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### List of abbreviations:

brn - brown; brownish  
cbncs - carbonaceous  
clayst - claystone  
gn - green; greenish  
gy - gray; grayish  
limest - limestone  
sandst - sandstone  
siltst - siltstone  
TD - total depth

GEOPHYSICAL AND LITHOLOGIC LOGS FOR 1978 COAL DRILLING IN  
MOUNTRAIL, RENVILLE, WARD, AND WILLIAMS COUNTIES, NORTH DAKOTA

Susan M. Cook and John M. Spencer

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INTRODUCTION AND ACKNOWLEDGMENTS

Under contracts no. 14-08-0001-17427 and no. 14-08-0001-17431, awarded by the U.S. Geological Survey, the Superior, Gregory, and Thompson Drilling Companies drilled 40 test holes in 1978 in Mountrail, Renville, Ward, and Williams Counties, North Dakota. The holes were drilled in partial completion of two projects: the Coteau project (Mountrail, Renville, and Ward Counties) and the Williams project (northern Williams County). Twenty-four holes were completed in the Coteau project (fig. 1) and 16 in the Williams project (fig. 2). Both projects are scheduled for completion during 1979. The overall purpose of the drilling was to obtain information on the quality, thickness, and extent of the coal in the area.

U.S. Geological Survey personnel collected drill cuttings for lithologic control. These cuttings were used in conjunction with the geophysical logs to determine the lithologic logs presented in this report. Core samples of coal beds from selected holes have been sent to the U.S. Bureau of Mines for proximate and ultimate analyses, determination of Btu/lb values, and form of sulfur present. The lithologic logs have been generalized to 10-foot intervals. The strip logs presented are based on the lithologic logs and are not interpretations of the geophysical logs, with the exception of the tops and bottoms of the lignite beds. All measurements are in feet; to convert to meters, multiply by 0.3048.

Fieldwork was done by the following USGS personnel: Susan M. Cook supervised the Coteau project, assisted by Mark G. Wickman; John M. Spencer supervised the Williams project, assisted by Herbert B. Wincentsen, Hal E. Owen, Gary L. Berg, Samuel G. Cobb, and Richard A. Dickman.

COTEAU PROJECT:  
MOUNTRAIL, RENVILLE, AND  
WARD COUNTIES, NORTH DAKOTA

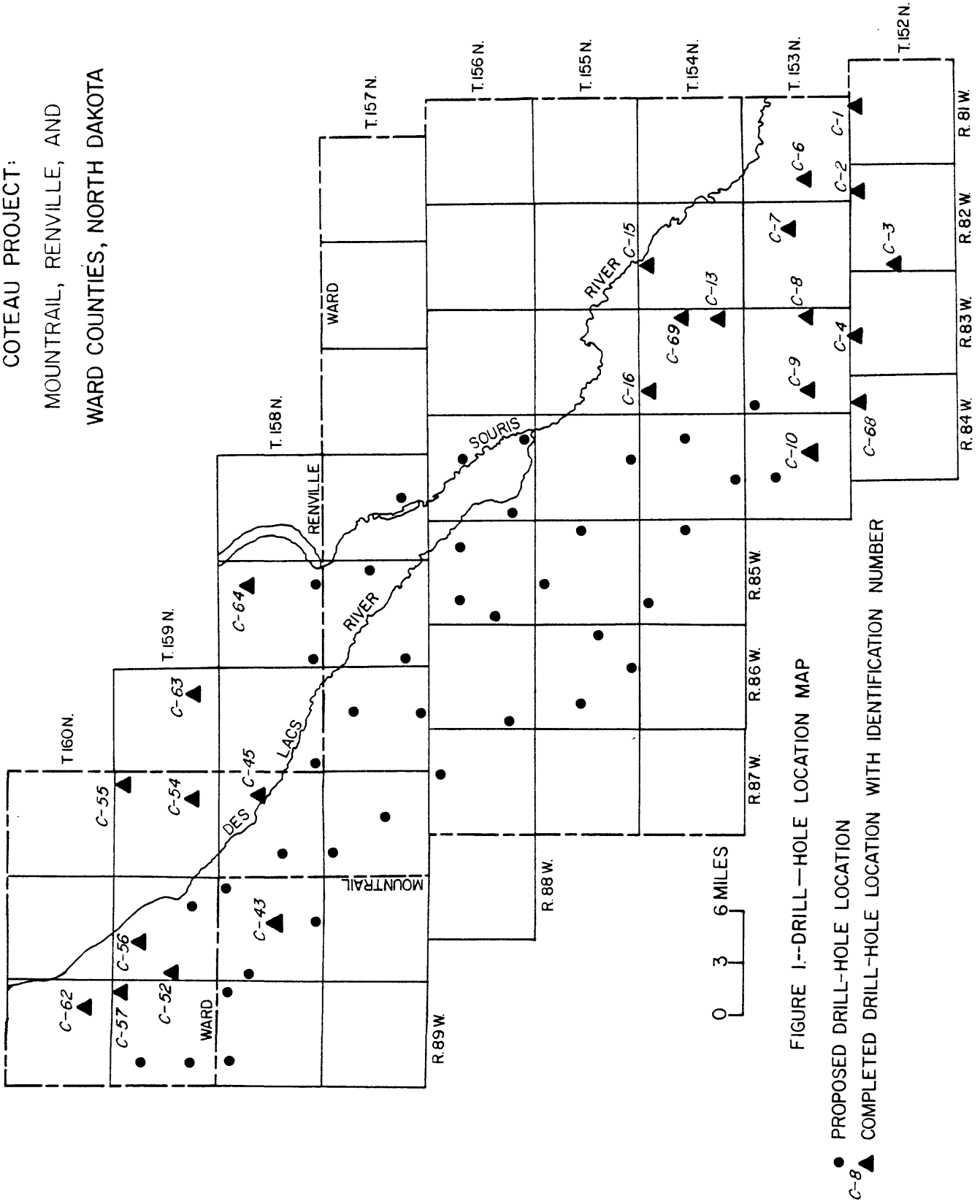


FIGURE 1--DRILL-HOLE LOCATION MAP

● PROPOSED DRILL-HOLE LOCATION

▲ COMPLETED DRILL-HOLE LOCATION

WITH IDENTIFICATION NUMBER

WILLIAMS PROJECT:  
WILLIAMS COUNTY, NORTH DAKOTA

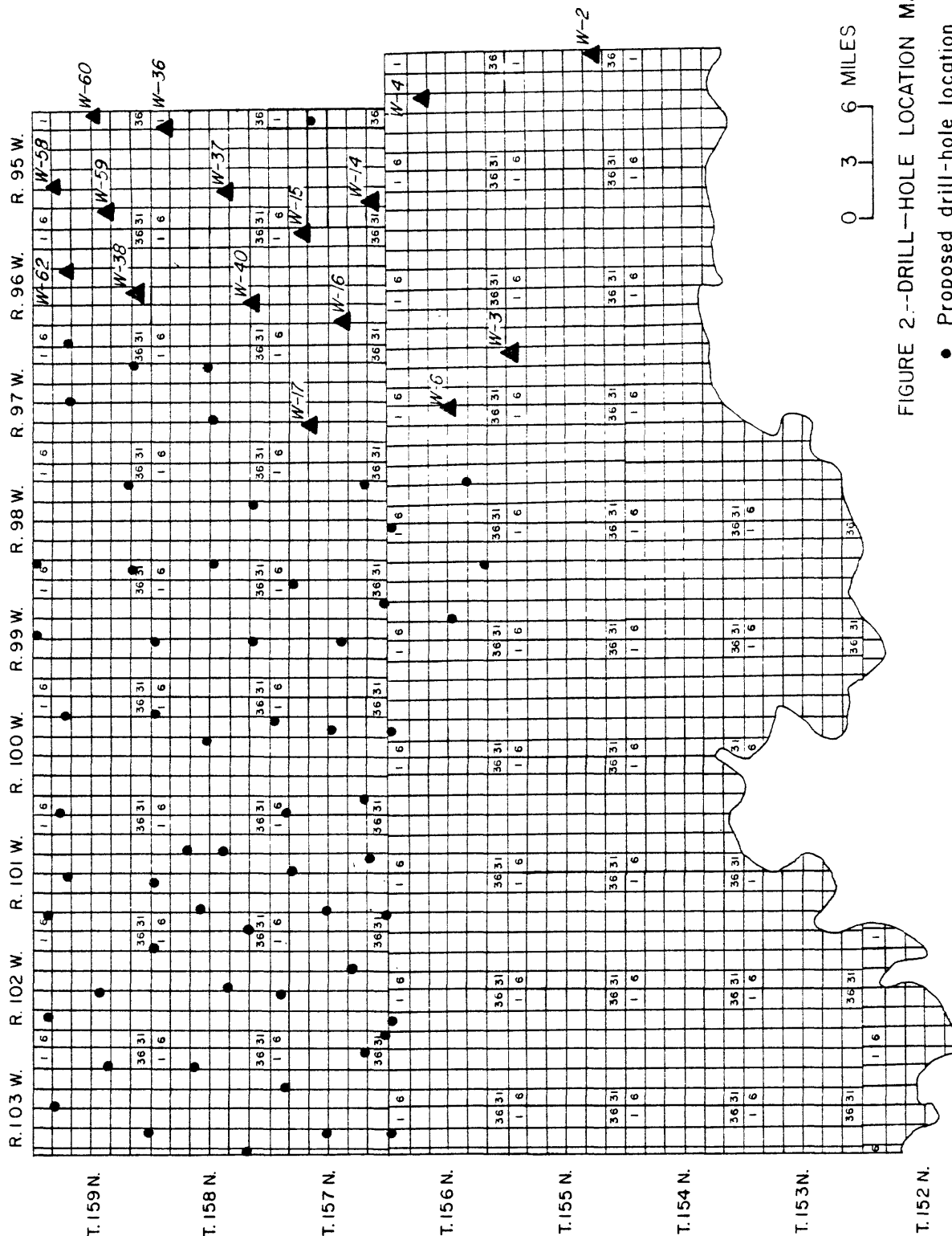


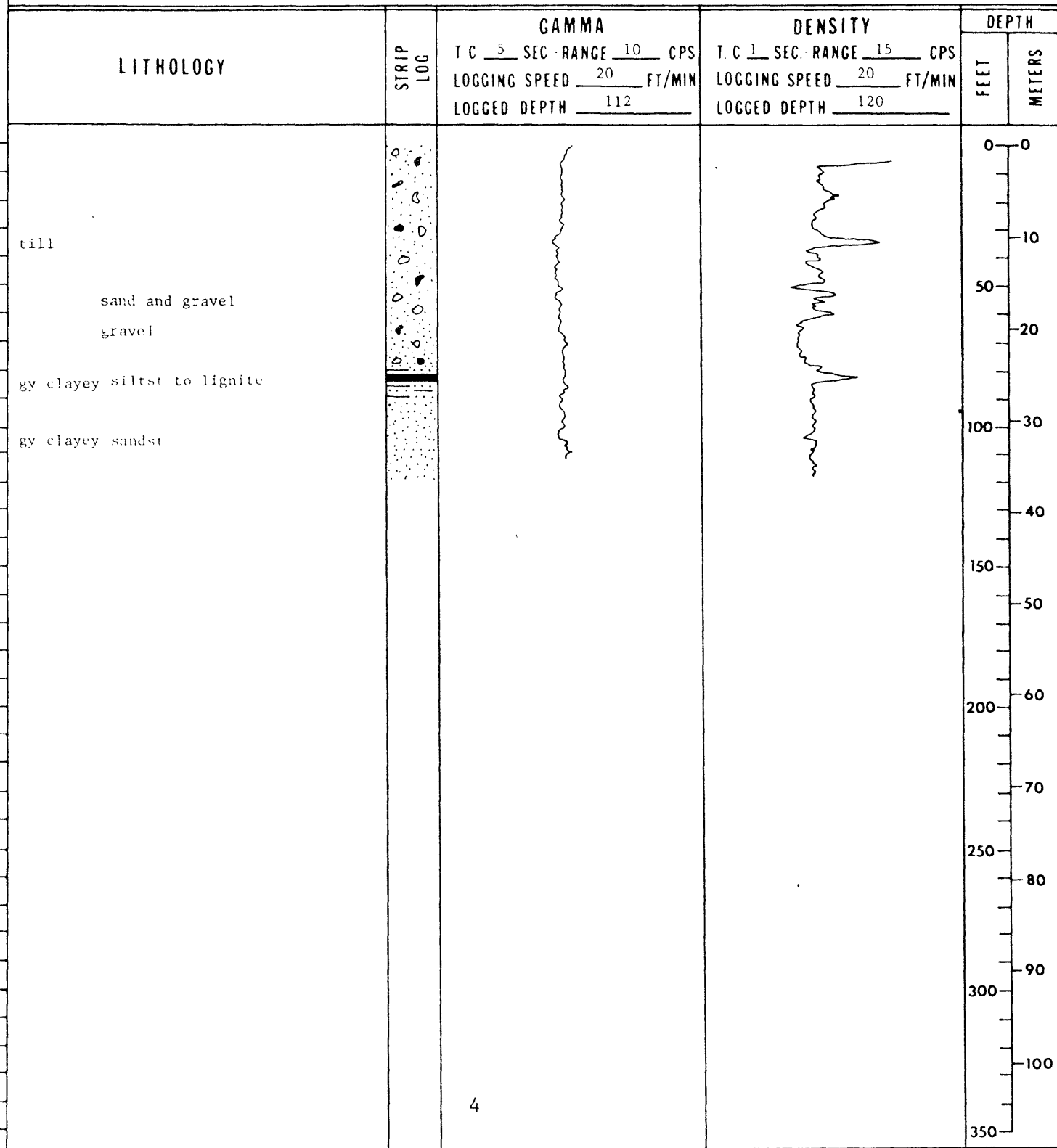
FIGURE 2.--DRILL-HOLE LOCATION MAP

- Proposed drill-hole location
- W-2▲ Completed drill-hole location with identification number

# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 1  
SHEET 1 OF 2

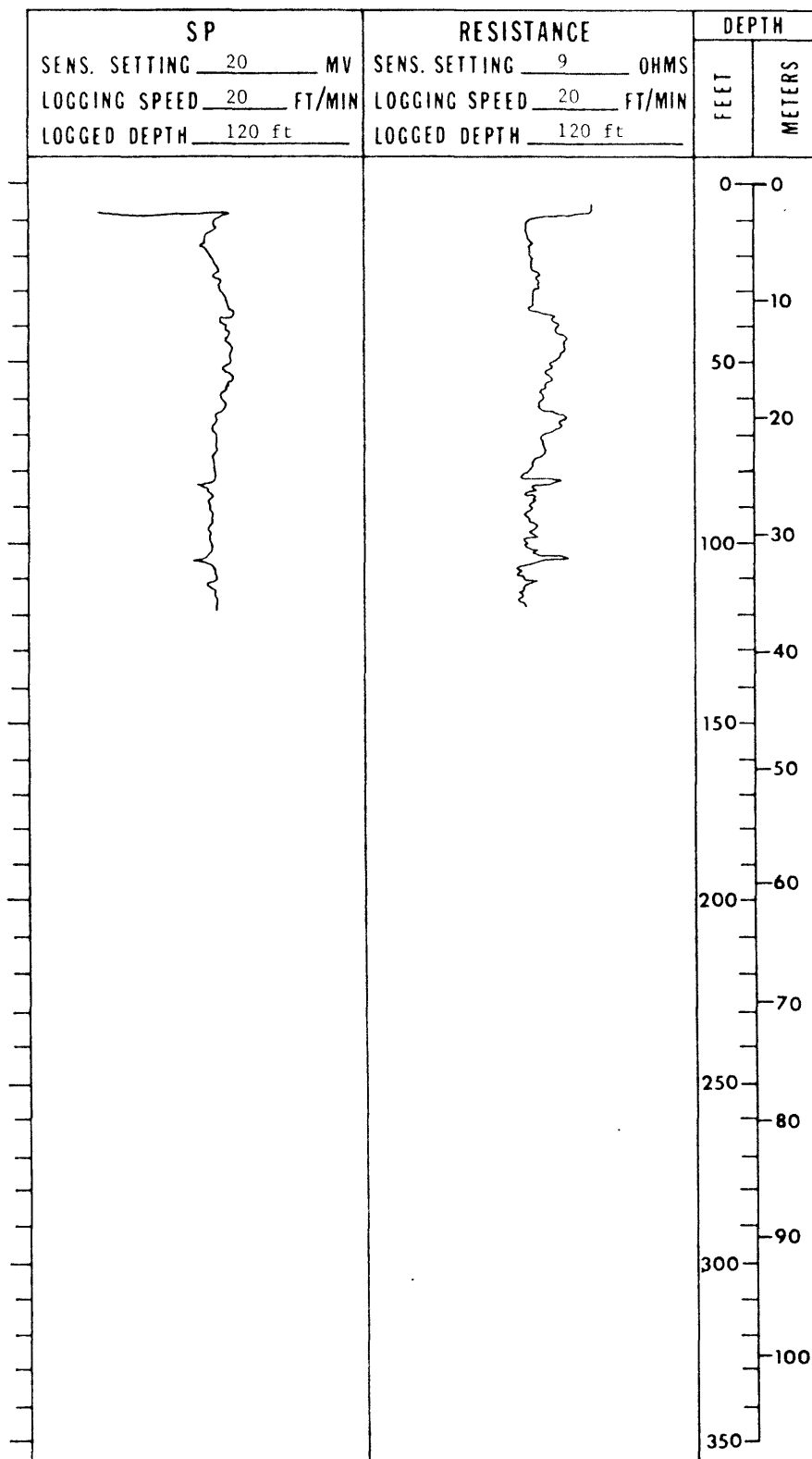
<b>AREA</b> Coteau		<b>QUAD NAME</b> Sawyer,	
<b>DATE STARTED</b> 10/23/78	<b>DATE COMP.</b> 10/23/78	<b>COUNTY</b> Ward	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 3 <b>T.</b> 152 N; <b>R.</b> 81 W. , <b>FOOTAGE LOC.</b> 15 ft		<b>FNL</b> 413 ft <b>FEL</b> 413 ft	<b>GROUND ELEV</b> 1706 ft
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b> ROTARY 120 CORING -----	<b>TOTAL DEPTH</b> 120 ft
<b>DRILLING AGENCY:</b> Superior Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 5 ft
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Barriga	
<b>REMARKS:</b> Drilled with mud			
Contract No. 14-08-0001-17431			



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 1  
SHEET 2 OF 2

REMARKS:



HOLE NO C 2  
SHEET 1 OF 2

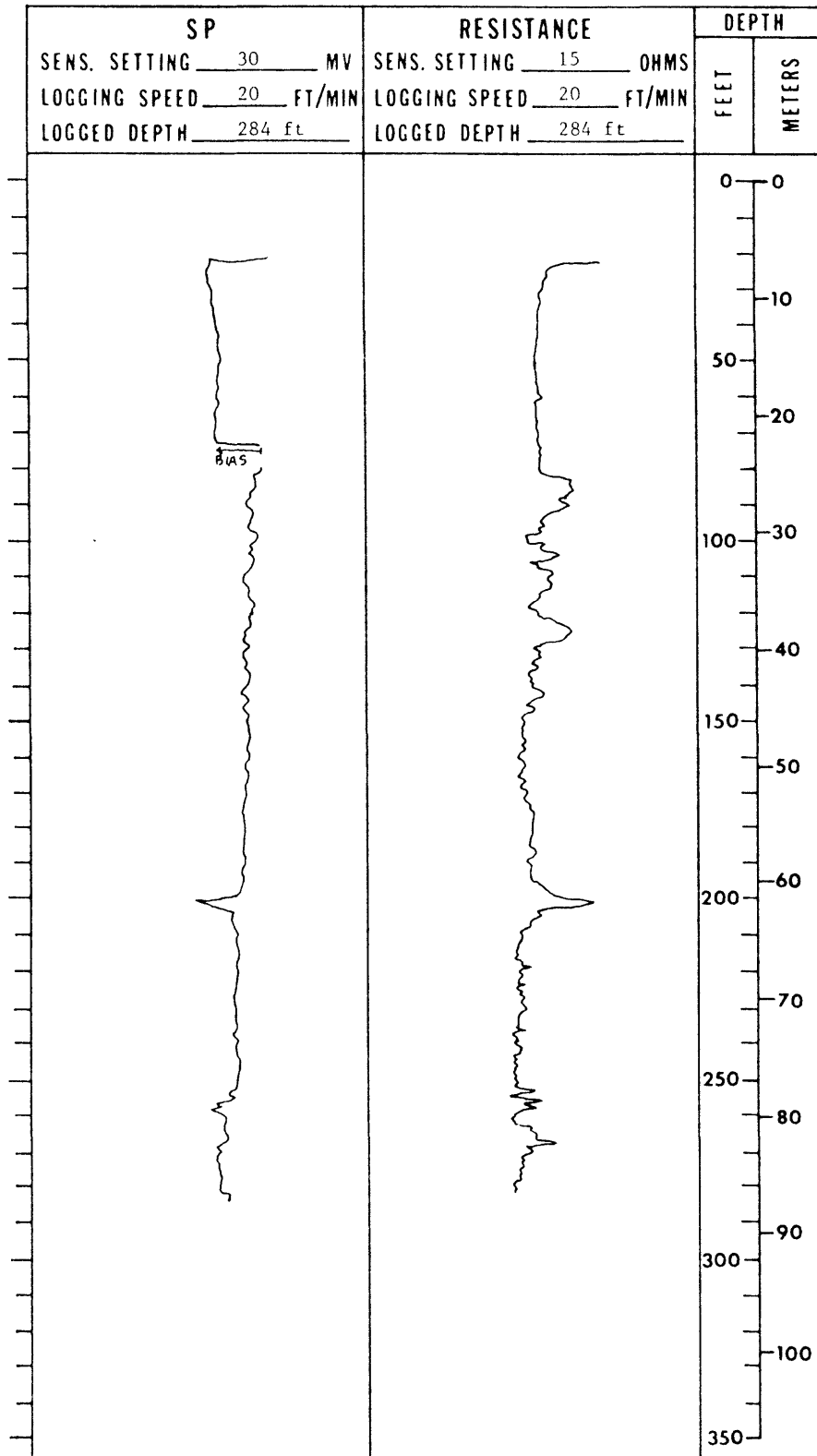
AREA      Coteau		QUAD NAME      Sawyer, SW	
DATE STARTED    11/3/78	DATE COMP.      11/3/78	COUNTY      Ward	STATE    North Dakota
LOCATION: SEC. 2      T. 152 N.; R. 82 W., FOOTAGE LOC.      12 ft		<del>FSL</del> 2416 ft <del>FEL</del> <del>FWX</del>	GROUND ELEV      1854 ft
SIZE AND BIT TYPE:      5 1/8 in.		FOOTAGE	
		ROTARY    285	CORING    -----
DRILLING AGENCY:    Superior Drilling		DRILL TYPE:    -----	
LITHOLOGY RECORDED BY    Susan M. Cook		GEOPHYSICAL LOGS RECORDED BY    Barriga	
REMARKS:      Drilled with mud			
Contract No. 14-08-0001-17431			

LITHOLOGY	STRIP LOG	GAMMA		DENSITY		DEPTH	
		T.C. <u>5</u> SEC. RANGE <u>10</u> CPS	LOGGING SPEED <u>20</u> FT/MIN	T.C. <u>1</u> SEC. RANGE <u>15</u> CPS	LOGGING SPEED <u>20</u> FT/MIN	FEET	METERS
till						0	0
gy silty clayst						10	
gy cbnes clayey siltst to lignite						50	
gy cbnes silty clayst						20	
gy silty clayst						30	
gy gn clayey sandst						40	
gy silty clayst						50	
gy cbnes silty clayst						60	
gy clayey sandst						70	
gy cbnes silty clayst and lignite						80	
gy cbnes silty clayst						90	
gy cbnes clayey siltst						100	
gy cbnes silty clayst						300	

# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 2  
SHEET 2 OF 2

REMARKS:

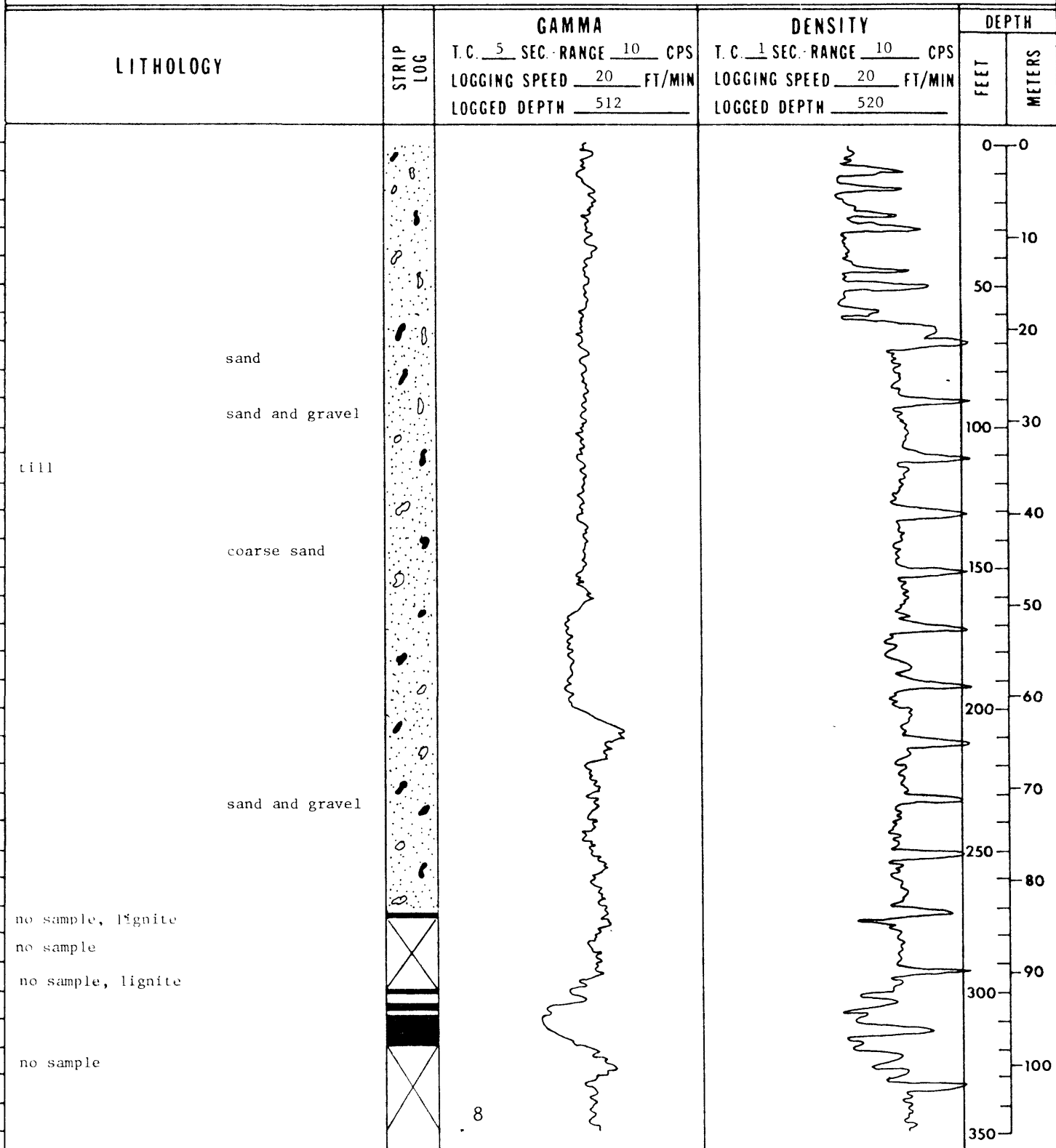




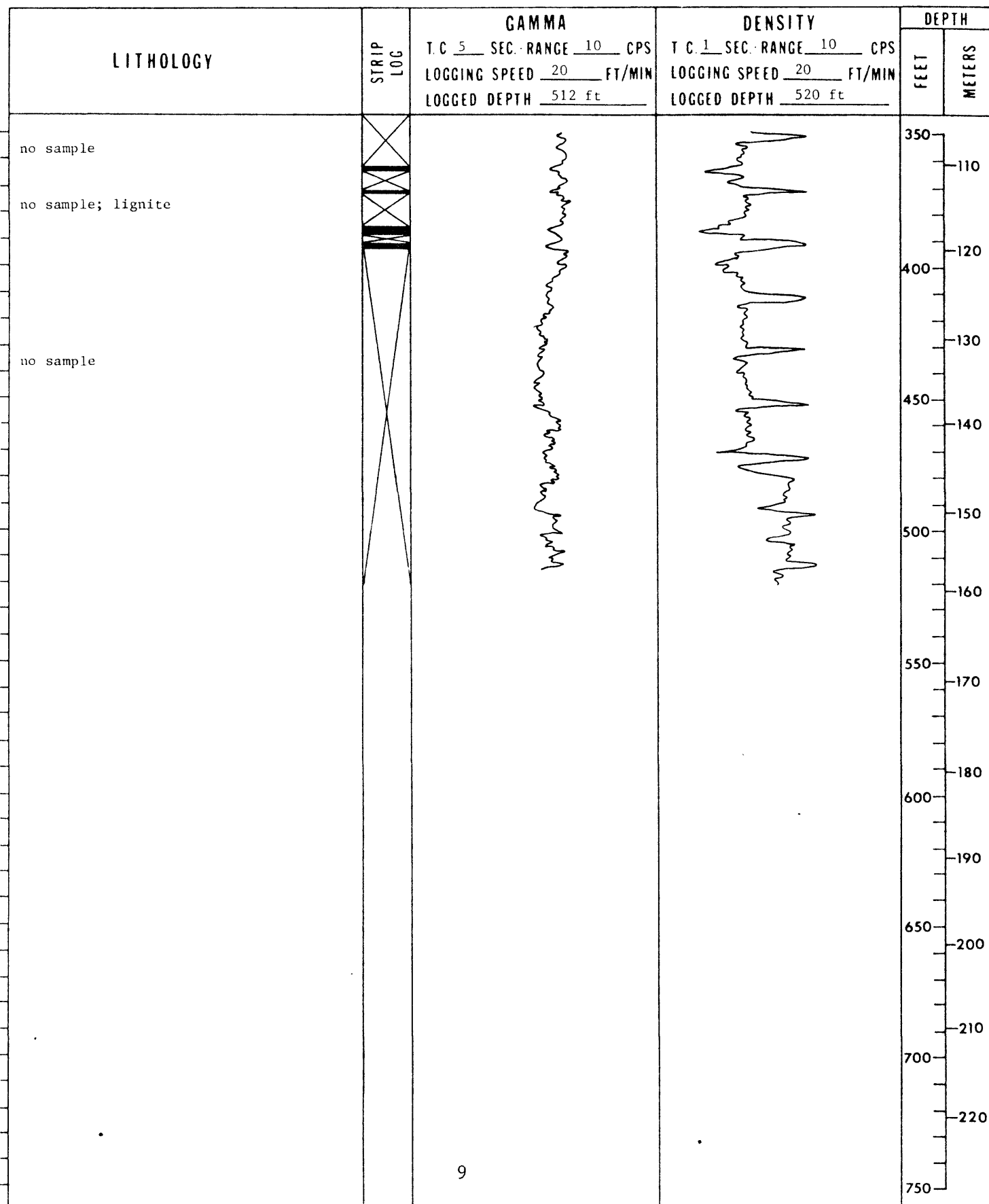
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 3  
SHEET 1 OF 2

<b>AREA</b> Coteau		<b>QUAD NAME</b> Benedict 15 min	
<b>DATE STARTED</b> 10/19/78	<b>DATE COMP.</b> 10/20/78	<b>COUNTY</b> Ward	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 18 <b>T.</b> 152 N, <b>R.</b> 82 W., <b>FOOTAGE LOC.</b> 37		<del>FWL</del> FSL 304	<del>FWL</del> PFL 2100 ft
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b> ROTARY 520 CORING -----	<b>TOTAL DEPTH</b> 520 ft
<b>DRILLING AGENCY:</b> Superior Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> -----
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Barriga	
<b>REMARKS:</b> Logged through drill pipe; drilled with mud; no sp or res logs			
Contract No. 14-08-0001-17431			



REMARKS:



UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY



GEOPHYSICAL AND LITHOLOGIC LOGS FOR 1978  
COAL DRILLING IN MOUNTRAIL, RENVILLE, WARD,  
AND WILLIAMS COUNTIES, NORTH DAKOTA

By  
Susan M. Cook and John M. Spencer

Open-File Report 79-912

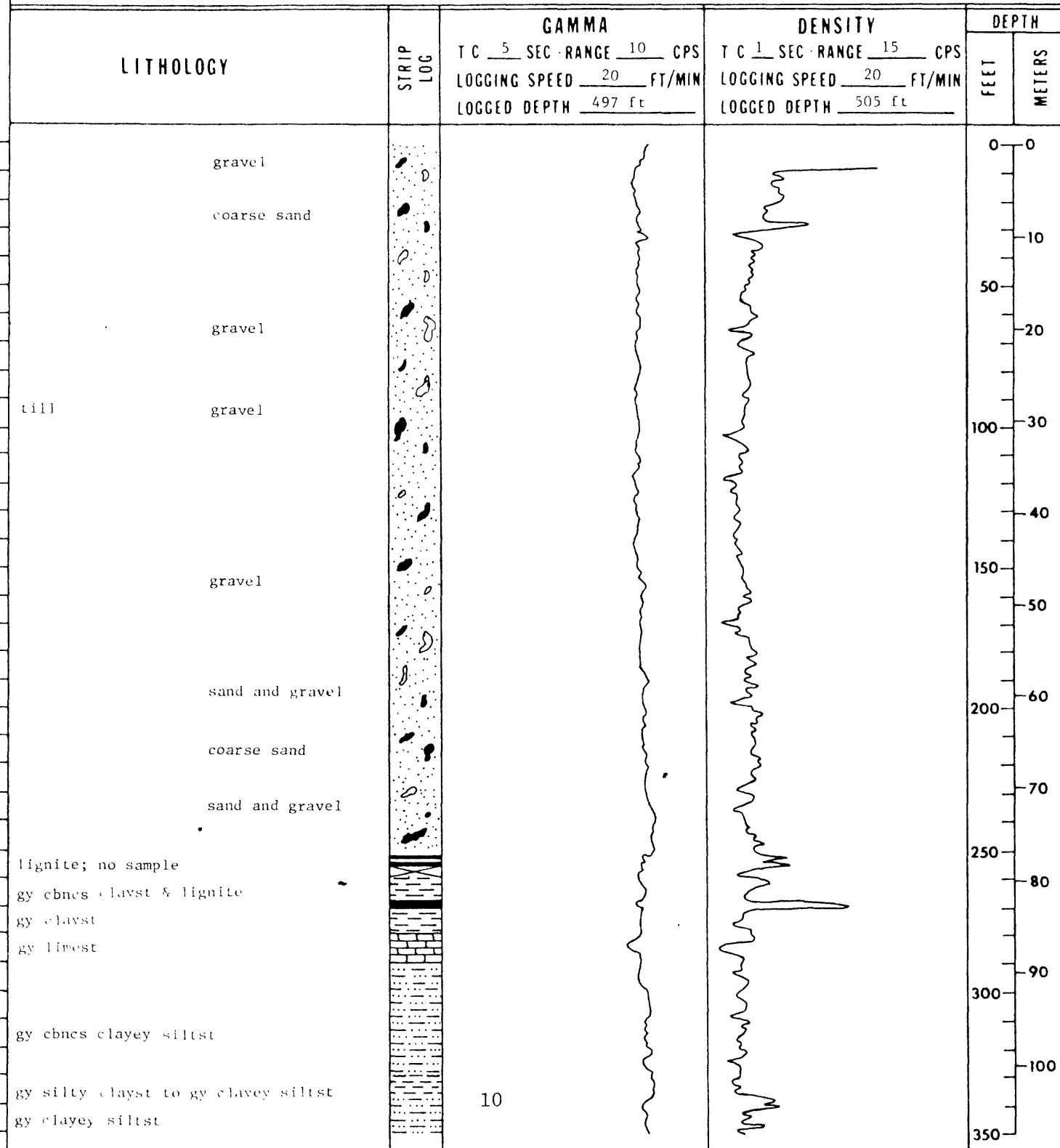
1979

This report has not been edited for conformity  
with U.S. Geological Survey editorial standards  
or stratigraphic nomenclature.

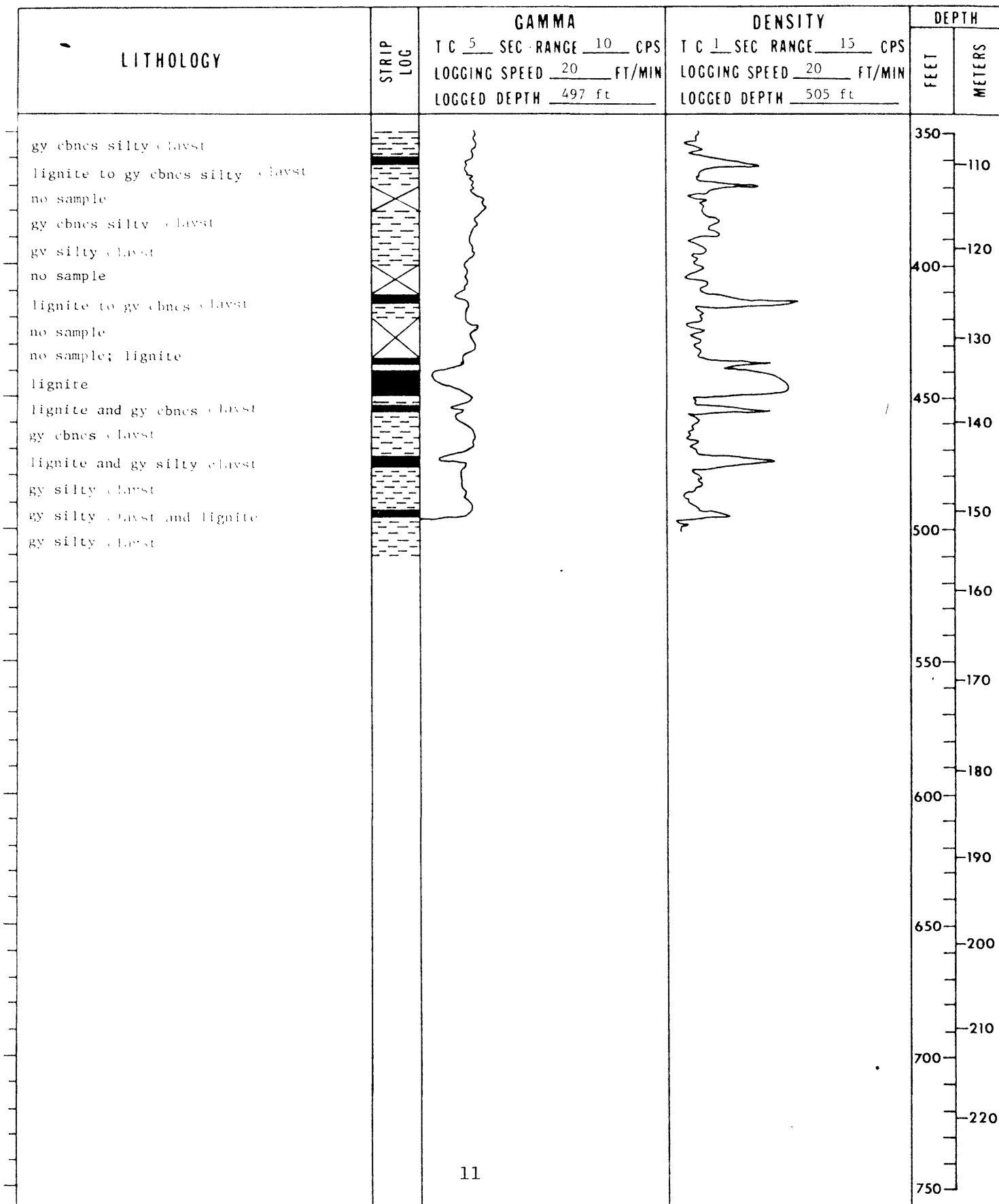
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 4  
SHEET 1 OF 4

<b>AREA</b> Coteau		<b>QUAD NAME</b> Minot 15 min	
<b>DATE STARTED</b> 10/22/78	<b>DATE COMP.</b> 10/22/78	<b>COUNTY</b> Ward	<b>STATE</b> North Dakota
<b>LOCATION: SEC. 4</b> T. 152 N., R. 83 W., <b>FOOTAGE LOC.</b> 44 ft		<b>FNL PSI</b> 265 ft	<b>FEL</b> 2089 ft
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b>	<b>TOTAL DEPTH</b> 505 ft
		<b>ROTARY</b> 505	<b>CORING</b> -----
<b>DRILLING AGENCY:</b> Superior Drilling		<b>DRILL TYPE:</b> -----	
		<b>DEPTH TO WATER</b> 10 ft	
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Barriga	
<b>REMARKS:</b> Drilled with mud			
Contract No. 14-08-0001-17431			



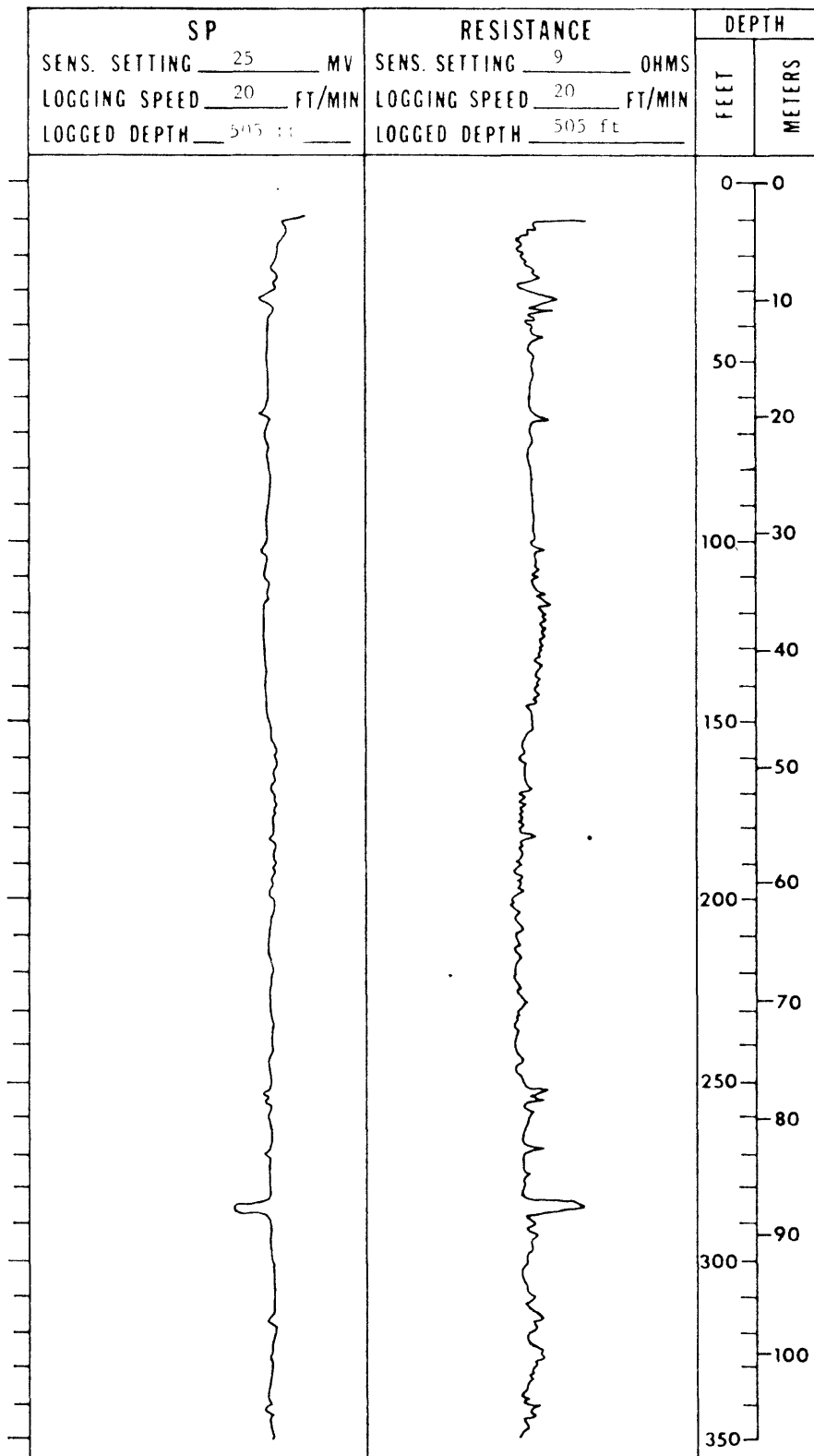
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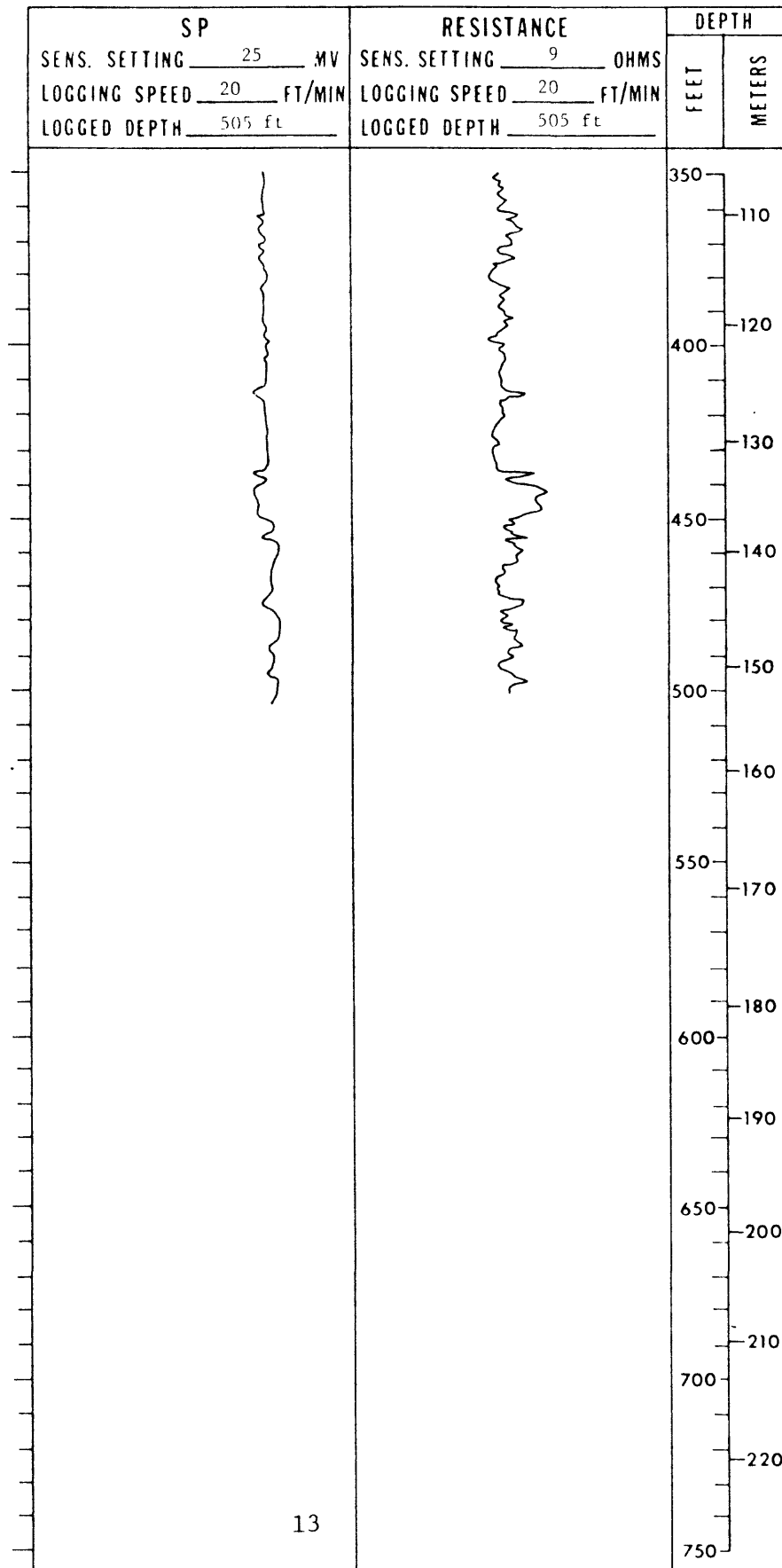
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 4  
SHEET 3 OF 4

REMARKS:



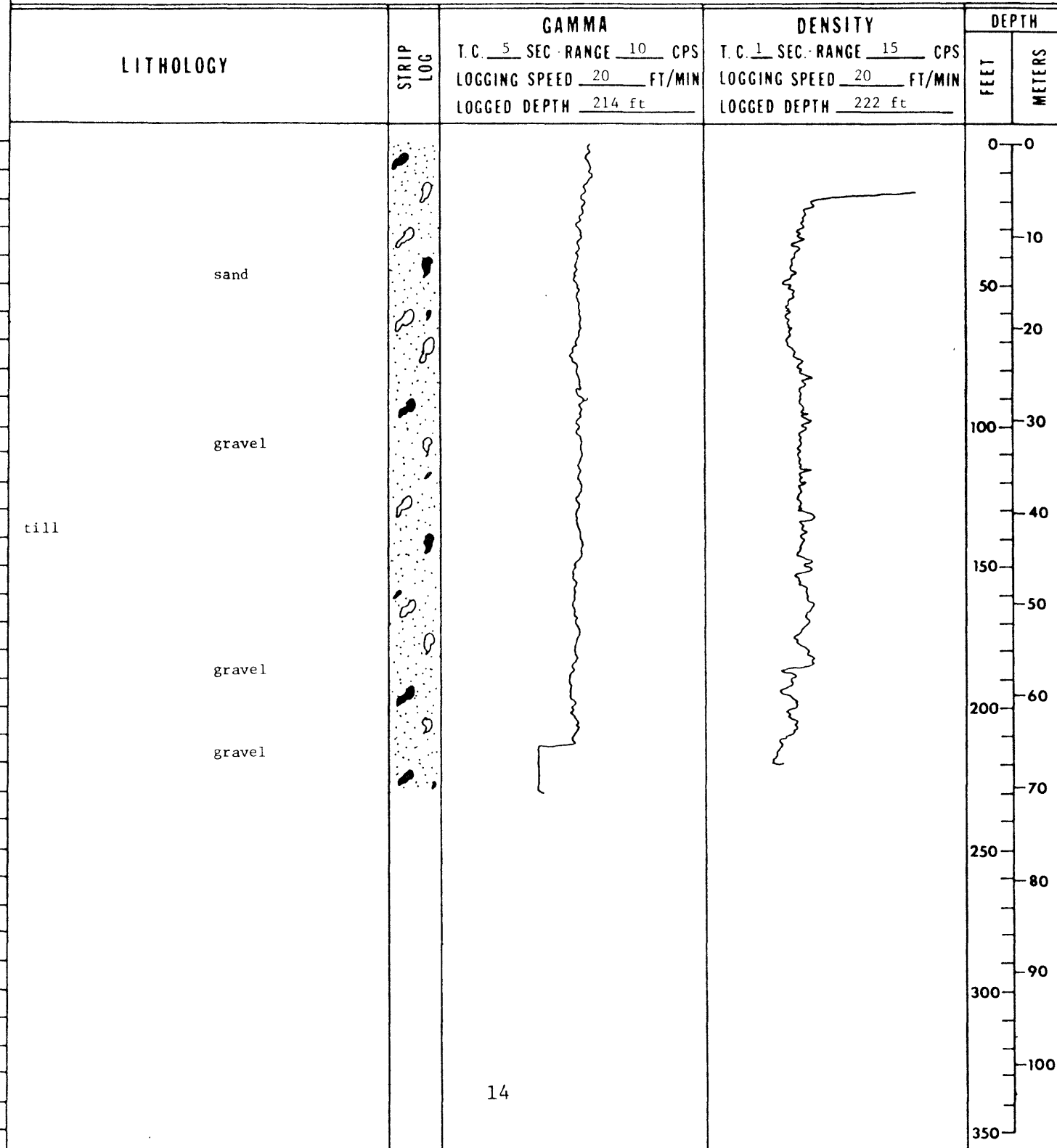
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 6  
SHEET 1 OF 2

<b>AREA</b> Coteau		<b>QUAD NAME</b> Sawyer	
<b>DATE STARTED</b> 10/23/78	<b>DATE COMP.</b> 10/23/78	<b>COUNTY</b> Ward	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 20 <b>T.</b> 153 N., <b>R.</b> 81 W., <b>FOOTAGE LOC.</b> 2479		<b>FNL</b> 19 <b>FWL</b> 19	<b>GROUND ELEV</b> 1753 ft
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b> 225	<b>TOTAL DEPTH</b> 225 ft
<b>DRILLING AGENCY:</b> Superior Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 19 ft
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Barriga	
<b>REMARKS:</b> Drilled with mud			
Contract No. 14-08-0001-17431			

