Upper Cretaceous:	Thick	ness		Coal, impure, resin blebs		2
Mesaverde Formation: 1. Shale, medium-dark-gray, thin and	Ft	in	26.	Shale, light-grayish-brown to medium- gray, thin and evenly bedded, fossil		
evenly bedded, slightly silty at top 2. Sandstone, medium-light-gray to light-	1	6+	27.	plant prints and rootsCoal, fine to medium cleats, bright, basal		7
gray, very fine to fine-grained, dark and light mineral grains, thin-bedded, fossil roots	1	2	28	4 in blocky with abundant resin blebs; upper ½ in shale laminations Tonstein, light-grayish-brown, fossil		10
3. Shale, light-brownish-gray, thin and evenly bedded, coal fragments, resin	•	2		plants, flattened volcanic ash frag- ments		3
blebs, fossil plants, basal 1 in medium- gray		4	29.	Coal, abundant resin blebs, fine to medium cleats, bright, upper 2 in slightly bony	1	8
attritus, slightly impure, banded, fine cleats		8	30.	Shale, light-grayish-brown, thin- to poorly bedded, carbonaceous, fossil		_
 Tonstein, light-grayish-brown, flattened volcanic ash particles, fossil plant frag- ments, resin blebs, sulfur-stained 		1	31.	plant and root fragments Underclay, medium-gray, nonbedded, abundant fossil roots	1	5 5
ments, tesiii bicos, suitui-stailied		1		additional 1000	1	J

		Thick	ness	Upper Cretaceous:	Thick	ness
		Ft	in	Cody Shale:	Ft	in
32.	Coal, fine cleats, bright, banded, resin blebs, upper 3 in impure bony, shale laminations, sulfur-stained, fusain at top	1	1	Shale, medium-gray, very fine grained, slightly silty, sandy, and carbonaceous; top gradational, base covered by alluvium	2	0
	Tonstein, medium-gray-brown, sulfur- stained, flattened volcanic ash parti- cles, coal fragments	•	3	2. Sandstone, medium-gray to medium-light- gray, very fine grained, thin-bedded, silty, interbedded with siltstone and	2	U
34.	Coal, bright, banded, resin blebs, medium cleats		6	shale	25	0
35.	Sandstone, medium-light-gray, very fine grained, silty, thin-bedded, top gradational	3	0	3. Sandstone, medium-light-gray, very fine grained, silty, massive, poorly cemented, solution cavities	18	0
36.	Shale, medium-gray, silty, scattered pyrite nodule bands; 7-in-thick medium-dark-gray bentonitic zone 3½ ft above	V	v	4. Shale, medium-gray, thin and evenly bedded, scattered gypsum crystals5. Sandstone, medium-light-gray, very fine	9	0
	base; top gradational	5	7	grained, thin-bedded, silty		5
	Siltstone, medium-light-gray, sandyShale, medium-gray to medium-dark-	1	2	6. Shale, medium-gray, thin and evenly bed-	1	8
	gray, pyrite nodule band at top; thin and evenly bedded; silty in top 4 in	1	10	7. Sandstone, medium-gray to medium-light-gray, very fine grained, silty	1	4
39.	Sandstone, medium-light-gray, very fine grained, thin-bedded, silty, crossbed-			8. Shale, medium-gray, thin and irregularly bedded, contains few silty and very	•	•
40.	ded, calcareous at top Underclay, medium-gray, basal 4 in silty, slightly bentonitic	1	9 6	fine grained sandstone laminations up to 2 in thick9. Sandstone, medium-light-gray, weathers	18	0
41.	Shale, medium-dark-gray to light-grayish- brown, carbonaceous, coal fragments,	2	0	light-grayish-brown, fine-grained, very calcareous, forms resistant ledge		8
42	gypsum crystals	1	0	10. Shale, medium-gray, thin and evenly bed- ded, silty, few sandy laminations		
	Underclay, medium-gray, fossil roots, coal fragments		3	11. Sandstone, medium-light-gray, very fine	1	4
	Coal, bright, banded, gypsum crystals, resin blebs		5	grained, thin-bedded, silty 12. Shale, medium-gray, thin and irregularly		5
	Shale, medium-gray, thin- to poorly bedded, upper 1 ft 10 in silty	3	6	bedded, contains abundant thin- bedded, very fine grained sandstone		
45.	Sandstone, very fine grained, thin- bedded, silty, calcareous, 7-in shale			beds mostly 1 to 2 in thick, locally up to 2 ft thick; upper 6 ft grades into very		
46	lens 8 in below top; solution cavities, pyrite nodules, fossil roots	3	0	sandy shale with a few medium-dark- gray shale laminations	36	_0
	Underclay, medium-gray, basal 3 in thin- bedded, silty, shaly	1	0	Total measured thickness of Cody Shale	113	10
47.	Shale, dark-gray, carbonaceous, few coal		11	Mesaverde Formation:		
48.	Shale, medium-gray, thin and evenly bed- ded, silty, basal 7 in slightly bentonitic;		11	13. Sandstone, light-gray to white, very fine grained, massive, thin- to thick-bedded		
49.	top gradationalSandstone, very fine grained, thin and	6	0	in upper 7 ft; crossbedded, friable, well-sorted, scattered dark and light mineral grains, few fossil rootlets at		
	irregularly bedded, basal 4½ ft silty;	10.		top	50	0
	Total measured thickness of Mesa	10+	_	 Sandstone, medium-light-gray, massive, very fine to fine-grained, upper 6 ft 		
	verde Formation==	<u>78</u>	<u>2</u>	slightly silty, calcareous, abundant solution cavities, scattered calcareous		
				nodules Base of Maverick Spring coal zone 15. Coal, dull to bright, thin-banded, scat-	85	0
1easur	ed section 9: Cody Shale and Mesaver	de		tered resin blebs and gypsum crystals- 16. Tonstein, light-grayish-brown, concoidal	1	0
ormati				fracture, scattered sulfur crystals		1
cation:	Eagle Point Quadrangle, Wyoming (7.5 min)			17. Coal, bright, scattered resin blebs		5
	Y-NE-SW sec. 29, T. 5 N., R. 1 E. Presented	from ol	dest to	18. Tonstein, weathers white, sulfur-stained-19. Coal, impure, abundant shale partings		3 5
d: NW-	-SW-SE sec. 29, T. 5 N., R. 1 E. by: R.C. Warlow and J.F. Windolph, Jr.			20. Shale, medium-dark-gray, thin and evenly bedded, silty, scattered fossil		
	, Dip 30° SE.			plant fragments	7	0

		Thick	ness			Thick	ness
		Ft	in	•		Ft	in
21.	Sandstone, medium-light-gray, very fine grained, thin-bedded, silty		10	43.	Shale, medium-gray, thin and evenly bed- ded		6
22.	Shale, medium-gray, thin and evenly bed- ded		10	44.	Siltstone, medium-gray, weathered rust- brown, fractured		10
23.	Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded, calcare-		10	45.	Underclay, medium-gray, poorly bedded, silty, fossil rootlets	2	6
24	ous		11	46.	Coal, impure, few bright laminations, thin-bedded	-	9
27.	siltstone interbeds, upper 2 in thin- bedded, very carbonaceous, fossil root-			47.	Coal, dull to bright, scattered resin blebs, medium cleats		10
25	letsCoal, bright, impure	2	6 2	48.	Shale, light-brownish-gray to medium-dark-gray, thin-bedded	1	4
	Shale, medium-dark-gray to dark-brown, thin-bedded, very carbonaceous	3	0	49.	Siltstone, medium-light-gray, weathered, thick-bedded to massive, calcareous	•	11
27.	Shale, medium-gray, thin- to poorly bed- ded, becomes silty toward top	3	4	50.	Shale, medium-dark-gray, scattered fossil rootlets	2	6
28.	Sandstone, medium-gray to medium-light- gray, very fine grained, thin and irreg-		4	51.	Shale, light-brownish-gray, thin-bedded, carbonaceous, coal fragments, plant	2	U
	ularly bedded, silty, abundant siltstone interbeds	4	0	52.	fragments		4
29.	Sandstone, very fine to fine-grained, thin- to thick-bedded, crossbedded, abun- dant solution cavities, calcareous, con-				gray; 4-in-thick ironstone band 7 in above base; 8-in-thick very fine grained, silty, sandstone lens 1 ft		
	tains 8-in-thick medium-gray shale lens 2½ ft above base	6	0	53.	below top	4	0
30.	Siltstone, medium-gray, with very fine grained, thin-bedded sandstone inter-				grained, thin-bedded, silty, pyrite nod- ules	2	0
31.	bedsShale, medium-gray, thin and evenly bed-	1	2		Shale, medium-dark-gray, thin and evenly bedded, slightly carbonaceous-		8
	ded; 4-in-thick ironstone band 9 in above base; scattered silty sandstone		0		Tonstein, light-grayish-brown, banded, volcanic skeletal crystalline material-		2
32.	Underclay, medium-gray, thin and evenly bedded	6	0 6	56.	Underclay, medium-gray, thin-bedded, upper 2 in slightly carbonaceous, scattered fossil rootlets	1	8
33.	Shale, light-grayish-brown, carbonaceous, abundant fossil plant fragments,	•	Ū	57.	Coal, bright to dull, medium cleats, scat- tered resin blebs and gypsum crystals-	1	1
34.	scattered carbonaceous fragments Coal, dull to bright, fine to medium		5	58.	Shale, medium-gray, thin and evenly bed- ded, silty	5	0
35.	cleats, scattered resin blebs Tonstein, light-grayish-brown, elliptical		9		Sandstone, medium-light-gray, very fine grained, thin-bedded, silty		10
36.	volcanic ash fragments Coal, bright to dull, fine to medium		11/2		Underclay, medium-gray, upper 2 in thin- bedded, very carbonaceous, shaly		6
27	cleats, few thin shale partings, scat- tered resin blebs		9	61.	Sandstone, medium-light-gray, very fine grained, thin-bedded, crossbedded,		
31.	Shale, medium-grayish-brown, thin and evenly bedded, very carbonaceous, very silty, upper 8 in medium-gray,			62	silty, calcareous, pyrite nodules, lens- shaped	3	0
38.	sandy	1	6		beddedSandstone, medium-light-gray, fine-	2	3
	grained, thin and irregularly bedded, silty, fossil roots	1	0		grained, thin-bedded	1	10
39.	Underclay, medium-gray, thin-bedded, top gradational; 5-in-thick sandy zone			65.	rootletsCoal, bright, fine to medium cleats, scat-		8
40.	5 in above base	2	0	66.	tered gypsum crystals Shale, medium-gray, silty, top grada-		8
	grained, thin to thick interbeds, contains lenses of dark and light mineral	12	0	67.	Sandstone, medium-light-gray, very fine	1	2
41.	grains Shale, medium-gray, thin-bedded, silty, few fossil rootlets	12	0	68	to fine-grained, thin-bedded, very cal- careous	6	0 10
42.	Shale, medium-dark-gray to light-brownish-gray, very carbonaceous,	•	J		Shale, light-brownish-gray, carbona- ceous		10
	scattered gypsum crystals, scattered coal laminations	1	8	70.	Coal, bright, banded, medium cleats, scattered resin blebs	2	4

		Thickn	ess		Thickn	ess
		Ft	in		Ft	in
	Shale, light-grayish-brown, upper 1 ft 4 in medium-gray, thin and evenly bedded-Sandstone, medium-light-gray, very fine	2	6	95. Coal, dull to bright, fine to medium cleats, scattered resin blebs (Glass and		
12.	to fine-grained, thin- to thick-bedded, silty, dark and light mineral grains,			Roberts, 1978, table 2, p. 371)96. Underclay, dark-grayish-brown, carbon-	5	6
	very calcareous	8	0	aceous, abundant plant fossils and coal		
	Shale, light-olive-gray, very sandy		4	fragments		4
	Coal, dull to bright, finely cleated, scattered resin blebs		4	97. Coal, impure, 30 percent shale partings - Top of Barquin coal bed		5
75.	Underclay, dark-grayish-brown, carbon- aceous, fossil rootlets, abundant plant		•	98. Tonstein, light-grayish-brown, few phenocrysts, scattered gypsum crystals		2
76.	fossils, scattered resin blebs Tonstein, light-grayish-brown, weathers	1	2	Top of Maverick Spring coal zone		2
	white, banded		1	99. Shale, dark-grayish-brown, thin and		
77.	Coal, dull, scattered bright, medium		_	evenly bedded, abundant coal frag-		
78.	Sandstone, medium-gray, very fine grained, poorly bedded to nonbedded,	1	1	ments and plant fossils, very carbonaceous		3
	very silty		10	100. Shale, medium-gray, thin and evenly bed-		
79.	Shale, medium-dark-gray, thin and		•	ded, basal 1 ft bentonitic; abundant siltstone laminations in upper 3 ft	7	
80	evenly bedded Underclay, dark-grayish-brown, fossil	1	3	101. Sandstone, medium-light-gray, very fine	,	6
00.	rootlets		4	grained, thin- to thick-bedded, scat-		
	Coal, dull, impure, medium cleats	1	0	tered dark and light mineral grains,		
82.	Shale, medium-gray, thin and evenly bed- ded		0	very calcareous in upper half; scattered		
83.	Siltstone, medium-light-gray, thin- to		9	pyrite nodules	8	_0
	poorly bedded, scattered pyrite nod-			Total measured thickness of Mesaverde Formation	314	1/2
9.1	ulesSandstone, medium-light-gray, very fine	3	0	=		===
04.	grained, very silty, thin- to poorly bed- ded, very silty, very calcareous, very					
05	iron stained	14	0			
	Underclay, sandy and silty, scattered plant fossils	1	0	Measured section 10: Cody Shale through Formation	Meet	eetse
00.	thin- to thick-bedded, crossbedded,			Location: Eagle Point and Lookout Butte Quadrangles,	Wyomin	ıg (7.5
	scattered pyrite nodules, fills channels			min); approximately 1 mi WNW. of the Barquin coal n	nine	•
97	in unit 85 laterally along outcrop	9	0	Start: NW-NE-SW sec. 30, T.5 N., R.1 E. Presented youngest	from old	dest to
07.	Underclay, dark-grayish-brown, thin and irregularly bedded, very carbonaceous,			End: SW-SE-NW sec. 31, T.5 N., R.1 E.		
	scattered plant fossils and coal frag-			Described by: N.L. Hickling, R.C. Warlow, and J.F. Wir	dolph, l	lr.
00	ments, scattered fossil rootlets		5	Strike 105°, Dip 40° SW.		
00.	Coal, dull, impure, medium cleats, sparse resin blebs	1	1	Upper Cretaceous:	Thickne	ess
89.	Shale, medium-dark-gray, thin and irreg-	•	•	Cody Shale:	Ft	in
	ularly bedded, very silty, siltstone band			 Shale, medium-gray, thin and evenly bed- ded, with thin sandstone and siltstone 		
	5 ft above base, carbonaceous in basal 2 in	7	0	interbeds	75	0
90.	Siltstone, medium-gray, thin-bedded, cal-	,	U	Total measured thickness of Cody		_
0.1	careous, scattered pyrite nodules	2	1	Shale================================	75	$\stackrel{0}{=}$
91.	Shale, medium-dark-gray, thin and evenly bedded, scattered plant fossils,			Mesaverde Formation:		
	slightly silty, becomes carbonaceous			Sandstone, light- to medium-gray, iron- stained, fine- to medium-grained, solu-		
	toward top	1	6	tion cavities, scattered pyrite nodules,		
92.	Underclay, dark-grayish-brown, scattered			thick-bedded to massive, crossbedded,		
	plant fossils, scattered resin blebs, car- bonaceous		2	resistant3. Shale, medium-gray, thin and evenly bed-	95	0
Base	e of Barquin coal bed		-	ded, interbedded siltstone laminations		
93.	Coal, dull to bright, fine to medium	_		in upper 2 ft	8	0
94	cleats, scattered resin blebs Tonstein, light-grayish-brown, banded,	1	9	4. Sandstone, light-gray, fine-grained, thick-		
- 11	few phenocrysts, fossil roots, excellent			bedded to massive, solution cavities, upper 1 ft contains fossil plant frag-		
	preserved plant fossils		7	ments; very resistant	49	0

		Thick	ness			Thick	kness
		Ft	in			Ft	in
_	se of Maverick Spring coal zone Underclay, light- to medium-brownish-			27.	Shale, medium-gray, thin and evenly bedded, scattered thin siltstone lamination,		
٥.	gray, abundant fossil plant material, scattered fossil rootlets		_	28.	becomes carbonaceous toward top Underclay, medium-gray, scattered fossil	1	2
6.	Coal, finely cleated, mostly bright, sparse		5	29.	plant and coal fragmentsCoal, impure, mostly bright, fine-cleated-		4 5
7.	resin blebs Underclay, light-pinkish-gray to light-		10	30.	Shale, medium-gray, thin and evenly bed- ded		7
	brownish-gray, abundant fossil plant material		2	31.	Shale, medium-brownish-gray, carbonaceous		5
	Coal, impure, finely cleated, 20 percent laminated shale		7		Coal, bright and dull, impure, scattered resin blebs		2
	Shale, medium-brownish-gray, thin and irregularly bedded, carbonaceous	1	6		Shale, medium-gray, thin and evenly bed- ded	9	0
	Shale, medium-gray, thin and evenly bed- ded, siltstone laminations	2	0		Shale, thin and evenly bedded, carbonaceous		10
11.	Siltstone, medium-light-gray, thin and irregularly bedded, shale lens 2 in thick 6 in above base; carbonaceous in top 1			35.	Siltstone, medium-gray, thin- to thick- bedded, calcareous, forms resistant ledge	2	6
12	inSandstone, medium-gray, thin and evenly	1	9	36.	Shale, medium-gray, thin and evenly bed- ded, 20 percent siltstone laminations -	10	8
12.	bedded, very fine to fine-grained, cal- careous zones up to 2 in thick; forms	•		37.	Underclay, dark-brownish-gray, highly weathered, sandy, fossil plant frag-	10	_
13.	resistant ledge	3	0	38.	Coal, mostly bright, fine to medium cleats		5 6
14.	in upper 1 ftShale, medium-purplish-gray, thin and	2	0	39.	Shale, medium-gray, thin and evenly bed- ded	1	2
15	evenly bedded to thin and irregularly bedded, carbonaceous	1	8	40.	Siltstone, medium-light-gray, thin- to thick-bedded, sandy, very calcareous, iron-stained, carbonaceous shale		
	dedSiltstone, medium-gray, very calcareous,		9	41.	lensesShale, medium-gray, thin and evenly bed-		8
20.	20 percent interbedded medium-gray shale	4	2		ded	2	0
17.	Siltstone, medium-gray, thin and irregularly bedded, very calcareous, sandy,	·	-		plants and coal fragments Coal, mostly bright, finely cleated, resin		8
10	pyrite nodules, iron-stained, forms resistant ledge	3	10	44.	blebs Shale, medium-gray, thin and evenly bedded, bentonitic	1	7 0
10.	ded, siltstone laminations up to 1 in thick in middle of unit	2	8	45.	Sandstone, medium-light-gray, very fine grained, thick and evenly bedded,	•	Ü
19.	Shale, medium-grayish-brown, thin and evenly bedded, carbonaceous	4	0	46.	silty, very calcareousShale, medium-gray, thin and evenly bed-	1	2
	Shale, medium-gray, thin and evenly bedded, thin and irregularly bedded at top-	1	0	47.	ded, carbonaceous	1	4
21.	Underclay, medium-gray, scattered fossil plant fragments, scattered fossil root-lets		3	40	bedded at base to thick-bedded at top, sandy, calcareous	1	2
22.	Coal, bright, finely cleated, scattered resin blebs, 2-in-thick bone parting 9 in		3		dedBentonite, light-gray, soft	1	8 2
23.	above base	1	4		Sandstone, medium-light-gray, fine- grained, massive at base; silty	2	2
24.	irregularly bedded, carbonaceous Sandstone, medium-gray, very fine to fine-grained, scattered light and dark		6		Shale, medium-gray, thin and evenly bed- ded, bentonitic in basal half of unit Underclay, medium-brownish-gray,	1	4
	mineral grains, thin and irregularly bedded	1	3	53.	highly weatheredCoal, bright, finely cleated		1 4
25.	Shale, medium-gray, thin and evenly bed- ded	1	3		Shale, medium-brownish-gray, plant fossils, carbonaceous		3
26.	Sandstone, medium-gray, very fine grained, crossbedded, silty, iron-	-	J	55.	Shale, medium-gray, thin and evenly bed- ded		4
	stained, scattered pyrite nodules, very resistant in top 6 in	2	8	56.	Siltstone, medium-gray, calcareous, sandy		4

		Thickn	ess			Thick	ness
		Ft	in			Ft	in
57.	Shale, medium-gray, thin and irregularly			82.	Bentonite		1
	bedded		6	83.	Sandstone, fine- to medium-grained,		
58	Siltstone, medium-gray, thin and irregu-		U		light-medium-gray, light and dark min-		
50.	larly bedded, sandy		-		eral grains, thick-bedded to massive,		
50	taran da araba da ar		5		solution cavities, pyrite nodules	25	10
39.	Underclay, medium-brownish-gray, fossil		_	84.	Sandstone, medium-gray, thin and evenly		
	plant fragments and resin blebs		6		bedded	5	2
60.	Coal, mostly bright, fine to medium			85.	Underclay, medium-brownish-gray, fossil		
	cleats, resin blebs	1	2		rootlets, very weathered		4
61.	Shale, medium-gray, thin and evenly bed-			86.	Coal, dull to bright, fine cleats, highly		_
	ded		10		weathered		6
62.	Sandstone, medium-light-gray, very fine			87.	Sandstone, very fine grained, thin and		
	grained, thin and irregularly bedded,				irregularly bedded, silty, calcareous,		
	silty	1	0	00	iron-stained	1	4
63	Shale, medium-gray, thin and evenly bed-	-	Ū	88.	Shale, medium-gray, thin and irregularly	2	^
05.	ded, siltstone laminations up to ½ in			90	bedded, thin sandstone laminations	2	0
	thick	4	0	89.	Underclay, medium-brownish-gray, abun-	•	2
64	Underclay, medium-brownish-gray, high-	т.	U	00	dant plant fossils		3 4
٠	ly weathered fossil plant fragments up				Coal, dull to bright, impure		4
	to ½ in thick		6	91.	Shale, medium-gray, thin and irregularly bedded, bentonitic	•	10
65.	Coal, bright, fine to medium cleats, resin		Ü	02			10
•••	blebs	1	6	92.	Siltstone, medium-light-gray, thin and evenly to irregularly bedded, very cal-		
66.	Shale, medium-gray, thin and evenly bed-	-	-		careous	1	6
	ded		9	93	Shale, medium-gray, thin and evenly bed-		Ü
67.	Siltstone, medium-gray, thin and irregu-			,,,	ded	1	0
	larly bedded	20	4	94	Underclay, medium-gray, abundant fossil	•	Ü
Ton	of Maverick Spring coal zone			24.	plant material and rootlets		4
	Sandstone, light-medium-gray, fine-			95.	Coal, dull to bright, fine cleats, highly		•
	grained, iron-stained, thick-bedded,			,,,,	weathered		1
	very calcareous, resistant	3	0	96.	Bentonite and shale, light-gray		2
69.	Sandstone, medium-gray, thick-bedded to				Sandstone, light- to medium-gray, fine- to		
	massive, crossbedded, light and dark				medium-grained, thick-bedded, solu-		
	mineral grains, pyrite nodules, solution				tion cavities, pyrite nodules	22	6
	cavities	55	0	98.	Shale, medium-gray, thin and evenly bed-		
70.	Shale, medium-gray, thin and evenly bed-				ded	4	8
	ded	6	4	99.	Sandstone, medium-gray, fine-grained,		
71.	Sandstone, medium-light-gray, fine-				iron-stained, thick-bedded to massive,		
	grained, light and dark mineral grains,				solution cavities, pyrite nodules	38	0
	thick-bedded to massive, crossbedded,			100.	Shale, medium-gray to medium-brownish-		
	pyrite nodules	20	6		gray, becomes carbonaceous in top part		
72.	Shale, medium-gray, thin and evenly bed-				of unit; thin siltstone laminations at		•
72	ded	1	4	101	basal contact		8
13.	Underclay, medium-brownish-gray, high-	1	4		Siltstone, medium-gray, thin-bedded		8
74	ly weathered, plant fossil fragments		4	102.	Shale, medium-gray, thin and evenly bed-		
74.	Coal, dull, very impure, highly weath-		0		ded, becomes carbonaceous toward		10
75	shale, medium-gray, thin and irregularly		8	102	top		10
15.	bedded, bentonitic in basal 2 in		8	103.	Sandstone, fine- to medium-grained, thin-		
76	Sandstone, medium-gray, fine-grained,		o		to thick-bedded, scattered pyrite nod- ules, thin shale lenses 1 to 2 in thick -	64	2
70.	thick and irregularly bedded, crossbed-			104	Shale, medium-gray, thin and evenly bed-	04	2
	ded, nonresistant, iron-stained, very			104.	ded, grades carbonaceous at top		8
	calcareous, pyrite nodules	11	0	105	Underclay, medium-brownish-gray, abun-		Ü
77.	Shale, medium-gray, thin and evenly bed-	••	Ü	100.	dant fossil plant material		6
	ded		8	106.	Coal, very impure, highly weathered		3
78.	Sandstone, medium-light-gray, fine-		•		Sandstone, light-medium-gray, very fine		-
	grained, several thin shale laminations,			10,,	grained, thin-bedded, thin shale lami-		
	thin and irregularly bedded, massive,				nations	8	6
	calcareous laminations, resistant beds-	44	0	108.	Shale, thin-bedded, few siltstone lamina-	-	
79.	Shale, medium-gray, thin and evenly bed-				tions, carbonaceous toward top, sandy-	9	10
	ded	7	6	109.	Sandstone, medium-light-gray, fine-		
80.	Underclay, medium-brownish-gray, fossil				grained, thin-bedded, pyrite nodules,		
	plant material		4		solution cavities	1	4
81.	Coal, very impure, dull, weathered		2	110.	Shale, thin and evenly bedded, sandy,		

		Thick	ness			Thick	ness
		Ft	in			Ft	in
	siltstone laminations, carbonaceous in				tions interbedded with 15 percent cal-		
	basal 6 in	10	2		careous siltstone	38	0
111.	Sandstone, very fine grained, light and			132.	Shale, medium-gray, thin and evenly bed-	0	,
	dark mineral grains, iron-stained,			122	ded, carbonaceous in upper 3 ft 2 in-	9	6
	pyrite nodules, very calcareous, solution cavities	9	0	133.	Sandstone, medium-gray, very fine to fine-grained, fossil plant fragments;		
112	Shale, basal 7 in carbonaceous, upper 3 in	,	U		basal 2 ft 2 in thin and irregularly		
112.	medium-gray, thin and evenly bedded-		10		bedded, very calcareous; upper 8 in		
113.	Sandstone, medium-gray, very fine				thin bedded; pyrite nodules, crossbed-		
	grained, iron-stained, thin and irregu-				ded	2	10
	larly bedded, calcareous, resistant			134.	Shale, medium-gray, thin and evenly bed-		
	ledges	10	0		ded	2	0
114.	Shale, medium-gray, thin and evenly bed-			135.	Siltstone, thin and irregularly bedded,		
	ded		10		highly calcareous, iron-stained	1	2
115.	Siltstone, medium-gray, very calcareous,	_	10	136.	Shale, medium-gray, thin and evenly bed-	2	10
116	thin and irregularly bedded	5	10	127	ded, carbonaceous in top 3 in	2	10
110.	Shale, medium-gray, thin and evenly bed- ded, carbonaceous in middle part with			157.	Sandstone, light- to medium-gray, fine- grained, silty, thin and irregularly to		
	7-in bentonitic zone	5	8		evenly bedded, crossbedded	4	0
117.	Sandstone, very fine grained, iron-	-	Ů	138.	Shale, underclay, medium-brownish-	•	Ů
	stained, scattered pyrite nodules, solu-			2001	gray, thin and irregularly bedded, fos-		
	tion cavities, very calcareous, scattered				sil plant material, carbonaceous		10
	thin shale laminations in 10 percent of			139.	Coal, mostly bright, fine to medium		
	unit	33	4		cleats, resin blebs		10
118.	Siltstone, medium-gray, iron-stained,			140.	Shale, medium-brownish-gray, carbon-		_
	very calcareous, thin and irregularly	17		1.41	aceous		3
110	bedded	16	4	141.	Sandstone, light-medium-gray, very fine		
119.	Sandstone, light-medium-gray, very fine to fine-grained, iron-stained, solution				grained, pyrite nodules thick- to thin- bedded, 10 percent shale laminations;		
	cavities, pyrite nodules, thin to thick				resistant calcareous ledges	13	0
	and irregularly bedded, crossbedded,			142.	Shale, medium-gray, thin and evenly bed-	15	Ū
	calcareous	22	8		ded	1	2
120.	Shale, medium-gray, thin and evenly bed-			143.	Underclay, medium-grayish-brown, high-		
	ded, carbonaceous in upper 3 ft	4	6		ly weathered, abundant fossil plants		3
121.	Sandstone, medium-gray, very fine				Coal, very impure, highly weathered		7
	grained, silty, very calcareous, pyrite	_	40	145.	Sandstone, light- to medium-gray,		
122	nodules, resistant	5	10		medium-grained, light and dark min-		
122.	Shale, medium-gray, thin and evenly bed- ded		6		eral grains, thick-bedded to massive, iron-stained, solution cavities, cross-		
123	Underclay, medium-brownish-gray,		U		bedded, resistant calcareous, concre-		
123.	highly weathered		4		tions up to 2 ft in length	60	6
124.	Coal, highly impure, dull, highly weath-		•	146.	Shale, medium-gray, thin and irregularly		
	ered		2		bedded	8	2
125.	Sandstone, medium-gray, very fine to			147.	Siltstone, light-gray, thin to thick and		
	fine-grained, thin-bedded; fossil plants				irregularly bedded	2	6
	in basal 10 in, thin and irregularly	_		148.	Sandstone, medium gray, fine grained,	_	
126	bedded, very calcareous, iron-stained-	5	2	140	massive	8	0
126.	Shale, medium-gray, thin and evenly bed-			149.	Shale, bentonitic, carbonaceous in upper	2	4
	ded to thin and irregularly bedded, sandy, few thin siltstone laminations -	16	2	150	1½ ftSandstone, medium-gray, fine-grained,	2	-
127	Sandstone, medium-gray, very fine to	10	2	150.	thin and irregularly bedded, pyrite nod-		
127.	fine-grained, 5 percent thin and evenly				ules, very calcareous	9	8
	bedded, iron-stained, crossbedded,			151.	Shale, medium-gray, thin and evenly bed-		
	pyrite nodules, shale laminations, solu-				ded	5	0
	tion cavities in basal portion, resistant-	65	6	152.	Siltstone, medium-gray, very calcareous,		
128.	Shale, medium-gray, thin and evenly bed-		_		sandy, thin sandstone laminations in		
120	ded	4	2		upper half of unit; carbonaceous in	11	10
129.	Sandstone, light-medium-gray, very fine	10	•	152	upper third of unit	11	10
130	grained, fossil plants, solution cavities- Shale, medium-gray, thin and evenly bed-	10	2	133.	Sandstone, fine-grained, thin to thick and irregularly bedded, crossbedded, iron-		
150.	ded, carbonaceous in top 4 in	1	0		stained, pyrite nodules, resistant, cal-		
131.	Sandstone, medium-gray, fine-grained,	•	•		careous concretions	24	4
	pyrite nodules, iron-stained solution			154.	Shale, medium-gray, thin and evenly bed-		
	cavities, 10 percent thin shale lamina-				ded	5	3

		Thick	ness			Thick	ness
		Ft	in			Ft	in
155.	Sandstone, light- to medium-gray, fine- to medium-grained, light and dark min-			178.	Underclay, medium-brownish-gray, fossil plant material		10
	eral grains, thin and irregularly bed- ded, crossbedded		10	179.	Sandstone, very fine to fine-grained, silty, pyrite nodules very calcareous,		
156.	Shale, medium-gray, thin and evenly bedded, 10 percent thin calcareous silt-		••		solution cavities, siltstone laminations in basal 3 ft	8	10
157	stone laminations	4	8	180.	Shale, medium-gray, thin and evenly bed- ded	1	4
137.	grained, silty, very calcareous, thin and evenly bedded, siltstone in medial part, basal 3 ft thin and evenly bedded; 8-in-thick shale bed 1 ft below top;				Sandstone, fine-grained, iron-stained, scattered pyrite nodules, solution cavities, calcareous, basal portion thin-bedded	17	0
158.	thick bedded and resistant at top Shale, medium-gray, thin and evenly bed-	9	0	182.	Sandstone, light- to medium-gray, medium-grained, light and dark mineral grains, thin-bedded to massive,s-		
159.	ded, very carbonaceous basal part Underclay, medium-brownish-gray, fossil		4		olution cavities, pyrite nodules, resis-	40	0
160.	plant materialSiltstone, medium-gray, thin and irregu-	1	6	183.	tant, very calcareous, crossbedded Shale, medium-gray, thin and evenly bed-		
161.	larly bedded, highly weathered Sandstone, medium-gray, fine-grained, iron-stained, pyrite nodules thin- to	1	6	184.	ded, carbonaceous	5	2
160	thick-bedded, crossbedded	5	4	185.	fossil plants, pyrite nodules Shale, medium-gray, thin and evenly bed-	1	4
102.	Shale, medium-gray, thin and evenly to thin and irregularly bedded, carbonac-	_			dedSandstone, light- to medium-gray, fine-	3	2
163.	eous, bentonite in top 1 ft	5	8	2001	grained, thin and irregularly bedded, fossil plants, pyrite nodules	1	8
164.	grained, thin and irregularly bedded Shale, medium-gray, thin and evenly bed- ded, thin calcareous siltstone lamina-	1	6	187.	Shale, medium-gray, thin and evenly bedded, upper 1 ft 4 in has calcareous		
165.	tions in upper 2 ft	13	4	188.	siltstone laminations	2	8
166.	careousShale, medium-gray, thin and evenly bed-	5	6	189.	Shale, medium-gray, thin and evenly bed- ded, carbonaceous in upper 6 ft 11 in,	20	0
167.	ded, very carbonaceous in upper 8 in- Sandstone, light- to medium-gray, very fine grained, calcareous, thin and irreg-	6	6	190.	siltstone laminations in upper 3 ft 5 in- Siltstone, thin and irregularly bedded,	10	4
168.	ularly bedded, scattered pyrite nodules- Shale, medium-gray, thin and evenly bed-	9	8	191.	very calcareous	1	6
	dedSiltstone, very calcareous in base, iron-	4	2		medium-grained, thick-bedded, pyrite nodules, solution cavities, resistant, calcareous	5	2
	stained, thin and evenly bedded, thin and irregularly bedded in upper 8 in	1	6	192.	Shale, medium-gray, thin and evenly bed- ded	2	2
	Sandstone, fine-grained, silty, pyrite nodules, solution cavities, resistant	5	0	193.	Sandstone, light-gray, medium-grained, light and dark mineral grains, scattered		
	Shale, medium-gray, thin and evenly bedded		10		pyrite nodules, iron-stained, noncalcareous	4	6
172.	Sandstone, fine-grained, light and dark mineral grains, thick- to thin-bedded, shale lens 2 ft above base	8	10	194.	Shale, medium-gray, thin and evenly bedded, 6-in sandstone laminations 2 ft	6	2
173.	Shale, medium-gray, thin and evenly bed-			195.	below topSiltstone, medium-gray, thin-bedded, cal-	6	2
	ded, basal 5 in carbonaceous Sandstone, medium-gray, very calcare- ous, thin-bedded, iron-stained	5	10	196.	Sandstone, fine-grained, light and dark mineral grains, solution cavities, fossil	1	6
175.	Shale, basal 2 in carbonaceous, siltstone laminations in medial part	1	2	197.	plants Shale, medium-gray, thin and evenly bed-		10
176.	Sandstone, fine-grained, light and dark mineral grains, thin and irregularly bedded, solution cavities, resistant	1	4		ded		10
177.	Shale, medium-gray, thin and evenly bed- ded	1	8		and dark filmeral grains, till to tillek and irregularly bedded, solution cavi- ties, pyrite nodules, calcareous	5	0

		Thick	ness			Thick	ness
		Ft	in			Ft	in
	Shale, medium-gray, thin and evenly bed- ded	5	0	224.	Sandstone, medium-gray, medium- grained, light and dark mineral grains, thick-bedded to massive, iron-stained, pyrite nodules, solution cavities, upper		
	thin- to thick-bedded, calcareous silt- stone in basal third of unit; pyrite	12	0	225	8 ft light-gray, thin and irregularly bedded	35	0
201.	nodules, solution cavities Shale, medium-gray, thin and evenly bed- ded	13	0		Shale, medium-gray, thin and evenly bed- ded	6	6
	Underclay, medium-brownish-gray, fossil plant material		8	220.	grained, iron-stained, pyrite nodules; lens of shale 6 in thick, calcareous		
	Shale, medium-gray, thin evenly bedded- Shale, medium-brownish-gray, carbonac- eous	2	4	227	siltstone laminations in lower third of unit, resistant	20	4
205	Coal, impure, detrital, transported		2 1	221.	Shale, medium-gray, thin and evenly bed- ded		10
	Sandstone, light- to medium-gray, very		1	228	Underclay, medium-brownish-gray, fossil		10
200.	fine to fine-grained, thin- to thick-			220.	plant material, highly weathered		1
	bedded, pyrite nodules, solution cavi-			229	Coal, bright to dull, highly weathered,		•
	ties	1	0	227.	impure		2
207.	Shale, medium-gray, thin and evenly bed-	•	·	230	Sandstone, light- to medium-gray, fine-		-
	ded, becomes carbonaceous in top half			200.	grained, light and dark mineral grains,		
	of unit		8		lower 3 ft thin-bedded, nonresistant,		
208.	Sandstone, medium-gray, very fine				upper 2 ft thick-bedded to massive	5	0
	grained, silty, iron-stained, pyrite nod-			231.	Shale, medium-brownish-gray, carbonac-		
	ules, fossil plants		10		eous, thin and irregularly bedded		5
209.	Shale, medium-gray, thin and irregularly			232.	Sandstone, light- to medium-gray,		
	bedded to thin and evenly bedded,				medium-grained, light and dark mineral		
	siltstone laminations, upper third of	_			grains, iron-stained, pyrite nodules,		
	unit calcareous, resistant	6	6		solution cavities, crossbedded; 6-in-		_
210.	Sandstone, medium-gray, very fine to				thick shale lens 10 in above base	4	2
	fine-grained, thin- to thick-bedded,			233.	Siltstone, medium-gray, thin and irregu-		
	pyrite nodules, iron-stained, solution cavities	3	0		larly bedded, mostly nonresistant,		
211	Shale, medium-gray, thin and evenly bed-	3	U		basal 4 in shale lens; calcareous lami- nations, resistant	9	4
211.	ded, siltstone laminations, upper 3 ft of			234	Sandstone, fine- to medium-grained, light	,	7
	unit calcareous, resistant	11	4	254.	and dark mineral grains, thick-bedded,		
212.	Sandstone, fine-grained, thick-bedded,				pyrite nodules, solution cavities, cross-		
	scattered pyrite nodules, iron-stained,				bedded	1	2
	solution cavities, crossbedded	5	4	235.	Shale, medium-gray, thin and evenly bed-		
213.	Shale, medium-gray, thin and evenly bed-				ded	6	2
	ded	1	0	236.	Sandstone, fine-grained, thin and irregu-		
214.	Underclay, medium-brownish-gray, fossil		_		larly bedded, iron-stained, very calcar-		
015	plants, coal fragments		5	225	eous		10
215.	Shale, medium-gray, thin and evenly bed-	1	2	237.	Shale, medium-gray, thin and evenly bed-	10	-
216	ded, thin calcareous siltstone interbeds-	1	2	220	dedSandstone, medium-gray, very fine to	10	6
210.	Siltstone, medium-gray, thin and irregularly bedded		9	236.	fine-grained, thin and irregularly bed-		
217.	Sandstone, very fine to fine-grained,		,		ded, iron-stained, fossil plants, very		
	thick-bedded, iron-stained, pyrite nod-				calcareous, resistant	1	4
	ules, solution cavities, resistant	4	6	239.	Shale, medium-gray, thin and evenly bed-		
218.	Shale, medium-gray, thin and evenly bed-				ded	6	6
	ded	4	6	240.	Sandstone, medium-gray, very fine		
219.	Underclay, medium-brownish-gray, fossil				grained, thin-bedded, iron-stained,		
	plant material		10		very calcareous, pyrite nodules, resis-		
220.	Shale, medium-brownish-gray, thin and		_		tant		10
201	evenly bedded, carbonaceous		8	241.	Shale, medium-gray, thin and evenly bed-		,
221.	Shale, medium-gray, thin and evenly bed-	F	10	2.42	ded	1	6
222	ded	5	10	242.	Sandstone, light- to medium-gray, very		
ZZZ.	Sandstone, medium-gray, very fine to				fine to fine-grained, iron-stained, solu-		
	fine-grained, thin- to thick-bedded, silty, iron-stained, pyrite nodules, very				tion cavities, pyrite nodules, very cal- careous, resistant	11	6
	calcareous	11	4	243	Shale, medium-gray, thin and evenly bed-		J
223.	Shale, medium-gray, thin and evenly bed-		•	۵٦٥.	ded, calcareous siltstone, laminations		
_=	ded, sandstone lamination interbeds	15	10		in upper 7 in	1	8
	,	-	-		-rr ·		

		Thick	ness			Thick	kness
		Ft	in			Ft	in
244.	Sandstone, medium-gray, very fine	• • •	•••		bedded, pyrite nodules, solution cavi-		
	grained, silty, iron-stained, scattered				ties, crossbedded	9	2
	pyrite nodules, calcareous	5	0	268.	Shale, medium-gray, thin and evenly bed-		
245.	Shale, medium-gray, thin and evenly bed-				ded, few thin, siltstone laminations,	20	
	ded, sandy	6	4	260	calcareous	20	4
246.	Sandstone, fine- to medium-grained, thin-			209.	Sandstone, light- to medium-gray, fine- to medium-grained, thin- to thick-		
	to thick-bedded, crossbedded, basal 3				bedded, pyrite nodules, crossbedded,		
	ft interbedded siltstone and shale lam-				solution cavities very calcareous	24	0
	inations, calcareous, solution cavities,			270.	Shale, medium-gray, thin and evenly bed-		-
	resistant	10	8		ded, grades into carbonaceous, alter-		
247.	Shale, medium-gray, thin and irregularly	_			nating siltstone and shale laminations		
240	bedded	6	6		in upper 2 ft	6	0
248.	Sandstone, light-medium-gray, very fine			271.	Sandstone, medium-gray, fine-grained,		
	to fine-grained, thin-bedded, pyrite nodules, very calcareous, solution cav-				iron-stained, thick-bedded, pyrite nod-		2
	ities	1	6	272	ules, very calcareous, resistant Shale, upper 4 ft medium-blue-gray,	6	2
249.	Shale, medium-gray, thin and evenly bed-	•	v	212.	lower 2 ft medium-olive-gray, thin and		
	ded	1	2		irregularly bedded	6	0
250.	Underclay, light- to medium-brownish-			273.	Shale, medium-green-gray, thin and		·
	gray, abundant fossil plants		7		irregularly bedded, sandy	1	2
251.	Shale, medium-gray, thin and irregularly			274.	Shale, upper 7 in medium-gray; lower 7 in		
	to thin and evenly bedded, calcareous,				light- to medium-olive-gray; thin and		
	5-in-thick zone of siltstone laminations	•	•		irregularly bedded	1	2
252	in middle part of unit	2	0	275.	Sandstone, fine- to medium-gray, mas-		
252.	Sandstone, light- to medium-gray, very				sive, blocky, solution cavities, cross-	25	
	fine to fine-grained, thin and irregularly bedded, pyrite nodules, slightly			276	beddedShale, lower 3 ft medium-olive-gray, next	25	6
	calcareous	55	8	270.	1ftdark-bluish-gray, remaindermedium-		
253.	Shale, medium-gray, thin and evenly bed-		•		gray	9	4
	ded		6	277.	Siltstone, medium-gray, thin and irregu-		•
254.	Underclay, medium-brownish-gray, abun-				larly bedded to thin and evenly bedded,		
	dant fossil plants, coal fragments		4		resistant, interbedded, light-gray, very		
255.	Coal, bright, bony		5		fine grained, sandstone laminations	42	_0
256.	Shale, medium-gray, thin and evenly bed-		,		Total measured thickness of main		
257	dedSandstone, light- to medium-gray, fine-		6		body of Mesaverde Formation	1,842	<u></u>
231.	grained, light and dark mineral grains,				sandstone member:		
	thin- to thick-bedded, resistant, cross-			278.	Sandstone, light- to medium-gray, dark		
	bedded	2	4		and light mineral grains, clean, well-		
258.	Shale, gray, thin and evenly bedded, car-				sorted, thick-bedded to massive, pyrite		
	bonaceous in upper 6 in	1	4		nodules, crossbedded, solution cavities; 8-in-thick grayish-red shale, lens-		
259.	Sandstone, medium-gray, fine-to medium-				shaped bed, 51 ft above base; 6-in-		
	grained, very calcareous, thin and				thick grayish-red shale bed, thin and		
260	irregularly bedded, pyrite nodules	4	8		irregularly bedded, 10-in gray, thin and		
200.	Shale, medium-brownish-gray, thin and irregularly bedded, carbonaceous	4	0		evenly bedded shale bed and 6-in red,		
261.	Siltstone, medium-gray, weathered	1	4		thin and irregularly bedded shale bed		
	Shale, medium-gray, thin and evenly bed-	-	•		87 ft above base; zone of thin-bedded,		
	ded, sandy, carbonaceous in lower 2 ft-	11	4		iron-stained siltstone and sandstone;		
263.	Sandstone, medium-gray, fine-grained,				mostly sandstone, light-gray, 104 ft above base	104	0
	thin- to thick-bedded, iron-stained,			279	Sandstone, white to light-gray, clean,	104	U
	pyrite nodules, crossbedded, solution		10	277.	well-sorted, thick-bedded to massive,		
264	Shale medium-gray thin and evenly bed-	8	10		very fine to fine-grained	190	0
∠∪4.	Shale, medium-gray, thin and evenly bed- ded		10		Total measured thickness of white		
265.	Sandstone, light- to medium-gray, fine-				sandstone member	294	_0
	grained, thick-bedded to massive,				Total measured thickness of Mesa-		
	pyrite nodules, calcareous, solution				verde Formation	2,136	<u>1</u>
	cavities	40	0		etse Formation:		
266.	Shale, medium-gray, thin and evenly bed-		_	280.	Shale, medium-gray, thin and irregularly	4	10
267	ded	15	2	301	Sandstone light area, this hadded fine	1	10
207.	Sandstone, light- to medium-gray, fine- to medium-grained, thin- to thick-			281.	Sandstone, light-gray, thin-bedded, fine- to medium-grained, interbeds of iron-		
	medium-gramed, unit- w unick-				w medium-gramed, interocus or non-		

	Thick	ness		Thick	ness
	Ft	in		Ft	
stained, resistant, sandstone lamina-			ships upper 1 ft thin hadded colours	Γl	in
tions	10	0	chips, upper 1 ft thin-bedded, calcare- ous	22	4
Valley bottom—end of section, covered	10	Ů	15. Shale and sandstone interbedded each	22	4
by alluvium			about 50 percent; shale medium thin,		
Total measured thickness of Mee-			evenly bedded, ripple bedded, silty,		
teetse Formation	10	10	scattered coal fragments, scattered		
		==	raindrop prints and animal tracks,		
			about 20 percent sandstone interbeds in		
			upper 35 ft	55	10
			16. Sandstone, medium-light-gray, very fine		
			to fine-grained, silty in basal 1 ft,		
Measured section 11: Cody Shale and Mesav	erde		upper 3 ft thin-bedded, calcareous; 2 ft		
Formation			above base, massive and friable in	_	4
Location: Morton Quadrangle, Wyoming (7.5 min)	_		1-ft-4-in-thick friable zone 17. Shale, medium-gray, very silty at base	5 4	4 0
Start: NE-SW-SW sec. 13, T. 3 N., R. 1 W. Presented	from o	ldest to	17. Shale, fliedfulli-gray, very sitty at base	4	U
youngest End: SW-NE-SW sec. 13, T. 3 N., R. 1 W. Partial secti	ion		grained, thin-bedded	1	4
Described by: J.F. Windolph, Jr.			19. Shale, medium-gray, thin and evenly bed-		
Strike 140°, Dip 18° NE.			ded, very silty, sandy	2	0
Upper Cretaceous:	Thick	ness	20. Sandstone, medium-light-gray, very fine		
Cody Shale:	Ft	in	grained, thin-bedded, crossbedded, silty	4	0
1. Shale, medium-dark-gray to medium-			21. Shale, medium-gray, nonbedded	4	0
gray, thin and evenly bedded, few thin			22. Sandstone, medium-light-gray, very fine	,	v
siltstone and sandstone interbeds, very			grained, thick-bedded, silty		8
silty light man first	94	11	23. Shale, medium-gray, thin and evenly bed-		
Sandstone, medium-light-gray, very fine to fine-grained, thin- to thick-bedded,			ded, very silty, sandy	1	4
crossbedded, slump-bedded, silty	4	4	24. Sandstone, medium-light-gray, very fine	4	0
3. Shale, medium-gray to medium-dark-		•	grained, thin-bedded, calcareous 25. Sandstone, medium-light-gray, very fine	4	0
gray, thin and evenly bedded, slightly			to fine-grained, thin-bedded, few shale		
carbonaceous	5	7	interbeds, silty	22	4
4. Sandstone, medium-light-gray, fine-			Strike 160°, Dip 20° NE.		
grained, thick-bedded, few pyrite nod- ules		10	Note: Contact between Cody Shale and Mesav-		
5. Shale, medium-gray to medium-dark-		10	erde Formation is at the top of 22 ft 4		
gray, thin and evenly bedded, slightly			inches in unit 25 and consists of an		
carbonaceous	2	6	approximately 2-ft zone of sandstone,		
6. Sandstone, medium-light-gray, very fine			coarse grained, granular, few pebbles,		
to fine-grained, thick-bedded to mostly	22	4	upper 1/4 in grayish-red bentonitic shale.		
massive 7. Shale, medium-dark-gray, very fine	22	4	Total measured thickness of Cody	201	2
grained, thin and evenly bedded, few			Shale =	301	=
thin sandstone interbeds	4	0	Mesaverde Formation:		
8. Sandstone, medium-light-gray, very fine			26. Sandstone, light-gray, very fine to		
to fine-grained, thin-bedded, crossbed-		_	medium-grained, thin-bedded, cross-		
ded, silty	1	6	bedded, massive, friable, solution cav-		
9. Shale, medium-gray, 10 percent very fine grained, sandstone with siltstone inter-			ities, pyrite nodules, upper 4–5 ft very calcareous, base poorly exposed	42	8
beds, few thin ripple beds, very silty;			27. Sandstone, fine-grained, very friable,	72	
8-in-thick sandstone 8 ft above base,			massive, forms topographic depres-		
and 10-in-thick sandstone 18 ft above			sion, scattered shale chips	22	4
base	27	11	Bottom of Maverick Spring coal zone		
10. Sandstone, medium-light-gray, fine-			28. Underclay, medium-gray, basal 5 ft thin-		
grained, thick-bedded, pyrite nodules- 11. Shale, medium-gray to medium-dark-	1	1	bedded, silty, upper part slightly ben- tonitic	9	2
gray, thin and evenly bedded, silty	6	0	29. Shale, medium-dark-gray, thin and	9	2
12. Sandstone, medium-light-gray, fine-	v	-	evenly bedded, carbonaceous	1	10
grained, thick-bedded	. 1	1	30. Shale, medium-gray, thin and evenly bed-		
13. Shale, medium-gray, thin and evenly bed-	-		ded, silty	4	6
ded	3	0	31. Sandstone, medium-light-gray, very fine		
14. Sandstone, medium-light-gray, fine- grained, massive, few scattered shale			to fine-grained, thin and evenly bed- ded, slightly calcareous	16	9
gramou, mussive, iew scaucied shale			ded, singlify calcareous	10	J