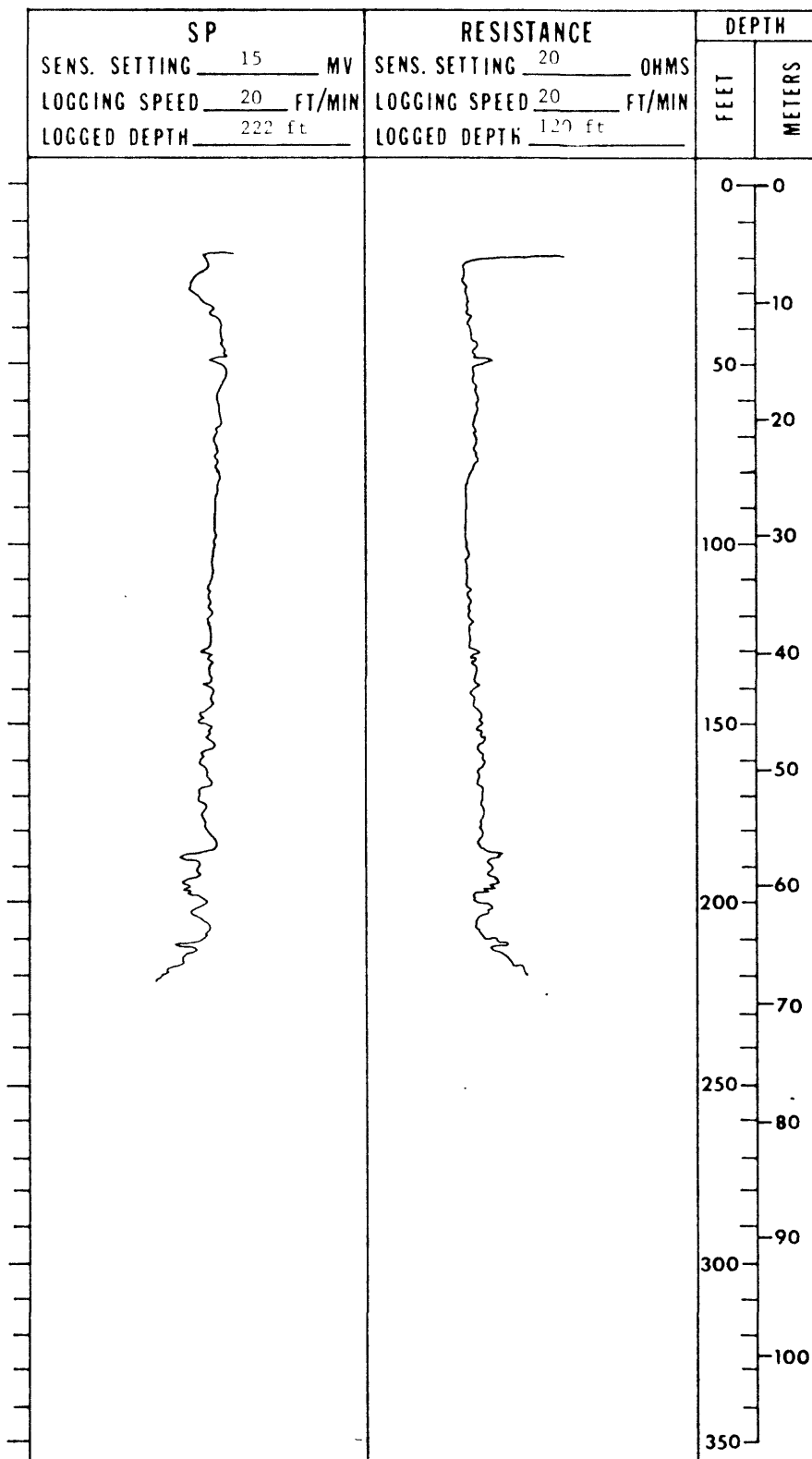




# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 6  
SHEET 2 OF 2

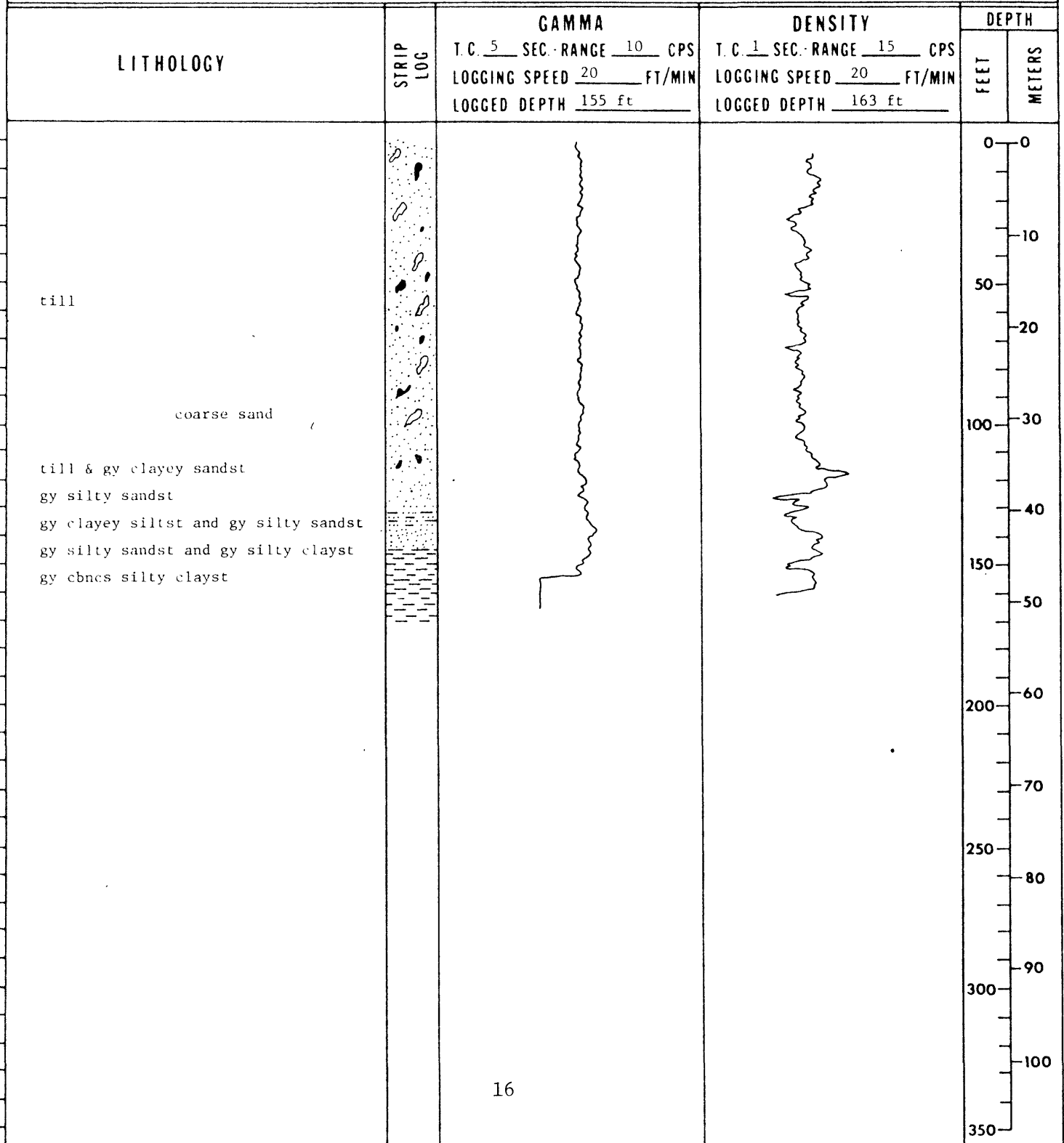
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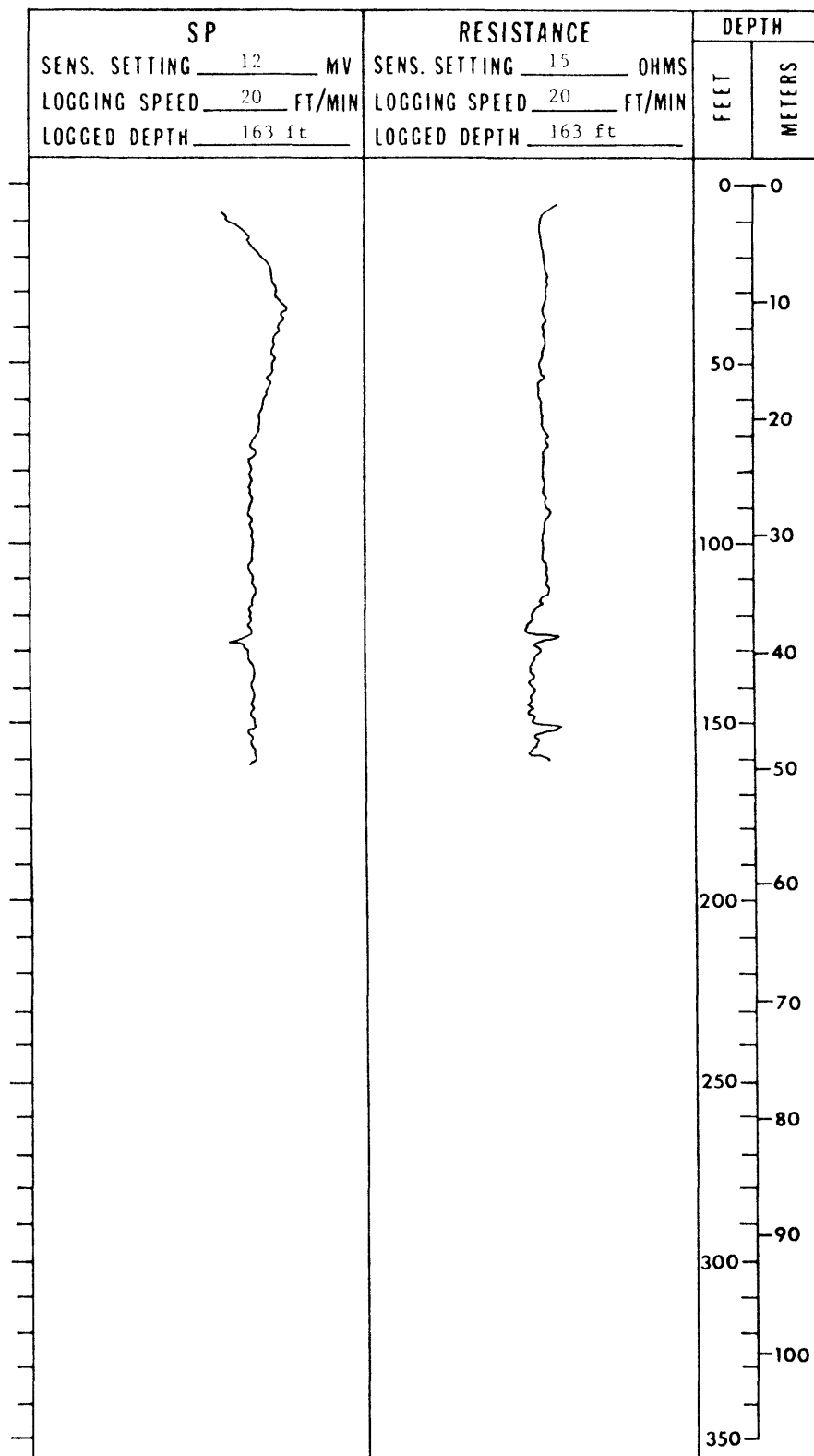
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 7  
SHEET 1 OF 2

<b>AREA</b> Coteau		<b>QUAD NAME</b> Sawyer SW	
<b>DATE STARTED</b> 10/24/78	<b>DATE COMP.</b> 10/24/78	<b>COUNTY</b> Ward	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 14 <b>T.</b> 153 N., <b>R.</b> 82 W., <b>FOOTAGE LOC.</b> 265		<b>FNL</b> 27 ft <del>PSL</del>	<b>FEL</b> 1750 ft <del>FWL</del>
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b>	
		<b>ROTARY</b> 165	<b>CORING</b> -----
<b>DRILLING AGENCY:</b> Superior Drilling		<b>DRILL TYPE:</b> -----	
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Barriga	
<b>REMARKS:</b>			
Contract No. 14-08-0001-17431			



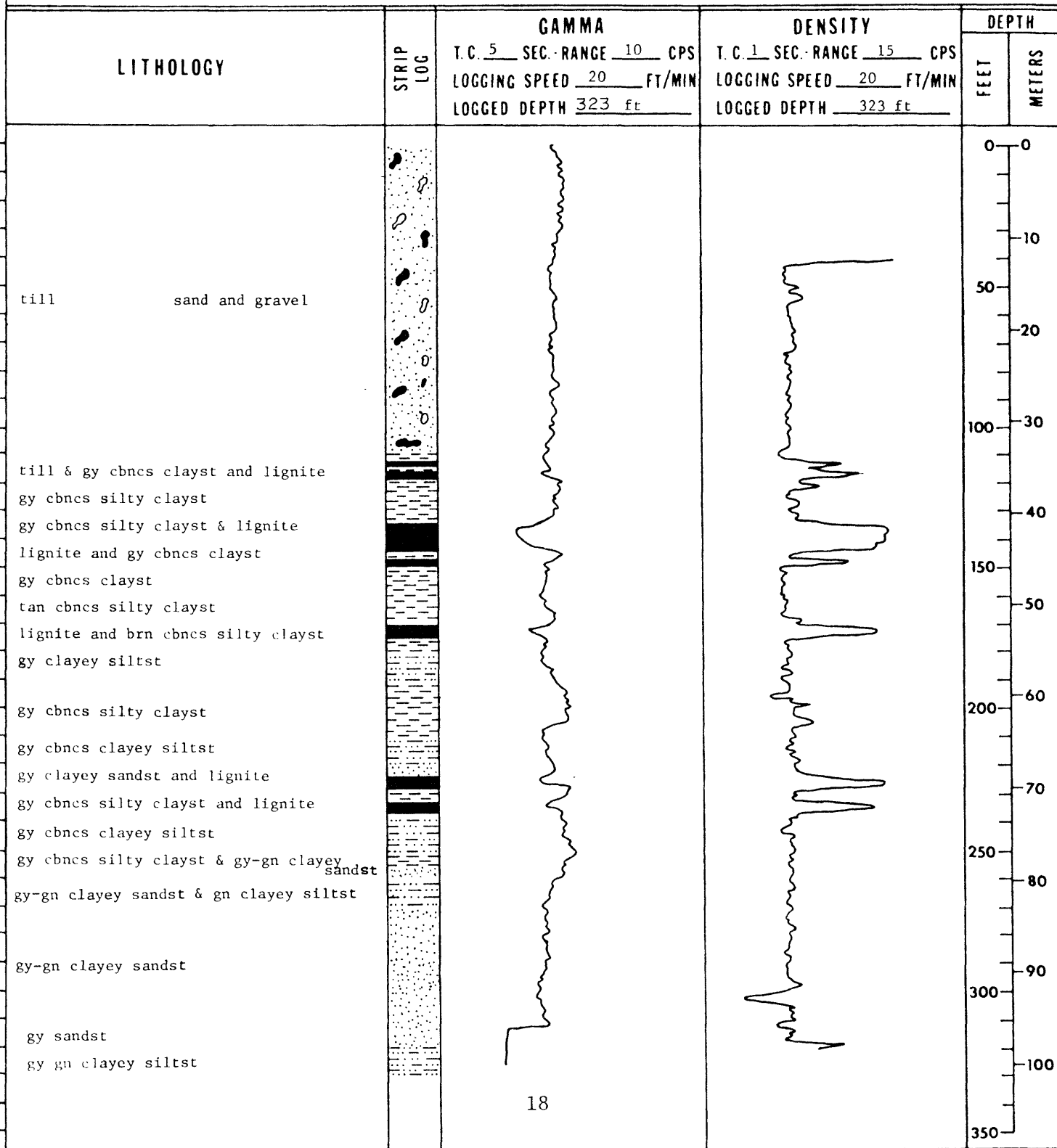
REMARKS:



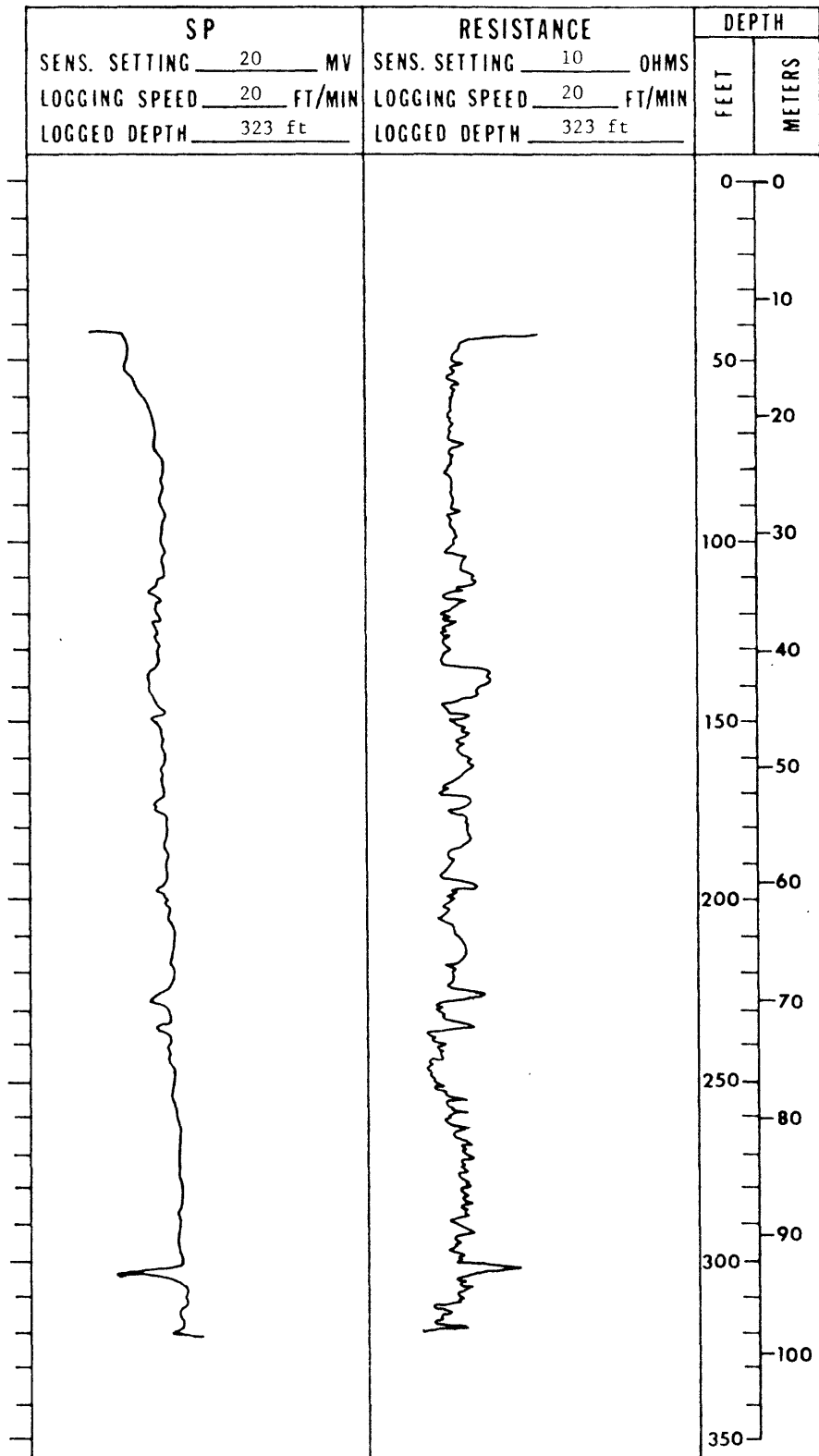
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 8  
SHEET 1 OF 2

<b>AREA</b> Coteau		<b>QUAD NAME</b> Minot 15	
<b>DATE STARTED</b> 10/26/78	<b>DATE COMP.</b> 10/26/78	<b>COUNTY</b> Ward	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 24 <b>T.</b> 153 N., <b>R.</b> 83 W., <b>FOOTAGE LOC.</b> 54		<b>FNL</b> 2009	<b>FEL</b> 1913 ft
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b>	<b>TOTAL DEPTH</b> 325 ft
		<b>ROTARY</b> 475	<b>CORING</b> 20
<b>DRILLING AGENCY:</b> Superior Drilling		<b>DRILL TYPE:</b> -----	
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Barriga	
<b>REMARKS:</b> Drilled with mud, Cored 20 ft at 130 ft			
Contract No. 14-08-0001-17431			

















REMARKS:

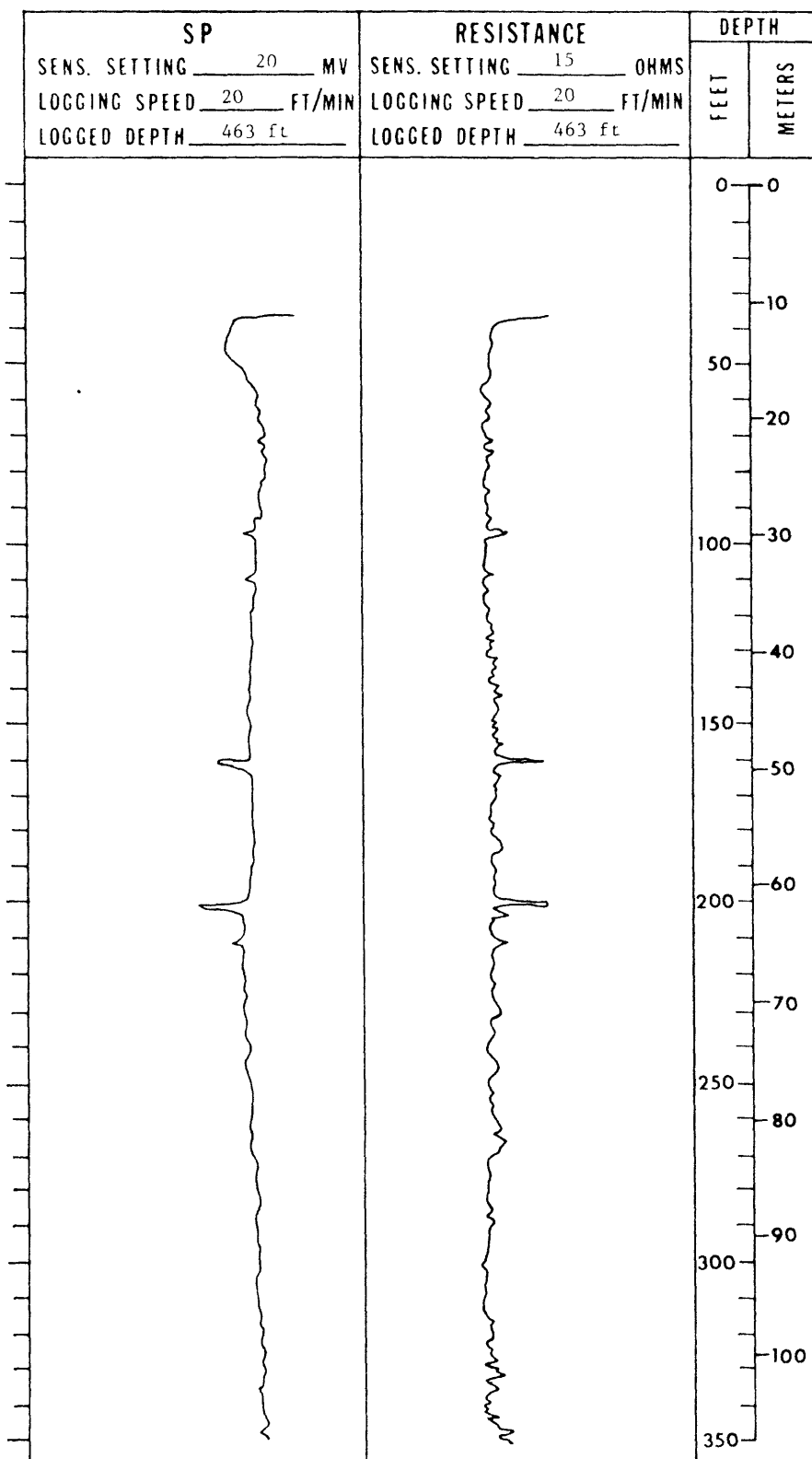




REMARKS:

LITHOLOGY	STRIP LOG	GAMMA	DENSITY	DEPTH	
		T C <u>5</u> SEC RANGE <u>10</u> CPS LOGGING SPEED <u>20</u> FT/MIN LOGGED DEPTH <u>456</u> ft	T C <u>1</u> SEC RANGE <u>15</u> CPS LOGGING SPEED <u>20</u> FT/MIN LOGGED DEPTH <u>463</u> ft	FEET	METERS
gravel				350	
till				110	
till & gy silty clayst					
gy silty clayst				120	
gy cbncs clayst & lignite				400	
lignite & gy cbncs clayst					
lignite & gy clayey sandst				130	
no sample, lignite					
no sample				140	
gn clayey sandst				450	
gy silty clayst & gy gn clayey sandst				150	
gy gn clayey sandst				160	
				500	
				170	
				180	
				190	
				200	
				210	
				220	
				750	

REMARKS:

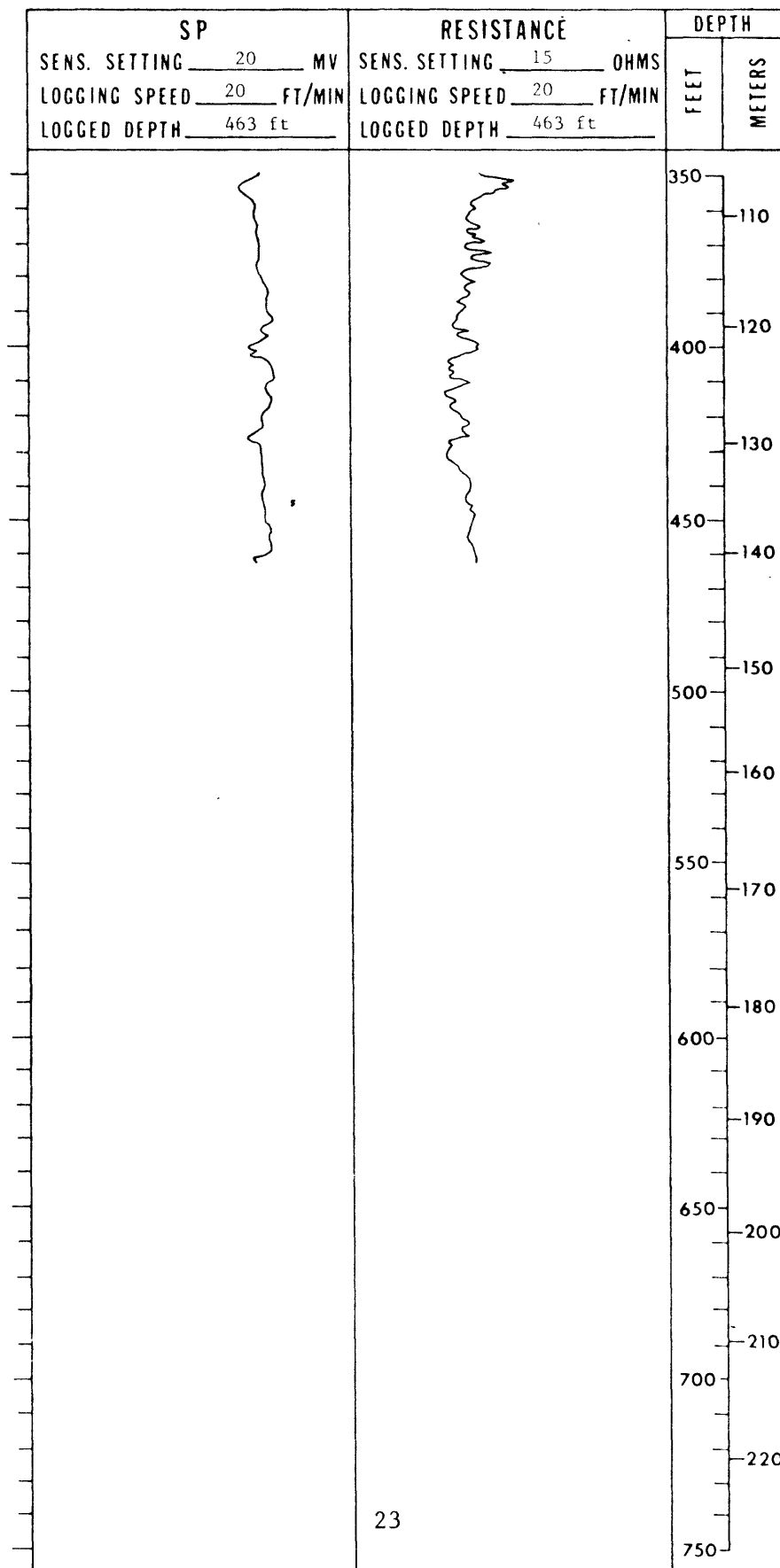




## UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 9  
SHEET 4 OF 4

REMARKS:



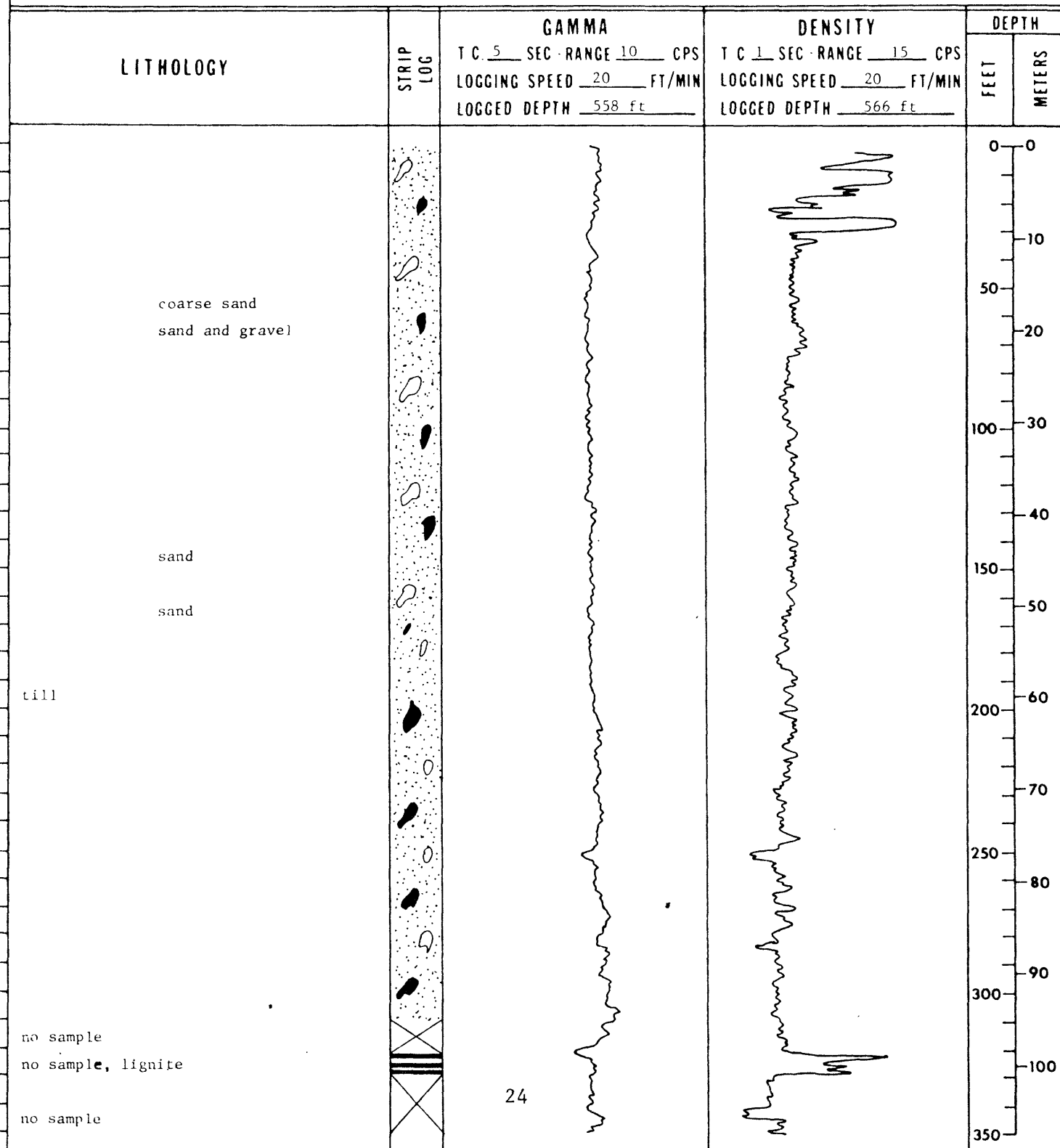
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HOLE NO C 10  
SHEET 1 OF 4

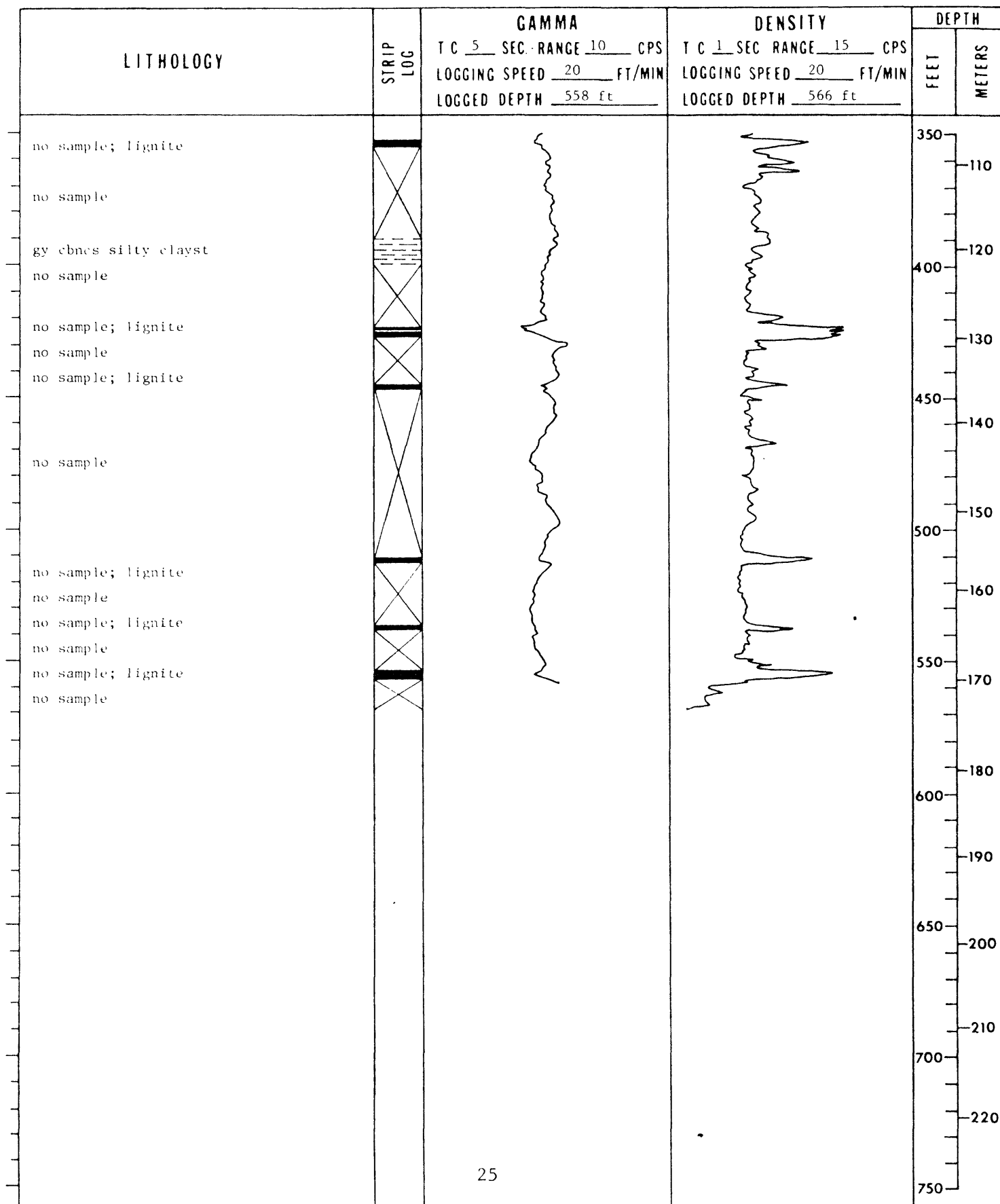
<b>AREA</b> Coteau		<b>QUAD NAME</b> Minot-15 min	
<b>DATE STARTED</b> 11/2/78	<b>DATE COMP.</b> 11/2/78	<b>COUNTY</b> Ward	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 22 <b>T.</b> 153 N., <b>R.</b> 84 W., <b>FOOTAGE LOC.</b>		84 ft <del>FSL</del> 114 ft <del>FEL</del>	<b>GROUND ELEV</b> 2155 ft
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b>	<b>TOTAL DEPTH</b> 570 ft
		<b>ROTARY</b> 570 <b>CORING</b> -----	
<b>DRILLING AGENCY:</b> Superior Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 35 ft
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Barriga	

**REMARKS:**

Contract No. 14-08-0001-17431



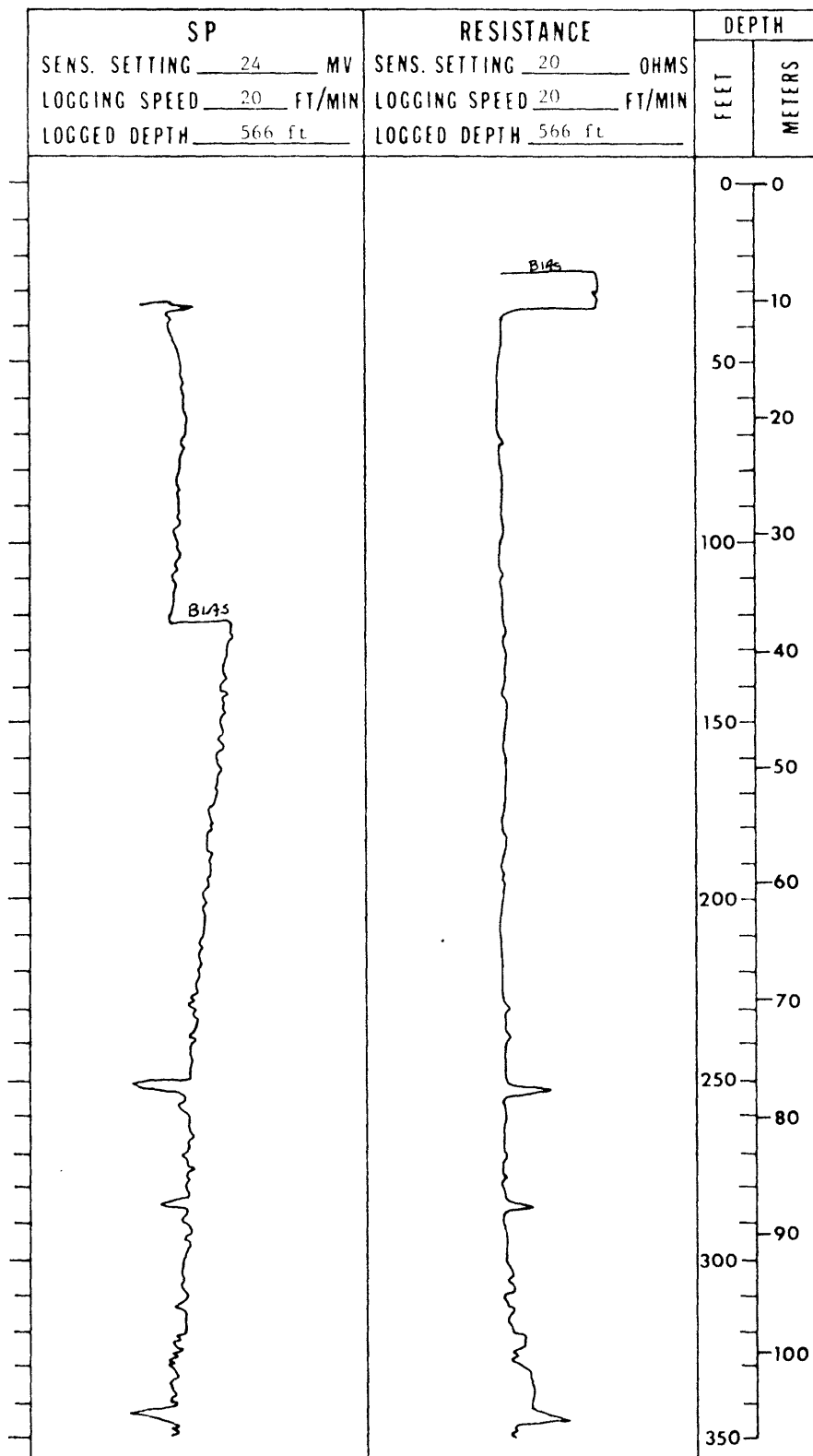
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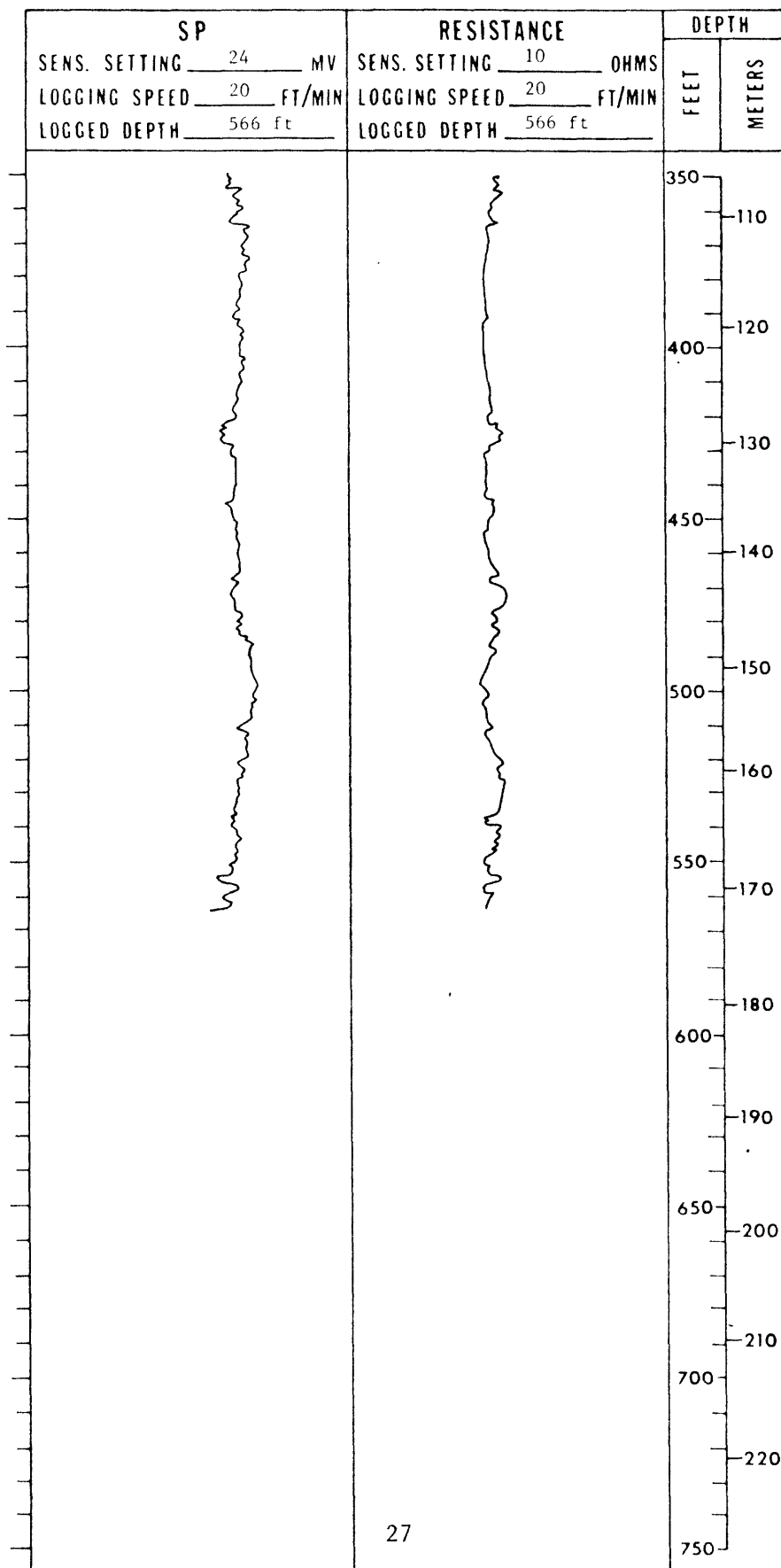
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 10  
SHEET 3 OF 4

REMARKS:



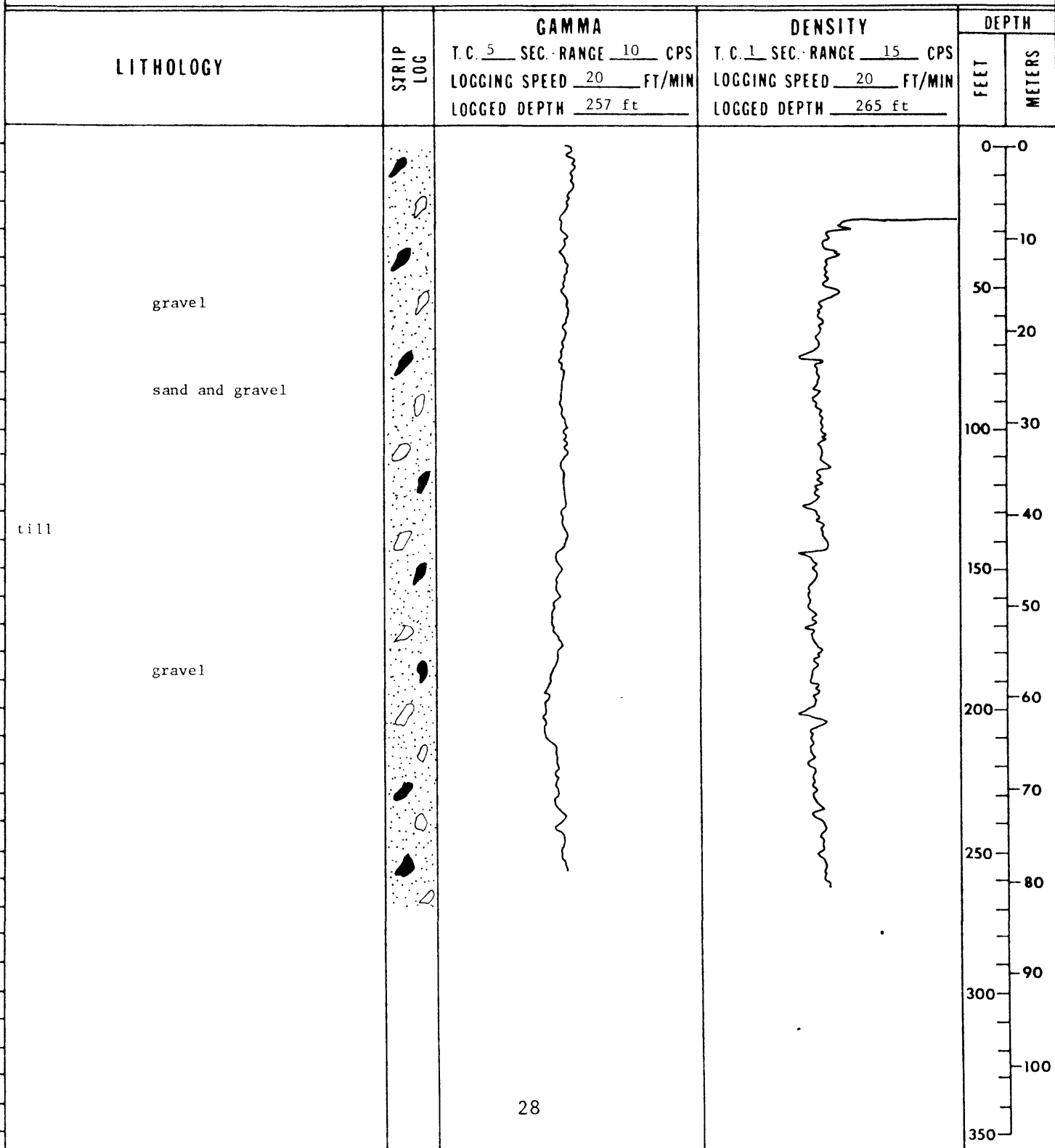
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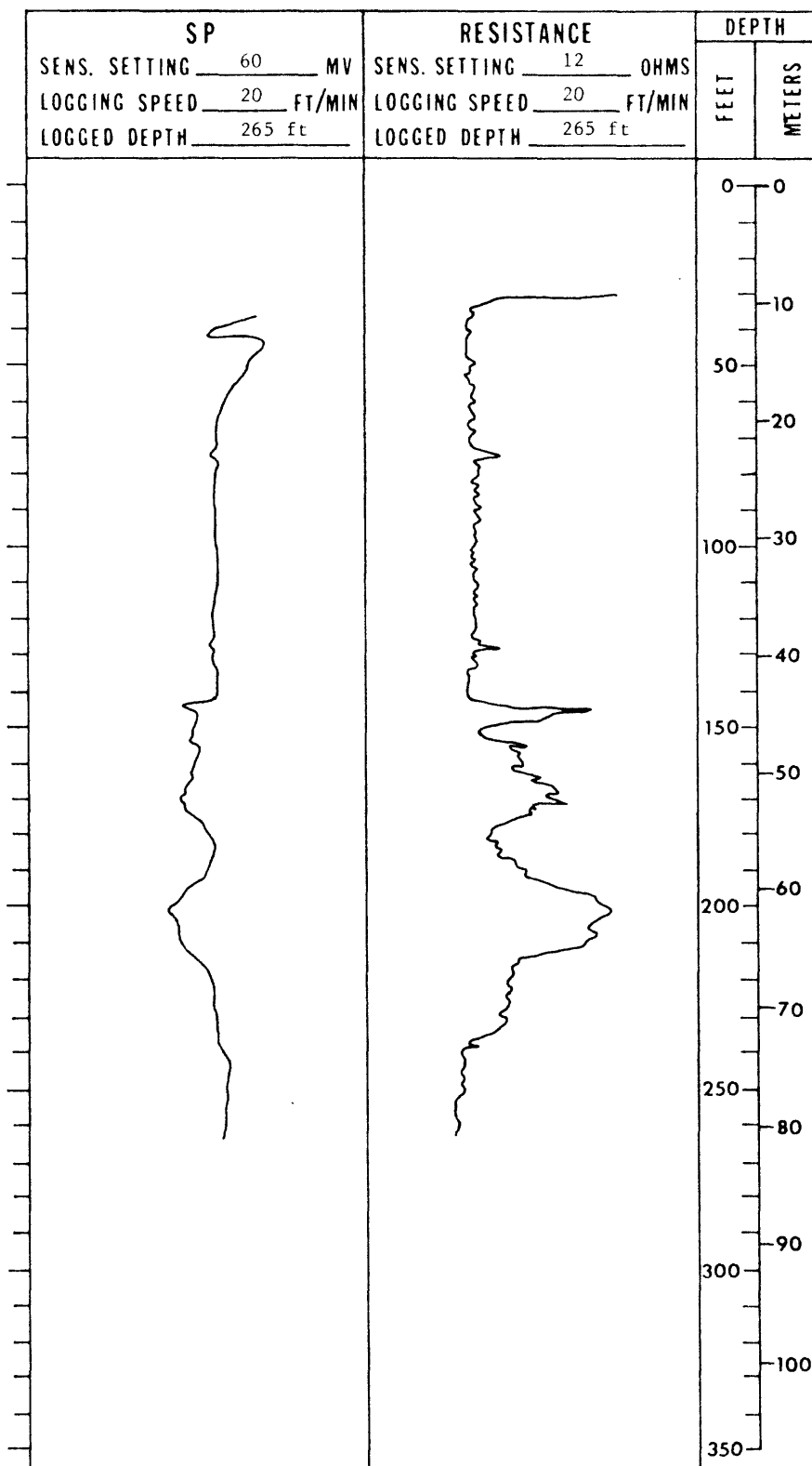
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 13  
SHEET 1 OF 2

<b>AREA</b> Coteau		<b>QUAD NAME</b> Minot	
<b>DATE STARTED</b> 11/6/78	<b>DATE COMP.</b> 11/6/78	<b>COUNTY</b> Ward	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 25 <b>T.</b> 154 N., <b>R.</b> 83 W., <b>FOOTAGE LOC.</b> 198		<b>FNL</b> 105 <b>FEET</b> 105 <b>FEET</b> 105	<b>GROUND ELEV</b> 1795 ft
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b> 265 <b>ROTARY</b> 265 <b>CORING</b> -----	<b>TOTAL DEPTH</b> 265 ft
<b>DRILLING AGENCY:</b> Superior Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 26 ft
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Barriga	
<b>REMARKS:</b> Drilled with water			
Contract No. 14-08-0001-17431			



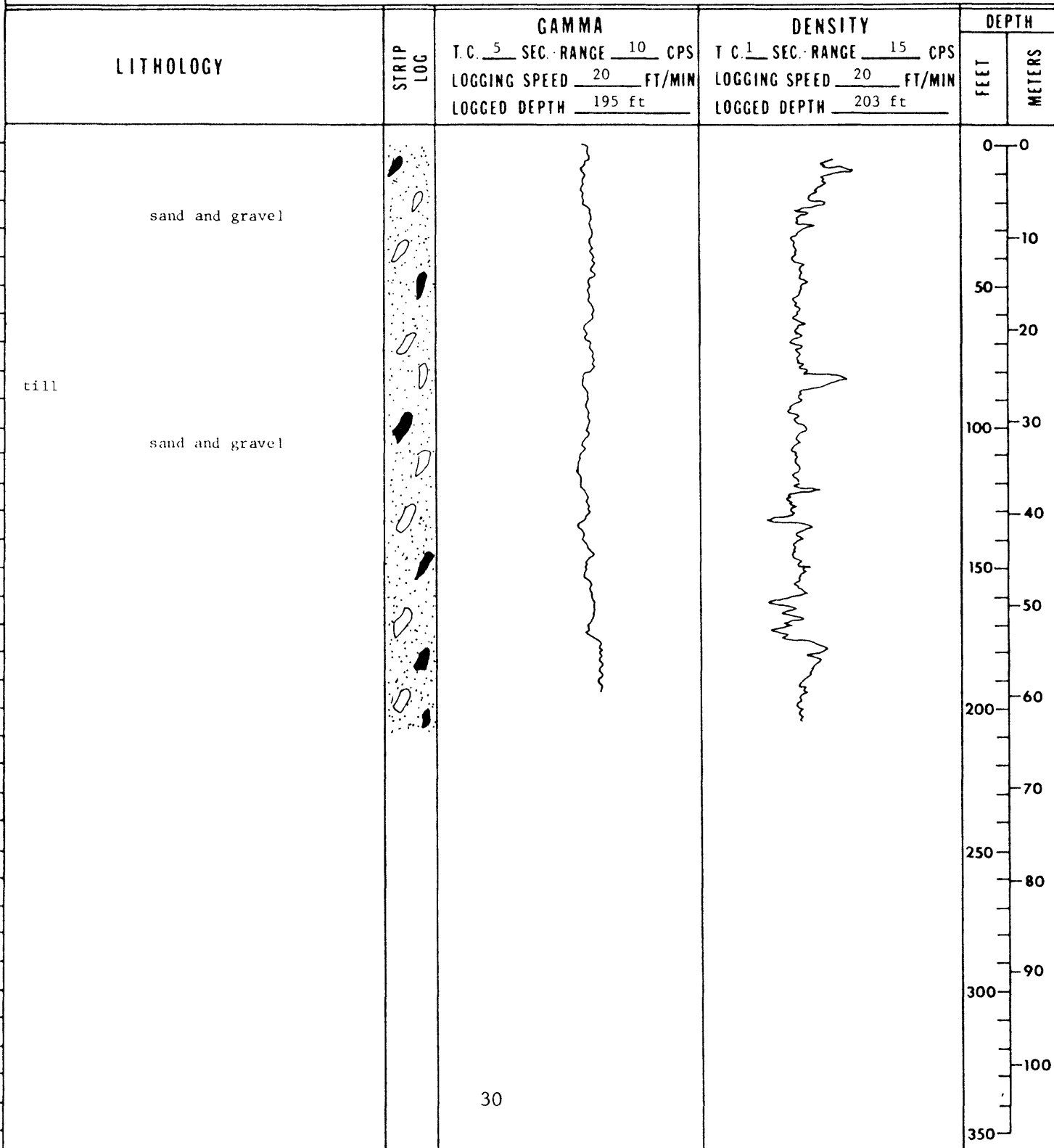
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

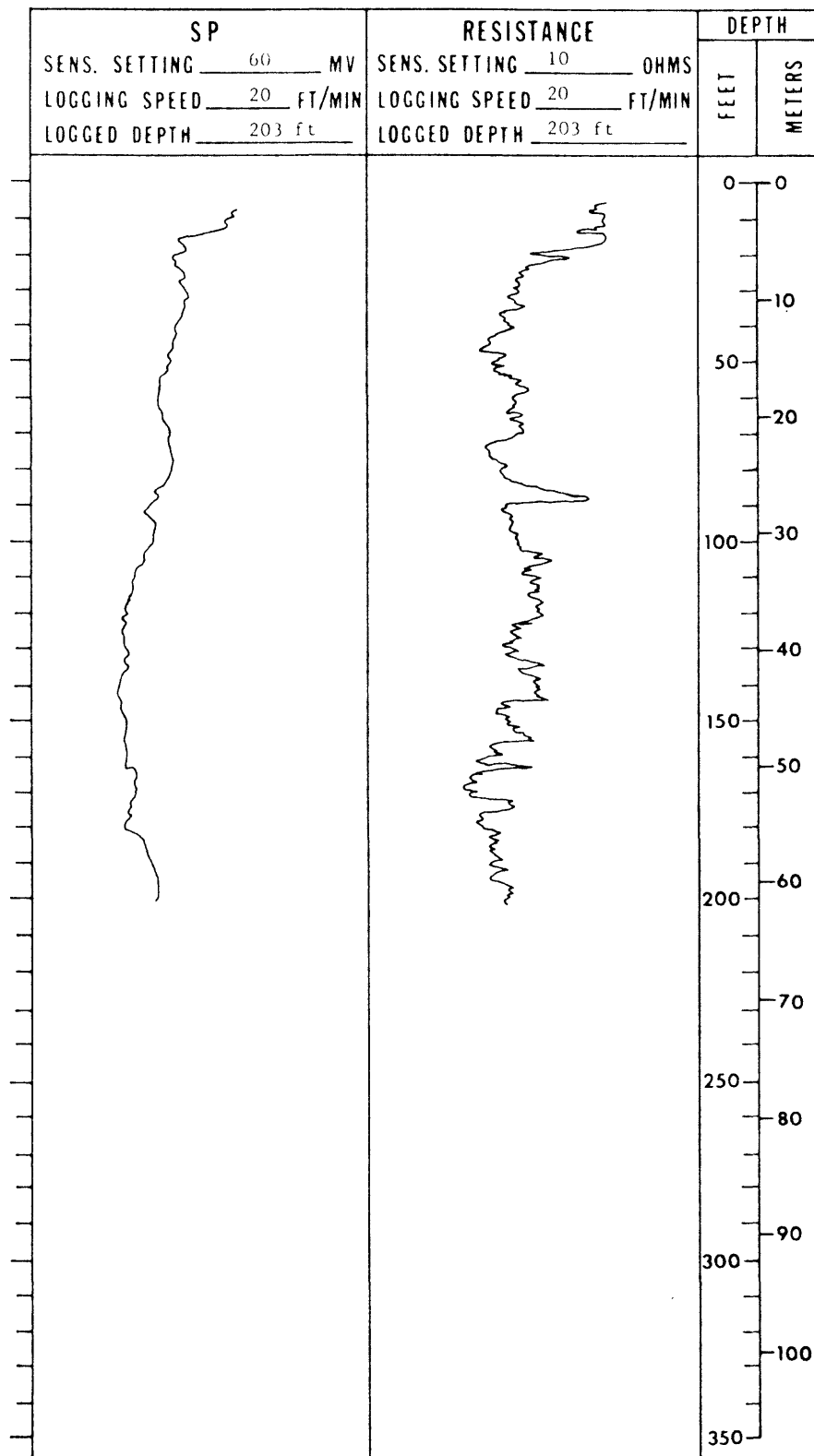
HOLE NO C 15  
SHEET 1 OF 2

AREA Coteau		QUAD NAME Surrey	
DATE STARTED 11/6/78	DATE COMP. 11/6/78	COUNTY Ward	STATE North Dakota
LOCATION: SEC. 4 T.154 N., R.82 W., FOOTAGE LOC. 364		<del>FWL</del> FSL 600	<del>FWL</del> FSL 1717 ft
SIZE AND BIT TYPE: 5 1/8 in.		FOOTAGE ROTARY 205 CORING -----	TOTAL DEPTH 205 ft
DRILLING AGENCY: Superior Drilling		DRILL TYPE: -----	DEPTH TO WATER 5 ft
LITHOLOGY RECORDED BY Susan M. Cook		GEOPHYSICAL LOGS RECORDED BY Barriga	
REMARKS: Drilled with water			
Contract No. 14-08-0001-17431			





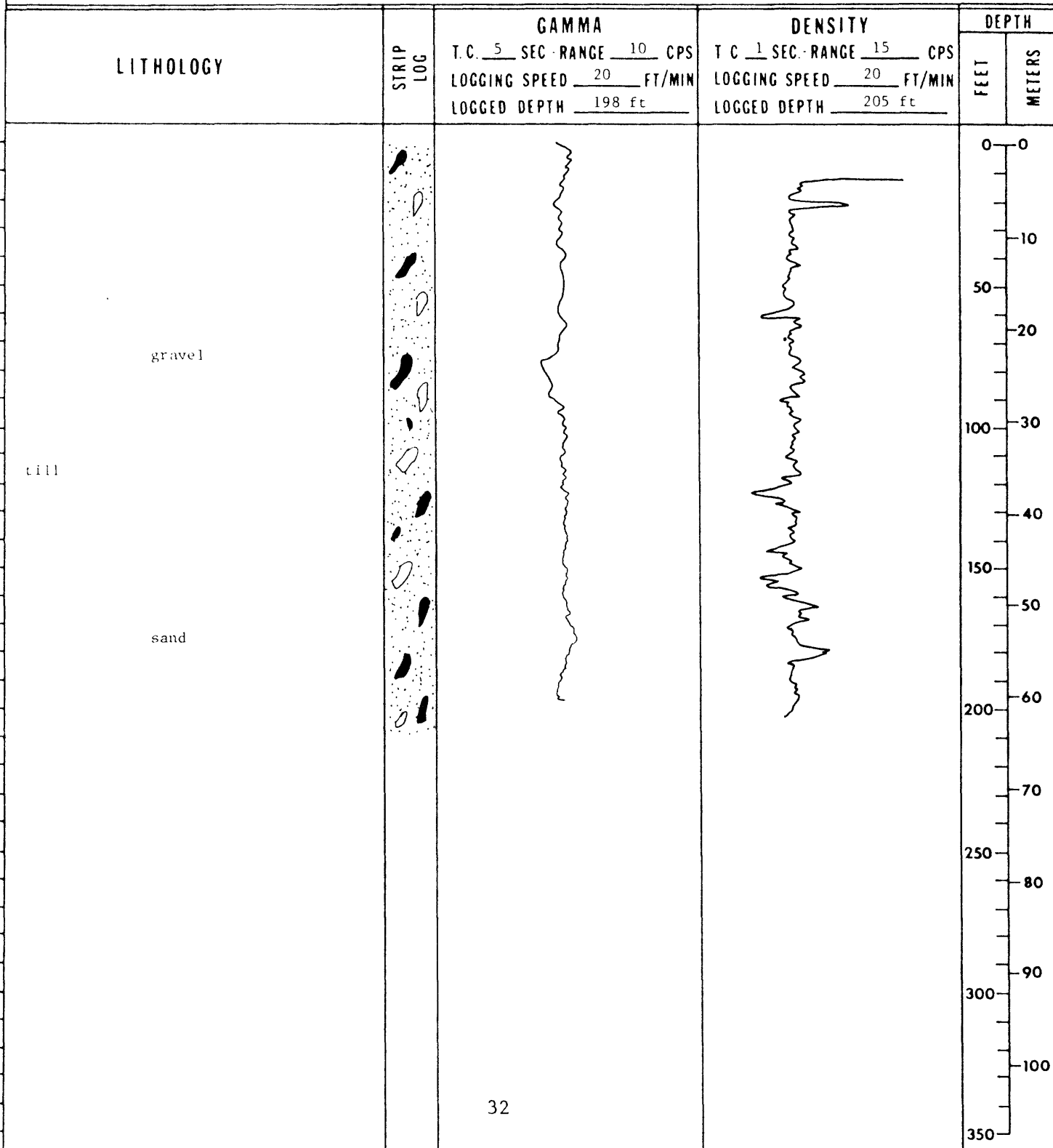
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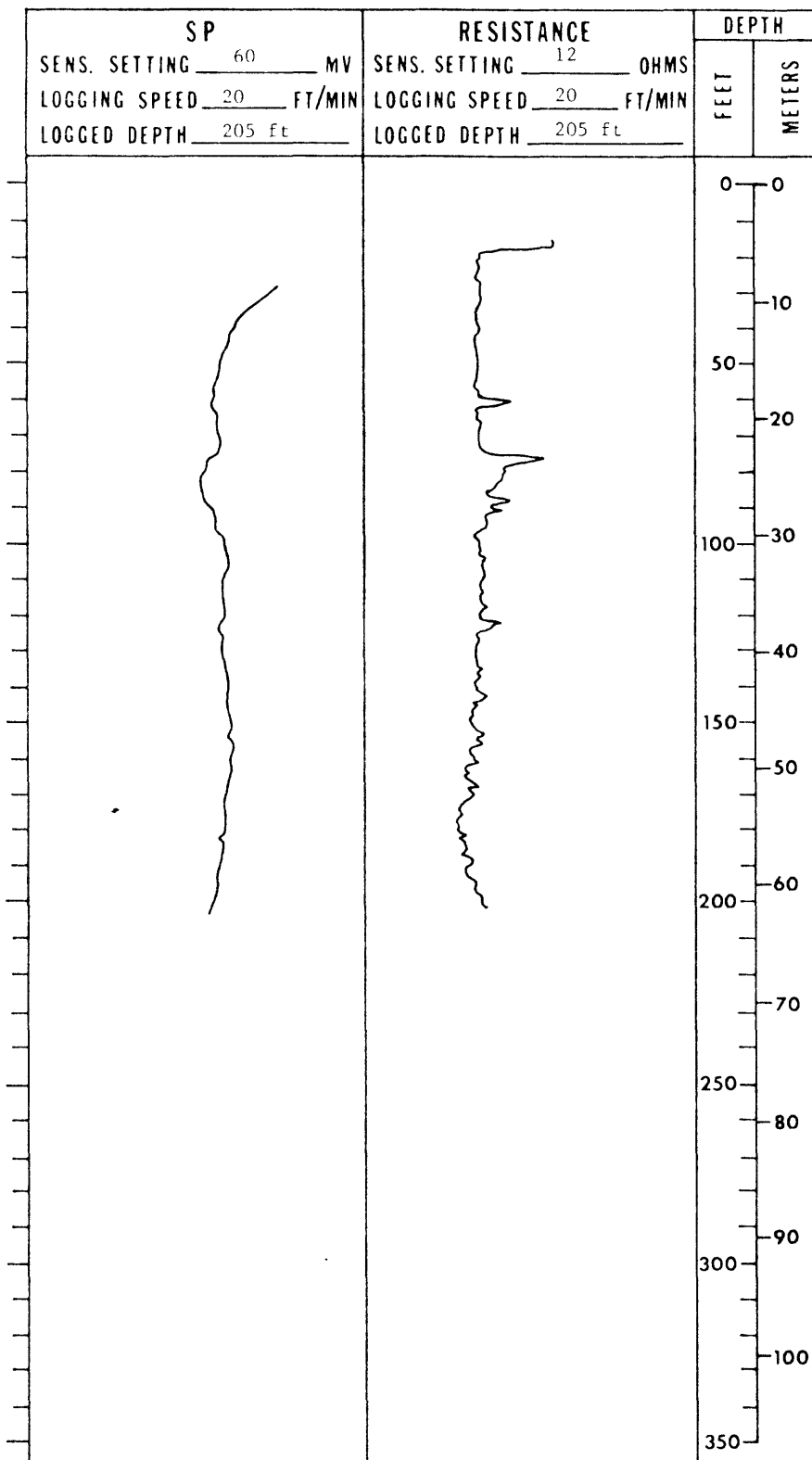
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 16  
SHEET 1 OF 2

AREA Coteau		QUAD NAME Minot	
DATE STARTED 11/6/78	DATE COMP. 11/6/78	COUNTY Ward	STATE North Dakota
LOCATION: SEC. 5 T.154 N., R. 83 W.,		FOOTAGE LOC. 135	FNL 2237 FSL 2237 GROUND ELEV 1816 ft
SIZE AND BIT TYPE: 5 1/8 in.		FOOTAGE ROTARY 205 CORING -----	TOTAL DEPTH 205 ft
DRILLING AGENCY: Superior Drilling		DRILL TYPE: -----	DEPTH TO WATER -----
LITHOLOGY RECORDED BY Susan M. Cook		GEOPHYSICAL LOGS RECORDED BY Barriga	
REMARKS:			
Contract No. 14-08-0001-17431			



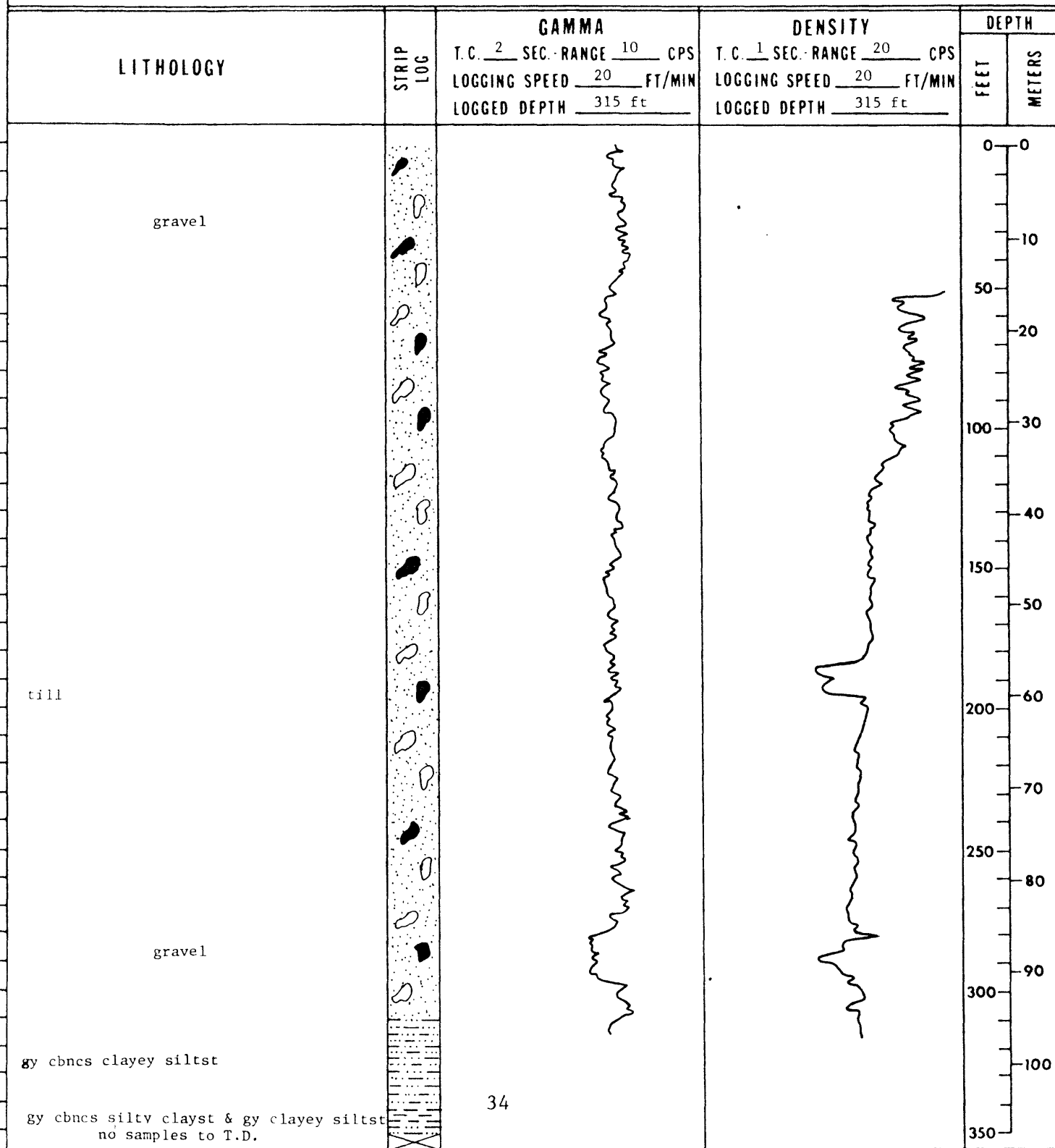
REMARKS:



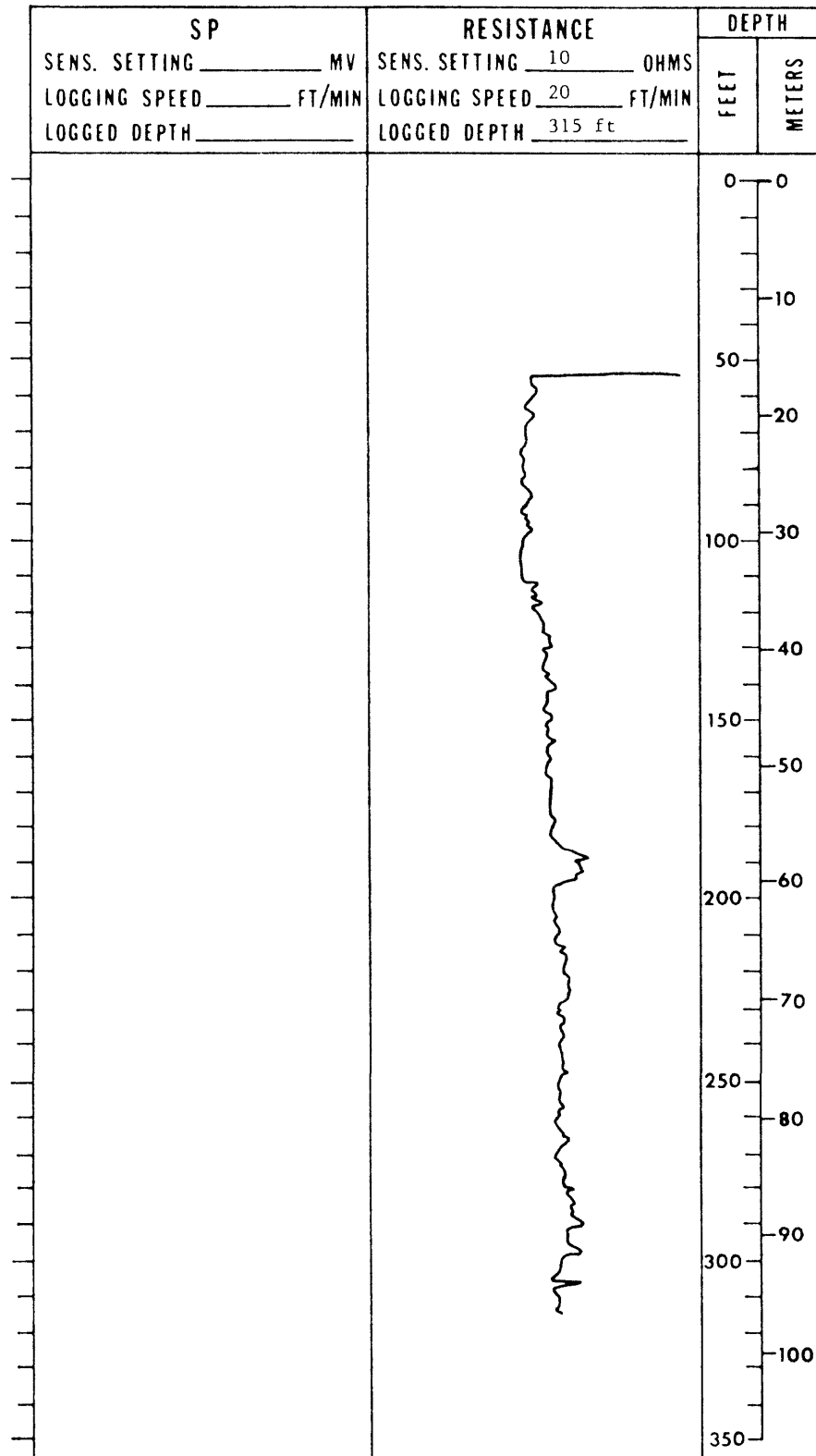
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 43  
SHEET 1 OF 2

AREA Coteau		QUAD NAME Williston AMS	
DATE STARTED 10/3/78	DATE COMP. 10/3/78	COUNTY Mountrail	STATE North Dakota
LOCATION: SEC. 22 T. 158 N, R. 88 W., FOOTAGE LOC. 2625		FNL 7	GROUND ELEV 2300 ft
SIZE AND BIT TYPE: 5 1/8 in.		FOOTAGE	TOTAL DEPTH 400 ft
		ROTARY 400	CORING -----
DRILLING AGENCY: Gregory Drilling	DRILL TYPE: -----		DEPTH TO WATER 54 ft
LITHOLOGY RECORDED BY Susan M. Cook	GEOPHYSICAL LOGS RECORDED BY Yeamans		
REMARKS: Drilled with water; no sp log			
Contract No. 14-08-0001-17431			



REMARKS:



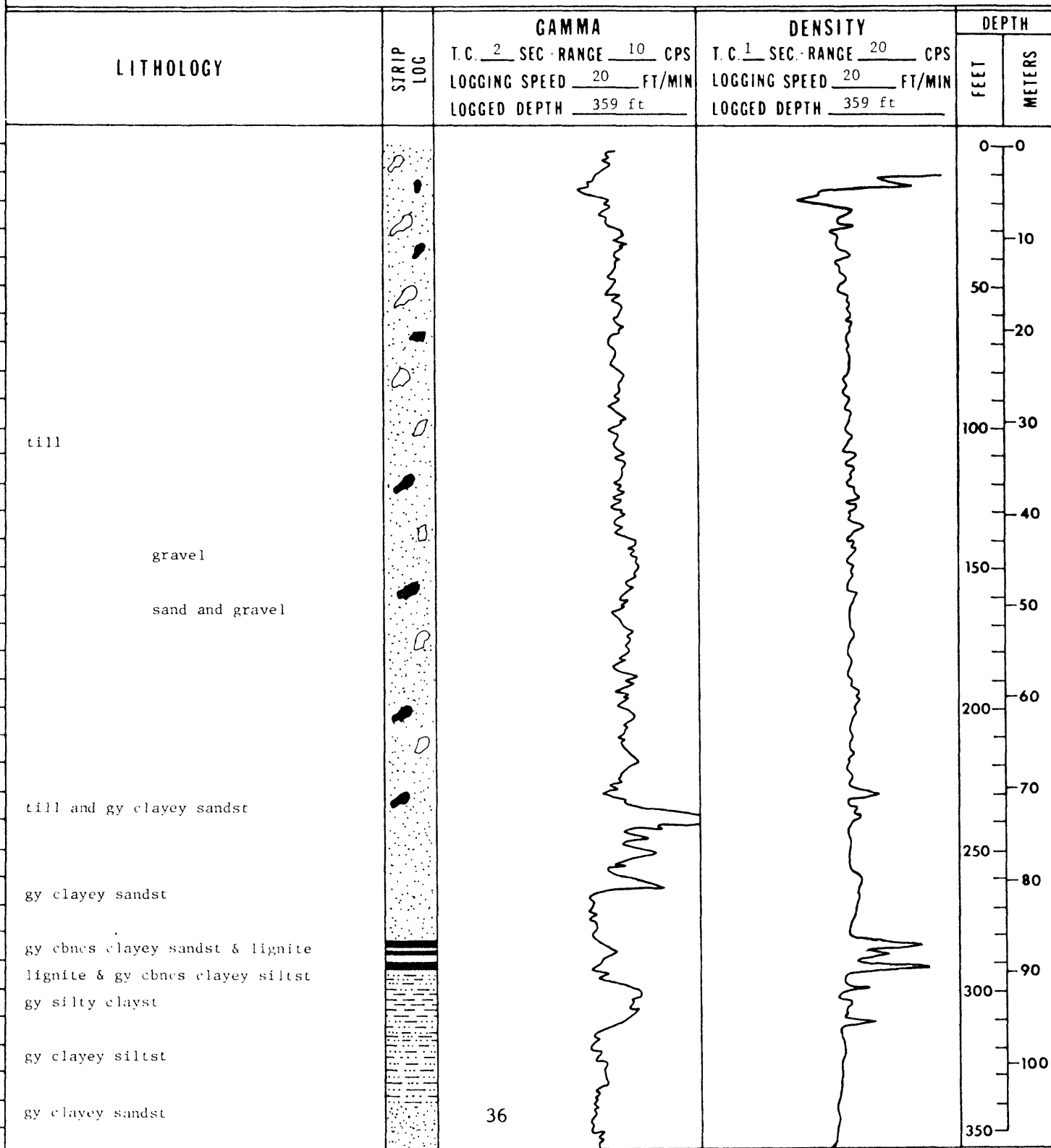
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 45  
SHEET 1 OF 2

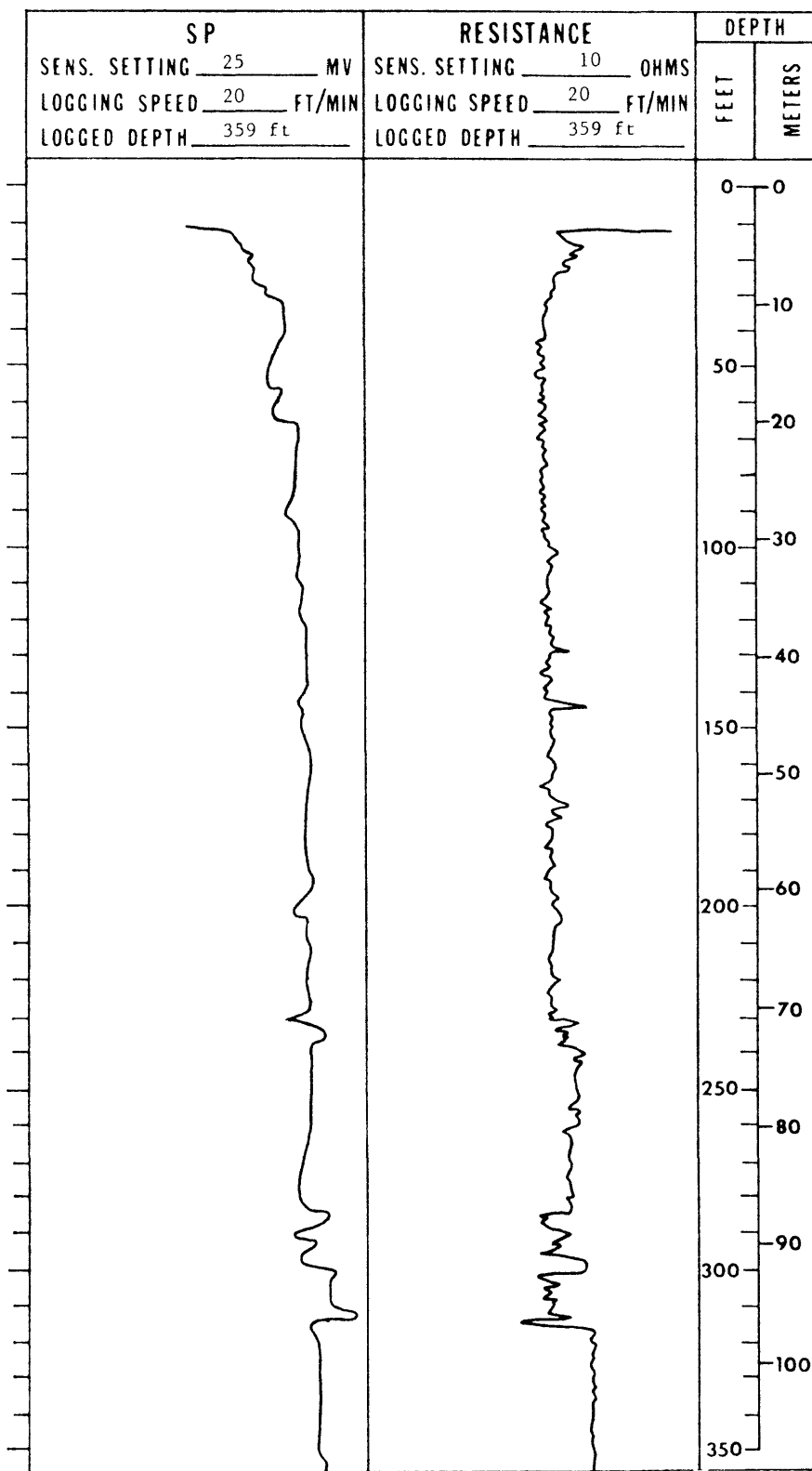
<b>AREA</b> Coteau		<b>QUAD NAME</b> Tolley SE	
<b>DATE STARTED</b> 10/2/78	<b>DATE COMP.</b> 10/2/78	<b>COUNTY</b> Ward	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 14 T.158 N., R.87 W., <b>FOOTAGE LOC.</b> 70		<b>FNL</b> 10 <b>FEL</b> 10	<b>GROUND ELEV</b> 1956 ft
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b> ROTARY 360 CORING -----	<b>TOTAL DEPTH</b> 360 ft
<b>DRILLING AGENCY:</b> Gregory Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 13 ft
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Yeamans	

**REMARKS:**

Contract No. 14-08-0001-17431



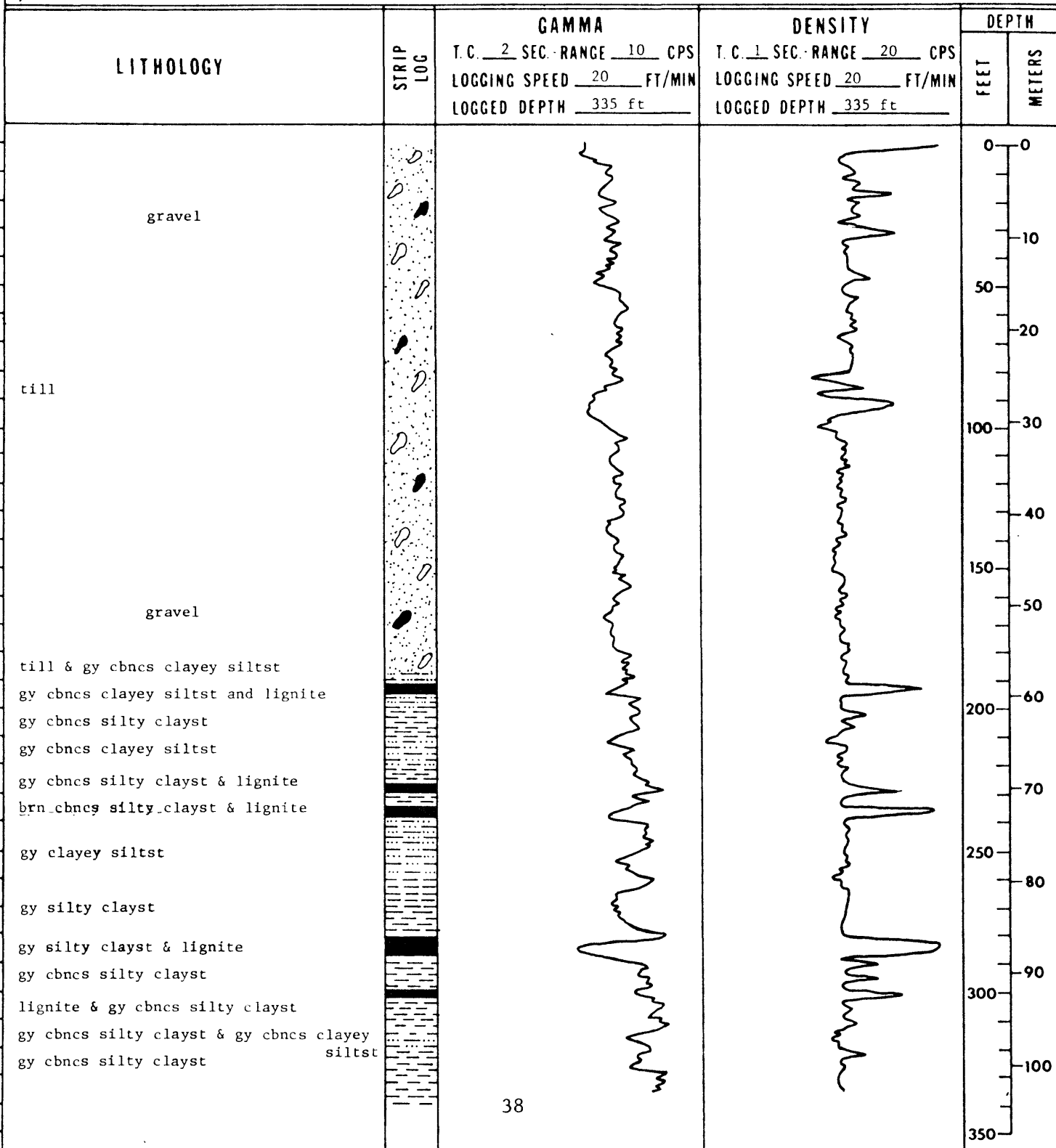
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 54  
SHEET 1 OF 2

<b>AREA</b> Coteau		<b>QUAD NAME</b> Tolley SE	
<b>DATE STARTED</b> 9/28/78	<b>DATE COMP.</b> 9/28/78	<b>COUNTY</b> Ward	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 26 <b>T.</b> 159 N. <b>R.</b> 87 W., <b>FOOTAGE LOC.</b> 2630		<b>FNL</b> 11 <b>FEL</b> 11	<b>GROUND ELEV</b> 1918 ft
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b> 340	<b>TOTAL DEPTH</b> 340 ft
<b>DRILLING AGENCY:</b> Gregory Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 2 ft
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Yeamans	
<b>REMARKS:</b> Drilled with water Contract No. 14-08-0001-17431			

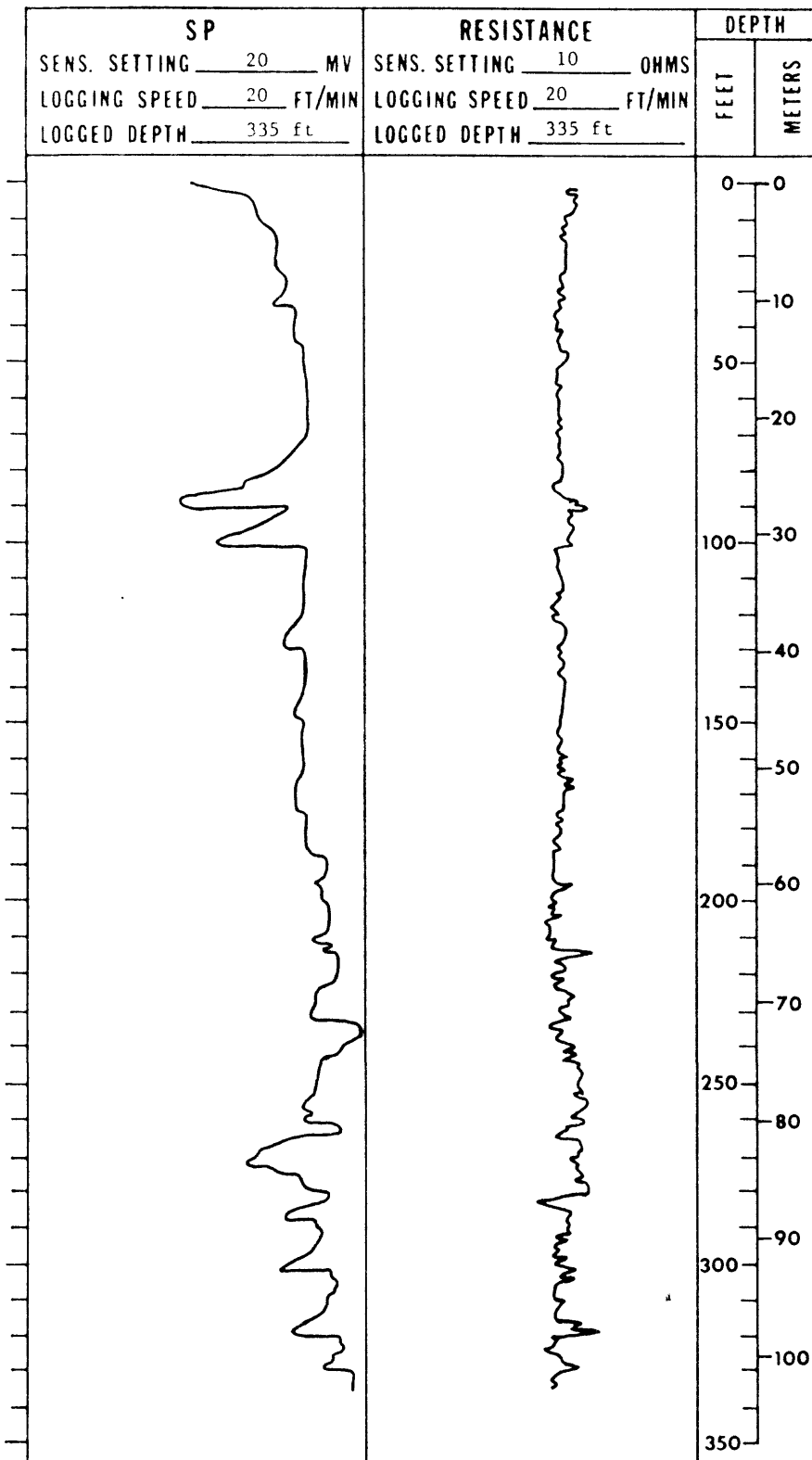




# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 54  
SHEET 2 OF 2

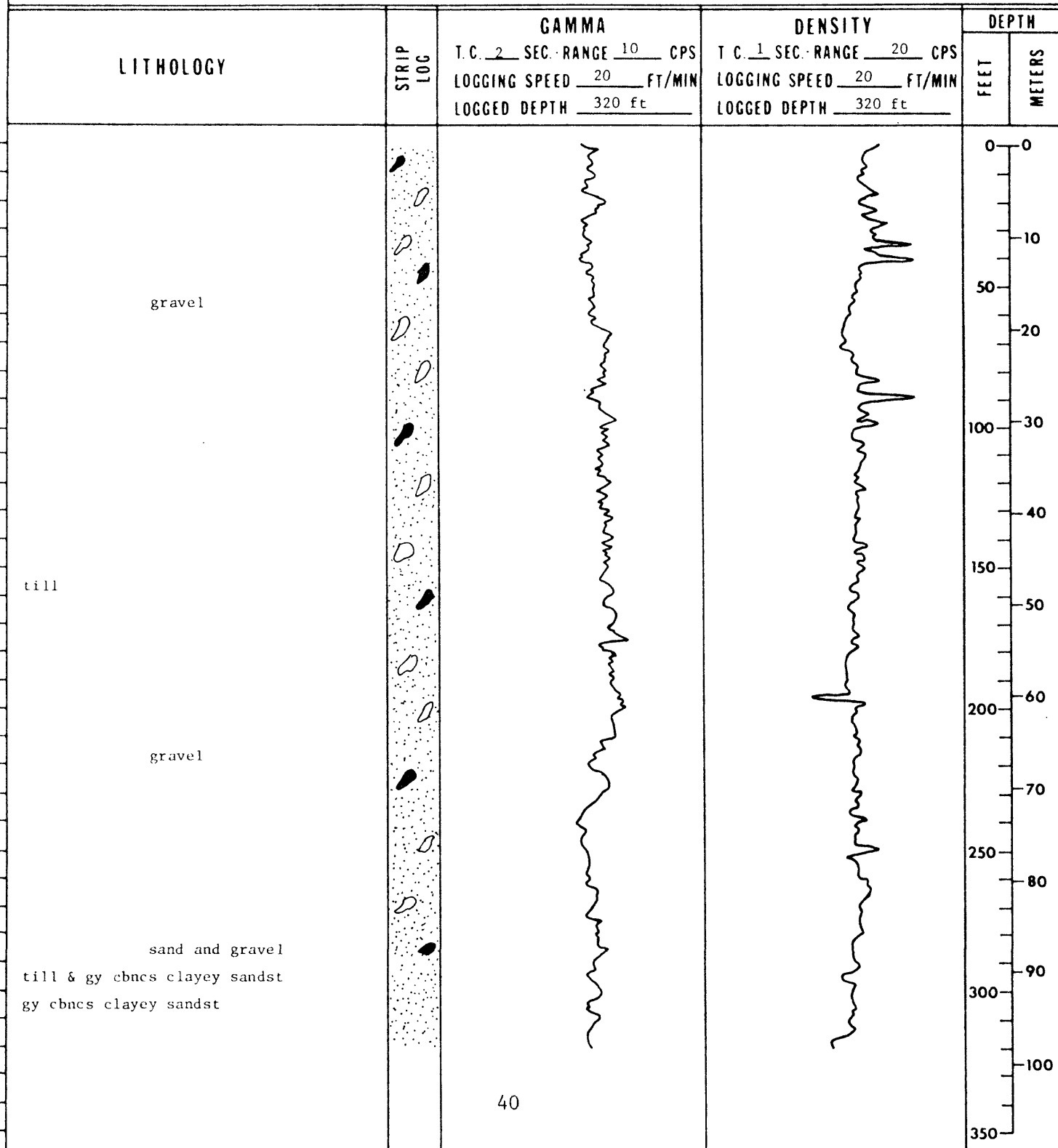
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 55  
SHEET 1 OF 2

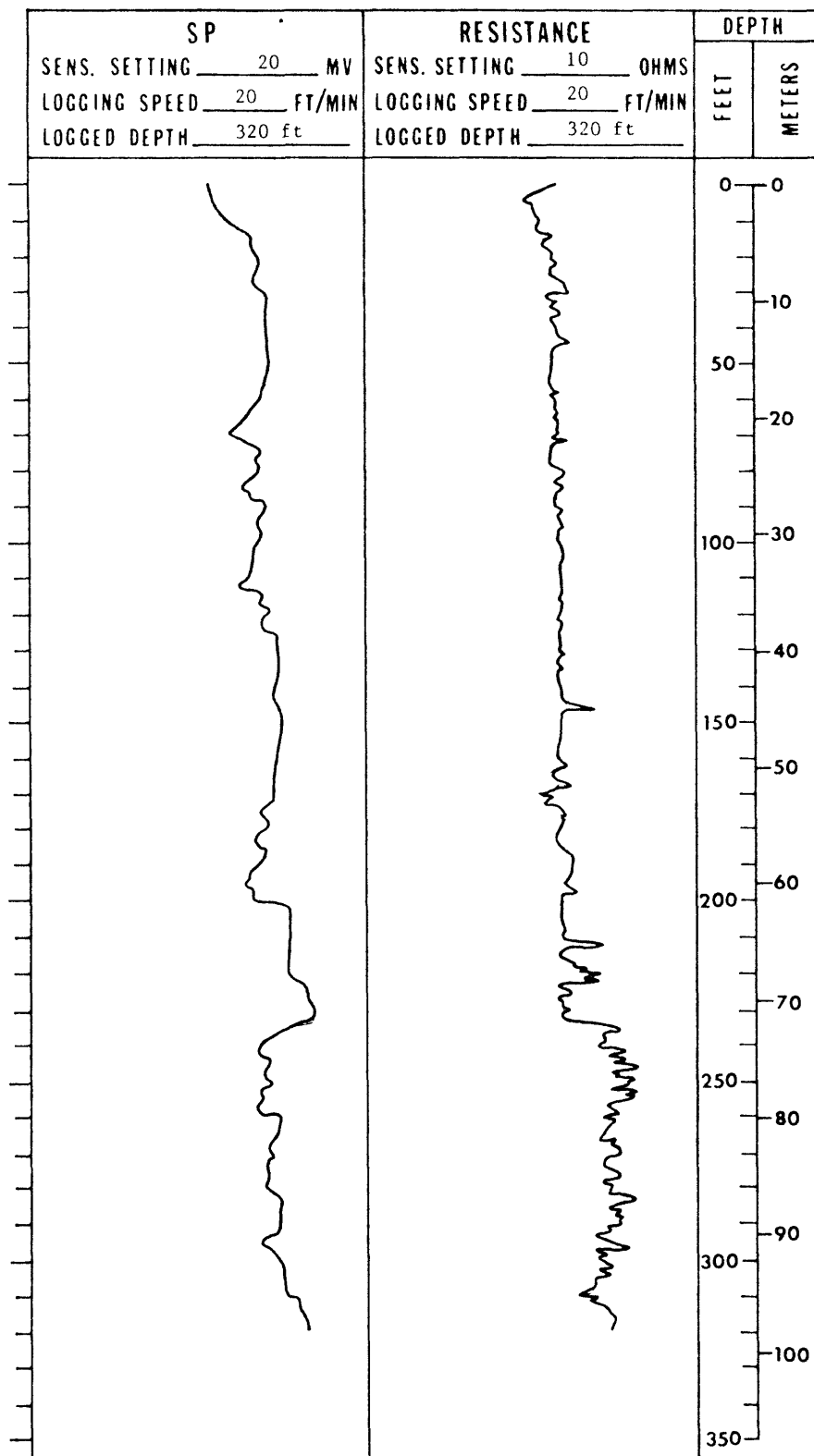
AREA Coteau		QUAD NAME Tolley SE	
DATE STARTED 9/28/78	DATE COMP. 9/28/78	COUNTY Ward	STATE North Dakota
LOCATION: SEC. 1 T159 N., R. 87 W., FOOTAGE LOC. 213		FWL 10	GROUND ELEV 1895 ft
SIZE AND BIT TYPE: 5 1/8 in.		FOOTAGE	
		ROTARY 320	CORING -----
DRILLING AGENCY: Gregory Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Susan M. Cook		GEOPHYSICAL LOGS RECORDED BY Yeamans	
REMARKS: Drilled with water			
Contract No. 14-08-0001-17431			



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 55  
SHEET 2 OF 2

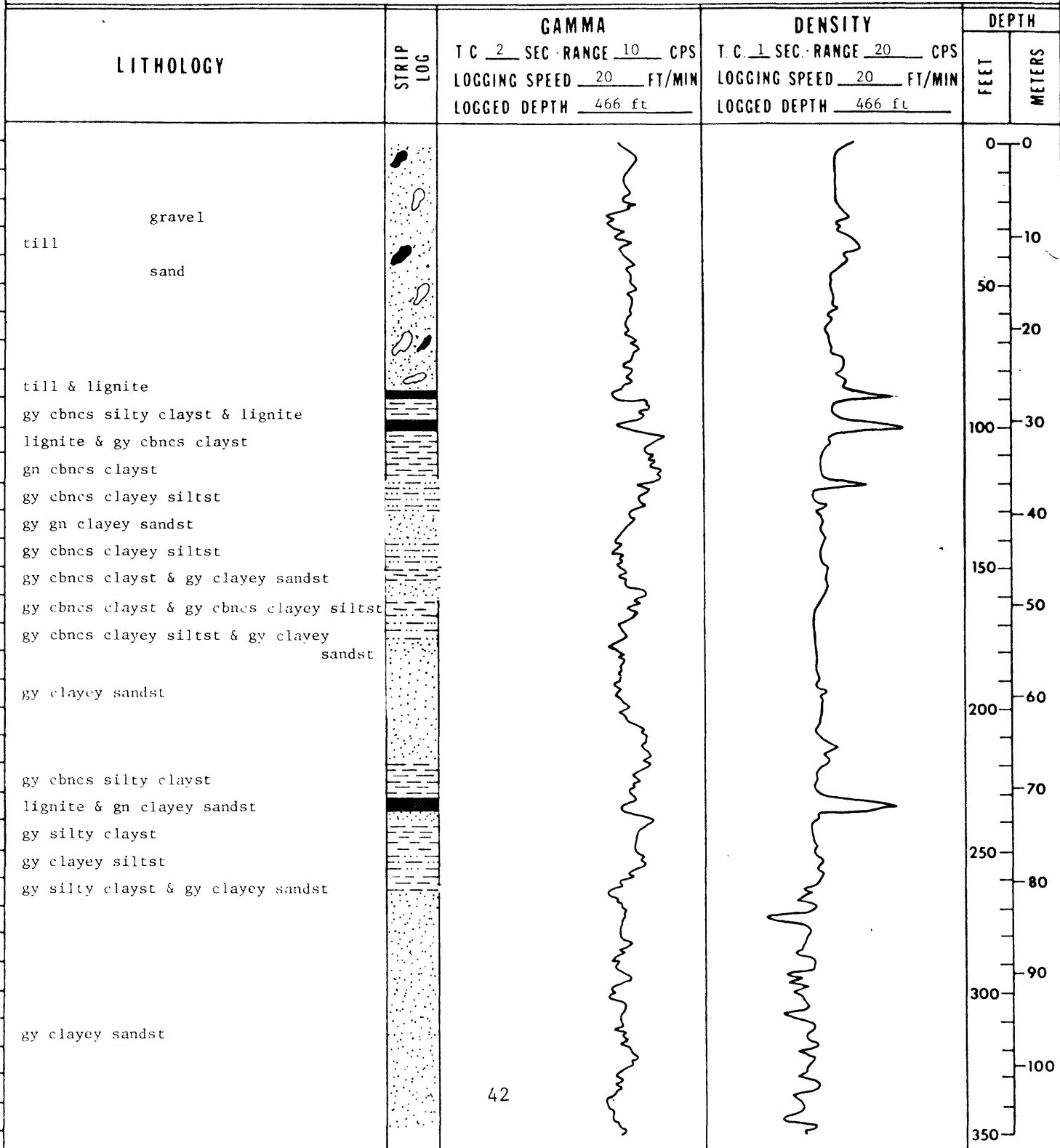
REMARKS:



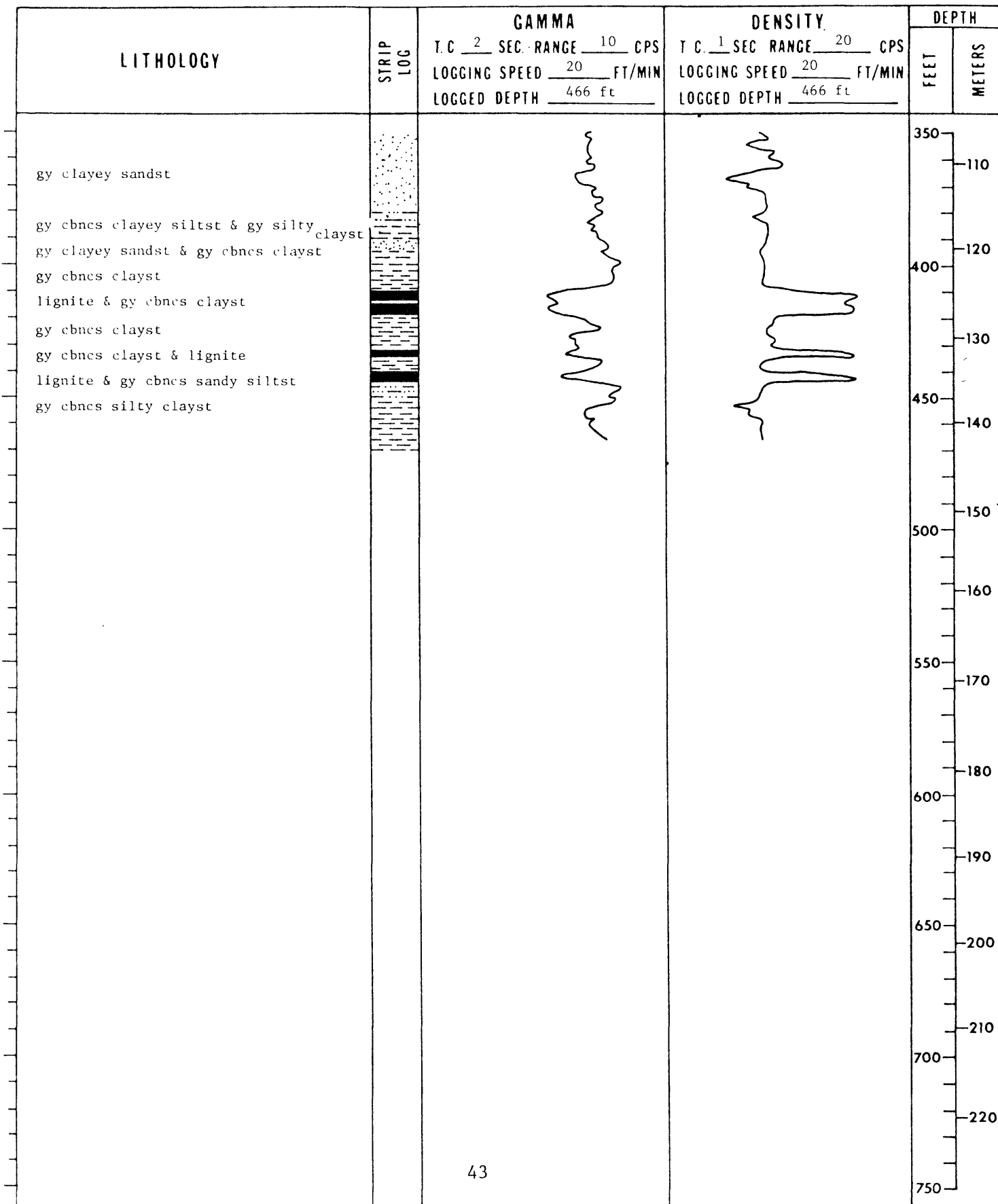
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 56  
SHEET 1 OF 4

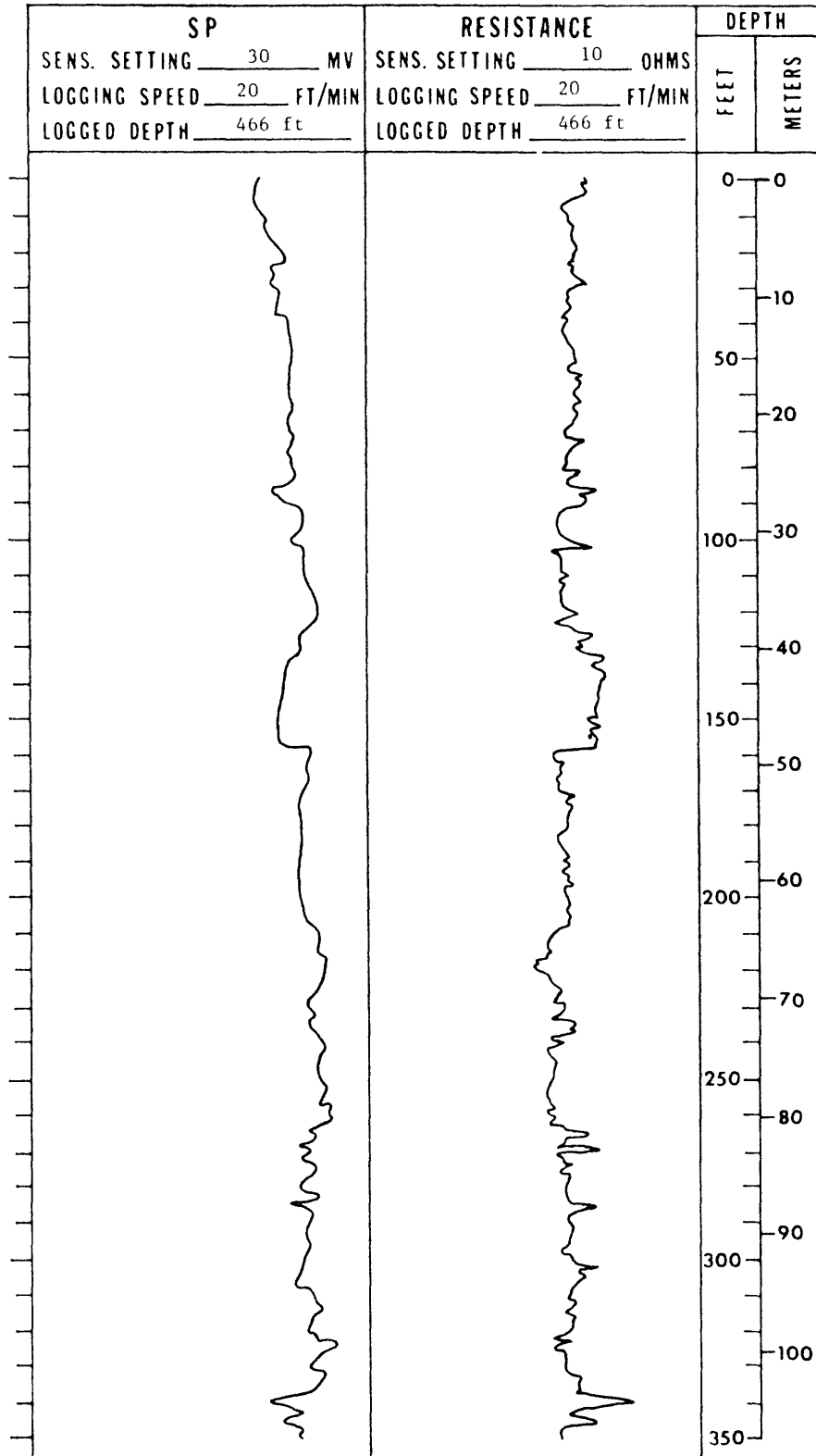
AREA Coteau		QUAD NAME Coulee	
DATE STARTED 9/24/78	DATE COMP. 9/25/78	COUNTY Ward	STATE North Dakota
LOCATION: SEC. 9 T. 159 N., R. 88 W., FOOTAGE LOC. 33		FOOTAGE FSL 2058	GROUND ELEV 2002 ft
SIZE AND BIT TYPE: 5 1/8 in.		FOOTAGE ROTARY 470	TOTAL DEPTH 470 ft
DRILLING AGENCY: Gregory Drilling		DRILL TYPE: -----	DEPTH TO WATER 0 ft
LITHOLOGY RECORDED BY Susan M. Cook		GEOPHYSICAL LOGS RECORDED BY Yeager	
REMARKS: Drilled with mud Contract No. 14-08-0001-17431			