	Thick	ness		Thick	ness
	Ft	in		Ft	in
32. Underclay, medium-gray, nonbedd	ed,		8. Shale, medium-dark-gray, poorly bedded-		5
fossil rootlets	-	7	9. Coal, impure, shaly at base		2
33. Shale, light-grayish-brown, thin-bedd			Top of Kinnear coal bed (A coal bed)		
very carbonaceous with scattered of			10. Shale, medium-gray, thin and evenly bed-		
fragments, scattered fossil plant fr ments, few scattered fossil rootlets			ded 11. Sandstone, medium-light-gray, very fine		6
Kinnear coal bed	0		to fine-grained, crossbedded, silty,		
34. Coal, bright attritus, fine cleats, band	ed,		scattered fossil plant leaves	1	10
fusain, sulphur-stained		2	12. Siltstone, medium-gray, thin and irregu-	•	,
35. Tonstein, light-grayish-brown, flatter	ned		larly bedded, thin sandstone interbeds- 13. Sandstone, medium-light-gray, very fine	2	6
ash particles at base		3/4	grained, crossbedded, silty, fossil root		
36. Coal, weathered, bright attritus, band			penetrations		11
cleated	*	2	14. Shale, medium-gray, bentonitic, few scat-		
 Tonstein, very light grayish brown, so tered carbonaceous fragments, f 			tered fossil rootlets in upper 1 ft, very carbonaceous at top	5	0
tened ash particles at base		5	15. Coal, weathered, impure	3	3
38. Shale, dark-brown, very carbonaceo		3	16. Shale, medium-gray, thin and evenly bed-		
scattered coal fragments		2	ded	6	0
39. Shale, medium-gray to light-gray, sil		2	17. Limestone, medium-gray, nonbedded,	_	_
grades upward to sandstone, appears	•		brittle, fractured	2	0
contain volcanic ash		4	18. Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded, ripple-		
40. Sandstone, medium-gray, very f	ine		bedded, very calcareous	15+	-
grained, very silty, shaly, iron-stain	ed- 2	6	Note: Sandstones are very lenticular.		
	ne-		Total measured thickness of Mesaverde		
grained, thin and irregularly bedo			Formation	54	3/4
with crossbeds, shale, chips, sm					
pyrite nodules, few medium grains base		4			
Section poorly exposed from this point to		4			
base of the Wind River conglomerate, and t					
beds approximately 800 ft to the northeast			Measured section 12: Fort Union Formation		
Total measured thickness of Mesave			Location: Shotgun Butte Quadrangle, Wyoming (7.5 min)		
Formation		73/4	Start: SW-NE-SW sec. 35, T. 6 N., R. 1 E. Presented		ldest to
			youngest		
			End: NW-NE-SW sec. 2, T. 5 N., R. 1 E. Described by: J.F.Windolph, Jr.		
			Strike 90°, Dip 35° N.		
Measured section 11a: Mesaverde Format	ion (Part)		Paleocene:	Thick	nocc
Location: Morton Quadrangle (7.5 min)			Fort Union Formation:	Ft	in
Start: SE-SW sec. 13, T. 3 N., R. 1 W. Presented from	n oldest to yo	ungest	Shotgun Member:		•••
End: SW-SE sec. 13, T. 3 N., R. 1 W. Described by: J.F. Windolph, Jr.			1. Shale, light-olive-brown, thin-bedded,		
Strike 142°, Dip 22° NE.			bentonite	3+	
Upper Cretaceous:	Thickn	occ	2. Sandstone, medium-light-gray, very fine		
Mesaverde Formation:	Ft	in	to fine-grained, dark and light mineral		
1. Sandstone, medium-light-gray to lig			grains, thin- to thick-bedded, lenticular beds	20	0
gray, grades thin-bedded and crossbe			3. Shale, medium-gray, silty, slightly bento-	20	U
ded to massive, solution cavities		6	nitic	5	0
2. Shale, light-brownish-gray to mediu		•	4. Sandstone, medium-light-gray, fine-		
gray, thin-bedded, silty	2	3	grained, dark and light mineral grains,		
Base of Kinnear coal bed (A coal bed) 3. Coal, bright, finely cleated, sligh	tlv		thick-bedded to massive, crossbedded, fractures filled with quartz, friable	32	0
impure, scattered shale fragments		1	5. Shale, medium-gray, poorly bedded, few	32	U
4. Tonstein, light-brownish-gray, flatten		-	fossil roots, slightly bentonitic, partly		
volcanic ash particles at base		3/4	covered	95	0
5. Coal, bright		10	6. Sandstone, medium-light-gray, fine-	_	_
6. Shale, light-brownish-gray, thin-bedde		2	grained, massive	5	0
silty, carbonaceous7. Coal, bright, upper 2 in impure, sha		2	7. Shale, medium-gray to medium-dark- gray, slightly bentonitic, poorly bed-		
bony		6	ded	12	0
•					-

		Thickr	ess			Thick	ness
		Ft	in			Ft	in
8.	Sandstone, medium-light-gray, very fine to fine-grained, thick-bedded, few fossil roots at top	9	0	31.	Shale, light-olive-gray, thin-bedded; 4-in-thick sandstone lens 4½ ft above base; 6-in-thick sandstone lens 10 ft above		
9.	Shale, medium-gray to medium-dark-				base	12	0
10.	gray, thin-bedded	18	0	32.	Sandstone, medium-light-gray, very fine grained, silty, thin-bedded, fossil roots at top	2	6
	very coarse, thin-bedded, slightly cal-			33.	Shale, light-olive-gray, poorly bedded	7	0
11.	careous, current bedding, top friable- Shale, medium-gray, thin and evenly bed- ded, silty	8	0		Sandstone, medium-light-gray, fine-grained, dark and light mineral grains,		
12.	Sandstone, medium-light-gray to medium- gray, fine-grained, silty, thin and irreg-	o	U	35.	thin-bedded to massive, crossbedded - Underclay, medium-gray, nonbedded,	7	6
12	ularly bedded, calcareous	9	0		few fossil rootlets in upper 4 in, silty, sandy	1	8
	Shale, light-olive-gray, poorly bedded, partly covered	36	0	36.	Shale, grayish-brown, thin-bedded, abundant fossil plant fragments, coal frag-		
14.	Sandstone, medium-light-gray, fine- to medium-grained, dark and light mineral grains, thin-bedded to massive,			27	ments, very carbonaceous, gypsum crystals, good fossil impressions	3	0
	slump-bedded, crossbedded, few shale lenses near top, few fossil plant			37.	Sandstone, medium-light-gray, very fine grained, silty, shaly lens-shaped inter-	•	
15	impressionsShale, medium-gray to light-olive-gray,	22	0	38.	beds, top part becomes silty Shale, light-olive-gray to medium-gray,	2	0
13.	silty, thin- to poorly bedded	15	0		very silty	3	6
16.	Sandstone, medium-light-gray, very fine grained, silty, thick-bedded	8	0	39.	Sandstone, medium-light-gray, fine- grained, dark and light mineral grains,		
17	- · · · · · · · · · · · · · · · · · · ·	25			massive to thin-bedded, slump-bedded,		
	Shale, light-olive-gray, nonbedded, silty- Shale, light-olive-gray, very fine grained,	23	0	40	friable, solution cavities	11	0
	silty, thin and irregularly bedded, crossbedded	25	0	40.	Shale, light-olive-gray to medium-gray, thin-bedded, silty, contains 5-in-thick		
19.	Shale, light-olive-gray, silty, slightly ben-				medium-dark-gray carbonaceous zone 1½ ft below top	6	0
	tonitic, upper 5 ft light-grayish-brown, slightly carbonaceous, thin-bedded	55	0	41.	Sandstone, medium-light-gray, fine- grained, thin- to thick-bedded, lens-	Ū	,
20.	Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded, calcare-				shaped beds	5	0
	ous, upper 2 ft light-gray	25	0	42.	Shale, light-olive-gray, poorly bedded	5	0
21.	Shale, light-olive-gray, bentonitic; 6-in-			43.	Shale, brown, thin- to poorly bedded, few		
	thick, fine-grained sandstone 55 ft above base; 1-ft-thick, fine-grained				fossil roots, very carbonaceous, sulfur- stained, gypsum crystals; 2-in-thick		
	sandstone 70 ft above base; upper 20 ft				impure coal 1 ft above base; 3-in-thick		
	very silty, few pyrite nodules	78	0		shaly coal 2½ ft above base; 1-in-thick		
22.	Sandstone, medium-light-gray, fine-	6	0		impure coal 4 ft above base; 1-ft-thick medium-gray underclay 3 ft above		
23.	grained, thin- to thick-bedded Shale, medium-dark-gray to medium-	6	U		base	6	0
	gray, thin-bedded	7	0	44.	Sandstone, medium-gray, very fine grained, silty, shaly, contains abundant		
24.	Sandstone, medium-light-gray, very fine grained, silty, thin-bedded		6		silt and shale interbeds	6	0
25.	Shale, medium-gray to light-olive-gray,				Shale, light-olive-gray, nonbedded	10	6
26.	thin-beddedSandstone, medium-light-gray, very fine	15	0	46.	Sandstone, medium-gray, very fine grained, thin-bedded, silty, calcareous,		
	grained, thin-bedded	2	0	47	contains pyrite nodules in top	2	0
27.	Shale, light-olive-gray to medium-dark-gray, thin-bedded	15	0	47.	Shale, medium-gray, thin and evenly bed- ded, contains a few siltstone and sand-		
28.	Sandstone, medium-light-gray, fine-grained, thin and irregularly bedded,				stone lenses up to 1 ft thick, becomes medium-gray and silty in upper 2 ft	15	0
20	contains few shale interbeds, silty	10	0	48.	Sandstone, medium-light-gray, very fine to fine-grained, dark and light mineral		
29.	Shale, light-olive-gray to light-grayish- brown to medium-dark-gray, thin-				grains, thin-bedded	1	6
20	bedded	8	0	49.	Shale, medium-gray to light-olive-gray,	` .	_
<i>3</i> 0.	Sandstone, medium- to medium-light- gray, fine-grained, thin-bedded to mas-			50.	thin-beddedSandstone, medium-light-gray, very fine	3	6
	sive, crossbedded, few silty shale inter-	~	_		grained, silty, thin-bedded, few shale	_	_
	beds, top calcareous	7	6		lenses	3	6

		Thick	ness			Thic	kness
		Ft	in			Ft	in
51.	Shale, light-olive-gray, pyrite nodules, silty; 8-in-thick siltstone 16 ft above base; 6-in-thick sandy siltstone 25 ft		•••	71.	Shale, medium-gray, silty, sandy, 4-in slightly carbonaceous zone 1½ ft above base; thin- to poorly bedded	11	111
52.	above base; becomes slightly bentonitic and sandy in top part Sandstone, medium-light-gray, fine-	47	0		upward, 2-ft silty and sandy zone 5 ft above base; 1½ ft silty zone with fossil roots 17 ft above base; fossil rootlets in		
	grained, thin- to thick-bedded, slump-bedded	10	0	72	upper 1 ft, nonbeddedShale, grayish-brown, very carbonac-	34	0
53.	Shale, light-olive-gray, contains few thin beds, light-grayish-brown carbona-			,	eous, thin-bedded, abundant coal lam- inations and fragments, sulfur stains,		
54.	ceous streaks and zonesSandstone, fine-grained, lens-shaped bed-	7	0	73.	gypsum crystals		10
55.	ding, thick-bedded, friable Shale, light-grayish-brown, carbona-	1	10	~.	to fine-grained, thin-bedded, few silty shale beds	4	0
56.	ceous, thin-bedded Tonstein, flattened volcanic ash particles,		2	74.	Shale, light-brownish-gray, basal 1 ft slightly carbonaceous, very silty,		
	fossil plant fragments and impressions, abundant fibrous gypsum		10		sandy, slightly bentonitic light-olive- gray; very bentonitic upward, top		
57.	Shale, light-grayish-brown, thin-bedded, silty, gypsum crystal, coal fragments,			75.	becomes siltySandstone, medium-light-gray, very fine	29	0
50	volcanic ash particles		3		grained to fine-grained, thin-bedded to massive, silty, solution cavities, cal-		
50.	Tonstein, medium-gray, thin-bedded to nonbedded, excellent fossil leaf				careous concretions up to 1 ft in diameter, fossil roots in top of unit	6	0
5 0	impressions, fossil plant fragments, fibrous gypsum, volcanic ash particles-		5	76.	Shale, light-olive-green, thin-bedded, bentonite; upper 6 in carbonaceous,	v	v
59.	Sandstone, medium-light-gray, very fine to fine- to medium-grained, thin-			77	thin-bedded, medium-dark-gray	5	6
	bedded to massive, crossbedded, silty and carbonaceous laminations, calcar-			//.	Sandstone, very fine to fine-grained, thin- bedded, crossbedded, few shale inter-	17	0
	eous, solution cavities	15	0	70	beds, top becomes silty	16	0
60.	Shale, medium-gray, poorly bedded; 1-ft-thick sandstone lens 6 ft above base;				Shale, medium-gray, poorly beddedSandstone, medium-light-gray, very fine	4	6
	6-in-zone of silty pyritic nodules 14 ft				grained, silty, thin-bedded	2	6
	above base; 1-ft-thick sandstone 18 ft				Shale, medium-gray, poorly bedded	30	0
	above base, becomes very silty, sandy			81.	Shale, light-grayish-brown, carbona- ceous, thin and evenly bedded, few thin		
	with siltstone-sandstone interbeds 25 ft				olive-gray interbeds	6	0
	above base; 1-ft-thick fine-grained sandstone 30 ft above base; top 1 ft,			82.	Sandstone, medium-light-gray, very fine	Ů	Ū
	light-grayish-brown, thin-bedded, very				to fine-grained, thin-bedded to mas-		
	carbonaceous, gypsum crystals	41	0		sive, lens-shaped bedding, crossbed-	~	•
61.	Sandstone, medium-light-gray, fine-			83.	ding, solution cavities Shale, light-olive-gray, thin-bedded,	7	0
	grained, thin-bedded, few shale lami- nations	8	0	05.	silty, partly covered, slightly bentoni-		
62.	Shale, light-olive-gray, nonbedded	9	0		tic	40	0
	Shale, dark-gray, thin-bedded, very carbonaceous			84.	Shale, grayish-brown, thin-bedded, silty, very carbonaceous, sulphur-stained,		
64	Coal, impure bony, bright	1	6 5	0.5	coal fragments, and laminations		10
	Shale, light-olive-gray, nonbedded	2	6	85.	Shale, light-olive-gray, thin- to poorly bedded	1	^
	Shale, light-grayish-brown, thin-bedded, very carbonaceous, coal fragments	3	6	86.	Shale, grayish-brown, very coaly, carbo-	1	0
67.	Shale, very light grayish brown, basal 3 ft	3	U	87.	naceous Shale, partly covered, light-olive-green,		3
	of upper part light-olive-gray, nonbed- ded, fossil rootlets in upper 1 ft	6	0	88.	poorly bedded, bentonite Sandstone, partly covered, medium-light-	25	0
68.	Shale, grayish-brown, thin-bedded, basal 5 in very bony, abundant coal frag-				gray, fine-grained, thick-beddedShale, light-olive-gray, poorly bedded,	15	0
	ments, gypsum crystals, very carbo- naceous, fossil plant fragments	2	0		bentonite	15	0
69.	Shale, light-olive-gray, thin-bedded at	_	-	,	carbonaceous, coal fragments	4	0
	base, poorly bedded at top, upper 2 ft				Shale, medium-gray, thin-bedded	5	0
70.	very siltySandstone, medium-light-gray, very fine	4	4	92.	Sandstone, medium-light-gray, very fine grained, silty, thin- to thick-bedded,		
	to fine-grained, silty, thin-bedded,	2	0		contains few light-olive-gray shale	20	^
	crossbedded, upper 3 ft massive	2	0		lenses	32	0

		Thick	ness			Thick	ness
		Ft	in			Ft	in
93.	Underclay, medium-gray, silty, sandy, fossil rootlets		6	117.	Shale, light-grayish-brown, carbonaceous, thin-bedded	1	2
94.	Shale, light-grayish-brown to light-olive-				Shale, medium-gray, poorly bedded Shale, very light grayish brown, very	1	0
	gray upward, very carbonaceous, sul- fur stains, coal laminations	5	0	117.	carbonaceous, thin-bedded, fossil plant		
95.	Shale, light-olive-gray, thin-bedded, fos-	•			impressions, upper 1 ft silty and sandy-	1	10
	sil rootlets in upper 6 in	11	0	120.	Sandstone, medium-light-gray, very fine		
96.	Shale, brownish-gray, coal fragments,		•		to fine-grained, thin-bedded to mas- sive, crossbeds	11	0
07	thin-bedded		3	121.	Shale, light-olive-gray, poorly bedded,	11	U
97.	Sandstone, medium-light-gray, very fine grained, silty, thin-bedded	1	8	121.	silty, partly covered	33	0
98.	Shale, medium-gray, poorly bedded, few	•	ŭ	122.	Sandstone, medium-light-gray, very fine		
	fossil rootlets		10		grained, silty, thin-bedded to massive,		
99.	Shale, brownish-gray, abundant coal frag-	_	_		slump-bedded, lens-shaped beds, few siltstone interbeds	13	0
100	ments at base and in top 4 in	2	6	123.	Shale, light-olive-gray, poorly bedded,	10	·
100.	Sandstone, medium-light-gray, very fine grained, silty, abundant carbonaceous				slightly carbonaceous in upper 1 ft	6	0
	shale laminations; 1-ft zone of pyrite			124.	Sandstone, medium-light-gray, very fine	10	•
	nodules at top	4	0	125	grained, silty, very friable	10	0
101.	Shale, light-olive-gray, bentonite, poorly	_		123.	Shale, medium-gray, poorly bedded, bentonitic, 1-ft-thick sandy zone 5 ft above		
100	bedded	8	0		basal contact, becomes light-olive-gray		
102.	Shale, light-grayish-brown, thin-bedded, very carbonaceous, abundant fossil				upward	22	0
	plant fragments, few coal fragments,			126.	Sandstone, medium-gray, very fine		
	sulfur stains	2	9		grained, very silty, thick-bedded, crossbedded	7	6
103.	Sandstone, medium-light-gray, very fine			127.	Shale, light-olive-gray to medium-gray,	,	U
	to fine-grained, dark and light mineral				upper 2 ft very silty, few fossil roots,		
	grains, slump-bedded, fossil roots at top, thick-bedded	2	0		slightly carbonaceous	7	0
104.	Shale, medium-gray to very light brown-	-	Ū	128.	Shale, grayish-brown, thin and evenly		
	ish gray, nonbedded	2	6		bedded, carbonaceous, few coal frag- ments		6
105.	Shale, brownish-gray, thin-bedded, very			129.	Shale, light-olive-gray to light-grayish-		·
	coaly, carbonaceous, coal laminations,	3	4		brown, slightly carbonaceous, thin and		
106	sulphur-stained Shale, medium-gray, bentonitic, contains	3	4		evenly bedded	4	0
100.	1-ft-thick sandy zone 10 ft above basal			130.	Sandstone, medium-gray, very fine		
	contact	13	0		grained, very silty, thin and evenly bedded, crossbedded, siltstone lamina-		
107.	Sandstone, medium-light-gray, very fine				tions	4	0
	to fine-grained, few shale interbeds,	4	_	131.	Shale, medium-gray to olive-gray, non-		
100	thin- to thick-bedded, fossil roots	4	2	100	bedded, top becomes silty	8	6
100.	Shale, medium-gray to light-olive-gray, nonbedded, silty, slightly bentonitic	13	0	132.	Sandstone, medium-light-gray, very fine to fine-grained, silty, friable, thin-		
109.	Sandstone, medium-light-gray, very fine				bedded to massive, upper 3 ft calcare-		
	grained, silty, thin- to thick-bedded,				ous	12	0
	few siltstone interbeds, abundant fossil	-	4	133.	Shale, light-olive-gray, poorly bedded;		
110	Shale, light-olive-green, nonbedded,	5	6		4-in-thick silty sandstone 8 ft above base; 2-ft-thick silty sandstone 12 ft		
110.	becomes silty upward	7	0		above base; 2-ft-thick siltstone 13 ft		
111.	Sandstone, medium-light-gray, very fine				above base	20	0
	grained, silty, thin-bedded	1	6	134.	Sandstone, medium-gray, very fine		
112.	Shale, light-olive-gray to very light gray-	_	10		grained, very silty, lens-shaped bed-		
113	ish brown, thin-bedded	2	10		ding, calcareous lenses; 3-ft-thick shale lens 3½ ft above base, thin-bedded to		
115.	grained, silty, friable, solution cavi-				massive	10	0
	ties, thin-bedded to massive, lens-			135.	Shale, light-olive-gray, a few 1-ft-thick		
	shaped beds, crossbedded	5	8		sandstone lenses in basal 2 ft; becomes	10	
114.	Shale, light-olive-gray, thin-bedded,	5	6	126	olive-green upward; top very sandy	13	0
115	upper 1 ft slightly carbonaceous Sandstone, medium-light-gray, very fine	3	U	130.	Sandstone, medium-gray, very fine grained, silty, thin-bedded	7	0
113.	grained, silty, thin-bedded, pyrite nod-				Shale, light-olive-gray, poorly bedded	12	0
	ules, calcareous	2	0		Shale, light-grayish-brown, carbona-		
116.	Underclay, medium-gray, fossil roots,		,		ceous, few siltstone-sandstone inter-	3	0
	silty		6		beds, fossil plant fragments	3	U

		Thick	ness		Thickr	ness
		Ft	in		Ft	in
139.	Sandstone, medium-light-gray, very fine	1	0	160. Shale, medium-gray to medium-light-	2	_
140	grained, silty, thin-bedded Shale, olive-gray, nonbedded	1 5	0 0	gray, very sandy 161. Sandstone, medium-light-gray, very fine	2	6
	Sandstone, medium-light-gray, very fine			grained, silty	1	2
142.	grained, silty, thick-beddedShale, light-olive-gray, silty, poorly bed-	3	0	162. Shale, medium-gray to light-olive-green, nonbedded, upper 2 ft grayish-red, thin	26	0
	ded	9	6	and evenly bedded Total measured thickness of Shotgun		_0
143.	Sandstone, medium-light-gray, fine- grained, thin high-angle crossbedding-	5	0	Member	1,889	_0
144.	Shale, medium-gray to light-olive-gray, thin-bedded	8	0	Total measured thickness of Fort Union Formation		_0
145.	Sandstone, medium-gray, very fine to fine-grained, thick-bedded, few fossil	1	6			
146.	rootsShale, medium-gray to light-olive-gray,	1	6			
	thin-bedded	9	0			
14/.	Sandstone, medium-light-gray, fine- grained, thick-bedded, crossbedding	95	0			
148.	Shale, light-olive-gray, medium-dark- gray silt, poorly bedded	18	0	Measured section 13: Cody Shale through In	ıdian	
149.	Sandstone, medium-light-gray, very fine	10	v	Meadows Formation		
	grained, silty, few shale lenses, thick-			Location: Jenkins Mountain Quadrangle, Wyoming (7.5 Start: NE-SE-NW sec. 24, T. 6 N., R. 2 E. Presented		dest to
150	Shale light clive gray nonhedded	5 12	0 0	youngest	. Hom or	ucst to
	Shale, light-olive-gray, nonbeddedSandstone, fine- to medium-grained, thin-	12	U	End: NW-SW-SE sec. 6, T. 5 N., R. 3 E.	indolah	T.,
	bedded to massive, crossbedded	25	0	Described by: N.L. Hickling, R.C. Warlow, and J.F. W. Strike 65°, Dip 30° SE.	muoipii, .	J1.
152.	Shale, light-olive-gray, very silty, poorly			Upper Cretaceous:	Thickr	ness
	bedded, nonbedded, silty nodules in upper 3 ft	5	. 6	Cody Shale:	Ft	in
153.	Sandstone, medium-gray to medium-light-	3	U	1. Shale, medium-dark-gray, thin interbeds,		
	gray; conglomeratic; lenses of rounded			very silty, becomes sandy upward	10+	
	quartz pebbles, sandstone pebbles, shale chips, and petrified wood, up to			Sandstone, medium-light-gray, very fine to fine-grained, thin- to thick-bedded,		
	1½ inches in diameter, silty shale;			silty	31	6
	crossbedded and thin bedded to mas-			3. Sandstone, medium-gray, very fine		
154	sive, friable, upper 3 ft calcareous	13	0	grained, thin-bedded, silty, very shaly, few thin, resistant beds	52	Λ
154.	Shale, light-olive-gray, basal 8 ft very sandy with sandstone lenses 1 ft thick,			4. Shale, medium-dark-gray, thin and	53	0
	thin-bedded	16	0	evenly bedded, sandy, silty, resistant,		
155.	Sandstone, medium-light-gray, very fine			thin-bedded sandstone lenses; becomes	38	^
	to fine-grained, lens-shaped and thick- bedded to massive	8	0	sandy at top5. Sandstone, medium-light-gray, very fine	36	0
156.	Shale, medium-gray to dark-olive-gray,	Ü	Ü	grained, dark and light grains, weath-		
	bentonitic, nonbedded	31	0	ered, generally nonresistant; 5-ft-thick		
157.	Sandstone, medium-gray to medium-light- gray, very silty, very fine grained,			resistant ledge at 25 ft above base; 3-ft-thick resistant ledge at 51 ft above		
	thin- to thick-bedded, crossbedded,			base; 1-ft-thick shale lens 1 ft below		
	few shale lenses, shale chips, unit			top of unit	56	0
	becomes granular and conglomeratic 15 ft above base, top 8 ft massive	25	0	Shale, medium-dark-gray, grades to medium-gray upward, thin and evenly		
158.	Shale, medium-gray to light-olive-gray,	23	U	bedded, a few dark-gray shale inter-		
	basal 3 ft very sandy, silty, thin-			beds; 1-ft-thick sandstone lenses 6 ft		•
	bedded; 1-ft-thick sandstone bed 36 ft			and 8 ft above base7. Sandstone, medium-light-gray, very fine	14	0
	above base, nonbedded above 36 ft, bentonitic; 1-ft-thick silty sandstone 60			grained, thin- to thick-bedded, very		
	ft above base; 2-ft-thick silty sandstone			silty, very calcareous	2	7
150	80 ft above base	95	0	 Shale, medium-gray, very silty, sandy, thin silt interbeds; 3-in dark-gray shale 		
139.	Sandstone, medium-light-gray, very fine to fine-grained, few granules, cross-			5 ft above base; nonsilty above 5 ft	14	6
	bedded, massive, lenses of conglomer-			9. Sandstone, medium-light-gray, very fine		
	ate up to 1 ft thick at base; 5 ft above			grained, few fine grains, thin-bedded,		
	base pebbles are up to 1½ inch in diameter	12	0	dark and light grains, silty, very calcar- eous	2	4
		• •	•		-	•

		Thickr	ness			Thick	ness
		Ft	in			Ft	in
	Shale, medium-dark-gray, thin and evenly bedded; 1-ft-thick silty sandstone beds 4½ ft above base, 7½ ft above base, 11 ft above base, 13 ft above base, 22 ft above base, 31 ft above base, 37 ft above base (thin-bedded, calcareous), and 47 ft above base; lens 47 ft above base; also contains several thin limestones; friable; more shaly 50 ft above base	115	0		ale, medium-gray, thin- to poorly bed- ded, few thin siltstone lenses and very fine grained sandstone interbeds, few limestones and thin calcareous beds; 4-in-thick, very fine grained nodular sandstone 17 ft above base, becomes very shaley above 17 ft; 3-ft-thick silty shale and very fine grained sandstone 25 ft above base; 45 ft above base very silty thin-bedded, very fine grained sandstone interbeds; top of unit		
	Covered, probably shale	35	0		becomes sandy and grades into unit 26-	65	0
	Siltstone, medium-gray, very fine grained, medium-dark-gray shale interbeds Total measured thickness of Cody Shale	376	<u>6</u> <u>5</u>	26. Sa	ndstone, medium-light-gray, very fine grained, thick-bedded to massive, few crossbeds, petroleum stain at base; very silty and friable in lower 10 ft; very fine to fine-grained 10 ft above base; pyrite nodules, solution cavities, very calcareous; thin bedded at top	65	0
	verde Formation: Sandstone, medium-light-gray, very fine grained, thin to thick and irregularly bedded, silty, slightly calcareous,				ale, medium-dark-gray to medium- gray, thin and evenly bedded, gypsum crystals; upper 1 ft contains few fossil		
	pyrite nodules, siltstone lenses up to 1 in thick, solution cavities 10 ft below top contact	50	0		rootlets ale, grayish-brown, thin-bedded, silty, abundant coal fragments and lamina-	19	6
14.	Shale, medium-gray to medium-dark- gray, thin and evenly bedded, contains			29. Ur	tions, very carbonaceous nderclay, medium-gray, nonbedded, silty and sandy at top, fossil rootlets	2 7	8
15.	several very fine grained silty sand- stone interbeds up to 1 ft thick Sandstone, medium-light-gray, very fine grained, crossbedded, very silty, pyrite nodules, very calcareous, 6-in-thick shale lens 2 ft above base, thin and	12	0		oal, bright to dull, impure, shale bands, resin blebs volcanic ash bands, gypsum crystals, fine to medium cleats; 4-in-thick tonstein 4 in above baseale, medium-gray to medium-dark-	ŕ	81/2
	irregularly bedded; 1-ft-thick shale lens 6 ft above base	12 25	6		gray, thin and evenly bedded, coal fragments, basal 3 in very carbonaceous with thin ash bed; 1-ft-thick calcareous siltstone 2 ft above base	6	6
	Shale, medium-dark-gray, thin and evenly bedded	3+		32. Sa	ndstone, medium-light-gray, very fine grained, thin and irregularly bedded,		5
	thick-bedded, slightly silty, very cal- careous, pyrite nodules, few shale lenses 2 ft above base; solution cavi-	100	0	33. Ur	very silty, slightly calcareous nderclay, medium-gray, nonbedded, fossil rootlets	1	3
19.	ties, scattered siltstone lenses Sandstone, light-grayish-brown, very fine grained, thin and irregularly bedded, very silty, very carbonaceous, scat-	100	0	35. Co	ale, light-grayish-brown, thin-bedded, silty, sandy, very carbonaceous pal, impure, thin-bedded, shaly		7 3
20.	tered fossil plants	4	6		ale, light-grayish-brown, thin-bedded, very carbonaceous, abundant fossil plant material, coal fragments, gypsum crystals, few fossil rootlets in upper part	1	11
21.	Sandstone, light-gray, very fine to fine-grained, thick-bedded, dark and light		10		pal, impure, bony, banded, resin blebs, medium-cleats, thin volcanic ash interbeds	1	4
22.	mineral grains		10	38. Sh	ale, medium-dark-gray, thin and evenly bedded, slightly carbonaceous-		7
23.	stems and rootsShale, dark-grayish-brown, thin and	1	6		distone, medium-gray, thin- to poorly bedded	3	2
Das	evenly bedded, abundance of coal frag- ments, gypsum crystals		3		ale, medium-gray, poorly bedded, few fossil roots	1	6
	e of Maverick Spring coal zone Coal, bright, resin blebs, gypsum crystals, thick bands, fine cleats		10		ndstone, light-gray, very fine grained, thick-bedded, fossil roots at top, silty, dark and light mineral grains		10

	Thick	ness			Thick	ness
	Ft	in			Ft	in
42. Underclay, medium-gray to medium-dark- gray, few fossil roots in upper 6 in,				Coal, bright Tonstein, very light brownish gray, scat-		3
slightly carbonaceous 43. Sandstone, medium-light-gray, very fine	3	0		tered fossil plants, carbonaceous mat- ter		1
grained, thin and irregularly bedded, silty, very silty in basal 3 in; dark and			66.	Coal, bright, abundant fusain at top, top channeled and filled by unit 67		7
light mineral grains	2	6	67.	Sandstone, very light gray, ironstone,		·
44. Shale, medium-gray, silty, thin-bedded, upper 1 ft contains coalified log, few		_		very fine to fine-grained, very calcare- ous, high-angle crossbeds, pyrite nod-		_
fossil rootlets	2	2	68.	ulesShale, medium-gray, thin and evenly bed-	12	0
thick-bedded, silty, dark and light min- eral grains, very calcareous, small			69	ded, upper 6 in very carbonaceous Coal, bright, resin blebs, slightly bony	7	0 4
pyrite nodules	2	8		Shale, light-grayish-brown, silty, thin-		•
46. Shale, medium-gray, thin and evenly bedded, coal fragments	3	0		bedded, very carbonaceous, fossil plant fragments	1	0
47. Sandstone, medium-light-gray, very fine grained, thin and irregularly bedded,			71.	Coal, bright, fine to medium cleats, resin blebs, cleats 170° at vertical and 55° at		
very silty48. Underclay, medium-gray, fossil roots,	1	10	72.	55° NW	2 2	4 4
poorly bedded	3	0		Sandstone, light-gray, very fine grained,	_	·
ash bands, fine cleats		61/2		thin-bedded, ironstone, pyrite nodules, very calcareous	10	0
50. Shale, medium-dark-gray, thin-bedded 51. Sandstone, light-gray to very light gray,	2	6	74.	Shale, medium-gray, thin and evenly bed- ded, silty, 2-in-thick impure coaly zone		
very fine grained, thin and irregularly bedded, fossil roots at top, very silty -	5	0	75	3 ft above base	18	0
52. Shale, medium-gray, thin-bedded,	3	v		thin-bedded, very silty	2	10
slightly silty, very carbonaceous, upper 8 in brownish-gray	9	2		Shale, medium-gray, thin and evenly bed- ded	12	0
53. Coal, bright, fine to medium cleats, banded	1	7	77.	Sandstone, very light gray to white, very fine grained, silty, pyrite nodules, fos-		
54. Shale, medium-gray, thin- to thick-bedded, upper 3 in very carbonaceous,			78.	sil roots Underclay, medium-dark-gray to medium-	4	0
black, sooty55. Coal, bright; 4-in-thick shaly zone 5 in	2	10	, , ,	gray, nonbedded, slightly bentonitic,		
above base; unit locally channeled and		_		fossil rootlets, upper 6 in very carbo- naceous, silty, coal fragments	2	4
filled by overlying sandstone Top of Maverick Spring coal zone	1	5	79.	Coal, bright, fine cleats, soft weathered, top channeled and filled by sand, unit		
56. Sandstone, light-gray to very light gray, very fine grained, thin- to thick-			80.	80	2	4
bedded, crossbedded, silty, very slightly calcareous, pyrite nodules,			00.	bedded, thin-bedded, abundant dark and light mineral grains, very calcare-		
ironstone lenses, massive-bedded in	25	0	01	ous	6	0
lower 10 ft; solution cavities 57. Shale, medium-gray, siltstone lens 5 ft	25	0		ft, few silty zones, ironstone bands	16	0
above base58. Underclay, medium-gray to light-grayish-	15	0	82.	Sandstone, very light gray, very fine grained, thin and irregularly bedded,		
brown, fossil roots, gypsum crystals, upper 4 in very carbonaceous, silty	1	9		locally crossbedded, iron-stained, very calcareous, silty in top 2 ft	18	0
59. Coal, bright to dull, fusain, resin blebs, few thin shale partings	1	2	83.	Shale, medium-dark-gray to medium- gray, thin and evenly bedded, very		
60. Shale, medium-gray, nonbedded, silty, few fossil plant fragments, hard, con-	1	2		silty in upper 2 ft, very carbonaceous in upper 1 ft, a few fossil rootlets and		
tain volcanic ash beds	1	1	0.4	plant fragments throughout	5	0
61. Sandstone, very light gray, very fine grained, irregularly bedded, top grades	_	_	84.	Coal, bright, resin blebs, fine to medium cleats, upper 1 in few volcanic ash		
shaly62. Underclay, medium-light-gray, fossil	3	6	85.	laminationsShale, medium-gray to light-brownish-		10
rootlets, silty63. Shale, light-grayish-brown, abundant car-	1	10		gray, lower 5 in and upper 5 in very carbonaceous and thin-bedded; middle		
bonaceous material, coal fragments,				part of unit contains fossil roots and is		^
very fine grained sandstone lamina-		4	86.	nonbeddedCoal, bright	1	9 3

		Thickr	iess			Thick	ness
		Ft	in			Ft	in
87.	Shale, light-brownish-gray, thin-bedded, very carbonaceous, coal fragments, resin blebs		4	111.	Sandstone, light-gray, very fine to fine- grained, thin and irregularly bedded, locally crossbedded, iron-stained, very		
88.	Coal, bright, 1/4-in-thick white volcanic ash bed in middle part		6	112	calcareous, pyrite nodules	10	0
89.	Shale, light-brown to medium-gray, thin and evenly bedded		7	112.	Shale, medium-gray, thin and evenly bedded; 2-ft-thick siltstone 3 ft above base;		
90.	Sandstone, light-gray, very fine grained,	5	0		6-in-thick dark-gray carbonaceous shale 6 ft above base; 1-ft-2-in-thick siltstone lens 11 ft above base	20	0
91.	very silty, thin- to thick-bedded Shale, medium-gray, thin- to poorly bed-	3	7	113.	Siltstone, calcareous, light-gray, thin and		4
92.	ded, slightly carbonaceous Sandstone, light-gray, very fine grained, very silty, very iron stained, very silty		,	114.	irregularly bedded	1	-
03	in basal 2 in	6	0		calcareous, dark and light mineral grains, limestone laminations 2 ft		
75.	gray, thin and evenly bedded, slightly carbonaceous	1	2	115	above base	4	0
94.	Underclay, medium-gray, bentonitic, nonbedded, fossil rootlets	1	0	115.	thin and evenly bedded, very silty, sandstone interbeds	7	6
95.	Coal, bright	1	5	116.	Sandstone, light-gray, very fine grained,	,	·
	Shale, light-gray to light-brownish-gray,				iron-stained, thin- to thick-bedded,		
	thin and evenly bedded, upper 1 ft slightly bentonitic; fossil roots, poorly		_		locally crossbedded, very calcareous; 1-ft-thick medium-gray shale lens 6 ft		
- 07	bedded at topShale, medium-gray to light-brownish-	1	8	117	below topShale, medium-gray, in basal 2 ft; grades	21	0
71.	gray, thin and evenly bedded, upper 1 ft slightly bentonitic; fossil roots,			117.	into light grayish brown for next 2½ ft; grades into poorly bedded, silty and		
	poorly bedded at top	3	4		sandy, medium-gray shale in upper 4		
98.	Shale, light-brownish-gray, carbonaceous, thin-bedded, coal, fossil plant			118.	ft Sandstone, very light gray to white, very	. 8	6
	fragments, resin blebs		6		fine grained, thin and irregularly bed-		_
	Coal, bright		6	110	ded, very silty, pyrite nodules Shale, medium-gray; 10-in-thick siltstone	2	5
100.	Shale, medium-gray, top becomes silty and sandy, thin and evenly bedded	1	4	119.	1½ ft above base; overlain by 2 ft of		
101.	Sandstone, light-gray, very fine grained, silty, crossbedded, pyrite nodules,				light-brownish-gray shale with coal fragments; upper 1 ft is light brownish	*	
400	ironstone lenses	4	0	120	gray, carbonaceous shale	, 7	6
102.	Shale, medium-gray to medium-dark- gray, thin and evenly bedded, basal 1 ft			120,	very calcareous, weathered, blocky	1	3
	2 in very carbonaceous; few ironstone			121.	Shale, medium-gray, thin and evenly bed-	•	•
	nodules in upper 1 ft	3	0	122	dedSandstone, light-gray, very fine grained,	2	0
103.	Sandstone, light-gray, very fine grained, thin and irregularly bedded, very silty,			122.	thin and irregularly bedded, very silty,		
	iron-stained, calcareous	3	6	123	pyrite nodules	1	6
104.	Shale, medium-gray, thin and evenly bed- ded, upper 4 in very carbonaceous;			123.	thick coaly carbonaceous zone 4 ft		
	1-ft-thick nonbedded zone with fossil				above base; 11/2-ft-thick sandy, calcar-		
	roots 4 in below top	3	8		eous siltstone 5 ft above base; 2½-ft-thick light-brownish-gray, silty, carbo-		
105.	Coal, bright, fine to medium cleats, upper 4 in shaly and bony, gypsum crystals-		11		naceous shale at top with gypsum crystals, resin blebs, and coal frag-		
106.	Shale, medium-gray, thin- to poorly bed- ded	1	2	124	ments, few fossil roots Coal, bright, slightly impure, resin blebs,	11	0
107.	Sandstone, light-gray, very fine grained,			124.	fine to medium cleats, upper 8 in bony-	1	8
100	thin and irregularly bedded, silty Shale, medium-gray, thin and evenly bed-	2	0	125.	Sandstone, very light gray to white, very		
100.	ded, contains 1-ft-thick siltstone 1 ft 4				fine grained, thin and irregularly bed- ded, silty	2	0
	in above base; scattered thin sand inter-		•	126.	Shale, medium-gray, thin and evenly bed-		-
100	bedsSandstone, very light gray, very fine	15	0		ded, silty to very silty; 1-ft-thick silty	12	Λ
107.	grained, thin and irregularly bedded	12	0	127.	ironstone 4 ft above base Sandstone, medium-light-gray, very fine	14	0
110.	Underclay, medium-gray, poorly bedded,				grained, thin- to thick-bedded, cross-		
	4-in-thick carbonaceous zone 5 ft above base	13	0		bedded, very silty; 6-in-thick shale lens 3 ft above base; pyrite nodules	16	0
	20010 0400	13	3		o it accord case, pythe hodgies	10	Ü

		Thickr	iess			Thick	ness
		Ft	in			Ft	in
128.	Shale, medium-gray, silty, thin and			149.	Coal, impure, weathered		4
	evenly bedded, upper 2 in bentonitic -	1	8		Shale, medium-gray, thin and evenly bed-		-
129.	Coal, bright		2	100.	ded, upper 8 in light-grayish-brown,		
	Shale, medium-gray, thin and evenly bed-				with abundant coal fragments, fossil		
	ded	1	2		roots, silty	6	0
131.	Sandstone, very light gray to white, very			151	Sandstone, medium-light-gray, very fine	_	-
	fine grained, thin- to thick-bedded,			1011	grained, thin-bedded, silty	2	0
	crossbedded, very silty, very calcare-			152	Shale, medium-gray, thin- to poorly bed-	-	
	ous, pyrite nodules	6	0	132.	ded, silty, few fossil roots	1	4
132.	Shale, medium-gray, thin and evenly bed-			153	Coal, bright, impure	•	41/2
	ded, upper 1½ ft very sandy and silty				Shale, medium-gray, thin- to poorly bed-		772
	with coal fragments; upper 3 in very			134.	ded, abundant siltstone and sandstone		
	carbonaceous, shaly	5	6		interbeds; basal 5 in very carbona-		
133.	Coal, impure		3		ceous; upper 1½ ft very sandy, thin		
134.	Shale, medium-gray to medium-dark-				bedded	6	0
	gray, thin and evenly bedded, few			155		U	U
	siltstone interbeds	7	0	133.	Shale, medium-gray, thin and evenly bed-		
135.	Sandstone, light-gray, very fine to fine-				ded, basal 1 ft very sandy; upper 3 in very carbonaceous	2	6
	grained, thin- to thick-bedded, cross-			156	Bentonite, light-olive-gray, nonbedded,	2	U
	bedded, dark and light mineral grains,			150.	few fossil roots in upper 2 in with few		
	very calcareous, solution cavities	18	0		coal fragments	3	0
136.	Shale, medium-light-gray in basal 10 in,			157	Shale, medium-gray, thin and evenly bed-	,	
	very silty and sandy, upper part light-		_	137.	ded	1	3
	gray-brown, very carbonaceous	1	2	158	Sandstone, medium-light-gray, very fine	1	3
137.	Coal, dull, weathered, fine cleats, resin		_	156.	to fine-grained, thin-bedded, silty		8
100	blebs		7	150	Shale, medium-gray to medium-dark-		O
138.	Shale, medium-gray, thin and evenly bed-		•	139.	gray, lower half thin-bedded, upper		
120	ded, scattered thin silt interbeds	4	0		half nonbedded	5	0
139.	Sandstone, very light gray, very fine			160	Sandstone, medium-light-gray, very fine	3	U
	grained, thick- to massive-bedded,			100.	grained, thick-bedded, silty, few fossil		
	silty, dark and light mineral grains,				roots at top	2	6
	scattered carbonaceous material, very	10		161	Shale, medium-gray, thin-bedded, silty,	2	U
140	Calcareous	12	6	101.	few coal fragments	1	8
140.	Shale, medium-gray, thin- to poorly bed			162	Siltstone and sandstone, medium-gray;	•	Ü
	ded, very silty; 1-ft-thick siltstone 1 ft above base; few carbonaceous zones in			102.	sandstone, very fine grained, contains		
	upper 3 ft	22	0		6-in-thick medium-gray shale interbed-	2	0
141	Sandstone, light-gray, very fine to fine-	22	U	163.	Shale, medium-gray to medium-dark-		
171.	grained, crossbedded, thin- to thick-				gray, thin and evenly bedded, few		
	bedded, slightly calcareous, iron-				carbonaceous zones	4	0
	stained	8	0	164.	Limestone, medium-gray, brittle, frac-		
142.	Shale, medium-gray, thin- to poorly bed-	v	Ü		tured; 8-in-thick very fine grained		
	ded, few sandy and silty zones; 1-in-				sandstones at base, overlain by 1-ft-4-		
	thick coaly bed 10 ft above base	17	0		in-thick medium-gray, thin-bedded		
143.	Sandstone, light-gray, very fine grained,		-		shale	6	0
	thin and irregularly bedded, crossbed-			165.	Shale, medium-gray; upper 1 ft, medium		
	ded, slightly calcareous, iron-stained,				dark gray, thin and evenly bedded; few		
	limestone in top 1 ft, pyrite nodules	10	0		coal fragments in upper 7 in	3	0
144.	Shale, medium-gray, thin-bedded, sandy,			166.	Shale, medium-gray, thin and evenly bed-		
	silty, has 1-ft-thick siltstone lens 16 ft				ded, very silty, sandy	1	1
	above base; becomes more silty and			167.	Sandstone, medium-light-gray, very fine		
	sandy upward	26	0		grained, thin- to thick-bedded, silty,		
145.	Sandstone, light-gray, very fine grained,				upper 8 in contains ironstone nodules		
	thin and irregularly bedded, silty, iron-				and shale	3	0
	stained	1	0	168.	Shale, medium-gray to medium-dark-		
146.	Shale, medium-gray, thin and evenly bed-				gray, thin and evenly bedded	2	6
	ded; 1-ft-3-in-thick carbonaceous coaly		_	169.	Sandstone, medium-light-gray, very fine		
	zone 2 ft above base	5	6		grained, silty	1	4
147.	Sandstone, light-gray, very fine grained,			170.	Shale, medium-gray to medium-dark-	_	_
	thin- to thick-bedded, dark and light				gray, thin and evenly bedded	2	6
	mineral grains, calcareous, iron-stained;	1.5	0	171.	Sandstone, medium-light-gray, very fine		
140	6-in-thick shale lens 2 ft above base	15	0		to fine-grained, thin-bedded; 4-in-thick		
148.	Shale, medium-gray, thin and evenly bed-	4	Λ		shaly, coaly, sooty lens 4 ft above	22	6
	ded, upper 1 ft bentonitic fossil roots-	4	0		base; upper half very calcareous	22	6

		Thick	ness			Thicl	kness
		Ft	in			Ft	in
172.	Shale, medium-gray, few thin, medium- and dark-gray carbonaceous shale interbeds; few very fine grained sand-			194.	Shale, medium-gray to dark-gray, thin and evenly bedded, silty, few carbonaceous laminations at base and top	3	6
173.	stone interbeds up to 1 ft thickSandstone, medium-light-gray, very fine	11	0	195.	Sandstone, basal 3 ft thin-bedded, very silty, upper part very fine grained,	3	Ū
	grained, thin-bedded, silty	3	6		massive	8	0
	Shale, medium-gray, thin-bedded, silty Shale, light-grayish-brown, very carbo-	1	6	196.	Underclay, medium-gray, sandy, silty, fossil rootlets	1	0
175.	naceous, silty, abundant coal frag- ments	2	3	197.	Coal, brown, banded, abundance of fusain	•	6
176	Shale, medium-gray, thin-bedded, silty,	2	3	198.	Shale, light-grayish-brown		7
170.	sandy, upper 6 in carbonaceous	1	4		Shale, medium-gray, thin-bedded		5
177.	Sandstone, medium-light-gray, very fine grained, thin-bedded, silty	1	3		Limestone, medium-gray, brittle, frac- tured	1	3
178	Shale, medium-gray, thin and poorly bed-	•	3	201.	Shale, medium-gray, thin-bedded	2	6
	dedSandstone, medium-light-gray, very fine	2	10		Sandstone, light-gray in basal 5 ft, medium-light-gray in top 3 ft, very fine		
177.	grained, silty, thin siltstone-shale in				to fine-grained, massive-bedded	8	0
	basal 1 ft	2	10	203.	Underclay, medium-gray, fossil roots	2	6
180.	Shale, medium-gray, poorly bedded,	_		204.	Shale, grayish-brown, thin-bedded, very		
	silty, few fossil roots	2	0		carbonaceous, coal fragments		8
181.	Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded, very cal-			205.	Coal, brownish-gray, resin blebs, fine to medium cleats		8
	careous, few shaly interbeds in basal 2			206.	Shale, medium-gray, silty in upper 4 ft,		
	ft; ironstone and pyrite nodules	25	0		slightly bentonitic, top channeled and	_	•
182.	Shale, medium-gray to light-grayish-			207	filled by unit 207	5	0
	brown, thin-bedded, upper 2 ft poorly			207.	Sandstone, medium-light-gray, fine-		
	bedded, few fossil roots	7	6		grained, thin- to thick-bedded, very calcareous	17	6
183.	Shale, light-grayish-brown to brown, very			208	Shale, medium-gray, thin and evenly bed-	1,	Ü
	carbonaceous, silty, coaly, abundance	7		200.	ded; 1-ft-thick ironstone lens 6 in		
104	of fossil plant fragments	7	6		above base; 3-in-thick carbonaceous		
104.	Shale, medium-gray, poorly bedded, contorted lens-shaped beds, possible fault				zone 61/2 ft above base; 11/2-ft-thick		
	zone	4	0		carbonaceous zone 3½ ft below top	33	0
185.	Sandstone, medium-light-gray, medium-	•	Ŭ	209.	Sandstone, medium-light-gray, light min-		
100.	to fine-grained, thin and irregularly				eral grains, silty, very calcareous,	_	Λ
	bedded, silty	4	0	210	upper 8 in very calcareous	5	0
186.	Shale, medium-gray in basal 11/2 ft, upper			210.	Shale, medium-gray, thin and evenly bed- ded, abundance of calcareous ironstone		
	part grayish-brown, a few fossil root-	_			and scattered sandstone lenses; 3-in-		
40=	lets, silty	5	0		thick limestone at base; scattered sand-		
	Coal, impure, shaly		6		stone lenses; 1-ft-thick sandstone lense		
188.	Shale, medium-gray, thin and evenly bed- ded				20 ft above base; 3-in-thick carbona-		
100			8		ceous shale 6 in below top contact	31	0
189.	Sandstone, light-gray, very fine to fine- grained, thin-bedded, very calcareous,			211.	Sandstone, medium-light-gray, thin-		40
	pyrite nodules, fossil roots in upper			212	Shale medium grow thin and evenly had	1	10
	part	6	0	212.	Shale, medium-gray, thin and evenly bed- ded, silty	2	6
190.	Shale, medium-gray to dark-gray, poorly			213.	Shale, medium-gray to dark-grayish-		U
	bedded, fossil roots, upper 4 in very			213.	brown, abundant coal fragments near		
	carbonaceous	3	6		top	4	6
191.	Sandstone, medium-light-gray, fine- to			214.	Shale, medium-gray to light-grayish-		
	very fine grained, thin and irregularly				brown, carbonaceous in places, few		
	bedded, crossbedded, basal 4 in very		_		siltstone lenses up to $2\frac{1}{2}$ ft thick; 1-ft	••	_
	friable, upper part very calcareous	17	0	215	carbonaceous zone above base	20	0
192.	Shale, medium-gray, thin-bedded, upper			215.	Sandstone, medium-light-gray, very fine	1	4
	2½ ft very carbonaceous, fossil plant	_	Λ	216	grained, silty, fossil plant fragments	1	6
102	fragments	5	0	210.	Shale, medium-gray, thin and evenly bed- ded	2	6
173.	Sandstone, light-gray, very fine to fine- grained, massive-bedded, dark and			217	Sandstone, medium-light-gray, pyrite	2	J
	light mineral grains, solution cavities,			₩17 ,	nodules	5	0
	basal 3 ft contains calcareous concre-			218.	Shale, medium-gray, thin and evenly bed-		
	tions	10	0		ded	3	0

		Thick	ness			Thick	ness
		Ft	in			Ft	in
219.	Siltstone, medium-gray, thin and irregularly bedded	3	0		coal, lens-shaped beds in central part of unit		8
220.	Shale, medium-gray to dark-gray, thin and evenly bedded, slightly carbona-			244.	Shale, medium-gray, poorly bedded, very silty	4	-
221.	ceousSandstone, light-gray, fine-grained, thin-	6	0	245.	Limestone, medium-gray, upper 2 ft con-	4	0
	beddedShale, medium-gray to medium-dark-	3	6	246.	tains 50 percent shale lenses Sandstone, medium-light-gray to gray,	3	0
223.	gray, thick-bedded, slightly bentonitic- Sandstone, medium-light-gray, fine- grained, thin-bedded, very calcareous,	10	0		very fine grained, grades massive- to thin-bedded upward, silty at top of unit	4	6
224.	very friable, very silty, shale interbeds- Shale, medium-gray to medium-dark- gray, thin-bedded, coal zone 5 ft above	32	0	247.	Shale, medium-gray to light-gray to light- brownish-gray, few carbonaceous beds with coal fragments	6	6
225.	base slightly bentonitic; 2-in-thick coal zone at top	10	6	248.	Sandstone, medium-light-gray, fine- grained, silty in basal 1 ft, contains siltstone coated with iron oxide, silty	Ü	
226	grained, thin- to thick-bedded, very calcareous	20	0	240	interbeds	4	0
220.	Underclay, medium-gray, poorly bedded, fossil rootlets, silty, few coal fragments	4	6	24).	ded, contains 8-in-thick carbonaceous shale 4 ft above base	10	0
227.	Sandstone, medium-light-gray, thin- bedded, silty		8	250.	Underclay, medium-gray, nonbedded, fossil rootlets, upper 8 in very silty,		
228.	Shale, medium-gray, thin-bedded, very silty, sandy	2	6	251.	carbonaceousCoal, bright, fine to medium cleats	2	6 7
229.	Sandstone, light-gray, fine-grained, thin- bedded, few carbonaceous laminations	5	6		Shale, medium-gray, nonbeddedSandstone, thin-bedded, fine-grained,	1	4
230.	Shale, medium-gray to light-grayish- brown to medium-dark-gray, coal frag-				silty, fossil roots at topCoal, brownish-gray, bony	2	0 9
231.	ments, locally slightly bentonitic Sandstone, medium-light-gray, fine- grained, thin- to thick-bedded, lens-	7	0		Shale, medium-gray, thin-bedded, bento- nitic	3	6
232.	shaped beds, shale in upper 2 ftShale, medium-gray, thin-bedded, silty,	9	0		bedded, silty	2	6
	sandy, gypsum crystals, iron-stained, carbonaceous in top ½ in	4	0		coal fragments at topSandstone, medium-light-gray, very fine	4	0
233.	Shale, light-grayish-brown, silty, sandy, very carbonaceous, coal fragments	1	2		grained, thin-bedded, crossbedded, very calcareous, pyrite nodules	4	6
	Bentonite, light-brown to light-olive-gray with gypsum crystals, calcareous		6	259.	Shale, medium-gray, thin-bedded, few carbonaceous plant fragments, siltstone		
235.	Sandstone, medium-light-gray, very fine grained, pyrite nodules, upper 2 ft very silty	4	2	260	and sandstone interbeds; 6-in-thick carbonaceous shale at baseSandstone, medium-light-gray, thin- to	20	- 6
236.	Shale, medium-gray to light-brownish- gray, thin and evenly bedded	4	6	200.	massive-bedded, silty, upper 5 ft shaly and silty	10	0
237.	Sandstone, light-gray, fine-grained, thick- bedded, silty, fossil roots	3	6	261.	Shale, medium-gray; 4-in-thick carbonaceous zone 2½ ft above base; becomes	-*	·
238.	Shale, light-gray, in basal 8 in; upper part light brownish gray, volcanic ash bed			262.	sandy at topSandstone, medium-light-gray, very fine	14	0
239.	contains crystallites	2	0	263.	to fine-grained, massive-bedded, silty, upper 4 ft very calcareous	25	0
240.	very calcareous, pyrite nodules, shale chips in basal 4 in, lens-shaped beds - Shale, medium-gray, thin and evenly bed-	20	0		nitic, volcanic ash fragments; 8-in- thick carbonaceous zone 5 ft above base; 1-ft-thick thin-bedded bony coal		
241.	ded	4	0	264.	10 ft above base; 2-ft-thick carbonaceous zone 20 ft above baseSiltstone, medium-gray, thin-bedded,	26	0
242.	in-thick shale lens 8 in below top Shale, medium-gray, thin and evenly bed-	21	0		very fine grained, top part sandy and shaly	2	0
243.	dedShale, light-grayish-brown, very carbo-	3	0	265.	Shale, medium-gray to light-grayish- brown, nonbedded, slightly carbona-		
	naceous, contains 1-in-thick impure				ceous	3	6