REMARKS:



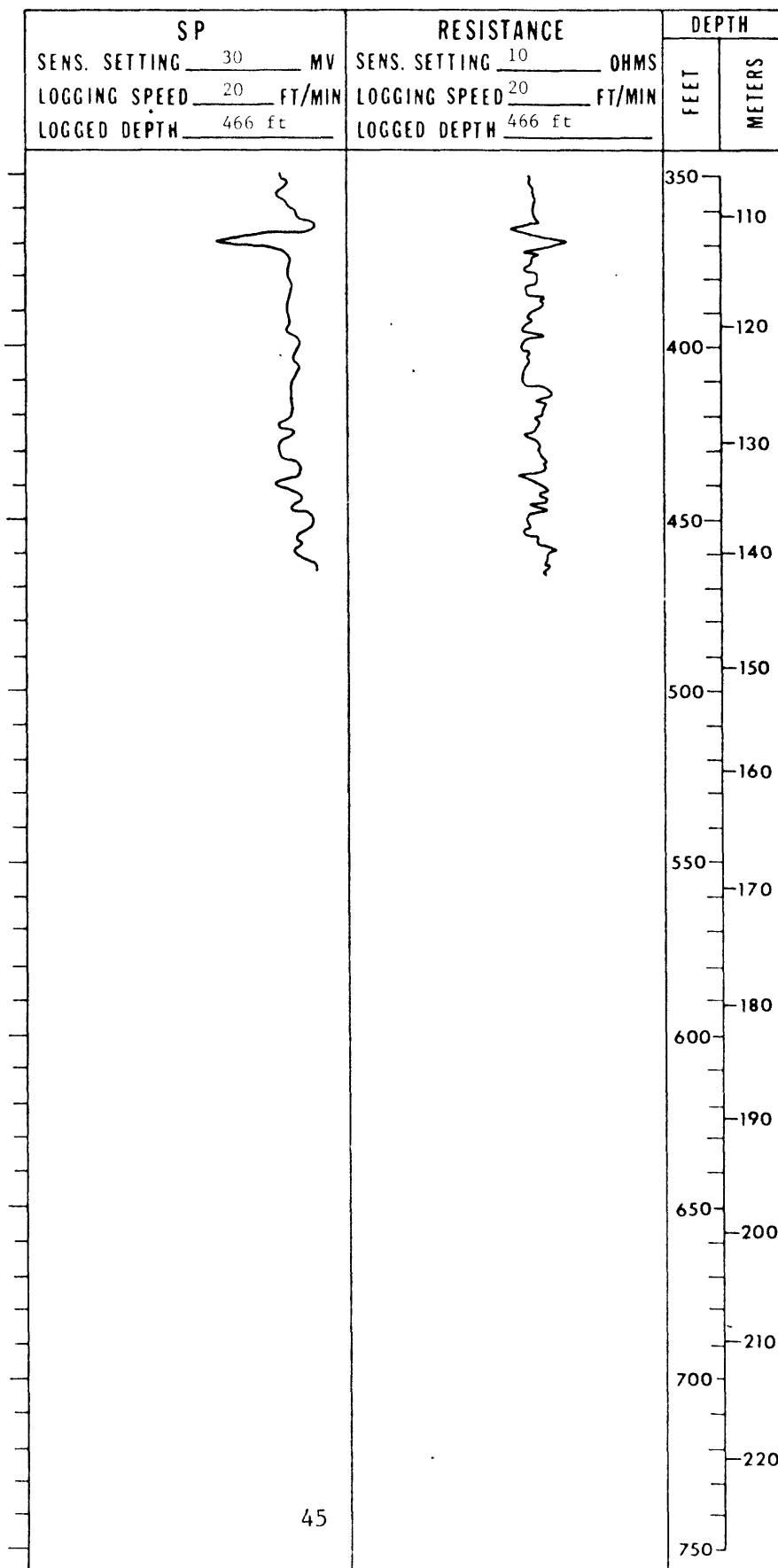
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 56  
SHEET 4 OF 4

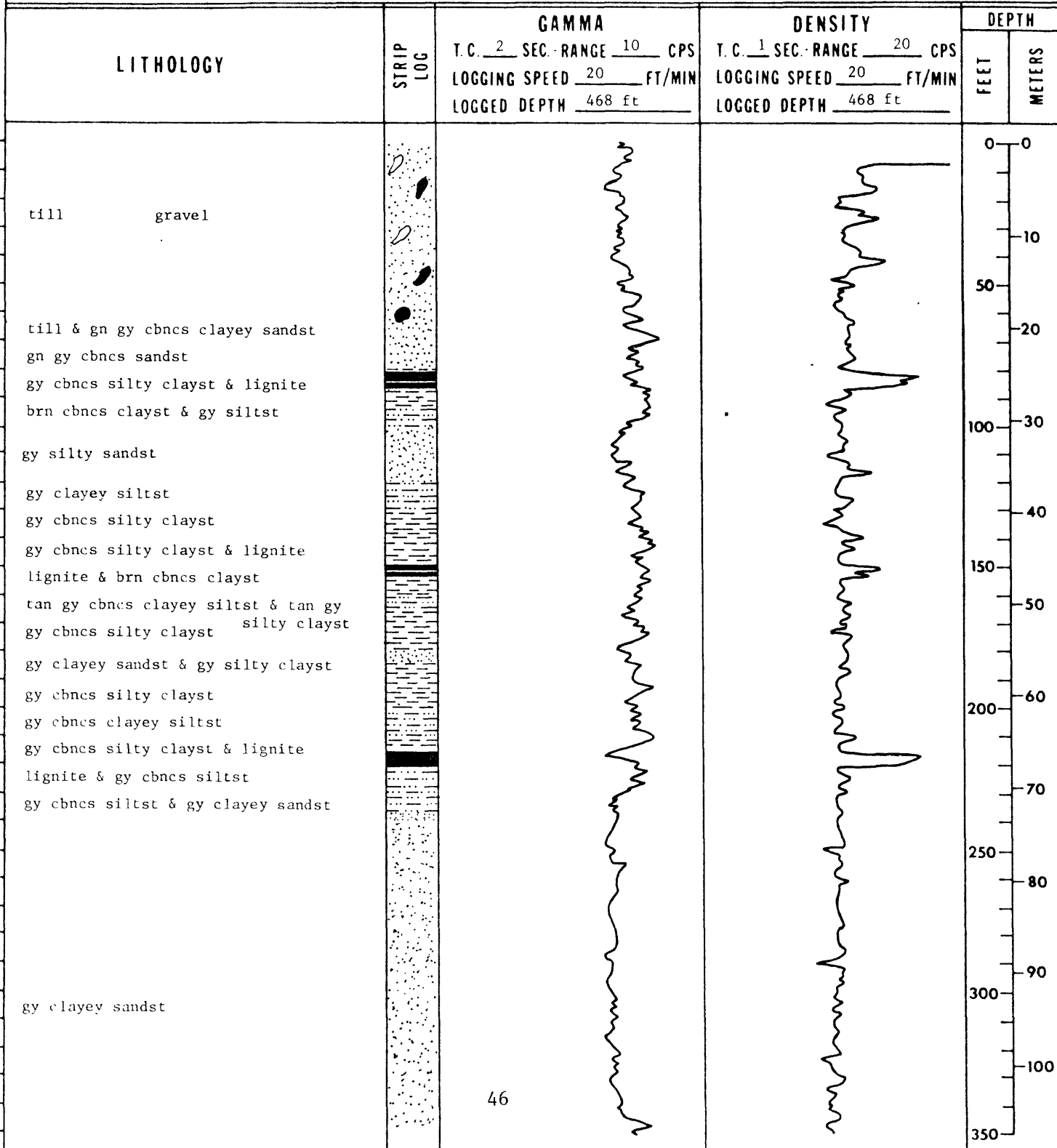
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

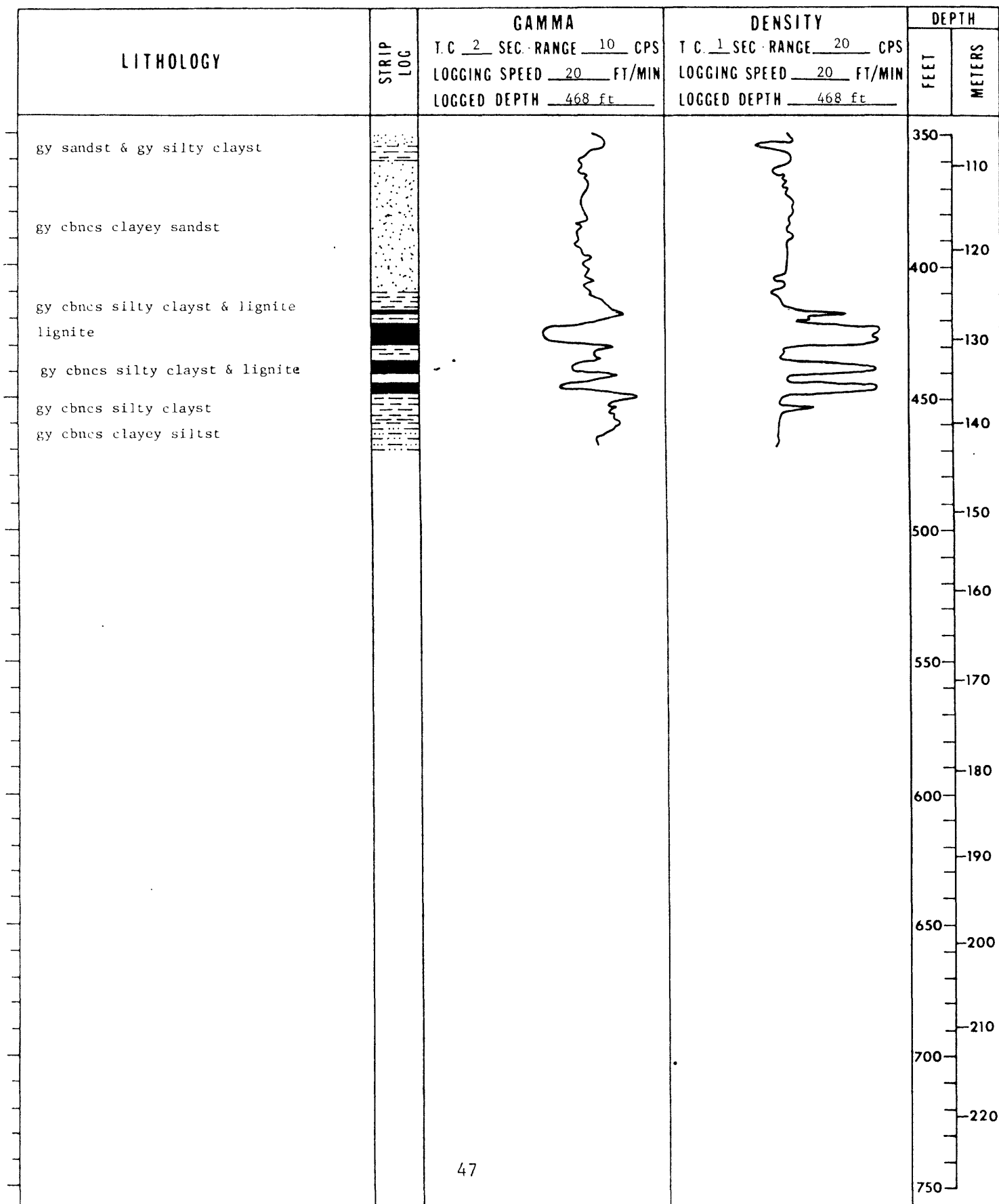
HOLE NO C 57  
SHEET 1 OF 4

<b>AREA</b> Coteau		<b>QUAD NAME</b> Kenmare			
<b>DATE STARTED</b> 9/26/78		<b>DATE COMP.</b> 9/26/78		<b>COUNTY</b> Ward <b>STATE</b> North Dakota	
<b>LOCATION: SEC.</b> 1 <b>T.</b> 159 N., <b>R.</b> 89 W., <b>FOOTAGE LOC.</b> 707		<b>FNL</b> 39 <b>FEET</b> 39		<b>GROUND ELEV</b> 2016 ft	
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b>		<b>TOTAL DEPTH</b> 470 ft	
		<b>ROTARY</b> 470 <b>CORING</b> -----			
<b>DRILLING AGENCY:</b> Gregory Drilling			<b>DRILL TYPE:</b> -----		<b>DEPTH TO WATER</b> 6 ft
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook			<b>GEOPHYSICAL LOGS RECORDED BY</b> Yeager		
<b>REMARKS:</b> Drilled with mud					
Contract No. 14-08-0001-17431					

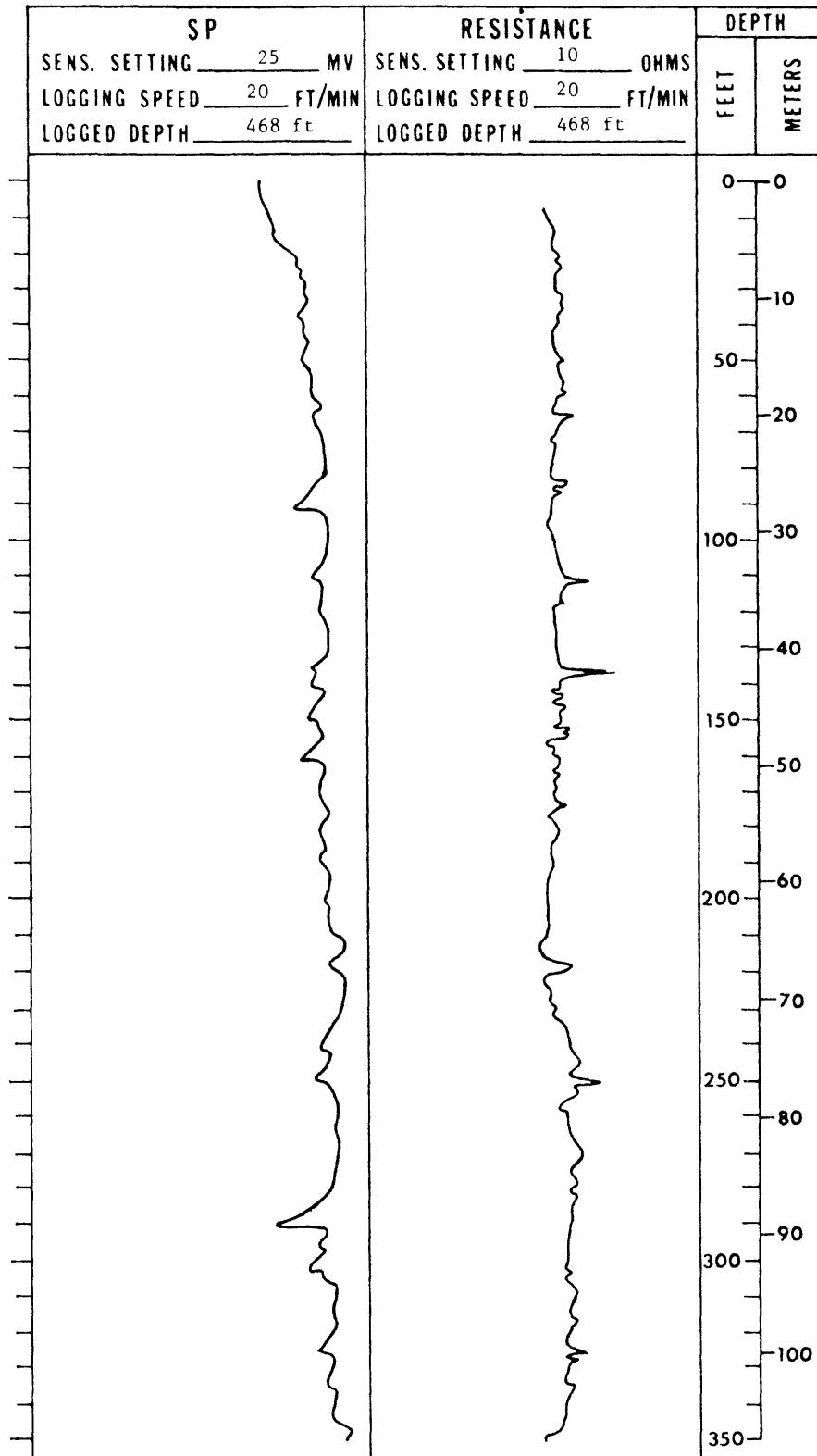




REMARKS:



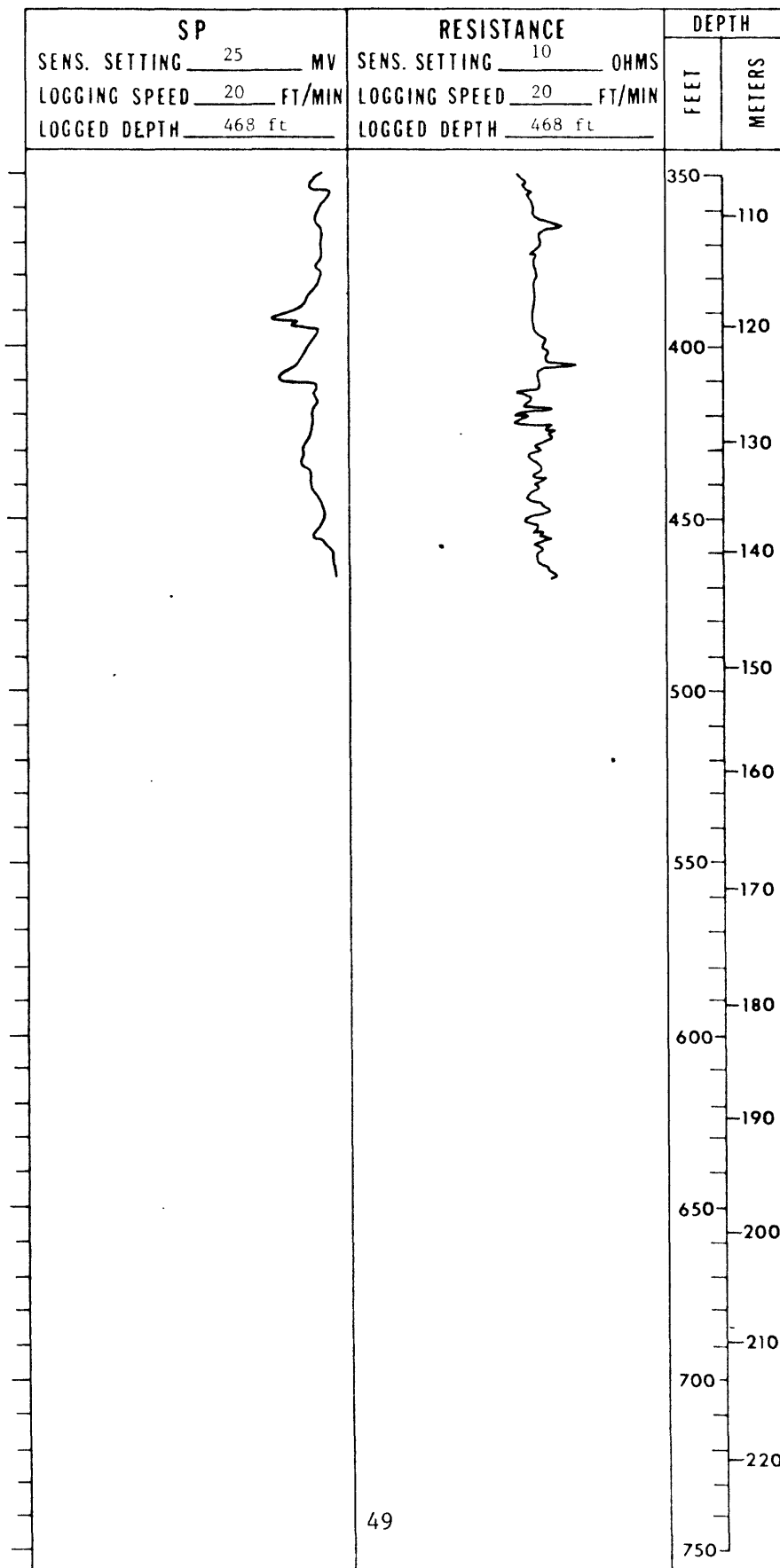
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 57  
SHEET 4 OF 4

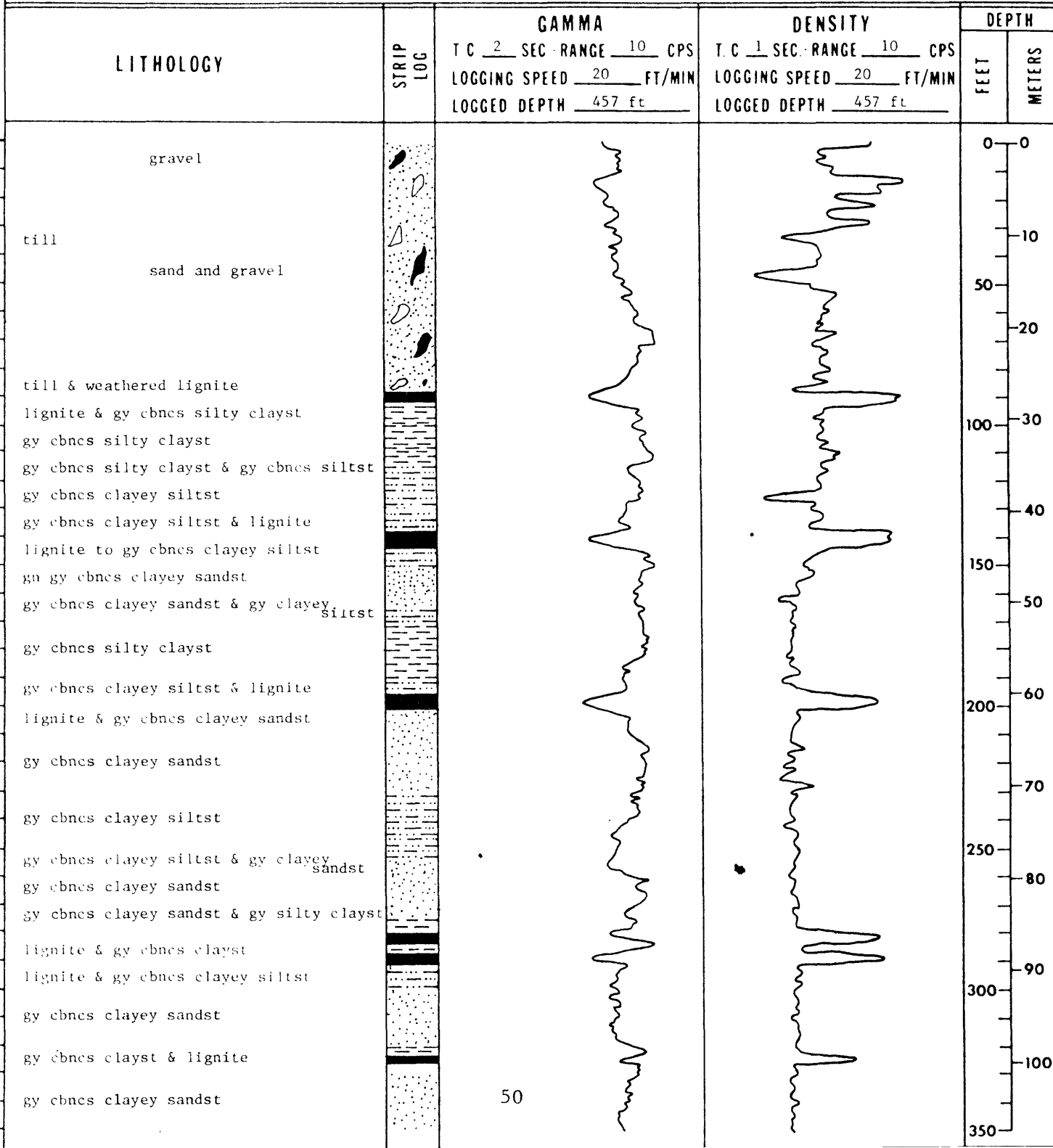
REMARKS:



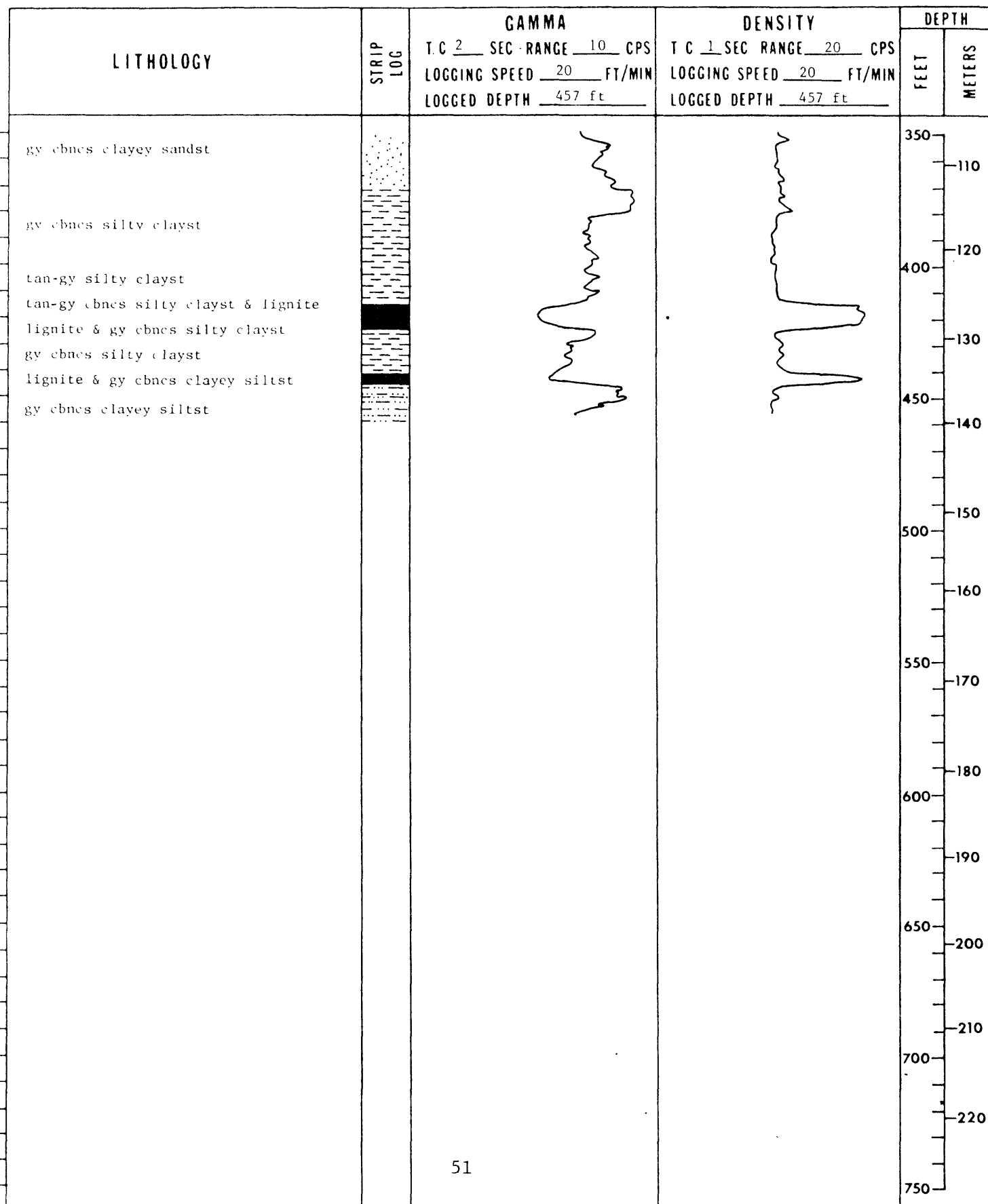
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 62  
SHEET 1 OF 4

<b>AREA</b> Coteau		<b>QUAD NAME</b> Niobe	
<b>DATE STARTED</b> 9/26/78	<b>DATE COMP.</b> 9/26/78	<b>COUNTY</b> Ward	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 26 <b>T</b> 160 N., <b>R.</b> 89 W., <b>FOOTAGE LOC.</b> 2609		<b>FNL</b> 2323	<b>FEL</b>
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b>	
		<b>ROTARY</b> 460	<b>CDRNG</b> -----
<b>DRILLING AGENCY:</b> Gregory Drilling		<b>DRILL TYPE:</b> -----	
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Yeamans	
<b>REMARKS:</b> Drilled with water, artesian flow estimated 18-20 gpm Contract No. 14-08-0001-17431			



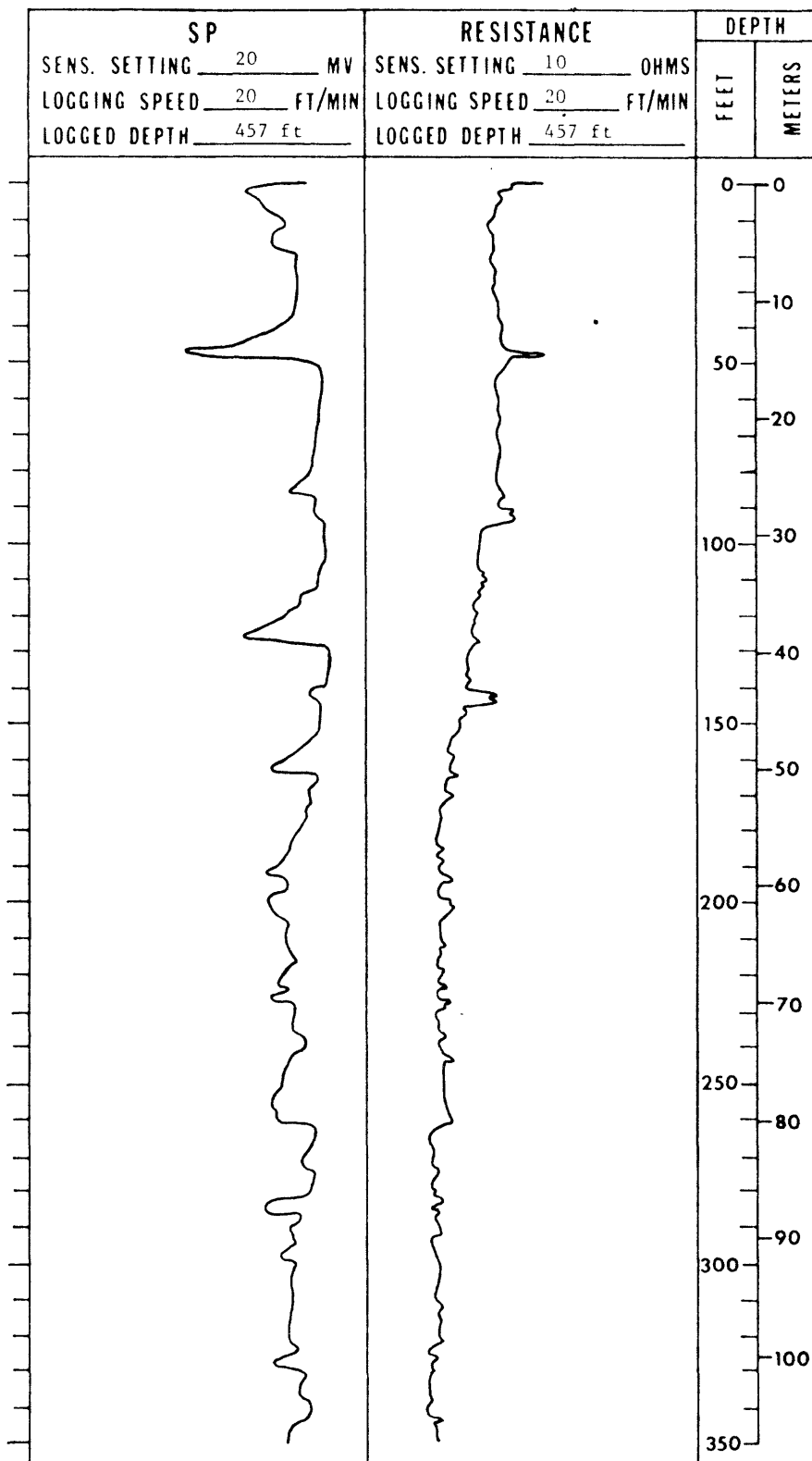
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 62  
SHEET 3 OF 4

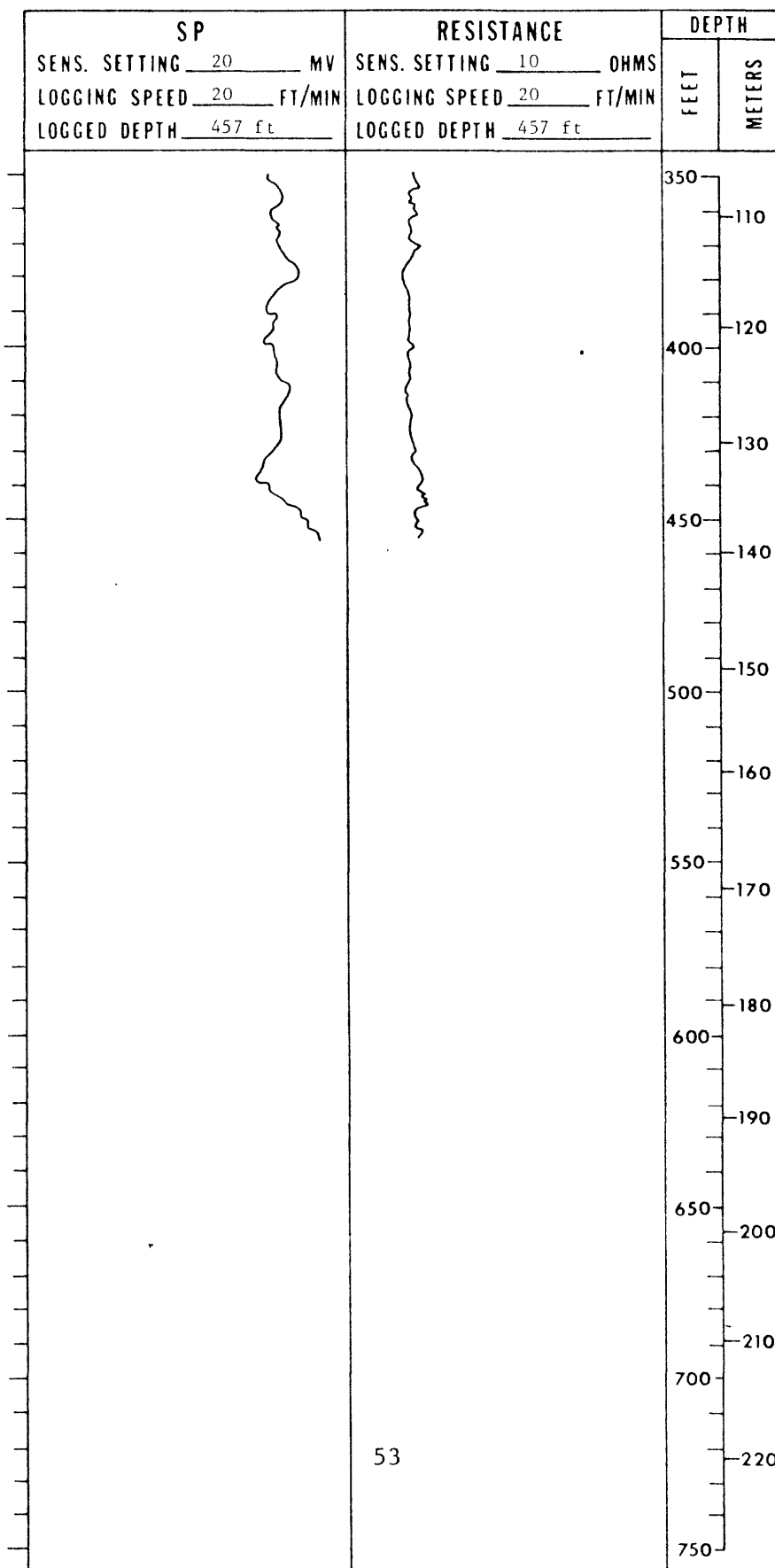
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 62  
SHEET 4 OF 4

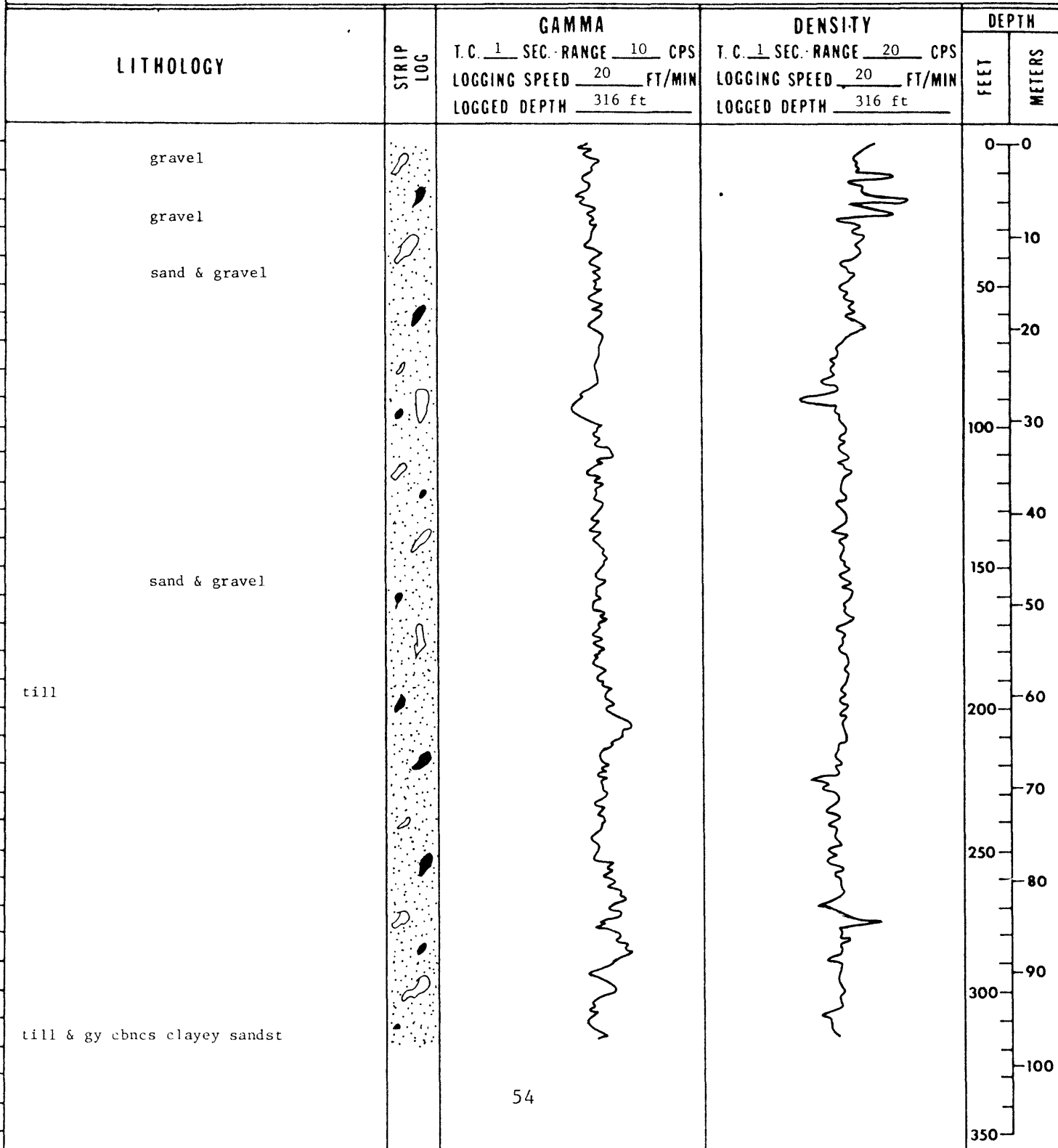
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 63  
SHEET 1 OF 2

<b>AREA</b> Coteau		<b>QUAD NAME</b> Tolley SE	
<b>DATE STARTED</b> 9/28/78	<b>DATE COMP.</b> 9/29/78	<b>COUNTY</b> Renville	<b>STATE</b> North Dakota
<b>LOCATION: SEC. 26</b> T159 N., R. 86 W., <b>FOOTAGE LOC.</b> 99		<b>FWL FSL</b> 583	<b>FWL FWL</b>
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b> 320	<b>TOTAL DEPTH</b> 320 ft
<b>DRILLING AGENCY:</b> Gregory Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 0 ft
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Yeamans	
<b>REMARKS:</b> drilled with mud Contract No. 14-08-0001-17431			

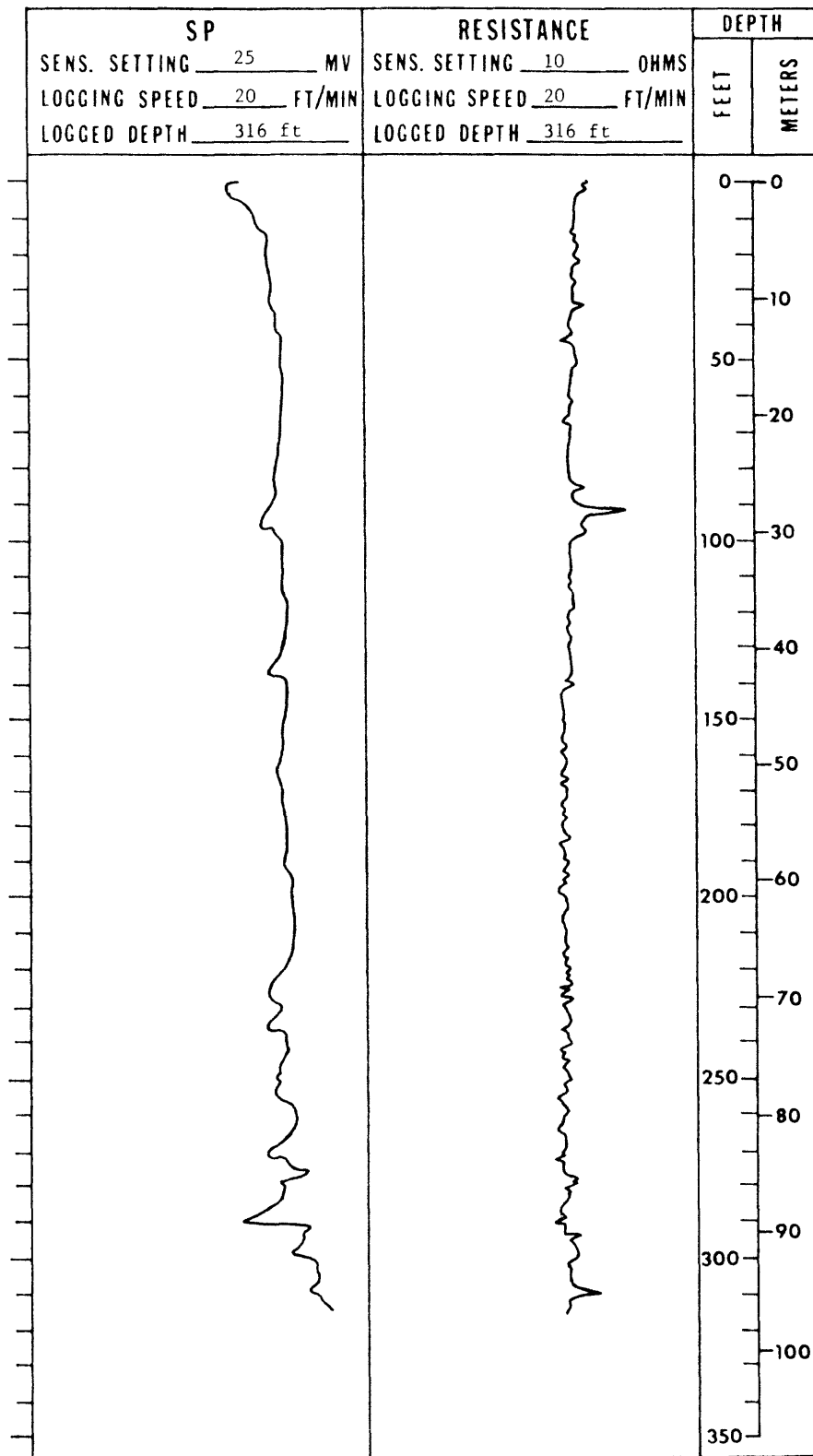




# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 63  
SHEET 2 OF 2

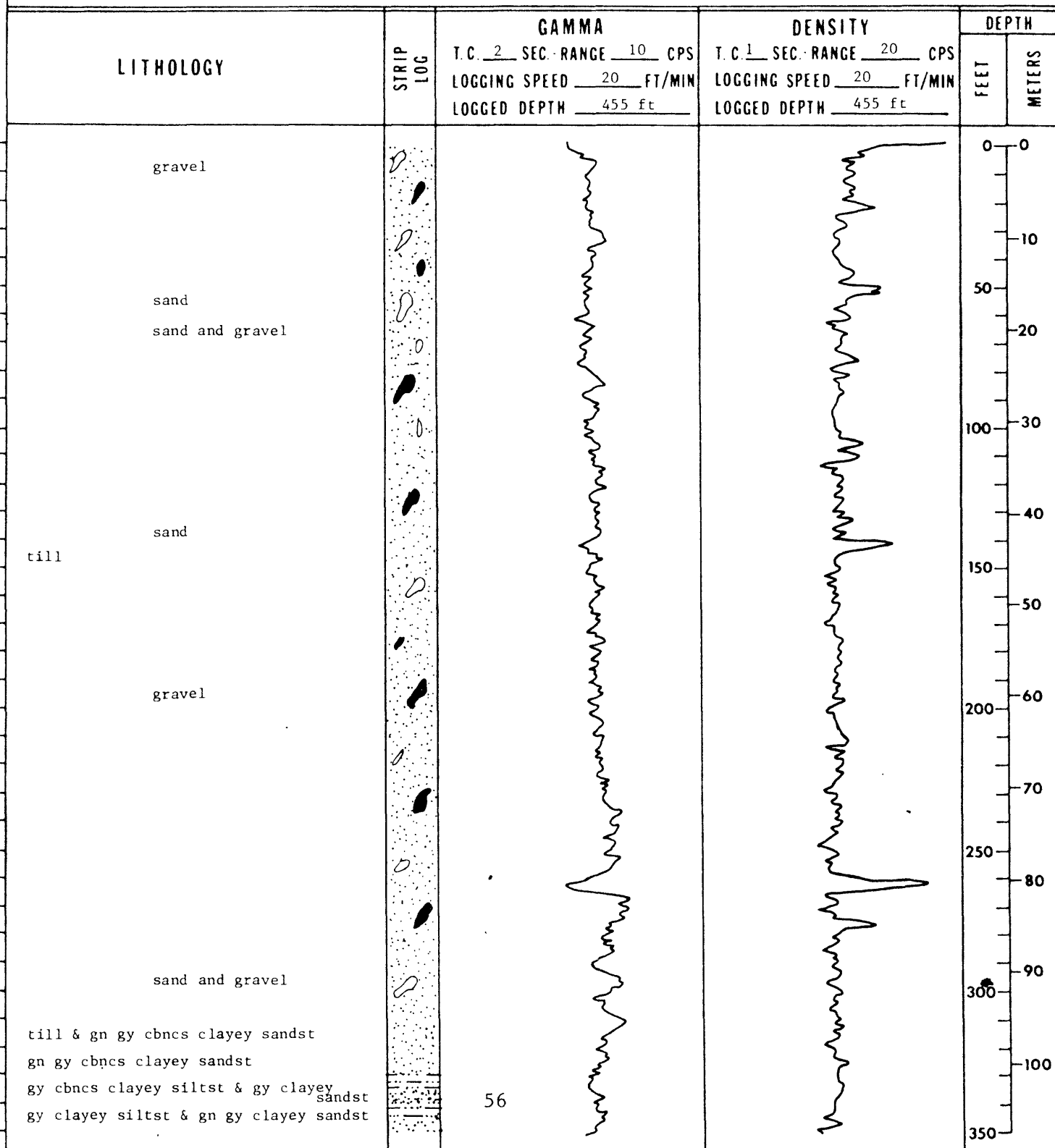
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 64  
SHEET 1 OF 4




AREA Coteau		QUAD NAME Grand	
DATE STARTED 10/2/78	DATE COMP. 10/2/78	COUNTY Renville	STATE North Dakota
LOCATION: SEC. 11 T. 158 N., R. 85 W., FOOTAGE LOC. 10		FNL 229	GROUND ELEV 1785 ft
SIZE AND BIT TYPE: 5 1/8 in.		FOOTAGE 460	TOTAL DEPTH 460 ft
DRILLING AGENCY: Gregory Drilling		DRILL TYPE: -----	DEPTH TO WATER -----
LITHOLOGY RECORDED BY Susan M. Cook		GEOPHYSICAL LOGS RECORDED BY Yeamans	
REMARKS: Drilled with water			
Contract No. 14-08-0001-17431			



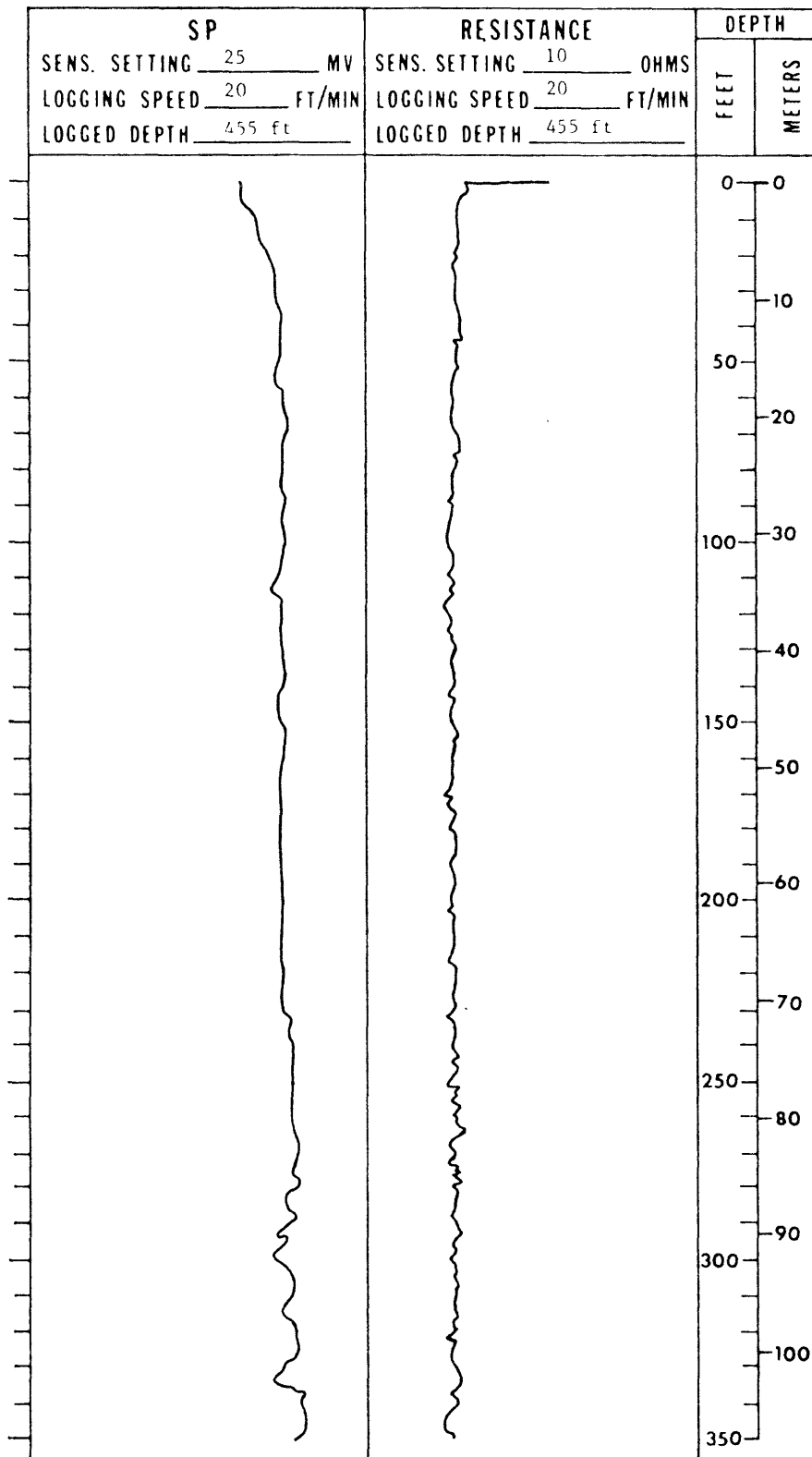
## UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 64  
SHEET 2 OF 4

REMARKS:

LITHOLOGY	STRIP LOG	GAMMA	DENSITY	DEPTH	
		T C <u>2</u> SEC. RANGE <u>10</u> CPS LOGGING SPEED <u>20</u> FT/MIN LOGGED DEPTH <u>455</u> ft	T C <u>1</u> SEC. RANGE <u>20</u> CPS LOGGING SPEED <u>20</u> FT/MIN LOGGED DEPTH <u>455</u> ft	FEET	METERS
gn gy clayey sandst				350	
				110	
gn gy cbnes sandst & gy silty clayst				120	
				400	
gy cbnes clayey siltst				130	
gy cbnes clayey siltst & gy silty clayst				140	
gy cbnes silty clayst				450	
				150	
				500	
				160	
				550	
				170	
				180	
				600	
				190	
				650	
				200	
				210	
				700	
				220	
				750	

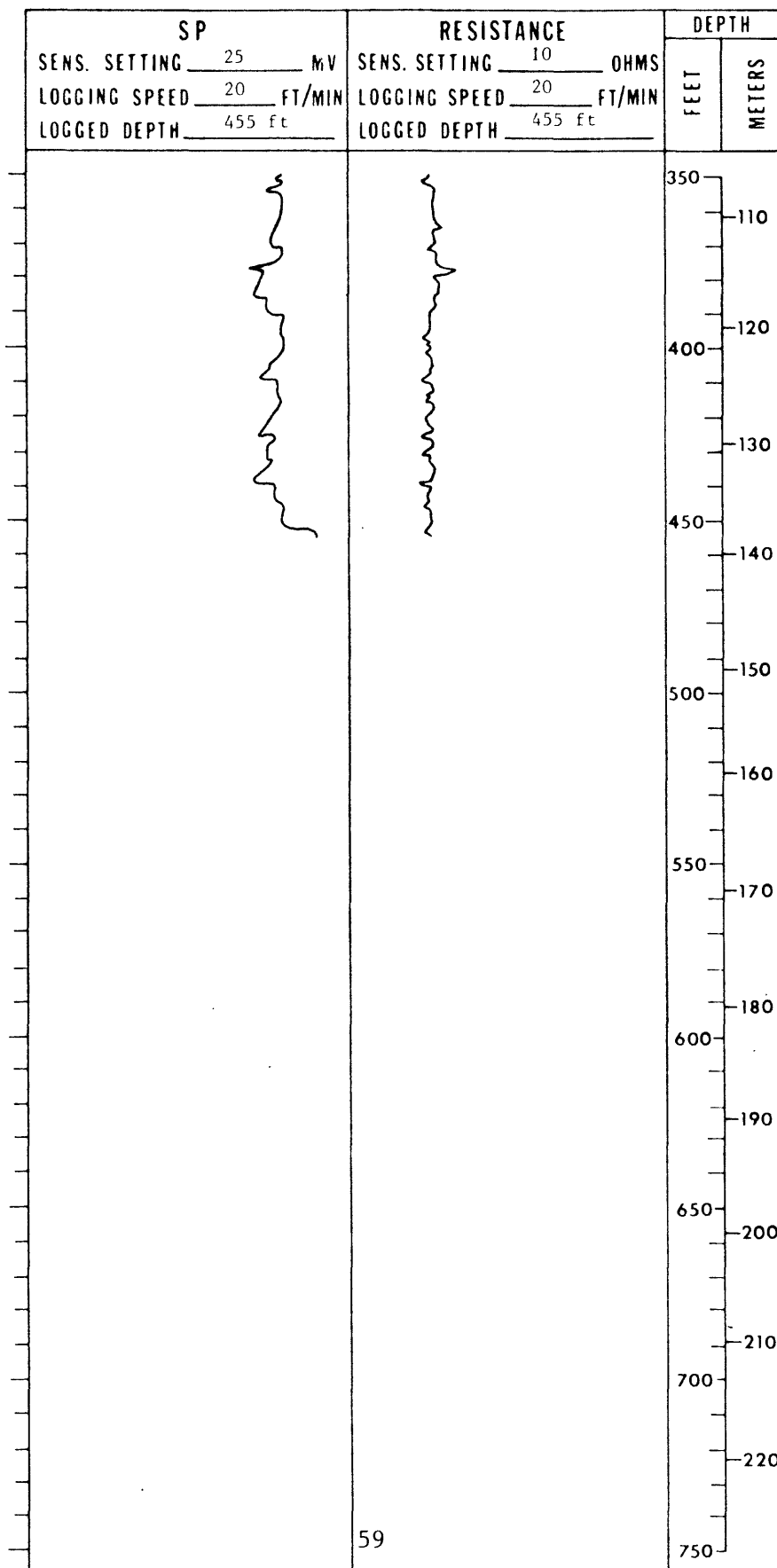
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. C 64  
SHEET 4 OF 4

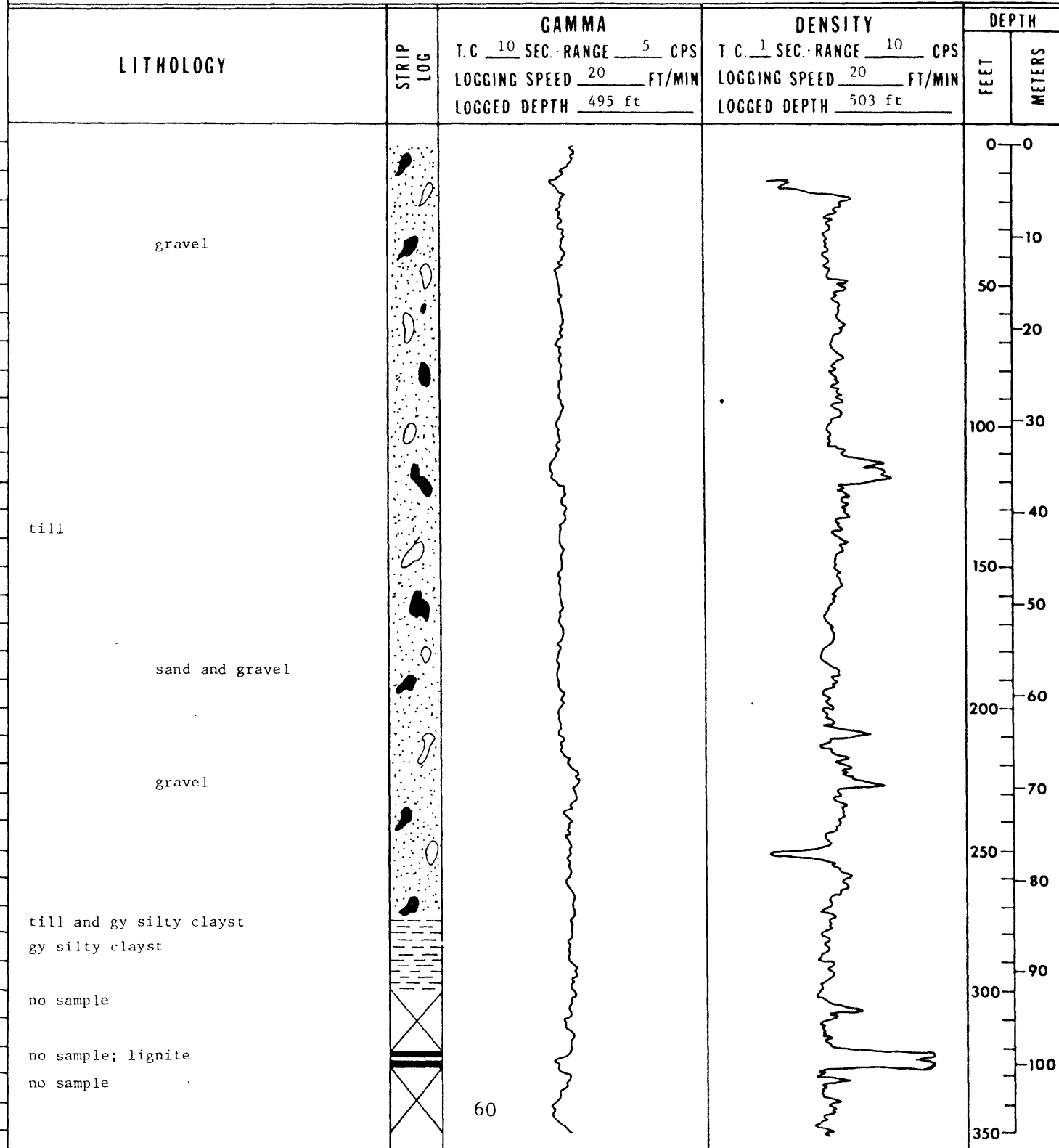
REMARKS:



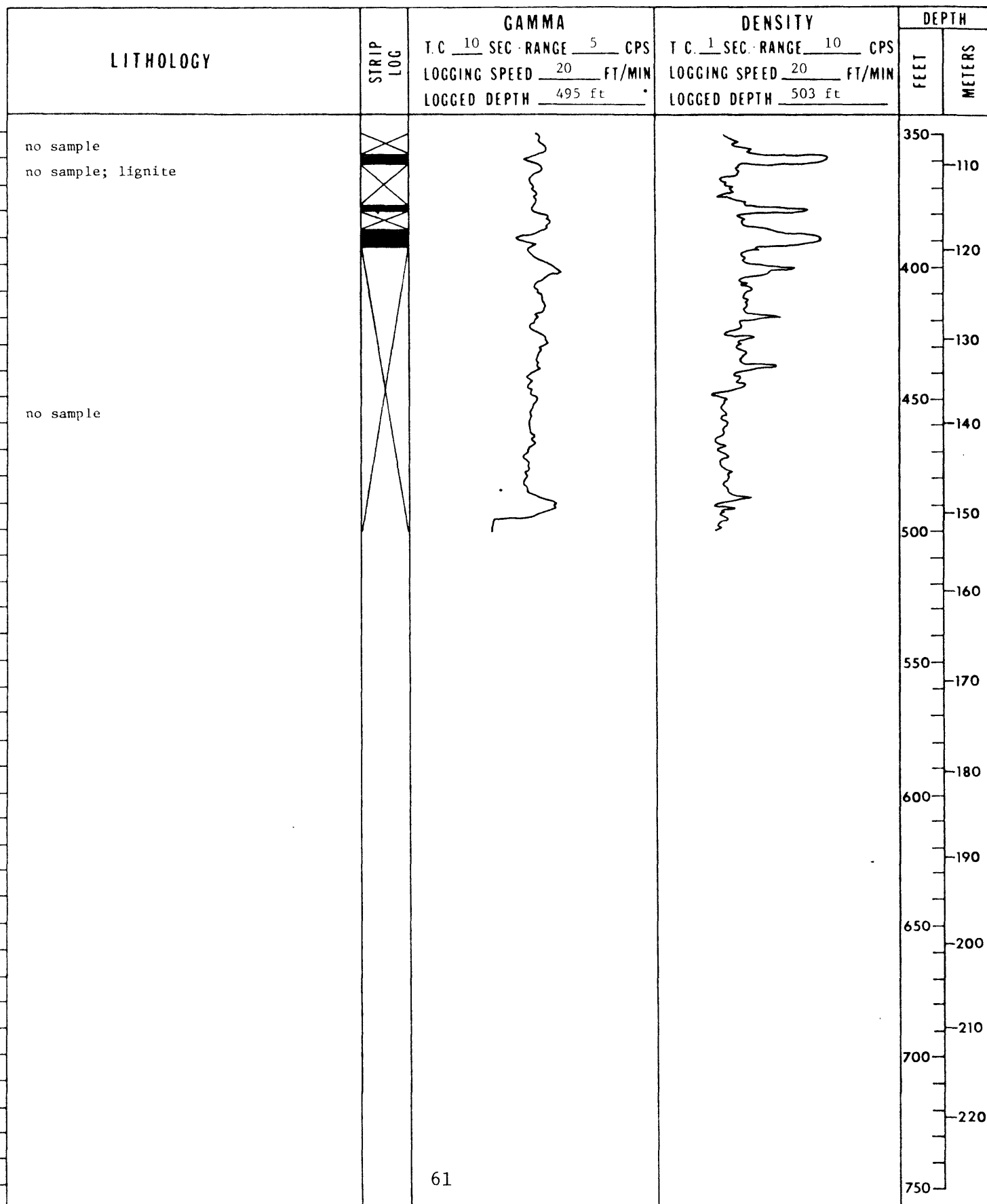
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 68  
SHEET 1 OF 4

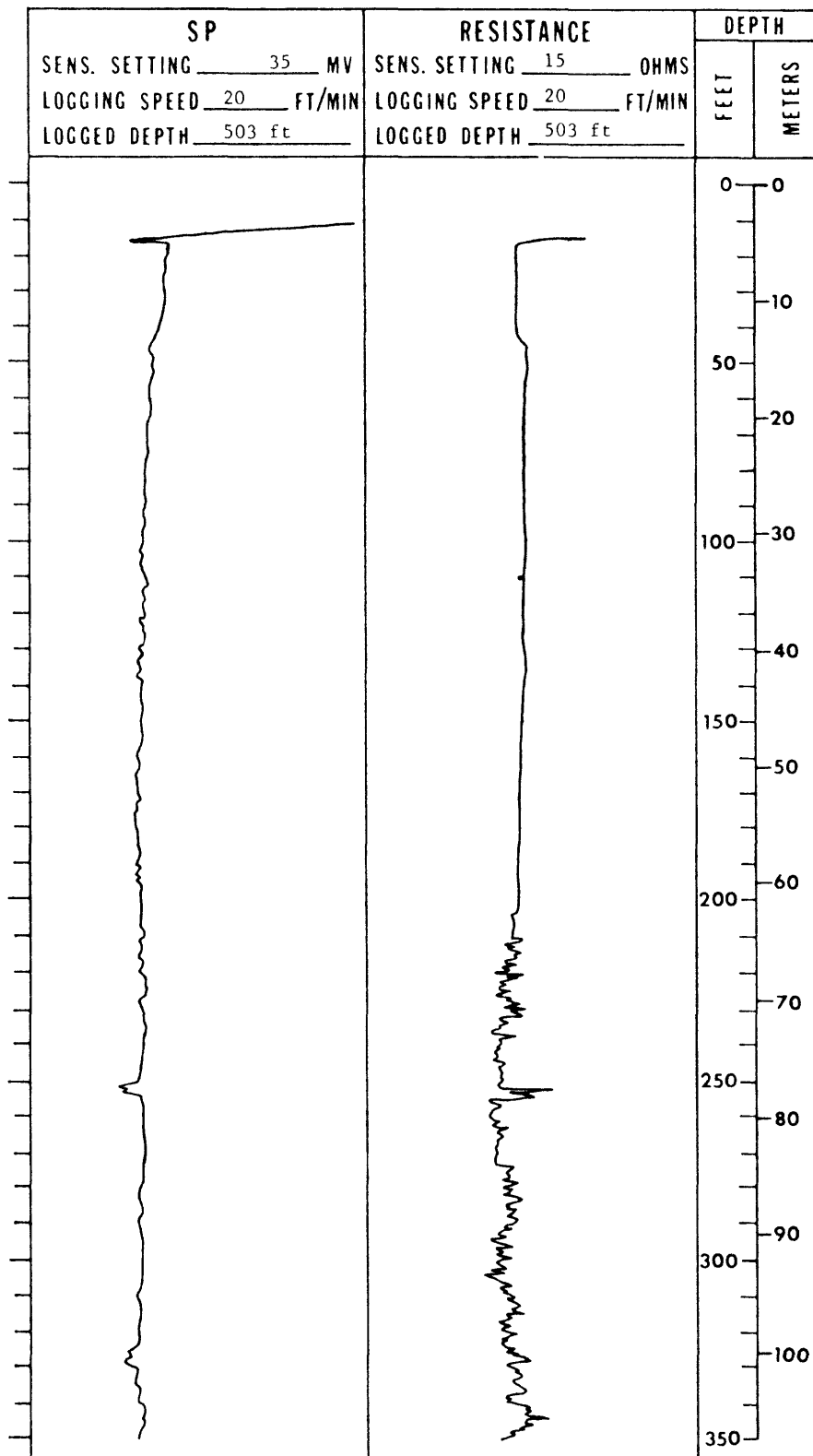
<b>AREA</b> Coteau		<b>QUAD NAME</b> Minot 15 min			
<b>DATE STARTED</b> 10/21/78		<b>DATE COMP.</b> 10/21/78		<b>COUNTY</b> Ward <b>STATE</b> North Dakota	
<b>LOCATION: SEC. 2</b> T152 N., R. 84 W.		<b>FOOTAGE LOC.</b> 208		<b>GROUND ELEV</b> 2099 ft	
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b> ROTARY. 505 CORING -----		<b>TOTAL DEPTH</b> 505 ft	
<b>DRILLING AGENCY:</b> Superior Drilling		<b>DRILL TYPE:</b> -----		<b>DEPTH TO WATER</b> 13 ft	
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Barriga			
<b>REMARKS:</b> Drilled with mud Contract No. 14-08-0001-17431					



REMARKS:

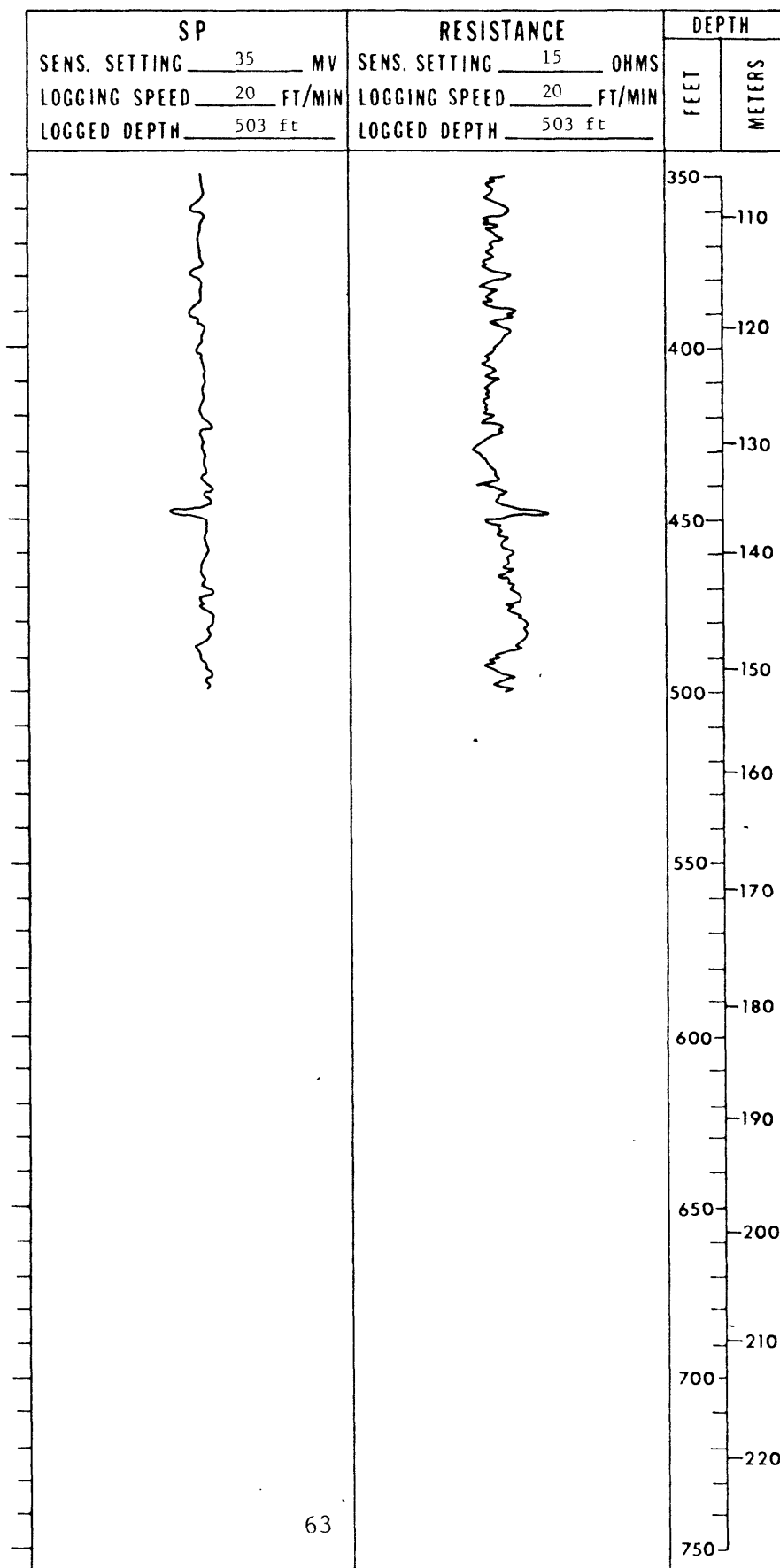


REMARKS:





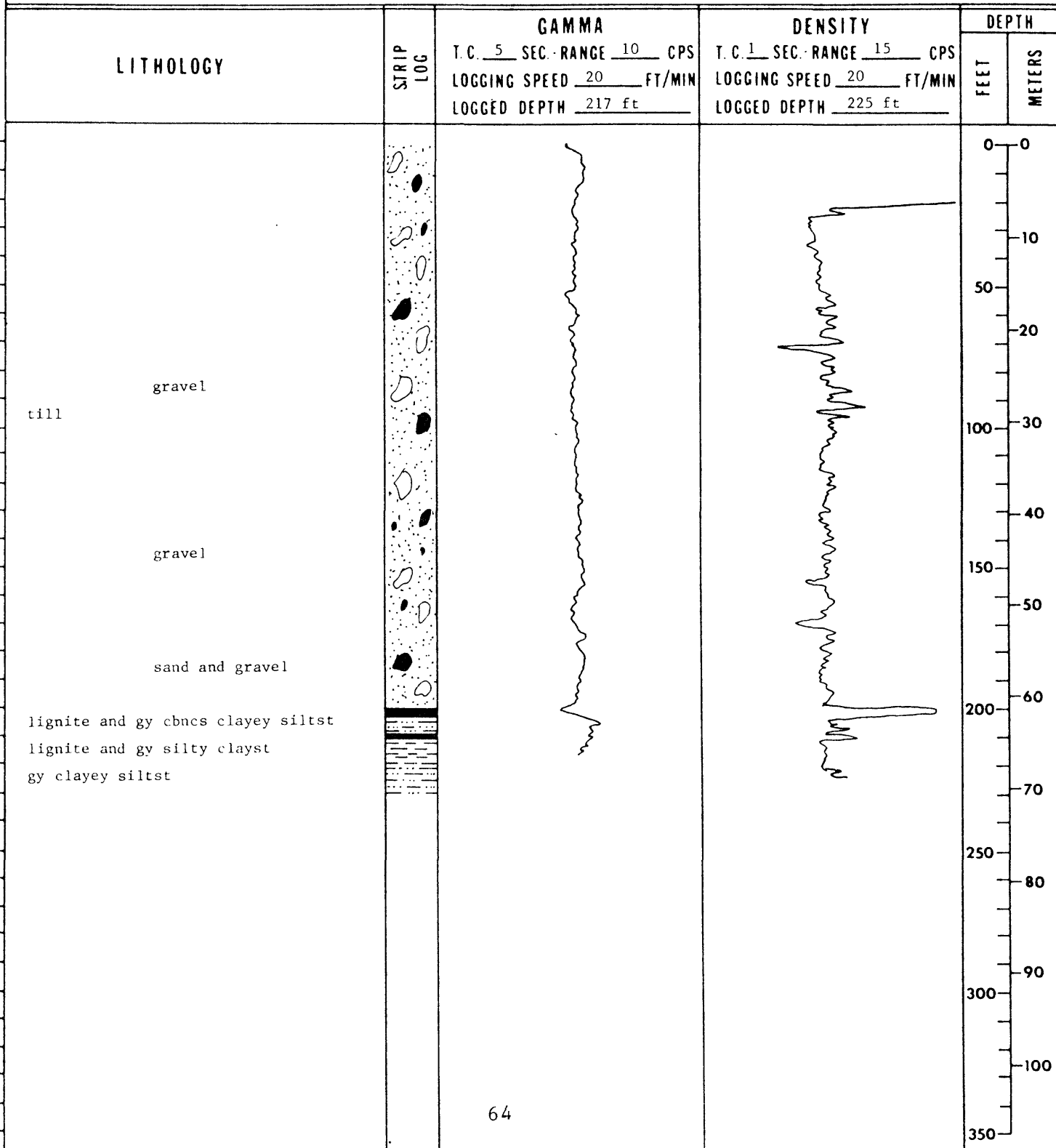
REMARKS:



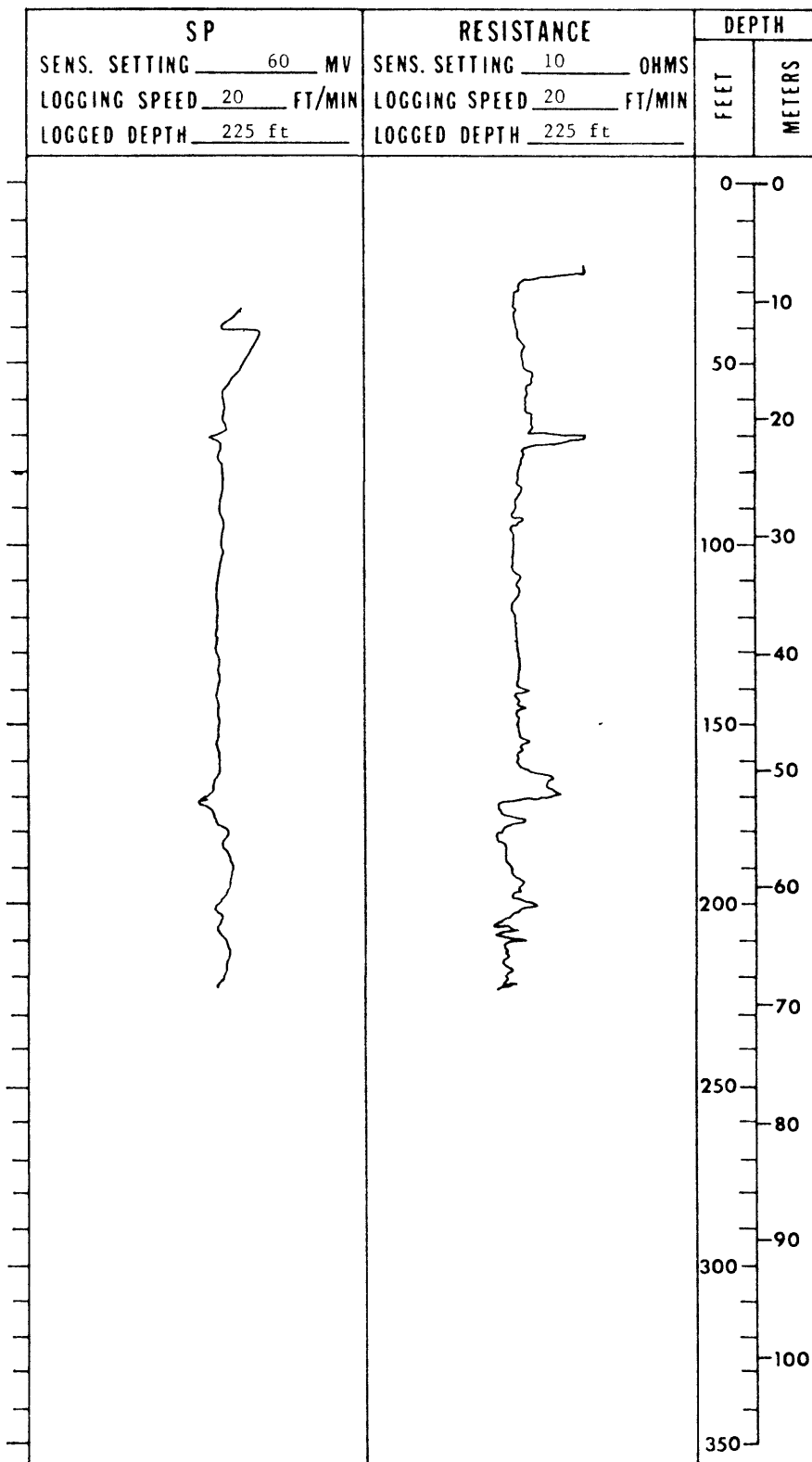
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO C 69  
SHEET 1 OF 2

<b>AREA</b> Coteau		<b>QUAD NAME</b> Minot	
<b>DATE STARTED</b> 11/3/78	<b>DATE COMP.</b> 11/3/78	<b>COUNTY</b> Ward	<b>STATE</b> North Dakota
<b>LOCATION: SEC. 13</b> T.154 N., R.83 W., <b>FOOTAGE LOC.</b> 672		<b>FNL</b> 58	<b>FEL</b> 1777 ft
<b>SIZE AND BIT TYPE:</b> 5 1/8 in.		<b>FOOTAGE</b> ROTARY 225 CORING -----	<b>TOTAL DEPTH</b> 225 ft
<b>DRILLING AGENCY:</b> Superior Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 20 ft
<b>LITHOLOGY RECORDED BY</b> Susan M. Cook		<b>GEOPHYSICAL LOGS RECORDED BY</b> Barriga	
<b>REMARKS:</b> Drilled with water			
Contract No. 14-08-0001-17431			



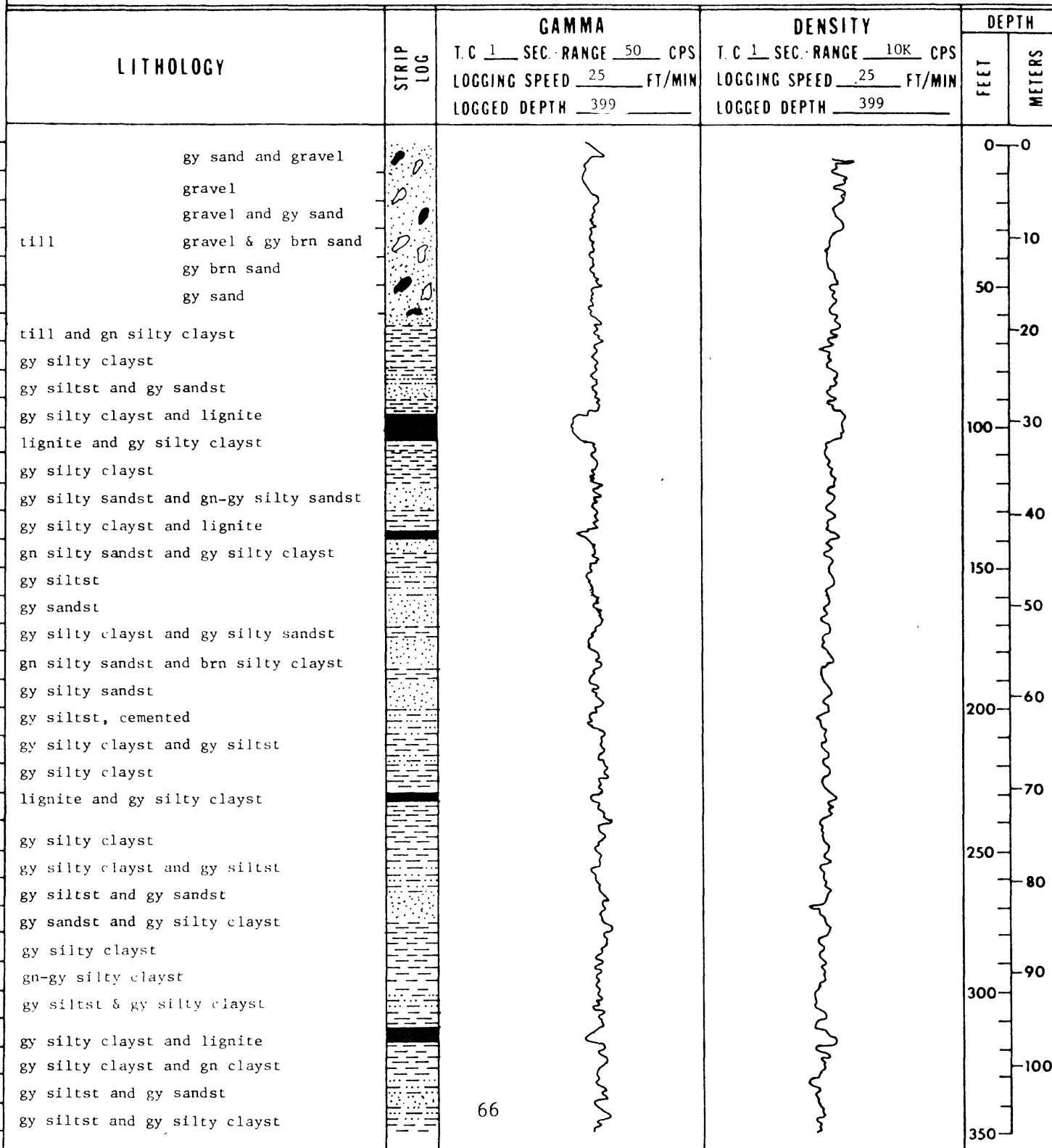
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 2  
SHEET 1 OF 4








<b>AREA</b> Williams County		<b>QUAD NAME</b> Charlson NE	
<b>DATE STARTED</b> 10/22/78	<b>DATE COMP.</b> 10/28/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 25 <b>T.</b> 155 N, <b>R.</b> 95 W. , <b>FOOTAGE LOC.</b> 43 ft		<b>FSL</b> 43 ft	<b>FEL</b> 43 ft
<b>SIZE AND BIT TYPE:</b> 4 1/2 in. drag		<b>FOOTAGE</b>	<b>GROUND ELEV</b> 2019 ft
		<b>ROTARY</b> 400	<b>CORING</b> -----
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 9 ft
<b>LITHOLOGY RECORDED BY</b> Wincentzen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud			
Contract No. 14-08-0001-17427			



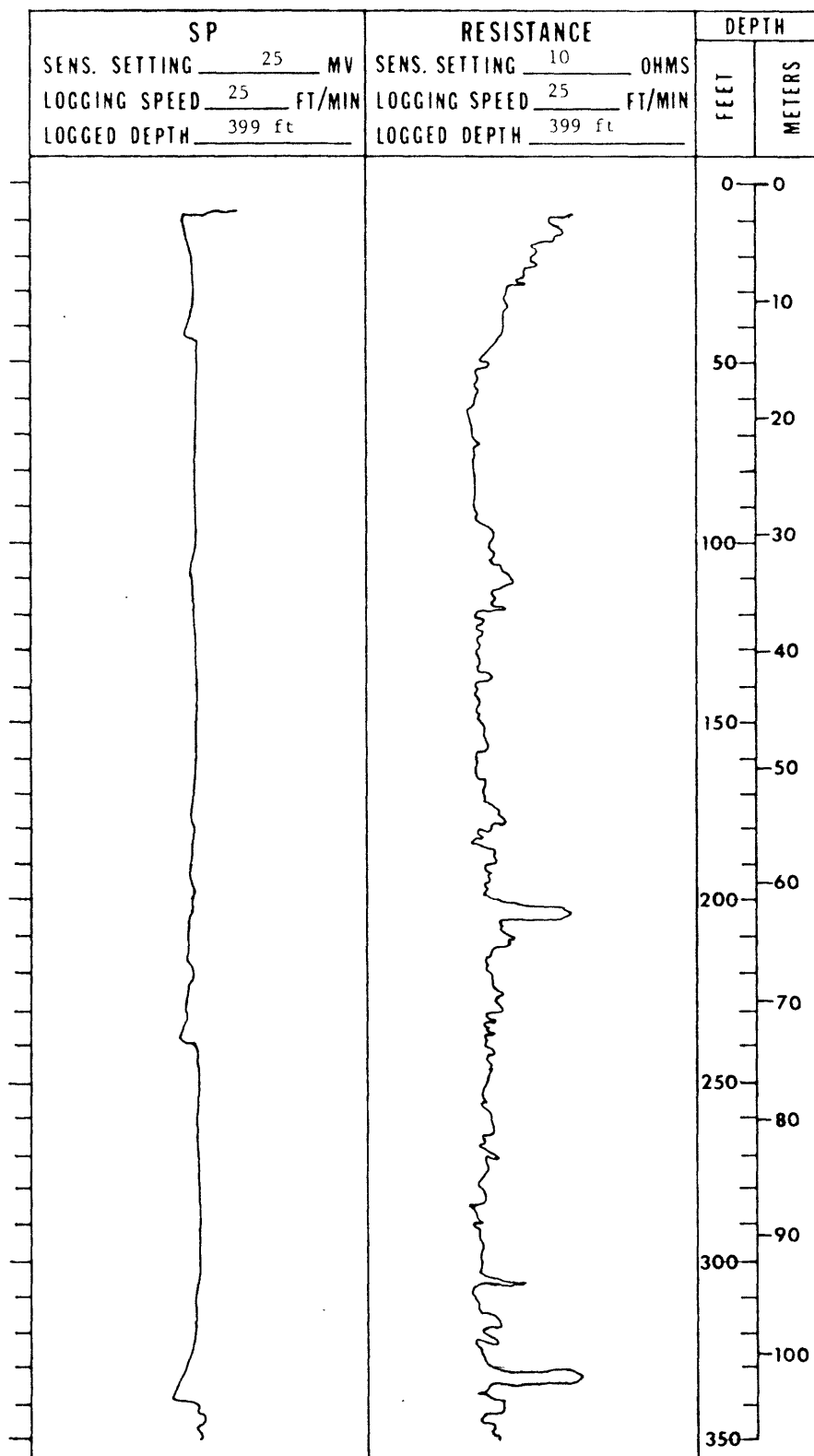
## UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 2  
SHEET 2 OF 4

REMARKS:

LITHOLOGY	STRIP LOG	GAMMA		DENSITY		DEPTH	
		T C <u>1</u> SEC. RANGE <u>50</u> CPS	LOGGING SPEED <u>25</u> FT/MIN	T C <u>1</u> SEC. RANGE <u>10K</u> CPS	LOGGING SPEED <u>25</u> FT/MIN	FEET	METERS
gy silty clayst						350	
gy silty clayst and lignite						110	
gy siltst and silty sandst							
gy silty clayst						120	
gy siltst						400	
						130	
						450	
						140	
						500	
						150	
						160	
						550	
						170	
						180	
						600	
						190	
						650	
						200	
						210	
						700	
						220	
						750	

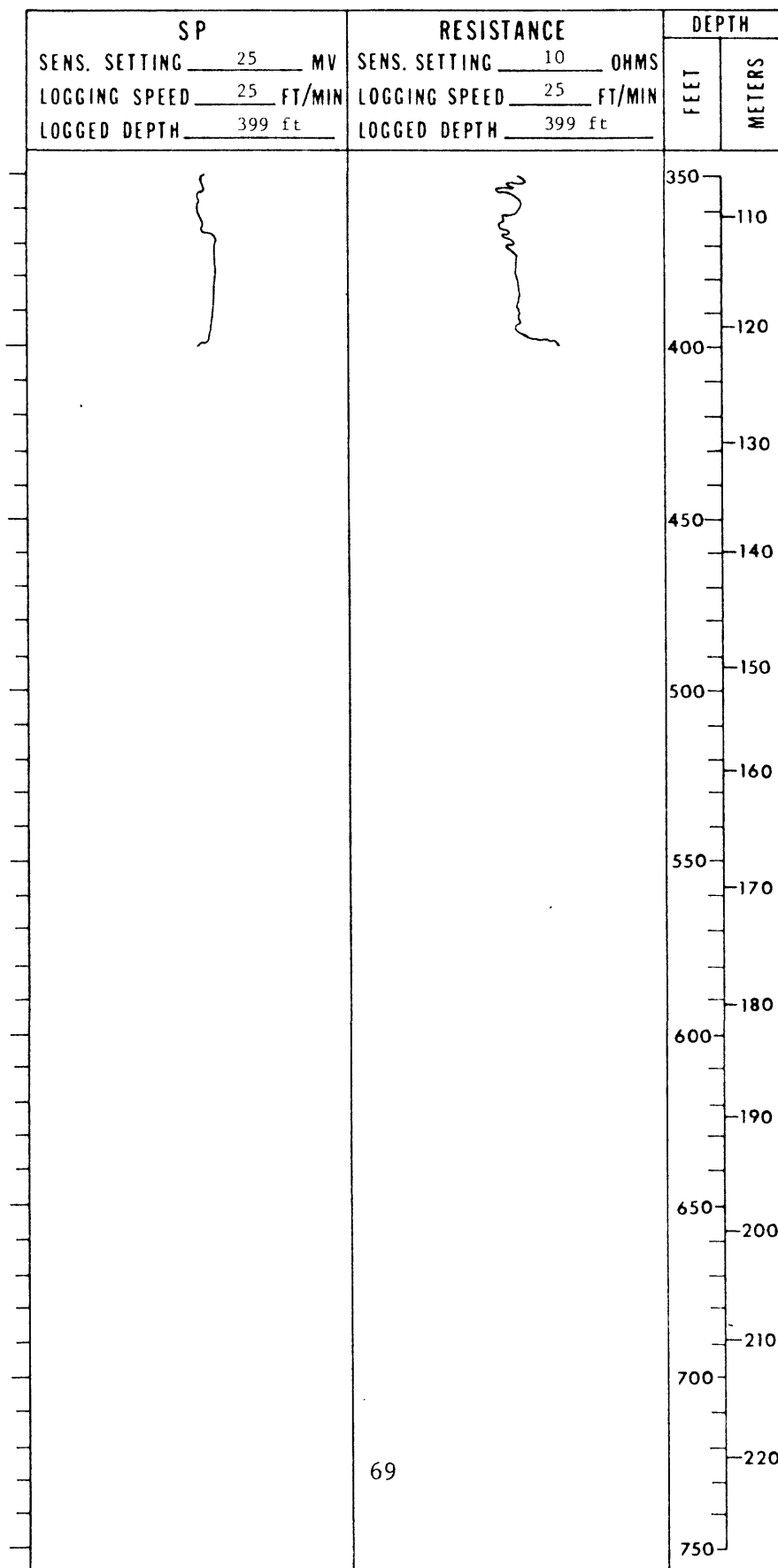
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 2  
SHEET 4 OF 4

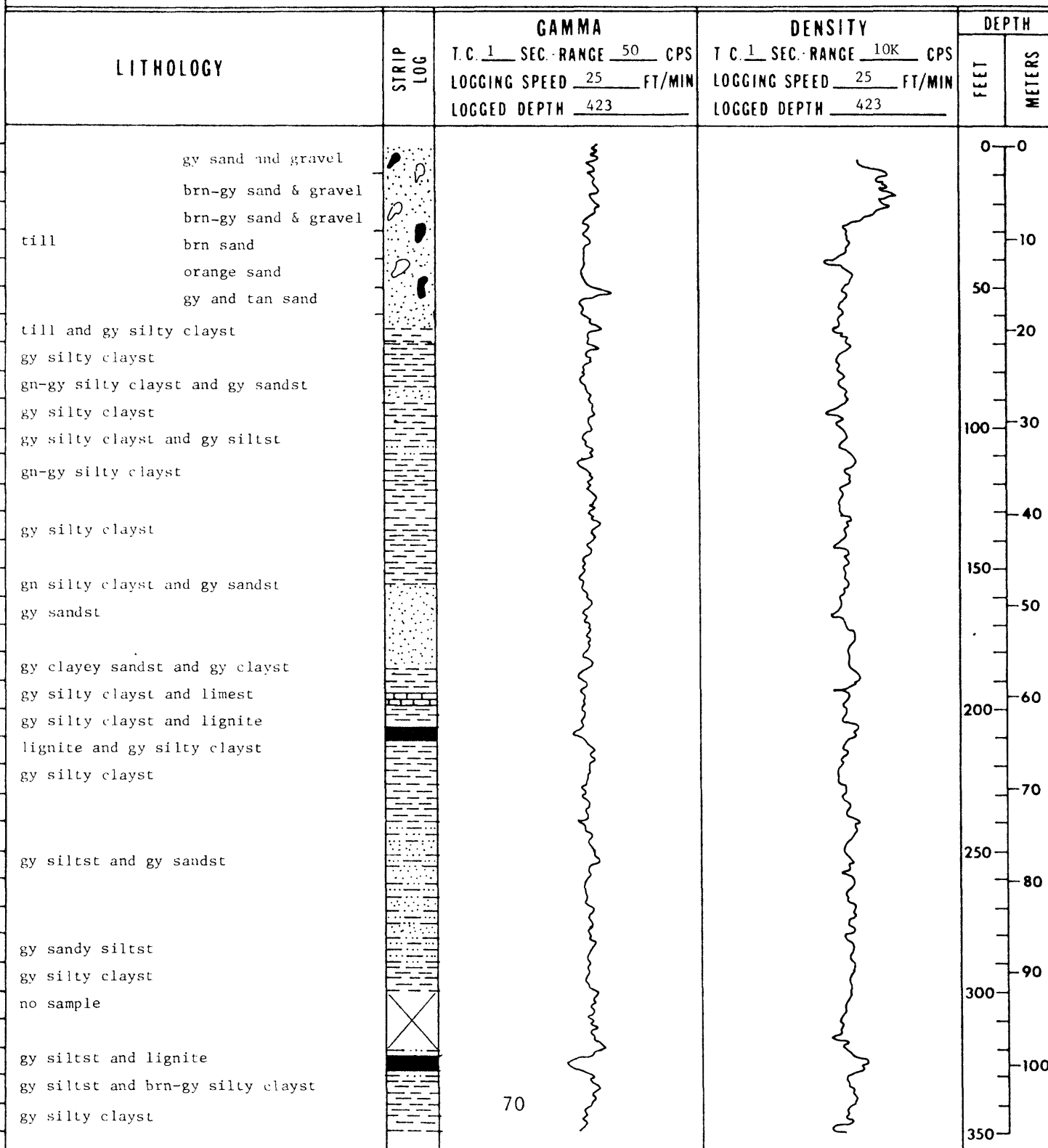
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 3  
SHEET 1 OF 4

<b>AREA</b> Williams County		<b>QUAD NAME</b> Ray 1 SW	
<b>DATE STARTED</b> 10/28/78	<b>DATE COMP.</b> 10/30/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 4 <b>T.</b> 155 N; <b>R.</b> 97 W., <b>FOOTAGE LOC.</b> 50		<b>FNL</b> 45 <small>PSX</small>	<b>FEL</b> <small>PWL</small>
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>FOOTAGE</b> ROTARY 440 CORING -----	<b>GROUND ELEV</b> 2314 ft
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>TOTAL DEPTH</b> 440 ft
<b>LITHOLOGY RECORDED BY</b> Wincentzen, Spencer		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud			
Contract No. 14-08-0001-17427			











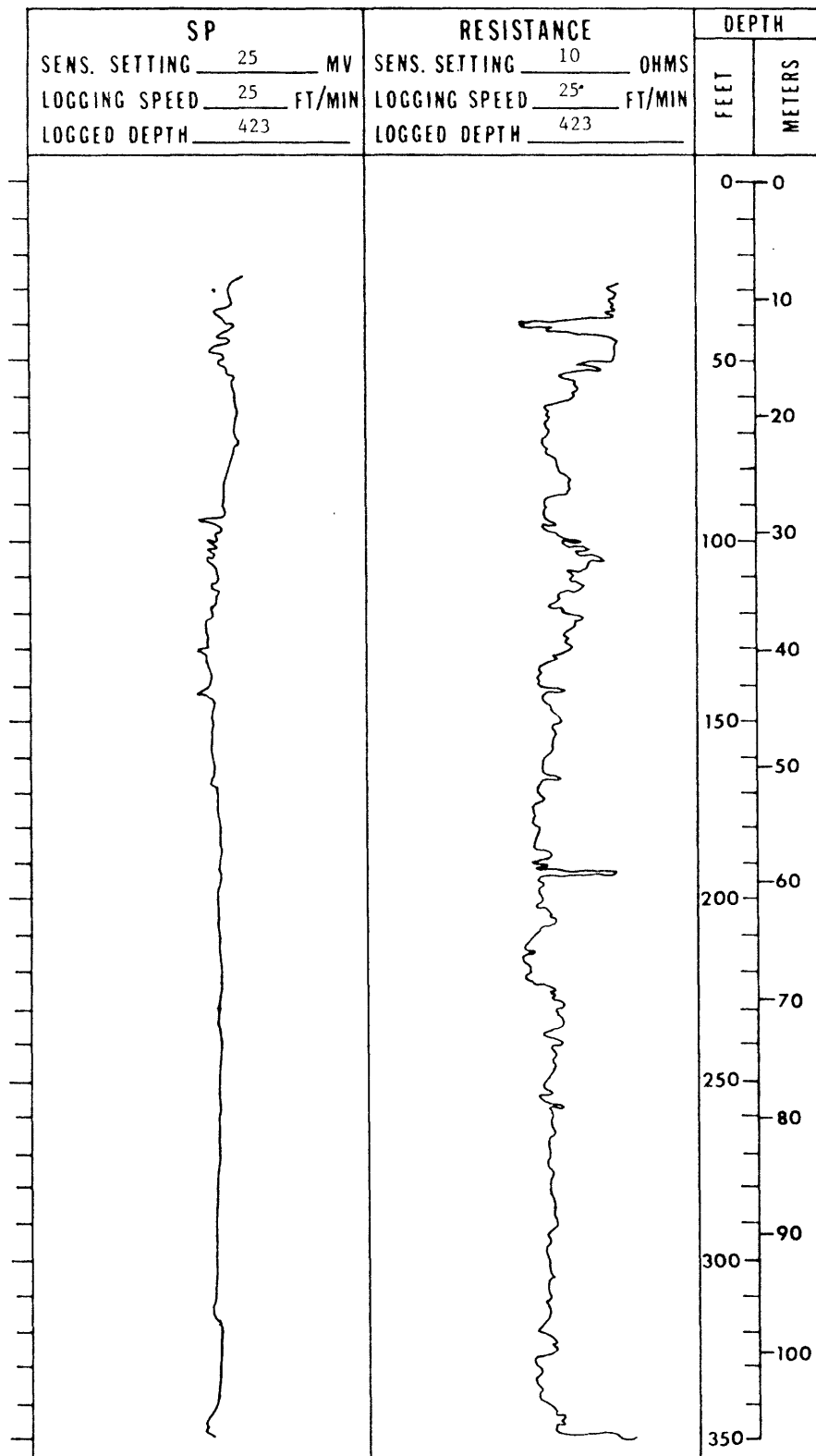
## UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 3  
SHEET 2 OF 4

REMARKS:

LITHOLOGY	STRIP LOG	GAMMA		DENSITY		DEPTH	
		T.C. <u>1</u> SEC. RANGE <u>50</u> CPS	T.C. <u>1</u> SEC. RANGE <u>10K</u> CPS	LOGGING SPEED <u>25</u> FT/MIN	LOGGING SPEED <u>25</u> FT/MIN	FEET	METERS
		LOGGED DEPTH <u>423</u>	LOGGED DEPTH <u>423</u>				
gy silty clayst				350			
gy cbnes siltst				110			
no sample				120			
				400			
gy silty clayst				130			
				450			
				140			
				500			
				150			
				160			
				550			
				170			
				180			
				600			
				190			
				650			
				200			
				210			
				700			
				220			
				750			

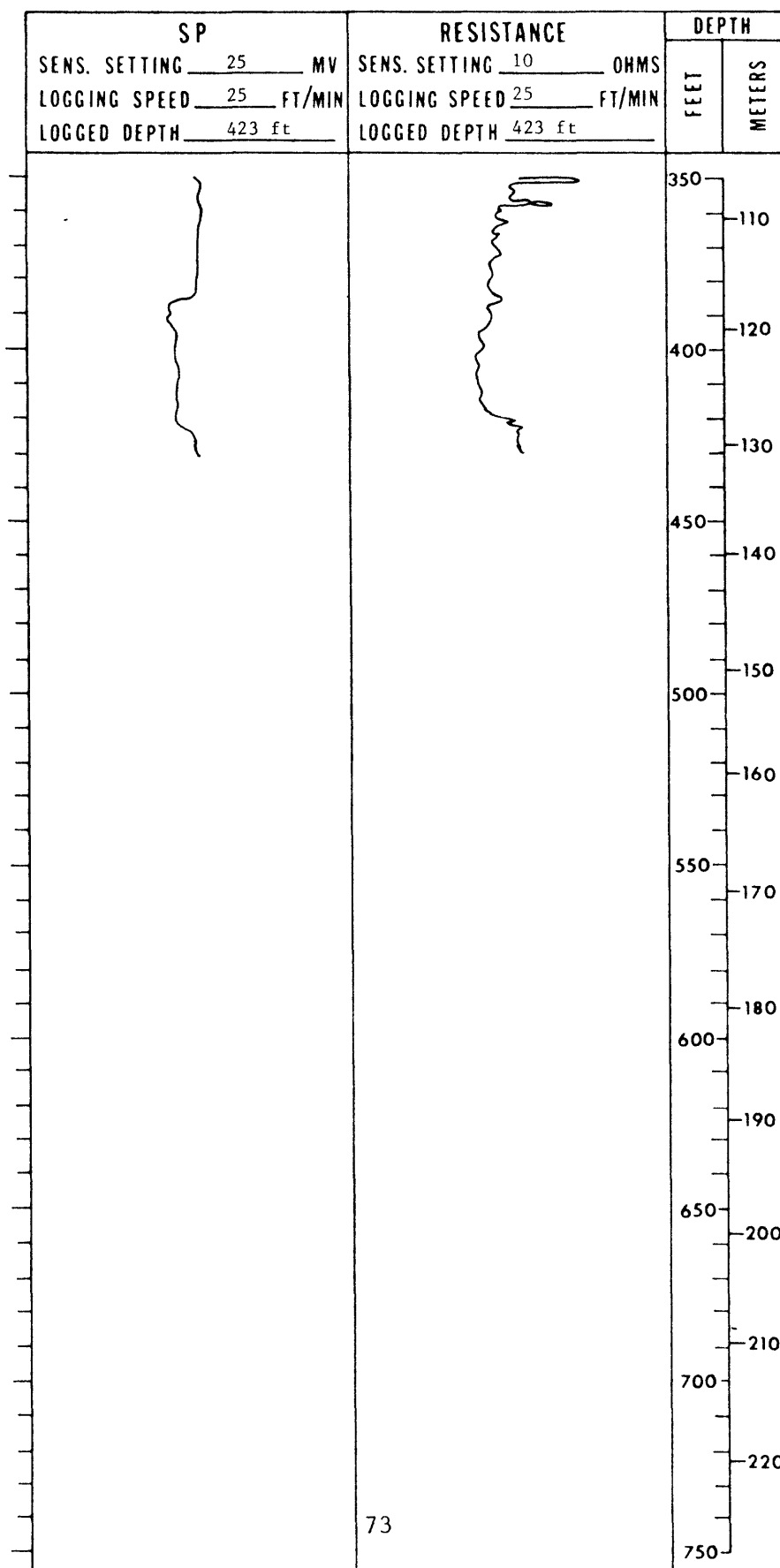
REMARKS:



## UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 3  
SHEET 4 OF 4

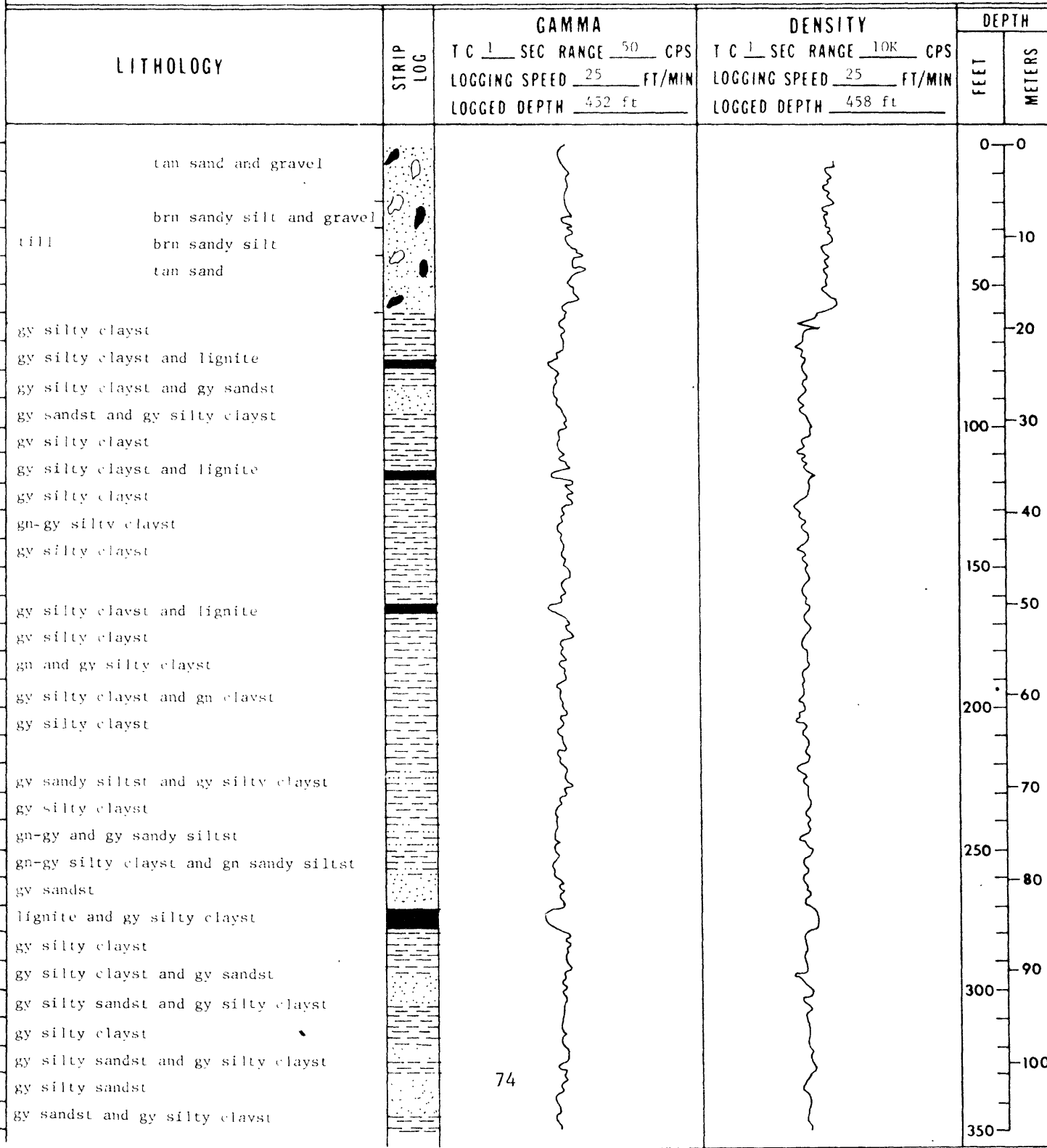
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 4  
SHEET 1 OF 4




<b>AREA</b> Williams County		<b>QUAD NAME</b> White Earth 2 SE	
<b>DATE STARTED</b> 10/21/78	<b>DATE COMP.</b> 10/21/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION:</b> SEC. 10 T. 156 N., R. 95 W., <b>FOOTAGE LOC.</b> 2638 ft		<b>FWL</b> 61 ft	<b>GROUND ELEV</b> 2313 ft
<b>SIZE AND BIT TYPE:</b> 4 1/2 in. drag		<b>FOOTAGE</b>	<b>TOTAL DEPTH</b> 460 ft
		<b>ROTARY</b> 460	<b>CORING</b> -----
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 71 ft
<b>LITHOLOGY RECORDED BY</b> Wincentzen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud			
Contract No. 14-08-0001-17427			