		Thick	ness			Thick	kness
		Ft	in			Ft	in
266.	Shale, grayish-brown, very carbona-			295	Sandstone, medium-light-gray, thin-		
	ceous, silty	2	0	2,5.	bedded, crossbedded, silty, pyrite nod-		
267.	Shale, medium-gray, thin-bedded	3	0		ules	4	6
	Sandstone, light-gray, fine- to medium-			206		7	U
	grained, massive-bedded, silty at top of			290.	Shale, light-grayish-brown, silty, very	2	•
	unit	4	0	207	carbonaceous, coal fragments	3	0
269.	Shale, medium-gray, thin and poorly bed-				Shale, medium-gray, bentonitic	2	6
	ded, upper 1 ft very silty	5	0	298.	Sandstone, medium-light-gray, very fine		
270.	Underclay, medium-gray, fossil rootlets -	1	6		to fine-grained, massive-bedded, few		_
271.	Coal, brown		4		calcareous solution cavities	27	0
272.	Shale, light-grayish-brown, carbona-			299.	Shale, medium-gray, thin and evenly bed-		_
	ceous		4	200	ded, silty	1	6
273.	Sandstone, medium-light-gray, thin- to			300.	Shale, grayish-brown, thin-bedded, silty,		
	thick-bedded, silty, few shale inter-				abundant coal fragments, few fossil	1	0
	beds	18	0	201	roots	1	8
274.	Underclay, medium-gray, fossil rootlets,		_	301.	Coal, resin, thin-banded, blebs, top chan-		7
	very silty	1	0	302	neled and filled by unit 302Sandstone, light-gray, fine-grained,		,
275.	Shale, light-grayish-brown, very carbo-			302.	massive-bedded, crossbedded, silty,		
	naceous, abundant fossil plant frag-		_		solution cavities, lens-shaped beds	4	6
076	ments	1	2	303	Shale, medium-gray, thin and evenly bed-	•	U
2/6.	Shale, medium-gray, thin-bedded,		10	505.	ded	1	0
277	slightly carbonaceous	4	10	304.	Shale, light-grayish-brown, nonbedded,	•	Ŭ
211.	Sandstone, medium-light-gray, silty, fos-			3011	very carbonaceous, gypsum crystals	1	8
	sil plant impressions, contains few	5	0	305.	Shale, medium-gray, thin- to poorly bed-	_	•
270	shale interbedsShale, medium-gray, thin-bedded, con-	3	U	-	ded, basal 1 ft 2 in very sandy, includes		
270.	tains 1-ft-thick siltstone lens 6 in below				7-in-thick light-olive-gray bentonite		
	top, well-preserved rootlets near top				lens	7	10
	contact	5	0	306.	Sandstone, medium-light-gray, fine- to		
279	Siltstone, medium-gray, thick-bedded	3	6		medium-grained, nonbedded, base fills		
	Shale, medium-gray, thin and evenly bed-		·		channel in unit 305, top 1 ft calcareous-	4	6
200.	ded	6	0	- 307.	Shale, medium-gray, few carbonaceous		
281.	Sandstone, medium-light-gray, very fine		•		zones	7	0
	grained, silty, shaly, very calcareous,			308.	Shale, dark-grayish-brown, thin-bedded,		
	fossil roots, ironstone 4 ft below top;				silty, very carbonaceous, fossil plant	_	_
	2-ft-thick shale interbeds near top	12	0	200	fragments	2	0
282.	Shale, medium-gray, thin and evenly bed-			309.	Shale, medium-dark-gray, thin and		•
	ded	3	6	210	evenly bedded	4	2
283.	Limestone, medium-gray, hard, brittle	2	0	310.	Sandstone, medium-light-gray, very fine	2	6
284.	Sandstone, medium-light-gray, fine-			211	grained, thin-bedded, silty Shale, medium-gray, thin and evenly bed-	2	U
	grained, silty, pyrite nodules, very cal-			311.	ded; 6-in-thick light-grayish-brown		
	careous	1	3		zone 1 ft above base; 6-in-thick carbo-		
285.	Shale, silty, carbonaceous, abundant coal				naceous zone 6 ft above base; 2-ft-thick		
	fragments	1	0		bentonitic zone 3 ft below top	11	0
	Shale, medium-gray, thin-bedded, silty	3	0	312.	Sandstone, medium-light-gray, silty, fos-		-
287.	Sandstone, medium-light-gray, thin-				sil roots	2	6
	bedded, silty, abundant coal frag-			313.	Shale, medium-gray, thin and evenly bed-		
	ments	4	6		ded	4	0
288.	Siltstone, medium-gray, fine-grained			314.	Siltstone, medium-gray, fine-grained,		
	sandstone and shale interbeds; fossil	_	_		sandy	2	0
•••	roots at top	9	0	315.	Shale, medium-dark-gray, thin and		
	Shale, medium-gray, thin-bedded, silty	4	10		evenly bedded, carbonaceous	. 3	4
290.	Shale, light-grayish-brown, thin-bedded,			316.	Sandstone, medium-light-gray, thin-		_
	silty, very carbonaceous, few fossil				bedded	1	6
201	roots, abundant fossil plant fragments-	1	6	317.	Shale, medium-gray, thin and evenly bed-	2	^
	Coal, brown, resin blebs, fine cleats		6	210	ded, very fine grained, sandy lenses	2	0
292.	Shale, light-grayish-brown, silty, very			318.	Siltstone, medium-gray, very fine grained	4	Λ
	carbonaceous, coal fragments, few fos-	1	10	210	sandstone and ironstone beds, shaly	4	0
203	sil rootlets Underclay, medium-gray, nonbedded,	- 1	10	319.	Shale, medium-gray to light-gray, silty, poorly bedded; 1-ft-thick black, carbo-		
473.	silty, fossil rootlets	2	2		naceous, sooty zone at the top	3	6
294	Shale, light-grayish-brown, thin-bedded,	_	~	320	Sandstone, medium-light-gray, very fine	,	v
11	silty, very carbonaceous	1	6	220.	to fine-grained, thin- to massive-		
		•	•		6		

		Thick	ness			Thick	ness
		Ft	in			Ft	in
	bedded, solution cavities, pyrite nod-				stained, abundant fossil plant impres-		
	ules, upper 8 in thin-bedded, very cal-	_	_		sions	4	0
221	Chale madium and this and smale had	3	8	349.	Shale, medium-gray to light-gray, poorly		
321.	Shale, medium-gray, thin and evenly bed-	o	0		bedded, silty, slightly bentonitic	9	0
322	ded, basal 1 ft very siltySiltstone, medium-gray, grades into sand-	8	U		Total measured thickness of main		
JLL.	stone	5	6		body of Mesaverde Formation	2,060	$\frac{2\frac{1}{2}}{2}$
323.	Shale, medium-gray, thin and evenly bed-	-	•	3371.14.			
	ded	4	0		sandstone member: Sandstone, light-gray, fine-grained, thick-		
324.	Sandstone, medium-light-gray, very fine			330.	bedded to massive, pyrite nodules,		
20.5	grained, thin-bedded, calcareous	3	0		fractures filled with quartz, crossbed-		
325.	Sandstone, light-gray, fine- to medium-				ded	22	0
	grained, few siltstone beds, few shale chips, very friable	27	0	351.	Siltstone and very fine grained sandstone,		
326.	Shale, medium-gray, thin-bedded, silty,	21	U		medium-gray, nonbedded, grades into		
	sandy	1	6	250	sandstone upward	5	0
327.	Sandstone, light-gray to medium-light-			352.	Sandstone, medium-light-gray, massive- bedded, silty	3	4
	gray, very fine to fine-grained; 4-in-			353	Shale, very silty, sandy, lens-shaped	3	6
•••	thick ironstone lens 16 ft above base -	18	0	333.	beds	5	0
	Shale, medium-gray, thin-bedded	2	2	354.	Sandstone, light-gray, very fine to fine-	-	Ū
329.	Limestone, medium-gray, brittle, fractured, abundant iron stains; 1½-ft-thick				grained, thick-bedded to massive,		
	very calcareous sandstone 1 ft below				crossbedded	7	0
	top	5	0	355.	Shale, medium-gray to medium-light-	_	_
330.	Shale, medium-gray, thin and evenly bed-		•	256	gray	5	6
	ded, sandy at top	5	0	330.	Siltstone, medium-gray, fine-grained, thin-bedded, sandy in basal 1 ft	5	0
331.	Siltstone, medium-gray, thin-bedded,			357	Shale, medium-gray, poorly bedded, very	3	U
222	shaly	2	6	557.	silty, sandy interbeds	5	0
332.	Shale, medium-gray, poorly bedded,	•	0	358.	Sandstone, light-gray, very fine to fine-		ŭ
333	silty, sandySandstone, light- to medium-gray, very	2	0		grained, crossbedded, dark and light		
333.	silty	1	1		mineral grains, pyrite nodules	35	0
334.	Siltstone, medium-gray, poorly bedded	3	0	359.	Shale, medium-gray, poorly bedded,		_
	Siltstone, medium-gray, poorly bedded,		Ŭ	260	slightly bentonitic	9	6
	shaly	4	2	360.	Sandstone, light-gray, basal 15 ft thin-		
336.	Sandstone, medium-light-gray, silty, thin-				bedded, crossbedded, solution cavities, pyrite nodules; 1-ft-thick silty-shaly		
225	bedded	4	0		interbeds with iron stains, carbona-		
337.	Siltstone, medium-gray, fine-grained, iron-				ceous zones, abundant iron stains	80	0
	stained, calcareous, abundant fossil roots	1	8	361.	Sandstones, light-grayish-brown, fine-		
338	Shale, medium-gray, poorly bedded,	1	0		grained, shaly, silty, very carbona-		
220.	silty, sandy	1	10	262	ceous	3	6
339.	Sandstone, light-gray to medium-gray,			362.	Shale, light-grayish-brown, thin-bedded,		
	fine-grained, massive-bedded, cross-				silty, sandy, carbonaceous, abundant fossil plant material, iron stains	20	6
	bedded	17	6		Total measured thickness of white		
340.	Shale, medium-gray; 10-in-thick siltstone	4	0		sandstone member of Mesaverde		
341	lens 1 ft 3 in above baseSandstone, light-gray to medium-gray,	4	0		Formation	206	6
J + 1.	fine-grained, massive-bedded, cross-				Total measured thickness of Mesa-		
	bedded	1	9		verde Formation	2,266	81/2
342.	Shale, medium-gray, thin-bedded to non-			Meete	etse Formation:		
	bedded, becomes sandy upward	2	6	363.	Shale, dark-grayish-brown, thin-bedded,		
343.	Sandstone, light-gray to medium-gray,				bony, coal band		8
	fine-grained, massive-bedded, cross-		^	364.	Shale, light-grayish-brown, poorly bed-	4	
3//	bedded Shale, medium-gray, thick-bedded	1 1	0 10	265	ded, very sandy, silty	4	4
	Sandstone, medium-light-gray, silty, iron-	1	10	303.	Sandstone, light-gray, fine- to medium- grained, thin-bedded to massive, cross-		
515.	stone band	2	6		bedded, upper 5 ft calcareous and thin-		
346.	Shale, medium-gray, thin and evenly bed-	_	·		bedded	15	0
	ded, grades sandy upward	3	0	366.	Sandstone, light-brownish-gray, very fine		
347.	Sandstone, light-gray, very fine grained,		_		grained, carbonaceous, very silty,		
240	siltstone-shale interbeds, silty	6	0		abundant fossil plant material; 6-in-		
<i>5</i> 48.	Sandstone, medium-light-gray, very fine				thick shale 2 ft below top; top 2 ft	13	0
	grained, silty, calcareous, top very iron				ironstone, very iron stained	13	U

		Thick	ness			Thick	ness
		Ft	in			Ft	in
367.	Shale, medium-gray to medium-light- gray, irregularly bedded to nonbedded, sandy, silty, few fossil roots	5	0	389.	Sandstone, light-gray, very fine grained, thin- to thick-bedded, very silty, pyrite nodules	_	
368.	Underclay, medium-grayish-brown, sandy, silty, abundant fossil plants and roots	1	0	390.	Shale, medium-gray to medium-dark- gray, thin-bedded, slightly carbona-	5	4
369.	Shale, dark-grayish-brown to black, thin- bedded, silty, very carbonaceous, scat- tered coal chips and lenses, sulphur-	1	v	391.	Coal, dull, impure, very bony, scattered shale partings	4	10 11
370.	stained	1	2	392.	Sandstone, light-gray, very fine grained, thin- to thick-bedded, very silty, plant fossils in basal 2 in, pyrite nodules	3	0
371.	silty, fractures filled with gypsum Shale, medium-brownish-gray, poorly bedded, fossil plant fragments, carbo-	2	0	393.	Underclay, light-brownish-gray, thin- to poorly bedded, abundant fossil plant		
372.	naceousSandstone, very light gray, very fine		9	394.	and root fragments		6 7
373.	grained, thin and irregularly bedded, silty Shale, medium-grayish-brown, few black	1	7	395.	Underclay, medium-brownish-gray, thin- bedded, fissile, carbonaceous, slightly silty, scattered coal fragments, gypsum		
374	carbonaceous lenses up to 1 in thick, silty, scattered fossil plant fragments - Sandstone, light-gray, very fine grained,	11	0		crystals, fossil root and plant frag-		10
	thin- to thick-bedded	1	11	396.	Shale, dark-gray to black, thin-bedded, carbonaceous, coaly, scattered coal		
	carbonaceous, scattered fossil plant fragments, contains coalified log, bright	1	0	397.	and fossil plant fragments		4
376.	Shale, medium-gray, thin- to poorly bed- ded; 6-in-thick very fine grained sand-			398.	shale interbeds	6	11
377.	stone lens 61/2 ft above base Shale, dark-grayish-brown to black,	12	0	399.	silty, highly iron stained in top 2 ft Shale, medium-gray, 10 percent silt lenses up to 2 in thick	7 9	0
	abundant fossil plant fragments, carbo- naceous coal fragments, sulphur- stained	1	6	400.	Underclay, light-brownish-gray, silty, hard, carbonaceous in top 4 in with	,	Ü
	Shale, medium-gray, thin and evenly bedded, carbonaceous in top 3 in	2	0	Dana	scattered coal fragments, fossil roots, abundant fossil plant fragments of unnamed coal bed	1	10
379.	Bentonite, light-olive-gray to light- yellowish-gray, poorly bedded to non-	,	2	401.	Coal, bright to dull, slightly impure		10 8
380.	bedded	1	2		Coal, bony, impure, bright laminations Shale, medium-brownish-gray, carbona- ceous		1
381.	up to 2 in thickSandstone, very light gray, very silty,	5	6	404.	Coal, bright to dull, fine cleats, sulphur- stained	1	8
382.	very shaly, fossil plant fragments Underclay, medium-brownish-gray, coal fragments, very silty, fossil root and	5	0		f unnamed coal bed Underclay, medium-gray, silty, fossil plant and root fragments		6
383.	plant fragmentsCoal, very dull, few bright lenses, bony,	1	3		Shale, dark-gray to black, very carbonaceous, scattered coal laminations		6
384.	very impure, shale lenses	1	9	407.	Underclay, medium-gray, abundant mica, carbonaceous in upper 4 in, fossil plant	1	4
385.	Underclay, medium-gray, thin and irregularly bedded, very sandy and silty,	1	1	408.	Sandstone, medium-gray, very fine to fine-grained, thin- to thick-bedded,	1	4
	fossil root fragments Shale, medium-gray, thin-bedded Sandstone, light-gray, very fine grained,		8 10		crossbedded, solution cavities, few interbeds of siltstone, pyrite nodules, lower 4 ft contains 20 percent fine		
3 88	crossbedded, thin- to thick-bedded, silty, iron stains	2	8	<i>4</i> ∩0	carbonaceous laminations, capped by 2-in iron-stained, resistant siltstoneShale, medium-gray, thin and evenly bed-	19	6
<i>3</i> 00.	Shale, medium-gray, thin-bedded, slightly bentonitic; 4-in-thick bentonitic zone 7 ft above base; carbonaceous				dedShale, medium-brownish-gray, carbona-		6
	in top 6 in, weathered	23	6	110.	ceous, abundant fossil plant fragments-		3

		Thick	ness		Thick	ness
		Ft	in		Ft	in
411.	Shale, dark-brownish-gray, carbonaceous, coaly laminations		4	435. Sandstone, light-medium-gray, fine- to medium-grained, friable	6	8
412.	Sandstone, light-gray to medium-gray, thin to thick and irregularly bedded,			436. Shale, medium-gray, thin and evenly bed- ded, basal 10 in carbonaceous		
	crossbedded, light and dark mineral grains, well-sorted, pyrite nodules,			437. Sandstone, medium-gray, fine-to medium-	14	4 2
413.	interbeds of shale and siltstone Shale, medium-gray, thin and evenly bedded, sandy, thin interbeds of friable	18	0	grained, fossil plant fragments 438. Shale, medium-gray, thin and evenly bedded, carbonaceous, sandy, bentonitic in upper few inches	1	0
414.	sandstoneSandstone, light- to medium-gray, very	11	4	439. Sandstone, medium-gray, very fine grained, highly carbonaceous	1	10
415.	fine to fine-grained, friable Shale, medium-gray, thin and evenly bed- ded, thin sandstone interbeds, 10 per-	1	4	440. Sandstone, medium-gray, very fine to fine-grained, very carbonaceous, friable, deeply weathered	5	0
416.	cent carbonaceous beds in upper third of unit	16	0	441. Shale, medium-dark-brownish-gray, car- bonaceous, friable, sandy, basal 6 in contains coal fragments; 1-ft-10-in-	3	
417.	bedded, 30 percent siltstone interbeds- Sandstone, medium-gray, very calcare-	9	4	thick sandstone interbeds 6 in above	6	2
	ous, lower 3 ft is thin and evenly bedded, silty, upper 10 in is friable and nonresistant	5	0	442. Shale, dark-brownish-gray, carbonaceous, coaly laminations, basal 8 in		
418.	Shale, medium-gray, thin and evenly bedded, siltstone 3 in thick at base	4	10	resistant443. Bentonite, medium-olive-gray	6	2
419.	Sandstone, light- to medium-gray, fine- grained, crossbedded, silty, friable	2	10	444. Shale, dark-brownish-gray, carbona- ceous		6
420.	Shale, medium-brown to gray, carbonaceous, thin and irregularly bedded,		10	445. Bentonite, medium-olive-gray, abundant fossil plant material Base of Welton coal bed		21/2
421.	bentonitic	5	4	446. Coal, dull, few bright bands, impure, fine to medium cleats, shale laminations		8
422.	Shale, medium-brownish-gray, carbonaceous, thin and evenly bedded, bento-	4	10	447. Shale, dark-brownish-gray, carbona- ceous, abundant coaly fragments		6
423.	nitic in upper half of unitSiltstone, medium-gray, thin and irregu-	10	4	448. Sandstone, medium-gray, very fine to fine-grained449. Underclay, very sandy, abundant fossil	4	8
424.	larly bedded, very calcareous, iron- stained, resistant	- 1	5	plant and root fragments 450. Shale, very dark brownish gray, carbona- ceous		10
	ded Shale, medium-brownish-gray, carbona-		10	451. Coal, very impure, dull, few bright bands, shale laminations, gypsum crys-		7
	ceousSandstone, medium-gray, fine-to medium-	1	0	tals, resin blebs, fine to medium cleats, upper 5 in mostly bright	1	8
127	grained, very carbonaceous, abundant fossil plant fragments, friable	6	0	452. Shale, medium-gray, thin and evenly bed- ded	1	2
	Shale, medium-gray, thin and evenly bed- ded	4	8	453. Underclay, medium-dark-brownish-gray, abundance of fossil plant fragments, coal laminations		2
	ceous, upper half of unit very bento- nitic, abundant fossil plant fragments	1	6	454. Coal, bright and dull bands, shale, very impure, resin blebs, upper 3 in mostly		3
429.	Shale, medium-gray, thin and evenly bed- ded, sandy	2	6	bright Top of Welton coal bed		10
430.	Shale, medium-brownish-gray, carbonaceous, interbeds of gray shale, abundant fossil plant fragments	9	s 8	455. Bentonite, medium-olive-gray456. Shale, very dark brownish gray, thin and	1	4
431.	dant fossil plant fragments Sandstone, medium-gray, fine-grained, friable, silty, shale interbeds, light and	J	0	evenly bedded, carbonaceous 457. Shale, very dark brownish gray, thin and evenly bedded, carbonaceous	1	8
432	dark mineral grains, deeply weathered- Sandstone, light-tomedium-gray, medium-	40	6	458. Shale, basal 1½ ft dark-brownish-gray, nonbedded	3	0
	grained, highly iron stained Sandstone, light- to medium-gray, fine- to	1	2	459. Underclay, medium-olive-gray, contains fossil plant fragments	1	6
434.	medium-grained, friableShale, medium-gray, thin and evenly bed-	16	0	460. Shale, medium-dark-brownish-gray, thin and irregularly bedded, very bento-		
	ded, bentonitic	8	0	nitic		6

		Thickr	ness			Thick	kness
		Ft	in			Ft	in
	Bentonite, medium-olive-gray		10		mineral grains, scattered ironstone		
462.	Shale, dark-brownish-gray, carbona-		_		lenses up to 1 in thick, friable; 1-		
162	ceous, abundant fossil plant fragments-	1	6		ft-thick siltstone lens 13 ft above base-	15	0
	Shale, olive-gray, sandy, bentonitic Shale, dark-brownish-gray, carbona-		8	488.	Shale, light- to medium-gray, thin and		
404.	ceous, thin and irregularly bedded	2	6		evenly bedded	5	0
465.	Shale, thin and evenly bedded, carbona-	-	Ŭ	489.	Sandstone, light-gray, fine-grained, thick-		
	ceous in upper 2 ft	3	2		bedded to massive, slightly silty, dark		
466.	Shale, medium-gray, thin and evenly bed-				and light mineral grains, crossbedded,		
4.5	ded	10	6		lens-shaped beds	7	0
467.	Sandstone, medium-gray, very fine			490.	Shale, medium-gray, thin- to poorly bed-	7	2
	grained, thin- to thick-bedded, iron- stained, very calcareous, resistant,			401	ded, very silty	7	2
	pyrite nodules, basal 2 ft contains fossil			4 71.	grained, thin and irregularly bedded,		
	roots up to 14 in long; top 6 in carbon-				locally crossbedded, very silty	8	6
	aceous	9	10	492.	Shale, medium-gray, thin and evenly bed-		
468.	Shale, thin and evenly bedded, dark-				ded	1	3
	brownish-gray in basal 2 in, next 1½ in			493.	Shale, light-olive-gray to light-gray, non-		
	very dark gray to black, top 3 in			404	bedded, hard, silty	1	8
	medium-brownish-gray; carbonaceous, scattered gypsum crystals		9	494.	Shale, light-olive-gray, thin and evenly bedded	5	0
469	Sandstone, friable, bentonitic in base,		,	495	Sandstone, light-gray, very fine grained,	3	U
.0,,	carbonaceous zone above, highly			1,501	ripple beds, very silty, calcareous	11	0
	weathered	5	0	496.	Shale, medium-gray, thin and evenly bed-		
470.	Underclay, sandy, abundant fossil plant				ded	8	6
	and root fragments	1	2	497.	Shale, medium-brownish-gray, thin-		
	Shale, carbonaceous, coal fragments	10	31/2		bedded, carbonaceous, gypsum crys-	1	2
	Bentonite, medium-dark-olive-gray, sandy Shale, medium- to dark-brownish-gray,	12	0	408	talsShale, light-olive-gray, silty, scattered	1	2
413.	carbonaceous	4	6	770.	siltstone lenses up to ½ in thick	4	0
474.	Shale, very dark gray to black, thin-		Ū	499.	Sandstone, very light gray, very fine		
	bedded, carbonaceous	1	4		grained, thick-bedded to massive in		
475.	Shale, light-olive-gray, thin- to poorly				lower half of unit, thin- to thick-bedded		
	bedded, silty, few scattered fossil plant	_	_	#00	in upper half, silty, micaceous	6	0
176	fragments	7	0	500.	Shale, medium-gray, thin- and to poorly		
4/6.	Sandstone, light-gray, very fine grained, silty	2	0		bedded, silty, scattered fossil plant fragments	4	6
477	Underclay, medium-gray, gypsum crys-	2	U	501.	Shale, light-yellowish-gray, thin-bedded,	•	Ü
	tals, carbonaceous in top 1 in, fossil				silty, abundance of gypsum		6
	roots	2	2		Total measured thickness of Mee-		
478.	Sandstone, light-gray, very fine grained,			I Imaaa	teetse Formation	621	
450	silty	2	0		nformity		
479.	Underclay, light-olive-gray, sandy, bentonitic, fossil roots	1	10		Formation:		
480	Shale, dark-brownish-gray, thin-bedded,	1	10	302.	Sandstone, very light gray, very fine to fine-grained, thick-bedded to massive,		
100.	carbonaceous, few scattered coal frag-				pyrite nodules, few shale chips in basal		
	ments	1	3		3 ft, solution cavities, micaceous, dark		
481.	Sandstone, very fine to fine-grained, fri-				and light mineral grains	159	0
400	able, silty, plant fossils	7	0	503.	Shale, medium-gray, thin and evenly bed-		
482.	Shale, light-olive-gray to light-gray, thin				ded, silty, slightly carbonaceous in		
	and evenly bedded, silty, few scattered siltstone laminations	5	6		basal 1 ft, abundant scattered petrified wood on surface	6	6
483.	Sandstone, very light gray, very fine	,	v	504.	Sandstone, very light gray, fine-grained,	·	v
	grained, thin and irregularly bedded,				thick-bedded to massive, crossbeds,		
	very silty	5	0		abundance of dark and light mineral		
484.	Shale, medium-light-gray, thin and	_	_		grains, scattered shale lenses up to 1 ft		
105	evenly bedded, scattered fossil plants-	1	6		thick, calcareous, few solution cavi-	58	0
403.	Sandstone, very light gray, thin and irreg- ularly bedded, very calcareous, very			505	ties, iron stained in top 3 ftShale, medium-gray, thin and evenly bed-	30	U
	silty	12	0	505.	ded	7	6
486.	Shale, medium-brownish-gray, sandy,	_		506.	Sandstone, medium-light-gray, very fine		
	carbonaceous	3	0		grained, silty, abundant dark and light		
487.	Sandstone, light-gray, very fine to fine-				mineral grains, very calcareous, very	_	•
	grained, silty, abundant dark and light				iron stained	7	0

		Thick	ness			Thick	ness
		Ft	in			Ft	in
507.	Shale, medium-gray, thin and irregularly				above 3 ft, dark and light mineral		
500	bedded, weathered	5	0		grains; 2-ft-thick medium-gray shale	4.5	
508.	Sandstone, very light gray, very fine			522	lens 15 ft above base	45	0
	grained, thick-bedded to massive, non- calcareous, slight petroleum stain, base			333.	Shale, medium-gray, thin and evenly bed- ded, carbonaceous in upper half of		
	sharp and undulatory	11	6		unit	15	0
509.	Shale, medium-gray, thin and evenly bed-			534.	Sandstone, light-gray, very fine to fine-		
	ded	1	6		grained, thick-bedded to massive,		
510.	Siltstone, medium-gray, very iron		0		pyrite nodules in lower 3 ft; from 3 ft to		
511	stained, sandy Shale, medium-gray, weathered	1 6	0 0		8 ft fine- to medium-grained with shale		
	Sandstone, light-gray, very fine grained,	O	U		chips; above 8 ft medium-grained, crossbedded, abundant shale chips,		
J12.	thin-bedded, scattered carbonaceous				fossils, pyrite nodules, solution cavi-		
	matter, weathered	3	0		ties, noncalcareous	50	0
513.	Underclay, medium-light-gray, nonbed-			535.	Shale, light-gray to light-olive-gray, ben-		
	ded, very silty, fossil rootlets, pyrite				tonitic	5	0
~	nodules	10	0	536.	Sandstone, light-gray, very fine grained,	_	_
514.	Sandstone, very light gray, very fine	7	0	527	silty, thick-bedded, iron-stained	6	6
515	grained, solution cavities, resistant Shale, medium-gray, nonbedded	7 6	0 6	337.	Shale, light-gray to olive-gray, thin- bedded to nonbedded	25	0
	Sandstone, very fine to fine-grained, thin-	U	U	538.	Sandstone, mostly very fine-grained,	23	U
	to thick-bedded, silty, dark and light			5551	some medium-grained, thin-bedded to		
	mineral grains, pyrite nodules, base				nonbedded, very silty, calcareous,		
	sharp and undulatory, few fossil roots				lens-shaped bed, fossil roots	1	0
	at top	38	0	539.	Shale, light-gray to light-olive-gray, ben-	••	_
517.	Shale, medium-gray, thin and irregularly	10	•	5.10	tonitic, thin and irregularly bedded	28	0
518	bedded, bentonitic in upper 1 ftSandstone, very light gray, very fine to	10	0	540.	Sandstone, light-gray, very fine grained, silty		10
510.	fine-grained, thin- to thick-bedded,			541	Shale, light-gray to light-olive-gray, ben-		10
	crossbedded, silty, noncalcareous,			5-11.	tonitic		7
	pyrite nodules, weathered	11	0	542.	Sandstone, light-gray, very fine grained,		
519.	Shale, medium-gray, thin and evenly bed-				thin- to thick-bedded, very silty, scat-		
	ded, scattered fossil plant fragments	2	4		tered shale lenses	2	8
520.	Sandstone, light-gray, very fine grained,	10	•	543.	Shale, light-gray to light-olive-gray, thin		,
521	silty, nonresistant Shale, medium-gray, thin and evenly bed-	12	0	544	and evenly bedded Sandstone, light-gray, very fine grained,	1	6
J21.	ded	6	6	J 44 .	thick-bedded, very silty, noncalcar-		
522.	Sandstone, light-gray, very fine grained,	·	Ü		eous	1	1
	silty, thick and irregularly bedded,			545.	Shale, light-gray to light-olive-gray, thin		
	very calcareous, iron-stained	2	8		and evenly bedded, bentonitic	16	0
523.	Shale, medium-gray, thin and evenly bed-	_		546.	Sandstone, very fine to fine-grained, thin		
524	ded light grow time	2	0		to thick and irregularly bedded, dark		
324.	Sandstone, very light gray, very fine grained, very silty, micaceous, few				and light mineral grains, silty, scat- tered carbonaceous matter, noncalcar-		
	dark and light mineral grains	6	0		eous	15	0
525.	Shale, medium-gray, thin and evenly bed-	Ü	Ü	547.	Bentonitic, light-olive-gray	15	ŏ
	ded	1	6		Sandstone, very fine to fine-grained,		
	Bentonite, light-olive-gray	1	0		thick- to massive-bedded, silty, dark		
527.	Shale, medium-gray, thin and evenly bed-				and light mineral grains, abundant dark	_	_
	ded, bentonitic, 1-ft-thick shale lens 20			540	minerals, very silty at top	5	6
	ft above base; carbonaceous in top	26	0	349.	Bentonite, light-olive-gray, thin and evenly bedded, gypsum crystals	8	4
528.	Sandstone, very light gray, very fine	20	U	550.	Underclay, medium-gray to medium-	Ū	•
	grained, thick-bedded, silty	1	6	-	grayish-brown, carbonaceous, fibrous		
529.	Shale, medium-gray, thin and evenly bed-				gypsum, abundant fossil roots		4
	ded; 8-in-thick very fine grained, silty,		_	551.	Coal, bright, fine cleats, interbedded gyp-		
520	sandstone lens 8 ft above base	12	0		sum crystals and sulfur stain		4
<i>33</i> 0.	Sandstone, light-gray, very fine grained,			552.	Underclay, medium-gray to medium-		
	thin to thick and irregularly bedded, silty, pyrite nodules	5	6		brownish-gray, gypsum crystals, silty, abundant fossil root and plant prints	1	6
531.	Bentonite, light-olive-gray	2	8	553.	Shale, light-olive-gray, thin and irregu-	-	-
	Sandstone, light-gray, very fine to fine-				larly bedded, bentonitic	2	10
	grained, thin- to thick-bedded, cross-			554.	Sandstone, light-gray, very fine grained,		
	bedded, thin and irregularly bedded				thin to thick and irregularly bedded,		

		Thickr	ness			Thick	kness
		Ft	in			Ft	in
	very silty, scattered fossil plant frag-				sum crystals, scattered bright coal frag-		
	ments	9	0		ments		5
555.	Shale, light-olive-gray, gypsum, crystals-	3	6	573.	Shale, light-gray to light-olive-gray, thin		-
	Sandstone, very light gray, very fine	_	Ŭ		and irregularly bedded, scattered fossil		
	grained, very silty, thin and irregularly				plant fragments	5	0
	bedded, crossbedded, scattered carbon-			574.	Sandstone, light-gray, very fine grained,		
	aceous matter	17	0		thick- to massive-bedded, very silty	15	0
557	Shale, light-olive-gray, bentonitic, car-	1,	Ū	575.	Shale, light-gray to light-olive-gray, silty,		
	bonaceous in top 1 ft	7	0		bentonitic, carbonaceous in upper 6 in-	8	6
558	Sandstone, very fine grained, silty, dark	,	U	576.	Sandstone, light-gray, very fine grained,		
550.	and light mineral grains	8	0		thick- to massive-bedded, very silty		8
550	Bentonite, medium-olive-gray, shaly	29		5/7.	Shale, light-gray to light-olive-gray, gyp-	0	0
	* * *	29	0	570	sum crystals	8	0
560.	Sandstone, very fine grained, thin- to			376.	Sandstone, light-gray, very fine grained, silty	2	6
	thick-bedded, crossbedded, silty,	12	0	579	Shale, medium-gray	3	0
	gypsum-filled fractures Total measured thickness of Lance	12	_0		Siltstone, light-gray, sandy	1	2
	Formation	762	8		Shale, medium-gray to light-gray, silty	4	Õ
	1 Officiation	702	<u>8</u>		Sandstone, light-gray, very fine grained		•
Unco	nformity				carbonaceous siltstone lenses, very		
••					silty, ironstone nodules, iron-stained in		
Paleocer					top 2 ft	11	0
Fort U	Jnion Formation, Shotgun Member:			583.	Shale, light-olive-gray, thin-bedded	3	11
561.	Shale, medium-gray to light-olive-gray,				Ironstone band, dark-brown to black		8
	interbedded with variegated grayish-			585.	Siltstone, light-olive-gray, thin-bedded to		
	red and olive-green, nonbedded to				nonbedded, silty, sandy	3	5
	poorly bedded, abundant gypsum crys-			586.	Sandstone, light-gray, very fine grained,		
	tals, scattered siltstone and sandstone				thin- to thick-bedded, very silty, basal	2	0
	lenses up to 1 ft thick, strike 60°, dip 10° SE.	108	0	507	6 ft burrowed	2	0
562.	Sandstone, light-gray, very fine grained,	100	Ü	367.	Sandstone, light-gray, very fine grained, very silty, massive-bedded in upper 10		
	thin to thick and irregularly bedded,				in, iron-stained, lenticular	4	0
	very silty, pyrite nodules, carbona-			588.	Shale, light-gray to light-olive-gray, very	•	ŭ
	ceous at 1 ft 7 in from base, scattered				bentonitic, carbonaceous shale in top 1		
	solution cavities, slightly carbonaceous				ft	7	6
	at top	7	0	589.	Sandstone, light-gray, very fine-grained,		
563.	Shale, light-gray to light-olive-gray,	_	_		thin- to thick-bedded, very silty, iron-		
564	slight grayish-red mottling, bentonitic-	5	0	700	stained in upper 1 ft	7	0
304.	Sandstone, light-gray, very fine grained,			590.	Shale, light-gray to light-olive-gray, ben-		
	thin to thick and irregularly bedded, very silty, slightly iron stained	4	6		tonitic, scattered gypsum crystals, scat-	10	0
565	Shale, light-gray to light-olive-gray, ben-	7	U	501	tered sand lenses up to 6 in thick Sandstone, light-gray, very fine grained,	10	U
303.	tonitic, three sandstone interbeds about			391.	thin- to thick-bedded, very silty, resist-		
	10 in thick, top 1 ft light-blue-gray and				ant bench, iron-stained	1	6
	sandy	25	0	592.	Shale, light-gray to light-olive-gray, ben-		
566.	Sandstone, light-gray, very fine grained,				tonitic	23	0
	thin to thick and irregularly bedded,			593.	Sandstone, medium-light-gray, very fine		
	very silty, slightly iron stained	3	0		grained, thin and irregularly bedded,	•	
567.	Shale, light-gray to light-olive-gray, ben-				very silty, iron-stained in top 6 ft	48	0
	tonitic, thin and irregularly bedded,			594.	Shale, light-gray to light-olive-gray,		
	gypsum crystals; 6-in-thick carbona-	21	0		abundant bentonite, fibrous gypsum	4	0
560	ceous shale lens 6 ft below top	31	0	505	Sandstone light gray yary fine grained	4	0
500.	Sandstone, light-gray, very fine grained, very silty	5	0	393.	Sandstone, light-gray, very fine grained, crossbedded, very silty	8	6
560	Shale, light-gray to light-olive-gray, ben-	J	J	596	Shale, light-olive-gray, silty, bentonitic,	U	Ü
509.	tonitic	5	6	570.	gypsum crystals	3	0
570.	Sandstone, light-gray, very fine grained,	,	•	597.	Sandstone, light-gray, very fine grained,		
	very silty	7	0		very silty	4	6
571.	Underclay, medium-grayish-brown, silty,			598.	Siltstone, light-olive-gray; 6-in-thick sand-		
	gypsum crystals, abundant fossil plant				stone lens 5 ft above base; top grades		_
_	fragments		4		sandy	8	6
572.	Shale, medium-grayish-brown, carbona-			599.	Sandstone, light-gray, very fine grained,		_
	ceous fossil plant fragments, silty, gyp-				very silty, iron-stained at top	1	6

		Thick	ness			Thick	ness
		Ft	in			Ft	in
600.	Shale, light-olive-gray, thin and irregularly bedded with sandstone and silt-			629.	Shale, light-olive-gray, thin and evenly bedded	5	0
	stone laminations up to 8 in thick	5	0	630.	Sandstone, light-olive-gray, very fine	3	U
601.	Sandstone, very fine grained, thin- bedded, silty, iron-stained at top	5	0		grained, silty, resistant ledges up to 8		
602.	Shale, light-gray to light-olive-gray, ben-	5	U		in thick; 2-ft-thick shale lens 10 ft		
	tonitic	20	0	(21	above base	45	0
603.	Sandstone, light-gray to light-olive-gray,			631.	Underclay, light-olive-gray to medium- brownish-gray, carbonaceous, gypsum		
	very fine grained, thin- to thick- bedded, dark gray shale laminations up				crystals, silty and sandy, few coal frag-		
	to 1 in thick, weathered	18	0		ments, abundant fossil plant and root		
604.	Shale, light-gray to light-olive-gray, non-			622	fragments	3	2
605	bedded	9	0	032.	Sandstone, very fine grained, very silty, carbonaceous material, abundant fossil		
605.	Sandstone, very fine grained, silty, iron- stained, resistant	1	2		leaf impressions	1	2
606.	Bentonite, light-olive-gray	11	0	633.	Siltstone, medium-light-gray, thin-		
	Shale, light-olive-gray to light-brownish-				bedded to nonbedded, sandy, scat-	15	0
	gray, carbonaceous, abundant gypsum	1	4	634	tered, iron-stained, resistant ledges Shale, light-olive-gray, thin and irregu-	45	0
608	lenses up to 1 in thickSandstone, light-gray, very fine grained,	1	4	0511	larly bedded, bentonitic	6	6
000.	very silty, weathered	11	0		Shale, light-olive-gray, nonbedded, silty-	20	0
609.	Shale, light-olive-gray, thin and irregu-			636.	Shale, light-olive-gray, grayish-red mot-	10	0
610	larly bedded	5	0		tling, sandy, silty Total measured thickness of Fort	10	_0
610.	Siltstone, medium-gray, thin- to thick- bedded, very calcareous, resistant, iron-				Union Formation, Shotgun Mem-		
	stained, top grades into shale	1	8		ber	810	9
611.	Shale, medium-gray	-	6				
	Siltstone, light-olive-gray, nonbedded	3	6	Unco	nformity		
613.	Shale, light-olive-gray, thin and irregu-	1	Λ	Lower F	Eocene:		
614.	larly beddedSiltstone, very iron stained	1 1	0	Indiar	Meadows Formation:		
	Shale, light-olive-gray, nonbedded, gyp-		v		lomeratic member		
	sum crystals	6	6	637.	Conglomerate, olive-gray to grayish-red, angular to subround, fragments and		
616.	Sandstone, light-gray, very fine grained,				boulders up to 2 ft in diameter, abun-		
	very silty, gypsum crystals, resistant, basal 2 ft thin-bedded, carbonaceous,				dant quartz pebbles, feldspar, epidote		
	scattered coal chips and fragments up				granitic material	30+	•
	to 1 inch in diameter; sandstone lami-		_				
617	nations 1 ft thick in middle part of unit-	13	0				
017.	Shale, light-olive-gray, thin and evenly bedded, sandy	5	6				
618.	Sandstone, light-olive-gray, very fine	-	Ū	Moscur	red section 14: Cody Shale and Mesav	arda	
	grained, very silty, wedges out later-	4.0	_	Format	·	ciuc	
610	ally along outcropShale, light-olive-gray, nonbedded, silty-	18 9	6 6		Hudson Quadrangle, Wyoming (7.5 min)		
	Sandstone, light-gray to light-olive-gray,	,	U	Start: SV	V-SW-NE sec. 3, T. 2 S., R. 2 E. Presented	from o	ldest to
	very fine grained, very silty, scattered			younge Fnd: SF-	est -NW-NE sec. 3, T. 2 S., R. 2 E.		
	resistant sandstone beds up to 8 in	4.0			d by: N.L. Hickling, R.C. Warlow, and J.F. Wi	ndolph,	Jr.
621	shale, light-olive-gray, nonbedded, silty-	49 12	0 0	Strike 12	0°, Dip 15° NE.		
	Shale, light-olive-gray, nonbedded, silty,	12	U	Upper C	Cretaceous:	Thick	ness
	weathers orange-gray	20	0	Cody	Shale:	Ft	in
623.	Shale, light-olive-gray, bedded to non-	•			Shale, medium-gray, silty	22+	•
624	bedded	9	0	2.	Sandstone, medium-gray, very fine		1
024.	Sandstone, light-gray, very fine grained, very silty	10	0	3.	grained, thin-beddedShale, medium-gray, silty	5	4 8
	Siltstone, light-olive-gray, nonbedded	15	Ŏ		Sandstone, medium-gray, very fine	-	-
	Underclay, light-grayish-brown, silty,				grained, thin-bedded	~=	6
	poorly bedded to nonbedded, scattered				Shale, medium-gray, silty	62	4
	coal fragments, carbonaceous, fossil plant fragments	4	6	o.	Sandstone, medium-gray, very fine grained, thin-bedded		4
627.	Shale, light-olive-gray, nonbedded, silty-	6	0	7.	Shale, medium-gray, silty	8	8
	Siltstone, resistant, iron-stained, calcare-		_		Sandstone, medium-gray, very fine		•
	ous, sandy		8		grained, thin-bedded		8

		Thick Ft	in	Measured section 15: Cody Shale through Inc Meadows Formation	dian	
9. SI	nale, medium-dark-gray, slightly carbo- naceous, few fossil rootlets	11	_4	Location: Hudson Quadrangle, Wyoming (7.5 min) Start: SW-SW-SW sec. 35, T. 1 S., R. 2 E. Presented	from o	ldes
	Total measured thickness of Cody Shale	111		youngest End: SW-SE-SE sec. 35, T. 1 S., R. 2 E. Described by: N.L. Hickling, R.C. Warlow, and J.F. Win	ndolph	I+
lecaver	de Formation:		<u>10</u>	Strike 120°, Dip 14° NE.	ndorpii,	J1.
	indstone, medium-light-gray, very fine			Upper Cretaceous:	Thick	ness
	grained, thick-bedded to massive,			Cody Shale:	Ft	i
11. Si	silty, iron-stained at topltstone, very light gray, 8-in-thick sand-	20	6	1. Sandstone, light-gray, dark and light mineral grains, thick-bedded to massive,	_	
	stone lens in medial part; scattered carbonaceous shale fragments and fos-			thin-bedded in top 6 in 2. Shale, medium-gray, thin and unevenly	6 8	
12. Sa	sil plant fragments undstone, very light gray, scattered dark	3	0	bedded, silty, sandy 3. Sandstone, light-gray, very fine grained, silty, weathered	30	
	and light mineral grains, massive, pyrite nodules, silty, carbonaceous			4. Siltstone, medium-light-gray, thin- to poorly bedded, sandy	11	
	shale lenses; fossil tree trunk casts 1 ft below top	11	6	5. Sandstone, medium-light-gray, very fine grained, abundant siltstone lamina-		
	Itstone, medium-gray, shaly	1	0	tions, few fossil plants, silty 6. Shale, light-gray, few dark and light min-	32	
17. 30	ndstone, very light gray, very fine grained, dark and light mineral grains,			eral grains, thin and evenly bedded, silty	18	
15. Si	calcareous concretionsltstone, light-gray, very shaly, sandy,	4	0	7. Sandstone, medium-light-gray, very fine grained, dark and light mineral grains-	4	
16 0-	thin and irregularly bedded	7	0	8. Covered, probably sandy shale	110	
10. Sa	ndstone, medium-light-gray, very fine grained, thick-bedded, abundant dark			9. Shale, medium-dark-gray, very sandy	5	
	and light mineral grains; 2-in-thick			10. Covered, probably sandy shale Total measured thickness of Cody	10	-
	shale lens 1 ft above base	7	11	Shale	234	=
17. Si	Itstone, light-gray, sandy, poorly cemented, carbonaceous shale inter-			Mesaverde Formation:		=
	beds	6	4	11. Sandstone, medium-light-gray, very fine		
l8. Sa	ndstone, medium-light-gray, very fine	Ů	•	to fine grained, dark and light mineral		
	grained, thick-bedded to massive, fria-			grains, thick-bedded to massive, cross-	40	
	ble, silty, calcareous; 6-in-thick shale			bedded 12. Shale, medium-gray, thin-bedded, sandy,	42	
	and siltstone laminations 4½ ft above base; top part is fine to medium			silty, abundant fossil plants	7	
	grained, calcareous	69	0	13. Sandstone, medium-light-gray, thin-		
19. Sa	ndstone, medium-light-gray, very fine			bedded, silty	10	
	grained, calcareous, thick-bedded,		_	14. Sandstone, medium-light-gray, very fine		
20 SH	pyrite nodulesale, light-brownish-gray, thin and	13	0	to fine grained, thick-bedded to massive, pyrite nodules, iron-stained	65	
	evenly bedded, silty, few siltstone			15. Sandstone, very light gray to white, fine-		
	lenses up to 1 in thick, very carbona-			grained, dark and light mineral grains,		
	ceous in top 2 in	2	0	massive, crossbedded, pyrite nodules up to 7 inches in diameter, solution		
	ndstone, medium-light-gray, very fine grained, thin-bedded, silty	3	0	cavities, carbonaceous shale lense 4 ft		
	ale, medium-light-gray, thick-bedded,	3	U	below top	55	
	carbonaceous, very fine grained sand-			16. Underclay, medium-dark-gray, fossil		
	stone lenses, basal 1½ ft silty and			rootlets, fossil plants	5	
	sandy	3	8	Base of Maverick Spring coal zone Base of A coal bed		
	ndstone, medium-light-gray, thick- bedded, silty	4	0	17. Coal, impure, bright to dull, fine to		
	ale, medium-dark-gray, very fine	7	U	medium cleats, scattered resin blebs		1
	grained, sandstone interbeds	10+		18. Shale, medium-gray, thin-bedded,		
	Total measured thickness of Mesa-	165	11	slightly carbonaceous	1	
noorf:	verde Formation= =	165	<u>11</u>	19. Sandstone, light-gray, very fine grained, dark and light mineral grains, grades	2	
nconfor er Eoce	•			very carbonaceous in top part of unit - 20. Coal, bright to dull, mostly dull, fine to medium cleats, gypsum crystals, sulfur	2	
nconfor	mably overlain by the conglomeration	:		stain, resin blebs	1	
	r of the Indian Meadows Formation			Top of A coal bed	-	

	Thick	ness		Thickr	ness
	Ft	in		Ft	in
21. Shale, light-brownish-gray to medium- gray, very carbonaceous, scattered coal laminations, resin blebs and gypsum			40. Shale, medium-dark-gray, thin- to poorly bedded; 3-ft-thick very carbonaceous zone 5 in above base	4	0
crystals, abundant fossil plant frag- ments, top 1½ ft contains fine-grained			41. Sandstone, medium-light-gray, very fine grained, silty	•	8
sandstone lenses22. Sandstone, medium-light-gray to light-	2	10	42. Shale, medium-gray, sandy, silty in basal 6 in	13	6
gray, very fine grained, dark and light mineral grains, massive, carbonaceous		0	43. Sandstone, medium-light-gray, very fine grained, thick-bedded to massive,		
laminations, silty 23. Shale, medium-dark-gray, carbonaceous, fossil plant fragments, sulfur-stain,		0	silty, scattered shale chips, basal 6 ft contains thin shale and siltstone beds up to 8 in thick; fossil root zone 5 in		
gypsum crystals		0	thick at base; very calcareous in top 5 ft; sandstone fills 5 ft deep channel at	25	
ded, very silty, pyrite nodules at top - 25. Sandstone, medium-light-gray, very fine	12	4	base 44. Sandstone, medium-light-gray, very fine to fine-grained, thick-bedded to mas-	25	0
to fine-grained, massive, upper 2 ft thin- to thick-bedded; very calcareous,			sive, abundant medium-gray to medium- dark-gray siltstone and shale lamina-		
solution cavities 26. Sandstone, medium-light-gray, very fine grained, massive, friable, silty, coal		6	tions up to 1 ft thick, upper 5 ft very calcareous and resistant 45. Covered, probably carbonaceous shale,	34	0
fragments in upper 6 in	2	6	light-grayish-brownBase of Signor coal bed	15	0
ded	4	0	46. Coal, bright attritus, fine to medium cleats, scattered resin blebs and gyp-		
28. Underclay, medium-gray, fossil rootlets -29. Shale, light-grayish-brown to medium-dark-gray, thin and evenly bedded, fis-		10	sum crystals, cleats: 40° at 80° SW. and 65° at 55° NW.; unit overlain		
sile, abundant fossil plant fragments		9	unconformably by and cut out to the northeast by unit 47 (Woodruff and	_	•
Base of Lander coal bed (upper bed) 30. Coal, bright, fine to medium cleats, abun-			Winchester, 1912, pl. L11, no. 124) - Top of Signor coal bed	7	2
dant gypsum crystals, cleats directions are 140° at 75° SW. and 65° at 60°	•		Total measured thickness of Mesaverde Formation	366	41/2
NW Top of Lander coal bed (upper bed)	2	0	Unconformity		
31. Shale, medium-gray, thin and evenly bed- ded, few thin siltstone lenses; 1-ft-6-in thick very fine grained sandstone lens 5			Lower Eocene: Indian Meadows Formation, conglomeratic members 47. Conglomerate, subrounded to well-rounded cobbles and boulders of red	er:	
ft above base32. Shale, light-grayish-brown, thin and		6	quartzite, shale, gray quartzite and a few igneous cobbles up to 1 ft in		
evenly bedded, carbonaceous, scat- tered coal lenses, sulfur stain and gyp- sum crystals, abundant fossil plant			diameter, cobbles average 4 inches in diameter; 3-ft-thick sandy ledge 22 ft above base	50	0
fragments33. Underclay, medium-gray, fossil rootlets -	1	9 6	48. Conglomerate, calcareous, indurated 49. Conglomerate (similar to unit 47)	5 70+	0
34. Coal, bright to dull, impure, resin blebs-		21/2	Total measured thickness of Indian Meadows Formation		
Top of Maverick Spring coal zone 35. Shale, light-grayish-brown to medium-			Meadows Formation	125	_0
gray, thin and irregularly bedded, silty, sandy, sulfur stain, fossil plant fragments		2			
36. Shale, medium-gray, top grades into unit	:				
37. Sandstone, medium-light-gray, very fine grained, massive, silty, fossil roots in		9	Measured section 16: Cody Shale through Inc Meadows Formation Location: Hudson Quadrangle, Wyoming (7.5 min)	dian	
top part of unit38. Underclay, medium-gray, fossil rootlets-39. Shale, light-grayish-brown, thin-bedded,		6 4	Start: NE-NE-SE sec. 32, T. 34 N., R. 98 W. Presented youngest End: NW-NE-SW sec. 33, T. 34 N., R. 98 W.	from ol	dest to
carbonaceous, coal laminations, sulfur stain, gypsum crystals	•	3	Described by: N.L. Hickling, R.C. Warlow, and J.F. Will Strike 120°, Dip 10° NE.	ndolph,	Jr.

top		retaceous:	Thickn	ess			Thick	ness
poordy bedded, interhedded with very fine grained sandstone and silty shale - 2. Sandstone, medium-light-gray, fine to medium-grained, dark and light mineral grains, noncresistant, basal 10 ft cross-beds 110° at 80° SW, solution cavities, pyrite nodules, thick-bedded to massive; thin-bedded and nonresistant above 64 ft from base. The state of the state o	Cody	Shale:	Ft	in.			Ft	in
2. Sandstone, medium-light-gray, the bedded of cross-bedded, strike and dip of cross-bedded, strike and dip of cross-bedded to massive; thin-bedded and nonresistant above 64 ft from base————————————————————————————————————	1.	poorly bedded, interbedded with very	_			-		
crossbedded; strike and dip of cross- beds 110° at 80° SW. solution cavities, pyrite nodules, thick-bedded to mas- sive; thin-bedded and nonresistant above 64 ft from base	2.	Sandstone, medium-light-gray, fine- to medium-grained, dark and light mineral grains, nonresistant, basal 10 ft	6+		21.	fine-grained, light and dark mineral grains, crossbedded, thick-bedded to	20	0
above 64 ft rrom base— sends broaded, scattered siltstone and sandstone lenses, silty at top———————————————————————————————————		beds 110° at 80° SW.; solution cavities, pyrite nodules, thick-bedded to mas-			22.	Underclay, medium-dark-gray, thin and irregularly bedded, carbonaceous, slightly silty, fossil rootlets, abundant	1	0
evenly bedded, scattered siltstone and sandstone lenses, silty at top	3.		109	0	23.	Shale, dark-gray to black, thin and evenly	1	0
4. Sandstone, very fine to fine-grained, dark and light mineral grains, thin and evenly bedded for some silvent of the grained sandstone and siltstone lenses, silty for grained, dark and light mineral grains, thin and irregularly bedded for some silvent of the grained, dark and light mineral grains, thin and evenly bedded, dark and light mineral grains, thin and evenly bedded, dark and light mineral grains, thin and evenly bedded, dark and light mineral grains, thin and evenly bedded, dark and light mineral grains, thin and evenly bedded, dark, and light mineral grains, thin and evenly bedded, dark and light mineral grains, thin and evenly bedded, dark and light mineral grains, thin and evenly bedded, dark and light mineral grains, thin and evenly bedded, dark and light mineral grains, thin and evenly bedded, dark and light mineral grains, inon-stained for some lenses, few fossil plant prints for the ded, thin siltstone and sandstone lenses, few fossil plant prints for the ded, silty same and sandstone lenses, few fossil plant prints for the ded, silty same and sandstone lenses, few fossil plant prints for the ded, silty same and sandstone lenses, few fossil plant prints for the ded, silty same and sandstone lenses, few fossil plant prints for the ded and light mineral grains, thin and irregularly bedded, very sinty with and irregularly bedded, every silty thin and irregularly bedded, very sinty for grained, parse the ded for some deded at top, silty for poorly bedded, carbonaceous at top for the deded for nonbedded at top, silty for poorly bedded, carbonaceous at top for for for for coal bedded to nonbedded at top, silty for poorly bedded, carbonaceous at top for for for for for coal bedded to nonbedded at top, silty for		evenly bedded, scattered siltstone and	35	0	24.	•		6
5. Shale, medium-gray, scattered very fine grained sandstone and siltstone lenses, silty	4.	and light mineral grains, thin and				westward along outcrop	4	0
6. Sandstone, very fine grained, dark and light mineral grains, thin and irregularly bedded. 7. Shale, medium-gray, silty in top 6 ft	5.	Shale, medium-gray, scattered very fine grained sandstone and siltstone lenses,			25.	grained, few fine grains, silty, abundant dark and light mineral grains,		
7. Shale, medium-gray, silty in top 6 ft	6.	Sandstone, very fine grained, dark and light mineral grains, thin and irregu-				pyrite nodules, solution cavities, thin- bedded toward top	44	0
grained, dark and light mineral grains, thin and evenly bedded, sire-gray, thin- to poorly bedded, silty, sandy, very sandy 1 ft below top ———————————————————————————————————		Shale, medium-gray, silty in top 6 ft			26.		1	0
9. Shale, medium-gray, thin- to poorly bedded, edity, sandy, very sandy 1 ft below top	0.	grained, dark and light mineral grains,	1	2.	27.		2	0
top————————————————————————————————————	9.	Shale, medium-gray, thin- to poorly bed-	•	-	28.			10
Mesaverde Formation: 10. Sandstone, medium-light-gray, thin and evenly bedded, dark and light mineral grains, iron-stained————————————————————————————————————		top	11	_0		ered	1	0
10. Sandstone, medium-light-gray, thin and evenly bedded, dark and light mineral grains, iron-stained		Shale	240			plant prints, silty		6
evenly bedded, dark and light mineral grains, iron-stained————————————————————————————————————	Mesav	verde Formation:						
grains, iron-stained————————————————————————————————————	10.							
lenses, few fossil plant prints	11.	grains, iron-stained		8		aceous shale; mostly bright, resin blebs		9
12. Sandstone, light-gray, very fine grained, massive, very silty, thin-bedded at base, medium-bedded above 2 ft 10 6 13. Shale, medium-gray, thin and irregularly bedded, very sandy and silty, becomes carbonaceous at top 7 0 35. Shale, dark-brownish-gray, thin- to poorly bedded, carbonaceous, fossil plant prints 10 6 14. Sandstone, medium-light-gray, very fine grained, thin and irregularly bedded, crossbedded at top, silty 3 0 36. Shale, medium-gray, thin and evenly bedded, carbonaceous		•	15	0	32.		1	0
13. Shale, medium-gray, thin and irregularly bedded, very sandy and silty, becomes carbonaceous at top	12.	Sandstone, light-gray, very fine grained, massive, very silty, thin-bedded at			33.	poorly bedded, carbonaceous, fossil		
carbonaceous at top	13.	Shale, medium-gray, thin and irregularly	10	6		Coal, bright, slightly impure	1	10 5
grained, thin and irregularly bedded, crossbedded at top, silty		carbonaceous at top	7	0	-	Shale, dark-brownish-gray, thin- to		
15. Shale, medium-dark-gray, thin and irregularly bedded, very silty 16. Siltstone, medium-light-gray, thinbedded to nonbedded	14.	grained, thin and irregularly bedded,			36.	Shale, medium-gray, thin and evenly bed-		0
16. Siltstone, medium-light-gray, thin-bedded to nonbedded	15.	Shale, medium-dark-gray, thin and irreg-			37.	Siltstone, medium-light-gray, thin-	2	5
17. Shale, medium-dark-gray, thin and evenly bedded, scattered siltstone and sandstone lenses, fossil plant prints—4 0 silty————————————————————————————————————	16.	Siltstone, medium-light-gray, thin-				prints	4	0
sandstone lenses, fossil plant prints 18. Sandstone, very fine grained, sparse light and dark mineral grains, thick-bedded, very silty	17.	Shale, medium-dark-gray, thin and	2	0		silty	2	0
very silty	18.	sandstone lenses, fossil plant prints	4	0		silty		4
19. Shale, medium-gray, thin and evenly bed- ded, scattered fossil plant prints 1 0 42. Sandstone, very fine grained, crossbed- 20. Siltstone, medium-light-gray, thin- ded, silty 1		and dark mineral grains, thick-bedded,		10		poorly bedded, sandyShale, medium-gray, thin and evenly bed-		10
20. Siltstone, medium-light-gray, thin- ded, silty 1	19.	Shale, medium-gray, thin and evenly bed-	1	0		ded Sandstone, very fine grained, crossbed-	14	0
	20.			8		ded, silty		2 0

	Thick	ness			Thick	cness
	Ft	in			Ft	in
44. Underclay, light-olive-gray, fossil root				carbonaceous 43 ft above base; gypsum		
and plant prints, carbonaceous in top 4				crystals; 6-in resistant sandstone 155 ft	40#	•
in	2	3	4	above base	185	0
45. Coal, bright to dull, mostly dull, fine to			4.	Sandstone, medium-gray, very fine		10
medium cleats	1	10	5	grained, silty		10
46. Shale, medium-gray, thin and irregularly			J.	fine grained sand stone lenses up to 6 in		
bedded, carbonaceous lower 3 in,				thick; gypsum crystals	50	0
abundant fossil plant prints	3	0	6.	Shale, medium-grayish-brown, bentoni-		
47. Shale, medium-gray, poorly bedded, very		•		tic, few thin sandstone lenses 20-25 ft		
silty, sandy	2	3		above base; sandy 30 ft above base	55	0
48. Underclay, medium-gray, scattered fossil plant prints, very silty	4	0	7.	Sandstone, medium-light-gray, very fine		
Base Lander coal bed (upper bed)	7	U		grained, calcareous, silty, thin and		
49. Coal, bright to dull, finely cleated, sand-				irregularly bedded, scattered large	0	0
stone dikes up to 1 ft wide, locally			0	marine pectin fossils	8	0
folded; coal is sandy, top 3 in of bed			٥.	Sandstone, medium-light-gray, very fine grained, massive, silty	18	0
appears to be detrital, as evidenced by			Q	Shale, medium-gray, thin-bedded, silty,	10	Ü
fragments, resin blebs (Woodruff and			,	sandy, scattered siltstone lenses,		
Winchester, 1912, pl. L11, no. 134) -	4	2		slightly carbonaceous at top	11	0
Top of Lander coal bed (upper base)			10.	Sandstone, light-gray, very fine grained,		
50. Underclay, light-gray, silty, fossil root-		•		silty, pyrite nodules	2	5
lets	22	0	11.	Shale, medium-gray, silty, sandy, silt-		
51. Underclay, light-gray, very silty, fossil roots, very hard		10		stone and very fine grained sandstone	10	,
52. Shale, dark-brownish-gray, scattered coal		10	12	interbeds Sandstone, light-gray, very fine grained,	10	6
fragments, carbonaceous		3	12.	thin-bedded, silty, calcareous		9
53. Underclay, light-gray, nonbedded, silty,		Ū	13	Shale, medium-gray, siltstone and very		,
fossil roots		4	15.	fine grained sandstone interbeds	1	3
54. Covered	10	_0	14.	Sandstone, light-gray, very fine grained,		
Total measured thickness of Mesa-				silty, crossbedded, thin- to thick-		
verde Formation	209	_2		bedded		4
Unconformity			15.	Shale, medium-gray, very sandy, thin-		
·				bedded, slightly carbonaceous in upper		,
Lower Eocene:			16	2 in	1	6
Indian Meadows Formation, conglomeratic memb	er:		10.	Sandstone, medium-light-gray, very fine grained, silty, calcareous, thin and		
55. Conglomerate, medium-light-gray,				evenly bedded		9
rounded cobbles and gravels, tuffa- ceous, chert, agate, and quartzite	10+	_	17.	Shale, medium-gray, sandy, scattered		
ccous, elicit, agaic, and quartzhe	10 1			very fine grained sandstone and silt-		
				stone lenses	19	0
			18.	Sandstone, medium-light-gray, very fine		
				grained, silty, crossbedded, thin-		
Measured section 17: Cody Shale and Mesave	arde			bedded	1	10
Formation	iuc		19.	Shale, medium-gray, very sandy, gypsum	20	
Location: Alkali Butte Quadrangle, Wyoming (7.5 min)			20	crystals, weatheredSandstone, medium-light-gray, very fine	20	0
Start: NE-SE-SW sec. 23, T. 34 N., R. 95 W. Presented	from o	ldest to	20.	grained, silty, thin and evenly bedded,		
youngest				scattered small pyrite nodules	1	5
End: SE-NE-SW sec. 4, T. 2 S., R. 6 E.			21.	Shale, medium-gray, silty	1	0
Described by: R.C. Warlow and J.F. Windolph, Jr. Strike 75°, Dip 15° NW.				Sandstone, medium-light-gray, very fine	_	
•				grained, silty, thin and evenly bedded-		4
Upper Cretaceous:	Thick	ness	23.	Shale, medium-gray, silty, gypsum crys-		
Cody Shale:	Ft	in		tals	19	0
1. Sandstone, medium-light-gray, very fine			24.	Sandstone, medium-light-gray, very fine		
grained, nonresistant, shale interbeds,	1.1	0	25	grained, silty, thin-bedded		8
Silty	11	0	23.	Shale, medium-gray, scattered very fine grained sandstone lenses up to 2 in		
2. Sandstone, medium-light-gray, very fine grained, thick-bedded to massive,				thick; gypsum crystals	19	0
silty, scattered shale chips in basal 3 ft;			26.	Sandstone, medium-light-gray, very fine		-
top 2 ft thin-bedded, fine-grained at				grained, very silty, thin-bedded, small		
top, few shale interbeds	18	0		pyrite nodules		8
3. Shale, medium-gray, thin and evenly bed-			27.	Shale, medium-gray, silty, thin and	_	_
ded, silty, sandy, few siltstone lenses,				evenly bedded	6	0

		Thick				Thick	ine
20	Condetene medium links man Con	Ft	in	47		Ft	
20.	Sandstone, medium-light-gray, very fine grained, thin- to thick-bedded, abun-			47.	Shale, medium-gray, silty, sandy, abundant gypsum crystals	3	
	dant pyrite nodules, iron-stained and			48.	Sandstone, very fine grained, very silty,		
	resistant in top 8 in; ripple bedded at top	10	0		thin and irregularly bedded, friable	6	
29	Shale, medium-gray, very sandy, weath-	10	0		Shale, medium-gray	1	
	ered	12	0	50.	Limestone, medium-light-gray, brittle, fractured		
<i>3</i> 0.	Sandstone, medium-light-gray, very fine grained, thin-bedded, pyrite nodules	2	1	51.	Shale, medium-gray, abundant gypsum crystals, thin and evenly bedded	1	
	Shale, medium-gray	5	6	52.	Sandstone, very fine- to fine-grained,	_	
32.	Sandstone, medium-light-gray, thin- to thick-bedded, very fine to fine-grained,			53.	pyrite nodules, thin-bedded, friable Shale, medium-gray, thin and evenly bed- ded, gypsum crystals, few fossil plant	3	
	pyrite nodules	2	<u>10</u>		fragments	1	
	Total measured thickness of Cody Shale	495	8	54.	Sandstone, medium-light-gray, very fine grained, silty; dark-gray shale inter-		
lesav	verde Formation:				beds containing gypsum crystals	1	
	Shale, medium-gray, silty, sandy, thin			55.	Shale, medium-dark-gray, very silty,		
	and evenly bedded	14	0		sandstone lens 6 ft above base, oil- stained	· 7	
34.	Sandstone, medium-light-gray, very fine grained, silty, thin-bedded		7	56.	Sandstone, medium-light-gray, very fine grained, oil-stained, very silty, resis-	,	
35.	Sandstone, medium-light-gray, very fine				tant ledge 19 ft above base	28	
	grained, very silty, nonresistant, scat- tered siltstone and shale lenses; resis-			57.	Sandstone, very light-gray to white, fria- ble, thin- to thick-bedded, pyrite nod-		
	tant 9-in-thick ledge at top; bentonitic in top 2 ft	25	0	50	ules, resistant ledge 35 ft above base -	46	
36.	Sandstone, medium-light-gray to light-brownish-gray, very fine grained,	23	v	36.	Shale, medium-gray to medium-dark- gray, slightly carbonaceous, thin and evenly bedded, abundant gypsum crys-		
27	slightly bentonitic, weathered	20	6		tals	15	
37.	Sandstone, medium-light-gray, very fine grained, silty, thin- to thick-bedded,			59.	Sandstone, medium-light-gray, very fine	0	
	very resistant in bottom 7 in	2	7	60.	grained, silty, nonresistant Shale, medium-gray, weathered	8 10	
38.	Shale, light-brownish-gray, bentonitic,				of Maverick Spring coal zone		
20	sandy, gypsum crystals	2	7	-	Sandstone, very light gray to white, very		
<i>3</i> 9.	Shale, light-grayish-brown, thin-bedded, carbonaceous, sulfur stains, gypsum			01.	fine grained, massive, thin-bedded in		
	crystals, sandy, scattered coal frag-				top 10 ft, calcareous, oil-stained, silty		
	ments, contains lens-shaped beds of				shale lens 65 ft above base; fine-		
	flattened volcanic ash particles; cross-				grained, few medium grains 10 ft below top; very iron stained at top	95	
40	bedded, top gradationalSandstone, light-gray, very fine to fine-	5	0	62.	Shale, light-brownish-gray to brown, thin-)3	
₩.	grained, dark and light mineral grains,				bedded, carbonaceous, very silty,		
	crossbedded, thin-bedded, scattered				abundant sulfur crystals, fossil plant	•	
	shale chips	16	0	63	fragments, basal 6 in nonbedded Shale, medium-dark-gray, thin-bedded,	2	
41.	Sandstone, light-gray, very fine to fine-			05.	slightly carbonaceous, top gradational-	3	
	grained, pyrite nodules, thick-bedded to massive, cliff-forming, oil-stained -	75	0	64.	Sandstone, light-gray to white, very fine		
42.	Shale, carbonaceous, silty, sandy, gyp-	7.5	U		grained, silty, thin- to thick-bedded,	_	
	sum bands 1/4 in thick	1	4	65	top gradational	2	
43.	Sandstone, light-gray, very fine grained, silty, fine-grained toward top, pyrite				Siltstone, light-grayish-brown, very silty, thin- to poorly bedded at tope e of lower split of Signor coal bed	1	
	nodules in form of sunbursts, gypsum crystals	43	0		· -		
44.	Sandstone, medium-light-gray, very fine grained, very silty, thin- to thick-	73	Ü	00.	Coal, resin blebs, fine to medium cleats, gypsum (Woodruff and Winchester, 1912, pl. L11, no. 167)	9	
	bedded	3	6	67.	Shale, light-grayish-brown, thin-bedded,		
	e of Maverick Spring coal zone				silty, abundant carbonaceous frag-		
45.	Shale, medium-gray, very silty, sand- stone and siltstone interbeds	2	6		ments, fossil plant impressions, gyp- sum crystals, sulfur-stained	5	
46.	Sandstone, medium-light-gray, very fine	2	U	68.	Shale, medium-gray, gypsum crystals;	J	
	grained, friable, calcareous nodules up				thin-bedded abundant gypsum crystals		

		Thickne	ess			Thick	ness
		Ft	in			Ft	in
69.	Sandstone, medium-light-gray, fine- grained, dark and light mineral grains, abundant bands of gypsum crystals and				cleats, top of bed irregular, possible detrital coal, abundant fusain at top (Thompson and White, 1952, fig. 2, loc. B, p. 3)	3	0
	sulfur staining; abundant pyrite nod- ules; top 6 in very iron stained, noncal- careous, burrowed, weathers light-			_	of Beaver coal bed Shale, light-grayish-brown, very silty,	J	v
70.	yellow-brown	11	6		thin-bedded, basal 3 in contains abundant detrital coal layers, sulphurstained, sandy at top, abundant gypsum crystals; upper 2 ft locally contains		
	few thin, resistant beds, top grades into			9.1	4-in-thick coal bed	8 1	0 4
71.	Shale, medium-gray, silty, thin-bedded, few silty sandstone lenses	25 5	0		Sandstone, medium-light-gray, very fine grained, very silty, shale interbeds,		•
72.	Shale, light-grayish-brown, carbonaceous, few coal fragments, abundant			86.	noncalcareous, thin and irregularly bedded, scolithus fossils	2	2
Base	fossil plant materiale of upper split of Signor coal bed	3	2		and dark mineral grains, iron-stained, solution cavities, friable, massive,		
	Coal, impure, banded, abundant carbonaceous shale laminations		41/2	87.	pyrite nodules, oil stain Shale, medium-gray, thin and irregularly bedded, carbonaceous	25 5	0 10
Top	of upper split of Signor coal bed			88.	Siltstone, medium-gray, thin and irregu-	,	10
74.	Siltstone, light-grayish-brown, very fine grained, sandstone laminations, abundant forcil plant material.		E	89.	Sandstone, medium-gray, fine-grained, iron-stained, solution cavities, pyrite	2	2
75.	dant fossil plant material		5	90.	nodules, resistantShale, medium-gray, thin and irregulary	2	0
	silty, thin-bedded, abundant fibrous gypsum crystals, oil-stained	3	0	01	beddedSiltstone, medium-gray, thin and irregu-	1	10
76.	Sandstone, medium-light-gray, very fine				larly bedded, oil stain	1	9
77.	grained, silty, friable	2	0	92.	Sandstone, medium-gray, very fine grained interbeds of medium-gray shale, thin and evenly bedded	22	0
70	stained	1	3	93.	Underclay, medium-dark-brownish-gray,		4
	Sandstone, medium-light-gray, very fine grained, silty	1	2	94.	fossil plant material, rootsCoal, highly weathered, resin blebs,		
79.	Shale, medium-gray, thin and evenly bed- ded, few thin sandstone interbeds, gyp-			95.	bright and dull laminations mostly dull- Tonstein, medium-brownish-gray, fossil	1	0
80.	sum crystals	1	6		plant material, basal 2 in very hard, upper 3 in weathered; carbonaceous		_
	gray, very fine grained, silty, oil- stained, massive, thin-bedded, resis-			96.	material		5
	tant, iron-rich layers up to 1 ft thick scattered throughout, few crossbeds, few thin shale and siltstone lenses up to				light and dark mineral grains, solution cavities, pyrite nodules, iron-stained, thick-bedded, friable, fossil plants in		
	2 ft thick; solution cavities, pyrite nod- ules; sandstone grades upward to fine			97	medial part	5	0
	grained, with few medium grains; very				bedded, abundant fossil leaves	4	0
	light gray 70 ft above base; few shale chips 130 ft above base; few shale lenses 130 ft above base; abundant			98.	Sandstone, light- to medium-gray, fine- to medium-grained, light and dark mineral grains, friable, solution cavities,		
	scolithus fossils 1/8 inch in diameter in 2-ft bed at top	130	0	00	pyrite nodules, massive	7	6
	onformity Shale, grayish-brown, silty, abundant	150	U		Shale, medium-brownish-gray, silty, thin and evenly beddedSandstone, medium-grained, light and		9
~ 	coal and carbonaceous fragments, very carbonaceous, sulfur stain, gypsum			100.	dark mineral grains, fossil plant material, friable, pyrite nodules, thin inter-		
D -	crystals		8	101	beds of shale	15	0
	e of Beaver coal bed Coal, abundant fusain in basal 10 in;				Shale, medium-gray, thin and irregularly bedded, lower 1 ft carbonaceous	2	0
	impure, resin, fragmental upper portion banded, dull, poor to irregular			102.	Sandstone, medium-gray, very fine to fine-grained, thin- to thick-bedded,		

		Thick	ness	Thickness
		Ft	in	Ft in
	light and dark mineral grains, oil stain, silty	4	6	123. Shale, carbonaceous, abundant fossil plant material at base, highly weath-
	Shale, medium-gray, thin and evenly bed- ded	2	4	ered 10 124. Shale, medium-gray, thin and evenly bed-
104.	Sandstone, medium-gray, very fine to fine-grained, silty, iron-stained, thin-			ded, interbeds of siltstone, carbona- ceous zone, sandy in upper portion 4 0
	to thick-bedded, basal 2 ft friable; interbed of shale 8 in thick, pyrite	22	2	125. Sandstone, light-medium-gray, very fine grained, silty, fossil plant material 8
105.	nodulesShale, medium-brownish-gray, carbona-	33	2	126. Underclay, medium-brownish-gray, fossil plant material and roots 6
106.	ceous, thin and irregulary bedded Sandstone, medium-gray, fine-to medium- grained, mostly light mineral grains, iron-stained, solution cavities, pyrite	2	8	Base of Shipton coal bed 127. Coal, bright and dull, mostly bright, very impure, amber blebs; carbonaceous shale, abundant plant material, medium-
107.	nodules	2	2	brownish-gray, thin and irregularly bedded
108	bed Underclay, medium-gray, thin and irreg-	4	10	irregularly bedded, carbonaceous, abundant fossil plant material 8
100.	ularly bedded, abundant fossil plants 6 in above base; abundant fossil ginkgo			129. Tonstein, medium-brownish-gray, volca- nic ash contains flattened phenocrysts-
	leaves and roots	3	2	130. Underclay, very weathered, abundant fossil plant material and roots 2
109.	Coal, dull and bright laminations, mostly dull, resin blebs, fine to medium			131. Coal, slightly weathered, impure 6 Top of Shipton coal bed
110.	cleats, impure	1	4	132. Shale, medium-dark-brownish-gray, carbonaceous, abundant fossil plant material 6 6
111.	evenly bedded top half, 4-in-thick car- bonaceous shale at top, sandy at base- Sandstone, very fine to fine-grained, iron-	3	10	133. Sandstone, medium-brownish-gray, very carbonaceous, silty, abundant fossil
	stained, fossil plant material, calcare- ous, pyrite nodules, thin- to thick- bedded	1	4	plant material, volcanic ash in top 2 in- 1 2 134. Shale, medium-gray, thin and irregularly bedded, weathers light-olive-brown,
112.	Shale, medium-gray, thin and irregularly bedded	1	4	base thin and irregularly bedded, poorly bedded to nonbedded in medial
113.	Sandstone, very fine to fine-grained, ironstained, solution cavities, noncalcar-			part; thin-bedded, silty at top, carbonaceous material, coaly, fossil plant fragments 15 0
114.	Shale, medium-gray, thin and evenly bed-		8	135. Sandstone, medium-gray, very fine to fine-grained, very calcareous, shale
115.	ded, thin and irregularly bedded carbo- naceous zones	5	5	chips, solution cavities, pyrite nodules, thin-tothick-bedded, weathers medium-
	ded, silty in basal 10 in; sandy in next 10 in; carbonaceous zone at top	5	2	grayish-brown 12 0 136. Shale, medium-gray, thin and evenly bed-
116.	Sandstone, medium-gray, very fine to fine-grained, very calcareous, solution			ded 7 6 137. Limestone, medium-gray, sandy, brittle - 8 Total measured thickness of Mesa-
	cavities, pyrite nodules, crossbedded, thick-bedded to massive, resistant, oil stain	10	0	verde Formation 941 3
117.	Shale, medium-gray, thin and evenly bed- ded	10 1	0 2	
118.	Siltstone, medium-gray, thin and evenly bedded, noncalcareous	1	6	
119.	Sandstone, medium-gray, silty, fossil plant fragments, friable	4	0	
	Shale, medium-gray, thin and evenly bed- ded	1	10	Measured section 17a: Mesaverde Formation through Indian Meadows Formation
	Siltstone, thin and irregularly bedded, iron-stained, oil stain		8	Location: Alkali Butte Quadrangle, Wyoming (7.5 min) Start: NE-SW-SW sec. 4, T. 2 S., R. 6 E. Presented from oldest to
122.	Sandstone, medium-gray, very fine to fine-grained, alternating resistant and friable beds, weathers to light brownish			youngest End: NW-NW-NE sec. 28, T. 1 S., R. 6 E. Described by: N.L. Hickling and R.C. Warlow
	gray, fossil plant material	19	0	Strike 85°, Dip 18° NW.

Upper Cretaceous:	Thick	ness			Thickn	iess
Mesaverde Formation:	Ft	in			Ft	in
 Sandstone, very light gray, very fine to fine-grained, dark and light mineral grains, thick-bedded to massive, non- calcareous, solution cavities; top 4 ft 				Sandstone, medium-light-gray, very fine to fine-grained, iron-stained, slightly calcareous, thin and evenly bedded, crossbedded	20	0
weathered bright brick red2. Shale, light-brownish-gray, very sandy,	19	0		Shale, medium-gray, thin and evenly bed- ded	2	6
carbonaceous3. Sandstone, very light brownish gray, very		5	26.	Sandstone, medium-light-gray, very fine grained, thin-bedded, iron-stained	1	6
fine grained, silty, carbonaceous, thick- bedded		6		Shale, medium-light-gray, sandy, silty Sandstone, light-gray, very fine grained,	4	0
4. Shale, dark-brownish-gray, silty, very carbonaceous, coal laminations, top				silty, iron-stained		8
gradational5. Sandstone, light-gray, very fine grained,	1	8		bedded, sandy, siltySandstone, light-gray, very fine grained,		8
silty, scattered carbonaceous frag- ments, weathered, very iron stained in				silty, iron-stained	1	0
top 4 in 6. Sandstone, light-brownish-gray, very fine	2	0		Shale, medium-gray, sandy, silty Sandstone, light- to medium-gray, very fine grained, iron-stained, pyrite nod-	1	0
grained, very silty, slightly carbona-	10	_		ules		6
ceous, thin and irregularly bedded 7. Underclay, medium-grayish-brown, very	10	6	33.	Shale, medium-gray, silty, sandy	1	6
carbonaceous, fossil plants and root		4		Sandstone, light- to medium-gray, very fine grained, iron-stained	1	0
Base of Shipton coal bed		•		Shale, medium-gray, silty, sandy	10	0
8. Coal, bright to dull, slightly impure, fine to medium cleats	1	8	36.	Sandstone, light-gray, weathered orange, quartzose, noncalcareous, few dark		
Top of Shipton coal bed 9. Shale, light-gray, very silty, thin and	-	_	37.	and light mineral grains, well-sorted Sandstone, medium-gray, very silty,	2	0
irregularly bedded, oil-stained	2	8	38	weathered, thin and irregularly bedded- Shale, medium-gray, thin and evenly bed-	22	0
10. Siltstone, medium-light-gray, sandy toward the top, iron-stained, thin and irregularly bedded	1	10	50.	ded, oil-stained; 4-in-thick medium- gray siltstone lens 23 ft above base;		
11. Shale, medium-light-gray, thin-bedded	•	8		scattered siltstone lenses up to 2 in	70	•
12. Siltstone, medium-light-gray, iron- stained		4	39.	Sandstone, medium-light-gray, weathered	79	0
13. Shale, light-medium-gray to light-brownish-gray, slightly carbonaceous,			40.	orange, hard, calcareous Sandstone, light-gray, very fine grained,	2	0
slightly oil stained 14. Shale, medium-grayish-brown, carbon-	2	0	41.	thin-beddedShale, medium-gray, thin and irregularly bedded	1	0
aceous, silty, thin and irregularly bed- ded	3	6	42.	Sandstone, light-gray, very fine grained, silty, nonresistant	5	6
 Siltstone, medium-light-gray, iron- stained, thin and irregularly bedded 		7	43.	Shale, medium-gray, thin and evenly bed- ded	1	0
16. Sandstone, light-gray, very fine grained, silty, thin and irregularly bedded,	_	0	44.	Sandstone, white to light-gray, very fine to fine-grained, pyrite nodules, friable,	1	U
slightly carbonaceous 17. Sandstone, medium-light-gray, very fine grained, thin- to thick-bedded	6 28	0		massive, noncalcareous, upper 3 ft thin-bedded and iron-stained, cross-		
18. Shale, medium-gray, sandy and silty, thin- bedded	5	0		beds, calcareous concentrations up to 6 in thick	42	0
19. Shale, medium-gray to medium-brownish- gray, basal 2 ft carbonaceous; scattered	J	Ū		Shale, medium-gray, thin and evenly bed- ded	, 7	6
siltstone lenses up to 3 in thick	10	0	46.	Sandstone, medium-gray, very fine grained, silty, nonresistant	1	6
20. Sandstone, light-gray, slightly iron stained, thin- to thick-bedded; 6-in-				Shale, medium-gray	2	6
thick shale 7 ft above base 21. Shale, medium-gray	27 3	0 0	48.	Sandstone, light-medium-gray, very fine to fine-grained, thin- to thick-bedded;		
22. Sandstone, medium-light-gray, very fine grained, iron-stained, thin- to thick-	3	J	49.	6-in-thick shale lens 2 ft below top Shale, medium-gray, thin and irregularly	7	0
bedded, very calcareous	4	6		beddedSandstone, very fine grained, silty, thin-	1	6
stone bed 2 ft above base; few scattered siltstone and sandstone lenses up to 3 ft				bedded, pyrite nodulesShale, medium-gray, thin and irregularly	5	6
thick	16	0	51.	bedded	6	0

		Thick	ness			Thick	iness
		Ft	in			Ft	in
	Sandstone, very fine grained, iron- stained, very silty	9	0	83.	Siltstone, medium-brownish-gray, thin- bedded, carbonaceous, sandy, sulfur-		
53.	Shale, medium-gray, thin and evenly bedded to thin and irregularly bedded	27	0	84.	stains	4	8
54.	Sandstone, very fine grained, silty, iron- stained, pyrite nodules, slightly calcar-				ceous, abundant coal lenses, fossil plant prints		10
	eous; 6-in-thick silty shale lens 8 ft above base	35	0		Coal, detrital, few bright lensesShale, medium-dark-brownish-gray, car-		4
	Shale, silty	8	0		bonaceous	1	0
50.	Sandstone, very fine grained, silty, iron- stained, thin- to thick-bedded, pyrite	,			Sandstone, light-gray, very fine grained, thin-bedded, silty	5	4
57.	nodulesShale, medium-gray, silty, thin and irreg-	3	6		Shale, light-brownish-gray, very silty, slightly carbonaceous		8
58.	ularly beddedSandstone, very fine grained, dark and	7	6	89.	Sandstone, light-gray, very fine grained, abundant sulfur stains	1	1
	light mineral grains, thin- to thick-bedded	2	6	90.	Siltstone, light-grayish-brown, thin and irregularly bedded, carbonaceous	1	3
59.	Shale, medium-gray, thin and evenly bed- ded	13	0	91.	Sandstone, light-gray to white, medium- grained, thin- to thick-bedded, few		
60.	Sandstone, medium-gray, very fine	2	0		coarse grains; 3-in-thick carbonaceous	28	0
61.	grained, iron-stained, ripple-bedded Shale, medium-gray, thin and evenly bed-			92.	shale lens 14 ft above basal contact Shale, medium-light-gray to medium-light-	26	U
62.	Sandstone, very light gray to white, very	1	. 6		brownish-gray, thin and evenly bed- ded, carbonaceous; 3-in-thick sand-		at i
	fine grained, silty, thin- to thick- bedded	5	0		stone lens 2 ft below top; gypsum crystals	5	6
63.	Shale, medium-grayish-brown, very carbonaceous, fossil plant prints		8	93.	Sandstone, light-medium-gray, very fine grained, very silty, iron-stained, non-		
64.	Sandstone, light-gray to white, very fine grained, thin and irregularly bedded,			94.	calcareousShale, medium-dark-gray, thin and	1	0
65.	siltyShale, light-brownish-gray, carbona-	4	8		evenly bedded, slightly carbonaceous, abundant gypsum crystals; 4-in-thick		
66.	ceousSandstone, light-gray, very fine grained,		6	95.	silty sandstone lens 6 in below top Shale, medium-gray, thin and evenly bed-	5	0
67.	silty, iron-stained Shale, gray	1 1	6 0	96.	dedSandstone, medium-gray, very fine	2	0
68.	Sandstone, very light gray, very fine grained, silty	1	0	97.	grained, thin-bedded, siltyShale, medium-brownish-gray, thin and		4
69.	Shale, light-brownish-gray, carbonaceous, abundant sulfur stains		4		evenly bedded, carbonaceousSandstone, medium-gray, very fine		3
70.	Shale, medium-gray; 6-in-thick sandstone lens 8 ft above base	12	6		grained, silty		3
71.	Siltstone, light-brownish-gray, thin and	12	Ü		evenly bedded	2	0
	irregularly bedded, slightly carbona- ceous	5	9		Sandstone, light-gray, very fine grained - Shale, medium-brownish-gray, carbona-	4	6
72.	Sandstone, very light gray, very fine grained, nonresistant	4	4	102.	ceousSandstone, light-gray to white, very fine	1	6
	Shale, light-brownish-gray, carbonaceous Sandstone, very light gray, very fine	1	0		grained, upper 4 in very coarse- grained, thin-bedded, abundant sulfur		
	grained, thin and irregularly bedded, silty, iron-stained at top	10	0		stains; 1-in-thick carbonaceous shale lens 4 in above basal contact	2	0
75.	Underclay, dark-grayish-brown, thin- bedded, silty, hard, carbonaceous, fos-			103.	Shale, medium-brownish-gray, carbonaceous, oil-stained	3	0
	sil root and plant fragments	1	3	104.	Sandstone, light-gray to white, medium-		Ĭ.
	Coal, dull, poorly cleated Shale, medium-grayish-brown, carbona-	1	0		to coarse-grained, bentonitic, silty, oil- stained, abundant sulfur stains	4	6
	ceous, fossil plants	1	9	105.	Shale, medium-brownish-gray, carbona-		o
	Coal, impure, sulfur-stains Tonstein, light-brownish-gray, flattened	1	3,,	106.	ceousSandstone, light-gray to white, medium-		8
•	volcanic ash particles		4	100.	grained, few coarse grains, thin and		
	Coal, impure, shaly	1	2		irregularly bedded, crossbedded, abun-	•	A
01.	Tonstein, light-brownish-gray, carbonaceous lenses, sulfur stains		5		dant sulfur stains Total measured thickness of Mesa-	3	-4
82.	Coal, bright to dull, weathered		6		verde Formation	623	

		Thickr	ness			Thickn	iess
Inconfo	rmity: Meeteetse Formation not present	Ft	in			Ft	in
				127.	Shale, dark-brownish-gray, very carbon-		
	ormation:			100	aceous, silty		4
107. 31	nale, medium-gray, nonbedded, few scattered sandstone lenses	3	0	128.	Coal, impure, few bright bands up to ½ in thick, sulfur stains		4
108. Sa	andstone, light-gray to white, very fine	3	v	129.	Shale, light-brownish-gray, slightly car-		•
	to fine-grained, massive, few scattered				bonaceous, sulfur stains, fossil plants,		
	carbonaceous lenses, upper 6 in iron-				scattered silty-sandy lenses up to 1 ft		
	stained	19	6		thick	16	6
109. Sa	andstone, light-gray to white, very fine			130.	Shale, medium-grayish-brown, very car-		_
	grained, few scattered carbonaceous shale lenses up to 4 in thick	4	6	121	bonaceous, fossil plant prints Shale, medium-gray to light-olive-gray,		6
110. St	nale, medium-gray, thin and evenly bed-	7	U	151.	slightly bentonitic, carbonaceous in top		
110. 51	ded, carbonaceous at top	2	6		1 ft, abundant gypsum crystals	8	0
111. Sa	andstone, medium-gray, silty, oil-			132.	Sandstone, light-gray to white, fine- to		
	stained		6		medium-grained, dark and light min-		
112. Sh	nale, medium-gray to medium-brownish-				eral grains, thin- to thick-bedded, scat-		
	gray, nonbedded, oil-stained	2	8		tered carbonaceous shale lenses up to 6		
113. Sa	andstone, light-gray, very fine grained,				in thick; 1-ft-thick coarse-grained sand-	22	0
	silty, abundant iron stains, lens-shaped in top 4 in	1	6	122	stone lens 13 ft above basal contact Shale, medium-gray, thin and evenly bed-	22	0
114 SI	nale, medium-gray, thin and evenly bed-	1	U	133.	ded, slightly carbonaceous	12	6
111. 51	ded, slightly carbonaceous, two thin			134.	Sandstone, light-gray to white, very fine	12	Ů
	sandstone lenses 3 in thick, grades to				grained, massive, very silty, upper 1 ft		
	carbonaceous shale in upper 10 in;				is very tuffaceous	4	0
	fossil plants and coal fragments	3	6	135.	Sandstone, light-brownish-gray, very fine		
115. Sa	andstone, medium-light-gray, very fine	_			grained, thin-bedded, very silty, car-		
116 01	grained, silty	6	0	126	bonaceous	11	0
116. 51	nale, medium-gray, thin and irregularly	3	8	130.	Shale, medium-gray, thin and irregularly bedded	2	0
117 SI	bedded, silty nale, dark-grayish-brown, carbona-	3	0	137	Sandstone, light-gray to white, very fine	2	U
117. 51	ceous, very silty, few fossil plant			157.	grained, massive, upper 5 ft thin-		
	prints	1	2		bedded; very silty, solution cavities	21	0
118. Sa	andstone, light-gray, thin- to thick-			138.	Conglomerate, light-gray to white, yellow		
	bedded, few scattered thin shale lenses-	3	0		stains, shale chips, angular rock frag-		
119. Sa	andstone, light-brownish-graytomedium-				ments (mostly shale chips), interbed-		
	brownish-gray, thin and irregularly				ded with very fine grained sandstone,	24	Λ
	bedded, shaly, carbonaceous, fossil	1	3	120	gray to white, siltyConglomerate, light-gray to white, angu-	24	0
120 Ss	rootlets, sulfur stainsandstone, light-gray to white, very fine	1	3	139.	lar fragments 1 in above base, mostly		
120. 50	grained, silty, scattered shale lenses up				shale chips, few carbonaceous zones -	16	0
	to 6 in thick, some carbonaceous;			140.	Sandstone, medium-light-gray, iron-		
	upper 10 ft carbonaceous	65	0		stained, scattered quartz pebbles	2	0
121. Sł	nale, medium-brownish-gray, carbona-			141.	Sandstone, light-gray, grades to medium-		
	ceous, thin-bedded to nonbedded, oil-	_			gray in top 1 ft; very fine grained, silty-	8	0
100 0	stained	3	10	142.	Sandstone, white, weathered	18	6
122. 38	andstone, very fine grained, thin- to thick-bedded, silty, hard, scattered			143.	Sandstone, light-gray, arkosic, calcareous, abundant feldspar grains	1	6
	gray shale lenses up to 2 ft thick,				Total measured thickness of Indian		_6
	oil-stained	63	0		Meadows Formation	224	_2
	Total measured thickness of Lance				•		=
	Formation	184	_7				
Jnconfo	rmity: Fort Union Formation not present		_				
wer Eoc	ene:						
	leadows Formation:						
	onglomerate, medium-light-gray, round-						
	ed quartz pebbles up to 1 inch in			Measur	ed section 18: Cody Shale and Mesav	erde	
	diameter	26	0	Format			
124. W	'elded tuff, light-grayish-brown, very				Alkali Butte Quadrangle, Wyoming (7.5 min)		
	fine grained, hard, silicious, angular	2	0		V-NE-SW sec. 25, T. 34 N., R. 95 W. Presented	l from ol	ldest
	fragments, fossil roots	2 9	0 0	young			
125 51							
	nale, medium-grayandstone, light-gray, very fine grained,	,	U		'-NE-SE sec. 25, T. 34 N., R. 95 W. 1 by: N.L. Hickling, R.C. Warlow, and J.F. Wi	ndolph.	Jr.

Unner C	Cretaceous:	Thickn	acc			Thick	
	Shale:	Ft	in				
_	Sandstone, weathered, oil-stained		111			Ft	in
	•	2+		23.	Sandstone, light-gray, very fine grained,		
۷.	Shale, medium-dark-gray to medium-	4	4		very silty, thin and irregularly bedded-	2	1
2	gray, weathered, thin-bedded	4	6	24.	Siltstone, medium-gray, shaly, very fine		
3.	Sandstone, medium-light-gray, slightly				grained sandstone interbeds, thin and		
	iron stained, pyrite nodules, very fine				irregularly bedded	11	0
	grained and very silty, top gradational;			25.	Sandstone, medium-light-gray, very cal-		Ŭ
	carbonaceous laminations in upper 2		4.0	2 5.	careous, very fine grained, silty, dark		
4	in, massive		10		and light mineral grains, thin and irreg-		
4.	Shale, medium-gray to medium-dark-	4	Λ		ularly bedded	3	6
_	gray, weathered, poorly bedded	4	0	26	Sandstone, medium-light-gray, very fine	3	U
5.	Sandstone, medium-light-gray, very fine			20.	grained, abundant dark and light min-		-
	grained, silty, calcareous, thin and		_		eral grains, pyrite nodules, very calcar-		
4	evenly bedded		6		eous, thin-bedded to massive, silty and		
0.	Shale, medium-gray, silty, thin-bedded,	10	_		shaly	6	9
7	top gradational to sandy shale	12	6	27	Sandstone, light-gray, very fine to fine-	U	9
7.	Sandstone, light-gray, very fine grained,			27.			
	silty, thin and irregularly bedded, top	_			grained, very calcareous, small pyrite		
0	gradational	2	0		nodules, dark and light mineral grains,	2	Λ
8.	Shale, medium-gray to medium-dark-			20	nodular weathering, lenticular	3	0
	gray, silty, upper 3 in slightly carbon-	2	2	26.	Shale, medium-gray, thin and evenly bed-		
0	aceous	3	3		ded, sandy, sandstone laminations in		
9.	Sandstone, light-gray, iron-stained, very				middle part, 1-in-thick underclay,	11	10
	fine grained, very silty, calcareous,			20	grades carbonaceous in upper 1 ft	11	10
	thin- to thick-bedded, grades to silty	•	•	29.	Sandstone, medium-light-gray, very fine	1	
10	and shaly sandstone toward top	3	0	20	grained, silty, thick-bedded	1	1
10.	Shale, medium-gray, very fine grained			30.	Sandstone, light-gray, very fine grained,	-	
	sandstone and siltstone interbeds; thin		,	21	very silty, thin and irregularly bedded	5	0
1.1	and evenly bedded	4	6		Limestone, ferruginous, hard, brittle		1
11.	Sandstone, medium-light-gray, very fine			32.	Sandstone, light-gray, friable, very fine		
	grained, very silty, thin and irregularly		•		grained, silty, dark and light mineral		
10	bedded	1	0		grains, ripple-bedded at top, very cal-		_
12.	Shale, medium-gray, few thin medium-				careous, massive	4	7
	dark-gray laminations; contains			33.	Shale, medium-gray, very fine grained,		
	slightly carbonaceous shale bed 1 in				very silty, sandy, top grades sandy,		
	thick and interbedded sandstone and	_			thin-bedded, top channeled and filled	_	_
12	siltstone beds about 2 in thick	5	0		by overlying sandstone unit 34	2	_8
13.	Sandstone, light-gray, very fine grained,				Total measured thickness of Cody		
	very silty, calcareous, dark and light mineral grains, thin-bedded	1	3		Shale	<u>155</u>	<u>l</u>
1.4		1	3	Mesay	verde Formation:		
14.	Siltstone, medium-gray, carbonaceous				Sandstone, medium-light-gray, very fine		
	laminations, few very fine grained sandstone interbeds; thin-bedded	14	0		to fine-grained, thin-bedded to mas-		
15		14	U		sive, nodular weathering, pyrite nod-		
15.	Sandstone, medium-light-gray, very fine-grained, silty, thin-bedded		0		ules, base angular	33	0
16	Siltstone, medium-gray, very fine		8	35.	Sandstone, light-gray to very light gray,		
10.	grained, sandstone interbeds, carbo-				very fine to fine-grained, dark mineral		
	naceous laminations, thin-bedded	3	10		grains, pyrite nodules, massive-		
17	Sandstone, medium-light-gray, very fine	3	10		bedded, large nodular weathering, oil		
17.	grained, very silty, scattered shale lam-				stains	46	0
	inations; thin and irregularly bedded,			36.	Shale, medium-gray to medium-dark-		_
	oil-saturated	4	0		gray, slightly carbonaceous, thin-		
18	Shale, medium-gray, very fine grained		U		bedded	5	0
101	sandstone and siltstone interbeds, thin-			37.	Sandstone, medium-light-gray, very fine	_	-
	bedded, silty	6	6		to fine-grained, scattered carbonaceous		
19.	Sandstone, medium-light-gray, very fine	Ŭ	v		matter, thin- to thick-bedded	1	0
	grained, silty, thin and irregularly bed-			38.	Shale, medium-gray, very silty and		
	ded	1	0		sandy, includes 3-in-thick sandstone		
20.	Siltstone, medium-gray, very shaly, very				bed; thin and irregularly bedded	2	0
	fine grained sandstone interbeds, thin-			39.	Sandstone, medium-light-gray, very fine	_	-
	bedded, oil stains	6	6		grained, silty, iron-stained, calcareous,		
21.	Sandstone, medium-light-gray, very fine				massive	2	4
	grained, silty, thin-bedded		8	40.	Shale, medium-gray, very silty, includes	_	•
22.	Shale, medium-gray, thin-bedded, basal 4				3-in-thick sandstone bed, thin-bedded-	3	6
	ft very silty, sandy siltstone and sand-			41.	Sandstone, medium-light-gray, very fine	=	
	stone interbeds	22	0		grained, very calcareous, abundant		
					, ,		

		Thickr	iess	Thick	ness
		Ft	in	Ft	in
	shale chips at base, thin-bedded, resist-			60. Sandstone, very fine grained, very silty,	
	ant	1	9	thin-bedded, basal 4 ft thick- to mas-	
42.	Shale, medium-gray, very silty, thin and evenly bedded	31	0	sive, solution cavities, pyrite nodules - 40	6
43.	Sandstone, medium-light-gray, very fine	31	U	61. Shale, medium-gray, thin and evenly bed-	
	grained, sparsely micaceous, calcare-			ded, silty, sandy, very fine grained	
	ous, thin- to thick-bedded	1	5	sandstone and siltstone interbeds, few sandstone beds up to 5 in thick 8	0
44.	Shale, medium-gray, thin- to poorly bed-			62. Sandstone, medium-light-gray, very fine	U
	ded, silty; 2½-ft-thick very fine grained sandstone 7 ft above base;			grained, very silty, crossbedded, slump	
	1-ft-thick very fine grained sandstone			structures, thin- to thick-bedded, very	
	14 ft above base; sandstone and shale			calcareous 7	0
	chips at base	19	0	63. Shale, medium-gray, very silty, thin and	
45.	Sandstone, light-gray, iron-stained, cal-			evenly bedded, siltstone and sandstone	
	careous, very fine to fine-grained, cross- bedded, thin- to thick-bedded, irregu-			interbeds, upper 4 ft grades into very	
	lar	2	5	silty, red oxidized, very fine grained sandstone 10	0
46.	Shale, medium-gray, very sandy, silty;			64. Sandstone, light-gray, very fine to fine-	U
	sandstone interbeds up to 6 in thick;			grained, pyrite nodules, 1-ft-thick	
	few slightly carbonaceous beds, medium-dark-gray underclay; thin and			shale bed 1 ft below top; noncalcare-	
	evenly bedded	21	6	ous, few fossil roots at top 60	0
47.	Sandstone, medium-light-gray, very fine			65. Underclay, medium-gray, abundant fossil	
	grained, thin and irregularly bedded,	_		rootlets, carbonaceous fragments,	
18	silty, green and black mineral grains - Shale, medium-gray, thin and evenly bed-	5	0	upper 2 in very carbonaceous	4
40.	ded, silty; 1-ft-thick very fine grained			Base of Signor coal bed	
	sandstone 3½ ft above base	7	3	66. Coal, bright, banded, gypsum crystals, resin blebs, fusain, fine to medium	
49.	Siltstone, light-gray, thin and irregularly			cleats, cleats 50° at 60° SE, and 150° at	
50	bedded, iron-stained		11	45° SW.; 2-in-thick tonstein with fossil	
50.	Shale, medium-gray, contains 7-in-thick very fine grained sandstone 2 ft above			plants 1 ft 2 in below top; coal 2 in	
	base, thin-bedded	5	6	above; tonstein contains flattened vol-	
51.	Sandstone, medium-light-gray, very fine			canic ash particles 16	0
	grained, silty, iron-stained, thin- to			Top of Signor coal bed	
	thick-bedded; 1-ft-thick shale lens 3 ft above base	5	0	67. Shale, light-gray-brown, very carbonaceous, sulfur-stained, gypsum crystals,	
52.	Shale, medium-gray, very silty, thin-	3	U	silty, thin and irregularly bedded 3	4
	bedded	3	2	68. Siltstone, light-gray, sandy, carbonaceous	
53.	Sandstone, medium-light-gray, very fine			shale laminations, oil stains 6	0
	grained, calcareous, thin- to thick- bedded	3	4	 Shale, medium-gray, thin and evenly bed- ded, very silty, few carbonaceous lam- 	
54.	Sandstone, light-gray to white, noncalcar-	3	4	inations, siltstone and sandstone inter-	
	eous, dark mineral grains, massive,			beds 1	11
	iron-stained pyrite nodules up to 4 ft in			70. Sandstone, light-gray, friable, very fine	
55	Shale, medium-gray, thin and evenly bed-	44	0	grained, silty, very calcareous, weathered, thin- to thick-bedded6	6
55.	ded, includes very fine grained, very			ered, thin- to thick-bedded 6 71. Shale, medium-gray, thin and evenly bed-	U
	silty, iron-stained sandstone bed	7	0	ded, interbeds of friable sandstone 21	0
56.	Sandstone, medium-light-gray, very fine			72. Sandstone, light-gray, very fine to fine-	
	grained, very iron stained, very calcar-			grained, thick-bedded to massive,	
	eous, thin-bedded, spongy weathering at top	1	8	abundant dark and light grains, very calcareous, top gradational7	0
57.	Shale, basal 1 ft very silty, medium-gray;	•	U	73. Shale, medium-gray, very fine grained,	v
	1-in-shaly limestone 1 ft above base;			thin-bedded, very silty, sandy 3	0
	medium-gray shale interbeds, few silt-			74. Sandstone, medium-light-gray, very fine	
	stone and sandstone interbeds up to 3 in thick; thin-bedded	28	0	grained to fine-grained, friable, abundant dark mineral grains, silty, thick-	
58.	Sandstone, light-gray, very fine grained,	20	J	bedded to massive	3
	very silty, lenticular, pyrite nodules,			75. Underclay, medium-gray, fossil roots,	
5 0	solution cavities, massive-bedded	2	6	silty1	0
39.	Shale, medium-gray, thin-bedded, very silty, sandy, few thin sandstone inter-			76. Shale, light-gray-brown, very silty, ½-in-thick coal 2 in above base, thin- to	
	beds	11	6	poorly bedded 1	2
				÷ •	

		Thickne	ess			Thick	ness
		Ft	in			Ft	in
77.	Shale, medium-gray, thin and evenly bed-			96.	Sandstone, light- to medium-gray, fine-		
	ded		8		grained, solution cavities, crossbed-		
78.	Shale, medium-light-gray, thin and irreg-	1			ded, pyrite nodules capped by very iron stained sandstone 8 in thick	4	4
70	ularly bedded, sandy	1	6	97.	Sandstone, light-gray, medium-grained,		
19.	Sandstone, light-gray, very fine grained,				dark mineral grains, massive, resistant,		
	silty, solution cavities, pyrite nodules,				solution cavities, pyritic nodules,		
	crossbedded, scattered shale lenses 8 ft				crossbedded, siltstone and very fine		
	above base, very calcareous, silty,				grained sandstone 2 ft thick, highly		
	shaly, thin-bedded in top 10 ft	34	4		iron stained, slightly calcareous, very		
80.	Shale, medium-gray, very silty, abundant				resistant at top	60	0
	siltstone and sandstone interbeds, thin-			98.	Shale, medium-gray, thin and evenly bed-		
	bedded	7	6		ded	6	6
81.	Sandstone, medium-light-gray, very fine			99.	Sandstone, light-gray, medium-grained,		
	grained, silty, massive, nodular weath-				dark mineral grains, massive, cross-		
	ering, dark mineral grains, grades to				bedded, friable	38	0
	silty shaly sandstone in top 3 ft	22	0	100.	Shale, thin and irregularly bedded, car-		
82.	Shale, very silty with sandstone interbeds,				bonaceous, silty	5	10
0.2	1-ft-thick medium-gray shale near base	17	0	101.	Sandstone, light-gray, medium-grained,		
83.	Sandstone, medium-gray, fine-to medium-				light and dark mineral grains, massive,		
	grained, iron-stained, crossbedded,				crossbedded, friable	37	0
	dark mineral grains, very calcareous, thin- to thick-bedded	32	0	102.	Shale, medium-gray, thin and evenly bed-		
84	Shale, thin and evenly bedded, medium	32	U		ded	2	0
07.	gray, interbedded with nonresistant			103.	Sandstone, medium-gray, fine- to		
	sandstone	12	0		medium-grained, light and dark min-		
85	Sandstone, light-gray, medium-grained,	12	U		eral grains friable	16	0
05.	thin- to thick-bedded, solution cavities,			104.	Shale, dark-brown-gray, carbonaceous,		
	resistant, crossbedded	33	0		irregularly bedded, resistant	1	8
86.	Shale, medium-gray, thin and evenly bed-		Ü	105.	Underclay, dark-brownish-gray, abundant		
	ded	1	0		fossil plants		6
87.	Underclay, medium-gray, highly weath-			106.	Coal, impure, fine cleats		4
	ered, very carbonaceous in top half	1	2	107.	Shale, medium-gray, thin and irregularly		
Base	e of Beaver coal bed				bedded	4	0
88.	Coal, mostly bright, fine to medium			108.	Shale, medium-gray, fine- to medium-		
	cleats	1	0		grained, thin and irregularly bedded,		
89.	Coal, bloom, highly weathered		4		thick-bedded in upper 10 ft, iron-		
Top	of Beaver coal bed				stained	28	0
90	Shale, medium-gray, thin and irregularly			109.	Shale, medium-gray, thin and evenly bed-		_
<i>7</i> 0.	bedded	1	3		ded, few sandstone interbeds	30	0
91.	Sandstone, medium-gray, very fine to	•	5	110.	Sandstone, light-gray, medium-grained,		
,	fine-grained, thin and irregularly bed-				thick-bedded, crossbedded, oil stains,		
	ded, partly resistant, crossbedded,				top 4 in ironed-stained; 1-in-thick coal		
	shale lenses up to 10 in thick, pyrite			111	at top	13	4
	nodules	41	6	111.	Sandstone, light-gray, medium-grained,		
92.	Underclay, medium-gray, fossil plants				carbonaceous laminations, medium to dark-brownish-gray, top gradational	1	4
	and rootlets, very sandy	1	0	112	Shale, resistant, carbonaceous, thin inter-	1	7
93.	Shale, medium-gray, thin and evenly bed-			112.	beds of silty sandstone	10	2
	ded to thin and irregularly bedded,			113	Underclay, medium-dark-gray, thin and	10	2
	siltstone laminations, carbonaceous in	_		115.	irregularly bedded	3	0
0.4	upper 1 ft	6	0	Rase	of lower split of Shipton coal bed	J	v
94.	Sandstone, light-gray, partly resistant,			Dusc	of lower spin of simploir coar sea		
	medium-grained, few coarse grains,			114.	Coal, mostly brown, fine to medium		
	clean, well-sorted, solution cavities, pyrite nodules, noncalcareous; very				cleats at 85° NE., 5° at 80° NW	4	0
	iron stained 8-in-thick sandstone	22	4	115.	Tonstein, medium-gray, fossil plant mate-		_
95.	Sandstone and shale: Sandstone—white,		•	116	rial, sandy with volcanic ash		8
	fine- to medium-grained; shale—			110.	Coal, impure, brown, dull laminations,		5
	medium-brownish-gray, carbonaceous,			Т	weathered		3
	weathered light-gray, thin and evenly			rop c	of lower split of Shipton coal bed		
	bedded, carbonaceous material; 5-ft			117.	Siltstone, light-yellow-gray, thin and		
	alternating beds of white sandstone and				irregularly bedded; 4-in-thick ironstone		
	carbonaceous, shaly material; resistant-	16	0		layer	2	0
					•		

		Thic	kness			Thick	ness
		Ft	in			Ft	in
118.	Shale, medium-gray, thin and evenly bed-			11.	Shale (underclay), medium- to light-olive-		
	ded, carbonaceous zones	11	0		gray, silty, fossil roots, carbonaceous		•
119.	Underclay, medium-dark-brownish-gray,			10	in upper 6 in	1	9
	thin and evenly bedded	4	0		Coal, bright, fine cleats		11
Base	of upper split of Shipton coal bed			13.	Shale, medium-gray, thin-bedded, carbonaceous	5	0
	Coal, mostly brown, fine to medium			14	Shale, medium-gray, good fissility, car-	3	Ū
	cleats, gypsum crystals, resin blebs,			1	bonaceous	2	0
	petrified wood at top	4	10	15.	Sandstone, medium- to light-gray, very		
Top	of upper split of Shipton coal bed				fine grained, crossbedded, calcareous		
	Shale, medium-gray, thin and evenly bed-				cement, pyrite nodules, solution cavi-	10	•
	ded	28	0	16	ties	10	0
122.	Sandstone, medium-light-gray, very fine			16.	Shale, dark-gray, very fissile, carbonaceous, fossil roots	2	3
	grained, thin-bedded	1	0	17	Sandstone, medium-gray, very fine	2	5
123.	Shale, medium-gray, thin and evenly bed-			17.	grained, calcareous, pyrite nodules	5	0
	ded	3	0	18.	Sandstone, light-gray to white, very fine		
124.	Sandstone, medium-light-gray, fine-				grained, silty, massive	11	0
	grained	6	0	19.	Sandstone, light-gray, fine-grained, cal-	_	_
125.	Shale, medium-gray, silty, ripple-			20	careous, crossbedded, pyrite nodules -	2	6
	marked	22	0	20.	Shale, medium- to light-gray, thin- bedded, silty, bentonitic, fossil roots,		
126.	Limestone, medium-gray, sandy		8		carbonaceous	6	6
127.	Shale, medium-gray, thin and evenly bed-			21.	Sandstone, light-gray, very fine grained,	Ū	Ŭ
	ded	15	0		thin-bedded, silty	3	6
128.	Sandstone, medium-light-gray, thin-			22.	Shale, medium-gray, fossil roots, bento-		
	bedded, very fine grained	2	0		nitic		8
	Total measured thickness of Mesa-			23.	Shale, medium-grayish-brown, very fis-		7
	verde Formation	1,110	_5	24	sile, bentonitic	1	7
				24.	Shale, brownish-gray, poorly bedded, carbonaceous, fossil roots, bentonitic -	4	6
				25.	Sandstone, light-gray, very fine grained,	-	Ū
					silty, thin-bedded	5	6
				26.	Sandstone, light- to medium-gray, very		
					fine to fine-grained, calcareous, solu-		_
Measur	ed section 19: Mesaverde Formation			27	tion cavities		8
	Jenkins Mountain Quadrangle, Wyoming (7.5)	min)		27.	Shale, medium-gray, very fissile, carbo-	1	4
	SESE-SW sec. 26, T. 6 N., R. 2 E. Presented		ldest to	28	naceous, bentonitic, fossil root prints - Sandstone, light-gray to white, very fine	1	4
younge				20.	to fine-grained, crossbedded, friable,		
	-SW-NW, sec. 25, T. 6 N., R. 2 E. 1 by: F.I. Frasse				solution cavities	5	6
	°, Dip 25° SW.			29.	Shale, light- to medium-gray, bentonitic,		
					carbonaceous	6	3
	retaceous:	Thick		30.	Sandstone, light- to medium-gray, very		
	verde Formation:	Ft	in		fine grained, thin-bedded, silty, calcar-	1	7
1.	Sandstone, light-gray, fine-grained, sub-rounded, calcareous, crossbedded,			21	Sandstone, light-gray, fine- to medium-	4	7
	solution cavities	10	0	31.	grained, calcareous, pyrite nodules,		
2.	Shale (underclay), medium-brownish-	10	Ü		solution cavities	1	8
	gray, carbonaceous		5	32.	Sandstone, light- to medium-gray, very		
	Coal, bright, resin blebs		7		fine grained, shale and siltstone inter-		
4.	Tonstein, medium-brownish-gray, gran-		.,		beds, thin-bedded, carbonaceous	16	0
5	ules, carbonaceous		1/ ₂ 3	33.	Sandstone, light- to medium-gray, fine- to		
_	Coal, bony, fossil root printsShale, medium-gray, carbonaceous,		3		medium-grained, calcareous, pyrite nodules, thin-bedded	8	6
0.	poorly bedded	1	2	34	Shale, light- to medium-gray, bentonitic,	U	U
7.	Coal, bony fossil root prints	-	2	51.	thin-bedded	4	9
	Coal, bright, medium cleats, gypsum on			35.	Sandstone, light- to medium-gray, very		
	cleats, fusain lenses	2	5		fine to fine-grained, calcareous, thin-		
	p of Maverick Spring coal zone				to thick-bedded	11	0
9.	Shale, light-gray, thin and evenly bedded,	~	0	36.	Sandstone, light-gray to white, very fine		
10	calcareous sandstone interbeds Sandstone, light-gray to white, very fine	7	0		grained, calcareous, thin siltstone interbeds 10 ft above base	16	6
10.	to fine-grained solution cavities	15	0	37	Coal, bright, banded	10	6
	To the Branch Solution Savines	15	•	27.	· · , -		-

		Thickn	ess			Thick	ness
		Ft	in			Ft	in
38.	Shale (underclay), medium-gray, bentonitic, carbonaceous		8	64.	Sandstone, brown, very fine grained, calcareous		3
39.	Shale, light- to medium-gray, poorly bedded, bentonite, carbonaceous, fossil			65.	Shale, light- to medium-gray, bentonitic, upper 3 ft medium-dark-gray, carbo-		
40.	Sandstone, light-gray to white, very fine	4	2	66.	naceous Sandstone, light-gray, fine-grained, cross-bedded, thin-bedded, calcareous	12	0
41	to fine-grained, crossbedded, thin- to thick-bedded, calcareous cement Shale (underclay), medium-gray, poorly	10	4	67.	Shale (underclay), light- to medium-gray, bentonitic, upper 8 in brownish-gray,	3	U
	bedded, upper 6 in very fissile, medium-dark-gray, carbonaceous	2	6	68.	carbonaceous, fossil root prints Coal, bright to dull, resin, fusain	6 1	0 7
	Coal, dull, resin, fusain in upper 3 in Shale (underclay), medium-gray, carbo- naceous	_	9		Shale, medium-light-gray, bentonitic, basal 4 in carbonaceous, coal laminations	2	0
44.	Coal, bright, resin, banded, basal 3 in bony	2	5	70.	Sandstone, light-gray to white, fine- to medium-grained, massive at base,	2	Ü
45.	Tonstein, medium-brownish-gray, silty, carbonaceous	2	1		crossbedded, calcareous, solution cavities, pyrite nodules	12	6
46.	Shale, medium-gray, very fissile, carbonaceous	2	0		Siltstone, light-gray, poorly bedded Shale, medium-gray, bentonitic, upper 8	5	0
47.	Coal, bright, gypsum on cleats, upper 2 in irregular and channeled; filled by over-				in medium-dark-gray, carbonaceous, fossil root prints	11	6
48.	lying sandstone unit 48	1	5		Coal, bright, resin blebs, medium cleats- Shale, light- to medium-gray, fossil root prints	1	21/2
40	bedded, calcareous, friable, pyrite nod- ules, solution cavities	22	0	75.	Sandstone, light-gray to white, very fine grained, thin-bedded, siltstone inter-		
	Shale, light- to medium-gray, poorly bed- ded	13	0	76.	Sandstone, light- to medium-gray, very	7	6
	naceous, fossil root prints Coal, weathered, gypsum crystals		9 6	77	fine to fine-grained, crossbedded, cal- careous	15	0
	Shale, light- to medium-gray, carbonaceous zones 10 in thick at top and 9 ft		U		siltyShale, light- to medium-gray, poorly bed-	10	0
53.	above base Underclay, medium-light-gray, poorly	14	6		ded, silty, bentonitic	7	6
	bedded, fossil root printsCoal, dull, banded, weathered, fossil		8	80.	bedded, thin-bedded, calcareous Shale, light- to medium-dark-gray, upper	11	6
55.	Shale, light- to medium-gray, silty, poorly bedded, bentonitic	12	6	81	3 ft very fissile, carbonaceous, fossil root prints	38	0
56.	Sandstone, light-gray, fine-grained, cross- bedded, thin-bedded, calcareous in	12	v		tonitic, upper half poorly bedded, fos- sil root prints	11	0
57	upper 2 ft, pyrite nodules, solution cavities	5	5	82.	Sandstone, light- to medium-gray, fine- grained, crossbedded, thin-bedded, pyritic nodules, calcareous	6	6
57.	ded, silty, bentonitic, 1-in very fine grained calcareous sandstone 9 ft above				Shale, light- to medium-gray, silty, bentonitic, thin sandstone interbeds	14	0
58.	base, 10-in carbonaceous zone 5 ft above base	13	6	84.	Sandstone, light-gray to white, very fine to fine-grained, crossbedded, massive, friable, calcareous	21	0
59	bedded, thin-bedded, calcareous, pyrite nodules, solution cavities Shale, light-gray to brown, very silty,	11	0	85.	Shale, light-gray, silty, bentonitic, upper two-thirds interbedded with siltstone and sandstone, calcareous	15	0
	poorly bedded, bentonitic	13	0	86.	Shale (underclay), medium-gray, carbonaceous, fossil root prints	1.3	8
	very fine grained, calcareous	2	0	87	Coal, weathered, fossil plant prints		3
	Shale, light-gray, silty, poorly bedded Siltstone, light-gray to white, thin-	10	0	88.	Shale, light- to medium-gray, bentonitic Sandstone, light-gray, very fine grained,	12	0
	bedded, siderite bands 1 in thick at base and 1 ft 3 in thick above base	4	0		silty, poorly bedded	10	6
63.	Shale, medium-gray, carbonaceous, bentonitic	5	6		bedded, thin-bedded, calcareous Concealed (probably shale)	1 46	6 0

		Thick	ness			Thick	ness
		Ft	in			Ft	in
92.	Shale, light- to medium-gray, bentonitic,			114.	Shale, light-medium-gray, basal 4 ft silty;		
	fossil root prints	4	4		6-in-thick carbonaceous shale 4 ft		
93.	Siltstone, light-gray, thin-bedded		10		above base; upper 81/2 ft poorly bedded		
	Sandstone, light-gray, very fine grained,				to nonbedded, bentonitic, fossil root		
	crossbedded, calcareous	2	6		prints; top 5 in light brown, carbona-		
95.	Concealed (probably shale)	58	0		ceous, slightly bentonitic	12	6
96.	Sandstone, light-gray, very fine grained,			115.	Coal, impure, dull and bright bands,		
	thin-bedded, pyrite nodules, calcare-				deeply weathered		5
07	Ous	3	0	116.	Shale, light-brown to light-medium-gray,		
	Concealed (probably shale)	8	0		poorly bedded, slightly bentonitic	9	3
90.	Shale, medium-gray to brown, bentonitic, carbonaceous coal laminations in upper			117.	Sandstone, light-yellow-orange to dark-		
	part	2	5		yellow-orange, very fine to fine-		
QQ	Shale, light-gray, silty, poorly bedded	8	6		grained, well-indurated, calcareous		10
	Sandstone, light-gray to grayish-brown,	Ü	Ū	118.	Shale, medium-light-gray, silty, slightly		
100.	very fine grained, thin- to thick-				bentonitic, 1-in very fine grained, cal-		
	bedded, silty, calcareous	6	0		careous sandstone, 4 ft above base;		
101.	Concealed (probably shale)	6	6		uppermost 4 ft light-brown, carbona-		
	Shale, medium-gray to dark-gray, poorly			110	ceous underclay, fossil root prints	13	6
	bedded, silty, very carbonaceous 4 ft			119.	Shale, carbonaceous, dull and impure,		0
	above base	24	0	120	bony and silty, fossil root prints Shale, dark-yellowish-orange to moderate-		8
103.	Sandstone, light-gray, very fine grained			120.	yellowish-brown, lower 4 ft silty,		
	to fine-grained, crossbedded, pyrite		_		upper part poorly bedded, bentonitic	14	3
104	nodules, calcareous	4	6	121.	Sandstone, light-yellow-brown, fine- to	••	•
104.	Shale, light- to medium-gray, bentonitic,				very fine grained, thin-bedded		10
	upper 1 ft brown, carbonaceous, fossil root prints	8	0	122.	Shale, medium- to light-gray, silty,		
105	Coal, bright to dull, resin, fusain	1	ŏ		locally bentonitic, poorly to moder-		
	Shale, medium-gray, poorly bedded, fos-	1	U		ately bedded	37	0
100.	sil rootlets, in basal 8 in carbonaceous			123.	Sandstone, light-yellow-brown, calcare-		
	zone, dark-brown, fossil plant frag-				ous, well-indurated, fine-grained, sub-		
	ments	10	0		angular to subrounded, thinly cross-		
107.	Sandstone, light- to medium-gray, thin- to				bedded, solution cavities, pyrite nodules in discrete layers	5	6
	medium-bedded, crossbedded at base,			124	Shale, light- to medium-gray, silty; upper	3	U
	fine-grained, friable, quartzose, sub-			124.	3 ft medium-gray, carbonaceous,		
	angular to subrounded, pyrite nodules,				locally bentonitic, poorly bedded	17	3
	limestone in upper 2½ ft,	7	^	125.	Siltstone, light-yellow-brown, calcare-		
100	well-indurated	7	0		ous, thin-bedded	1	1
100.	silty, bentonitic, above fossil root			126.	Shale, light- to moderate-gray, bentonitic,		
	prints	9	6		poorly to nonbedded, 101/2 ft above		
109.	Sandstone, medium-yellow-brown, pyrite		Ū		base is a moderate-brown, iron-		
	nodules 1/2 inch in diameter, siderite,				cemented siltstone 2 in thick	14	6
	quartz grains, fine-grained, well-			127.	Limestone, medium-gray, finely crystal-		
	rounded to rounded, well-indurated		11		line, fine-grained sandstone layers,		
110.	Shale, light- to medium-gray, poorly to				thin- to thick-bedded, weathers dark- yellowish-orange, upper 10 in calcare-		
	moderately bedded, lower 7 ft bentoni-				ous sandstone, very fine grained, few		
	tic, next 8 ft silty, top 3 ft silty and	10	0		pyrite nodules up to 1 inch in diameter-	2	6
111	moderately bedded	18	U	128.	Shale, light- to medium-gray, slightly car-		
111.	grained, subangular to subrounded,				bonaceous, bentonitic; upper 3 ft		
	crossbedded, well-indurated, pyrite				medium gray to moderate brown, car-		
	nodules 1/4 inch in diameter	5	6		bonaceous fossil root and plant frag-		
112.	Shale, light-yellow-browntomedium-light-				ments	11	0
	gray; basal 11 ft silty, poorly bedded,				Covered (shale)	22	0
	upper 14 ft less silty, moderately bed-			130.	Shale, light- to medium-gray and pale-		
	ded, locally bentonitic and carbona-	~-	•		orange-brown, lower 15 ft silty; upper		
112	Ceous	25	0		14 ft shale, bentonitic, carbonaceous, fossil roots, poorly bedded	29	0
115.	Sandstone, light-yellow-brown, fine-			121	Sandstone, dark-yellowish-orange to light-	27	v
	grained, subangular to subrounded, thin-bedded, calcareous, few pyrite			131.	brown, calcareous, fine- to medium-		
	nodules up to ½ inch in diameter,				grained, crossbedded, well-indurated,		
	small solution cavities	3	6		pyrite nodules	4	0

		Thick	ness			Thick	kness
		Ft	in			Ft	in
132.	Sandstone, pale-yellow-brown, nonbed- ded, friable; 1-ft-2-in-thick siltstone at base; very fine-grained, calcareous,			151.	Sandstone, grayish-orange to light-gray, very fine to fine-grained, crossbedded,		
		8	0		thin-bedded, subangular to angular		
122	ferruginous cement	0	U		grains, abundant pyrite nodules up to		
133.	Shale, light-medium-gray, locally benton-				1/2 inch in diameter	5	10
	itic, carbonaceous, fossil roots,			152.	Shale, medium-gray, moderately bedded,		
	poorly bedded; 7 in of siltstone at base,				silty in the basal 5 ft, bentonitic in the		
	ferruginous cement	5	3		upper 3 ft 5 in	8	9
134.	Shale, light- to medium-gray, slightly			153	Shale, dark-gray to moderate-brown, car-	Ŭ	
	bentonitic, nonbedded	4	6	133.			
135	Sandstone, medium-gray to moderate-	•	•		bonaceous fossil plant fragments,		
133.	brown, very fine grained, calcareous,				slightly bentonitic, few dull coal lay-	_	
			10		ers	2	1
100	ferruginous cement		10	154.	Sandstone, medium-gray to yellow-		
136.	Shale, light-medium-gray, fossil roots,				orange, very fine to fine-grained, cal-		
	poorly bedded, slightly bentonitic	6	0		careous, pyrite nodules up to 1/8 inch in		
137.	Sandstone, grayish-orange, calcareous,				diameter	2	6
	fine-grained, thin-bedded, well-			155	Covered	25	Õ
	indurated, pyrite nodules up to ½ inch				Shale, light-gray, nonbedded, bentonitic	9	ŏ
	in diameter	2	4				v
138	Shale, light- to medium-gray, nonbedded,	-		137.	Sandstone, medium-light-gray, crossbed-		*
156.		0	0		ded, thin-bedded, fine-grained, sub-		
120	slightly bentonitic in upper 10 in	9	8		angular to subrounded, quartzose,		
139.	Limestone, light-greenish-gray, silty,				well-indurated, calcareous, few pyrite		
	weathers dark-yellowish-orange, thin-				nodules up to 1/8 inch in diameter	20	0
	bedded	5	8	158.	Shale, light-gray, poorly bedded to non-		
140.	Shale, light-medium-gray, slightly benton-				bedded, bentonitic; 8-in-thick light-		
	itic, basal 21/2 ft dark-gray, carbona-				gray sandstone $3\frac{1}{2}$ ft above base,		
	ceous, upper 4 ft silty	5	6		quartzose, fine-grained to very fine		
141	Sandstone, light- to medium-gray, very		Ū				
171.					grained, friable, subangular to sub-	0	•
	fine grained, calcareous, crossbedded,				rounded	8	0
	thin-bedded, pyrite nodules up to inch			159.	Shale, medium-light-gray, few coal lay-		
	in diameter; base friable; upper 2½ ft				ers, abundant fossil plant fragments,		
	well indurated	5	6		locally bentonitic	12	6
142.	Shale, light-medium-gray, moderately			160.	Sandstone, light-gray to medium-gray,		
	bedded, slightly bentonitic	4	2		crossbedded, thin-bedded, very fine to		
143.	Sandstone, grayish-orange, fine-grained,				fine-grained, subangular, moderately		
	subrounded-rounded, crossbedded, cal-						
	careous, quartzose, friable	4	0		quartzose, calcareous layers, indu-		
144		, 7	U		rated, few pyrite nodules, solution cav-	06	•
144.	Shale, light-medium-gray; 2½-ft-thick				ities	26	0
	carbonaceous shale 8½ ft above base,				Covered (probably shale)	17	0
	moderate- to light-brown, fissile, dull		_	162.	Siltstone, light-gray to medium-gray;		
	coal layers, slightly bentonitic	10	0		basal part irregularly bedded, calcare-		
145.	Sandstone, light-gray to grayish-orange				ous, indurated; upper part friable	9	0
	on weathered surface, fine- to very fine			163.	Sandstone, very light gray to white, very		
	grained, irregular lens-shaped beds,				fine grained, very thin bedded; irregu-		
	friable, crossbedded, pyrite nodules up				lar, friable; includes limestone lens up		
	to 1 inch in diameter; upper 5 in				to 1½ ft thick	23	6
	moderate-brown, well-indurated, cal-			164	Siltstone, grayish-orange, irregularly bed-		v
	careous	3	5	104.			8
146		3	5	165	ded, well-indurated, ferruginous		0
140.	Shale, light- to medium-gray, silty, thinly		•	165.	Shale, medium-gray to dark-gray, carbo-		
	laminated, bentonitic	8	0		naceous, fossil root and plant frag-		
147.	Coal, dull, impure, very deeply weath-				ments, carbonaceous, bright coaly lay-		
	ered, abundant fossil plant fragments				ers common; poorly developed		
	and roots, very dark gray to dark-				fissility	1	4
	brown		3	166.	Siltstone, grayish-orange, ferruginous		
148.	Shale, light-medium-gray, moderately				cement, irregularly bedded, well-		
	bedded, bentonitic, carbonaceous, fos-				indurated		3
	sil root prints	3	6	167	Shale, medium-gray to dark-gray, carbo-		5
140	Sandstone, grayish-orange to light-gray,	, 3	U	107.			
177,					naceous, fossil root and plant frag-		10
	very fine to fine-grained, crossbedded,			1/0	ments, carbonaceous		10
	thin-bedded, calcareous, solution cavi-			168.	Siltstone, brownish-gray, ferruginous		
	ties, pyrite nodules, friable at base,		_		cement, irregularly bedded, well-		
	indurated in upper 3½ ft	10	0		indurated		11
150.	Shale, light-gray, silty, poorly bedded,			169.	Shale, medium-gray, bentonitic, poorly		
	bentonitic	11	6		bedded	14	0

		Thickr	ness		Thickne	ss
		Ft	in		Ft	in
170.	Sandstone, medium-gray, calcareous, fine-grained, crossbedded, subangular,			187. Sandstone, grayish-orange to light-gray, fine- to medium-grained, friable, cal-		
171	pyrite nodules	3	6	careous, thin-bedded, ferruginous	7	_
1/1.	Shale, light-gray to white, slightly bentonitic, slightly carbonaceous	15	0	cement in basal 8 in188. Siltstone, light-gray, poorly bedded,		6
172.	Sandstone, medium-gray, fine-grained, moderately quartzose, subangular to			slightly bentonitic in upper part 189. Shale, light-gray to white, bentonitic,	3	3
173	rounded, pyrite nodulesShale, light-gray to medium-gray, poorly	35	0	evenly bedded; 4-in-thick limestone 1 ft 3 in above base; 2-in-thick limestone		
175.	bedded, slightly bentonitic, 3 ft above base carbonaceous with fossil plant			1 ft 9 in above base, overlain by a thin-bedded, 2-ft-4-in-thick, friable		
	fragments	11	0	sandstone	<u>11</u> _	0
174.	Sandstone, medium-gray, very fine to fine-grained, calcareous, thin-bedded,			Total measured thickness of main body of Mesaverde Formation		<u>5</u>
	well-indurated, pyrite nodules	2	6	White sandstone member:		
175.	Shale, medium-gray, carbonaceous, ben-			190. Sandstone, light-gray to white, fine-		
	tonitic, fossil roots	2	0	grained, crossbedded	50+	
	CoveredShale, medium-gray to dark-gray, very	5	6	Total measured thickness of Mesaverde Formation	 1.621	5
	carbonaceous, bentonitic; 3-in-thick			End of section	=	<u>5</u>
	zone of bright coal laminae 1 ft below	1.4	0			
178.	Shale, medium-light-gray, silty, thin-	14	0			
	bedded	5	4			
179.	Sandstone, medium-gray, calcareous, very fine to fine-grained, weathered			Measured section 20: Cody Shale through Inc	dian	
	pyrite nodules	1	6	Meadows Formation		
180.	Shale, medium-gray to white; basal 7 ft	_	-	Location: Eagle Point and Shotgun Butte Quadrangles,	Wyoming	(7.5
	bentonitic;8-in-thickcalcareousgrayish-			min) Start: SW-SW-NW sec. 17, T. 5 N., R. 1 E. Presented	from olde	st to
	orange siltstone; shale becomes carbo- naceous in the upper 7 ft; near the top is			youngest	mom orde	DE 10
	a 1-ft-thick, dark-gray, fissile, carbo-			End: SE-SE-SW, sec. 15, T. 5 N., R. 1 E.		
	naceous shale containing bright coal			Described by: R.C. Warlow and N.L. Hickling Strike 55°, Dip 23° NE.		
	laminations and a 5-in-thick bentonitic			•		
	layer, medium-gray to light-olive with			Upper Cretaceous:	Thickness	S
	fossil roots; at the top is a 6-in-thick,	22	0	Cody Shale:	Ft	in
181	highly carbonaceous shale, dark-gray - Sandstone, medium-gray, fine-grained,	23	0	Shale, light-brownish-gray, slightly silty, slightly bentonitic	30	0
101.	crossbedded to irregularly bedded,			2. Sandstone, light-brownish-gray, very fine	30	U
	subangular to subrounded, interbedded			to fine-grained, thick-bedded, dark and		
	with carbonaceous shale	19	0	light mineral grains, silty, very calcar-		
182.	Shale, light-gray to dark-gray to medium-			eous	2	8
	brown, bentonitic; upper 24 ft very carbonaceous, dark-gray with fusain			3. Shale, light-brownish-gray, silty, slightly calcareous	12	9
	layers and fossil plant fragments	39	0	4. Sandstone, light-brownish-gray, very fine	12	
183.	Sandstone, medium-gray, fine-grained,			to fine-grained, thin and evenly bed-		
	calcareous, thin-bedded, well-			ded, dark and light mineral grains,		_
	indurated, quartzose, subrounded to	10	٥	micaceous, very silty		5
184	rounded, pyrite nodules	12	0	5. Shale, light-brownish-gray, very silty, weathered	4	5
104.	bedded; ferruginous cemented siltstone			6. Sandstone, light-brownish-gray, very fine	•	,
	8 in thick 9 ft above base, and 3 in			grained, thin and irregularly bedded,		
	thick 14½ ft above base, bentonitic,			very silty		41/2
	slightly carbonaceous, few fossil plant	10	6	7. Shale, light-brownish-gray, very silty, weathered	13	6
185.	fragments Sandstone, medium-gray to grayish-	18	O	8. Sandstone, light-brownish-gray, very fine	13	U
	orange, fine- to medium-grained, cal-			grained, thin and irregularly bedded,		
	careous, thin-bedded to crossbedded,			low quartz content, dark and light min-		_
	solution cavities, few pyrite nodules,	1.7	,	eral grains, very calcareous	1	7
186	limonite concretions in upper part Shale, medium-gray, carbonaceous,	17	6	 Shale, light-brownish-gray, very silty, sandy, top gradational 	2	8
100.	slightly bentonitic, nonbedded, fossil			10. Sandstone, light-brownish-gray, very fine	_	J
	plant fragments	3	9	grained, thin and irregularly bedded,		

		Thick	ness			Thick	ness
		Ft	in			Ft	in
	low quartz content, few dark and light mineral grains, slightly calcareous	1	8	29.	Shale, medium-grayish-brown, very carbonaceous, silty, gypsum crystals, fos-		
	Shale, light-brownish-gray, very silty, sandy	4	0	30.	sil plant fragments	1	5
12.	Sandstone, light-brownish-gray, very fine to fine-grained, thick-bedded, abundant dark and light mineral grains,	1	5	31.	abundant gypsum crystals Siltstone, light-brownish-gray, thin and irregularly bedded, fossil plant frag-	2	1
13.	micaceous, very calcareous	1	3	32.	ments, weathered	2	3
14.	bedded, crossbedded, resistant ledges up to 9 in thick, weathered	21	9	33.	finely micaceous, very calcareous Sandstone, medium-brownish-gray, very	1	3
	ered	21	9		fine grained, thin and irregularly bed- ded, very calcareous in top 1 ft	4	0
15.	Sandstones, light-gray, very fine to fine- grained, thin- to thick-bedded, dark and light mineral grains		<u>11</u>		Siltstone, light-gray, lens-shaped, sandy- Sandstone, medium-light-gray, very fine grained, thin- to thick-bedded, silty,	1	2
	Total measured thickness of Cody Shale	119	11	26	mica flakes, very calcareous	2	10
Mesay	verde Formation:		=	30.	Underclay, dark-brownish-gray, abundant carbonaceous fragments, gypsum crys-		
16.	Shale, medium-gray, very silty, slightly carbonaceous	2	0	37.	tals, top contact gradational	3	0
17.	Sandstone, light-gray, very fine grained, thin to thick and irregularly bedded, dark and light mineral grains, scattered carbonaceous matter	5	0	38.	sum crystals, carbonaceousSandstone, light-gray, very fine grained,	2	8
18.	Sandstone, light-gray, fine-grained, thick- bedded to massive, dark and light min- eral grains, solution cavities, pyrite	3	U		thin- to thick-bedded, ripple-bedded in top 6 in; dark and light mineral grains, fossil plant fragments, pyrite nodules up to ½ inch in diameter, very calcar-	5	0
	nodules up to ½ inch in diameter, light-gray shale lenses up to 1 ft thick, thin-bedded and calcareous in top 5 in,	105	•	39.	eous	5	8
19.	coarse-grained in upper 30 ftShale, medium-gray, silty, sandy, weath-	135	0	40.	mentsSandstone, light-gray, very fine grained,	1	2
20.	ered	8	9	41	thin and irregularly bedded, dark and light mineral grains		4
	sive, dark and light mineral grains, abundant pyrite nodules up to ½ inch in diameter	4	4		Shale, medium-brownish-gray, poor fis- sility, silty, scattered fossil plant frag- ments	1	1
21.	Sandstone, light-gray, very fine grained, thin and irregularly bedded, dark and light mineral grains, very friable	4	0		Shale, medium-dark-gray, nonfissile, slightly carbonaceous, scattered fossil plant fragments		9
22.	Siltstone, light-brownish-gray to medium- gray, thin and irregularly bedded, sandy	6	0		abundant fossil plant fragments, gyp- sum crystals		3
23.	Sandstone, medium-gray, very fine	Ū	Ū		Siltstone, light-olive-gray, abundant fos- sil plant fragments		4
24.	grained, thin and irregularly bedded, sandy	6	0		Shale, dark-brownish-gray, fair fissility, abundant fossil plant fragments Sandstone, very light gray, very fine		10
	bonaceous, silty, poor fissility, scat- tered fossil plant fragments	2	4		grained, thin-bedded, siltySandstone, very light gray, very fine	1	1
	Underclay, dark-grayish-brown, abundant fossil plant fragments	2	4		grained, thin-bedded, very silty, carbo- naceous		10
26.	Shale, dark-brownish-gray, carbon-aceous, very fissile, abundant fossil plant fragments	1	5	48.	Sandstone, light-gray, very fine grained, thin-bedded to nonbedded, siltstone interbeds, very carbonaceous; scattered		
	Underclay, dark-brown, abundant fossil root prints	•	3		coal lenses up to ¼ in thick, abundant fossil plant fragments		6
	e of Maverick Spring coal zone			49.	Underclay, dark-brownish-gray, abundant		
28.	Coal, very finely cleated, mostly bright,				coal fragments and lenses up to 1/8 in		
	weathered, scattered sulfur stains, gyp- sum crystals	1	3		thick, abundant gypsum crystals and fossil plant fragments		4

		Thick	ness			Thick	ness
		Ft	in			Ft	in
50.	Coal, bright to dull, weathered, impure -		2		bedded at top, pyrite nodules, iron-		
	Underclay, dark-brownish-gray, very car-				stained	4	6
	bonaceous, coal lenses up to 1/8 in			77.	Shale, medium-gray, weathered	2	2
	thick, scattered fossil plant fragments-		5	78.	Sandstone, light-gray, very fine grained,		
52.	Sandstone, light-gray, very fine to fine-				thin and irregularly bedded, silty, dark		
	grained, thick-bedded to massive, dark				and light mineral grains	1	10
	and light mineral grains, pyrite nodules			79.	Shale, medium-dark-gray, abundant fossil		
	up to 1/4 inch in diameter, calcareous -	4	11		plant fragments, scattered siltstone		
53.	Shale, medium-brownish-gray, silty,				lenses up to 2 in thick, carbonaceous,	•	0
<i>5</i> 4	sandy, weathered		4	00	weathered	3	0
54.	Sandstone, light-gray, very fine grained,		4	80.	Sandstone, light-gray, very fine grained,		
55	thin and irregularly bedded, very silty-		4		thin and irregularly bedded, very silty,	2	2
33.	Siltstone, light-olive-gray, sandy, fossil		11	01	slightly calcareous, iron-stained	3	2
56	plant fragmentsShale, medium-brownish-gray, poor fis-		11	01.	Shale, medium-light-gray, gypsum crystals, weathered	1	0
50.	sility, carbonaceous, scattered fossil			82	Siltstone, light-gray, thin and irregularly	1	U
	plant fragments, abundant gypsum			02.	bedded, iron-stained		10
	crystals	1	1	83.	Shale, light-olive-gray, weathered		7
57.	Underclay, medium-gray, silty, sandy,	•	•		Sandstone, light-gray, very fine grained,		•
٥,,	finely micaceous, scattered fossil plant			0	thin- to thick-bedded, silty, pyrite nod-		
	fragments and roots	1	2		ules up to 1/4 inch in diameter, unit is		
58.	Coal, impure, weathered, abundant shale	_			lens-shaped	1	2
	lenses up to 1/8 in thick		6	85.	Shale, medium-gray, slightly carbona-		
59.	Shale, gray, carbonaceous		4		ceous, weathered	3	1
	Siltstone, light-olive-gray, sandy		8	86.	Sandstone, medium-gray, very fine		
61.	Sandstone, light-gray, fine-grained, thick-				grained, thin-bedded, silty, abundant		
	bedded to massive, dark and light min-				carbonaceous fragments		5
	eral grains, pyrite nodules up to 1 inch			87.	Shale, medium-gray, poor fissility, very		
	in diameter, solution cavities up to 6				silty, scattered fossil plant fragments,		
	inches in diameter, very calcareous	8	0		grades carbonaceous upward	. 1	0
62.	Siltstone, light-olive-gray, sandy, weath-			88.	Underclay, medium-brownish-gray, silty,		
	ered	1	3		abundant fossil roots, scattered coal		
63.	Shale, light-olive-gray, poor fissility,				fragments		7
	scattered fossil plant fragments,	_		89.	Coal, mostly dull, medium cleats, abun-		_
	slightly carbonaceous	2	1	00	dant sulfur stains		5
04.	Sandstone, light-gray, very fine grained,			90.	Tonstein, light-pinkish-gray, abundant		1/2
	thick-bedded, abundant dark and light	1	7	01	flattened volcanic ash particles		1/2
65	mineral grains, micaceous Shale, medium-gray, gypsum crystals,	1	7	91.	Coal, mostly dull, medium cleats, abundant sulfur stains and gypsum crystals-		51/2
05.	slightly carbonaceous		8	92	Underclay, dark-brownish-gray, very		312
66	Coal, bright to dull, finely cleated, gyp-		U	72.	silty, scattered fossil roots, scattered		
٠٠.	sum crystals, weathered		9		fossil plant fragments	2	1
67.	Shale, dark-brownish-gray, fair fissility,		-	93.	Coal, weathered		1
	gypsum crystals, carbonaceous	1	4		Shale, medium-gray, weathered		3
68.	Shale, medium-dark-gray, poor fissility,				Sandstone, light-gray, very fine to fine-		
	scattered fossil plant fragments	1	9		grained, thin- to thick-bedded, silty,		
69.	Sandstone, light-gray, very fine grained,				abundant dark mineral grains	5	8
	finely micaceous, silty		10	96.	Shale, medium-brownish-gray, poor fis-		
70.	Shale, light-brownish-gray, slightly car-				sility, abundant fossil plant fragments,		
	bonaceous, weathered	3	0		carbonaceous	1	3
71.	Underclay, light-brownish-gray, scattered			97.	Underclay, dark-brownish-gray, very		
	fossil plant fragments, silty		7		silty, abundant coal and fossil plant		_
72.	Shale, dark-brownish-gray, abundant fos-			00	fragments, very carbonaceous		5
	sil plant fragments, gypsum crystals,		•	98.	Coal, bright to dull, finely cleated, gyp-		
72	very carbonaceous		3	00	sum crystals		4
13.	Coal, mostly dull, impure, abundant gyp-		o	99.	Shale, dark-brownish-gray, abundant coal		6
74	Shale medium-brownish-gray fair fissil-		8	100	fragments, very carbonaceous Coal, dull, very impure		6 8
/+.	Shale, medium-brownish-gray, fair fissility, silty, abundant fossil plant frag-				Coal, bright to dull, finely cleated		6
	ments, carbonaceous		9		Shale, medium-brown-gray, slightly car-		U
75	Shale, medium-gray, fissile, slightly car-		,	102.	bonaceous, scattered plant fragments,		
, 5.	bonaceous, weathered	4	0		top gradational	2	3
76.	Sandstone, light-gray, very fine grained,	•	•	103.	Sandstone, very fine grained, very silty,	_	-
	thin and irregularly bedded, ripple-				thin and irregularly bedded	1	10
	••				•		

	Thickness			Thick	kness
104 01 1 11 1 1	Ft in			Ft	in
104. Shale, light-olive-gray, very silty, weath ered, poorly fissile			ral grains, pyrite nodules 1/4 inch in size	4	3
105. Siltstone, light-brownish-gray, weath ered, sandy, scattered fossil plant frag	1-	132.	Sandstone, light-gray, very fine grained,		
ments, thin-bedded			thin and irregularly bedded, very silty	6	10
106. Shale, medium-gray, very weathered	11		Shale, medium-gray, weathered	2	5
107. Sandstone, light-gray, very fine grained		134.	Underclay, dark-brownish-gray, carbo- naceous, thin tonstein laminations		4
very silty, lens-shaped		135.	Coal, bright to dull, weathered, gypsum		•
108. Underclay, dark-brownish-gray, very carbonaceous, scattered coal fragments			crystals		5
109. Coal, dull, impure, weathered		136.	Shale, medium-brownish-gray, carbona-		
110. Shale, light-olive-gray, carbonaceous			ceous, abundant coal fragments, top		_
fissile, scattered fossil plant material			gradational	1	2
111. Siltstone, light-gray, thin and irregular		137.	Sandstone, very fine to fine-grained, thin-		
bedded, sandy			to thick-bedded, calcareous, abundant dark to light mineral grains, pyrite		
112. Sandstone, light-gray, very fine grained weathered			nodules up to 1 inch in diameter, solu-		
113. Underclay, medium-olive-gray, scattere	-		tion cavities	7	0
fossil roots and plant fragments, silty		138.	Shale, medium-gray, weathered, slightly		
hard	4		carbonaceous	2	11
114. Coal, dull, impure	21/2	139.	Siltstone, light-medium-gray, thin and	. 1	2
Top of Maverick Spring coal zone		140	irregularly bedded Shale, medium-gray, weathered	1 1	3 0
115. Underclay, light-olive-gray, abundar		141.	Shale, light-pinkish-gray, carbonaceous,	•	Ů
carbonaceous fossil plant fragments abundant coal lenses, silty			abundant fossil plant fragments	1	3
116. Shale, dark-gray to black, carbonaceous		142.	Shale, medium-dark-gray, very silty, car-		
weathered	·- 1		bonaceous, scattered fossil plant frag-		•
117. Underclay, medium-gray, fossil plan		1.42	ments	1	3
material, top gradational		143.	Shale, medium-gray, slightly carbona- ceous, highly weathered, scattered fossil		
118. Sandstone, light-gray, fine- to medium grained, thick-bedded to massive, solu			plants	7	0
tion cavities, dark and light miner		144.	Shale, medium-dark-gray, carbonaceous,		
grains, crossbedded			weathered, silty toward top	4	9
119. Siltstone, medium-gray, weathered, gra		145.	Sandstone, light-gray, very fine grained,		
mineral grains			thin-bedded, crossbedded, dark and light mineral grains, pyrite nodules up		
120. Shale, medium-gray to dark-brownish			to 1/4 inch in diameter		11
gray, carbonaceous, abundant foss plant material, weathered		146.	Shale, medium-gray, highly weathered	7	6
121. Shale, dark-brownish-gray, very carbon		147.	Shale, dark-brownish-gray, very carbo-		
aceous, abundant gray minerals, foss			naceous, abundant coal fragments		5
plant fragments; 2-in-thick silty zone		148.	Sandstone, light-gray, very fine to fine-		
in above base			grained, thin and irregularly bedded, abundant dark and light mineral grains,		
122. Coal, bright to dull, weathered 123. Tonstein, light-pinkish-gray, scattere			scattered carbonaceous material, lens-		
volcanic ash fragments			shaped	3	9
124. Coal, bright to dull, weathered, finel			Shale, medium-gray, weathered		8
cleated	_	150.	Sandstone, light-gray, very fine grained,	2	^
125. Tonstein, light-pinkish-gray, scattere		151	thin and irregularly bedded, silty	3	0 7
carbonaceous fragments 126. Shale, brownish-gray, abundant coa			Shale, medium-gray, weatheredSandstone, light-gray, very fine to fine-	3	,
lenses up to 1/4 in thick		152.	grained, thin- to thick-bedded, dark		
127. Coal, bright to dull, weathered, medium			and light minerals, iron-stained	7	3
cleats, abundant sulfur stains and gra		153.	Siltstone, medium-gray, weathered,	•	
minerals		154	sandySandstone, light-gray, very fine grained,	8	6
128. Shale, dark-brownish-gray, very carbor aceous, fissile, abundant coal frag		134.	thin- to thick-bedded, scattered fossil		
ments	9		plant fragments	2	10
129. Sandstone, light-gray, very fine to fine		155.	Shale, medium-gray, weathered	1	0
grained, silty, thin and irregularly bed	l-		Coal, bright to dull, highly weathered,		
ded		4	impure		7
130. Shale, medium-dark-gray, carbonaceous		157.	Sandstone, light-gray, very fine to fine-		
scattered fossil plant fragments 131. Sandstone, light-gray, very fine grained			grained, thick-bedded to massive, dark and light minerals, solution cavities	2	8
crossbedded, silty, light and dark mir		158.	Shale, medium-gray, weathered	1	10
			y •••		

		Thick	ness			Thick	ness
		Ft	in			Ft	in
159.	Underclay, medium-brownish-gray, car-			183.	Shale, medium-gray, slightly carbona-		
	bonaceous, fossil root prints		2		ceous, slightly bentonitic, weathered -	1	2
160.	Coal, bright to dull, medium cleats,			184.	Sandstone, light-gray, very fine grained,		
	impure, weathered, scattered shale		4		thin- to thick-bedded, dark and light		
161	lenses up to ½ in thickSiltstone, light-gray, weathered	2	6 7		minerals, silty	6	0
	Sandstone, medium-light-gray, very fine	2	,	185.	Shale, medium-dark-gray, carbonaceous,		
	to fine-grained, thin to thick and irreg-				scattered fossil plant fragments, weath-	2	^
	ularly bedded, noncalcareous, iron-			106	ered	3	0
	stained, pyrite nodules up to 1/4 in			180.	Sandstone, light- to medium-gray, very fine grained, very silty, nonresistant		5
	thick, solution cavities	4	0	187	Shale, light-brownish-gray, slightly car-		3
	Shale, medium-gray, weathered	1	6	107.	bonaceous, weathered	6	6
164.	Sandstone, light-gray, fine to medium-			188.	Sandstone, light-gray, very fine grained,	•	
	grained, dark and light mineral grains,	2	10		thin- to thick-bedded, iron-stained	5	0
165	crossbedded, calcareous Shale, medium-gray, weathered	2 1	10 6	189.	Shale, light-olive-gray, weathered	1	4
	Sandstone, light-gray, fine-grained, thin-	1	U	190.	Siltstone, light-gray, weathered, iron-		
100.	to thick-bedded, dark and light miner-				stained, nonresistant, scattered fossil		
	als, resistant, lens-shaped	3	3		plants		9
167.	Sandstone, light-gray, fine-grained, thin				Shale, medium-gray	1	1
	and irregularly bedded, dark and light			192.	Sandstone, very light gray, very fine		
	minerals, very calcareous	15	0	102	grained, weathered, nonresistant		11
	Siltstone, light-gray, sandy, weathered	3	0		Shale, medium-gray, weathered		11
169.	Sandstone, medium-light-gray, thin- to			194.	Sandstone, light-gray, very fine grained, very silty, weathered, nonresistant		5
	thick-bedded, dark and light minerals,	25	^	105	Shale, medium-gray, weathered	1	2
170	very calcareous	25	0		Sandstone, very fine to fine-grained, thin	1	2
170.	Sandstone, light-gray, very fine to fine- grained, thin- to thick-bedded, abun-			170.	and irregularly bedded, dark and light		
	dant dark and light minerals, abundant				mineral grains, nonresistant		6
	pyrite nodules up to 1 in thick, solution			197.	Siltstone, light-gray, sandy, nonresistant-		9
	cavities, calcareous	22	0	198.	Underclay, dark-brownish-gray, very car-		
171.	Shale, light-olive-gray, weathered	. 7	0		bonaceous, weathered, scattered fossil		
172.	Sandstone, light-gray, very fine grained,				plant material		5
	thin and irregularly bedded, silty, few				Coal, bright to dull, highly weathered	1	0
	pyrite nodules up to 1/4 in thick, iron-			200.	Shale, medium-gray, weathered, slightly	_	_
172	stained, lens-shaped	2	4	201	bentonitic	5	6
1/3.	Shale, medium-gray, very silty, bentonitic, weathered, top gradational	21	0	201.	Sandstone, light-gray, very fine to fine- grained, thick- to thin-bedded, dark		
174	Sandstone, light-gray, very fine grained,	21	U		and light minerals, iron-stained, pyrite		
174.	thin- to thick-bedded, scattered pyrite				nodules up to ½ inch in diameter	20	0
	nodules up to 1/4 inch in diameter,			202.	Sandstone, light-gray, very fine grained,		
	iron-stained, finely micaceous, calcar-				silty, very calcareous, abundant carbo-		
	eous	14	0		naceous fragments, iron-stained	1	9
	Shale, light-olive-gray, weathered	13	0	203.	Shale, light-olive-gray, poor fissility,	_	
176.	Sandstone, light-gray, weathered, nonre-			204	scattered carbonaceous fragments	2	1
177	sistant	2	0	204.	Sandstone, light-gray, fine-grained, thin- to thick-bedded, abundant dark and		
	Shale, medium-gray, weatheredSandstone, light-gray, very fine to fine-	3	6		light mineral grains, pyrite nodules up		
170.	grained, thin- to thick-bedded, resist-				to 1/4 inch in diameter	3	8
	ant, very calcareous, iron-stained, few			205.	Shale, light-olive-gray to medium-gray,	-	ŭ
	solution cavities	5	0		slightly carbonaceous, slightly bentoni-		
179.	Limestone, medium-light-gray, very				tic, poor fissility, scattered fossil plant		
	finely crystalline, conchoidal fracture,				fragments	5	6
	slightly iron stained, brittle	2	1	206.	Sandstone, light-gray, very fine grained,		
180.	Sandstone, light-gray, very fine grained,				thin- to thick-bedded, silty, nonresis-	_	_
	thin and irregularly bedded, dark and			207	tant	3	0
	light minerals, iron-stained, calcare-		0	207.	Underclay, light-gray, very silty, abundant fossil plant fragments, hard	2	1
181	ous, lens-shapedShale, medium-gray, silty, contains 6-in-		8	208	dant fossil plant fragments, hard Sandstone, light-gray, very fine grained,	3	1
101.	thick siltstone lens 2 ft above base,			200.	thin and irregularly bedded, silty, iron-		
	weathered	7	0		stained; 1-ft-thick medium-gray shale		
182.	Sandstone, very fine grained, thin and				lens 2 in above base	7	6
	irregularly bedded, finely micaeous,			209.	Shale, medium-gray, scattered fossil plant		
	nonresistant	1	3		material, weathered	1	0

		Thick	ness			Thick	ness
		Ft	in			Ft	in
210.	Sandstone, light-gray, thin and irregularly bedded, very silty		41/2	234.	Sandstone, medium-light-gray, very fine to fine-grained, thin- to thick-bedded,		
211.	Shale, medium-gray, weathered, poor fis-sility		5	235.	dark and light minerals, silty Shale, medium-gray, bentonitic, weath-	1	0
212	•		3		ered	3	6
212.	Sandstone, medium-light-gray, very fine grained, thin to thick and irregularly			236.	Sandstone, medium-gray, very fine grained, dark and light minerals,		
213.	beddedShale, medium-dark-gray, highly weath-	2	0		weathered		6
	ered, scattered carbonaceous frag-	1	10	237.	Shale, medium-light-gray, bentonitic, fossil plant fragments	3	10
214.	Sandstone, medium-light-gray, very fine	•	10	238.	Siltstone, medium-light-gray, very calcareous, iron-stained		1
	to fine-grained, thin- to thick-bedded, few dark and light minerals, lens-			239.	Shale, medium-gray, weathered		3
	shaped, pyrite nodules up to 1/4 inch in				Siltstone, medium-gray, weathered		1
	diameter	1	6	241.	Shale, medium-gray, weathered		21/2
215	Shale, medium-gray, highly weathered	3	0	242.	Siltstone, medium-gray, weathered		1
	Siltstone, light-gray, thin and irregularly	3	U		Shale, medium-gray, carbonaceous frag- ments	1	1
	bedded, sandy, iron-stained, contains			244.	Sandstone, very fine grained, thick-	_	_
	1½-in-thick shale lens 6½ in above	_		2	bedded, dark and light minerals, silty-	2	0
	base	2	11	245	Shale, medium-gray, weathered	5	6
217.	Shale, medium-gray, silty, poor fissility,				Sandstone, medium-light-gray, very fine		
	weathered, scattered fossil plant frag-		•	2.50	grained, dark and light minerals, silty,		
	ments, top gradational	1	0		finely micaceous	1	0
218.	Sandstone, medium-light-gray, very fine grained, thin and irregularly bedded,			247.	Shale, medium-gray, slightly carbona-	7	0
	very silty, finely micaceous, iron-			249	ceous, bentonitic Shale, dark-grayish-brown, very carbo-	,	U
	stained, scattered fossil plant leaves	1	9	240.			
219.	Shale, light-olive-gray- to medium-dark-				naceous, abundant fossil plant frag-		5
	gray, weathered, scattered fossil plant			240	ments, scattered coal fragments		3
	fragments	1	2	249.	Shale, medium-gray to light-olive-gray, bentonitic, weathered	3	0
220.	Siltstone, medium-gray, iron-stained, cal- careous		8	250.	Sandstone, medium-light-gray, very fine	3	U
221	Sandstone, medium-light-gray, very fine		v		grained, thin and irregularly bedded,	_	•
221.	grained, thin and irregularly bedded,				very silty	1	3
	very silty		11		Shale, medium-gray, weathered	1	4
222	Shale, medium-dark-gray, weathered,		••		Siltstone, medium-gray, weathered	1	0
	scattered fossil plant fragments		2	253.	Shale, medium-dark-gray, slightly carbo-		
223.	Underclay, medium-brownish-gray, very		_		naceous, slightly bentonitic, weathered, top gradational	1	7
	carbonaceous, coal fragments and scat-			254	Sandstone, light-gray, very fine to fine-	-	•
	tered fossil plant fragments		3	254.	grained, thin- to thick-bedded, cross-		
224.	Shale, light-olive-gray, weathered	7	0		bedded, solution cavities, pyrite nod-		
225.	Sandstone, light-gray, very fine to fine-				ules up to to ½ inch in diameter	1	7
	grained, dark and light minerals, thin			255	Shale, medium-dark-gray, weathered	1	i
	and irregularly bedded, very silty, scat-				Sandstone, medium-light-gray, very fine	-	_
	tered carbonaceous fragments, iron-				grained, thin and irregularly bedded,		
	stained	6	6		dark and light minerals, very silty,		
226.	Shale, light-olive-gray to medium-gray,	_	0		finely micaceous		10
227	very silty, highly weathered	5	0	257.	Shale, dark-brownish-gray, carbona-		
221.	Sandstone, light-medium-gray, very fine				ceous, scattered fossil plant fragments,		
	grained, thin to thick and irregularly				grades upward to light-olive-gray	2	3
	bedded, dark and light minerals, very	1.1	0	258.	Sandstone, light-gray, very fine to fine-		
220	Chala modium light arous highly worth	11	0		grained, thin and irregularly bedded,		
228.	Shale, medium-light-gray, highly weath-		0		nonresistant	1	3
220	ered		8		Shale, medium-light-gray, weathered		4
	Coal, highly weathered		2+	260.	Sandstone, medium-light-gray, very fine		
230.	Sandstone, medium-light-gray, very fine grained, thin and irregularly bedded,				to fine-grained, crossbedded, abundant dark and light mineral grains, silty,		
	very silty, iron stains, nonresistant	3	6		calcareous, iron-stained	3	10
231	Shale, medium-gray, weathered		11	261	Shale, medium-gray, weathered	2	0
	Sandstone, medium-gray, very fine		-		Sandstone, medium-light-gray, very fine	~	•
	grained, nonresistant	3	6	202.	grained, thin to thick and irregularly		
233	Shale, light-olive-gray, highly weathered-	-	7		bedded, crossbedded, silty	18	0
	, 5						

263. Shale, medium-gray, silty, weathered 2 0 0 264. Sandstone, very fine to fine-grained, thin to thick-bedded, silty, southor cavities, pyrite nodules up to ½ in thick, irregular base fills channel into under lying units— 265. Shale, medium-gray, weathered 6 0 266. Silktone, medium-gray, weathered 6 0 267. Shale, medium-gray, weathered 6 0 268. Shale, dark-grayish-throw, very carbonaceous, scattered fossil plant fragments— 276. Shale, medium-gray, weathered 5 0 276. Shale, medium-gray, weathered 5 0 276. Shale, medium-gray, weathered 5 0 277. Shale, medium-gray, weathered 5 0 278. Shale, medium-gray, weathered 6 10 0 279. Shale, medium-gray, weathered 6 279. Shale, medium-gray, very fine to fine-grained, thin to thick and irregularly bedded, very silty weathered 6 279. Shale, medium-gray, weathered 6 279. Shale, medium-gray, weathered 6 279. Shale, medium-gray, very fine grained, thin to microparianed, thin bedded to massive, dark and light mineral grains, solution cavities, pyrite nodules up to 1 in thick 9 10 10 10 10 10 10 10 10 10 10 10 10 10			Thick	ness			Thick	cness
26. Shale, medium-gray, weathered 6. Shale, medium-gray, slightly bentonitic 6. Shale, medium-gray, slightly carbonaceous, abundant fossil plant fragments 6. Shale, medium-gray, slightly carbonaceous, abundant fossil plant fragments 6. Shale, medium-gray to light-olive-gray to light-olive-gray to light-olive-gray, to light-olive-gray, slightly bentonitic 6. Shale, medium-gray, weathered 6. Shale, medium-gray, weathered 6. Shale, medium-gray, slightly carbonaceous, abundant soft gray were fine grained, thin to thick and irregularly bedded, crossbedded, dark and light mineral grains 6. Shale, medium-gray, weathered 6. Shale, medium-gray to light-olive-gray to light-olive-gray, very fine grained, thin diameter 6. Shale, medium-gray, weat			Ft	in			Ft	in
ties. pyrite nodules up to ½ in thick, irregular base fills channel into underlying units————————————————————————————————————	263.	Shale, medium-gray, silty, weathered	2	0	289.	Shale, medium-brownish-gray, weath-		
ties, pyrite nodules up to ½ in thick, irregular base fills channel into underlying units————————————————————————————————————	264.							
irregular base fills channel into underlying units — 13 0 bedded, lens-shaped, irregularly base 6 6 6 0 5 Shale, medium-gray, weathered — 5 0 292. Shale, medium-gray, weathered — 5 0 293. Sandstone, medium-gray, very fine on fine-grained, thin to thick and irregularly bedded, class-shaped, irregularly set of fine-grained, thin to thick and irregularly ments, scattered actonoaceous materials, scattered actonoaceous, scattered fossil plant fragments — 5 0 270. Sandstone, medium-gray, weathered — 5 0 270. Sandstone, medium-light-gray, weathered — 5 0 270. Sandstone, medium-light-gray, weathered — 5 0 270. Sandstone, medium-light-gray, weathered — 5 0 270. Sandstone, medium-gray, weathered — 7 272. Coal, highly weathered — 8 273. Shale, medium-gray, weathered — 8 274. Sandstone, light-gray, very fine to fine-grained, thin-bedded of, silty, nomersist and thick hedded, dist, and light mineral grains — 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		•					7	0
Siste of the medium-gray, weathered					291.			
265. Shale, medium-gray, weathered 6 6 3 5 6 6 6 8. Shale, medium-gray, weathered 5 0 7 8 5 8 5 8 5 8 5 8 5 8 5 8 5 8 5 8 5 8			12	0				
266. Siltstone, medium-gray, sandy, iron-statisted————————————————————————————————————	265	• •					6	6
stained staine			6	U	292			
268. Shale, medium-gray, weathered 6 3 crossbedded, dark and light mineral grains, shale lenses up to 4 in thick, beaded, shale, medium-gray, weathered 5 0 Shale, medium-gray,	200.		1	0		- ·		Ū
cossbedded, dark and light mineral regularly bedded, prospected for the firegrained, thin of thick and irregularly bedded, crossbedded to massive, dark and light mineral grains, salter leaves up to 4 in thick, few pyrite nodules up to 4 in thick pyrite nodules up to 4 in thick and irregularly bedded, are and light mineral grains, salt up to 4 in thick pyrite nodules up to 4	267							
maceous, scattered fossil plant frag- ments, scattered cabonaceous mate- rial			O	3				
ments, scattered carbonaceous material ————————————————————————————————————	200.							
Sale							_	
270. Sandstone, medium-light-gray, very fine of fine-grained, thin to thick and irregularly bedded, crossbedded, dark and light minerals, very calcareous, finely mineral mi				8	-0.4		7	6
270. Sandstone, medium-light-gray, very fine to fine-grained, thin to thick and irregularly bedded, crossbedded, dark and light minerals, very calcareous, finely middle dark fossil plant fragments and the bedded, silty, nomesistant, prite nodules up to 1 inch in diameter fossil most plant fragments abundant sosil plant fragments fossil plant	269.		5		294.	Shale, medium-gray to light-olive-gray,	0	•
to fine-grained, thin to thick and irregularly bedded, crossbedded, dark and light minerals, very calcareous, finely micaceous-might gray, weathered, abundant fossil plant fragments — 272. Coal, mostly bright————————————————————————————————————				•	205	Undersley medium brownish gray silty	8	0
ularly bedded, crossbedded, dark and light minerals, very calcareous, finely micaceous medium-light-gray, weathered abundant fossil plant fragments ant, pyrite nodules up to 1 inch in diameter fossil medium-gray, weathered and light mineral grains, solution cavities, pyrite nodules up to 1 inch in diameter fossil medium-gray, weathered and in thick and light mineral grains, solution cavities, pyrite nodules up to 1 inch in diameter fossil plant fragments abundant salfur grains abundant salfur gray, very fine grained, thinch chied and irregularly bedded, crossbedded, salfur hand irregularly bedded, crossbedded, salfur many salfur fragments abundant salfur salins fragments fragments abundant salfur salins fragments fragments abundant salfur salins fragments fragmen					293.			
light minerals, very calcareous, finely micaceous								9
micaceous micace		light minerals, very calcareous, finely			296.			
Abundant fossil plant fragments — 7 298. Underclay, dark-brownish-gray, very fine grained, thick-bedded, silty, nonresistant— 10 10 277. Shale, medium-gray, weathered— 10 10 6 278. Sandstone, light-gray, very fine grained, thick-bedded, silty househered— 10 10 6 277. Shale, medium-gray is lightly bentonitic, highly weathered— 10 10 6 277. Shale, medium-light-gray, very fine grained, thick-bedded, dark and light mineral grains— 10 10 6 287. Shale, medium-light-gray, very fine grained, thin diameter— 10 10 10 10 10 10 10 10 10 10 10 10 10			10	0				_
273. Shale, medium-gray, very fine to fine-grained, thick-bedded, silty, nonresistant-erd-medium-light-gray, very fine to fine-grained, thick-bedded, silty, nonresistant-erd-medium-light-gray, very fine to fine-grained, thick-bedded, silty, nonresistant-erd-medium-gray, slightly bentonitic, highly weathered-medium-gray, slightly weathered-medium-gray, bight-gray, very fine to fine-grained, thin-bedded to massive, dark and light mineral grains, solution cavities, pyrite nodules up to 16 inch in diameter-medium-gray, weathered-medium-gray, weather	271.			_			1	10
274. Sandstone, light-gray, very fine to fine-grained, thick-bedded, silty, nonresistant, pryite nodules up to ½ inch in diameter					298.	Underclay, dark-brownish-gray, very		
274. Sandstone, light-gray, very fine to fine- grained, thick-bedded, silty, nonresistant ant, pyrite nodules up to Vs inch in diameter 275. Shale, medium-gray, slightly bentonitic, highly weathered 276. Siltstone, highly weathered 2777. Shale, medium-gray to light-olive-gray, highly weathered 2778. Sandstone, light-gray, very fine grained, thick-bedded, dark and light mineral grains 2789. Shale, medium-light-gray, very fine grained, thick-bedded, dark and light mineral grains 279. Shale, medium-gray, slightly weathered 279. Shale, medium-light-gray, very fine to fine-grained, thin-bedded to massive, dark and light mineral grains, solution cavities, pyrite nodules up to 1 inch in diameter 280. Sandstone, very fine grained, thin to thick and irregularly bedded, very silty 281. Shale, medium-gray, slightly carbona- ceous, grades to light-olive-gray in top 1 ft 282. Sandstone, light-gray, very fine grained, thin and irregularly bedded, very silty 283. Shale, medium-gray, weathered 284. Sandstone, very fine grained, thin to thick and irregularly bedded, very silty 284. Sandstone, light-gray, very fine grained, thin and irregularly bedded, very silty 285. Shale, medium-gray, slightly carbona- ceous, grades to light-olive-gray in top 1 ft 286. Sandstone, light-gray, very fine grained, thin and irregularly bedded, very silty 287. Shale, medium-gray, weathered 288. Shale, medium-gray, weathered 289. Shale, medium-light-gray, very fine grained, thin and light mineral grains, very silty, some iron staining 288. Sandstone, light-gray, very fine grained, thin and irregularly bedded, very silty, some iron staining 289. Shale, light-olive-gray, weathered 299. Shale, medium-dark-gray, very fine grained, thin, non- results stains 293. Shale, medium-dark-gray, verbona- ceous, graded, dark and light mineral grains, very silty, some iron staining 294. Underclay, medium-gray, very fine grained, thin and irregularly bedded, very silty, some iron staining 295. Shale, light-olive-gray, wery silty, hard, abundant scattered coal frag-								
grained, thick-bedded, silty, nonresistant, pyrite nodules up to \(\) sinch in diameter \(\) 1 9 301. Shale, medium-light-gray, very fine grained, silty, nonresistant \(\) 2 11 275. Shale, medium-gray, slightly bentonitic, highly weathered \(\) 1 276. Siltstone, highly weathered \(\) 1 303. Shale, medium-gray, weathered \(\) 1 303. Shale, medium-gray, weathered \(\) 1 303. Shale, medium-gray, weathered \(\) 1 0 6 5 5 8 3 andstone, light-gray, very fine grained, thinck-bedded, dark and light mineral grains \(\) 2 5 0 5 8 3 5 3 b b conaceous, solution cavities, pyrite nodules up to 1 inch in diameter \(\) 5 6 0 5 8 8 3 Shale, medium-gray, weathered \(\) 1 0 5 5 0 5 8 8 3 Shale, medium-gray, weathered \(\) 1 0 6 5 0 5 8 8 3 Shale, medium-gray, very fine grained, thin to thick and irregularly bedded, very silty \(\) 2 0 2 8 3 Shale, medium-gray, very fine grained, thin to thick and irregularly bedded, very silty \(\) 1 1 0 5 8 8 13 5 Shale, medium-gray, weathered \(\) 2 1 2 1 3 3 3 5 Shale, medium-gray, weathered \(\) 1 0 6 5 0 5 0 5 0 5 0 5 0 5 0 5 0 5 0 5 0		- ·		6			1	
ant, pyrite nodules up to ½ inch in diameter	274.							6
diameter		•			300.			10
275. Shale, medium-gray, slightly bentonitic, highly weathered 2 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3			1	0	201	•	2	
highly weathered 2 3 bedded, very silty 1 1 1 276. Siltstone, highly weathered 303. Shale, medium-gray, weathered 1 0 6 304. Underclay, medium-brownish-gray, carbonaceous, abundant fossil plant fragments, abundant scattered coal fragments, abundant sulfur stains 7 305. Coal, mostly bright, finely cleated, gypsum crystals 208. Sandstone, medium-light-gray, very fine read 5 0 306. Shale, dark-gray, carbonaceous, scattered fossil plant fragments, abundant sulfur stains 7 307. Shale, light-olive-gray, carbonaceous, scattered fossil plant fragments, abundant sulfur stains 7 307. Shale, light-olive-gray, carbonaceous, scattered fossil plant fragments 308. Sandstone, light-gray, very fine grained, thin nod indiameter 5 0 0 306. Shale, dark-gray, carbonaceous, scattered fossil plant fragments 308. Sandstone, light-gray, very fine grained, silty, non-resistant 5 0 307. Shale, light-olive-gray, weathered 5 0 308. Sandstone, light-gray, very fine grained, silty, non-resistant 5 3 2 310. Sandstone, medium-light-gray, very fine grained, thin to thick and irregularly bedded, very silty 5 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	275		1	9			2	11
276. Siltstone, highly weathered	213.		2	3	302.			11
277. Shale, medium-gray to light-olive-gray, highly weathered———————————————————————————————————	276.		_		303.		1	
highly weathered				•				
278. Sandstone, light-gray, very fine grained, thick-bedded, dark and light mineral grains — — — — — — — — — — — — — — — — — — —			10	6		bonaceous, abundant fossil plant frag-		
thick-bedded, dark and light mineral grains ————————————————————————————————————	278.							_
grains————————————————————————————————————		thick-bedded, dark and light mineral			205			7
280. Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded to massive, dark and light mineral grains, solution cavities, pyrite nodules up to 1 inch in diameter		grains	4	0	<i>3</i> 05.			2
280. Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded to massive, dark and light mineral grains, solution cavities, pyrite nodules up to 1 inch in diameter ———————————————————————————————————	279.	Shale, medium-light-gray, highly weath-			306			3
to fine-grained, thin-bedded to massive, dark and light mineral grains, solution cavities, pyrite nodules up to 1 inch in diameter ———————————————————————————————————		ered	5	0	500.			7
tic, top gradational tich in did, thin and irregularly very silty, some iron staining top silty, some iron stainin	280.				307.			•
solution cavities, pyrite nodules up to 1 inch in diameter							6	2
inch in diameter ———————————————————————————————————					308.	Sandstone, light-gray, very fine grained,		
281. Shale, medium-gray, weathered			56	Λ				
282. Sandstone, very fine grained, silty, non-resistant	281						•	
resistant———————————————————————————————————			•	U	200		2	1
283. Shale, medium-gray, slightly carbonaceous, grades to light-olive-gray in top 1 ft				6	309.		7	Q
grained, very silty, nonresistant	283.	Shale, medium-gray, slightly carbona-			310		,	o
Sandstone, light-gray, very fine grained, thin to thick and irregularly bedded, very silty		ceous, grades to light-olive-gray in top 1			510.			5
284. Sandstone, light-gray, very fine grained, thin to thick and irregularly bedded, very silty			3	2	311.			
very silty	284.							
285. Shale, medium-gray, weathered		thin to thick and irregularly bedded,	2	0				
286. Sandstone, medium-light-gray, very fine grained, thin and irregularly bedded, crossbedded, scattered shale lenses up to 4 in thick, pyrite nodules up to 1/8 inch in diameter	205		2					6
grained, thin and irregularly bedded, crossbedded, scattered shale lenses up to 4 in thick, pyrite nodules up to $\frac{1}{8}$ inch in diameter		<u> </u>		11	312.			_
crossbedded, scattered shale lenses up to 4 in thick, pyrite nodules up to $\frac{1}{8}$ ceous, weathered, silty	200.				212		2	
to 4 in thick, pyrite nodules up to $\sqrt{8}$ ceous, weathered, silty							2	U
inch in diameter 5 8 315. Shale, light-olive-gray, weathered 3 10 287. Underclay, dark-brownish-gray, abundant fossil plant fragments, abundant coal fragments 7 317. Shale, light-olive-gray, silty, weathered,					317.			7
287. Underclay, dark-brownish-gray, abundant fossil plant fragments, abundant coal fragments			5	8	315.		3	
fossil plant fragments, abundant coal bedded	287.	Underclay, dark-brownish-gray, abundant				Siltstone, light-gray, thin and irregularly		
		fossil plant fragments, abundant coal				bedded		6
288. Coal, weathered 2 scattered silty lenses up to 1 in thick - 4 2	200				317.		_	_
	288.	Coal, weathered		2		scattered silty lenses up to 1 in thick -	4	2

		Thickne	ess			Thickr	ness
		_	in			Ft	in
318.	Sandstone, medium-light-gray, very fine grained, thin and irregularly bedded,			342.	Sandstone, medium-light-gray, very fine grained, thin and irregularly bedded,	. 5	6
	very silty	1	10	3/13	very silty, nonresistant Shale, medium-gray, weathered	1	6
	Shale, olive-gray, slightly carbonaceous- Underclay, dark-brownish-gray, silty, hard, abundant fossil plant fragments,	1	10		Underclay, dark-brownish-gray, carbonaceous, very silty, hard, abundant coal and fossil plant fragments	•	4
	scattered coal lenses up to 1½ in thick; resistant ledge in top 4 in	1	7	345.	Coal, mostly bright, fine to medium cleats, gypsum crystals		61/2
321.	Shale, light-olive-gray, weathered, contains 2-in siltstone lens 2½ ft above		0		Underclay, medium-brownish-gray, carbonaceous		3
322.	base, top gradational	6	0		Shale, medium-light-gray, silty, weathered	5	0
	crossbedded, very silty, some iron	2	2		Siltstone, light-gray, thin-bedded, nonre- sistant		3
323.	Shale, light-olive-gray, very silty in top 1 ft, weathered, top gradational	8	6		aceous, weathered	. 1	0
324.	Sandstone, medium-light-gray, very fine grained, thin and irregularly bedded,			330.	bonaceous, silty, hard, abundant fossil plant fragments		11
225	very silty, pyrite nodules up to 1/8 inch in diameter	1	7		Shale, medium-gray, sandy, silty, top gradational		6
	Shale, light-olive-gray, silty, sandstone lenses Underclay, dark- brownish-gray, silty,	1	2	352.	Sandstone, medium-light-gray, very fine to fine-grained, thin- to thick-bedded to massive, crossbedded, silty, thin-		
	hard, very carbonaceous Coal, bright attritus, fine to medium		11/2		bedded and very silty in basal 2 in; scattered shale and siltstone lenses up		
	cleats, gypsum crystals Underclay, medium-brownish-gray, silty,		7		to 6 in thick, pyrite nodules up to inch diameter, solution cavities	28	0
	hard, abundant carbonaceous frag- ments		11		Shale, medium-dark-gray, very silty, weathered	10	0
	Shale, light-olive-gray, scattered silt lenses, weathered	5	0		Siltstone, medium-light-gray, sandy, non-resistant		5
	Shale, medium-dark-gray, carbonaceous, siltyShale, light-olive-gray to medium-dark-		6	333.	Shale, medium-light-gray, silty, sandy, contains scattered siltstone and sand-stone lenses up to 2 in thick	2	10
	gray, top gradationalSandstone, very fine grained, thick to thin	3	0	356.	Sandstone, medium-light-gray, very fine grained, thin and irregularly bedded,		
	and irregularly bedded, very silty, very				very silty	1	2
	calcareous; 2-in-thick siltstone lens 1 ft	10	0		Shale, medium-gray, weathered	1	9 .
333.	8 in below top	10 6	0	338.	Sandstone, medium-light-gray, very fine grained, thin-bedded, very silty, non-resistant		5
334.	Siltstone, medium-light-gray, thin and irregularly bedded, iron-stained	_	8		Shale, medium-gray, bentonitic, weathered	3	0
	Shale, light-olive-gray to medium-gray, weathered	2	0	360.	Sandstone, light-olive-gray, very fine grained, thin and irregularly bedded,	-	•
	Siltstone, medium-light-gray, thin and irregularly bedded, iron-stained Shale, light-olive-gray to medium-gray,		7	361.	very silty, coal lenses up to ½ in thick- Sandstone, very fine grained, very silty, dark and light mineral grains, scattered	7	2
	weathered, top gradationalSandstone, medium-light-gray, very fine	4	6		carbonaceous fragments, pyrite nod- ules up to 1/8 inch in diameter	4	0
	grained, thick to thin and irregularly bedded, crossbedded, very silty, iron-				Shale, light-olive-gray, silty, slightly bentonitic, slightly carbonaceous	2	0
	stained, scattered siltstone lenses up to 3 in thick; fossilized log 1½ ft above base; 5-in-thick silty shale lens 1 ft 2 in			363.	Sandstone, medium-light-gray, very fine grained, thick and irregularly bedded, very silty, finely micaceous	1	3
339.	below topShale, medium-gray, weathered	7 21	0	364.	Underclay, light-olive-gray to medium- gray, very silty		6
	Shale, dark-brownish-gray, carbonaceous, abundant scattered fossil plant				Shale, light-gray, very fine grained sand- stone interbeds; silty	1	6
341.	fragmentsShale, medium-gray, weathered, slightly	10	8	366.	Sandstone, medium-light-gray, very fine grained, thin and irregularly bedded,	2	5
	bentonitic	12	6		crossbedded, very silty	2	5

		Thickn	ess			Thickr	ness
		Ft	in			Ft	in
	Shale, light-olive-gray, silty, weathered - Sandstone, medium-light-gray, very fine		8	391.	Underclay, light-brownish-gray, weathered		4
000.	grained, thin and irregularly bedded, very silty, scattered fossil plant frag-			392.	Coal, mostly bright, abundant sulfur stains and gypsum crystals, appears to		7
	ments		8		be truncated by unit 393		11/2
369.	Shale, medium-gray, slightly bentonitic,			393.	Sandstone, medium-light-gray, very fine		2 /2
	weathered	6	0		to fine-grained, thin-bedded, carbona-		
370.	Sandstone, medium-light-gray, very fine				ceous, scattered fossil roots		9
	to fine-grained, thick to thin and irreg-			394.	Shale, medium-light-gray, silty, weath-		
	ularly bedded, crossbedded, slightly				ered, slightly bentonitic, top grada-		
	silty, dark and light mineral grains,				tional	6	0
	base appears to truncate units 368 and			395.	Sandstone, medium-light-gray, very fine		
	369, lens-shaped (wedges from 20 to 4	26	5		to fine-grained, thin- to thick-bedded,		
371	ft)Shale, medium-gray to dark-brownish-	26	3		crossbedded, silty, pyrite nodules up to	2	_
0,1.	gray, slightly bentonitic, slightly car-			206	1/4 inch in diameter	3	5 5
	bonaceous, weathered	14	0		Shale, medium-light-gray, siltySandstone, light-gray, very fine to fine-		3
372.	Sandstone, medium-light-gray, very fine			391.	grained, thin and irregularly bedded,		
	to fine-grained, thick to thin and irreg-				silty	1	6
	ularly bedded, very silty, iron iron			398.	Shale, medium-gray, weathered	•	6
	stains	2	4		Sandstone, medium-light-gray, very fine		Ū
373.	Shale, light-olive-gray, silty, slightly ben-		•		to fine-grained, thick-bedded, cross-		
274	tonitic	11	0		bedded, silty, calcareous, iron-stained,		
3/4.	Sandstone, medium-light-gray, very fine				pyrite nodules up to 2 inches in diam-		
	to fine-grained, thick-bedded, silty, pyrite nodules up to 1/4 inch in diame-				eter, solution cavities	7	6
	ter	2	7	400.	Shale, medium-gray to light-olive-gray,		
375.	Shale, light-olive-gray, silty, weathered -	2 5	6		silty, slightly bentonitic, scattered car-		_
	Limestone, medium-light-gray, finely	_	-		bonaceous lenses up to 2 in thick	14	0
	crystalline, sandy, lens-shaped, brittle-	1	7	401.	Siltstone, medium-light-gray, thin and		
377.	Sandstone, medium-light-gray, very fine			402	irregularly bedded, sandy, iron-stained	1	8
	to fine-grained, thick-bedded to mas-				Shale, medium-gray, weathered	7	6
	sive, crossbedded, dark and light min-			403.	Sandstone, very fine to fine-grained, thin	3	6
	eral grains, solution cavities	2	5	404	and irregularly bedded, siltyShale, light-olive-gray to medium-gray,	3	U
378.	Shale, medium-gray to light-olive-gray,	_		707.	silty, scattered silty lenses up to 2 in		
270	weathered thin and impay	2	0		thick	8	0
319.	Siltstone, medium-gray, thin and irregularly bedded, weathered		7	405.	Sandstone, medium-light-gray, very fine	_	_
380	Shale, medium-gray to light-olive-gray		11		grained, nonresistant	1	0
	Underclay, dark-grayish-brown, silty,		11	406.	Shale, light-olive-gray to medium-gray,		
	scattered coal lenses up to 1 in thick -		10		silty	8	0
382.	Shale, medium-gray to light-olive-gray,			407.	Sandstone, medium-light-gray, very fine		_
	scattered siltstone lenses up to 2 in			400	grained, silty, iron-stained	1	0
	thick	6	0	408.	Shale, medium-gray to light-olive-gray,	12	0
383.	Shale, light-olive-gray, slightly silty,			400	weathered	13	0
	slightly bentonitic, thin to thick-		_	409.	to fine-grained, thin to thick and irreg-		
201	bedded, few solution cavities	4	7		ularly bedded, crossbedded, silty, cal-		
304.	Sandstone, medium-light-gray, very fine to fine-grained, thick-bedded, very				careous, iron-stained	2	0
	silty, pyrite nodules up to ½ inch in			410.	Shale, light-olive-gray to medium-gray,	_	_
	diameter	1	7		slightly bentonitic, weathered	11	0
385.	Shale, light-olive-gray, slightly bento-	•	•	411.	Shale, medium-light-gray, slightly car-		
	nitic	5	6		bonaceous, weathered	1	0
386.	Shale, dark-brownish-gray, carbona-			412.	Shale, light-olive-gray to gray, weath-		_
	ceous, weathered, slightly bentonitic -	2	0		ered	2	3
387.	Underclay, dark-brownish-gray, very			413.	Sandstone, medium-light-gray, very fine		
	silty, very carbonaceous, locally scat-		2		to fine-grained, thick to thin and irreg-	1	5
200	tered fossil plant fragments	1	3	414	ularly beddedShale, medium-gray, weathered	1	2
Jōō.	Shale, medium-gray to light-olive-gray, weathered, top gradational	7	6		Underclay, dark-brownish-gray, silty,		4
380	Sandstone, medium-light-gray, very fine	,	U	713.	abundant fossil plant fragments, car-		
207.	to fine-grained, thin- to thick-bedded,				bonaceous		6
	crossbedded, silty, dark and light min-			416.	Coal, weathered		31/2
	eral grains	4	0		Shale, medium-brownish-gray, carbona-		
390.	Shale, medium-gray, slightly bentonitic -		8		ceous		5

		Thick	ness			Thick	ness
		Ft	in			Ft	in
418.	Sandstone, medium-light-gray, very fine grained, very silty, pyrite nodules up to			442.	Shale, light-olive-gray to light-gray, highly weathered	15	0
	1/2 inch in diameter	1	11	443.	Sandstone, very light gray, fine-grained,		
	Shale, medium-gray, weathered		10		thin- to thick-bedded, scattered carbo-		
420.	Siltstone, medium-gray, weathered, iron-				naceous fragments, pyrite nodules up		
	stained		10		to 1/4 inch in diameter	4	0
421.	Sandstone, medium-light-gray, few dark			444.	Shale, medium-gray to light-olive-gray	1	0
	and light mineral grains, iron-stained -		10		Sandstone, medium-light-gray, very fine		
422.	Shale, medium-gray to light-olive-gray,				to fine-grained, thin-bedded, crossbed-		
	highly weathered	22	0		ded, upper 3 in calcareous and very		
423.	Sandstone, medium-light-gray, very fine	_	_		resistant	18	0
40.4	grained, very silty, shaly, nonresistant-	3	0	446.	Shale, medium-gray, weathered	6	6
424.	Shale, medium-light-gray to olive-gray,		_	447.	Underclay, dark-brownish-gray, silty,		
405	slightly carbonaceous in top 4 in	1	6		carbonaceous, abundant coal lenses up		
425.	Sandstone, medium-light-gray, very fine				to 1/4 in thick, scattered fossil plant		
	to fine-grained, thick to thin and irreg-				fragments, weathered		11
	ularly bedded, crossbedded, silty,			448.	Shale, very silty, carbonaceous, abundant		
	pyrite nodules up to 1/4 inch in diame-	6	4		fossil plant fragments		7
126	Shala light alive grow to madium grow	6	6	449.	Sandstone, medium-light-gray, very fine		
420.	Shale, light-olive-gray to medium-gray,				grained, thin- to thick-bedded, very		
	slightly bentonitic, slightly silty, weathered	7	0		silty, calcareous	1	1
427	Siltstone, medium-gray, thin and irregu-	,	U	450.	Shale, medium-gray, silty, scattered silt-		
721.	larly bedded, iron-stained, weathered		8		stone lenses up to ½ in thick	2	10
428	Shale, light-olive-gray to medium-gray,		0	451.	Sandstone, medium-light-gray, very fine		
720.	slightly silty, slightly bentonitic,				to fine-grained, thick-bedded to mas-		
	weathered	6	6		sive, silty, dark and light mineral		
429	Sandstone, medium-light-gray, very fine	U	Ū		grains, 6 inches in diameter fossilized		
427.	grained, thick to thin and irregularly				log 2 in above base, scattered fossil		
	bedded, very silty		11		plant material	9	0
430.	Shale, medium-gray, carbonaceous in		••	452.	Shale, medium-gray to light-olive-gray,		
	upper 6 in	4	6		very silty, very weathered	5	0
431.	Sandstone, medium-light-gray, very fine	•	ŭ	453.	Underclay, medium-gray, slightly silty,		
	to fine-grained, thick-bedded to mas-				abundant fossil plant material		4
	sive, crossbedded, pyrite nodules up to			454.	Coal, mostly bright, weathered		4
	1/2 in thick, abundant solution cavities-	4	7	455.	Shale, medium-gray, fairly fissile, weath-		
432.	Shale, light-olive-gray, slightly bentoni-				ered		5
	tic, highly weathered	13	0	456.	Sandstone, medium-light-gray, very fine		
433.	Sandstone, medium-light-gray, very fine				to fine-grained, thin to thick and irreg-		
	to fine-grained, few dark and light				ularly bedded, scattered carbonaceous		_
	mineral grains, pyrite nodules up to 1/4				material, finely micaceous	2	0
	in thick	2	3	457.	Shale, medium-gray to light-olive-gray,	_	_
	Shale, medium-gray, weathered	6	7	450	fairly fissile, weathered	2	2
435.	Sandstone, light-gray, very fine grained,			458.	Sandstone, very light-gray, very fine to		
	thick to thin and irregularly bedded,				fine-grained, thick and irregularly bed-		
	silty, pyrite nodules up to 1/8 inch in	_			ded, silty, pyrite nodules up to 1/8 inch	1	7
40.6	diameter	2	4	450	in diameter	1	7
436.	Shale, light-olive-gray to medium-gray,			439.	Shale, medium-gray to light-olive-gray,		
427	weathered	1	8		fairly fissile, carbonaceous in top 2 ft,	5	6
437.	Underclay, dark-brownish-gray, silty,	1		160	top gradational	3	U
120	carbonaceous	1	1	400.	Underclay, dark-grayish-brown, carbo-		
438.	Shale, light-olive-gray, few scattered car-				naceous, abundant fossil plant mate-	1	0
	bonaceous lenses up to 2 in thick, weathered	7	0	461	Sandstone, medium-light-gray, very fine	1	U
420		7	0	401.	to fine-grained, thick-bedded to mas-		
439.	Sandstone, medium-light-gray, fine-				sive, crossbedded, pyrite nodules up to		
	grained, few medium-sized grains, thin-bedded, crossbedded, dark and				1/8 inch in diameter	1	3
	light mineral grains, pyrite nodules up			462	Shale, dark-brownish-gray, very carbo-	-	,
	to 1/4 inch in diameter	7	0	702.	naceous, abundant fossil plant mate-		
440	Shale, medium-gray, weathered	1	Ö		rial, weathered	1	7
	Sandstone, very light gray to white, fine	1	•	463	Shale, medium-gray to light-olive-gray,	-	•
	to medium-grained, thin- to thick-			105.	weathered	4	8
	bedded, crossbedded, dark and light			464	Sandstone, medium-light-gray, fine-	•	-
	mineral grains, pyrite nodules up to $\frac{1}{2}$				grained, thick-bedded to massive,		
	inch in diameter	12	0		slightly silty, finely micaceous	1	10
					<u> </u>	_	

		Thick	ness			Thick	ness
		Ft	in			Ft	in
465.	Shale, medium-gray to light-olive-gray,			489.	Sandstone, very light gray to white, very		
	slightly silty, weathered	1	6		fine to medium-grained, thick-bedded		
466	Shale, medium-gray to light-purplish-	•	U		to massive, crossbedded, dark and light		
100.	gray, gypsum crystals	1	1		mineral grains, scattered carbonaceous		
467	Underclay, dark-grayish-brown to black,	1	1		material, solution cavities, pyrite nod-		
	scattered fossil root and plant frag-				ules from 1 to 3 inches in diameter,		
	ments		3		abundant pyrite-filled joints, abundant		
468.	Shale, dark-brownish-gray to dark-olive-		J		crossbeds, abundant shale lenses up to		
	gray, carbonaceous		10		10 in thick in basal 5 ft; 7-in medium-		
469.	Shale, light-olive-gray, very bentonitic		4		gray shale lens 25 ft above base; 2-ft		
	Gypsum, crystalline, massive		1/2		medium-gray shale lens 223 ft above		
	Shale, dark-brownish-gray, carbona-				base; 2-ft medium-gray shale lens 235		
	ceous, slightly bentonitic, weathered -		10		ft above base; medium grained in upper		^
472.	Shale, dark- grayish-brown, bentontic,			400	half of unit	324 6	0
	weathered		8		Shale, medium-light-gray, weathered Sandstone, very light gray to white, very	O	U
473.	Shale, medium-gray to light-olive-gray,			₹21.	fine to medium-grained, nonresistant -	-6	0
	fairly fissile, weathered	6	0	492	Shale, medium-dark-gray, weathered	3	2
474.	Underclay, dark-brownish-gray, very car-				Sandstone, light-gray to white, very fine	, ,	~
	bonaceous, abundant coal lenses up to			1,,,,	to medium-grained	5	_0
	1/4 in thick, abundant fossil plant mate-	_	•		Total measured thickness of white		<u> </u>
175	rial, weathered	1	9		sandstone member	346	_2
	Coal, mostly bright, weathered		8		Total measured thickness of Mesa-	===	
470.	Underclay, dark-brownish-gray, very car-				verde Formation	2,072	_2
	bonaceous, gypsum crystals, abundant coal lenses up to ½ in thick, top			Maata	eetse Formation:		=
	gradational	1	7		Shale, medium-dark-gray, scattered sand-		
477.	Shale, medium-gray to light- olive-gray,		,	7,77	stone lenses up to 1 in thick, highly		
	fairly fissile, weathered, slightly carbo-				weathered	10	6
	naceous in top 3 ft	12	6	495.	Sandstone, medium-light-gray, fine to	10	·
478.	Sandstone, very light gray, very fine to				medium-grained, thin- to thick-bedded;		
	fine-grained, thick to thin and irregu-				scattered siltstone lenses up to 1 in		
	larly bedded, crossbedded, silty	8	6		thick	7	6
479.	Shale, medium-gray, weathered; 8-in-				Shale, medium-gray, highly weathered	10	6
	thick dark-gray lens 1 ft below top	9	8	497.	Sandstone, medium-light-gray, very fine		
480.	Sandstone, medium-gray, very fine to			400	grained, nonresistant	4	0
	fine-grained, thick to thin and irregu-			498.	Shale, medium-light- to medium-dark-	,	,
	larly bedded, dark and light minerals,	_		400	gray, highly weathered	6	6
401	iron-stained	3	0	499.	Sandstone, medium-gray, very fine grained, silty, weathered	2	0
	Shale, medium-gray, weathered	1	0	500	Shale, medium-gray, weathered	. 2 5	0
402.	Sandstone, medium-light-gray, very fine				Sandstone, light-gray, very fine grained,	3	U
	to fine-grained, dark and light mineral			501.	thin- to thick-bedded, crossbedded,		
	grains, silty, pyrite nodules up to 1/4 inch in diameter	1	6		iron-stained; 1-ft-thick medium-gray		
483	Shale, medium-gray, highly weathered	1	0		shale lens $2\frac{1}{2}$ ft above base; shaly		
	Sandstone, medium-light-gray, very fine	1.	Ū		sandstone lens 16 ft above base; mostly		
	to fine-grained, thin- to thick-bedded,				medium-gray in upper 2 ft	31	0
	crossbedded, dark and light mineral			502.	Shale, medium-light-gray, silty, includes		
	grains, silty, scattered shale lenses up				light-gray sandstone lens up to 2 ft		
	to 8 in thick; iron-stained in top 10 ft-	35	0		thick, 3 ft below top, wedges out lat-		
485.	Shale, light-olive-gray, weathered		9	502	erally	16	0
486.	Sandstone, medium-gray, very fine to			503.	Sandstone, medium-light-gray to gray,		
	fine-grained, thick and irregularly bed-				medium- to fine-grained, thin- to thick- bedded, dark and light mineral grains,		
	ded, few dark and light mineral grains-	1	2		solution cavities, scattered pyrite nod-		
487.	Shale, medium-gray to light-olive-gray,				ules up to ½ inch in diameter	15	0
	silty, sandy, scattered siltstone lenses			504.	Shale, medium-gray, weathered	2	ŏ
	up to 8 in thick; weathered; very silty in		0		Sandstone, very light gray, very fine to		
	upper 2 ft Total measured thickness of main	11	_0		fine-grained, thin and irregularly bed-		
	body of Mesaverde Formation	1 726	O		ded, silty, top gradational	3	0
		1,720	_0_	506.	Shale, medium-brownish-gray, weath-		
	sandstone member:				ered	11	0
488.	Sandstone, medium-light-gray, very fine			507.	Sandstone, medium-light-gray, fine-		
	to fine-grained, thick and irregularly	•	0		grained, crossbedded, silty, light min-		10
	bedded, silty, iron-stained	2	0		eral grains, iron-stained		10

		Thick	ness			Thick	ness
		Ft	in			Ft	in
	Shale, medium-dark-gray, weathered Sandstone, very fine grained, thin and	5	6	531.	Underclay, medium-grayish-brown, car- bonaceous, gypsum crystals, abundant fossil plant material and rootlets	1	10
	irregularly bedded, very silty, scattered medium-gray shale lens up to ½ in	10	•	532.	Shale, light-olive-gray, slightly bentoni-		
510.	thickShale, medium-gray to light-olive-gray,	10	0	533.	tic, weathered	2	1
511.	weathered	10	0		very fine to fine-grained, silty, friable, nonresistant, scattered calcareous nodules up to 3 inches in diameter	11	6
	bedded, dark and light mineral grains, moderately quartzose	27	0	534.	Underclay, light-purplish-gray, very silty, very hard, scattered coal fragments up		
512.	Shale, medium-gray, weathered	1	6		to 1/4 inch in diameter		10
	Shale, very dark gray to black, very carbonaceous, bentonitic, abundant fossil plant material, scattered coal			535.	Siltstone, light-gray to light-olive-gray, scattered fossil plant fragments, weathered, nonresistant	5	0
	lenses up to 1/4 in thick	1	0	536	Underclay, light-purplish-gray, abundant	•	ŭ
514.	Shale, medium-dark-gray	1	6	550.	slickensides		9
515.	Sandstone, medium-gray, very fine to fine-grained, thick to thin and irregularly bedded, scattered carbonaceous			537.	Shale, dark-purplish-gray to black, very carbonaceous, silty, gypsum crystals, abundant fossil plant fragments, nonre-		
	material, iron-stained	5	4		sistant	2	11
516.	Shale, medium-gray to light-olive-gray; 1-ft-thick sandstone lens 14 ft above				Shale, medium-gray to light-olive-gray, slightly bentonitic	6	6
	base, carbonaceous in top 2 ft; weathered	12	0	539.	Sandstone, medium-gray to light-olive-		
517.	Sandstone, very light gray, very fine	12	v		gray, very fine to fine-grained, silty, iron-stained	5	6
	grained, thick and irregularly bedded,			540	Sandstone, medium-light-gray, very fine	,	U
	crossbedded, dark and light mineral			540.	grained, silty, abundant fossil plant		
~10	grains	5	6		fragments and rootlets, weathered,		
518.	Shale, medium-light-gray, very fine				nonresistant, friable	2	9
	grained, sandstone lens 4 ft above base, weathered	10	0	541.	Shale, light-olive-gray to medium-dark-	•	2
519.	Sandstone, medium-light-gray to very	10	Ū	5.40	gray, weathered, fairly fissile	2	3
	light gray, very fine grained, thick-			542.	Shale, dark-purplish-gray to black, silty, gypsum crystals		8
	bedded to massive, silty, dark and light			543	Siltstone, light-olive-gray, sandy, slightly		O
	mineral grains	9	0	545.	carbonaceous, hard	2	6
520.	Underclay, medium-olive-gray, silty,		a .	544.	Shale, carbonaceous, gypsum crystals,		
521	weatheredShale, dark-gray to black, very carbona-		2		weathered, poorly fissile	4	0
321.	ceous, scattered fossil plant material-	1	1	545.	Shale, light-olive-gray to medium-gray,		•
522.	Shale, medium-gray to light-olive-gray,	•	•	546	fairly fissile, weathered	4	3
	silty, weathered	12	0	540.	Sandstone, light-olive-gray to medium- gray, fine-grained, silty, weathered; 1-		
	Underclay, dark-brownish-gray, silty,				in-thick coal lens 1 in above base	1	5
	carbonaceous, abundant fossil plant		11	547.	Sandstone, light-purplish-gray, very fine		
524	fragments and rootletsCoal, bright-to-dull, gypsum crystals,		11		grained, silty, carbonaceous, abundant		
324.	medium cleats, highly weathered		91/2		fossil plant fragments, abundant coal	_	_
525.	Sandstone, medium-light-gray, very fine				chips, weathered	5	0
	to fine-grained, silty, basal part con-				Shale, light-olive-gray, very weathered-	3	3
	tains abundant carbonaceous shale			549.	Shale, medium-gray to very light olive		
	fragments, weathered, nonresistant	9	0		gray, medium-grained, abundant dark mineral grains, few green and red min-		
526.	Shale, olive-gray, slightly bentonitic; 8-				eral grains, very calcareous; 2-ft-thick		
	in-thick purple-gray lenses 5 ft and 9 ft above base; highly weathered	10	0		iron-stained zone 2 ft above base; fria-		
527.	Underclay, light- to medium-olive-gray,	10	v		ble	9	6
	very silty, slightly bentonitic, hard,			550.	Sandstone, very light gray, fine- to		
	abundant fossil plant fragments and				medium-grained, crossbedded, dark		
	rootlets	4	0		and light mineral grains, pyrite nodules		
528.	Shale, dark-purplish-gray, carbonaceous,	2	4		up to 1/4 inch in diameter; scattered calcareous concretions up to 2 ft thick;		
520	poor fissility, highly weathered Underclay, dark-purplish-gray to black,	2	4		slump bedding, very friable, nonresis-		
347.	very carbonaceous, silty	1	3		tant, iron-stained	14	8
530.	Coal, fine to medium cleats, highly	=		551.	Shale, light-olive-gray, sandy, bentonitic,		
	weathered, gypsum crystals		101/2		weathered	2	6

		Thick	ness			Thick	ness
		Ft	in			Ft	in
552.	Underclay, light-purplish-gray, very silty, scattered fossil plant fragments and			576.	Shale, light-olive-gray, bentonitic, very silty, weathered, hard	3	7
553.	rootletsShale, very dark gray to black, carbona-		3	577.	Underclay, medium-light-gray, very sandy, very silty, abundant fossil plant		
554.	ceous, abundant fossil plant fragments- Shale, light-olive-gray, bentonitic, weath-		4	578.	fragments, hard	1	8
	ered	3	6		ered		31/2
	Shale, medium-gray, siltySiltstone, light-olive-gray, thin and irreg-		9	579.	Sandstone, light-gray, very fine grained, very silty, calcareous concretions in		
557.	ularly bedded, weatheredShale, medium-gray to light-olive-gray,	3	6	500	basal 2 ft; 6-in medium-gray shale lens 6 ft above base; nonresistant	10	6
558.	weathered	5	0		Underclay, light-olive-gray, silty, sandy- Shale, very dark gray to black, very	2	7
	grained, very calcareous, silty, dark	2	4	592	carbonaceous, very siltySiltstone, light-olive-gray, abundant fos-	2	1
559	and light mineral grains, iron-stained - Shale, light-olive-gray, highly weathered-	3 4	6 8	302.	sil plant fragments, weathered	3	5
	Sandstone, very light gray, very fine grained, thick to thin and irregularly	•	Ü	583.	Underclay, medium-brownish-gray, very silty, poorly fissile	1	5
	bedded, crossbedded, very silty, very calcareous, slightly carbonaceous,			584.	Coal, resin blebs, fine cleats, gypsum crystals, abundant sulfur stains		61/2
	abundant fossil plant fragments, iron-			585.	Shale, medium-gray to light-olive-gray,		
	stained in top 2 ft	5	6		basal zone very carbonaceous, silty, bentonitic	1	4
	Shale, light-olive-gray, very silty, weathered	6	3	586.	Underclay, olive-gray, slightly silty, ben- tonitic	1	6 5
562.	Underclay, medium-purplish-gray, very silty, slightly bentonitic, abundant fos-			587.	Coal, mostly bright, very silty		1½
	sil plant fragments and rootlets, weath-				Sandstone, light-olive-gray to gray, very		_,_
	ered	4	7		silty, bentonitic, nonresistant	3	3
563.	Shale, dark-brownish-gray, very carbo-				Shale, medium-olive-gray, bentonitic	3	9
	naceous, silty, fairly fissile, abundant			590.	Sandstone, light-gray, very fine grained,	1	4
	fossil plant fragments, abundant coal fragments, hard	2	2	591	very silty, iron-stained	1	4
564.	Sandstone, light-gray, very fine grained,	2	2	371.	ered	5	0
	thin and irregularly bedded, silty, basal			592.	Coal, highly weathered		1/2
	contact sharp and irregular, appears to			593.	Sandstone, medium-light-gray, very fine		
565	fill channel into unit 563	3	6	504	grained, very silty, weathered	3	4
303.	Shale, olive-gray to dark purplish-gray, very carbonaceous, resistant, top 6 in very silty	2	0		Underclay, light-olive-gray, sandy, silty, weathered	3	0 1½
566	Sandstone, very light gray, very silty,	2	0		Sandstone, medium-light-gray, very fine		142
200.	highly weathered	1	9	570.	to fine-grained, very silty, calcareous,		
567.	Shale, light-olive-gray, slightly bentoni-				nonresistant, iron-stained in top 2 ft	16	0
	tic, weathered	2	0		Shale, light-olive-gray, very silty	8	5
568.	Shale, medium-purplish-gray, bentonitic,	1	0	398.	Underclay, light-olive-gray to very dark gray, very silty, hard	1	2
569.	highly weatheredShale, light-olive-gray to medium-gray,	1	9	599.	Shale, dark-gray to black, carbonaceous,	•	2
	bentonitic, highly weathered	3	2	0,,,,	poorly fissile	1	11
570.	Sandstone, very light gray, weathered, friable	1	8		Shale, light-olive-gray to medium-gray, very silty	6	6
571.	Underclay, dark-brownish-gray, slightly carbonaceous, silty, abundant fossil			601.	Underclay, dark-brownish-gray, carbonaceous, silty, abundant fossil plant		
	rootlets, scattered coal fragments		10		fragments, gypsum crystals	2	0
572.	Coal, mostly dull, highly weathered, fine			602.	Shale, very dark gray to black, very	_	
	to medium cleats, abundant gypsum			603	carbonaceous, poorly fissile	2 5	1 0
	crystals in cleats, abundant sulfur stains		4		Shale, light-olive-gray, silty, weathered - Sandstone, very fine to fine-grained, thin	3	J
573.	Underclay, light-brownish-gray, very		•	50 11	and irregularly bedded, very silty, car-		
	sandy, slightly carbonaceous		2		bonaceous, very calcareous, abundant		_
	Coal, weathered		1	CO5	carbonaceous fragments	4	6
5/5.	Sandstone, very light gray to white, very fine grained, very silty, friable to non-			605.	Shale, light-olive-gray, sandy, silty, weathered	4	9
	resistant, basal 4 in highly weathered,			606.	Shale, dark-brownish-gray to dark-	-7	,
	coal chips	20	0		purplish-brown, silty, carbonaceous,		

		Thickn	ess			Thickn	ess
		Ft	in			Ft	in
	fairly fissile, abundant fossil plant frag- ments, hard		11	637.	Shale, light-brownish-gray, slightly carbonaceous, fairly fissile, abundant fos-		
607.	Shale, medium-gray to light-olive-gray, silty, scattered siltstone lenses	14	6	638	sil plant fragments		8 9
608.	Shale, medium-light-gray, silty, sandy, slightly carbonaceous, weathered	5	6		Sandstone, very fine grained, very silty, nonresistant	9	6
609.	Shale, dark-brownish-gray, very silty, carbonaceous, fairly fissile, weathered,	J	Ü		Shale, light-olive-gray, weathered Shale, light-brownish-gray, slightly car-		11
610.	abundant fossil plant fragments Shale, medium-gray to light-olive-gray,	1	11		bonaceous, scattered fossil plant frag- ments		8
611.	weathered Underclay, dark-purplish-brown to black,	6	2		Underclay, medium-gray to light-olive- gray, very silty, fossil plant rootlets	3	0
	carbonaceous, scattered coal lenses up to 1/4 in thick	1	2		Shale, dark-gray to black, very carbonaceous, fairly fissile	1	6
	Shale, very dark gray to black, very carbonaceous, sulfur-stains		11		Shale, olive-gray, slightly carbonaceous, very silty top 6 in, weathered	4	5
	Shale, light-olive-gray to medium-gray, silty, bentonitic, weathered	4	10	645.	Sandstone, medium-light-gray, very fine grained, thin- to thick-bedded, calcar-		
614.	Sandstone, medium-light-gray, very fine grained, thick-bedded to massive,	•	2		eous, silty, abundant sulfur stains and gypsum crystals; 4-in-thick carbona-		
615.	silty, very calcareous, iron-stained Shale, light-olive-gray, slightly bentonitic, weathered	5	3		ceous shale zone 6 ft 4 in above base increasing to 1 ft thick along outcrop;		
616.	Shale, dark-purplish-gray, very carbonaceous, weathered	3	3	646	2-ft medium-gray shale 1 ft below top; resistant, iron staining	18	0
	Shale, medium-gray, siltySandstone, medium-light-gray, very fine	1	10	040.	grained, thin-bedded to massive, very silty, few solution cavities	5	9
010.	grained, abundant fossil plant rootlets, iron-stained	2	0	647.	Underclay, medium-brownish-gray, car- bonaceous, silty, gypsum crystals, fos-	-	
619.	Siltstone, light-olive-gray, sandy, benton- itic	1	11	648.	sil plant rootlets Coal, impure, fine to medium cleats, resin		3
	Shale, medium-purplish-gray, silty, weathered	4	8		blebs, gypsum crystals, abundant sul- fur stains, few shale lenses up to 1/4 in		_
621.	Sandstone, medium-gray, very fine grained, thin and irregularly bedded,			649.	thickSiltstone, medium-gray to light-olive-	1	6
622	very silty, very calcareous, slightly carbonaceous	2	9	650.	gray, thin and irregularly bedded Shale, light-olive-gray, slightly bentoni- tic	1 4	0
	itic, weathered	8	0	651.	Sandstone, light-gray, very fine grained, thin- to thick-bedded, iron-stained	3	8
	fossil plant rootlets, hard Coal, mostly bright, very fine cleats	1	5 2½		Shale, medium-gray to light-olive gray, silty	5	0
	Underclay, medium-purplish-gray, very silty, carbonaceous, coal fragments	1	5		Underclay, dark-brownish-gray, silty, carbonaceous, abundant gypsum crys-	_	Ū
	Coal, weathered, very impureShale, medium-greenish-gray, very ben-		11/2	654.	tals, abundant fossil plant fragments Sandstone, light-gray, very fine grained,	1	2
	tonitic, weatheredSandstone, medium-light-gray, very fine	12	0		dark mineral grains, thin and irregularly bedded	1	5
629.	grained, silty, nonresistant	2	6		Shale, medium-greenish-gray, weathered- Shale, medium-brownish-gray, fairly fis-	2	0
630.	silty, bentonitic, weathered Underclay, olive-gray, silty, abundant	32	0		sile, carbonaceous, abundant fossil plant fragments		4
631.	fossil plant rootlets Shale, medium-grayish-brown, carbonac-	1	2	657.	Sandstone, light-gray, fine-grained, thin- to thick-bedded, crossbedded, silty,		
	coal, weathered		7 ½		basal 1 in abundant shale fragments; 4-in lens of medium-coarse-grained		
	Sandstone, light-olive-gray, very weathered, friable	5	0	658	material 1 ft above base; slumpbed- ding, iron stains	42	0
	weathered	11	0		weathered	5	0
	weathered, slightly bentonitic Shale, dark-purplish-gray to black,	4	0		gypsum crystals, scattered fossil plant fragments	2	0
	weathered		10	660.	Coal, dull, impure		7

		Thick	ness			Thic	kness
		Ft	in			Ft	in
661.	Shale, dark-gray to black, silty, carbona-			690.	Sandstone, very fine grained, thin to thick		
	ceous	1	0		and irregularly bedded, very silty, non-		
662.	Sandstone, medium-gray, very fine	2	7		resistant	3	3
663	grained, very silty, nonresistant Shale, medium-gray to light-olive-gray,	2	7	691.	Shale, light-olive-gray, bentonitic, weath-		
005.	weathered	1	0		ered	2	0
664.	Sandstone, medium-gray, very fine	•	•	692.	Underclay, light-olive-gray, very weath-		,
	grained, very silty, nonresistant	4	0	603	eredShale, dark-gray to black, carbonaceous-		6 9
665.	Shale, medium-brownish-gray, carbona-				Shale, light-olive-gray to medium-gray,		,
"	ceous, weathered	3	6	07.1.	silty, weathered	6	0
000.	Underclay, dark-brownish-gray, silty,			695.	Sandstone, very fine grained, very silty,		
	carbonaceous material, gypsum crystals, fossil plant fragments and rootlets,				very weathered		4
	resistant	6	0		Shale, medium-gray, weathered	1	6
667.	Coal, dull, impure, finely cleated, weath-			697.	Shale, medium-brownish-gray, carbona-		0
	ered, abundant sulfur stains	1	5	698	ceous, scattered fossil plant fragments- Shale, medium-gray, weathered	3	8 0
668.	Shale, dark-purplish-gray to black, gyp-				Shale, dark-brownish-gray, carbona-	3	Ū
660	sum crystals	2	11		ceous, scattered fossil plant fragments-		. 8
009.	Shale, light-olive-gray to medium-gray, slightly bentonitic	5	6	700.	Shale, black, carbonaceous	-	_7
670.	Sandstone, very fine to fine-grained, thick	3	Ů		Total measured thickness of Mee-	000	•
	and irregularly bedded, very silty, cal-				teetse Formation	932	<u>3</u>
	careous, basal contact gradational	14	6	Lance	Formation:		
671.	Shale, light-olive-gray, few siltstone		_	70 1.	Sandstone, light-gray, fine-grained, silty,		
670	lenses up to 6 in thick, weathered	20	0		ironstone lag deposits up to 4 in thick		
	Sandstone, light-gray, weathered Shale, dark-brownish-gray, carbona-	2	0		in basal 10 ft; solution cavities, scattered shale lenses up to 2 ft thick	83	0
073.	ceous, abundant fossil plant fragments-	1	6	702	Shale, medium-dark-gray to brownish-	63	U
674.	Coal, dull, impure, weathered, resin	•	•	702.	gray, weathered	7	6
	blebs, gypsum crystals		9	703.	Underclay, dark-brownish-gray, carbo-		
675.	Sandstone, medium-gray, very fine				naceous, abundant fossil plant frag-		
(7)	grained, very silty, raindrop imprints -	3	0	704	ments		7
	Shale, light-olive-gray, very weathered		11	704.	Shale, dark-gray to black, silty, weathered	4	8
0//.	Underclay, dark-brownish-gray, silty, carbonaceous, scattered coal lenses up			705	Shale, light-olive-gray to medium-gray,	4	0
	to 1/8 in thick, hard	1	5	705.	bentonitic, weathered	23	0
678.	Sandstone, very light gray, very fine			706.	Sandstone, light-gray, very fine to fine-		
	grained, thin- to thick-bedded, cross-				grained, thin to thick and irregularly		
	bedded, very silty, scattered siltstone				bedded, crossbedded, very silty, fria-	•	
670	lenses up to 1 in thick	6	0	707	Shala madium annu ta linha alima annu	8	8
0/9.	Shale, dark-brownish-gray, fairly fissile, very carbonaceous, weathered	1	4	707.	Shale, medium-gray to light-olive-gray, slightly bentonitic, weathered	14	0
680.	Sandstone, light-gray, fine- to medium-	1	7	708.	Shale, dark-purplish-gray, poor fissility,	17	U
	grained, thin- to thick-bedded, calcar-				bright coal lens 3 in thick wedging out		
	eous, weathered, iron-stained	12	0		along outcrop, 21/2 ft above base; scat-		
681.	Shale, medium-gray to light-olive-gray,	••	_		tered fossil plant fragments, slightly		
692	Silty	20	0	700	bentonitic, weathered	4	6
062.	Sandstone, very light gray, very fine grained, silty	2	0	709.	Shale, light-olive-gray to medium-gray, weathered, slightly bentonitic	11	0
683.	Underclay, medium-brownish-gray, car-	2	Ü	710.	Shale, dark-purplish-gray, carbonaceous-	11	5
	bonaceous, scattered fossil plant frag-				Siltstone, medium-gray, iron-stained	1	2
	ments	1	2		Sandstone, medium-light-gray, very fine		
684.	Coal, dull, very impure, bony, resin				grained, thin- to thick-bedded, lens-		
605	blebs, gypsum crystals	1	0	710	shaped, very silty	2	0
083.	Underclay, dark-brownish-gray, silty, carbonaceous, scattered fossil plant				Shale, medium-gray, very siltySandstone, very fine to fine-grained, thin		4
	fragments		5	/14.	to thick and irregularly bedded, silty -	1	2
686.	Shale, medium-gray to light-olive-gray	5	6	715.	Shale, light-olive-graytomedium-purplish-	•	~
	Shale, dark-brownish-gray to dark-gray,				brown, slightly carbonaceous, weath-		
	carbonaceous, weathered		10		ered	1	0
688.	Shale, light-olive-gray, silty, bentonitic,	,	2	716.	Sandstone, very fine grained, thin and		
680	weathered, carbonaceous in top 3 ft Shale, dark-brownish-gray, silty, weath-	6	3		irregularly bedded, very silty, wedges out laterally, scattered fossil plant frag-		
JU).	ered, scattered fossil plant fragments -	2	2		ments	1	_3
	, r	-	-		•		_

	Thick	ness			Thick	ness
	Ft	in			Ft	in
Total measured thickness of Lance Formation Unconformity	<u>164</u>	_3	731.	Sandstone, light-gray, medium-grained, thick and irregularly bedded, crossbedded, ripple marks, conglomerate lenses		
Paleocene:				up to 6 in thick, subangular clasts up to		
Fort Union Formation:				1/4 inch in diameter, very silty in basal		
717. Underclay, dark-brownish-gray, silty,				4 ft; 2-ft-thick medium-gray shale lens		
carbonaceous, scattered fossil plant				15 ft above base	35	0
rootlets and fragments, hard	2	6	732.	Shale, medium-dark-gray to olive-gray,		
718. Shale, light-olive-gray to medium-gray,	_	_		weathered	5	6
slightly bentonitic	5	0	733.	Sandstone, medium-light-gray, fine-		
719. Sandstone, light-gray to very light gray,				grained, thin-bedded, lens-shaped	1	6
fine-grained, dark and light mineral			734.	Shale, medium-gray to light-olive-gray,		
grains, thick-bedded to massive, cross- bedded, conglomeratic zones up to 1 ft				highly weathered	2	0
thick, subangular to angular feldspathic			735.	Sandstone, very fine to fine-grained, thin		
pebbles, shale zones up to 2 in thick,				and irregularly bedded, dark and light		
solution cavities	44	0		mineral grains, silty, noncalcareous,		
720. Shale, olive-gray to medium-gray, car-				iron-stained in top 1 ft	2	0
bonaceous	6	0	736.	Shale, light-olive-gray, bentonitic, weath-	_	
721. Sandstone, medium-brownish-gray to			707	ered	2	0
medium-light-gray, fine- to coarse-			131.	Sandstone, very fine grained, silty, weathered, fossil plants and rootlets	2	4
grained, iron-stained, small solution			738	Shale, light-olive-gray to medium-gray,	. 2	7
cavities up to 1 inch in diameter in			750.	silty, scattered silt lenses		11
basal 2½ ft; angular to subangular pebbles up to ¾ inch in diameter, shale			739.	Sandstone, dark-purplish-brown, highly		
chips, sandstone fragments, quartz and				iron stained, very fine to fine-grained,		
feldspar grains in a few conglomerate				thick-bedded, ferruginous iron cement-	5	0
zones	5	7	740.	Siltstone, light-olive-gray, bentonitic	4	3
722. Shale, medium-dark-gray to dark-olive-			741.	Shale, medium-gray, silty, weathered	4	2
gray, slightly carboniferous, weath-			742.	Siltstone, medium-gray, bentonitic, sandy	26	6
ered	10	6	743.	Sandstone, light-gray, very fine grained,		
723. Shale, medium-dark-gray, weathered,		_		very silty	1	6
carbonaceous		8	744.	Shale, light-olive-gray, silty, bentonitic,		
724. Sandstone, light-brownish-gray, fine- to			745	weathered	14	6
medium-grained, thick and irregular bedding, lenticular, conglomerate lens			/43.	Sandstone, medium-light-gray, very fine		
up to 2 in thick, angular to subangular				grained, thin-bedded, crossbedded, silty	1	0
clasts up to 1/4 inch in diameter	2	6	746.	Shale, dark-gray to olive-gray, highly car-	•	U
725. Shale, medium-gray, highly weathered	2	0	,	bonaceous	9	0
726. Conglomerate, medium-gray to light-			747.	Sandstone, light gray, very fine grained,		
brownish-gray, fine- to coarse-grained				thin and irregularly bedded, very silty,		
matrix, pebbles up to 2 inches in diam-				weathered	1	2
eter, subrounded to subangular, com-			748.	Shale, light-olive-gray, slightly bento-	0	0
posed of quartz, pink feldspar, and			740	nitic, weathered	9	0
agate, thick-bedded to massive, sand- stone clasts, iron-stained	16	0	749.	Sandstone, light-gray, very fine to fine- grained, thin- to thick-bedded, iron-		
727. Sandstone, medium-light-gray, medium-	10	Ü		stained, weathered	6	0
grained, conglomerate lenses up to 6 in			750.	Shale, medium-gray, bentonitic, sandy,		
thick with clasts up to 1/4 inch in				silty, weathered	6	0
diameter, friable, highly weathered	8	0	751.	Sandstone, medium-light-gray, fine-		
728. Shale, medium-dark-gray, carbonaceous,		_		grained, thick-bedded, silty	20	0
highly weathered	1	7	752.	Shale, medium-gray, highly weathered,	1.5	,
729. Sandstone, medium-light-gray, medium-			752	Silty	15	6
grained, crossbedded, conglomerate lenses up to 6 in thick, clasts up to \(^1/4\)			133.	Sandstone, light-gray, fine-grained, massive, silty, scattered shale lenses up to		
inch in diameter, friable, highly weath-				1 ft thick in top 5 ft	18	0
ered	4	6	754.	Shale, medium-light-gray, silty, slightly		~
730. Conglomerate, medium-brownish-gray,				bentonitic, weathered	16	0
coarse-grained matrix, quartz, feld-			755.	Sandstone, light-gray, very fine to fine-		
spar, sandstone, agate, and quartzite				grained, thick-bedded to massive,	_	^
pebbles and cobbles up to 3 inches in			75/	silty, calcareous	5	0
diameter, subangular to subrounded, few well-rounded cobbles	15	0	/56.	Shale, medium-dark-gray, bentonitic, highly weathered	2	7
iew wen-tounded coopies	13	U		inginy weathered	2	,

		Thick	ness			Thick	kness
		Ft	in			Ft	in
757.	Sandstone, medium-light-gray, very fine		•••	784.	Sandstone, medium-gray, very fine		
	to fine-grained, few medium grains, thick and irregularly bedded	1	4		grained, thin- to thick-bedded, silty, iron-stained	2	6
758.	Shale, light-brownish-gray, weathered	3	6	785.	Shale, medium-gray, silty, weathered	16	Ö
	Sandstone, very fine grained, thin and		•		Sandstone, light-gray, fine- to medium-		•
	irregularly bedded, very silty, nonre-				grained, thin- to thick-bedded, cross-		
	sistant, iron-stained	2	6		bedded, dark mineral grains, iron-		
760.	Sandstone, light-gray, fine to medium-	_	-		stained	5	0
	grained, few coarse grains, thick and			787.	Shale, medium-gray, silty, weathered	1	6
	irregularly bedded to massive, cross-				Sandstone, light-gray, fine- to medium-		
	bedded, few solution cavities, iron-				grained, thick-bedded, crossbedded,		
	stained	32	0		iron stains, scattered conglomerate		
761.	Shale, medium-gray, highly weathered	4	0		lenses up to 6 in thick with clasts 1 inch		
	Sandstone, light-gray, very fine to medium-				in diameter	26	0
	grained, weathered	2	4	789.	Shale, medium-gray, bentonitic, weath-		
763.	Shale, medium-light-gray, bentonitic,				ered	16	0
	highly weathered	5	0	790.	Sandstone, medium-light-gray, fine- to		
764.	Sandstone, light-gray, very fine to medium-				medium-grained, thick-bedded, iron-		
	grained, weathered	1	0		stained	3	0
765.	Shale, medium-gray, silty, abundant silty			791.	Shale, medium-gray, silty, bentonitic,		
	sandstone lenses up to 8 in thick	15	0		weathered	27	0
766.	Sandstone, very light gray, fine-grained,			792.	Sandstone, very fine to fine-grained,		
	thick and irregularly bedded	1	2		silty, shaly, highly iron stained, weath-		
767.	Shale, medium-gray, slightly bentonitic,				ered	1	2
	highly weathered	1	5	793.	Sandstone, very light gray, very fine to		
768.	Sandstone, very light gray, fine-grained,				fine-grained, thick and irregularly bed-		
	few coarse grains, thick and irregularly				ded, iron stains	10	6
	bedded	3	0	794.	Shale, medium-gray, slightly bentonitic,		
769.	Shale, medium-gray, slightly bentonitic,				weathered	4	6
	highly weathered	2	1	795.	Sandstone, medium-light-gray, fine-		
770.	Sandstone, very light gray, fine-grained,				grained, thin- to thick-bedded, dark	_	_
	few coarse grains, thick and irregularly	_	_		mineral grains, weathered	2	0
	bedded, crossbedded	2	3		Shale, medium-gray, weathered	1	6
771.	Shale, medium-gray, very silty, weath-		•	797.	Sandstone, very light gray, fine-grained,		
770	ered	9	0		thick and irregularly bedded, iron	•	
112.	Sandstone, medium- to coarse-grained,			700	stains, weathered	2	11
	thin to thick and irregularly bedded,	1	7		Shale, medium-gray, weathered	6	0
772	dark mineral grains, very iron stained-	1 12	7	/99.	Sandstone, light-gray, fine-grained, dark		
	Shale, medium-gray, silty, weathered	12	0		mineral grains, thick and irregularly		
//4.	Sandstone, very light gray, medium-				bedded, noncalcareous, pyrite nodules	6	1
	grained, few coarse grains, thick and irregularly bedded, iron-stained	6	2	800	up to 1 inch in diameter	6	1
775	Sandstone, light-gray to dark-brownish-	U	2	800.	Shale, medium-gray, silty, bentonitic, weathered	1	6
113.	gray, conglomeratic, thick and irregu-			9 01	Sandstone, medium-light-gray, fine- to	1	U
	larly bedded, angular to subangular,			601.	medium-grained, thick-bedded to mas-		
	mostly feldspathic clasts up to ½ inch				sive, crossbedded, noncalcareous,		
	in diameter	17	0		pyrite nodules up to 1 inch in diameter-	7	6
776.	Sandstone, light-gray, fine-grained, thin	1,	v	802.	Shale, medium-gray, silty, weathered	i	6
	to thick and irregularly bedded, iron-				Sandstone, very light gray, fine- to	•	·
	stained, scattered shale lenses up to 1 ft			0021	medium-grained, thin- to thick-		
	thick, wedges out	30	0		bedded		11
777.	Shale, medium-gray, weathered	5	6	804.	Shale, medium-gray, weathered, slightly		
	Sandstone, light-gray, fine-grained, silty-	-	8		bentonitic	10	6
	Shale, medium-gray; 6-in-thick medium-			805.	Sandstone, medium-light-gray, very fine		
	light-gray sandstone lens, weathered		11		to fine-grained, thin and irregularly		
780.	Sandstone, medium-light-gray, fine-				bedded, iron-stained	1	9
	grained, silty, weathered	5	0	806.	Shale, medium-gray, weathered	1	0
781.	Shale, medium-gray to light-olive-gray,				Sandstone, medium-light-gray, medium-		
	slightly bentonitic, weathered	6	0		grained, thick-bedded, high-angle cross-		
782.	Sandstone, medium-light-gray, very fine				bedding; iron-stained, conglomerate		
	grained, thin and irregularly bedded,				wedge up to 2 ft thick with subangular		
	very silty, iron-stained		9		to angular clasts of quartz, feldspar,		
783.	Shale, medium-gray, sandy, silty, highly	_			sandstone fragments, and quartzite up		
	weathered	4	0		to ½ inch in diameter; 3½-in-thick		

		hickn	ess		red section 21: Mesaverde Formation thr	ough	
ironstone layer in conglom	erate wedge	Ft	in	Location	Formation Eagle Point Quadrangle, Wyoming (7.5 min) NAME OF THE Property of the Name of the Property of the Name	om old	last ta
5 ft below top of unit 808. Sandstone, light-gray, fine-		19	0	young	V-NW-SW sec. 31, T. 6 N., R. 1 E. Presented fro est V-SE-SE sec. 31, T. 6 N., R. 1 E	om om	iesi io
grained, crossbedded, wea stains		<u>15</u>	_0	Described Strike 16	d by: J.F. Windolph, Jr. 0°, Dip 20° NE.		
Total measured thickney Union Formation		 na		Section s	tarts at top of approximately 200 ft of the white sandst	tone me	ember
Unconformity	<u></u>	=	9			Thickne	
•					verde Formation: e sandstone member 2	Ft 200+	in
Eocene:				VV 111 C	e sandstone member	200+	
Indian Meadows Formation:					eetse Formation:		
809. Shale, light-olive-gray, highly		9	6	1.	Shale, medium-gray, sandy, thin-bedded sandstone interbeds	6	0
810. Conglomerate, dark-bro				2.	Shale, medium-gray to light-brownish-	Ŭ	Ü
coarse, grained, pebbles a subrounded up to 2 inches					gray, few sandstone lenses, thin-		
agate matrix, clasts of petr		35	0		bedded, fissle, fossil plant fragments and roots in top of unit	4	5
811. Sandstone, medium-light-gra				3.	Coal, impure	7	2
medium-grained, thin-bed		1 1	0		Sandstone, white to light-gray, massive,		
bedded, silty812. Siltstone, light-olive-gray, thi		11	0		crossbedded, coal fragments, fine- to		•
ularly bedded, weathered -		1	10	5	medium-grained, silty	21	0
813. Shale, medium-gray, weather		1	6	5.	Shale, medium-gray to light-brown, upper 6 in carbonaceous	3	5
814. Sandstone, light-gray, very fithin and irregularly bedded	ine grained,	4	0	6.	Coal, slightly impure in basal 4 in, bright, fusain	1	0
815. Shale, medium-gray, weather	ed		10	7.	Shale, medium-gray, thin- and poorly		
816. Sandstone, light-gray, very fithin and irregularly bedded	, very silty-	3	0	8.	beddedSandstone, light-gray, very fine grained	1	0
817. Shale, medium-gray, silty, w		4	0		to fine-grained, massive, carbonaceous matter in upper 1 ft	13	0
818. Sandstone, light-gray, very fi thin and irregularly bed slightly iron stained	lded, silty,	1	6	9.	Shale, medium-gray with a few light- brownish-gray carbonaceous zones 6 in	13	Ū
819. Shale, medium-gray, benton		1	Ü		thick	9	0
ered		6	0	10.	Shale, carbonaceous, light-brownish-	2	2
820. Sandstone, light-gray, fine-gr				11	gray, fossil rootsCoal, bright, weathered, fragile	2	3 9
mineral grains, thin and bedded		3	6		Shale, light-brownish-gray to dark-gray, poorly bedded	2	5
821. Shale, medium-gray to light bentonitic, weathered		8	0	13.	Shale, medium-gray, bentonitic; 1-ft-		
822. Sandstone, light-gray, fine-gr		0	U		thick sandstone at top of unit	5	0
mineral grains, thin- to th					Shale, medium-grayShale, light-brownish-gray, carbona-	4	5
iron-stained		18	0	13.	ceous	1	0
823. Shale, light-olive-gray to me				16.	Shale, medium-gray, thick-bedded	5	0
silty, scattered sandstone 1 1½ ft thick, bentonitic		20	0		Shale, light-brownish-gray, fossil roots		5
824. Sandstone, very light gray, th			Ŭ		Coal, bright to impure, basal 2 in bony - Shale, medium-gray, bentonitic	1 9	4 0
very silty		1	0		Shale, grayish-brown, nonbedded, fossil	7	U
825. Shale, medium-gray to light	-olive-gray,			20.	roots		5
very silty, bentonitic		4	0		Coal, bright		3
826. Sandstone, light-gray, fine-		2	6	22.	Shale, medium-gray, thin and evenly bed-		
gray, dark mineral grains, r. 827. Siltstone, olive-gray, benton		3	6		ded, changes to light-brownish-gray upward	5	0
ered		6	6	23.	Shale, light-brownish-gray	J	5
828. Shale, dark-olive-gray to blace				24.	Coal, bright		7
ceous, poorly fissile, sca	attered coal		_	25.	Sandstone, white to medium-light-gray,		
lenses up to 1/4 in thick		3	6		very fine to fine-grained, massive, fri-	25	0
829. Siltstone, light-olive-gray, be Section truncated by sharp fold and		15+		26	able, dark mineral grains Shale, poorly bedded, fossil roots	23	8
			_		Coal, impure, sandy lenses	-	1
Total measured thicknes Meadows Formation -		61	<u>2</u> +		Sandstone, white, very fine to fine- grained, massive, crossbedded, calcar-		

		Thickr	ness			Thick	ness
		Ft	in			Ft	in
	eous lens 1 ft thick; channel filling sandstone wedges out to the east and			54.	Underclay, medium-gray, silty, hard, fos-		
	south	14	0		sil roots		9
29.	Shale, light-brownish-gray, fossil roots	3	Õ		Coal, bright to impure		6
30.	Coal, impure	•	5		Shale, medium-dark-gray, carbonaceous-	1	2
	Shale, medium-dark-gray, carbonaceous,		-	57.	Shale, medium-gray, silty, thin and evenly bedded	5	0
	bentonitic		7	58.	Sandstone, medium-gray, thin-bedded,	-	Ü
32.	Shale, light-brownish-gray, carbona-	_	•		very fine grained, silty, contorted bed-		
22	ceous, bentonitic	2	0		ding	5	5
	Shale, grayish-brown	1	0	59.	Shale, medium-gray, silty	2	0
34.	Sandstone, medium-light-gray, dark mineral grains, bentonitic	2	6	60.	Coal, bright		4
35	Shale, light-brownish-gray, carbona-	2	U		Shale, medium-gray, silty, thin-bedded	9	5
55.	ceous		6		Shale, medium-dark-gray, fossil roots		7
36.	Shale, medium-gray, bentonitic	14	Õ		Coal, bright to impure		4
	Shale, light-brownish-gray, carbona-			64.	Shale, medium-gray, thin and evenly bed-	. 1	2
	ceous	1	3	65	ded, light-brownish-gray, fossil roots - Sandstone, medium-light-gray, very fine	1 .	3
38.	Sandstone, light-gray, very fine to fine-			05.	grained, silty, thick-bedded, fossil		
	grained, dark mineral grains, bentoni-		_		roots	4	5
20	tic, shaly	6	0	66.	Shale, light-brownish-gray, carbona-	·	-
	Shale, light-brownish-gray		6		ceous	1	2
40.	Sandstone, light-gray, very fine to fine-			67.	Shale, black, coaly, impure, very fissile-		- 3
	grained, dark mineral grains, shaly, bentonitic, calcareous nodules	11	0	68.	Shale, medium-gray, thin-bedded	4	2
41.	Shale, light-brownish-gray, coaly	11	1	69.	Shale, medium-dark-gray to dark-gray,		
	Sandstone, medium-light-gray to medium-		•		resin blebs	2	- 2
	gray, very fine to fine-grained, silty,			70.	Shale, medium-greenish-gray to olive-	_	
	massive, friable	9	0	7.1	green, bentonitic	7	0
	Shale, medium-gray, bentonitic		5	/1.	Sandstone, medium-gray, very fine to		
44.	Coal, bright to dull, fusain, basal ½ ft				fine-grained, thin-bedded, contorted bedding, calcareous, few shaly zones		
	shaly and bony; 1-in-thick granular				locally fill a massive channel; 4-ft-		
	tonstein 1 ft 3 in above base; 1 ¹ / ₄ -in-				thick shaly zone 10 ft above base	17	0
	thick brown granular tonstein 8 in below top of unit (Woodruff and Win-			72.	Shale, brownish-gray	1	0
	chester, 1912, pl. L, no. 53)	3	3		Shale, medium-gray, thin-bedded, silty	6	0
45.	Shale, medium-gray, thin and evenly bed-	J			Sandstone, medium-gray, thin-bedded,		
	ded	1	6		very fine grained, silty	1	0
46.	Shale, medium-gray to medium-light-			75.	Shale, medium-gray, thin-bedded, silty	10	0
	gray, sandy, silty, bentonitic, interbed-				Sandstone, light-gray, silty, massive	16	0
	ded with sandstone and thin, carbona-	40	•	77.	Shale, medium-gray, thin-bedded, benton-	_	•
47	ceous shale	10	0	70	itic this hadded facil	7	0
47.	Sandstone, light-gray, fine-grained, dark mineral grains, bentonitic	15	0	70.	Shale, grayish-brown, thin-bedded, fossil roots	2	0
48	Shale, carbonaceous, light-brownish-	13	U	79	Coal, bright to dull, fusain, contains 1½-	2	U
,.,	gray	1	0	,,,	in-thick granular tonstein at top	1	8
49.	Sandstone, medium-light-gray to light-			80.	Shale; 4-in-thick light-brownish-gray to		
	gray, silty, shaly, calcareous nodules				medium-gray sandstone lens 1½ ft		
	up to 1 inch in diameter, bentonitic,				below top	4	0
	becomes medium-grained and darker	•		81.	Sandstone, medium-gray to medium-light-		
50	upward	30	0		gray, calcareous lenses up to 2 ft thick,		
30.	Shale, medium-dark-gray, carbonaceous, coaly, thin-bedded at base, nonbedded				very fine to fine-grained, thick-bedded, massive	5	0
	at top	1	6	82	Shale, medium-gray, thin-bedded	3	0
51.	Shale, medium-gray, medium-dark-gray	•	Ů		Shale, light-brownish-gray, carbona-	Ü	Ŭ
	and light-greenish-gray, bentonitic				ceous, thin-bedded, fossil roots	1	0
	with sandstone lenses; 5-ft-thick sandy			84.	Coal, bright to dull, fusain; 2-in-thick		
	zone 10 ft above base; 6-in-thick dark-				granular tonstein at top	2	4
	gray, carbonaceous shale zone 17 ft			85.	Shale, light-brownish-gray, carbona-		_
	above base; 7-ft-thick medium-			0.0	ceous, thin-bedded		2
	grained, light-gray, sandy zone 25 ft above base	45	Λ	80.	Sandstone, medium-gray, very fine grained, thin-bedded	1	0
52	Sandstone, light-gray, bentonitic, very	43	0	27	Shale, medium-gray; 1-in-thick calcare-	1	U
52.	fine to fine-grained, thin-bedded	11	0	07.	ous layers, light-greenish-gray; thin		
53.	Shale, medium-gray, silty, bentonitic	16	5		bedded at top	9	0
	<u> </u>				•		

		Thick	ness			Thick	ness
00	Sandaran and Paris and Paris	Ft	in			Ft	in
88.	Sandstone, medium-gray to medium-light- gray, very fine to fine-grained, calcar- eous lenses 3 ft thick, irregular, thick-				Shale, light-brownish-gray, carbona- ceous		4
	bedded	5	5	121.	Sandstone, medium- to medium-light-		
89.	Shale, medium-gray, silty, sandy	5	0		gray, calcareous nodules up to 3 ft in		
90.	Sandstone, medium-gray, very fine to				diameter, very fine grained to fine-		
	fine-grained, thin-bedded	15	0		grained, few lenses of light-greenish-		_
91.	Shale, light-brownish-gray, carbona-			100	gray shale in basal 1 ft, silty	25	0
0.0	ceous	1	4	122.	Shale, medium-gray to light-greenish-		
	Shale, medium-gray, bentonitic	2	9	100	gray	1	1
93.	Sandstone, medium-gray, very fine			123.	Shale, light-brownish-gray, carbona-		_
04	grained, thin-bedded		4	124	ceous, fossil roots Coal, bright to dull, resin blebs		2 8
94.	Shale, medium-gray, thin-bedded, benton-	_	^		Shale, light-brownish-gray to medium-		0
05	Shale, light-brownish-gray, carbona-	6	0	125.	dark-gray		4
93.	Shale, light-brownish-gray, carbona- ceous		3	126	Siltstone, medium-gray, very fine		4
96	Shale, light- to medium-light-gray, ben-		3	120.	grained, silty, sandy	3	5
, , ,	tonitic, gypsum crystals	3	0	127.	Shale, light-brownish-gray, carbona-	,	3
97.	Shale, light-brownish-gray to brown, very	3	U		ceous, fossil roots		8
	carbonaceous, resin blebs	1	4	128.	Coal, impure		3
98.	Coal, impure, canneloid, shaly	-	7		Shale, light-brownish-gray, thin-bedded,		
	Shale, medium-gray, bentonitic	16	0		carbonaceous		7
100.	Shale, medium-gray, silty, sandy	5	0	130.	Shale, light-greenish-gray to medium-		
101.	Sandstone, medium-gray, very fine				gray, thin-bedded, silty	1	3
	grained, thin-bedded		8	131.	Sandstone, medium-light-gray, very fine		
	Shale, medium-gray, silty, thin-bedded	2	0		to fine-grained, silty, thin-bedded,		
103.	Shale, light-brownish-gray, fossil roots		6		shaly	11	0
104.	Coal, bright, resin blebs in base, fusain,			132.	Shale, light-greenish-gray, medium-gray,		
	locally 1-in-thick tonstein 7 in below			100	calcareous	17	0
105	top, occasional petrified wood at base-	1–3		133.	Sandstone, medium-light-gray to medium-		
105.	Shale, light-brownish-gray, carbona-		_		gray, very fine to fine-grained, silty,	10	_
106	Ceous		5	124	thin-bedded, shaly	12	0
100.	Sandstone, medium-light-gray, very fine			134.	Shale, light-greenish-gray to medium-	3	0
	grained, silty, shaly, dark mineral grains bentonitic	25	0	135	gray, silty, thin and evenly bedded Sandstone, medium-light-gray, very fine	3	U
107.	Shale, medium-gray to light-olive-gray,	23	U	133.	to fine-grained, silty, massive, calcar-		
	bentonitic	9	0		eous nodules; lens-shaped bedding up		
108.	Sandstone, medium-gray to medium-light-		·		to 3 ft thick, dark mineral grains,		
	gray, very fine to fine-grained, silty,				crossbedded	60	0
	massive	24	0	136.	Shale, light-greenish-gray to medium-		
109.	Shale, medium-gray, silty, sandy, benton-				gray, calcareous, thin and evenly bed-		
	itic, contains 6-in-thick carbonaceous				ded	17	0
	shale 11/2 ft above base of unit, iron-			137.	Shale, light-brownish-gray, carbona-		
	stones	8	0		ceous	3	2
110.	Sandstone, medium-light-gray, very fine			138.	Shale, medium-gray, silty, sandy, thin		
	to fine-grained, dark mineral grains,	10	^	100	and evenly bedded	5	0
111	Shale gravish harves and an arrival	10	0	139.	Sandstone, medium-gray, thin-bedded,		^
111.	Shale, grayish-brown, carbonaceous, thin-bedded		2	140	very fine grained, calcareous	1	0
112			2	140.	Shale, medium-gray, thin and evenly bed-	4	Λ
112.	Shale, light-greenish-gray, thin and evenly bedded, calcareous	10	Λ	141	ded, silty	4	0
113	Shale, light-brownish-gray, carbona-	10	0	141.	Shale, medium-gray, thin and evenly bed- ded, silty		7
115.	ceous, fossil roots		9	142	Coal, bright		7 8
114.	Coal, bright		3		Shale, light-greenish-gray to medium-		U
	Shale, medium-gray, thin-bedded, silty,		,	145.	gray, thin and evenly bedded	1	2
	sandy, with sandstone lenses	2	4	144.	Limestone, medium-gray, silty, brittle,	•	_
116.	Shale, light-brownish-gray, carbona-	_	•	± • • • •	weathers brown	1	0
	ceous, thin-bedded, fossil roots		3	145.	Shale, medium-gray, medium-dark-gray,	•	J
117.	Coal, bright to dull, impure, bony, resin				and light-greenish-gray, few carbona-		
	blebs		8		ceous zones	12	0
118.	Shale, dark-gray, nonbedded, very car-			146.	Siltstone, calcareous, sandy, shaly, thin		
	bonaceous		8		and evenly bedded	5	0
119.	Shale, light-greenish-gray, silty, thin and			147.	Shale, light-greenish-gray to medium-		
	evenly bedded	1	6		gray, silty	3	0

		Thick	ness		Thick	ness
		Ft	in		Ft	in
148.	Shale, light-brownish-gray, carbona-			bedding, pebble conglomerate contain-		
140	ceous, fossil roots		9	ing pyrite nodules and fossil bone.		
	Coal, weathered, impureShale, dark-brown, carbonaceous, inter-		21/2	Base undulates; chaotic deposition 130		
150.	bedded volcanic ash and tonstein, coal			ft above base, friable and silty, with		
	fragments, thin-bedded	1	0	lenses of heavy minerals; 200 ft above		
151.	Sandstone, medium-light-gray, very fine			base, sandstone is white to light gray,		
	to fine-grained, massive, crossbedded,			thick bedded, massive; 5-ft medium- gray shale lens at 225 ft above base; 35		
	calcareous nodules up to 3 ft in diam-	_	_	ft of medium-gray shale 245 ft above		
152	Shala light granish gray to madium	6	5	base	545	0
132.	Shale, light-greenish-gray to medium- gray, thin and evenly bedded	5	0	Total measured thickness of Lance	3 13	_
153.	Shale, light-brownish-gray, carbona-	3	v	Formation	545	0
	ceous, fossil roots	1	5	= = = = = = = = = = = = = = = = = = = =		$\stackrel{0}{=}$
	Coal, bright, resin blebs, fusain	1	2			
155.	Shale, light-brownish-gray, carbona-		_			
150	Chala Links and all and a line and a large		9			
156.	Shale, light-greenish-gray, silty, calcare- ous, thin and evenly bedded	1	6			
157.	Sandstone, medium-light-gray to white,	1	U	Measured section 22: Frontier Formation and	Cody	
10,,	massive, friable, very fine to fine-			Shale		
	grained, silty, calcareous nodules up to			Location: Blue Holes Quadrangle, Wyoming (7.5 min)	fuom al	daa4 4a
	3 ft in diameter	30	0	Start: SW-SW-NE sec. 5, T. 5 N, R. 5 W. Presented youngest	HOIH O	uest to
158.	Shale, light-greenish-gray, calcareous,	-	0	End: SE-SW-NE sec. 5, T. 5 N, R. 5 W.		
150	thin and evenly bedded	7	0	Described by: J.F. Windolph, Jr.		
139.	Shale, light-brownish-gray, thin and evenly bedded, carbonaceous	1	0	Strike 110°, Dip 45° NE.		
160.	Shale, medium-gray, thin and evenly bed-	•	U	Upper Cretaceous:	Thick	ness
	ded, silty	2	6	Frontier Formation:	Ft	in
161.	Sandstone, medium-light-gray to light-			1. Shale, dark-gray to black, bentonitic, car-		
	gray, very fine to fine-grained, mas-			bonaceous, few coal lenses	2	0
	sive, few calcareous lenses, crossbed-			2. Sandstone, medium-light-gray, very fine		
	ded, few ironstone pebble conglomerate zones, friable	70	0	to fine-grained, crossbedded, thin- bedded	1	3
162.	Shale, light-greenish-gray to medium-	70	U	3. Shale (underclay), light-brownish-gray,	•	,
	gray, silty, thin and evenly bedded,			sandy, thin-bedded, fossil roots		6
	calcareous	1	6	4. Coal, bright, faulted, sheared	2	0
163.	Shale, light-brownish-gray, carbona-			5. Sandstone, medium-light-gray, very fine		4
164	Ceous		9	to fine-grained, lens-shaped bed 6. Shale, light-brownish-gray, thin-bedded;		4
104.	Shale, light-greenish-gray to medium- gray, silty, thin and evenly bedded,			few 2-in-thick silty sandstone beds in		
	calcareous	2	4	upper 1 ft	3	0
165.	Shale, light-brownish-gray, fissile, car-	_	•	7. Sandstone, medium-light-gray, very fine		
	bonaceous	1	0	to fine-grained, silty, few light-		
166.	Shale, light-greenish-gray, silty, thin and	_		brownish-gray shale laminae	5	8
167	evenly bedded, calcareous	5	0	8. Shale, light-brownish-gray, thin-bedded, carbonaceous, fossil root prints		8
107.	Sandstone, medium-light-gray, very fine grained, silty, thin-bedded		9	Base of Wilderness coal bed		U
168.	Shale, light-brownish-gray to dark-			9. Coal, bright to dull, fusain, cleats 40° at		
	brown, very carbonaceous, coaly, resin			90° and 140° at 45° SW., gypsum		
	blebs	2	1	crystals in cleats, basal 2 in shaly	2-4	
169.	Shale, light-greenish-gray to medium-	_	_	Top of Wilderness coal bed		
170	gray, silty, calcareous Shale, light-brownish-gray, carbona-	5	0	10. Sandstone, medium-light-gray, very fine		
170.	ceous, fossil roots		6	to fine-grained, thin-bedded, carbona- ceous lenses, crossbedding, layer of		
171.	Coal, impure, shaly, channels in upper		O	black, rounded quartz pebbles at top of		
	surface filled by unit 172, locally up to			bed, pebbles up to 1½ inches in diam-		
	1 ft thick		_4	eter	1	9
	Total measured thickness of Mee-	04:		11. Shale, medium-gray, thin and evenly bed-		
Uncor	teetse Formation	944	<u>11</u>	ded, calcareous; 2-in-thick medium-	4	Λ
	Formation:			grained sandstone in upper 3 in, silty- 12. Coal, bright	4	0 4
	Sandstone, light-yellow-brown, massive,			13. Sandstone, medium-light-gray, very fine		7
- -	contorted bedding, high-angle cross-			to fiZne-grained, massive	8	0
				•		

14. Shale, medium-gray to medium-dark gray, thin-bedded, sily, slightly carbonaccous 30			Thick	ness		Thick	ness
gray, thin-bedded, slightly carbon nobed ded ded ded ded ded ded ded ded ded			Ft	in		Ft	in
naceous — 30 0 15. Shale, light-greenish-gray, soft, nonbedded — 31 2 16. Shale, medium-gray to medium-dark gray, silty, slightly carbonaceous — 61 8. Shale, medium-gray to light-brownish-gray, silty, sliphdy carbonaceous — 61 8. Shale, medium-gray to light-brownish-gray, silty, thin-bedded, slightly carbonaceous hale layers up to 2 in thick, crossbedded — 62 18. Shale, dark-brown, carbonaceous shale layers very fine grained, silty, crossbedded, shale to dark-brown, consume at lop of unitable dedded — 62 18. Shale, black to dark-brown, consumeration — 63 18. Shale, medium-gray to medium-light-gray, fine-to medium-granied, fermignious, thick bedded — 62 18. Shale, light-greenish-gray, carbonaceous shale layers very fine grained, silty, carbonaceous laminate; medium-gray shale, coal fragments, crossbedded, thin bedded — 62 18. Shale, medium-gray to medium-grained, dering spray, carbonaceous, sandy— 63 18. Shale, medium-gray to light-brownish-gray, carbonaceous, shale lenses in basal 7 ft, upper 10 ft thin bedded — 63 18. Shale, medium-gray to light-brownish-gray, very carbonaceous, shale lenses in basal 7 ft, upper 10 ft thin bedded — 63 18. Shale, medium-gray to light-brownish-gray, very carbonaceous, shale lenses in basal 7 ft, upper 10 ft thin bedded — 63 18. Shale, medium-gray to light-brownish-gray, very carbonaceous, shale lenses in basal 7 ft, upper 10 ft thin bedded — 63 18. Shale, medium-gray to light-brownish-gray, very carbonaceous, shale lenses in basal 7 ft, upper 10 ft thin bedded — 63 18. Shale, medium-gray to light-brownish gray, very carbonaceous, shightly coaly — 63 18. Shale, medium-gray to medium-dark-gray to medium-dark-gray carbonaceous, shightly carbon	14.				38. Bentonite, medium-gray	7	0
15. Shale, light-greenish-gray, soft, nonbed ded ded ded ded gray, silty, slightly carbonaceous. 16. Shale, medium-gray to medium-dark gray, silty, thin-bedded, slightly carbonaceous medium-gray, very fine grained, silty, thin-bedded, slightly carbonaceous medium-gray to light-brownish-gray, silty, thin-bedded, slightly carbonaceous shale layers up to 2 in thick, crossbedded layers up to 2 in thick, crossbedded silty, carbonaceous and coal larninae at top of unit-dark-gray, carbonaceous shale layers up to 2 in thick are silty, carbonaceous shale layers, very fine grained, silty, carbonaceous sandy shale, coal fragments, crossbedded, thin bedded coal silty, carbonaceous shale larninations in the upper 2 ft. 25. Shale, light-greenish-gray to white limestone nodules 5 ft and 10 ft above base—29. Sandstone, medium-gray to light-brownish-gray, thin-bedded, thin bedded crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft, upper 10 ft thin bedded crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft, upper 10 ft thin bedded crossbedded, shale chips, sandstone, medium-gray to light-brownish-gray, thin-bedded, silghtly bentonitic, few shale lenses; of thin bedded crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft, upper 10 ft thin bedded crossbedded, shale chips, sandstone, medium-gray to inthe bedded crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft, upper 10 ft thin bedded crossbedded, shale chips, sandstone medium-gray to dark-gray, crossbedded, shale chips, sandstone medium-gray to dark-gray, crossbedded, shale chips, sandstone medium-gray to			••			50+	
ded			30	0	•		
16. Shale, medium-gray to medium-dark-gray, sitly, slightly carbonaceous prained, sitly, thin-bedded slightly carbonaceous medium-gray to light-brownish-gray, sitly, thin-bedded, sightly carbonaceous shale layers up to 2 in thick, crossbedded as layers, very fine grained, sitly, crossbedded, shale chips, sandstone, medium-gray to medium-gray, very fine grained, sitly, carbonaceous laminaer medium-gray shale, coal fragments, crossbedded, thin bedded, crossbedded, shale chips, sandstone, medium-gray to light-prownish-gray, to thin-bedded, crossbedded, thin bedded, crossbedded, shale chips, sandstone, medium-gray to light-greenish-gray to medium-gray, thin-bedded, crossbedded, thin bedded, crossbedded, thin bedded, crossbedded, thin bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedded, shale chips, sandstone, medium-gray to light-brownish-gray, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedded, shale chips, sandstone, medium-gray, to light-brownish-gray, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedding, very fine grained, thin-bedded, crossbedded, thin-bedded, crossbedding, very fine grained, thin-bedded, crossbedded, thin-bedded, crossbedded, thin-bedded, crossbedding, very fine grained, thin-bedded, crossbedding, very fine grained, thin-bedded, crossbedding, v	15.			•	Shale	<u>74</u> +	_
gray, silty, slightly carbonaceous— 18. Shale, medium-gray to light-brownish- gray, silty, thin-bedded. 19. Sandstone, medium-gray to medium-light- gray, thin-bedded, very fine to fine- grained, few fissile carbonaceous shale layers up to 2 in thick, crossbedded— 20. Shale, dark-brown, carbonaceous, sandy— 21. Sandstone, medium-gray, few carbona- ceous shale layers, very fine grained, silty, crossbedded, thin-bedded, carbonaceous shale layers, very fine grained, silty, crossbedded, thin-bedded, carbonaceous shale layers, were fire freinginous, thick- bedded—————————————————————————————————	16		1	2	Unconformity		
Indian Meadows Formation: gray, very fine grained, sity, thin-bedded, slightly carbonaccous	10.		2	n	Lower Eocene (Basal conglomerate):		
grained, silty, thin-bedded. —————————————————————————————————	17.		2	U	Indian Meadows Formation:		
Shale, medium-gray to light-brownish-gray, silty, thin-bedded, slightly carbonaceous smale layers up to 2 in thick, crossbedded - 2. Shale, dark-brownish-gray, thin-bedded, carbonaceous shale layers, very fine grained, silty, crossbedded, thin bedded - 2. Shale, dark-brownish-gray, tendium-gray to medium-light-gray, fine to medium-grained, ferruginous, thick-bedded - 2. Shale, light-greenish-gray, carbonaceous, sandy - 2. Shale, dark-brownish-gray, tendium-gray to medium-light-gray, fine to medium-gray to medium-light-gray, fine to medium-gray to medium-gray to medium-gray, carbonaceous, sandy - 2. Shale, medium-gray to light-brownish-gray, thin-bedded, few zones of light-gray, fine to medium-gray to light-brownish-gray, thin-bedded, few zones of light-gray, fine to medium-gray to light-brownish-gray, thin-bedded, few zones of light-gray, fine to medium-gray to light-brownish-gray, thin-bedded, shale chips, sandstone, medium-gray to light-brownish-gray, thin-bedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded - 2. Shale, medium-gray to light-brownish-gray, thin-bedded - 2. Shale, medium-gray to light-brownish-gray, thin-bedded, slightly carbonaceous, sli				6			
naceous maction—gray to medium-lightgray, thin-bedded, very fine to fine-grained, few fissite carbonaceous shale layers up to 2 in thick, crossbedded—12. Sandstone, medium-gray, few carbonaceous shale layers, very fine grained, silty, crossbedded, thin-bedded, carbonaceous and coal laminae at top of unit—22. Shale, black to dark-brownish-gray to medium-gray for medium-gray few carbonaceous and coal laminae at top of unit—23. Sandstone, medium-light-gray, fine-to medium-grained, ferruginous, thick-bedded—————————————————————————————————	18.	Shale, medium-gray to light-brownish-					
19. Sandstone, medium-gray to medium-light-gray, thin-bedded, carbonaceous shale layers up to 2 in thick, crossbedded. 20. Shale, dark-brown, coaly carbonaceous shale layers up to 2 in thick, crossbedded, carbonaceous shale layers, very fine grained, silty, crossbedded, thin-bedded, carbonaceous shale layers, very fine grained, silty, crossbedded, thin-bedded, carbonaceous dark-gray, carbonaceous, sandy. 21. Sandstone, medium-gray fine-to medium-dark-gray to medium-dark-gray to medium-light-gray, very fine grained, silty, carbonaceous laminae; medium-gray shale, coal fragments, crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded. 22. Shale, medium-gray to light-brownish-gray, thin-bedded —————————————————————————————————					Measured section 23: Frontier Formation and	India	1
gray, thin-bedded, very fine to fine-grained, few fissile carbonaceous shale layers up to 2 in thick, crossbedded - 20. Shale, dark-brown, carbonaceous, sandy-ceous shale layers, very fine grained, silty, crossbedded, thin-bedded - 42. Shale, light-greenish-gray, to medium-grained, ferruginous, thick-bedded - 53. Sandstone, medium-light-gray, fine-to medium-gray, carbonaceous - 25. Shale, light-greenish-gray, carbonaceous, sandy - 25. Shale, light-greenish-gray, carbonaceous, sandy - 27. Sandstone, medium-light-gray, very fine grained, silty, carbonaceous laminaer, medium-gray to medium-gray, carbonaceous, sandy - 27. Sandstone, medium-light-gray, very fine grained, silty, carbonaceous laminaer, medium-gray to medium-gray, carbonaceous laminaer, medium-gray to medium-gray, carbonaceous laminaer, medium-gray, carbonaceous laminaer, medium-gray, carbonaceous laminaer, medium-gray, carbonaceous shale laminations in the upper 2 ft - 28. Shale, medium-gray to light-brownish-gray, thin-bedded, crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded - 20. Shale, medium-gray to light-brownish-gray, thin-bedded - 20. Shale, medium-gray to medium-gray to medium-gray to light-brownish-gray, thin-bedded - 20. Shale, light-brownish-gray, thin-bedded - 20. Shale, light-brownish-gray, thin-bedded, carbonaceous slightly conductable devices of light greenish-gray to medium-gray to medium-gray to medium-gray to light-brownish-gray, thin-bedded, slightly forms resistant ledge, crossbedded, massive, thin-bedded, slightly forms resistant ledge, crossbedded, massive, thin-bedded, slightly forms resistant ledge, crossbedded, massive, thin-bedded, crossbedded, slight-greenish-gray, to medium-gray to medium-gray to light-brownish-gray, thin-bedded, slightly bentonitic, few shale lenses,	10		24	0	Meadows Formation		
grained, few fissile carbonaceous shale layers up to 2 in thick, crossbedded - 20. Shale, dark-brown, carbonaceous, sandy-21. Sandstone, medium-gray, few carbonaceous and coal laminae at top of unit-22. Shale, black to dark-brown, coaly - 23. Sandstone, medium-light-gray, bentonitic - 24. Shale, light-greenish-gray, carbonaceous, sandy-25. Shale, dark-brownish-gray to medium-dark-gray, carbonaceous, sandy-26. Shale, light-greenish-gray, carbonaceous, sandy-27. Sandstone, medium-gray to light-brownish-gray, thin-bedded, few zones of light-greenish-gray to hin-bedded, crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-crossbedded, shale, medium-gray to light-brownish-gray, thin-bedded-crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-crossbedded, shale chips, sandstone ledge at top of unit-crossbedded, shale crossbedded, shale crossbedded shale crossbedded shale crossbedded shale crossbedded shale crossbedded sh	19.						
layers up to 2 in thick, crossbedded						from o	dest to
20. Shale, dark-brown, carbonaccous, sandy- 21. Sandstone, medium-gray, few carbonaccous and coal laminae at top of unit- 22. Shale, black to dark-brown, coaly- 23. Sandstone, medium-light-gray, fine- to medium-grained, dark-gray, carbonaccous- 24. Shale, light-greenish-gray to medium-dark-gray, carbonaccous, sandy- 25. Shale, adark-brownish-gray to medium-dark-gray, carbonaccous, sandy- 26. Shale, medium-gray to medium-light-gray, very fine grained, silty, carbonaccous and coal laminae; at top ded- 27. Sandstone, medium-gray to medium-light-gray, thin-bedded, thin bedded- 28. Shale, medium-gray to light-brownish-gray, thin-bedded, few zones of light-greenish-gray to white limestone nodules 5 ft and 10 ft above base- 29. Sandstone, medium-light-gray to white limestone chips, coal fragments, crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded- 29. Shale, medium-gray to light-brownish-gray, thin-bedded- 29. Shale, medium-gray to dark-gray, very carbonaccous, slightly coaly- 29. Shale, medium-gray to dark-gray, very carbonaccous, slightly coaly- 29. Shale, medium-gray to dark-gray, very carbonaccous, slightly coaly- 29. Shale, medium-gray to medium-dark-gray, thin-bedded- 20. Shale, medium-gray to medium-dark-gray, thin-bedded- 21. Shale, medium-gray to medium-dark-gray, thin-bedded- 22. Shale, medium-gray to medium-light-gray fine-bedded- 23. Sandstone, medium-light-gray fine-bedded, thin bedded- 24. Shale, medium-gray to light-brownish-gray to olive-gray, bentonitic, few shale lenses; 6-in-thick, thin-bedded, slightly bentonitic, few shale lenses; 6-in-thick, thin-bedded, massive, thin-bedded, slightly bentonitic, few shale lenses; 6-in-thick, thin-bedded, massive, thin-bedded, carbonaccous, nonbedded coarbonaccous, nonbedded coarbonaccous, nonbedded coarbonaccous, slightly coaly- 29. Shale, medium-gray to light-brownish-gray, thin-bedded, mentonitic, gypsum crystals, fossil plant fragments, coarbonaccous, slightly coaly- 29. Shale, medium			Q	Λ			
21. Sandstone, medium-gray, few carbonaceous shale layers, very fine grained, silty, crossbedded, thin-bedded, carbonaceous and coal laminae at top of unitbebedded. 22. Shale, light-greenish-gray, pentonitic-bedded-shale pray, carbonaceous-bale dead-shale pray to medium-gray to medium-gray to medium-gray to make minimage and loft above base-bale coal fragments, crossbedded, thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal stagments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, coal fragments in urbble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded-shale chips, sandstone,	20.						
ceous shale layers, very fine grained, silty, crossbedded, thin-bedded, carbonaceous and coal laminae at top of unit- 22. Shale, black to dark-brown, coaly————————————————————————————————————			_	Ü	Strike 140°, Dip 40° NE.		
Silty, crossbedded, thin-bedded, carbonaccous and coal laminea at top of unit- 22. Shale, black to dark-brown, coaly — 2 2 2 5 N.E. — 6 6 23. Sandstone, medium-light-gray, fine- to medium-grained, ferruginous, thick-bedded — 2 2 0 2 5 25. Shale, dark-brownish-gray to medium-dark-gray, carbonaceous, sandy — 2 5 26. Shale, light-greenish-gray to medium-light-gray, very fine grained, silty, carbonaceous sandy — 2 5 27. Sandstone, medium-gray to medium-light-gray, very fine grained, silty, carbonaceous laminae; medium-gray shale, coal fragments, crossbedded, thin bedded ded — 2 5 28. Shale, medium-gray to light-brownish-gray to white limestone nodules 5 ft and 10 ft above base— 2 29. Sandstone, medium-light-gray to light-gray, fine- to medium-grained, dark mineral grains, massive to thin-bedded; crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded— 3 30. Shale, medium-gray to light-brownish-gray to light-brownish-gray to light-brownish-gray to light-brownish-gray to medium-dark-gray to dark-gray, very carbonaceous, slightly coaly — 1 31. Shale, medium-gray to light-brownish-gray, thin-bedded, carbonaceous, slightly coaly — 1 32. Shale, medium-gray, thin-bedded— 33. Sandstone, medium-light-gray, redium-to fine-grained, thin-bedded— 34. Shale, medium-gray to medium-dark-gray to medium					Unner Cretaceous:	Thickn	000
naceous and coal laminae at top of unit- 2. Shale, black to dark-brown, coaly					= -		in
23. Sandstone, medium-light-gray, fine- to medium-grained, ferruginous, thick-bedded			49			••	
medium-grained, ferruginous, thick-bedded				2	25° N.E	6	0
bedded	23.				2. Shale, olive-brown to dark-brownish-		
24. Shale, light-greenish-gray, bentonitic			1	8			
25. Shale, dark-brownish-gray to medium-dark-gray, carbonaceous. 26. Shale, light-greenish-gray, carbonaceous, sandy	24.					40	0
dark-gray, carbonaceous - 2 5 Shale, light-greenish-gray to medium-light-gray, very fine grained, silty, carbonaceous laminae; medium-gray shale, coal fragments, crossbedded, thin bedded			-	Ü			
sandy			2	5			
27. Sandstone, medium-gray to medium-light-gray, very fine grained, silty, carbonaceous laminae; medium-gray shale, coal fragments, crossbedded, thin bedded—————————————————————————————————	26.						
gray, very fine grained, silty, carbonaceous laminae; medium-gray shale, coal fragments, crossbedded, thin bedded—————————————————————————————————		•	1	7		15	0
gray, very limite grained, silty, catobacted ded coal fragments, crossbedded, thin bedded ded coal fragments in thin bedded ded coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded coal fragments in rubble zone, shale, medium-gray to light-brownish-gray, thin-bedded coal fragments in rubble zone, shale, medium-gray to dark-gray, very carbonaceous, slightly coaly coal solution fine-grained, thin-bedded coal solution for fine-grained, thin-bedded coal solution for fine-grained, thin-bedded coal solution from the fine-grained, thin-bedded coal solution from the fine-grained, thin-bedded coal solution from the fine-grained discoal solution from the fine-grained discoal solution from the fine-grained discoal coal solution from the fine fine fine from the fine fine fine fine fine fine fine fin	27.					15	Ü
coal fragments, crossbedded, thin bedded							
28. Shale, medium-gray to light-brownish-gray, thin-bedded, few zones of light-greenish-gray to white limestone nodules 5 ft and 10 ft above base							
28. Shale, medium-gray to light-brownish-gray, thin-bedded, few zones of light-greenish-gray to white limestone nodules 5 ft and 10 ft above base			11	0			
gray, timi-bedded, experish-gray to white limestone nodules 5 ft and 10 ft above base	28.	Shale, medium-gray to light-brownish-				40	^
bentonitic — 4 29. Sandstone, medium-light-gray to light-gray, fine- to medium-grained, dark mineral grains, massive to thin-bedded; crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded—————————————————————————————————						40	0
29. Sandstone, medium-light-gray to light-gray, fine- to medium-grained, dark mineral grains, massive to thin-bedded; crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded			•			4	0
gray, fine- to medium-grained, dark mineral grains, massive to thin-bedded; crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded	20		20	Ü		•	•
mineral grains, massive to thin-bedded; crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded	29.				ceous, nonbedded		4
crossbedded, shale chips, sandstone chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded					7. Siltstone and tonstein; Siltstone—light-		
chips, coal fragments in rubble zone, shale lenses in basal 7 ft; upper 10 ft thin bedded					· · · · · · · · · · · · · · · · · · ·		
thin bedded							
30. Shale, medium-gray to light-brownishgray, thin-bedded, carbonaceous						1	6
21. Shale, medium-dark-gray to dark-gray, very carbonaceous, slightly coaly 1 0 10. Shale, medium-gray, thin-bedded 3 5 10. Shale, medium-gray, thin-bedded 3 5 11. Sandstone, medium-light-gray, medium-to fine-grained, thin-bedded 3 0 11. Sandstone, light-gray, thin-bedded, small-scale crossbedding, very fine grained, silty, carbonaceous laminae, shale interbeds 2 12. Shale (underclay), light-brownish-gray,	20		30	0		1	U
31. Shale, medium-dark-gray to dark-gray, very carbonaceous, slightly coaly 1 0 32. Shale, medium-gray, thin-bedded 3 5 33. Sandstone, medium-light-gray, medium-to fine-grained, thin-bedded 3 0 34. Shale, medium-gray to medium-dark-gray, carbonaceous 16 Total measured thickness of Frontier Formation 151 7 9. Shale, light-greenish-gray, nonbedded, bentonitic	<i>3</i> 0.		0	0			4
very carbonaceous, slightly coaly 1 0 32. Shale, medium-gray, thin-bedded 3 5 Sandstone, medium-light-gray, medium-to fine-grained, thin-bedded 3 0 34. Shale, medium-gray to medium-dark-gray, carbonaceous 16 Total measured thickness of Frontier Formation 151 7 10. Shale, dark-brownish-gray, thin-bedded, carbonaceous, silty and sandy at top 1 11. Sandstone, light-gray, thin-bedded, small-scale crossbedding, very fine grained, silty, carbonaceous laminae, shale interbeds 2 12. Shale (underclay), light-brownish-gray,	31		9	U	9. Shale, light-greenish-gray, nonbedded,		
32. Shale, medium-gray, thin-bedded 3 5 carbonaceous, silty and sandy at top 1 1. Sandstone, light-gray, thin-bedded, small-scale crossbedding, very fine grained, silty, carbonaceous laminae, shale interbeds 2 Shale (underclay), light-brownish-gray,	31.	- · · · · · · · · · · · · · · · · · · ·	1	0			7
33. Sandstone, medium-light-gray, medium- to fine-grained, thin-bedded	32.						•
34. Shale, medium-gray to medium-dark-gray, carbonaceous						1	3
gray, carbonaceous laminae, shale interbeds			3	0			
Total measured thickness of Frontier Formation 151 7 interbeds 2 12. Shale (underclay), light-brownish-gray,	34.			_			
Formation 151 7 12. Shale (underclay), light-brownish-gray,			16	_0		2	4
			151	7			
		:	131	<u> </u>	very silty, very sandy, fossil roots;		
Cody Shale: 4-in-thick sand lenses; dark-gray car-				0			
35. Limestone, medium-gray, silty				ð		2	5
36. Shale, medium-gray, thin-bedded, bento- nitic, gypsum 6 0 Base of Wilderness coal bed	<i>5</i> 0.		6	0		2	5
37. Ironstone, very dark gray, silty, carbona- 13. Coal, basal 5 in dull, shaly, few \(\frac{1}{4}\)-in	37.		J	J			
ceous 4 shale partings in basal 6 in; 11/4-in-				4			

thick shale parting 8 in below top of unit————————————————————————————————————			Thick	ness		Thick	ness
unit			Ft	in		Ft	in
Top of Wilderness coal bed 14. Shale, medium-gray, nonbedded, bentonic ic							0
14. Shale, medium-gray, combonaceous, thin-bedded soft medium-gray, very fine to fine-grained, shale chips in lens-shaped beds medium-gray, try fine to fine-grained, shale chips in lens-shaped beds medium-gray, try fine to fine-grained, shale chips in lens-shaped beds medium-gray, try fine to fine-grained, silty, crossbedded, upper 1 ft medium-grained with bedded medium-gray, carbonaceous, thin-bedded soft medium-gray, very fine grained, silty, crossbedded, thin-bedded medium-gray, try fine grained, silty, crossbedded, thin-bedded medium-gray, try fine grained, silty, crossbedded, thin-bedded at top-medium-gray, try fine grained, silty, crossbedded, thin-bedded at top-medium-gray to medium-gray to medium-gray, try fine to fine-grained, silty, very fine to medium-gray, try, try fine to fine-grained, silty, very fine to medium-gray, try, thin-bedded, calcareous nodules, fraible—medium-gray to medium-gray, try, fine to fine-grained, silty, very fine to fine-grained, silty, very fine to fine-grained, silty, very fine to fine-grained, silty, crossbedded gray, carbonaceous, thin-bedded gray, carbonaceous, thin-bedded gray, carbonaceous shale. 2 S. Shale, medium-gray, try to medium-gray to medium-gray to medium-gray to medium-gray to medium-gray to medium-gray, try, fine to fine-grained, silty, try, or fine grained, thin-bedded gray, carbonaceous shale. 2 S. Shale, medium-gray, try fine grained, thin-bedded, gray, very fine to fine-grained silty, crossbedded grained, gray, very fine to fine-grained gray to grained, thin-bedded, gray, carbonaceous shale with medical gray to gray t	Тор		1	7	36. Limestone, white, silty and sandy at base-	4	
thin-bedded 16. Sandstone, medium-gray, very fine to fine-grained, shale-thy isn lens-shaped beds 17. Shale, medium-gray, thin and evenly bedded 18. Sandstone, medium-light-gray, very fine grained, shilty, crosshedded, upper 1 ft medium-grained 29. Shale, medium-gray, carbonaecous, thin-bedded 20. Sandstone, medium-gray, carbonaecous, thin-bedded 21. Ironstone band, black, sandy, hard 22. Shale, medium-gray, thin-bedded to non-bedded at top-most fine the grained, shilty, crosshedded, thin-bedded 23. Shale, dark-gray to black, very carbonaecous, thin-bedded 24. Sandstone, medium-light-gray to light-gray, very fine to fine-grained, shilty. Crosshedded 25. Shale, medium-gray, thin-bedded coaly 26. Shale, medium-gray to medium-light-gray, very fine to fine-grained, thin-to thick-bedded, calcarcos nodules, friable 27. Sandstone, medium-light-gray to medium-gray, very fine to fine-grained, thin-to thick-bedded, calcarcos nodules, friable 28. Shale, medium-gray, thin and evenly bedded 29. Shale, light-brownish-gray, carbonaecous, very shilty to sandy 20. Shale, medium-gray, thin and evenly bedded 21. Shale, medium-gray, thin and evenly bedded 22. Shale, medium-gray, thin and evenly bedded 23. Shale, medium-gray, thin and evenly bedded 24. Shale, medium-gray, thin and evenly bedded 25. Shale, medium-gray, thin and evenly bedded 26. Shale, medium-gray, thin and evenly bedded 27. Total measured thickness of Frontier 28. Formation 29. Shale, medium-gray, thin and evenly bedded 29. Shale, medium-gray, thin and evenly bedded 20. Shale, medium-gray, thin and evenly bedded 21. Shale, medium-gray, thin and evenly bedded 22. Shale, medium-gray thin and evenly bedded 23. Shale, medium-gray, thin and evenly bedded 24. Shale, medium-gray, thin and evenly bedded 25. Shale, medium-gray, thin and evenly bedded 26. Shale, medium-gray thin and evenly bedded 27. Shale, medium-gray thin and evenly bedded 28. Shale, medium-gray thin and e	14.		3	3	gray, carbonaceous, thin-bedded 38. Limestone, light-greenish-gray, nodules 1	17	0
5. Sandstone, medium-gray, thin and evenly bedded medium-gray, expressions band, black, sandy, bard bedded at top-bedded at top-bedded at top-bedded to black, sandy, bard cost black, very carbonaccous, thin-bedded at top-bedded top	15.		5	0	greenish-gray shale		
17. Shale, medium-gray, thin and evenly bedded ded. 18. Sandstone, medium-light-gray, very fine grained, silty, crossbedded, upper 1 ft medium-graned. 20. Sandstone, medium-gray, carbonaccous, thin-bedded. 21. Ironsone band, black, sandy, hard— 22. Shale, medium-gray, thin-bedded to non-beddeed at top— 23. Shale, dark-gray to black, very carbonaccous, thin-bedded, coaly— 24. Sandstone, medium-light-gray to light-gray, yery fine to fine-grained, large, very fine to fine-grained, large, very fine to fine-grained, thin-bedded, calcareous nodules, and fossil plant fragments, light-trownish-gray very fine to thick-bedded, calcareous nodules, friable— 25. Shale, medium-gray, thin and evenly bedded— 26. Shale, medium-gray, thin and evenly bedded— 27. Sandstone, medium-light-gray to medium-gray, very fine to fine-grained, thin-bedded— 28. Shale, medium-gray, thin and evenly bedded— 29. Shale, light-brownish-gray carbonaccous, very silty to sandy————————————————————————————————————	16.	fine-grained, shale chips in lens-shaped	1	0	40. Conglomerate, cobbles and boulders of Paleozoic and metamorphic rocks,	17	0
18. Sandstone, medium-gray, carbonaceous thin-bedded	17.	Shale, medium-gray, thin and evenly bed-			Total measured thickness of Indian		_
19. Shale, medium-gray, carbonaceous, thin-bedded medium-gray, very fine parained, silty, crossbedded, thin-bedded medium-gray, thin-bedded to non-bedded at top———————————————————————————————————	18.	Sandstone, medium-light-gray, very fine grained, silty, crossbedded, upper 1 ft	2		Meadows Formation		<u>4</u>
20. Sandstone, medium-gray, very fine grained, silty, crossbedded, thin-bedded combedded at top— 21. Ironstone band, black, sandy, hard— 22. Shale, medium-gray, thin-bedded to non-bedded at top— 23. Shale, dark-gray to black, very carbonacous, thin-bedded, coaly— 24. Sandstone, medium-light-gray to light-gray, wery fine to medium-grained, lelenses of shale chips, coal chips, carbonacous shale, with underclay, pyrite nodules, and fossil plant fragments, light-brownish-gray— 25. Sandstone, medium-light-gray to medium-gray, pyrite nodules, and fossil plant fragments, light-brownish-gray— 26. Shale, medium-gray to medium-gray, every fine to fine-grained, thin-bedded— 27. Sandstone, medium-light-gray to medium-gray, very fine to fine-grained, thin-bedded— 28. Shale, medium-gray, thin and evenly bedded— 29. Shale, light-brownish-gray, carbonaceous, very silty to sandy— 29. Shale, medium-gray, thin and evenly bedded— 20. Shale, medium-gray, thin and evenly bedded— 21. Sandstone, medium-light-gray, very fine to fine-grained upward, silty, thin-bedded— 22. Shale, medium-gray, thouse, 20, T. 41 N., R. 105 W. Described by J. F. Windolph, Jr. Strike 100°, Dip 40° NE. Lover Eocene: Indian Meadows Formation: 1	19.		2	5			
Frontier Formation Thrust Slice grained, silty, crossbedded, thin- bedded—————————————————————————————————	20		3	4	Measured section 24: Indian Meadows Forma	tion a	nd
2.1. Ironstone band, black, sandy, hard————————————————————————————————————	20.					ition a	
22. Shale, medium-gray, thin-bedded to non-bedded at top		bedded	2		Location: Bain Draw Quadrangle, Wyoming (7.5 min)		
bedded at top- 23. Shale, dark-gray to black, very carbonacous, thin-bedded, coaly- 24. Sandstone, medium-light-gray to light-gray, massive, friable, dark mineral grains, very fine to fine-grained, silty- 25. Sandstone, medium-grapt on medium-light-gray, very fine to medium-grained, lenses of shale chips, coal chips, carbonaceous shale, with underclay, pyrite nodules, and fossil plant fragments, light-brownish-gray very carbonaceous shale, with underclay, pyrite nodules, and fossil plant fragments, light-brownish-gray very fine to fine-grained, thin-to thick-bedded, calcareous noutles, friable. 26. Shale, medium-dark-gray, very carbonaceous shale, with underclay, pyrite to fine-grained, thin-to thick-bedded, calcareous noutles, friable. 27. Sandstone, medium-light-gray to medium-gray, very fine to fine-grained, thin-to thick-bedded, calcareous noutles, friable. 28. Shale, medium-gray, thin and evenly bedded. 29. Shale, light-brownish-gray, carbonaceous, very silty to sandy. 30. Shale, medium-gray, thin and evenly bedded. 31. Sandstone, medium-light-gray to medium-light-gray, very fine to fine-grained upward, silty, thin-bedded. 32. Shale, medium-dark-gray, carbonaceous, silty, thin-bedded. 33. Sandstone, medium-light-gray to ryfine grained, thin-bedded, very silty to sandy. 34. Conglomerate, medium-gray, cobbles, boulders, nunded metamorphics and Paleozoic rocks, ±1 fit in diameter, 5				4	Start: NE-NW-NW sec. 20, T. 41 N., R. 105 W; trending	eastwar	d down
23. Shale, dark-gray to black, very carbonaceous, thin-bedded, coaly	22.		2	6	End: NE-NE-NW sec. 20, T. 41 N., R. 105 W.		
24. Sandstone, medium-light-gray to light-gray, massive, friable, dark mineral grains, very fine to fine-grained, lenses of shale chips, coal chips, carbonaceous shale, with underclay, pyrite nodules, and fossil plant fragments, light-brownish-gray	23.	Shale, dark-gray to black, very carbona-		5			
grains, very fine to fine-grained, silty- gray, very fine to medium-light- gray, very fine to medium-grained, lenses of shale chips, coal chips, car- bonaceous shale, with underclay, pyrite nodules, and fossil plant frag- ments, light-brownish-gray ————————————————————————————————————	24.	Sandstone, medium-light-gray to light-			Lower Eocene:	Thickr	ness
25. Sandstone, medium-gray to medium-right-gray, very fine to medium-grained, lenses of shale chips, coal chips, carbonaceous shale, with underclay, pyrite nodules, and fossil plant fragments, light-brownish-gray — 3 4 26. Shale, medium-dark-gray, very carbonaceous————————————————————————————————————			10	0		Ft	in
26. Shale, medium-dark-gray, very carbonaceous————————————————————————————————————	25.	Sandstone, medium-gray to medium-light- gray, very fine to medium-grained, lenses of shale chips, coal chips, car- bonaceous shale, with underclay, pyrite nodules, and fossil plant frag-			ders, metamorphic boulders, up to 3 ft in diameter, granular sandstone, matrix arkosic, potassium feldspars, few lenses of red and green shale, parallel		
27. Sandstone, medium-light-gray to medium-gray, very fine to fine-grained, thin- to thick-bedded, calcareous nodules, friable	26.	Shale, medium-dark-gray, very carbona-	3			<u>16</u>	_0
gray, very fine to fine-grained, thin- to thick-bedded, calcareous nodules, friable	27.			9	Formation	16	_0
28. Shale, medium-gray, thin and evenly bedded	27.	gray, very fine to fine-grained, thin- to thick-bedded, calcareous nodules, fria-			-	f Indiar	1
ded	28		5	0	Upper Cretaceous:		
ceous, very silty to sandy	20.		1	2			
30. Shale, medium-gray, thin and evenly bedded	29.					10	0
31. Sandstone, medium-gray to medium-light- gray, very fine to fine-grained upward, silty, thin-bedded	30.	Shale, medium-gray, thin and evenly bed-	1		3. Shale, medium-gray, thin and evenly bed-		J
32. Shale, medium-dark-gray, carbonaceous- 33. Sandstone, medium-light-gray, very fine grained, thin-bedded yery silty, shaly at base, massive, friable, very fine to fine-grained at top, fossil roots	31.	Sandstone, medium-gray to medium-light- gray, very fine to fine-grained upward,			in-thick thin-bedded, light- greenish-gray sandstone 53 ft above		
33. Sandstone, medium-light-gray, very fine grained, thin-bedded. Total measured thickness of Frontier Formation — 173 6 Unconformity — 173 6 Sandstone, medium-gray to light-greenish-gray, very fine grained, thin-bedded, very silty, shaly at base, massive, friable, very fine to fine-grained at top, fossil roots — 64 0 5. Coal, weathered, basal 3 in impure sandy lenses — 65. Coal, weathered, basal 3 in impure sandy lenses — 66. Sandstone, medium-gray, very fine to fine-grained, thick-bedded, pyrite nodulders, rounded metamorphics and Paleozoic rocks, ±1 ft in diameter, 7. Shale, medium-gray, thin-bedded, silty	32		4			68	0
Total measured thickness of Frontier Formation		Sandstone, medium-light-gray, very fine		Ü	4. Sandstone, medium-gray to light-greenish-		
Formation				_7			
5. Coal, weathered, basal 3 in impure sandy lenses	Unco	Formation	173	<u>6</u>	able, very fine to fine-grained at top,	64	0
Indian Meadows Formation: 34. Conglomerate, medium-gray, cobbles, boulders, rounded metamorphics and Paleozoic rocks, ±1 ft in diameter, 6. Sandstone, medium-gray, very fine to fine-grained, thick-bedded, pyrite nod- ules		·			5. Coal, weathered, basal 3 in impure sandy	٥.	-
34. Conglomerate, medium-gray, cobbles, fine-grained, thick-bedded, pyrite nod-boulders, rounded metamorphics and les							6
boulders, rounded metamorphics and ules							
		boulders, rounded metamorphics and			ules	1	5
			17	0		4	0

		Thick	ness		Thick	ness
		Ft	in			
8.	Shale, brownish-gray, thin-bedded, car-			Cody Shale:	Ft	in
	bonaceous, fossil plant and coal frag-		4	31. Shale, medium-gray to medium-dark-		
0	ments		4	gray, few thin-bedded sandstone inter-		
	Shale, light-greenish-gray, bentonitic Shale, medium-dark-gray, poorly bedded-		3 9	beds, approximately 500 ft exposed		
	Shale, light-greenish-gray, calcareous,		9	ocus, approximately 500 it exposed		
11.	silty, ferruginous		8			
12	Shale, medium-gray to medium-dark-		0			
12.	gray, carbonaceous in basal 2 ft, poorly					
	bedded	12	0			
13.	Sandstone, medium-light-gray, very fine	12	Ü	Measured section 25: Mesaverde Formation (I	Part)	
	grained, silty, thin- to thick-bedded,			Location: Alkali Butte Quadrangle, Wyoming, (7.5 min)		
	crossbedded	2	8	Start: SE-SE-SW sec. 22, T. 34 N., R. 95 W. Presented	from o	ldest to
14.	Shale, light-greenish-gray, silty, calcare-			youngest		
	ous, ferruginous	1	7	End: NW-NW-NW sec. 27, T. 34 N., R. 95 W.		
15.	Shale, dark-brownish-gray, carbona-			Described by: J.F. Windolph, Jr. Strike 160°, Dip 30° SW.		
	ceous, fossil root prints		4	Sainte 100 ; Dip 30 5W.		
	Coal, impure		4	Upper Cretaceous:	Thick	ness
17.	Sandstone, bentonitic, carbonaceous,			Mesaverde Formation:	Ft	in
10	abundant gypsum crystals	1	1	1. Sandstone, medium-light-gray, weathered		
18.	Shale, bentonitic, light-olive-gray to			to light-yellow-gray, very fine to fine-		
10	light-olive-brown, weathered	14	0	grained, silty, thin-bedded to massive,		
19.	Shale, light-brownish-gray to medium-		4	contorted bedding, crossbedded, solu-		
20	dark-gray, carbonaceous, thin-bedded-		4	tion cavities; few carbonaceous lamina-		
20.	Shale, light-greenish-gray to olive-gray, silty	8	8	tions, calcareous zones, and pyrite		
21	Shale, dark-brownish-gray, thin-bedded,	0	0	nodules; upper 10 ft light gray, parallel	90	•
21.	carbonaceous	1	9	bedded	80	0
22.	Sandstone, medium-light-gray, very fine	•		Underclay, medium-gray, fossil root prints		3
	to fine-grained, thin- to thick-bedded -	2	5	3. Sandstone, medium-light-gray, fine- to		3
Base	e of Wilderness coal bed			medium-grained, carbonaceous frag-		
				ments		4
23.	Coal, bright to dull, fusain, cleats 35° at	1	4	4. Shale (underclay), medium-gray, gypsum		•
Ton	90° and 100° at 55° SWof Wilderness coal bed	1	4	crystals		11/2
тор	of winderness coal bed			5. Shale, light-brown, carbonaceous, thin-		
24.	Shale, light-brownish-gray, carbona-			bedded, fossil plant and root prints		1
	ceous, tonstein-volcanic ash bed at			6. Coal, bright		2
	base; 1-in-thick volcanic ash bed 2 ft			7. Shale, carbonaceous, brown, thin-		
	below top	4	0	bedded, gypsum crystals, fossil plants-	1	0
25.	Coal, impure, sandstone interbeds		2	8. Shale, medium-gray, thin-bedded, gyp-		
26.	Sandstone, white, medium- to coarse-			sum crystals	1	1
	grained, arkosic, abundant dark min-			 Sandstone, medium-light-gray, very fine grained, silty, thin-bedded 	4	0
	eral grains, crossbedded, thin- to thick-			10. Shale, medium-gray, thin-bedded	4	0
	bedded, fault zone trending 145° and		•	11. Shale (underclay), medium-gray, thin-	7	U
27	dipping 70° NE	22	0	bedded, carbonaceous, fossil plant and		
21.	Shale, medium-gray to medium-dark-gray, carbonaceous, sandy at base	6	0	root prints		9
28	Sandstone, very fine to fine-grained,	6	U	12. Coal, bright, resin blebs, fragile		6
-0.	shaly, medium-gray to medium-light-			13. Shale, carbonaceous, light-brownish-		
	gray	2	2	gray, thin-bedded, vitrain lenses		6
29.	Shale, medium-gray, poorly bedded	3	9	14. Shale, medium-gray, thin-bedded, few		
	Sandstone, medium-light-gray to dark-			silty beds; upper 10 ft very sandy, with		_
	gray, crossbedded, thick-bedded to			sandstone interbeds	26	0
	massive, very fine to fine-grained,			15. Shale, light-brown, carbonaceous, thin-bedded	1	
	shaly zones, few calcareous nodular				1	6 3
	zones up to 2 ft thick; 4-ft zone of			16. Coal, bright, resin blebs		3
	medium-dark-gray shale and carbona-			17. Shale, medium-gray, thin-bedded, upper 1 ft bentonite	3	0
	ceous sandstone 15 ft above base; 5-ft			18. Shale (underclay), light-brown, carbona-	3	U
	zone of medium-dark-gray to light-			ceous, thin-bedded, fossil plant and root		
	brownish-gray carbonaceous shale 60 ft above base	115	0	prints		6
	Total measured thickness of Frontier	115	_0	19. Coal, bright		7
	Formation	349	6	20. Shale, light-brown, thin-bedded, carbo-		
	= =====================================		=	naceous, fossil plant impressions		4

		Thickr	ness			Thick	ness
		Ft	in			Ft	in
	Shale, medium-gray, thin-beddedShale, light-brown, thin-bedded, carbon-	4	6	45.	Sandstone, white- to light-gray, very fine grained, silty, burrows, crossbedded,		
	aceous		6	16	base fills channel in unit 44	1	0
23.	Sandstone, medium-light-gray, lenses, contorted bedding	1	0	46.	Shale (underclay), light-brown, carbonaceous, very silty, sandy, fossil plant		,
24.	Shale (underclay), light-brown, carbona-	•	Ū	Ras	and root printse of Beaver coal bed		1
	ceous, thin-bedded, fossil plant and root prints		4		Coal, bright to dull, fusain bands, gypsum crystals and sulfur stains on cleats,		
25.	Coal, bright, fragile, resin blebs		9		sparse resin blebs, mud-filled fossil		
	Shale, light-brown to medium-gray, ben-				roots; cleats 100° at 75° NE. and 10° at 60° SE.	3	6
	tonitic, gypsum crystals, coal lenses,	2	2	Top	of Beaver coal bed		ŭ
27	thin-bedded to nonbedded	3	2	48.	Sandstone, medium-light-gray, very fine		
28.	Coal, bright to dull Shale, medium-gray, thin-bedded to non-		7		to fine-grained, thin-bedded, lens-shaped bed		1
20.	bedded, bentonitic, gypsum crystals	2	0	49.	Shale, medium-gray, thin-bedded	1	4 8
29.	Shale, light-brown, thin-bedded, carbon-	-	U		Shale, light-brown, carbonaceous, thin-	•	Ü
	aceous, gypsum crystals, fossil plant				bedded	1	0
	and root prints	1	6		Shale, medium-gray, thin-bedded	1	4
	e of Signor coal bed			52.	Sandstone, medium-light-gray, very fine grained, silty		7
30.	Coal, bright to dull resin blebs, fusain and			53	Shale, medium-gray, thin-bedded		7 8
Ton	1/2-in tonstein layer 28 in above base -	4	0		Sandstone, medium-light-gray to light-		Ü
	of Signor coal bed Shale, light-brown to medium-gray, silty,				yellow-brown, very fine grained, silty,		
51.	sandy, thin-bedded, carbonaceous	1	10		shaly, upper 4 ft very shaly and benton-		_
32.	Sandstone, medium-light-gray, very fine	•	10		itic	14	0
	grained, silty, fills basal channel in unit			55.	Shale, light-brown, carbonaceous, thin- bedded, gypsum crystals	2	0
	31; parallel bedding; upper 3 ft inter-			56.	Sandstone, light-yellowish-gray, very	2	U
	bedded with medium-gray shale	17	0		fine to fine-grained, thin-bedded, con-		
33.	Shale, light-brown, thin-bedded, carbo-	•			torted bedding	10	0
2.4	naceous	3	0	57.	Shale, medium-gray, interbedded silt-		
34.	Sandstone, medium-light-gray, very fine				stone, sandstone, and thin carbona-		
	to fine-grained, silty, thin-bedded, crossbedded	32	0		ceous shale beds, upper 3 ft very sandy	10	0
35.	Shale, medium-light-gray, thin-bedded,	J 2	Ü	58.	Sandstone, white- to light-gray, very fine		•
	sandstone lenses	10	0		to fine-grained, massive, thin volcanic		
36.	Sandstone, medium-light-gray, weathers				ash laminations; upper 1½ ft very cal-	1.0	^
	light-yellowish-gray, very fine to fine-			50	careous; weathers yellow brown	16	0
	grained, silty, crossbedded at base; upper two-thirds parallel bedded,			39.	Sandstone, medium-light-gray, very fine grained, silty, friable (partly covered)-	16	0
	includes calcareous beds	43	0	60.	Shale, light-brown, thin-bedded, carbon-		
37.	Sandstone, white to light-gray, fine- to				aceous, fossil plants	1	1
	medium-grained, crossbedded, pyrite				Shale, medium-gray, thin-bedded	1	6
	nodules, abundant burrows in upper 4	20	0	62.	Shale, light-brownish-gray, thin-bedded, silty, fossil plant and root prints		8
38.	in, sulfate efflorescence on surfaces Shale, light-brownish-gray, thin-bedded,	30	U	63.	Coal, bright to dull, fusain, resin blebs;		0
	fossil plant prints	2	0	00.	1-in-thick tonstein 2 ft above base	3	0
39.	Sandstone, light-brown, thin-bedded,			64.	Shale, light-brown, carbonaceous, thin-		
	fine- to medium-grained, pyrite nod-				bedded	3	0
40	ules, burrows	1	0 8		Shale, medium-gray, silty, thin-bedded-	4	0
	Shale, medium-dark-gray, thin-bedded Sandstone, white- to light-gray, fine-	1	0	00.	Shale, light-brown, thin-bedded, fossil plant and root prints	2	6
	grained, massive, crossbedded, abun-			67.	Coal, bright	_	6
	dant burrows in upper 1 ft; 2 in of				Sandstone, medium-light-gray, fine- to		
	carbonaceous shale 3 ft below top	16	0		medium-grained, lens-shaped bed		3
42.	Shale, light-brown, very silty, sandstone			69.	Shale, medium-gray, silty, thin-bedded,	4	
	lenses, burrows, poorly bedded, fossil plant prints	3	0	70	slightly carbonaceous Ironstone, black, hard, brittle	4	6 6
43.	Shale, brown, thin-bedded, very carbon-	3	J		Shale, medium-gray	3	0
	aceous, fossil plant prints		6		Ironstone, brown, hard, brittle	-	6
44.	Siltstone, light-brownish-gray, poorly				Sandstone, light-gray, fine-grained,		_
	bedded, slightly carbonaceous	1	4		partly covered	5	0

		Thick	ness		Thick	ness
		Ft	in		Ft	in
74.	Sandstone, white- to light-gray, arkosic, fine- to medium-grained, thin-bedded to massive, burrowed in upper 1 ft; pyrite nodules, few carbonaceous layers; parallel bedded at top, crossbedded			101. Tonstein, light-brown to pinkish-gray, fossil plant prints and flattened volcanic ash particles 102. Coal, bright Top of Shipton coal bed	,,	1/ ₂ 21/ ₂
75.	in basal portion	60	0	103. Shale, very light brown, thin-bedded104. Ironstone, brownish-black, very fine grained, sandy, thin-bedded	2	8
76.	brown and slightly carbonaceous Sandstone, white, fine-grained, top bur- rowed	6	0 6	105. Shale, medium-gray, thin-bedded106. Ironstone, brownish-black, very fine grained, sandy, thin-bedded	7	0
77.	Shale, light-brown, carbonaceous, fossil plant and root prints	1	0	107. Shale, medium-gray 108. Sandstone, white- to light-gray, silty, friable	2	0
	Coal, bright to dull, fusain, basal 2 in bony	1	10	109. Shale, light-brown, carbonaceous, thin-bedded	1	0
	Sandstone, medium-light-gray, very fine grained, silty, shaly	11	0	110. Shale, medium-gray, few sandstone and ironstone bands, thin-bedded, very sandy at top	17	0
81.	beddedSiltstone, medium-gray, shaly	6 1	0 10	 111. Shale, light-brown, carbonaceous, silty, sandy, thin-bedded 112. Sandstone, light-yellowish-brown, very 	1	6
82.	Sandstone, medium-light-gray, very fine to fine-grained, thin-bedded, weathers reddish-brown		6	fine grained, friable, shaly, includes few ironstone bands	16	0
	Shale, medium-gray, silty, sandySandstone, brown, fine-grained, thin-bedded, ironstone fills pore spaces in	1	4	113. Shale, light-brown, carbonaceous, thin-bedded114. Sandstone, light-gray, very fine grained,	1	0
85.	sandstone		5	friable, silty, shaly, few ironstone layers 115. Sandstone, light-gray, very fine grained,	16	0
86.	contains fossil root prints Shale, brown, carbonaceous, silty, fossil plant and root prints	4	0 9	very silty, and shaly, calcareous, resist- ant calcareous and shale interbeds Total measured thickness of Mesa-	54	_0
	Coal, bright Sandstone, light-brown, very fine to fine- grained, coal and carbonaceous lami- nations	. 1	21/2 2	verde Formation	694	<u>6</u>
89.	Sandstone, dark-brown, fine- to medium- grained; abundant detrital coal	13	0			
90.	Sandstone, white- to light-gray, very fine to fine-grained, silty, massive, calcareous; 3-ft-thick contorted beds 15 ft above base	22	0	Measured section 26: Cody Shale through Inc Meadows Formation Location: Sand Draw Quadrangle, Wyoming (7.5 min)	dian	
91.	Sandstone, medium-light-gray, very fine grained, partly covered	13	0	Start: SW-NW-NW sec. 27, T. 33 N., R. 95 W. Presented youngest		ldest to
92.	Shale, light-brownish-gray, carbonaceous, silty, thin-bedded, fossil plant			End: SE-NW-NW sec. 27, T. 33 N., R. 95 W., Partial s Described by: J.F. Windolph, Jr., and F.I. Frasse Strike 110°, Dip 15° NE.	ection	
93.	and root prints	4	6 8	Upper Cretaceous: Cody Shale:	Thickn Ft	iess in
94.	Shale, medium-gray, thin-bedded	2	6	1. Shale, medium-gray, weathered, silty;		
95.	Shale, light-brown, thin-bedded, fossil plant and root prints	1	2	slightly bentonitic, with a few inter- beds of very fine grained sandstone	145	0
96. 97.	e of Shipton coal bed Coal, bright to dull, basal 2 in bony Tonstein, light-brown to pinkish-gray	1	2 1½	 Sandstone, medium gray, fine-grained, dark and light mineral grains, animal tracks, possible salt casts, coarse ripple 		
	Shale, light-brown, upper 2 in very carbonaceous Tonstein, light-brown to pinkish-gray,		8	marks 3. Shale, medium-gray, weathered, silty; slightly bentonitic, with a few inter-		4
	fossil plant prints Coal, bright to dull, fusain, resin blebs,		7	beds of very fine grained sandstone 4. Sandstone, medium-gray, fine-grained,	20	0
	cleats 65° at vertical and 160° at 40° NE	4	7	very calcic, thin and evenly bedded, animal tracks		6

	Thick	ness			Thick	ness
	Ft	in			Ft	in
5. Shale, medium-gray to light-grayish-brown, thin-bedded, weathered, silty,				tracks, possible salt casts, coarse ripple marks		4
slightly bentonitic; contains iron- stained concretions up to 1 ft in diam-			3.	Shale, medium-gray, weathered, silty,		4
eter; sandstone lens 70 ft above base becomes very silty at top; 4 in of thin			4.	bentoniticSandstone, medium-gray, fine-grained,	20	0
and evenly bedded sandstone 40 ft above base	130	0		very calcic, thin and evenly bedded, animal tracks		6
6. Sandstone, medium-gray to medium-light-	130	U	5.	Shale, medium-gray to light-grayish-brown, thin-bedded, weathered, silty,		
olive-gray, very fine grained, silty, dark and light grains, weathered, non-				slightly bentonitic; contains iron-		
bedded, bentonitic	25	0		stained concretions up to 1 ft in diameter; sandstone lens 70 ft above base		
 Shale, medium-gray, silty, bentonitic, a few thin beds but mostly nonbedded 	58	_0		becomes very silty at top; 4 in of thin		
Total measured thickness of Cody				and evenly bedded sandstone 40 ft above base	130	0
Shale	378	10	6.	Sandstone, medium-gray tomedium-light-	130	U
Mesaverde Formation:				olive-gray, very fine grained, silty,		
8. Shale, carbonaceous, brownish-gray, tar stains, silty, abundant gypsum crystals				dark and light grains, weathered, non- bedded, bentonitic	25	0
up to 4 in; base grades on bentonitic			7.	Shale, light-grayish-brown to medium-	23	U
Cody Shale; contains long coal streaks;				gray, silty	99	0
upper 10 in very carbonaceous 9. Coal, impure, bony, coal is 50 percent	2	4	8.	Sandstone, medium-gray, very fine grained, silty, 20 percent interbeds of		
carbonaceous shale interbeds; plant				calcareous shale, a few possible animal		
fragments at top; highly weathered,		_		tracks and pellets	9	0
some sulfur 10. Shale, light-gray to brown, carbonaceous,		8	9.	Shale, medium-gray, very silty, thin- bedded; contains few silty sandstone		
silty		_8		layers up to 1 in thick	44	0
Total measured thickness of Mesa-			10.	Sandstone, light-gray, conglomeratic,		
verde Formation	4	_0		pebbles up to 1 inch in diameter, some granitic clasts, massive-bedded; very		
Unconformity				calcareous in upper 13 ft	40	0
Lower Eocene:			11.	Conglomerate, limestone, and chert nod-		
Indian Meadows Formation:				ules up to 2 ft in diameter; some limestone boulders up to 4 ft in diam-		
11. Sandstone, very light gray to white, very fine to fine-grained, thin-bedded, some				eter	45	0
crossbeds, yellow coatings of sulfur(?)				Total measured thickness of Cody	574	10
along rock cracks near base; some coarse granules; several carbonaceous				Shale	<u>574</u>	<u>10</u>
shale zones	35	0		verde Formation: Sandstone, very light gray, very fine to		
Total measured thickness of Indian			12.	fine-grained; contains few calcareous		
Meadows Formation	35	$\stackrel{0}{=}$		concretions up to 2 ft in diameter; base		
				covered, friable; 55 ft exposed at base, next 65 ft covered, 50 ft sandstone at		
				top (basal sandstone of Mesaverde)	170	0
			13.	Shale, medium-gray, silty; contains 2 ft 2		
				in of very fine grained, silty sandstone 2 ft 5 in above base	6	4
Measured section 26a: Cody Shale and Mesav Formation	/erde		14.	Sandstone, medium-light-gray, very fine		
Location: Sand Draw Quadrangle, Wyoming (7.5 min)			15	grained, silty thin-bedded, calcareous Shale, medium-gray, thin-bedded	2	0
Start: NE-NW-NW sec. 27, T. 33 N., R. 95 W. Presented	from o	oldest to		Sandstone, medium-light-gray, very fine	3	U
youngest End: NE-SE-SW sec. 22, T. 33 N., R. 95 W. Partial sec	tion			grained, silty, thin-bedded, calcareous-	1	6
Described by: J.F. Windolph, Jr., and F.I. Frasse			17.	Shale, medium-gray, thin-bedded; 4-in sandstone 5 ft above base; 6-in sand-		
Strike 105°, Dip 14° NE.				stone 12 ft above base, very fine to		
Upper Cretaceous:	Thick			fine, very calcareous; some gypsum		
Cody Shale: 1. Shale, medium-gray, weathered, silty;	Ft	in		crystals; 1-ft, thin-bedded, calcareous sandstone 2 ft above base	80	0
slightly bentonitic, with a few inter-			18.	Sandstone, medium-light-gray, very fine		-
beds of very fine grained sandstone	145	0		grained, friable, poorly exposed, slightly bentonitic, massive bedding	150	n
 Sandstone, medium-gray, fine-grained, dark and light mineral grains, animal 			19.	Carbonaceous shale	152 2	0

	Thick	ness		Thick	ness
	Ft	in		Ft	in
20. Coal, impure, poor quality		0	shove hase colorrous long up to 21/2 ft	- •	•••
Total measured thickness of Mesa-		-	above base, calcareous lens up to $2\frac{1}{2}$ ft		
verde Formation	417	10	thick and 6 ft 1 in long; 198 ft above		
voide i officiation		==	base, 4-ft calcareous siltstone at top of		
			white sandstone	225	0
			13. Shale, medium-gray, plant fragments,		
			bentonitic, lies above sandstone and		
			under lower Eocene Wind River For-		
			mation	28	0
Measured section 26b: Cody Shale and Mesa	verde		14. Gravels, nonigneous material, well-		
Formation			rounded, mostly quartz sandstone,		
Location: Sand Draw Quadrangle, Wyoming (7.5 min)	chert, few agate and some conglomer-				
Start: SE-SW-SW sec. 22, T. 33 N., R. 95 W. Presented	from o	oldest to	ate pebbles	12	0
youngest			15. Covered	75	0
End: SW-NE-SE sec. 22, T. 33 N., R. 95 W. Partial sec	ction		16. Sandstone, light-gray to white, very fine		
Described by: J.F. Windolph, Jr., and F.I. Frasse			grained, silty, friable, pyrite nodules		
Strike 105°, Dip 14° NE.			up to 1/4 inch in diameter, calcareous		
Upper Cretaceous:	Thick	ness	concretions up to 1 ft in diameter	20	0
Cody Shale:	Ft	in	17. Covered	75	0
1. Shale, medium-gray, silty, thin to poorly		•••	18. Coal, dull to bright, fusain laminations,		
bedded, slightly bentonitic	50⊣	-	gypsum on cleat surfaces; 3 ft 5 in		
bodded, slightly bolitomic	50	ı	below top, 1/4-in tonstein; 5 ft 10 in		
Mesaverde Formation:			below top, 7-in carbonaceous shale	0	1.1
2. Sandstone, light-gray to white, very fine			parting	8	11
to fine-grained, massive with some			19. Shale, medium-gray to light-grayish-		
crossbedding, iron staining, friable,			brown, thin and evenly bedded, some	3	2
calcic concretions with pyrite, dark and			plant fragments	3	2
light grains, partially covered, solution			20. Sandstone, light-gray, very fine grained,		
cavities, 60-65 percent quartz	100	0	silty, shaly, thin-bedded in basal por- tion	10	Λ
3. Shale, medium- to dark-gray, slightly			Total measured thickness of Mesa-		_0
bentonitic, few thin interbeds of very			verde Formation	622	Q
fine grained sandstone	5	0	verue Politiation =	622	
4. Shale, medium-gray to light-grayish-			Ouotomow.:		
brown, carbonaceous	2	0	Quaternary: 21. Alluvial fill, covers sandstone below	15+	
5. Shale, dark-grayish-brown, very carbon-	_	_	21. And viai ini, covers sandstone below	15 1	
aceous, fissile	1	5			
6. Sandstone, medium to light-gray, very		0			
fine grained, silty, weathered	4	0			
7. Siltstone, medium-gray, thin-bedded	1	10 2			
8. Sandstone, medium-gray9. Shale, medium-brown to gray to light-		2	Measured section 27: Mesaverde Formation at	nd Inc	lian
			Meadows Formation		
olive-gray, slightly bentonitic, rootlets and plant fragments	27	0	Location: Hudson Quadrangle, Wyoming (7.5 min)		
10. Sandstone, medium-gray, very fine to	21	U	Start: SW-SE-SW sec. 35, T. 1 S., R. 2 E. Presented 1	from ole	dest to
fine-grained, very calcic, well-			youngest		
indurated		2	End: NW-SE-SW sec. 35, T. 1 S., R. 2 E. Partial section	1	
11. Shale, medium-gray, silty near the top;		_	Described by: N.L. Hickling		
few thin interbeds, up to 3 in thick, of			Strike 320°, Dip 12° NE.		
very fine grained sandstone, medium-			Upper Cretaceous:	Thick	ness
to light-gray	24	0	Mesaverde Formation:	Ft	in
12. Sandstone, medium- to light-gray, fine-			1. Sandstone, white, very fine to fine-		
grained, less than 50 percent quartz,			grained, massive	40+	
massive-bedded, solution cavities and			2. Underclay, medium- to dark-grayish-		
pyrite nodules, calcic zones. Basal 10			brown, very carbonaceous, plant frag-		
ft partially covered; 40 ft above base,			ments		3
increased quartz percentage, cross-			3. Coal, mostly bright, medium cleats, scat-		
beds, tree-trunk print, solution cavi-			tered rosin	1	2
ties, penecontemporaneous slump			4. Shale, medium- to dark-grayish-brown,		
structures; 65 ft above base, calcareous			carbonaceous, ledgy	3	0
interbeds up to 6 in thick; becomes			5. Sandstone, white, very fine to fine-		
more quartzose and less silty and thin			grained, light and dark minerals, mas-	_	
bedded toward the top; 110 ft above			sive	8	0
base, yellow stains with pyrite nodules;			6. Shale, medium to dark-grayish-brown,	2	0
finer sands from 140 ft on up; 175 ft			carbonaceous, thin and evenly bedded-	2	8

		Thickr	ess			Thick	ness
		Ft	in			Ft	in
7.	Sandstone, medium-grayish-brown, fine-grained, friable, some silty lamina-			34.	Coal, impure, very thin, very poor quality, laminated with carbonaceous		
	tions, some plant fragments	4	2		shale		1
8.	Shale, medium-gray, thin-bedded	4	6	35.	Shale, medium- to dark-grayish-brown,		
	Siltstone, medium-gray, iron-stained	1	4		carbonaceous		8
10.	Sandstone, light- to medium-grayish-			36.	Coal, mostly bright		2
	brown, fine- to medium-grained, mas-				Shale, medium- to dark-grayish-brown,		
	sive, resistant, scattered iron-rich con-				carbonaceous	1	8
	cretions	9	4	38.	Shale, medium-gray, very hard, thin-		
11.	Shale, medium-yellowish-gray, thin and				bedded	6	2
	irregular beds	3	2	39.	Sandstone, light- to medium-gray, very		
12.	Sandstone, medium-gray, fine-to medium-				fine to fine-grained, light and dark		
	grained, weathered, friable, light and				minerals, poorly resistant	10	0
	dark mineral grains	2	4	40.	Shale, medium-grayish-brown, carbona-		
	Shale, medium-gray, thin-bedded	4	6		ceous, thin-bedded	2	0
	Siltstone, very resistant, iron-stained		2	41.	Shale, medium-gray, thin-bedded	1	8
	Shale, medium-gray, thin-bedded	1	0	42.	Sandstone, medium-grayish-brown, very		
	Siltstone, resistant, iron-stained		2		fine grained, poorly resistant, iron-		
	Shale, medium-gray, thin-bedded	1	8		stained, weathered		10
	Underclay, light-gray, sandy, rooted	1	2	43.	Shale, medium-gray, thin-bedded, plant		
19.	Shale, carbonaceous, medium- to dark-				fragments in upper 10 in	2	0
	grayish-brown, plant fragments		4	44.	Sandstone, medium-grayish-brown, very		
20.	Underclay, medium-grayish-brown, plant		_		fine grained, poorly resistant, iron-		
	fragments, ash(?)		2		stained, weathered	1	0
21.	Coal, dull to bright, weathered impure,		_	45.	Shale, medium-gray		10
	small cleats, scattered rosin		8	46.	Sandstone, medium-grayish-brown, very		
22.	Shale, medium-grayish-brown, carbona-		_		fine grained, poorly resistant, iron-		
	ceous	1	6		stained, weathered	1	4
	Shale, medium-gray, thin-bedded	1	0	47.	Shale, medium-gray, thin and irregular		
24.	Shale, medium- to dark-grayish-brown,		_		bedding	5	5
25	carbonaceous		5	48.	Sandstone, medium-grayish-brown, very		
	Underclay, 40 percent coal laminations		3		fine grained, poorly resistant, iron-		
26.	Coal, some fusain, mostly bright; 3-in-	•	0		stained, weathered		10
27	thick parting 7 in above base	2	0	49.	Shale, medium-gray, thin and irregular	_	
27.	Underclay, light-gray, sandy, plant frag-				bedding	5	4
20	ments	_	4	50.	Sandstone, medium-grayish-brown, very		
	Shale, medium-gray, thin-bedded	5	4		fine grained, lower half thick-bedded,		
29.	Sandstone, light-grayish-brown, friable,				upper half massive; iron stained, resist-		
	weathered, with light and dark miner-	4	4		ant; several 4-in- to 1-ft-thick shale		•
20	als	4	4		breaks	60	0
<i>3</i> 0.	Shale, medium-gray, thin and irregular	•	0	51.	Sandstone, friable, nonresistant, covered		
21	bedding	1	0		by washed out conglomerate above	10	_0
31.	Sandstone, light-grayish-brown, friable,				Total measured thickness of Mesa-	210	_
	weathered, with light and dark miner-	2	0	Harr	verde Formation	219	
22	Shala madium gray thin hadded	2 1	0 6	Lower E	nformity Focene:		
	Shale, medium-gray, thin-bedded	1	U		Meadows Formation:		
<i>55</i> .	Underclay, dark-grayish-brown, abundant plant fragments		3		Conglomerate	6+	_
	Prant Hagments		J	32.	Congromorate	U	