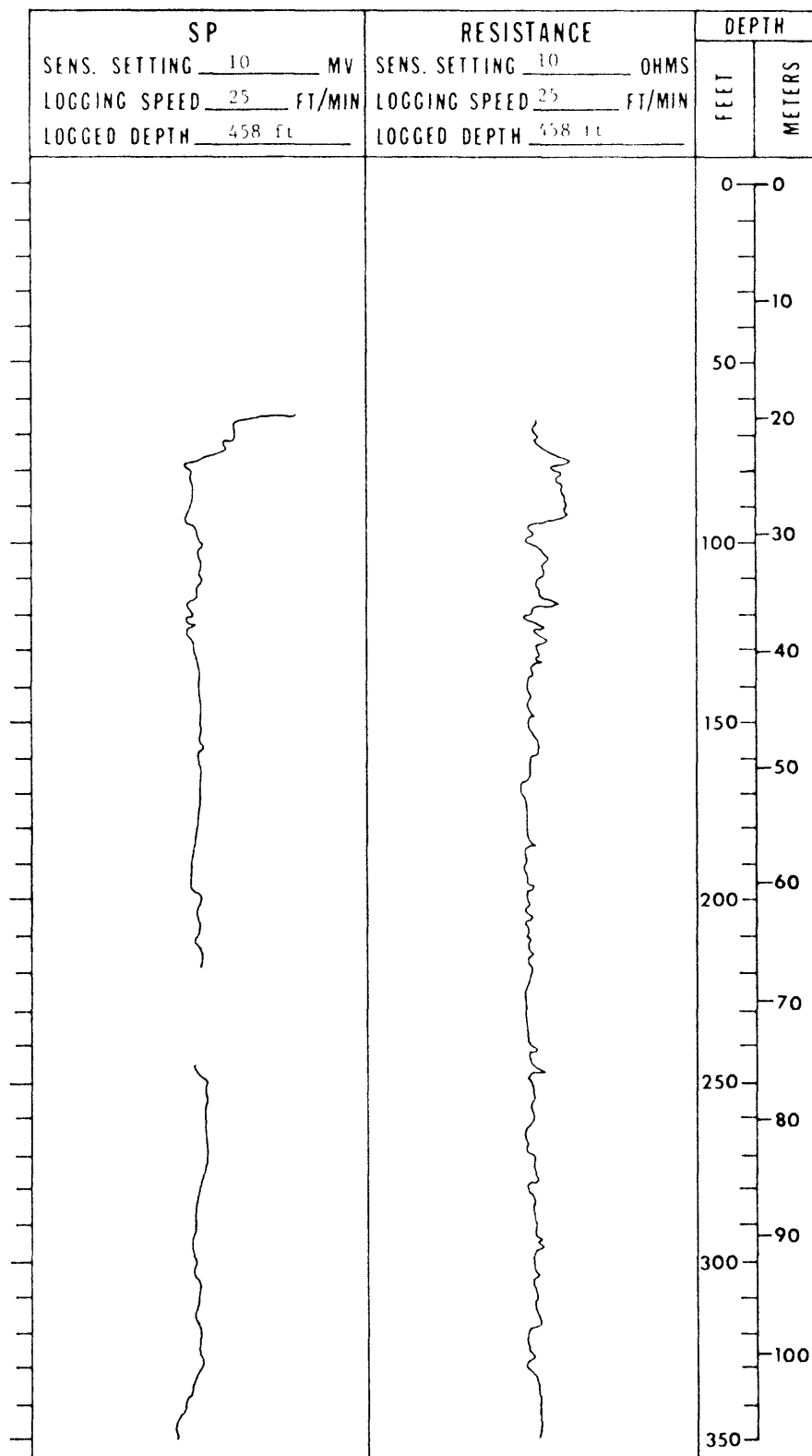
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 4  
SHEET 2 OF 4

REMARKS:

LITHOLOGY	STRIP LOG	GAMMA	DENSITY	DEPTH	
		T C 1 SEC RANGE 50 CPS LOGGING SPEED 25 FT/MIN LOGGED DEPTH 452 ft	T C 1 SEC RANGE 10K CPS LOGGING SPEED 25 FT/MIN LOGGED DEPTH 458 ft	FEET	METERS
gn-gy silty clayst and gy sandst gy sandst				350	
gy siltst				110	
gy silty sandst				120	
gy silty clayst				400	
gy silty clayst and gy sandst				130	
gy silty sandst and gn silty clayst				140	
gy silty clayst				150	
				160	
				170	
				180	
				190	
				200	
				210	
				220	
				750	

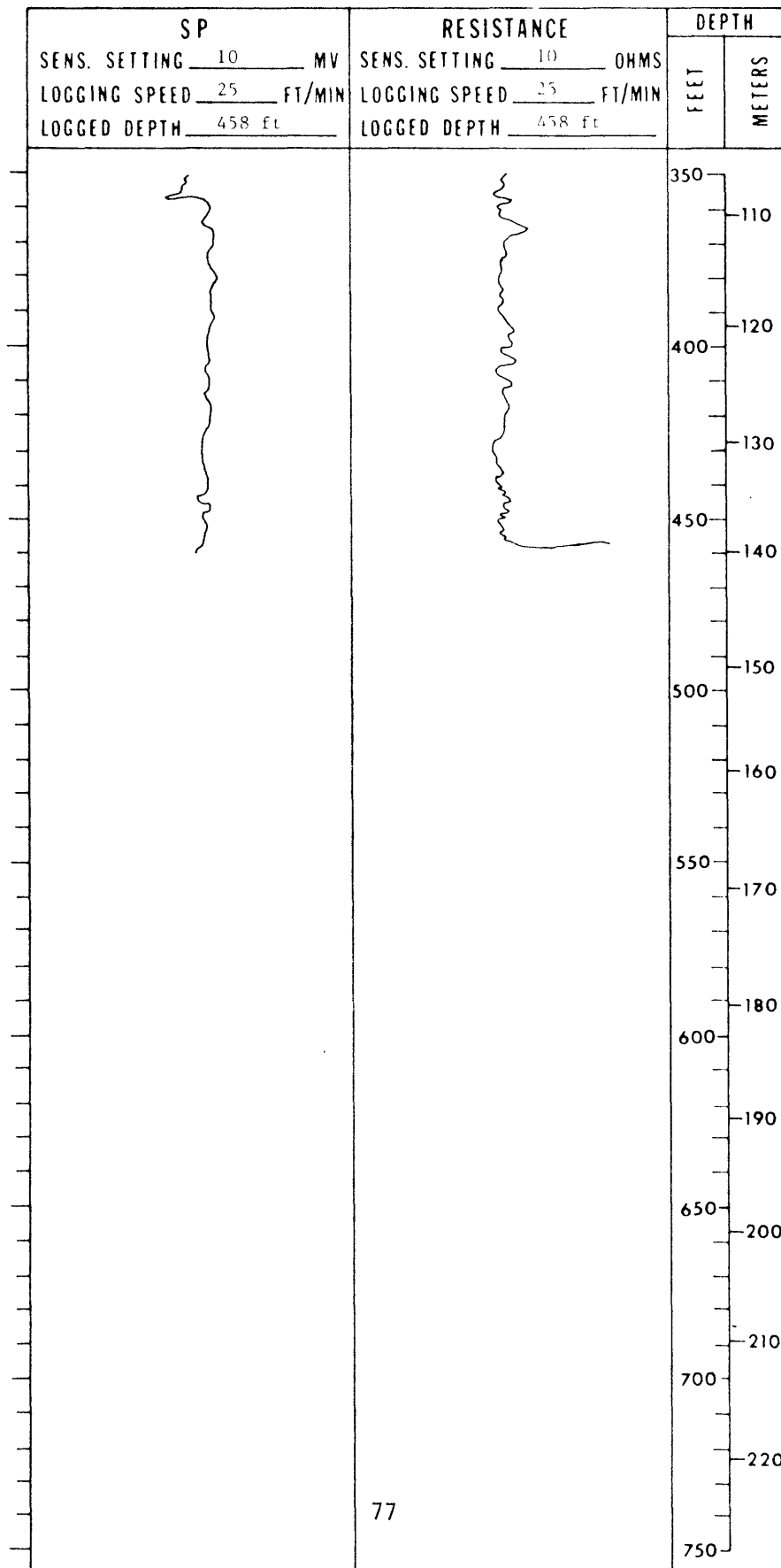
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 4  
SHEET 4 OF 4

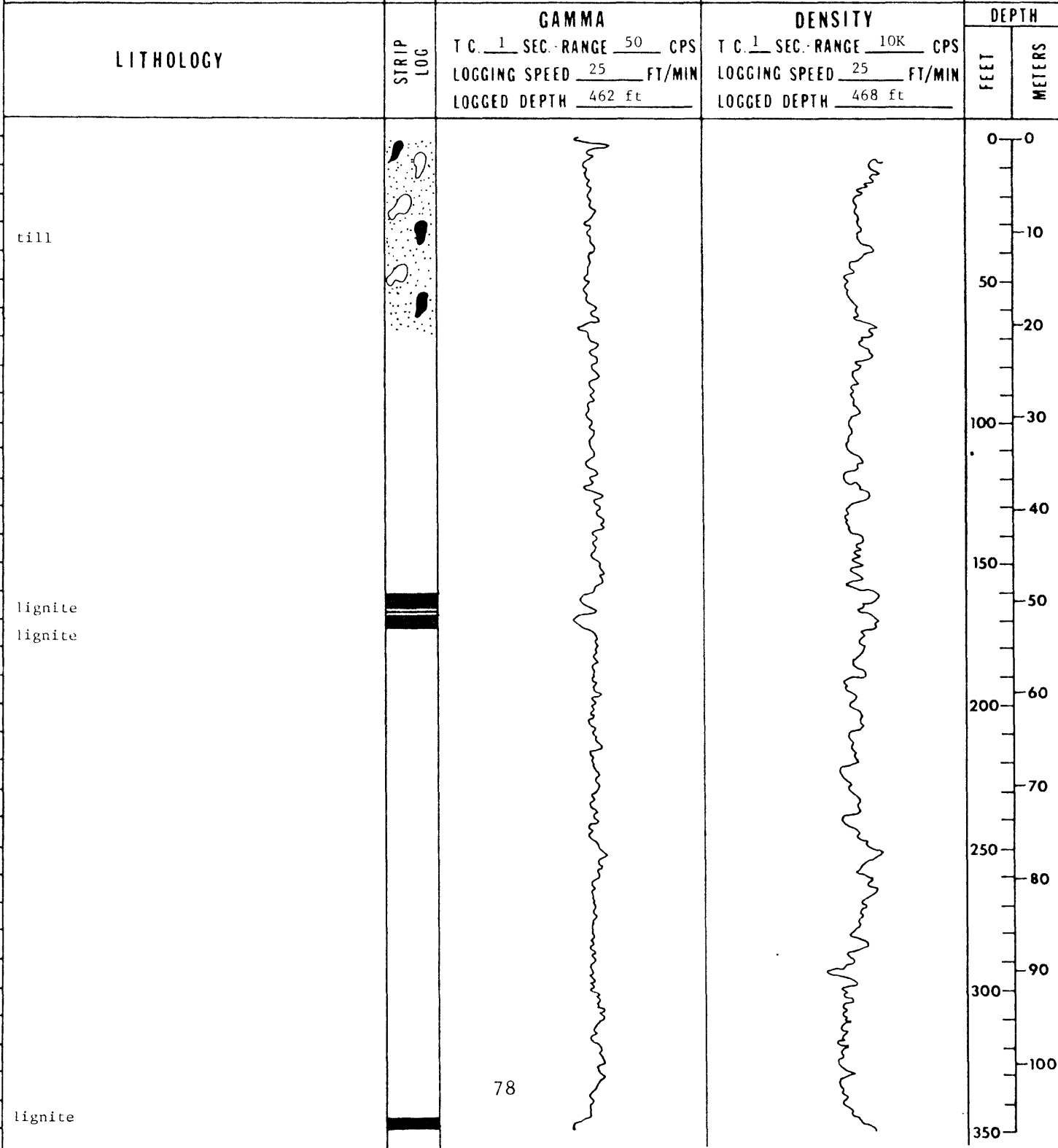
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 6  
SHEET 1 OF 4

<b>AREA</b> Williams County		<b>QUAD NAME</b> Ray 1 SW	
<b>DATE STARTED</b> 10/30/78	<b>DATE COMP.</b> 11/2/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION:</b> SEC. 24 T.156 N., R. 98 W., <b>FOOTAGE LOC.</b> 10		<b>FNL</b> <del>PSL</del> 1150 <b>FEL</b> <del>PWL</del>	<b>GROUND ELEV</b> 2355 ft
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>FOOTAGE</b>	<b>TOTAL DEPTH</b> 468 ft
		<b>ROTARY</b> 468 <b>CORING</b> -----	
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 7 ft
<b>LITHOLOGY RECORDED BY</b> Spencer		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud; geologist's log missing Contract No. 14-08-0001-17427			

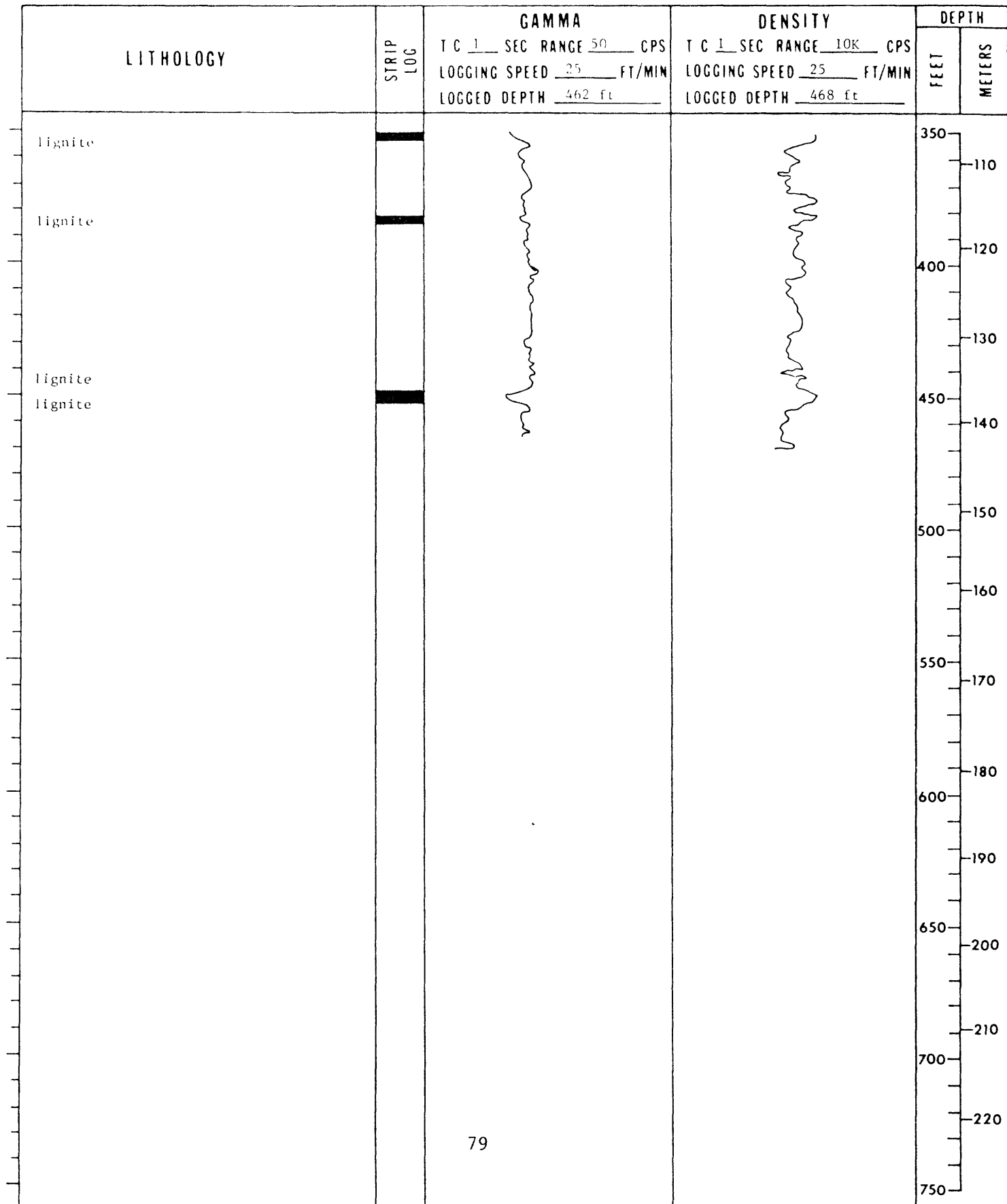






# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 6  
SHEET 2 OF 4

REMARKS:



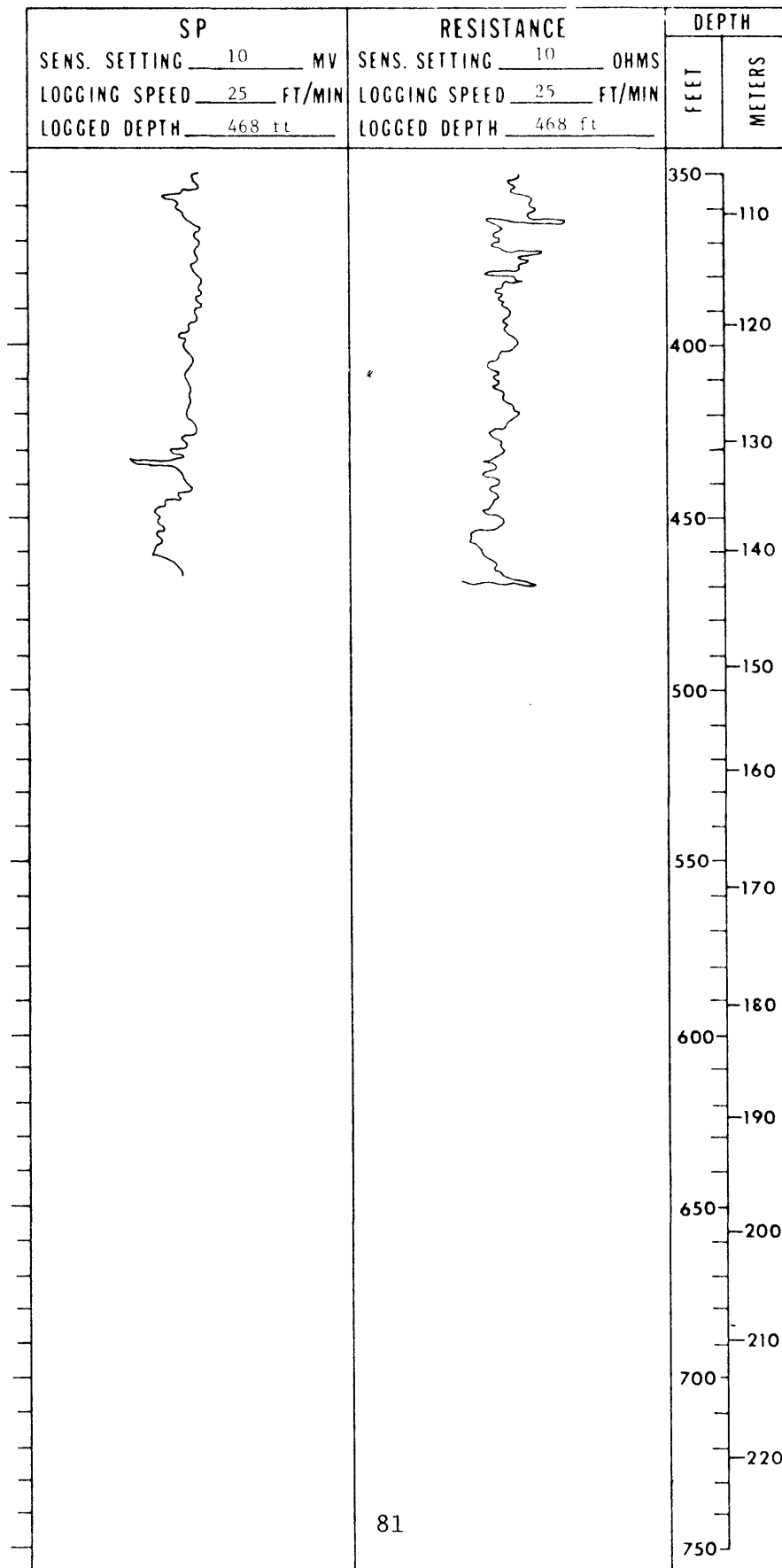
HOLE NO. W 6  
SHEET 3 OF 4

SP		RESISTANCE		DEPTH	
SENS. SETTING <u>10</u> MV		SENS. SETTING <u>10</u> OHMS		FEET	METERS
LOGGING SPEED <u>25</u> FT/MIN		LOGGING SPEED <u>25</u> FT/MIN			
LOGGED DEPTH <u>468 ft</u>		LOGGED DEPTH <u>468 ft</u>			
				0	0
				10	
				50	
				20	
				100	30
				40	
				150	
				50	
				200	60
				70	
				250	
				80	
				300	90
				100	
				350	

# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. : 6  
SHEET 4 OF 4

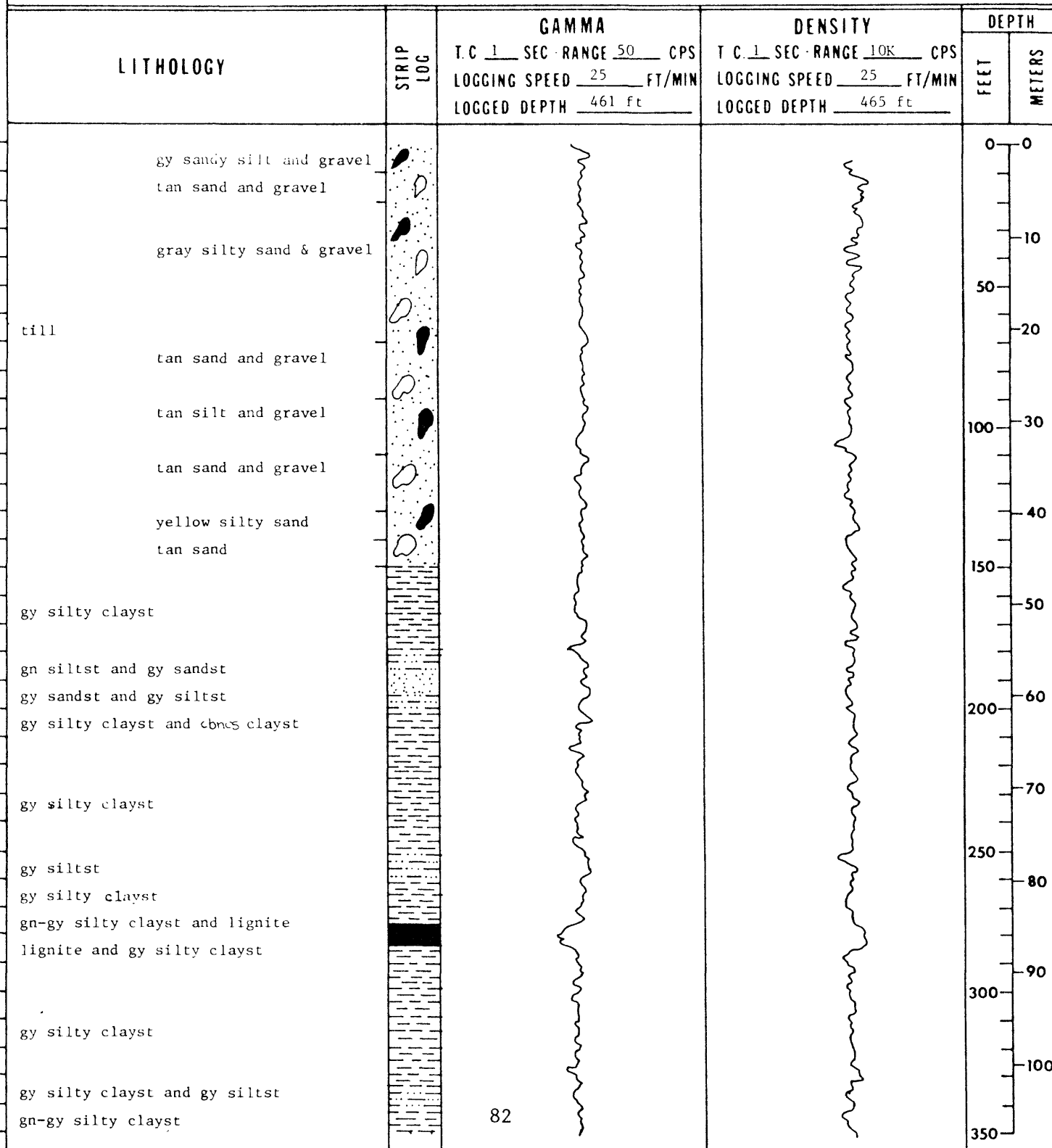
REMARKS:






# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 14  
SHEET 1 OF 4

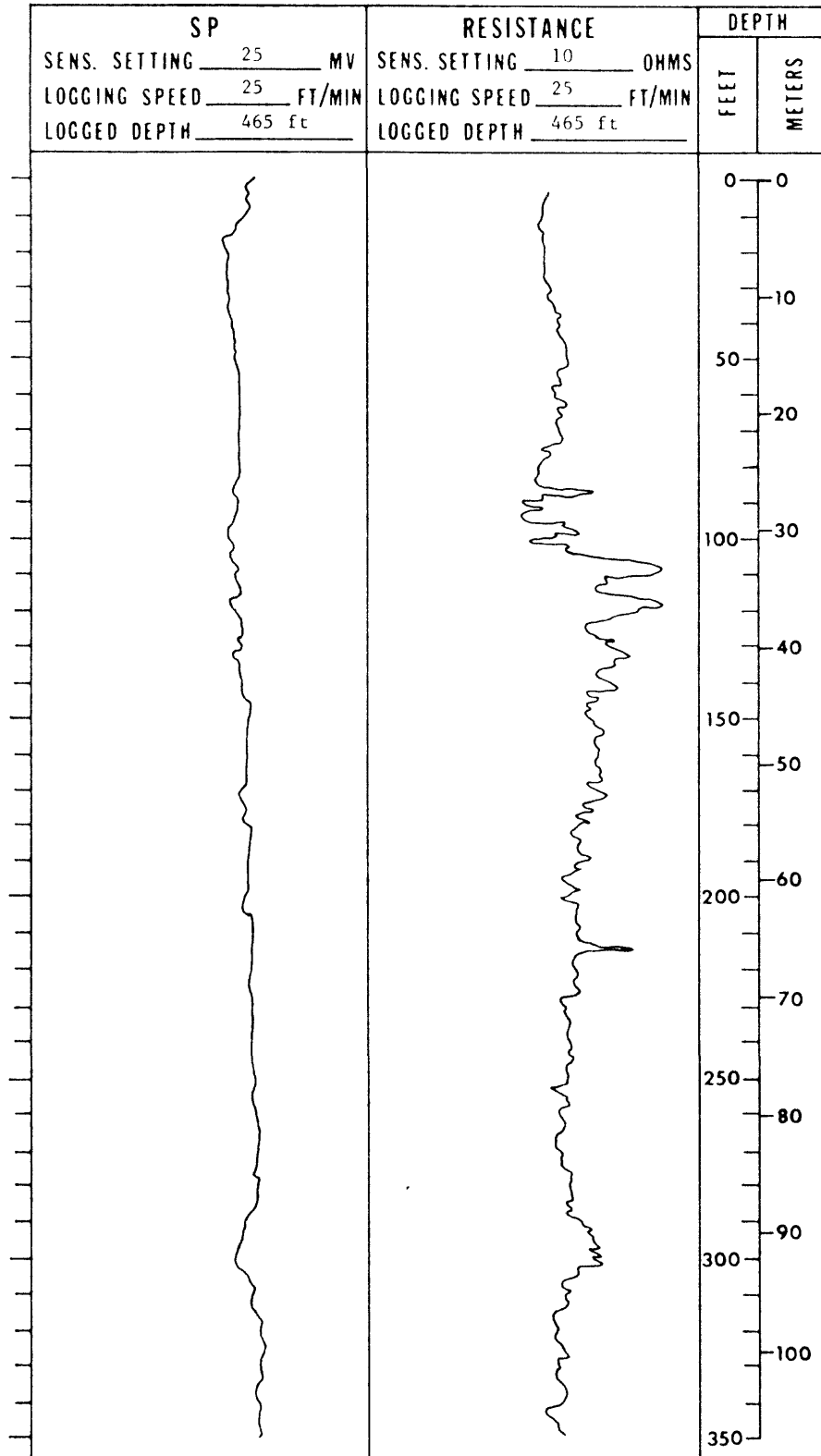
<b>AREA</b> Williams County		<b>QUAD NAME</b> White Earth 2 NW	
<b>DATE STARTED</b> 10/19/78	<b>DATE COMP.</b> 10/20/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 32 <b>T.</b> 157 N. <b>R.</b> 95 W. <b>FOOTAGE LOC.</b> 2958		<b>FNL</b> 69 ft <del>XPS</del>	<b>GROUND ELEV</b> 2350 ft <del>XPS</del> <b>FWL</b>
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>FOOTAGE</b> <b>ROTARY</b> 465 <b>CORING</b> -----	
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	
<b>LITHOLOGY RECORDED BY</b> Wincentzen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud Contract No. 14-08-0001-17427			



REMARKS:

LITHOLOGY	STRIP LOG	GAMMA		DENSITY		DEPTH	
		T C <u>1</u> SEC. RANGE <u>50</u> CPS	LOGGING SPEED <u>25</u> FT/MIN	T C <u>1</u> SEC. RANGE <u>10K</u> CPS	LOGGING SPEED <u>25</u> FT/MIN	FEET	METERS
gy silty clayst gy sandy siltst and gy siltst gy cemented siltst						350	
							110
							120
gv silty clayst						400	
							130
gn siltst						450	
gy silty clayst							140
							150
						500	
							160
							170
							180
						600	
							190
							200
							210
						700	
							220
							230
							240
							250
							260
							270
							280
							290
							300
							310
							320
							330
							340
							350
							360
							370
							380
							390
							400
							410
							420
							430
							440
							450
							460
							470
							480
							490
							500
							510
							520
							530
							540
							550
							560
							570
							580
							590
							600
							610
							620
							630
							640
							650
							660
							670
							680
							690
							700
							710
							720
							730
							740
							750

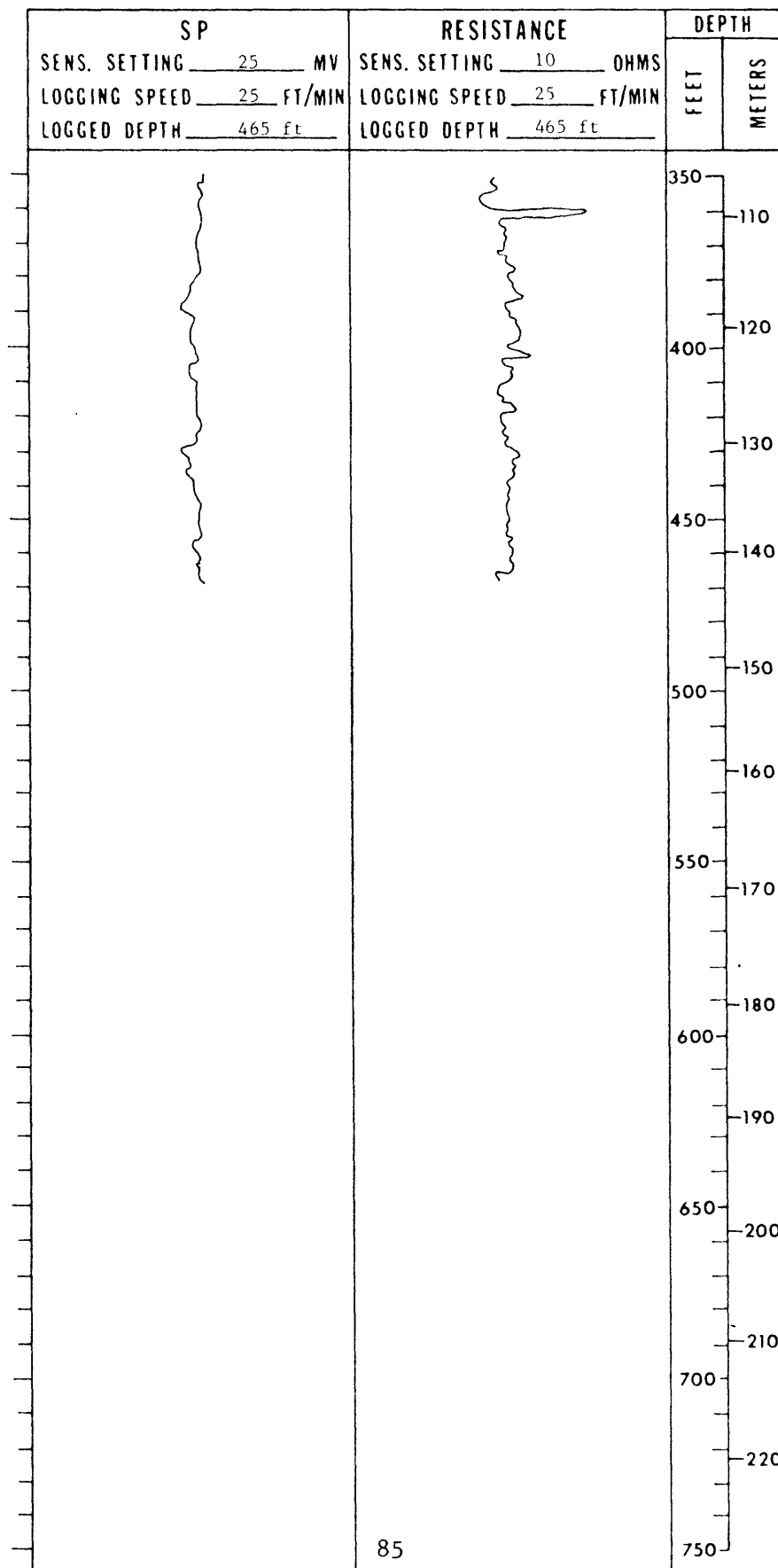
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 14  
SHEET 4 OF 4

REMARKS:



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# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 15  
SHEET 1 OF 1

<b>AREA</b> Williams County		<b>QUAD NAME</b> Ray 1 NE	
<b>DATE STARTED</b> 10/17/78	<b>DATE COMP.</b> 10/17/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC. 12</b> T. 157 N., R. 96 W., <b>FOOTAGE LOC.</b> 35		<b>FOOTAGE</b> 10	<b>GROUND ELEV</b> 2367 ft
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>ROTARY</b> 105	<b>TOTAL DEPTH</b> 105 ft
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> -----
<b>LITHOLOGY RECORDED BY</b> Wincentzen		<b>GEOPHYSICAL LOGS RECORDED BY</b> none	
<b>REMARKS:</b> No geophysical log			
Contract No. 14-08-0001-17427			

LITHOLOGY	STRIP LOG	GAMMA	DENSITY	DEPTH	
		T.C. ____ SEC. RANGE ____ CPS LOGGING SPEED ____ FT/MIN LOGGED DEPTH ____	T.C. ____ SEC. RANGE ____ CPS LOGGING SPEED ____ FT/MIN LOGGED DEPTH ____	FEET	METERS
tan sand and gravel tan silt and gravel  gy silty clay, tan sand and gravel till  brn sandy silt brn sandy silt & brn sand  brn sandy silt				0	0
				10	
				50	
				20	
				100	30
				40	
				150	
				50	
				200	60
				70	
				250	
				80	
				300	90
				100	
				350	



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 16  
SHEET 1 OF 4

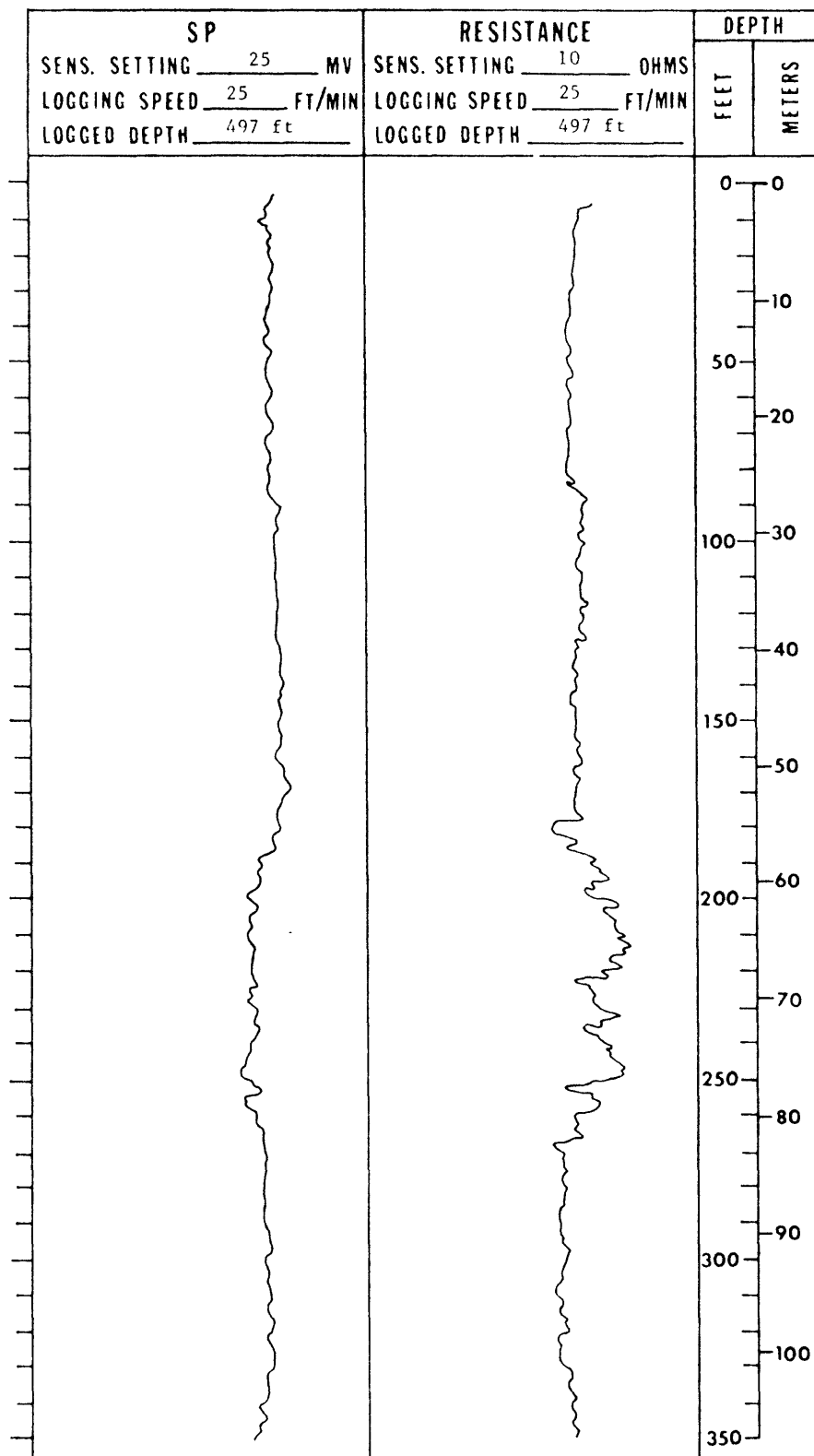
<b>AREA</b> Williams County		<b>QUAD NAME</b> Ray 1 NE	
<b>DATE STARTED</b> 10/27/78	<b>DATE COMP.</b> 10/29/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 20 <b>T.</b> 157 N., <b>R.</b> 96 W., <b>FOOTAGE LOC.</b> 15		<b>FWL</b> 210	<b>GROUND ELEV</b> 2334 ft
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>FOOTAGE</b> 500	<b>TOTAL DEPTH</b> 500 ft
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 0 ft
<b>LITHOLOGY RECORDED BY</b> Owen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud Contract No. 14-08-0001-17427			

LITHOLOGY	STRIP LOG	GAMMA	DENSITY	DEPTH		
		T C. <u>1</u> SEC. RANGE <u>50</u> CPS LOGGING SPEED <u>25</u> FT/MIN LOGGED DEPTH <u>494 ft</u>	T C. <u>1</u> SEC. RANGE <u>10K</u> CPS LOGGING SPEED <u>25</u> FT/MIN LOGGED DEPTH <u>497 ft</u>	FEET	METERS	
					0	0
brn sand and gravel						
					10	
brn silt					50	
brn sand					20	
brn silt					100	30
till					40	
					150	
brn sand					50	
					60	
brn sand and gravel					200	60
brn sand					70	
brn very coarse sand					250	80
brn sandst					80	
brn sandst and lignite						
gy siltst and gn clayst						
brn sandst					90	
brn sandst and brn siltst					300	90
brn siltst					100	
brn siltst and gy sandst					350	

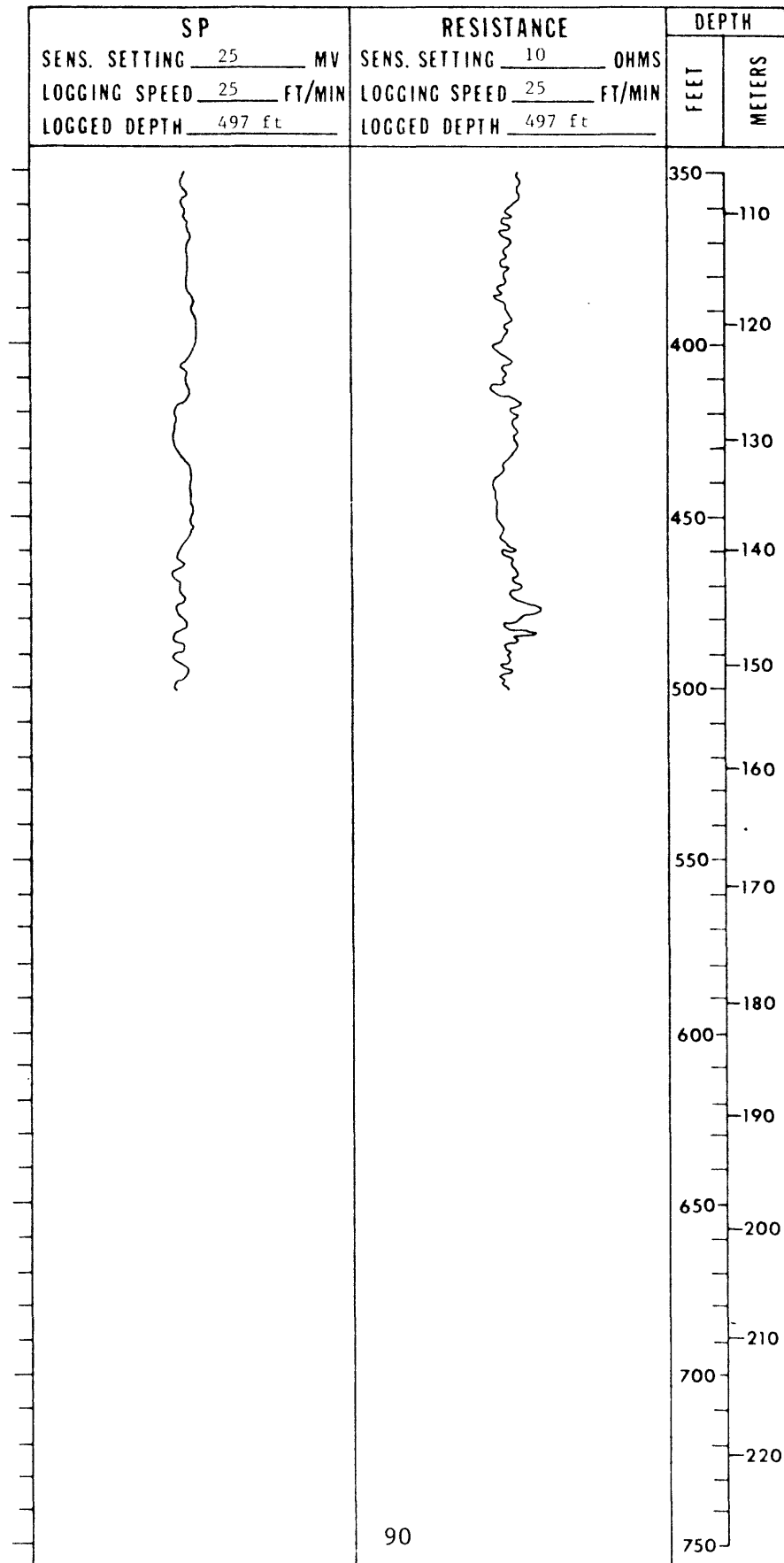
REMARKS:

LITHOLOGY	STRIP LOG	GAMMA		DENSITY		DEPTH	
		T C <u>1</u> SEC. RANGE <u>50</u> CPS	LOGGING SPEED <u>25</u> FT/MIN	T C <u>1</u> SEC. RANGE <u>10K</u> CPS	LOGGING SPEED <u>25</u> FT/MIN	FEET	METERS
			LOGGED DEPTH <u>494</u> ft		LOGGED DEPTH <u>497</u> ft	350	
gy sandst						110	
						120	
lignite						400	
gy sandst							
gy siltst						130	
						450	
gy siltst and lignite						140	
						150	
gy siltst						500	
						160	
						550	
						170	
						180	
						600	
						190	
						650	
						200	
						210	
						700	
						220	
						750	

REMARKS:



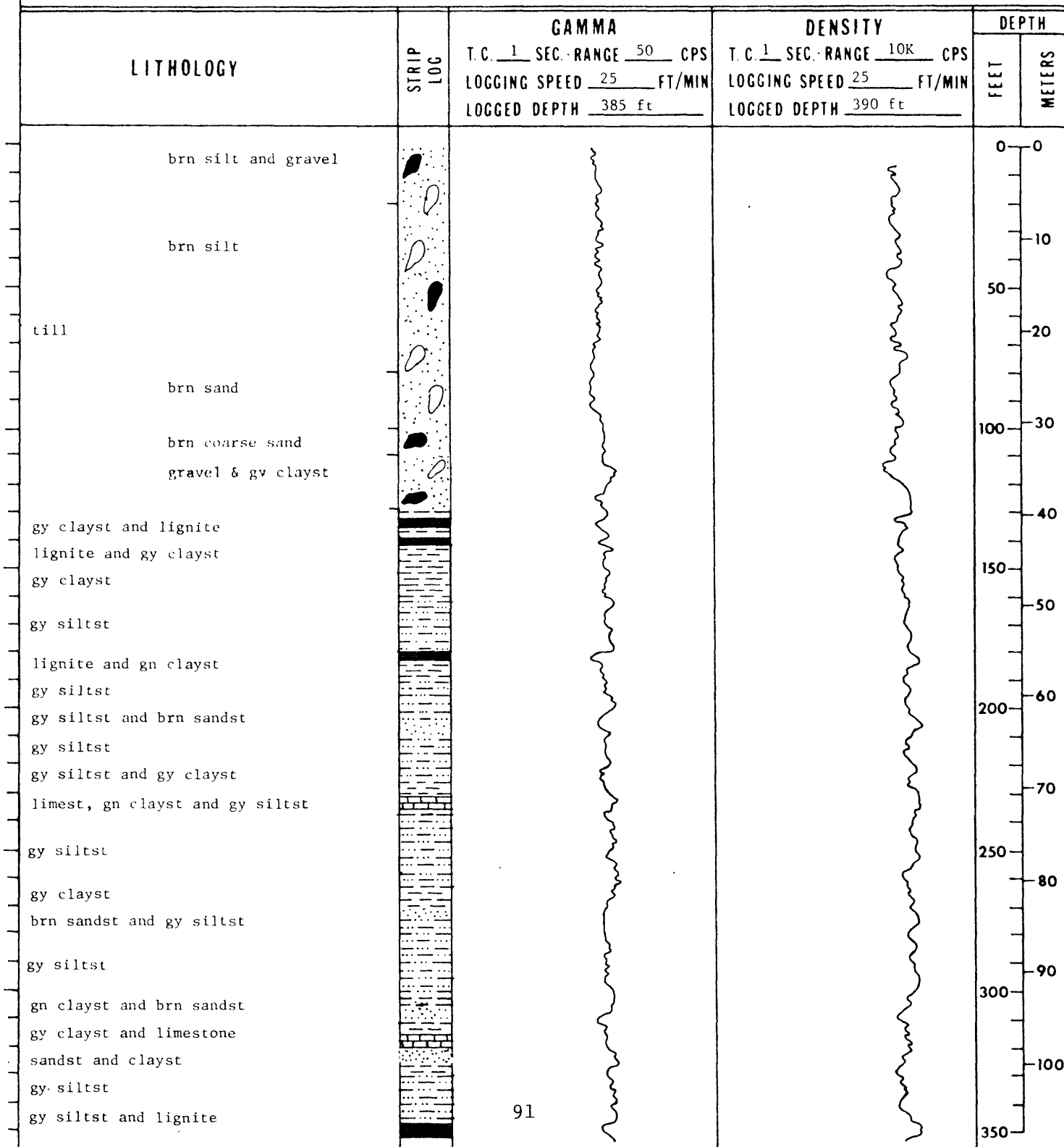
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 17  
SHEET 1 OF 4

<b>AREA</b> Williams County		<b>QUAD NAME</b> Ray 1 NW	
<b>DATE STARTED</b> 10/30/78	<b>DATE COMP.</b> 11/1/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC. 17 T. 157 N., R. 97 W., FOOTAGE LOC.</b> 66		<b>FNL</b> 30	<b>GROUND ELEV</b> 2276 ft
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>FOOTAGE</b> ROTARY 390    CDRING -----	<b>TOTAL DEPTH</b> 390 ft
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 6 ft
<b>LITHOLOGY RECORDED BY</b> Owen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud Contract No. 14-08-0001-17427			



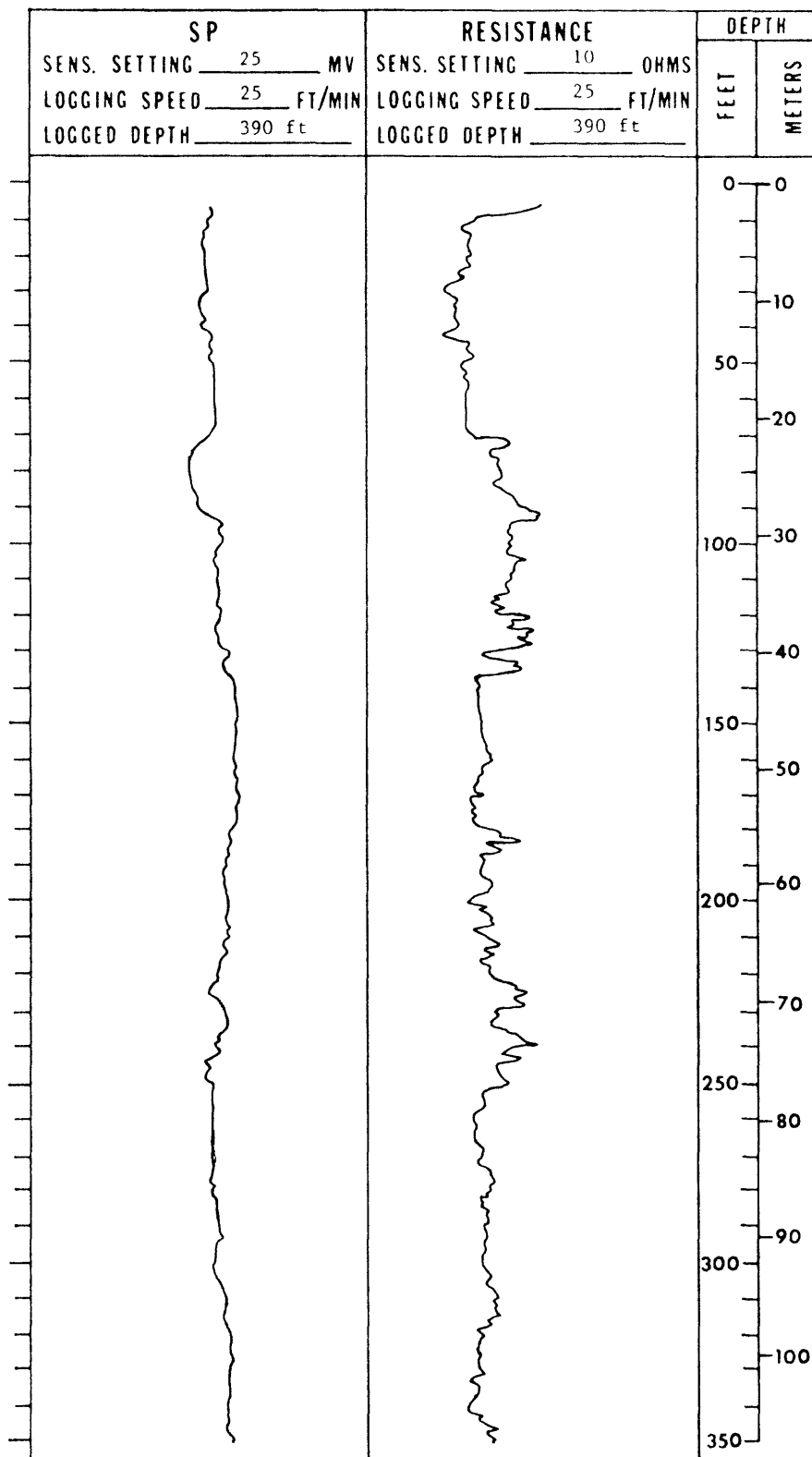
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 17  
SHEET 2 OF 4



REMARKS:

LITHOLOGY	STRIP LOG	GAMMA	DENSITY	DEPTH	
		T C <u>1</u> SEC RANGE <u>50</u> CPS LOGGING SPEED <u>25</u> FT/MIN LOGGED DEPTH <u>385</u> ft	T C <u>1</u> SEC RANGE <u>10K</u> CPS LOGGING SPEED <u>25</u> FT/MIN LOGGED DEPTH <u>390</u> ft	FEET	METERS
lignite, no sample				350	
no sample				110	
				120	
				400	
				130	
				450	
				140	
				150	
				500	
				160	
				550	
				170	
				180	
				600	
				190	
				650	
				200	
				210	
				700	
				220	
				750	

REMARKS:



REMARKS:

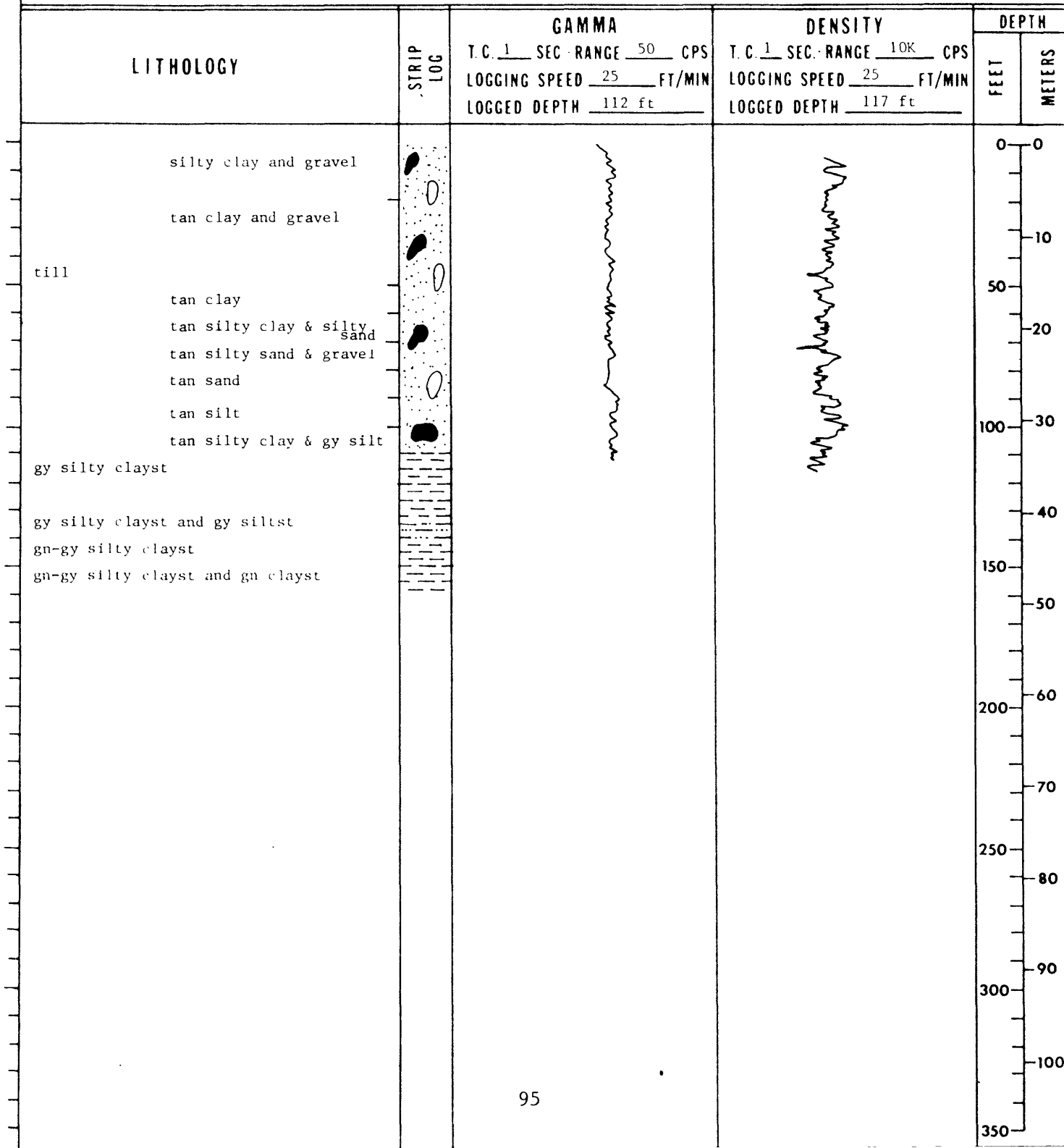
SP		RESISTANCE		DEPTH	
SENS. SETTING <u>25</u> MV		SENS. SETTING <u>10</u> OHMS		FEET	METERS
LOGGING SPEED <u>25</u> FT/MIN		LOGGING SPEED <u>25</u> FT/MIN			
LOGGED DEPTH <u>390</u> ft		LOGGED DEPTH <u>390</u> ft			
				350	
				110	
				120	
				400	
				130	
				450	
				140	
				500	
				150	
				160	
				550	
				170	
				180	
				600	
				190	
				650	
				200	
				210	
				700	
				220	
				750	



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 36  
SHEET 1 OF 2

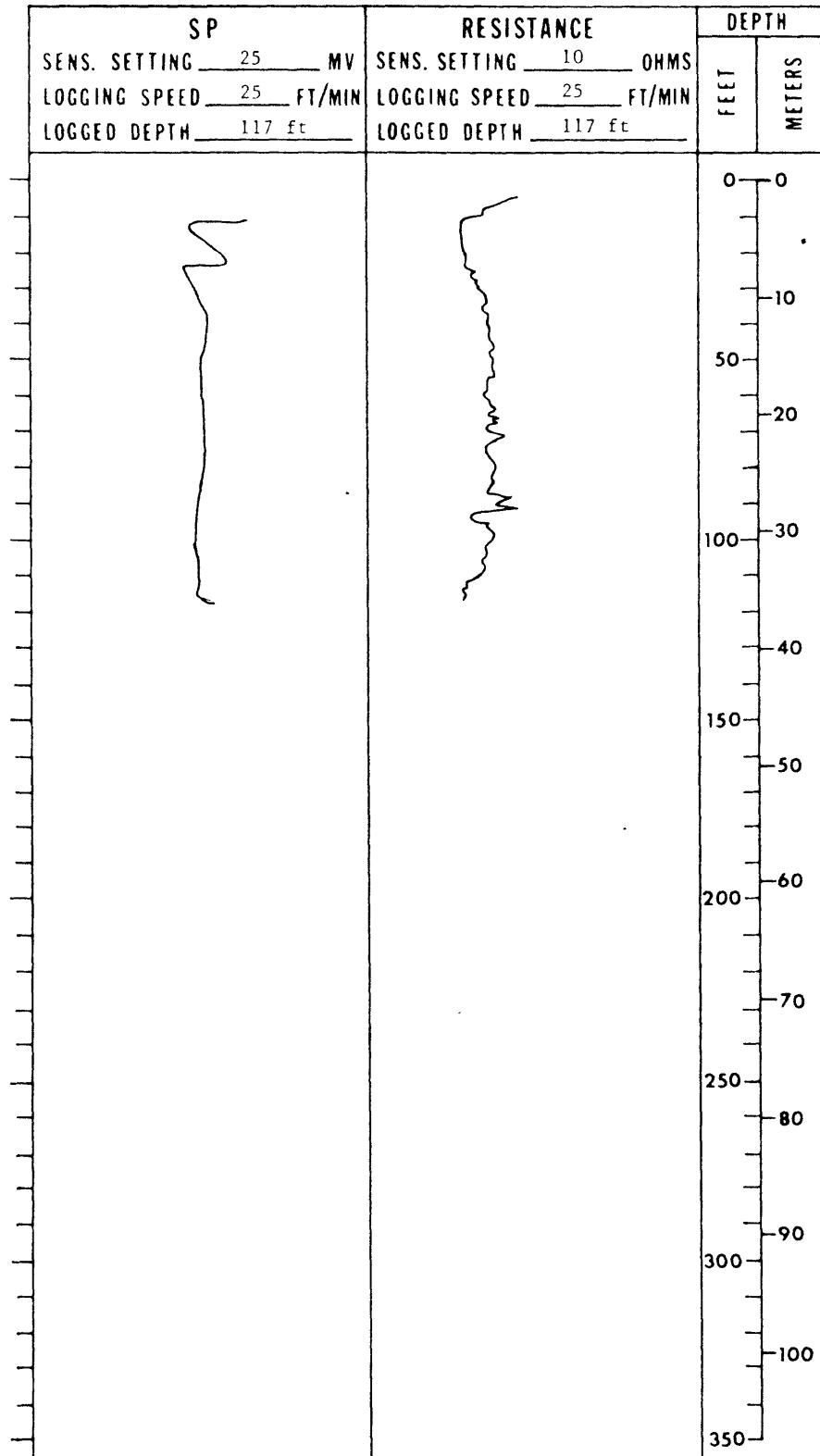
<b>AREA</b> Williams County		<b>QUAD NAME</b> McGregor	
<b>DATE STARTED</b> 10/2/78	<b>DATE COMP.</b> 10/3/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC. 1</b> T.158 N., R. 95 W., <b>FOOTAGE LOC.</b> 30		<b>PMX FSL</b> 500	<b>XPX FWL</b>
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>FOOTAGE</b>	<b>GROUND ELEV</b> 2367 ft
		<b>ROTARY</b> 160	<b>CORING</b> -----
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>TOTAL DEPTH</b> 160 ft
<b>LITHOLOGY RECORDED BY</b> Wincentzen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud, hit shallow natural gas pocket			
Contract No. 14-08-0001-17427			



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 36  
SHEET 2 OF 2

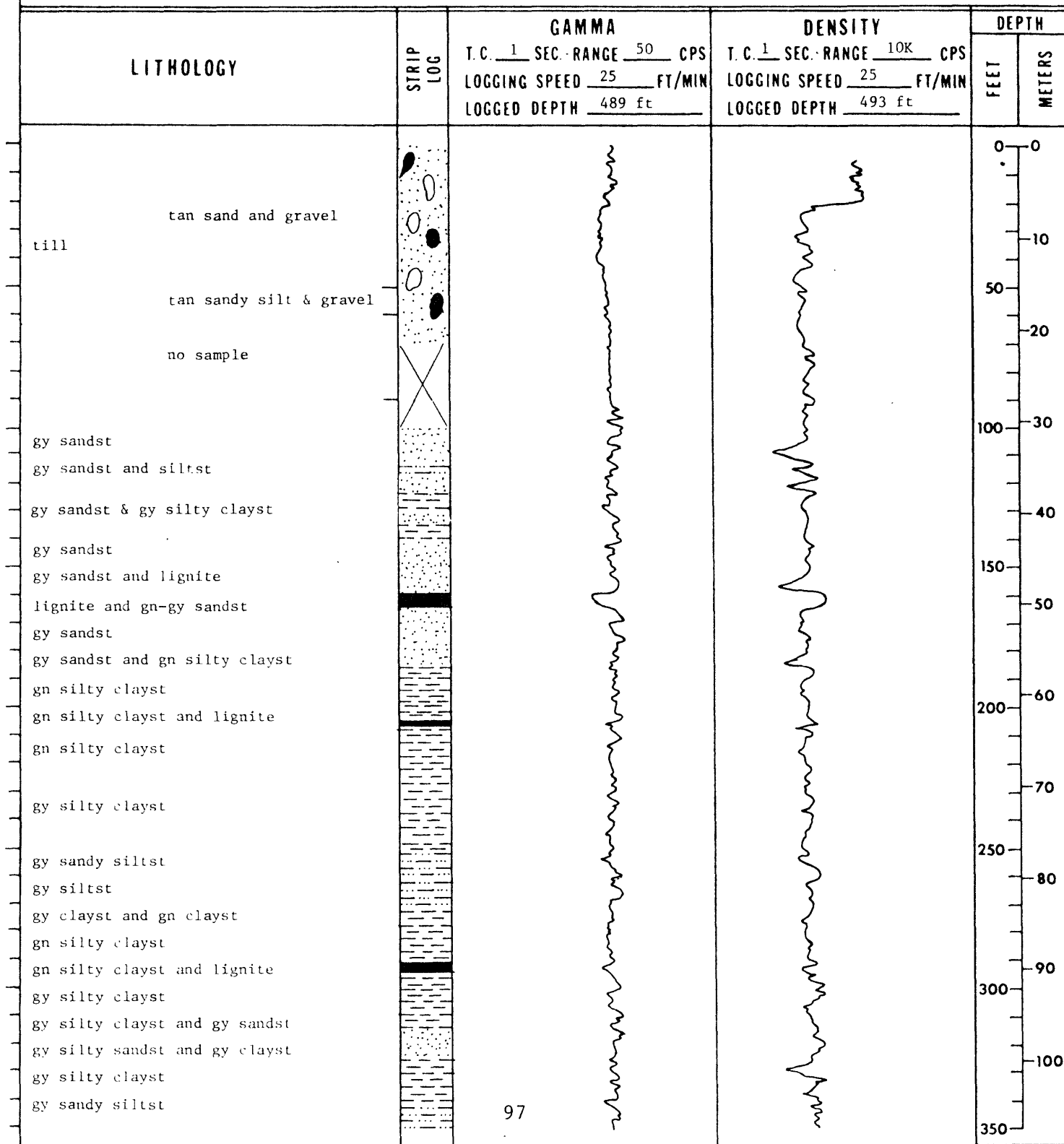
REMARKS:



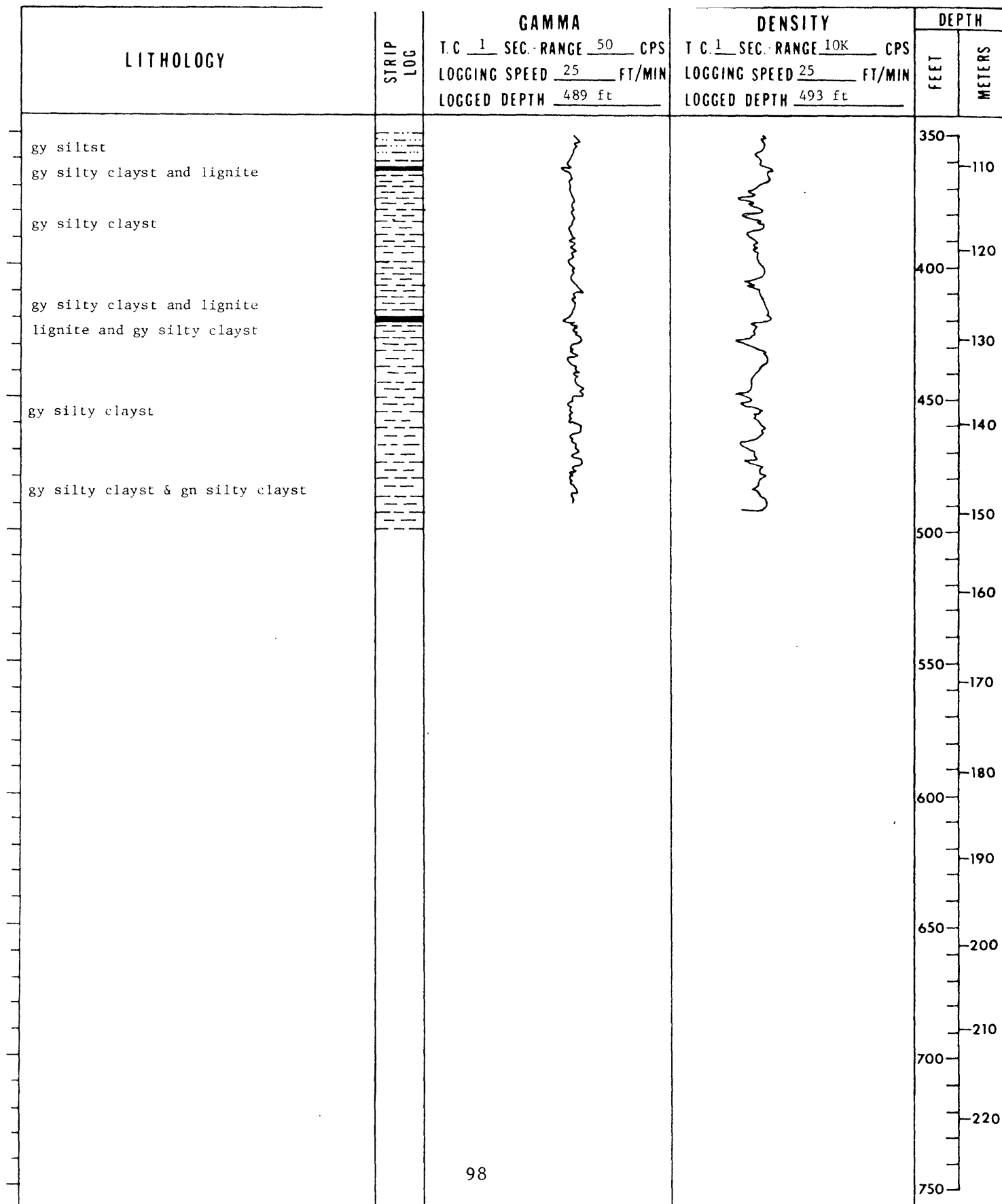
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 37  
SHEET 1 OF 4

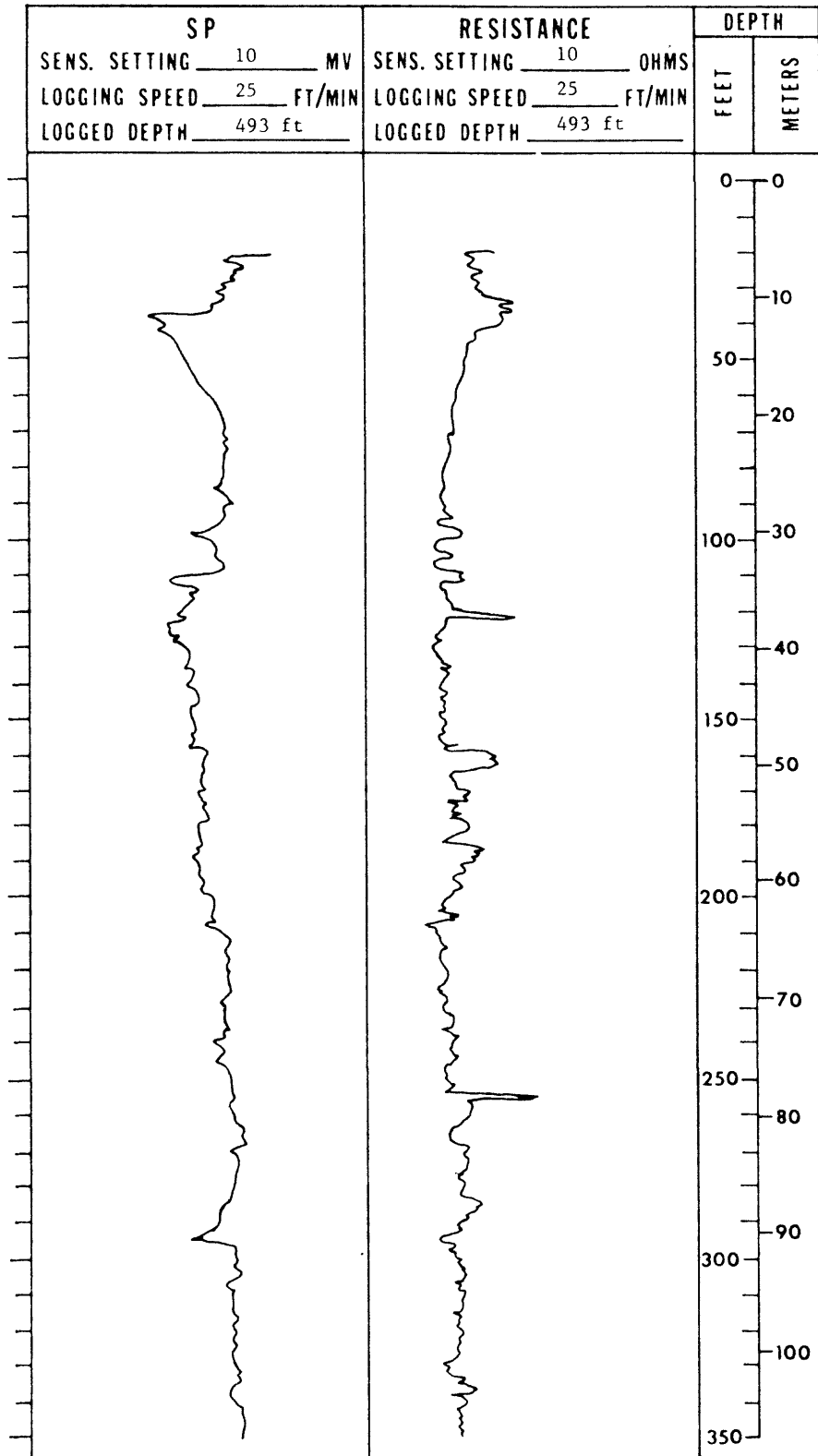
<b>AREA</b> Williams County		<b>QUAD NAME</b> White Earth 2 NW	
<b>DATE STARTED</b> 10/14/78	<b>DATE COMP.</b> 10/16/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 20 T.158 N., R. 95 W., <b>FOOTAGE LOC.</b> 25		<del>500</del> FSL 1050	<del>FEL</del> PWE
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>FOOTAGE</b> ROTARY 500 CORING -----	<b>GROUND ELEV</b> 2411 ft
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 21 ft
<b>LITHOLOGY RECORDED BY</b> Wincentzen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud			
Contract No. 14-08-0001-17427			



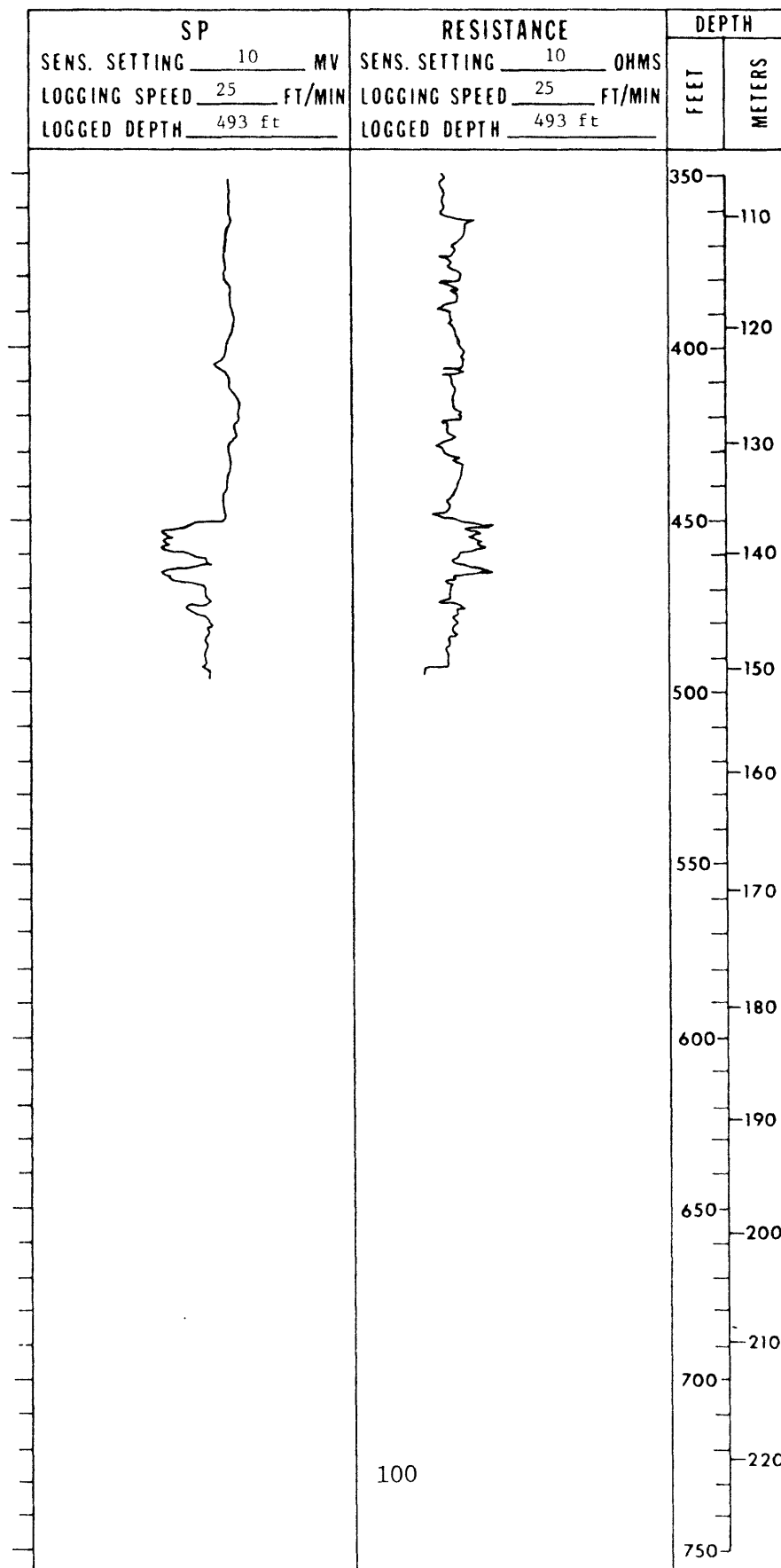
## REMARKS:



REMARKS:



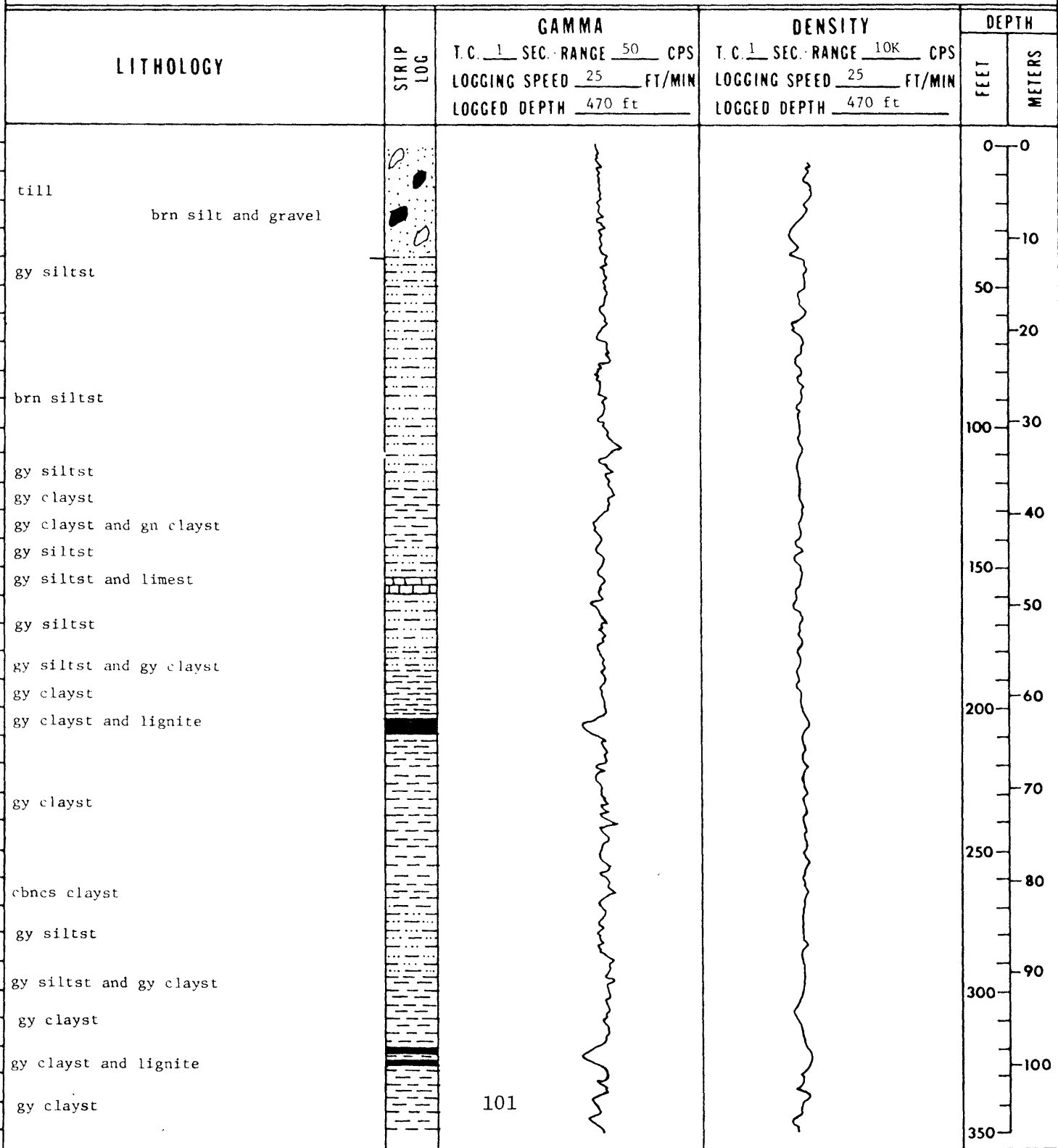
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 33  
SHEET 1 OF 4

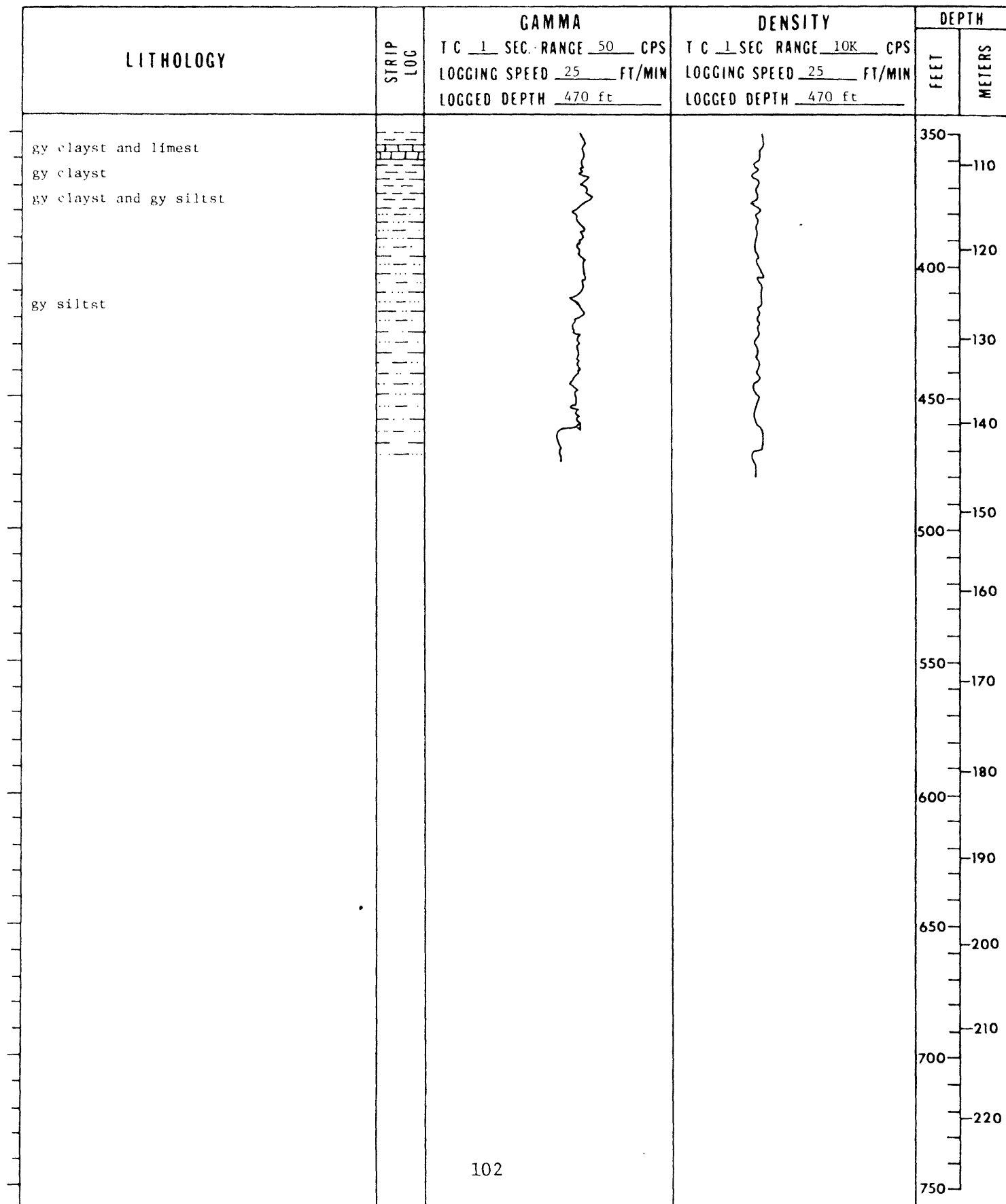
<b>AREA</b> Williams County		<b>QUAD NAME</b> Big Meadow	
<b>DATE STARTED</b> 10/15/78	<b>DATE COMP.</b> 10/18/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 33 <b>T.</b> 159 N., <b>R.</b> 96 W., <b>FOOTAGE LOC.</b> 5		<b>ENL</b> 315	<b>FEL</b> 2323 ft
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>FOOTAGE</b> 470	<b>TOTAL DEPTH</b> 470 ft
<b>DRILLING AGENCY:</b> Thompson		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 3 ft
<b>LITHOLOGY RECORDED BY</b> Owen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud			
Contract No. 14-08-0001-17427			



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 38  
SHEET 2 OF 4

REMARKS:

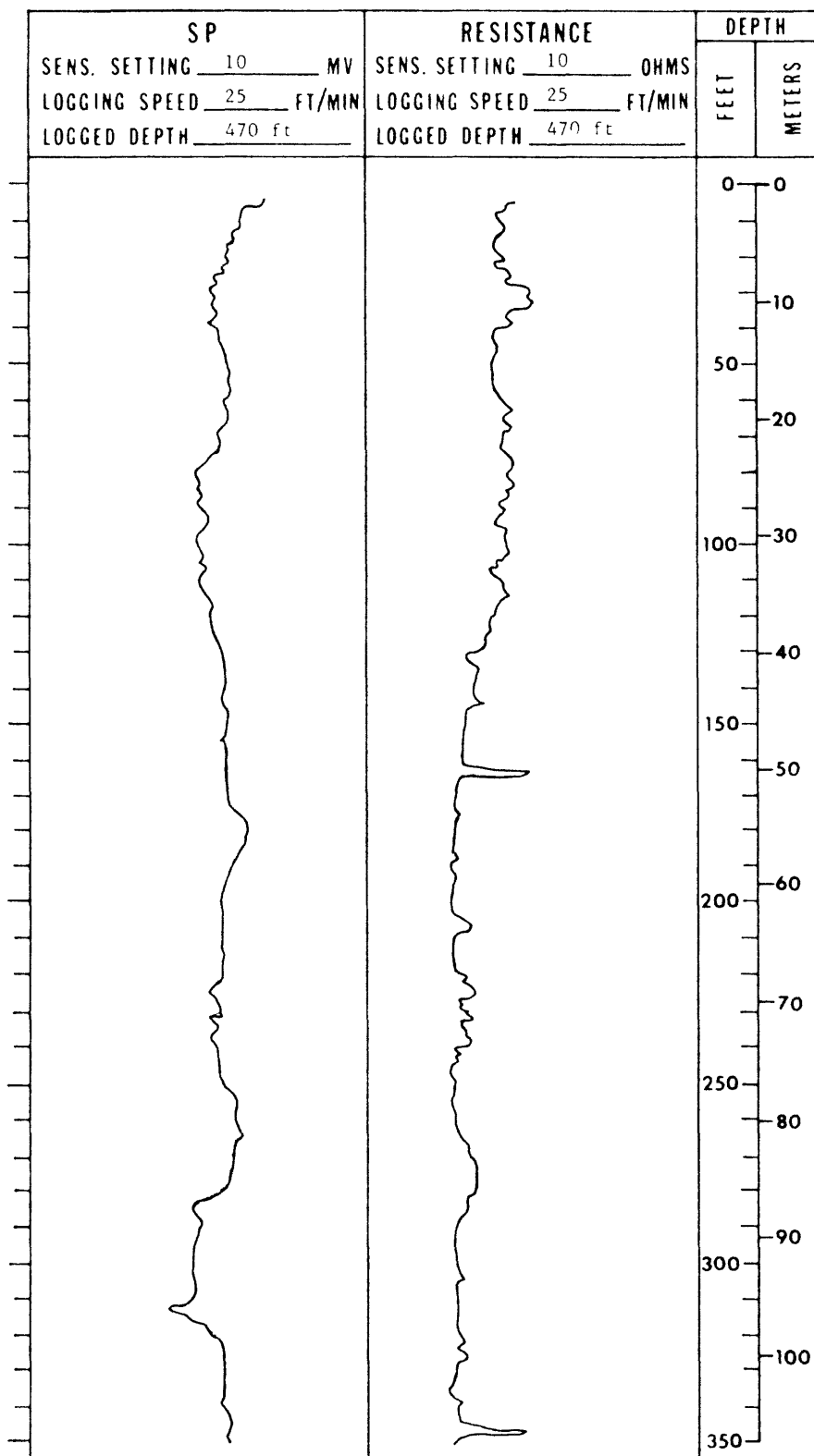




# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 38  
SHEET 3 OF 4

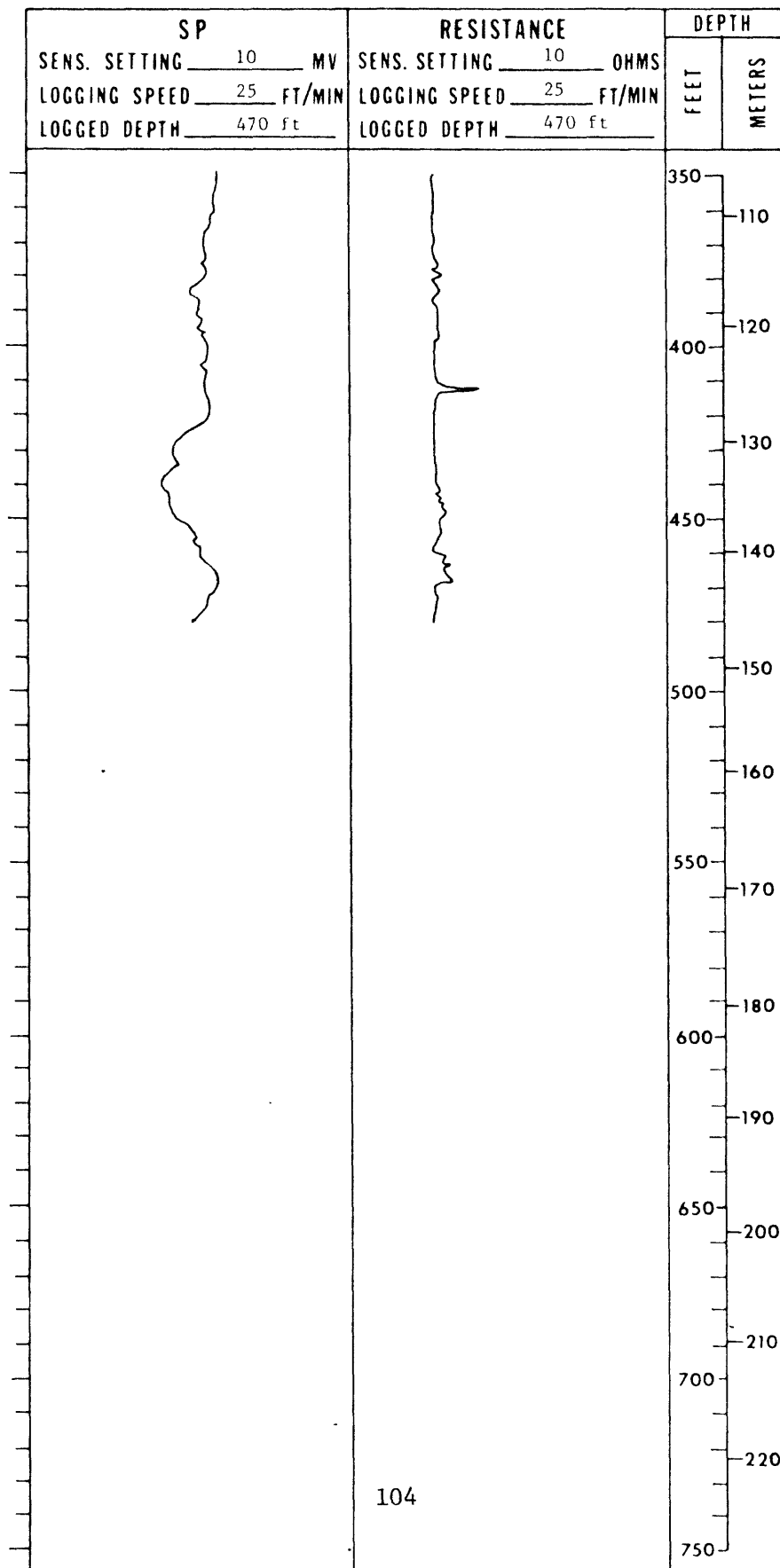
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 38  
SHEET 4 OF 4

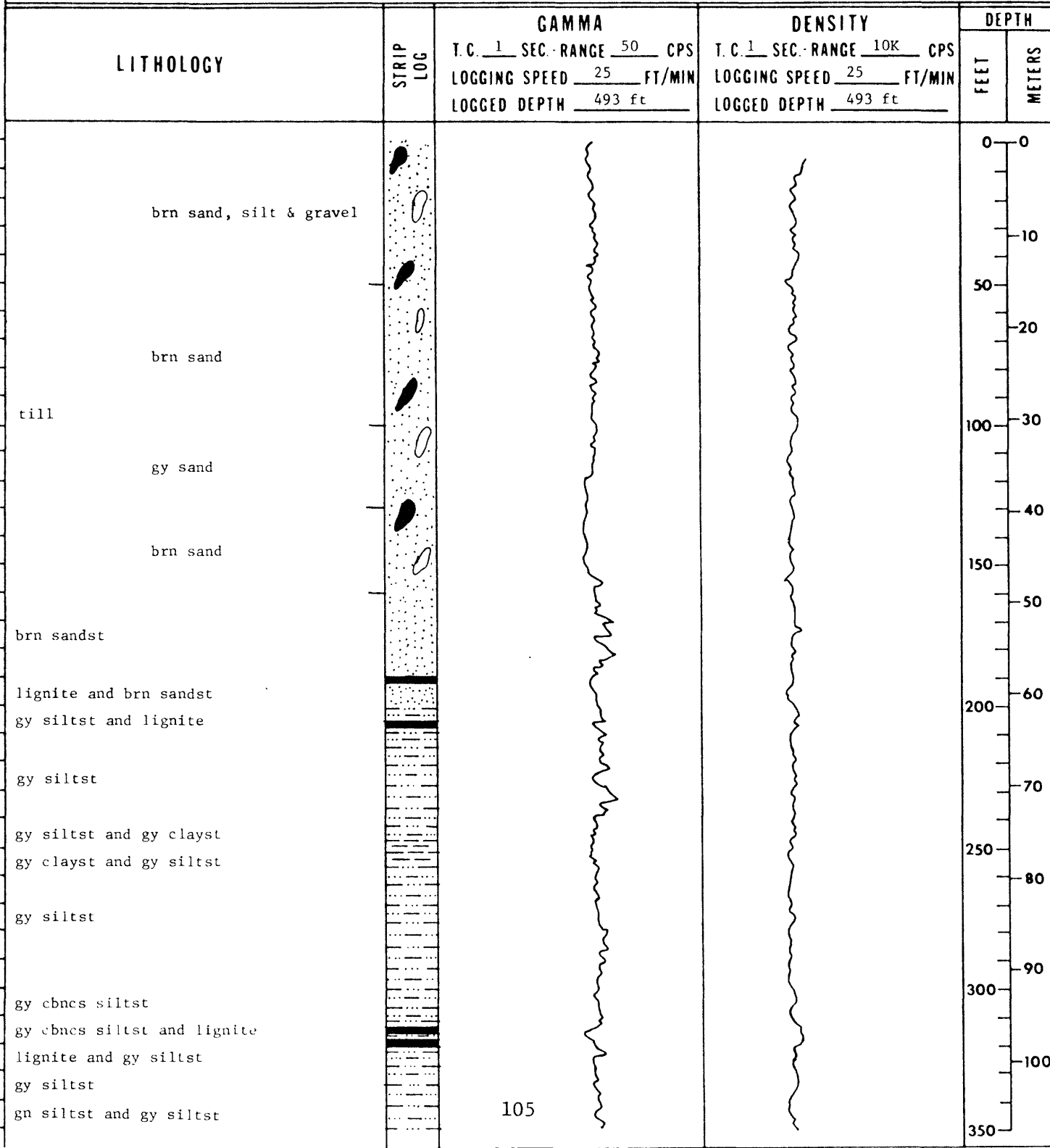
REMARKS:



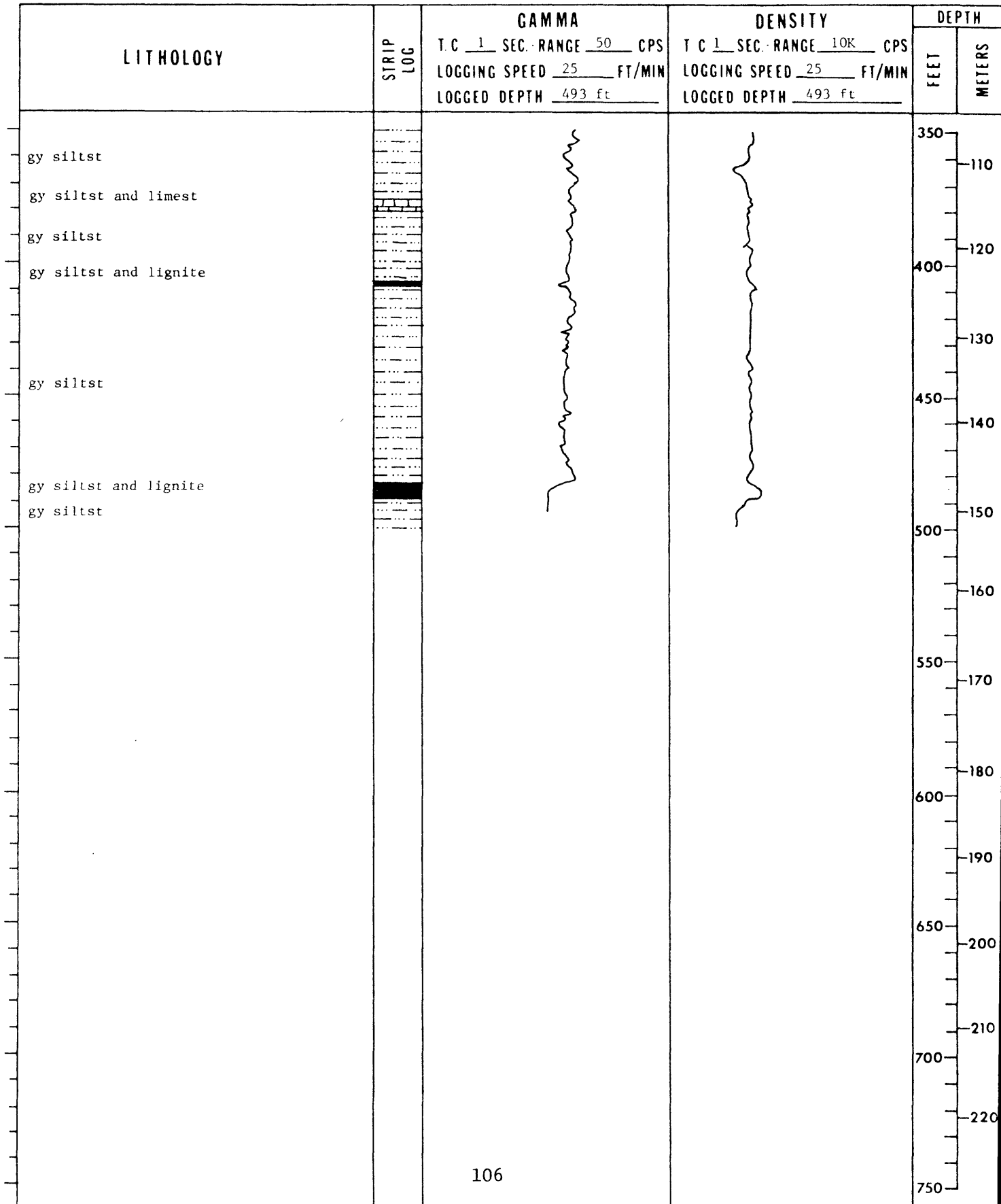
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 40  
SHEET 1 OF 4

<b>AREA</b> Williams County		<b>QUAD NAME</b> Ray 1 NE	
<b>DATE STARTED</b> 10/18/78	<b>DATE COMP.</b> 10/22/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC. 33</b> T.158 N., R.96 W., <b>FOOTAGE LOC. 33</b>		<b>FNL</b> 48 <del>48</del>	<b>GROUND ELEV</b> 2415 ft
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>FOOTAGE</b> ROTARY 500 CORING -----	<b>TOTAL DEPTH</b> 500 ft
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 2 ft
<b>LITHOLOGY RECORDED BY</b> Owen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud Contract No. 14-08-0001-17427			



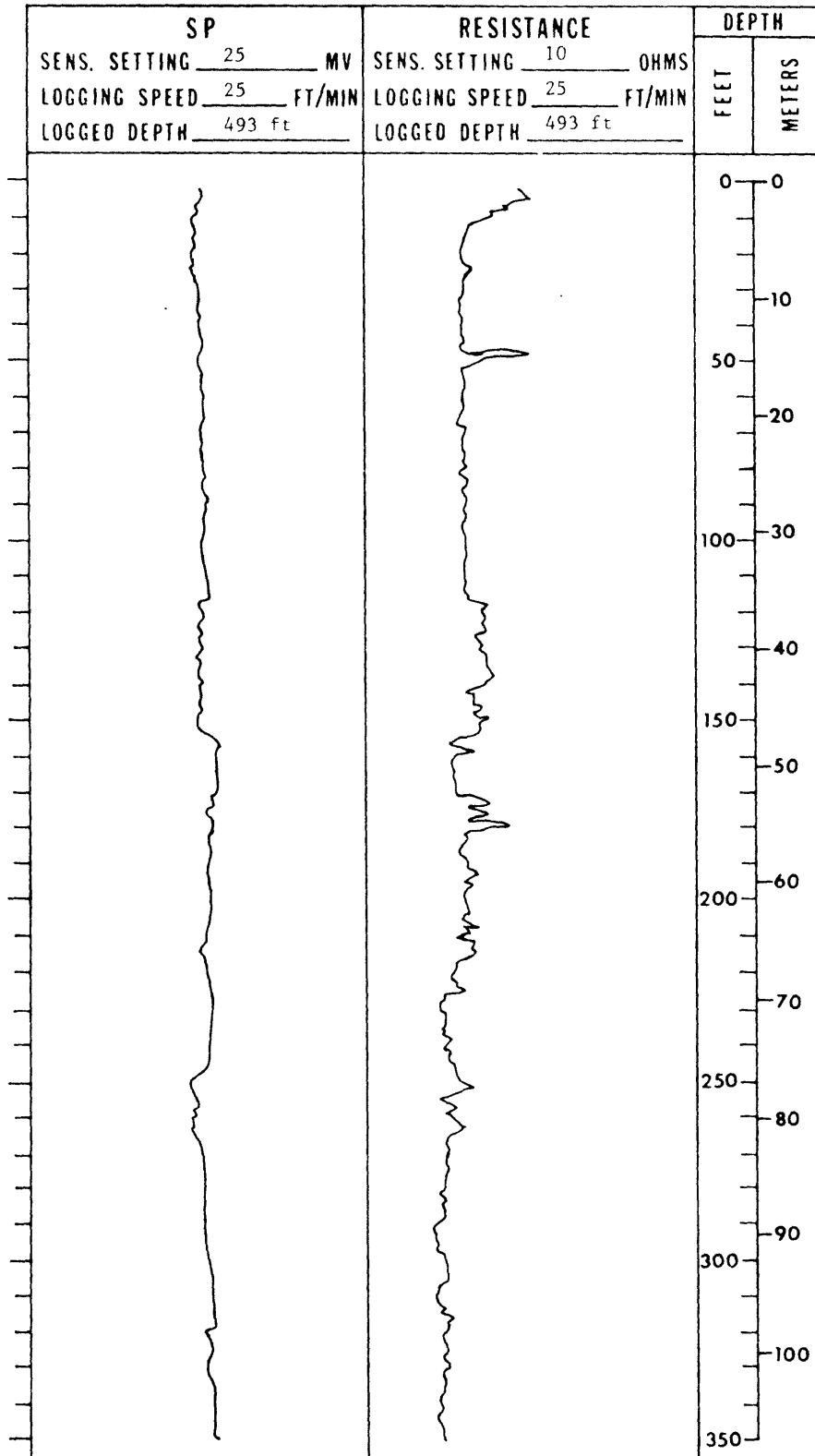
REMARKS:



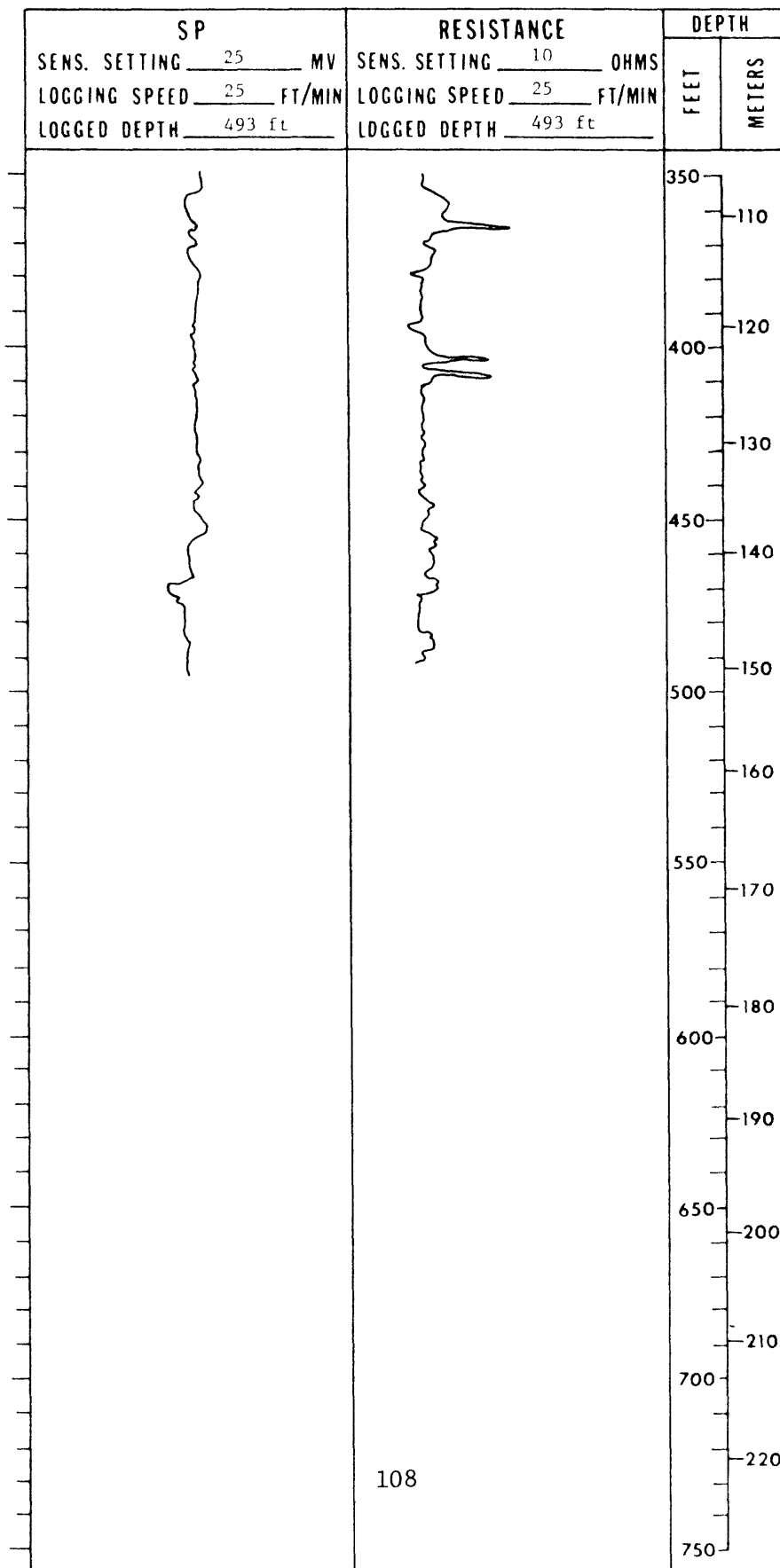
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 40  
SHEET 3 OF 4

REMARKS:



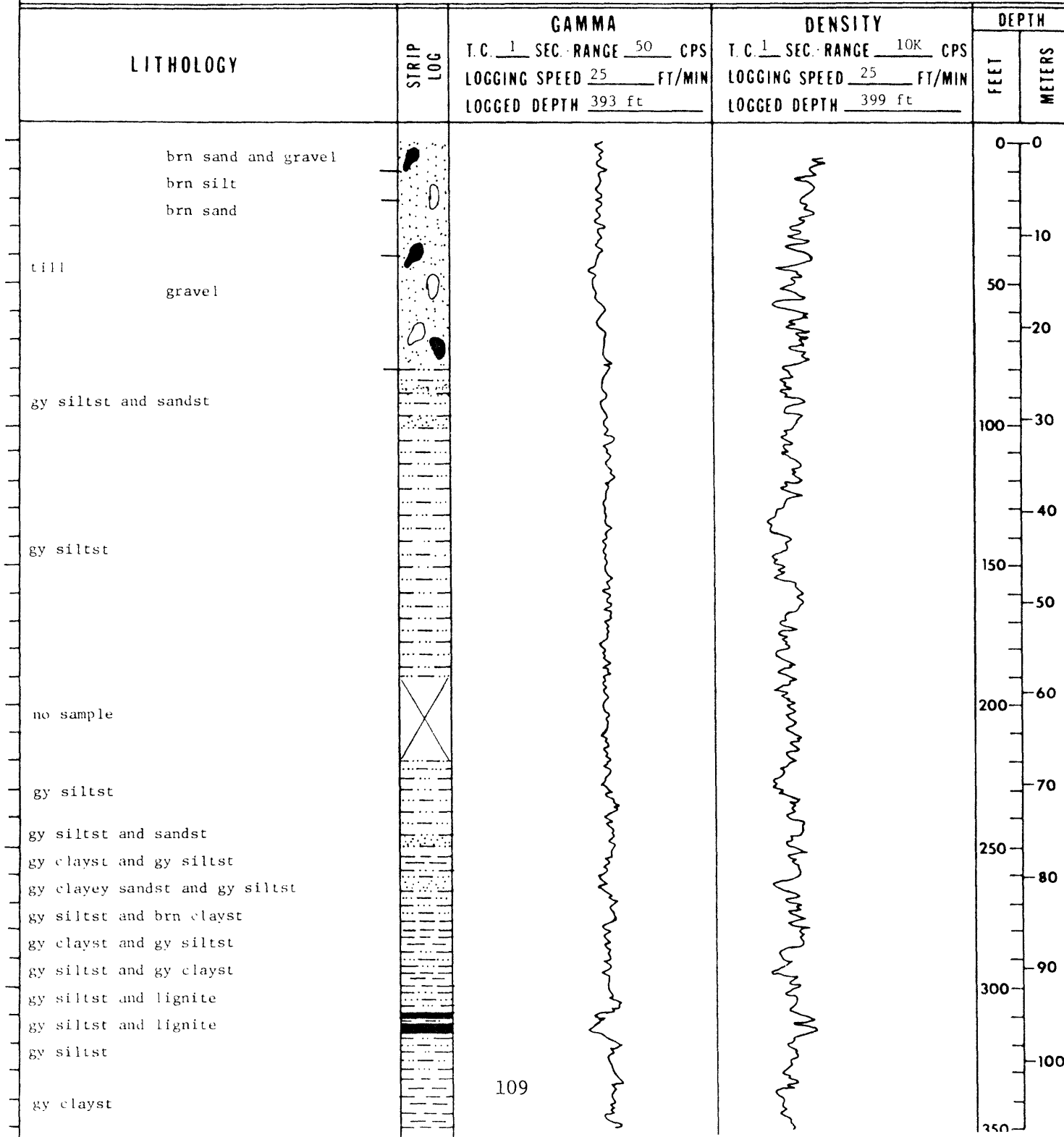
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 58  
SHEET 1 OF 4

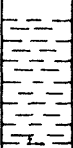




<b>AREA</b> Williams County		<b>QUAD NAME</b> McGregor	
<b>DATE STARTED</b> 10/5/78	<b>DATE COMP.</b> 10/6/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 9 T.159 N., R.95 W., <b>FOOTAGE LOC.</b> 36		<b>FNL</b> 125 P39L	<b>GROUND ELEV</b> 2277 ft
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>FOOTAGE</b> ROTARY 400 CORING -----	<b>TOTAL DEPTH</b> 400 ft
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 5 ft
<b>LITHOLOGY RECORDED BY</b> Owen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud			
Contract No. 14-08-0001-17427			



# UNITED STATES GEOLOGICAL SURVEY

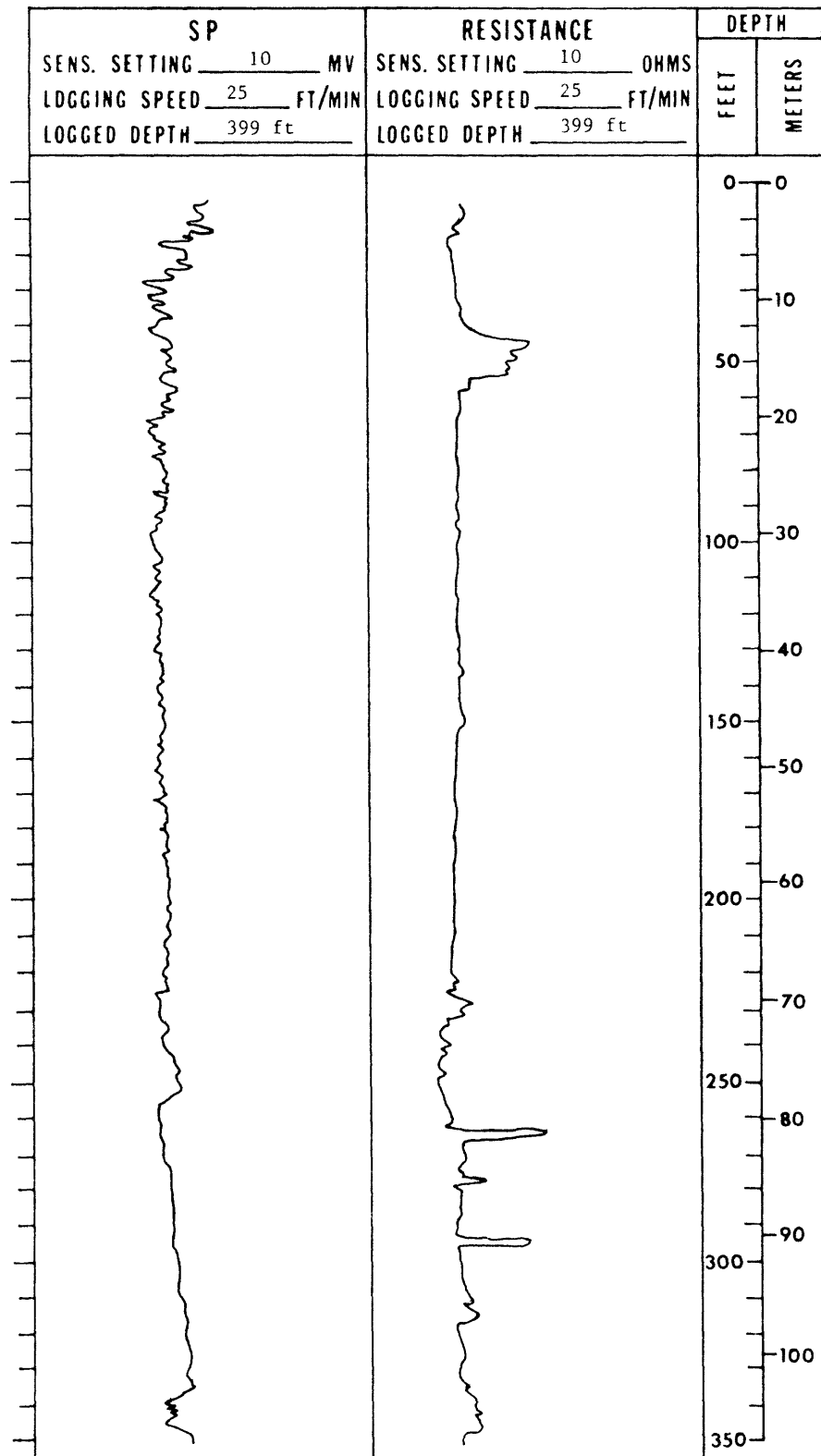
HOLE NO W 58  
SHEET 2 OF 4

REMARKS:

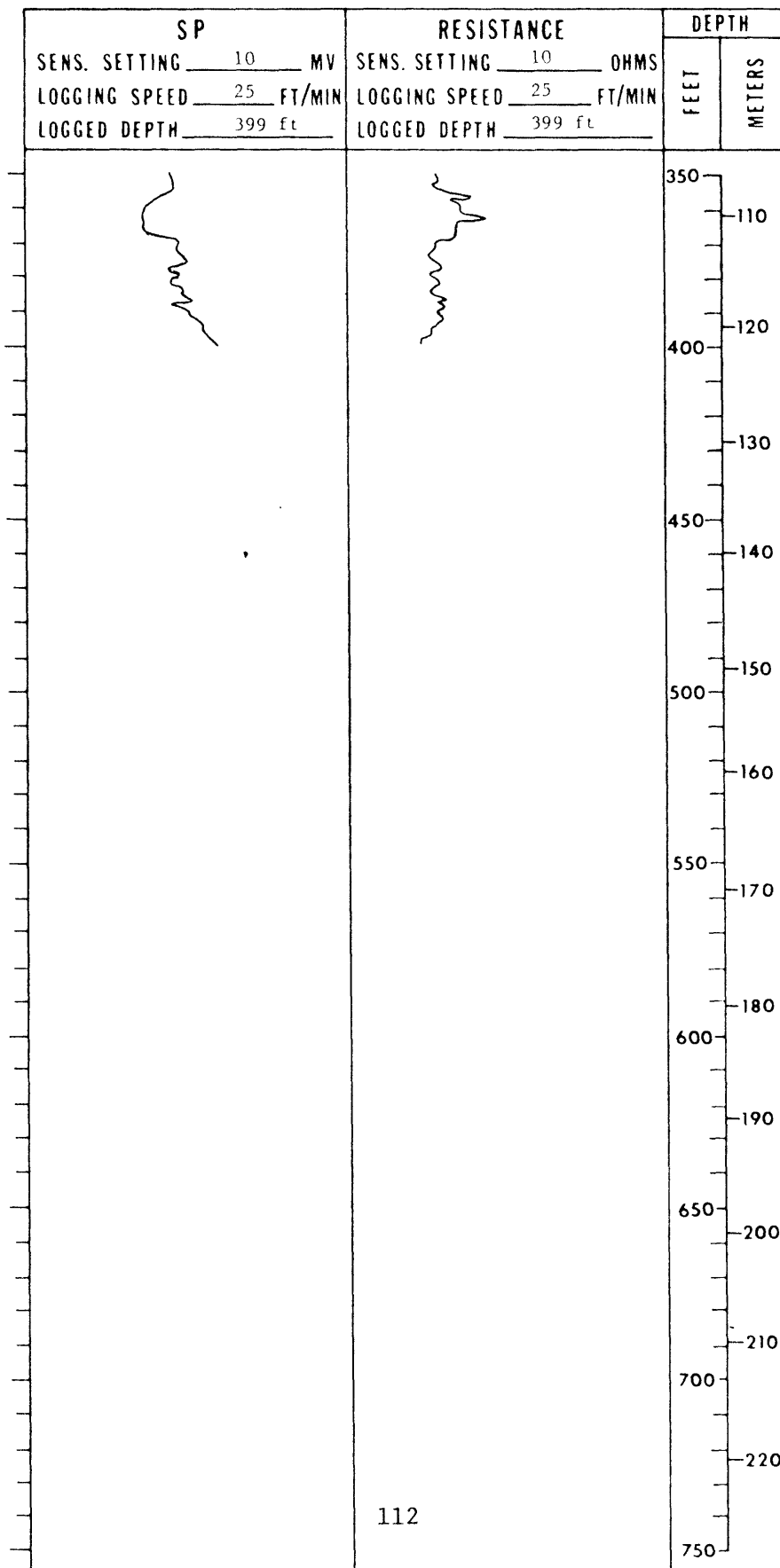
LITHOLOGY	STRIP LOG	GAMMA	DENSITY	DEPTH	
		T.C. <u>1</u> SEC. RANGE <u>50</u> CPS LOGGING SPEED <u>25</u> FT/MIN LOGGED DEPTH <u>393</u> ft	T.C. <u>1</u> SEC. RANGE <u>10K</u> CPS LOGGING SPEED <u>25</u> FT/MIN LOGGED DEPTH <u>399</u> ft	FEET	METERS
gy clayst				350	
gy clayst and lignite				110	
gy clayst				120	
				400	
				130	
				450	
				140	
				500	
				150	
				160	
				550	
				170	
				180	
				600	
				190	
				650	
				200	
				210	
				700	
				220	
				750	
		110			



REMARKS:



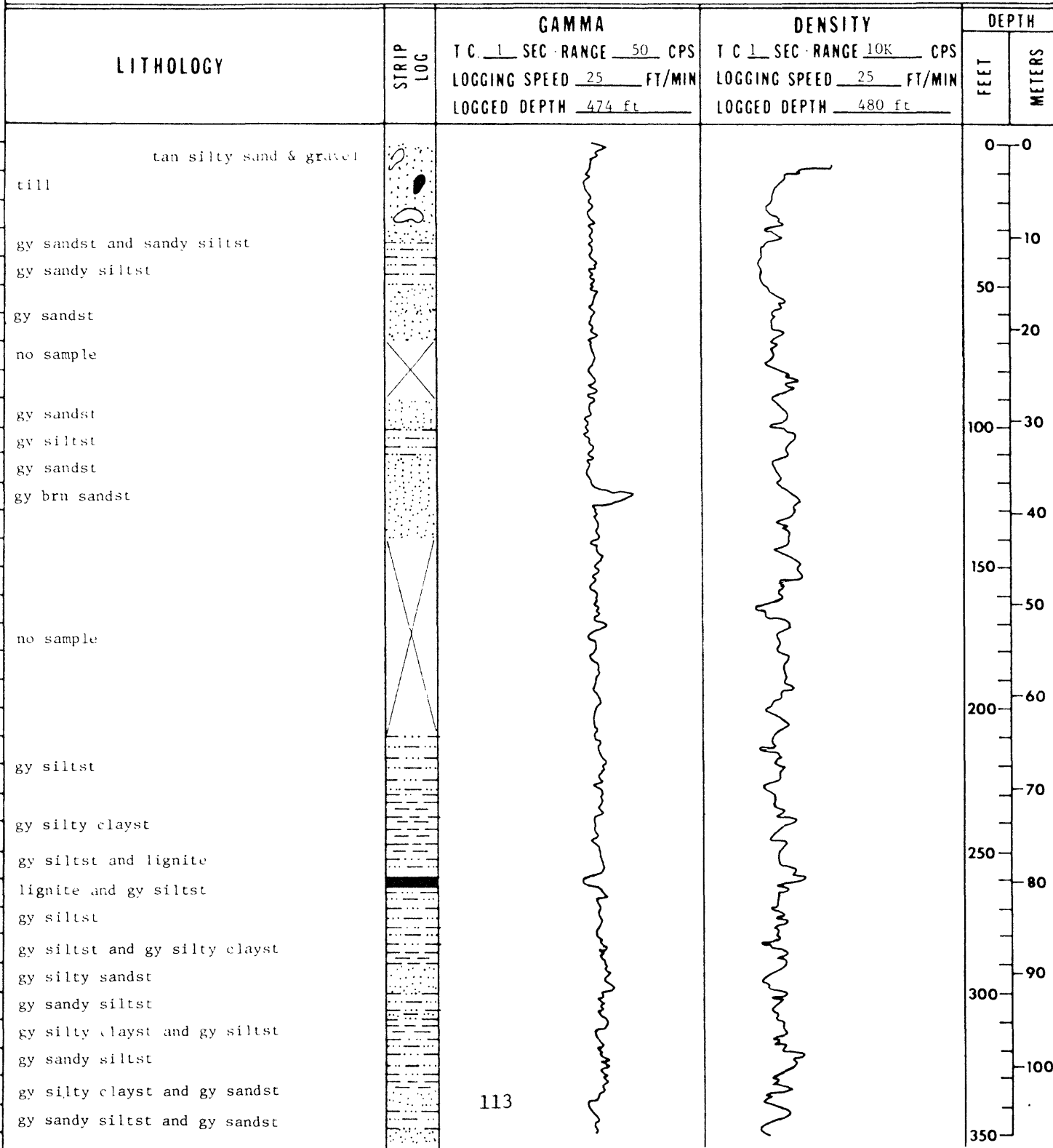
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 59  
SHEET 1 OF 4

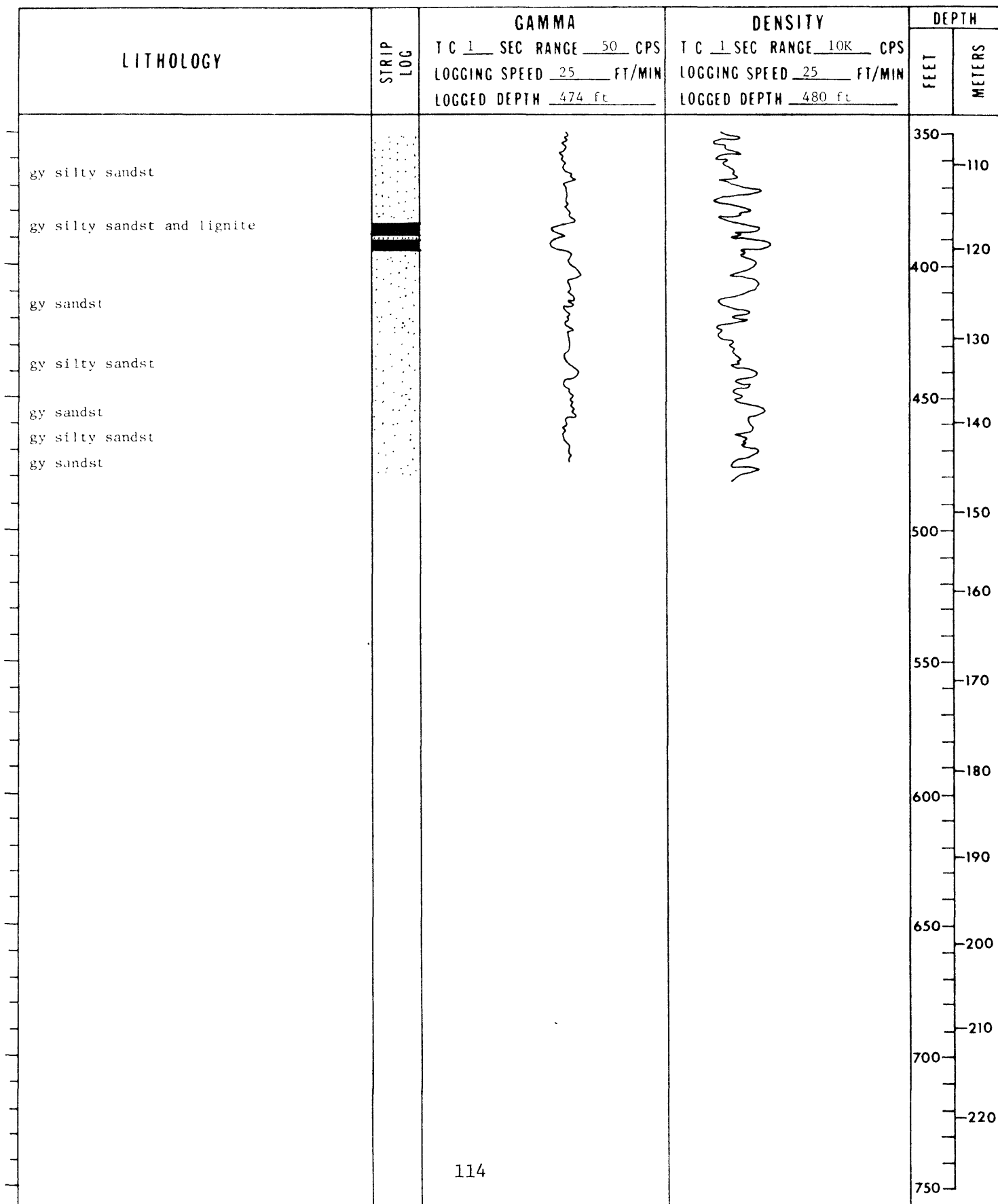
<b>AREA</b> Williams County		<b>QUAD NAME</b> McGregor	
<b>DATE STARTED</b> 10/6/78	<b>DATE COMP.</b> 10/8/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 19 <b>T.</b> 159 N. <b>R.</b> 95 W. <b>FOOTAGE LOC.</b> 30		<b>FWL FSL</b> 700	<b>FEL PWL</b> 2365 ft
<b>SIZE AND BIT TYPE:</b> 4 1/2 in. drag		<b>FOOTAGE</b> ROTARY 490 CORING -----	<b>TOTAL DEPTH</b> 480 ft
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 4 ft
<b>LITHOLOGY RECORDED BY</b> Wincentzen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud Contract No. 14-08-0001-17427			



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 59  
SHEET 2 OF 4

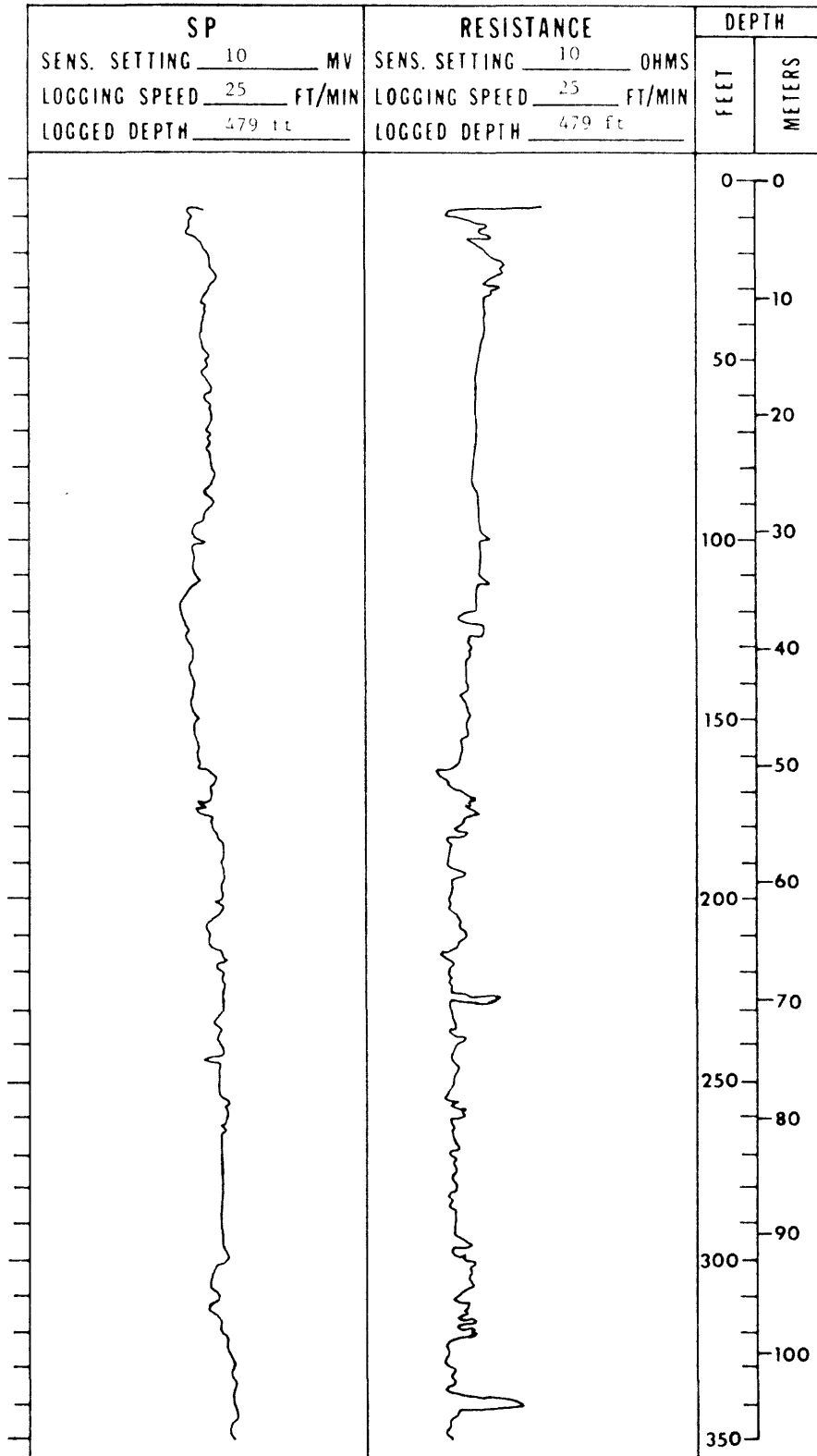
REMARKS:



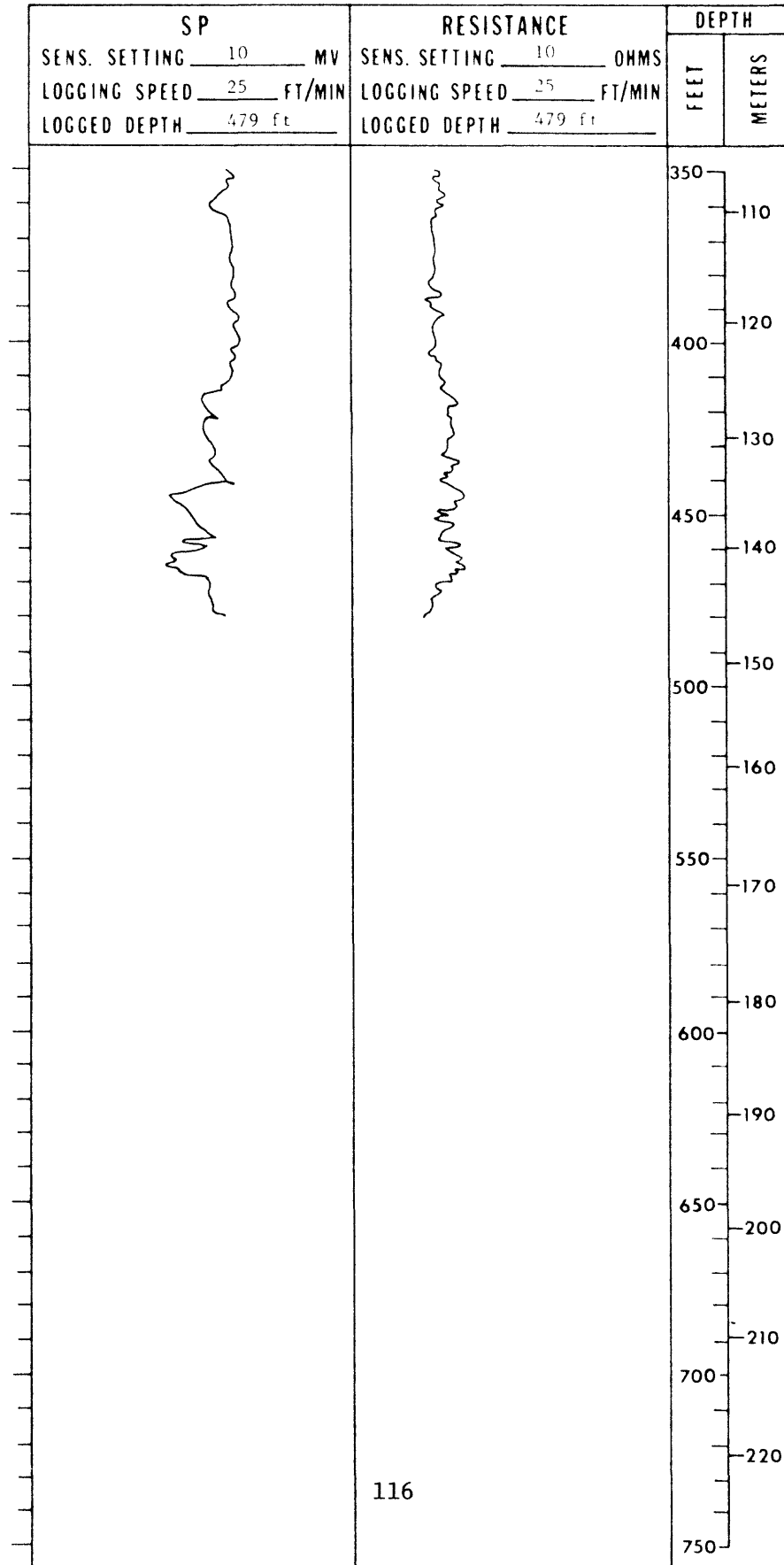
# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 59  
SHEET 3 OF 4

REMARKS:



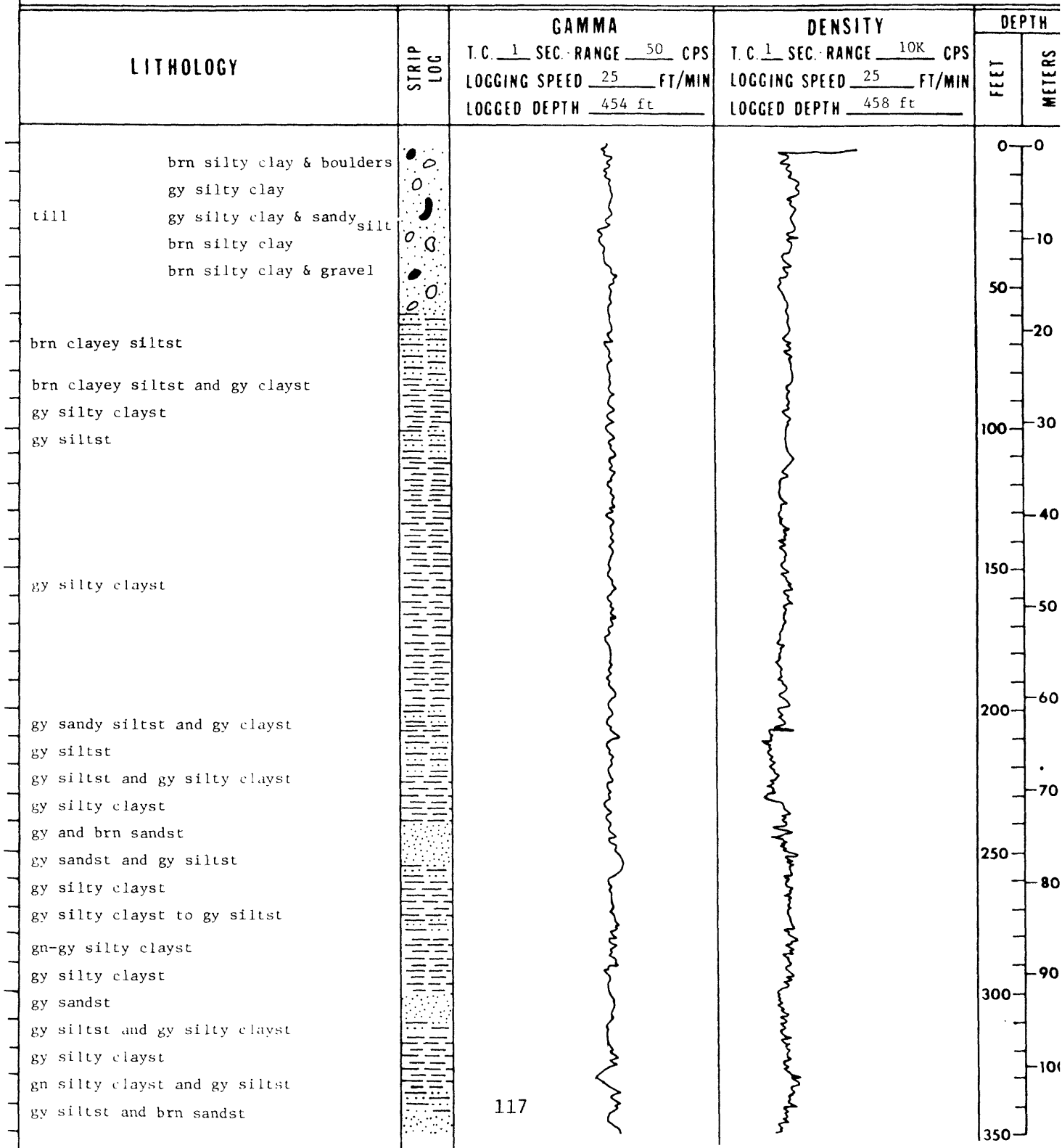
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 60  
SHEET 1 OF 4

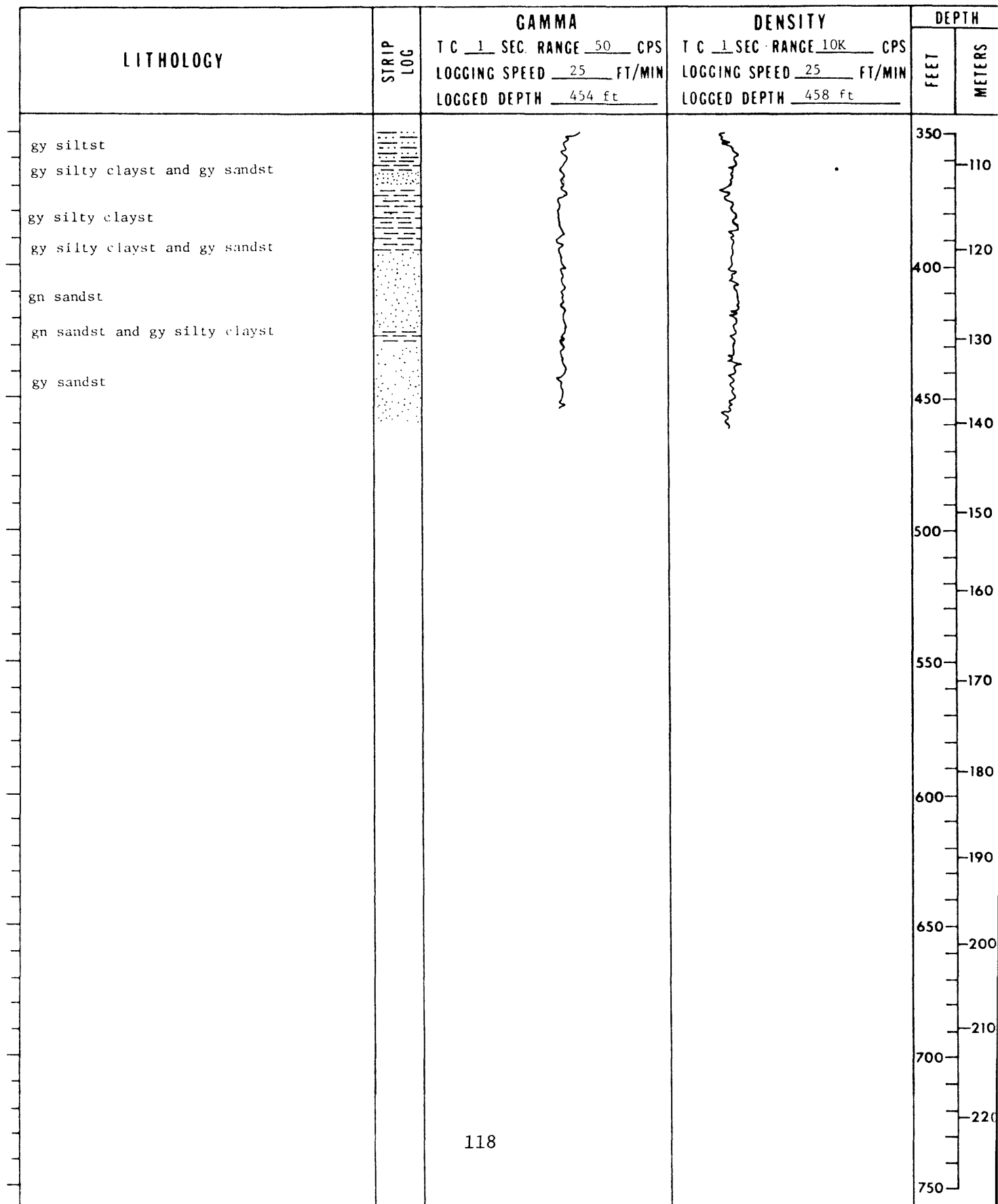
<b>AREA</b> Williams County		<b>QUAD NAME</b> McGregor	
<b>DATE STARTED</b> 9/29/78	<b>DATE COMP.</b> 10/1/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC. 24 T. 159 N., R. 95 W., FOOTAGE LOC. 1320</b>		<b>FNL</b> 30 <del>30</del>	<b>FEL</b> <del>PWD</del>
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>FOOTAGE</b>	<b>GROUND ELEV</b> 2260 ft
		<b>ROTARY</b> 460	<b>CORING</b> -----
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>TOTAL DEPTH</b> 460 ft
<b>LITHOLOGY RECORDED BY</b> Wincentzen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud			
Contract No. 14-08-0001-17427			



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 60  
SHEET 2 OF 4

REMARKS:

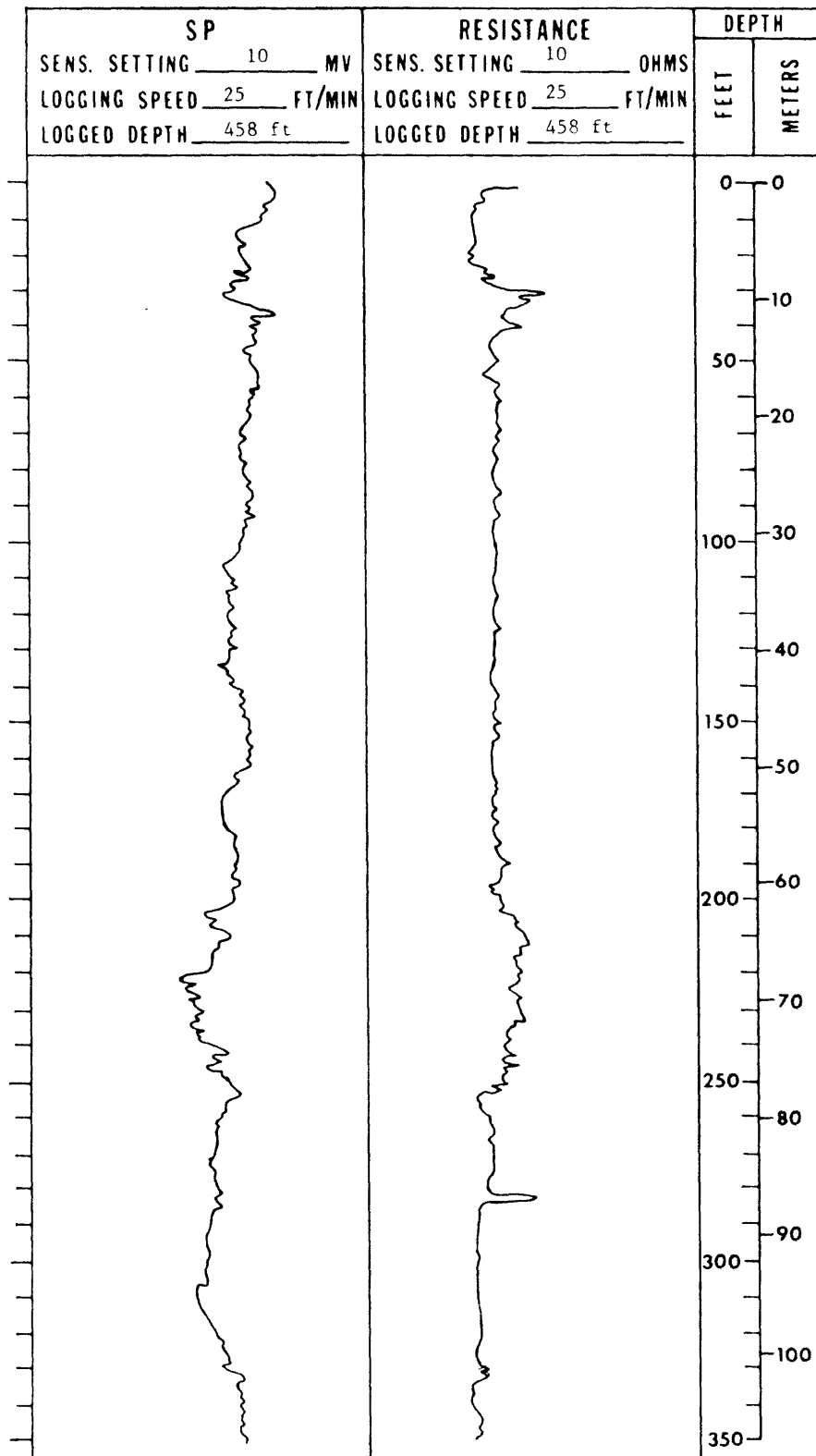




# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 60  
SHEET 3 OF 4

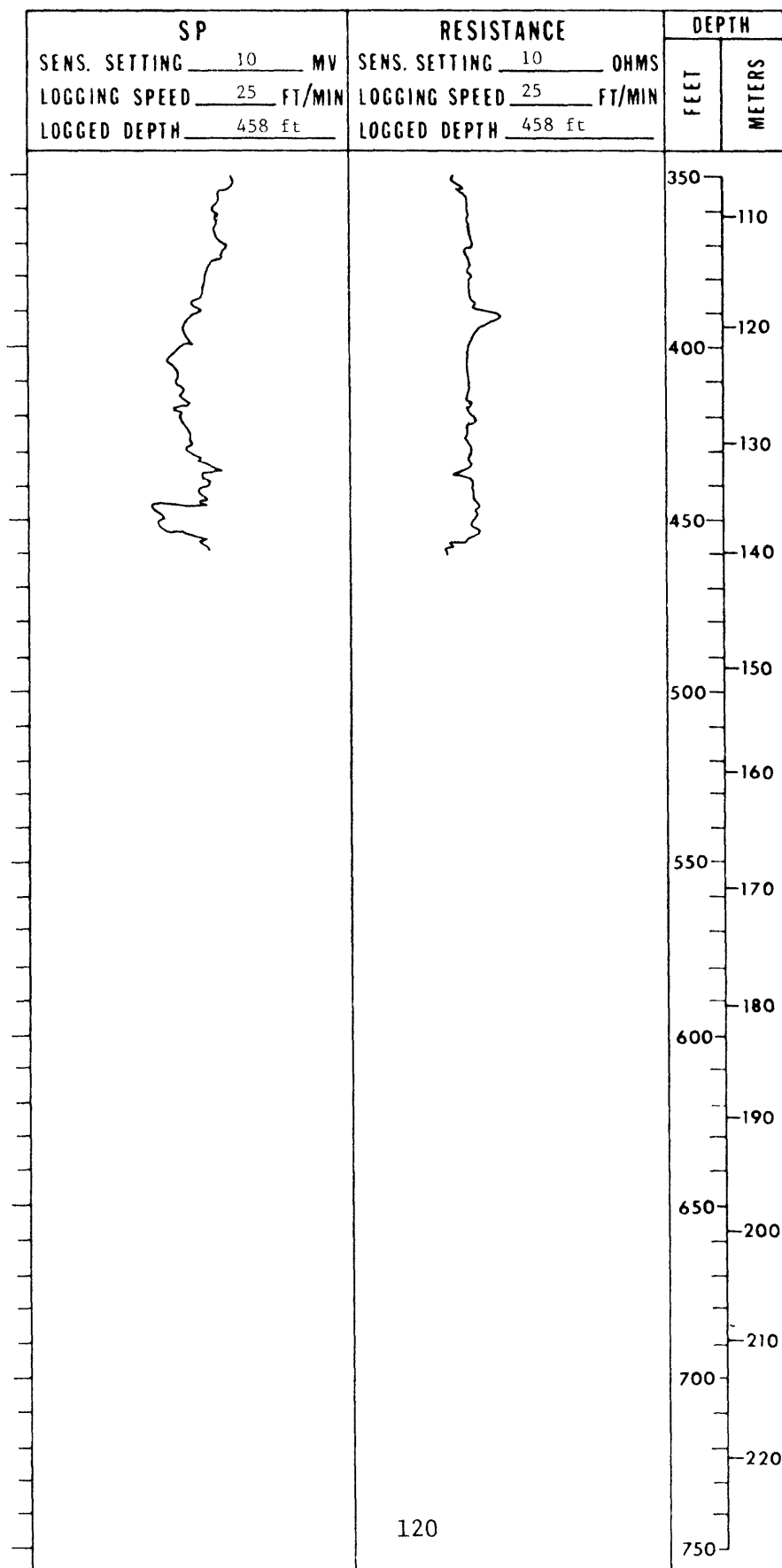
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 60  
SHEET 4 OF 4

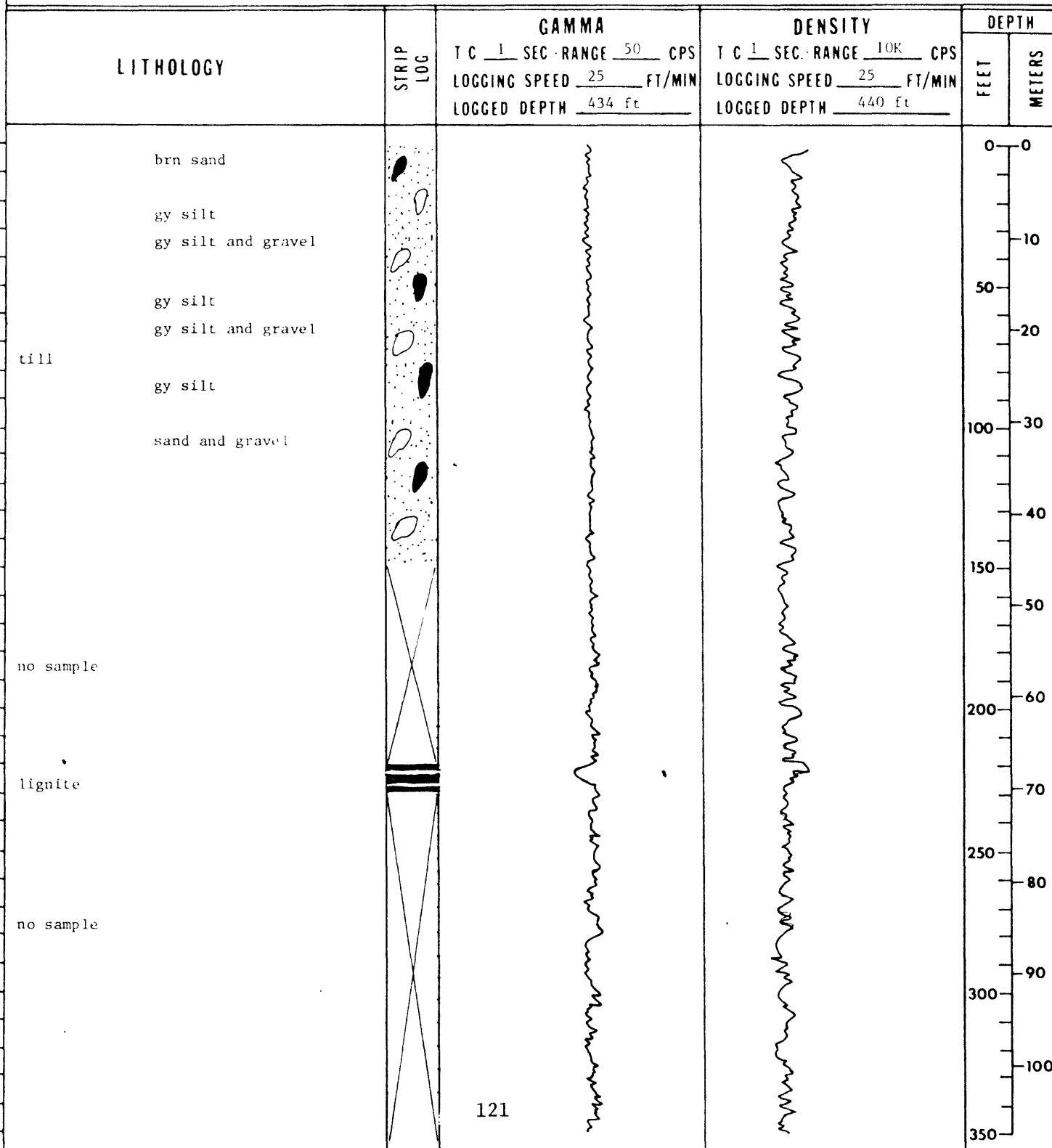
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 62  
SHEET 1 OF 4

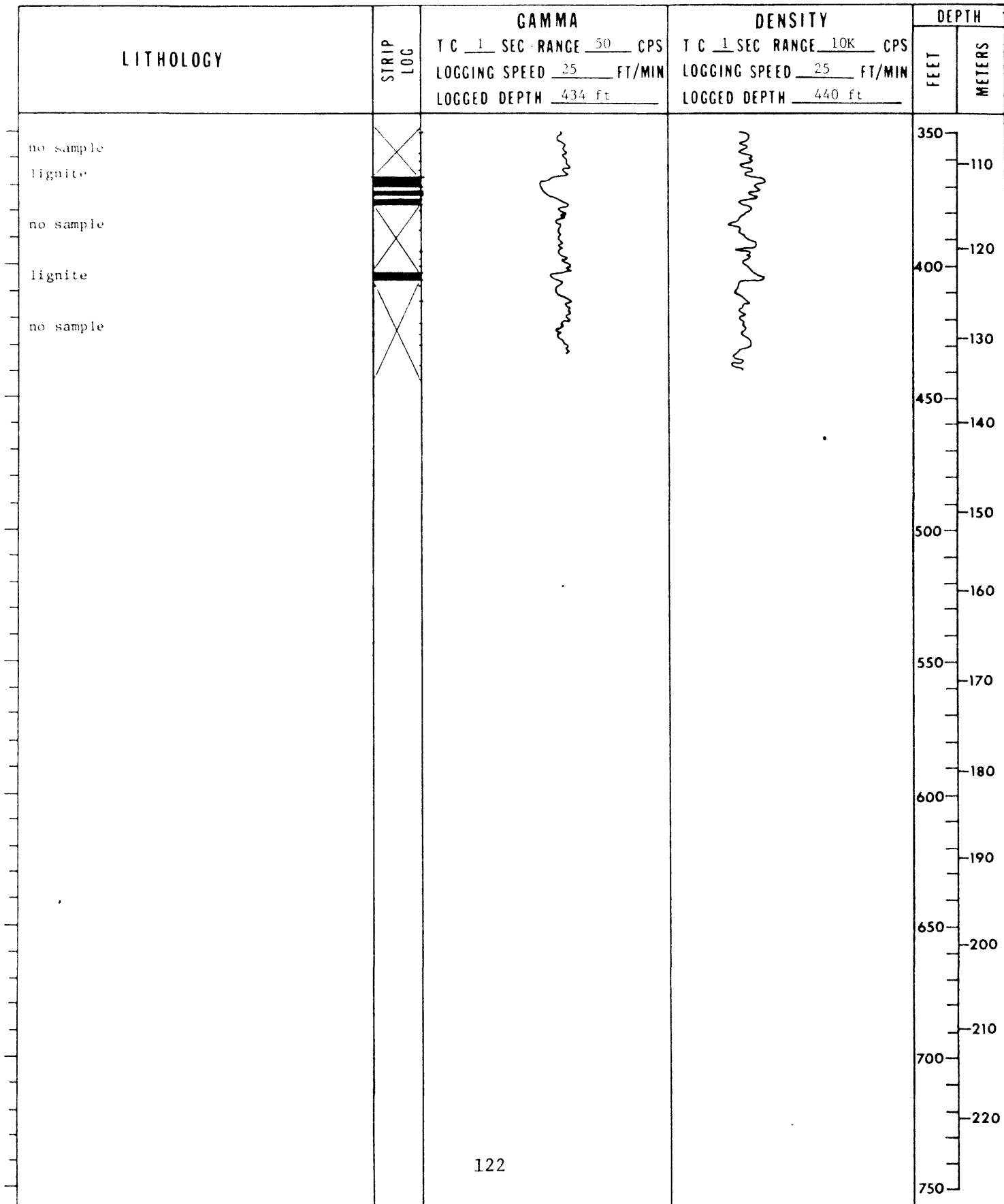
<b>AREA</b> Williams County		<b>QUAD NAME</b> Big Meadow	
<b>DATE STARTED</b> 10/8/78	<b>DATE COMP.</b> 10/14/78	<b>COUNTY</b> Williams	<b>STATE</b> North Dakota
<b>LOCATION: SEC.</b> 10 T.159 N., R.96 W., <b>FOOTAGE LOC.</b> 325		<b>FOOTAGE</b> 45 <small>FSL</small>	<b>GROUND ELEV</b> 2315 ft
<b>SIZE AND BIT TYPE:</b> 4½ in. drag		<b>ROTARY</b> 440	<b>TOTAL DEPTH</b> 440 ft
<b>DRILLING AGENCY:</b> Thompson Drilling		<b>DRILL TYPE:</b> -----	<b>DEPTH TO WATER</b> 4 ft
<b>LITHOLOGY RECORDED BY</b> Owen		<b>GEOPHYSICAL LOGS RECORDED BY</b> Harris	
<b>REMARKS:</b> Drilled with mud Contract No. 14-08-0001-17427			



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 62  
SHEET 2 OF 4

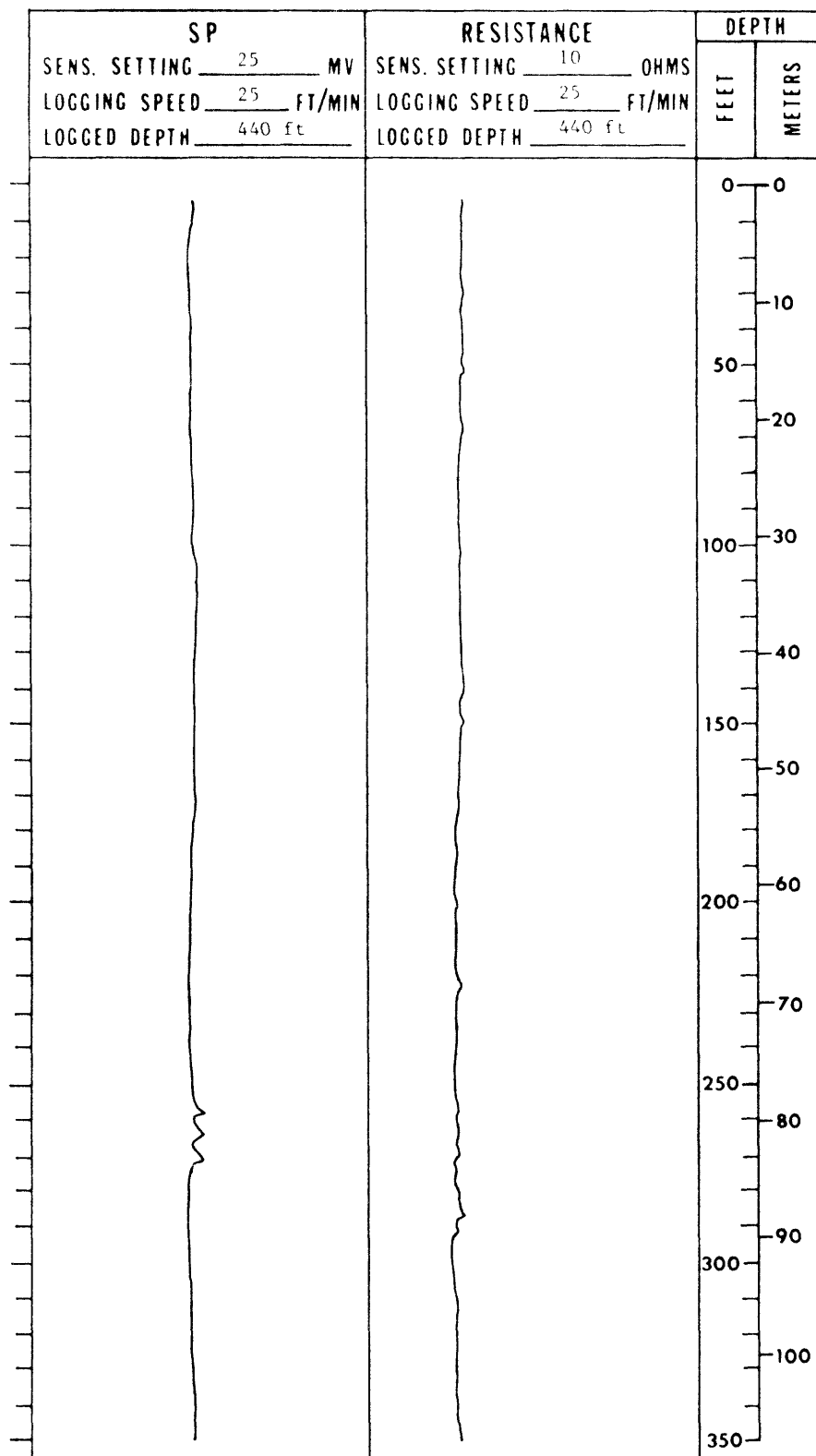
REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 62  
SHEET 3 OF 4

REMARKS:



# UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 62  
SHEET 4 OF 4

REMARKS:

