

COLORADO GEOLOGICAL SURVEY

GEOPHYSICAL AND LITHOLOGICAL LOGS
FROM THE 1980 COAL DRILLING AND
CORING PROGRAM, DENVER EAST $\frac{1}{2}^{\circ}$ x 1° QUADRANGLE

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Open File Report 80-9
1980
USGS Grant #14-08-0001-G-577

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ILLUSTRATIONS

Plate 1 DENVER EAST $\frac{1}{2}^{\circ}$ x 1° QUADRANGLE-----	Attached
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INTRODUCTION

The Colorado Geological Survey, under United States Geological Survey grant #14-08-0001-G-577, continued its exploratory coal drilling program in the Denver East $\frac{1}{2}^0 \times 1^0$ Quadrangle. The program was designed to evaluate the coal resources of the quadrangle especially near the Denver Metropolitan Area. As in the case of the first phase of the drilling program, the drilling was performed by Teton Exploration Drilling Co., Inc. of Casper, Wyoming, and the geophysical logging was performed by Frontier Logging Corp. of Broomfield, Colorado.

The second phase of the drilling program was needed to fill gaps left from the first phase of the drilling program. As in the first phase, holes were drilled in the Antelope Flats-Deer Trail Area which contains the Laramie Formation coals, and the Watkins-Lowry Area which contains the Denver Formation lignites.

Ten holes were drilled and geophysically logged with a coal suite (single point resistance, focused density, caliper, and natural gamma) logging tool. Hole CGS-30c was twinned and cored between 346'-367', 422'-442', and 595'-627'. The coal samples were sent to Commercial Testing and Engineering Co. for analysis.

Lithologies were compiled using cores, drill cuttings, and geophysical logs. Similarity of rock types permits the omission of full descriptions. Many lithologies have been combined in the descriptions to accommodate the reduced scale of logs presented in this report. Drill logs from phase one of the program may be found in CGS Open File 80-1.

Unless otherwise noted all measurements are given in feet; to convert feet to meters multiply feet by 0.3048.

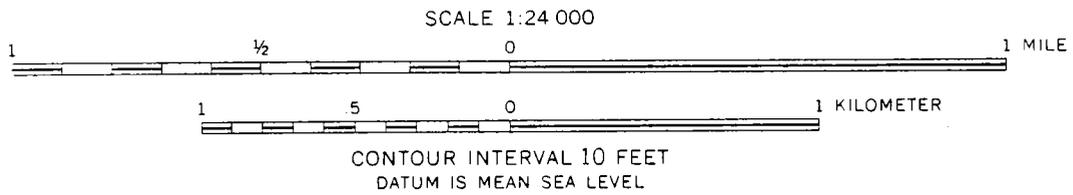
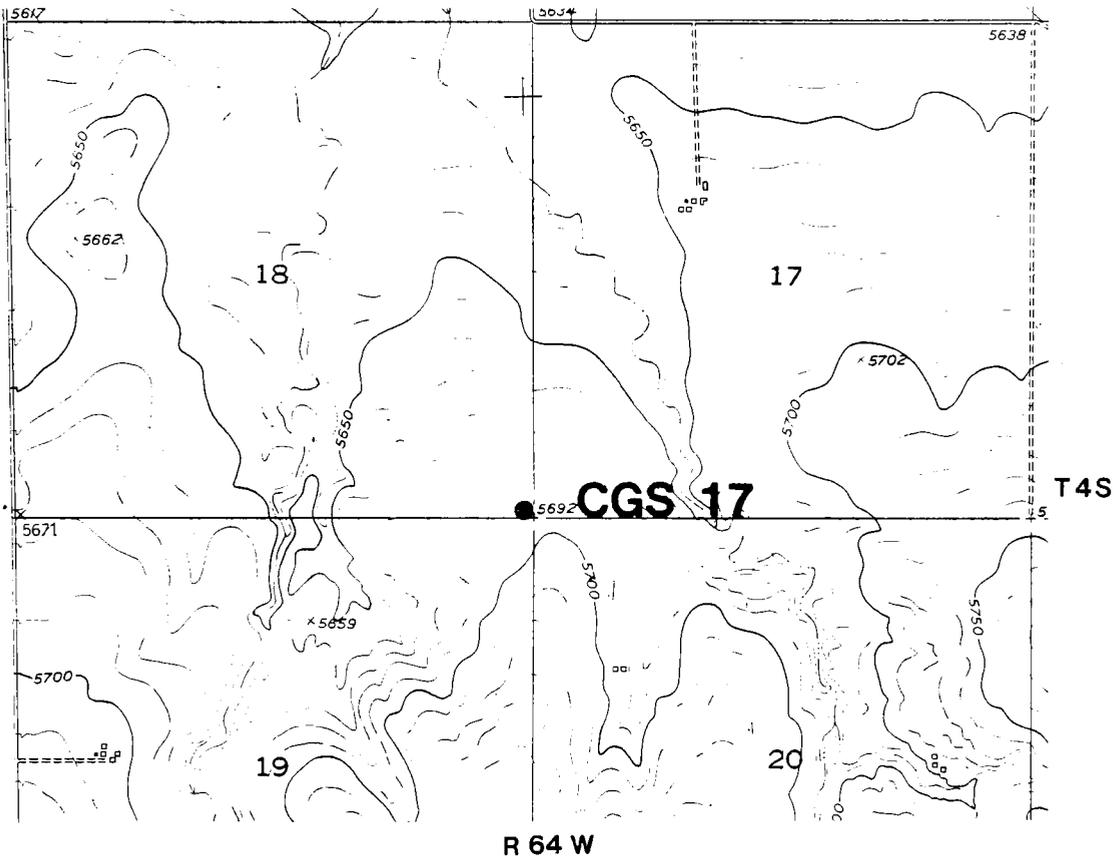


Figure 1.--Location of drill holes in the Watkins quadrangle

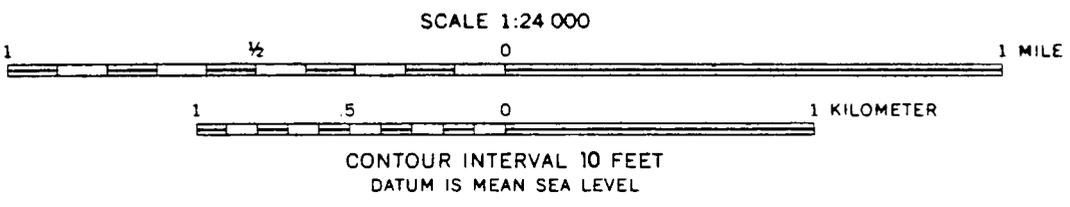
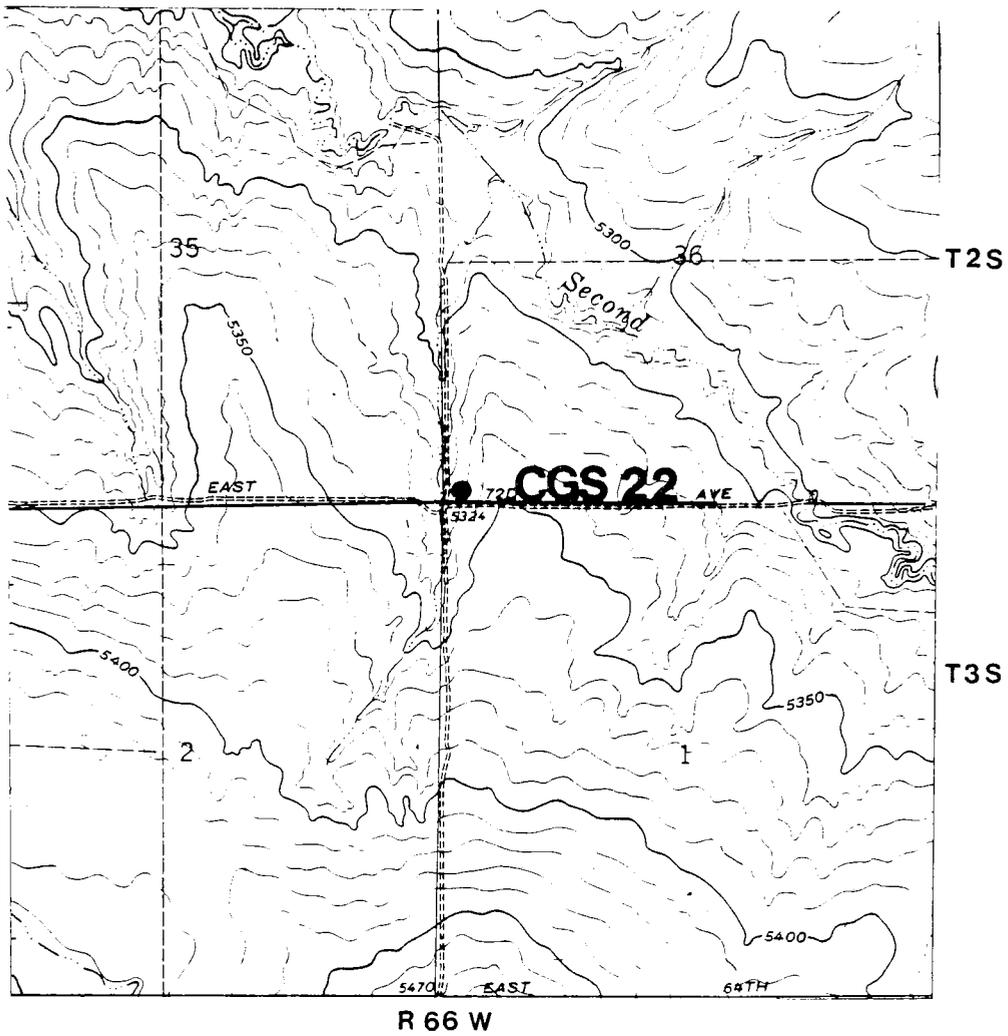


Figure 2.--Location of drill holes in the Box Elder School quadrangle

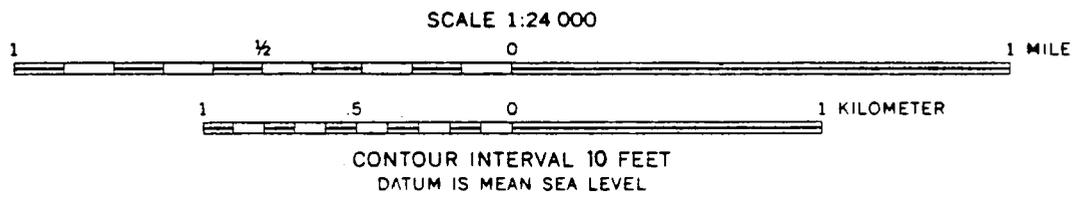
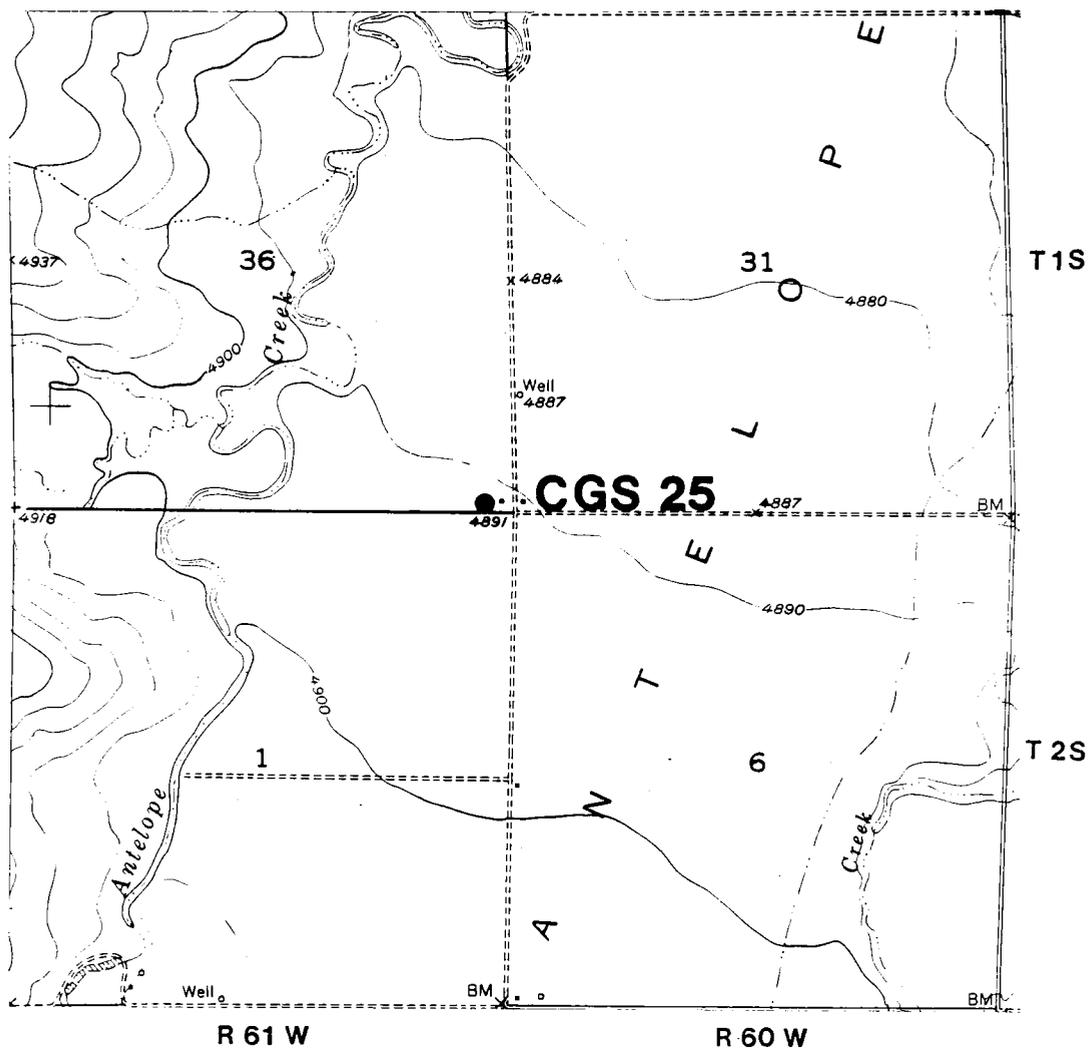


Figure 3.--Location of drill holes in the Leader NW quadrangle

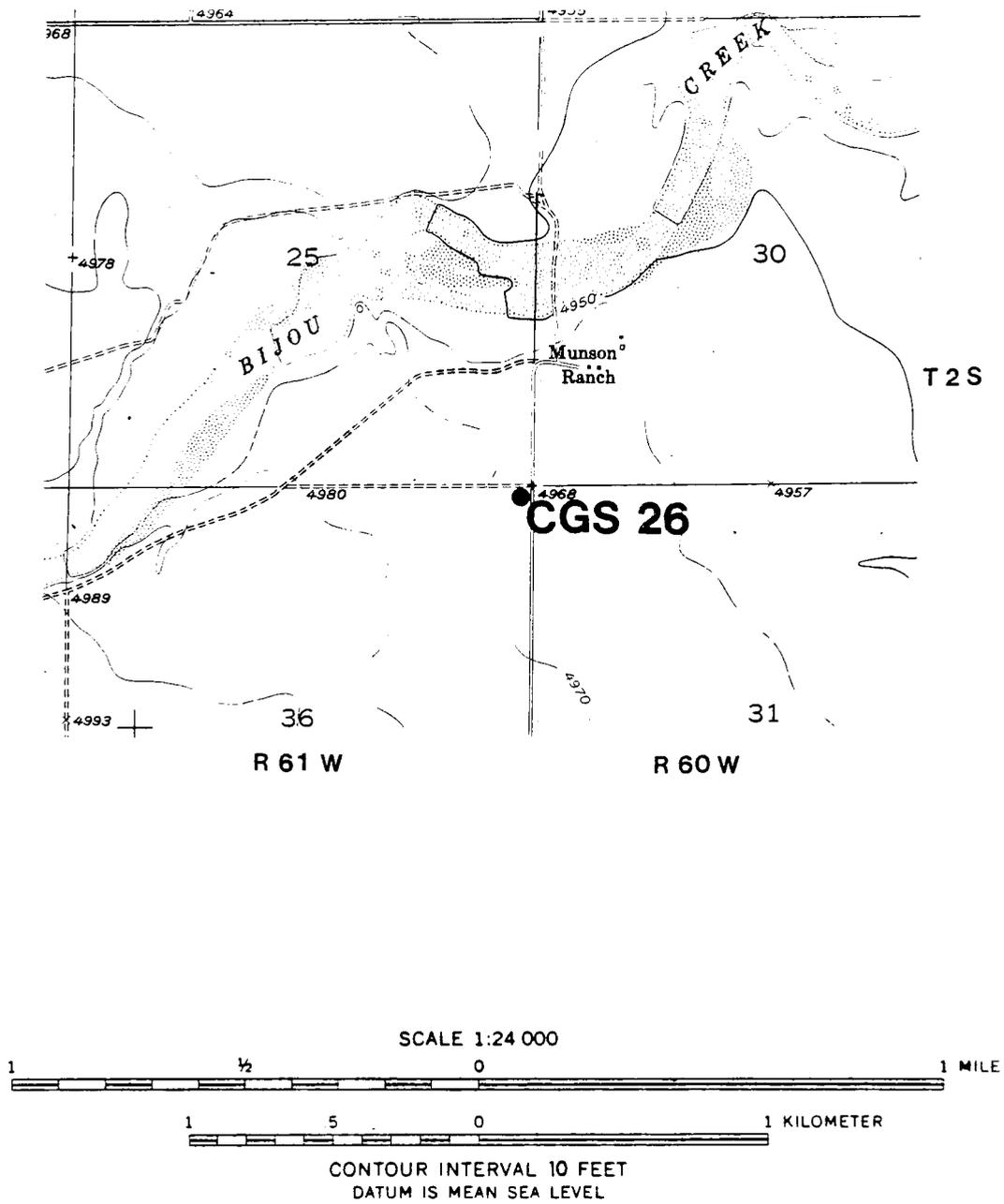


Figure 4.--Location of drill holes in the Leader SW quadrangle

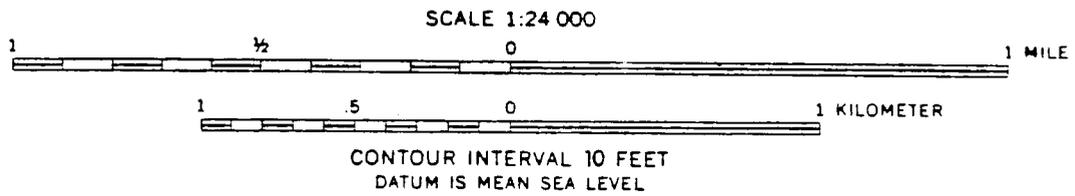
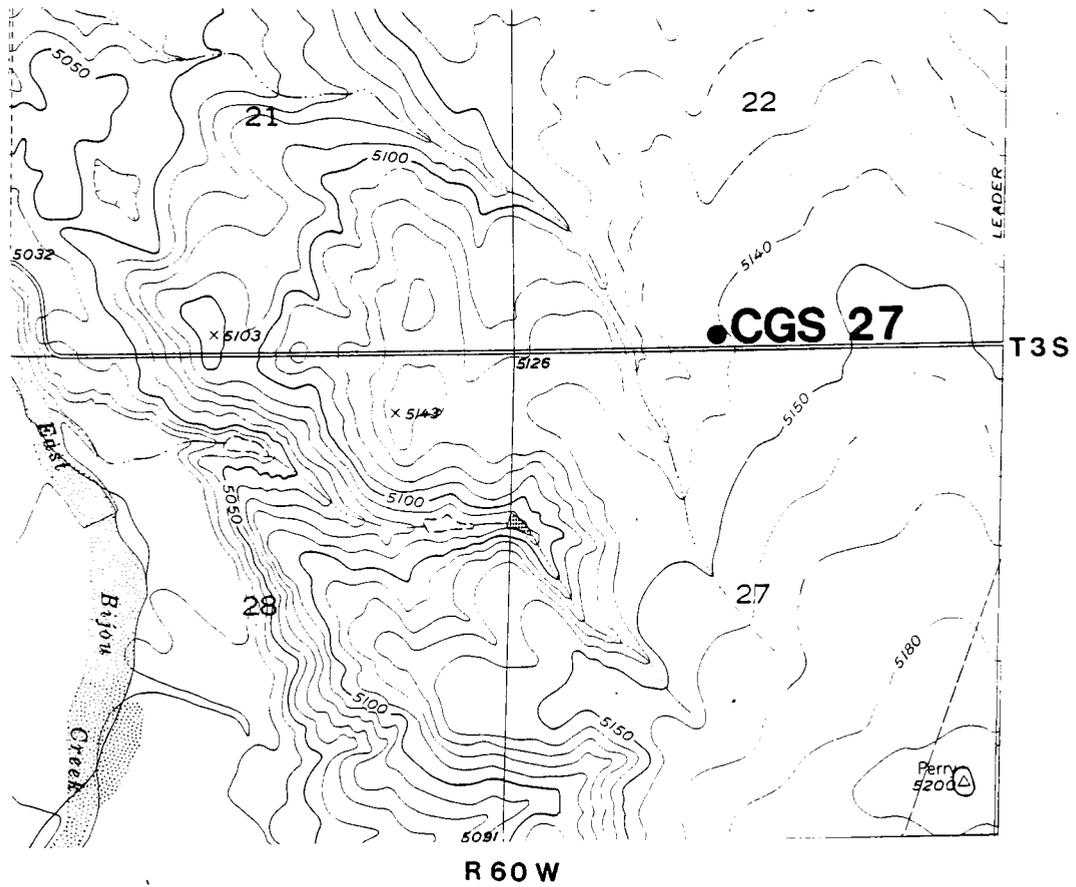


Figure 5.--Location of drill holes in the Leader SE quadrangle

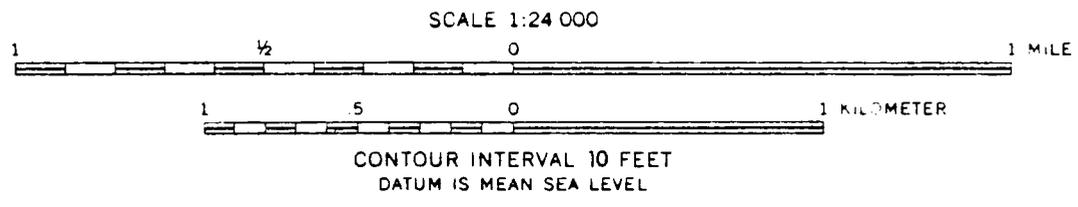
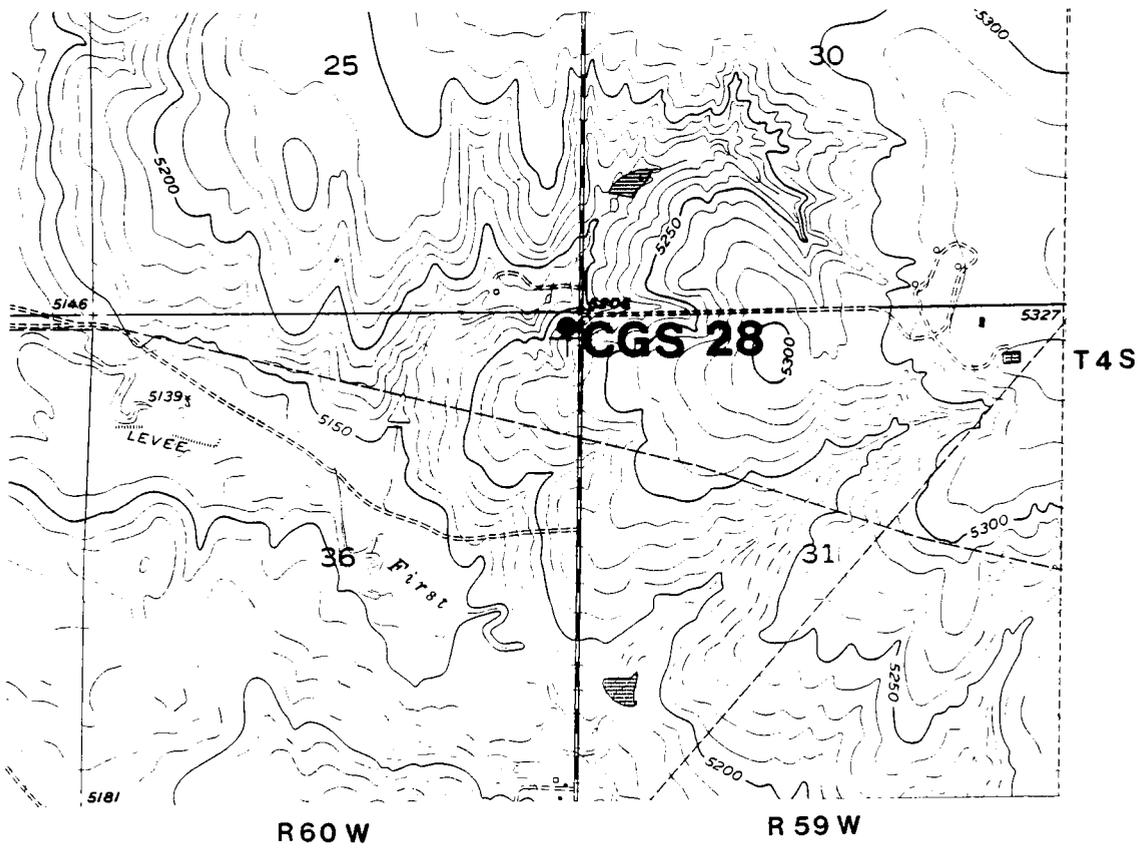


Figure 6.--Location of drill holes in the Peoria quadrangle

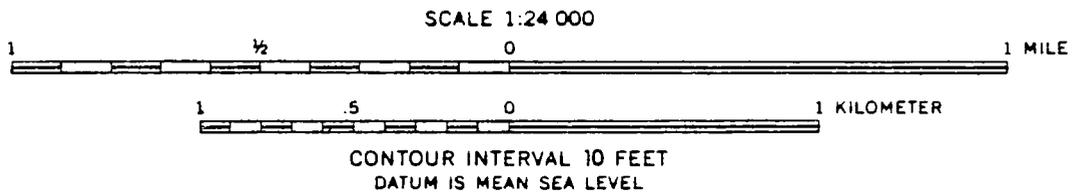
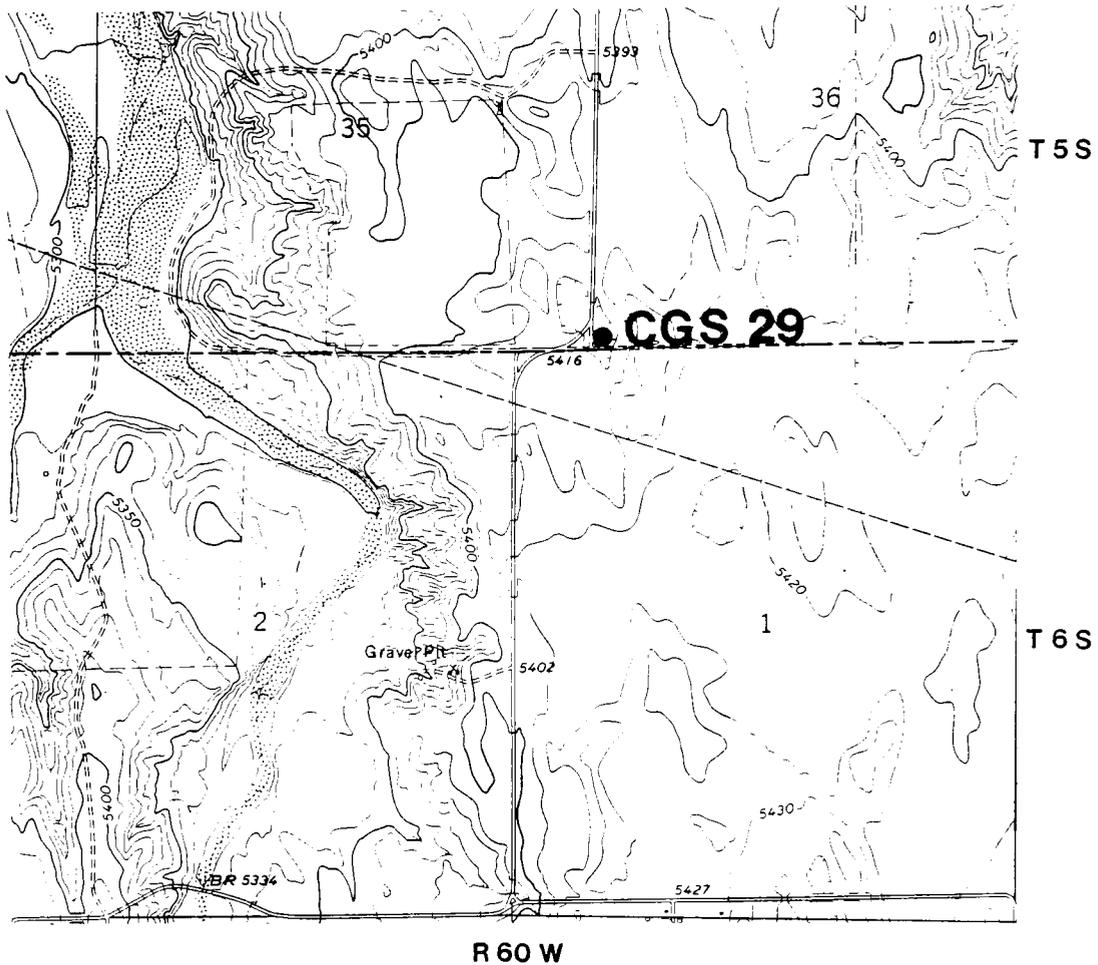
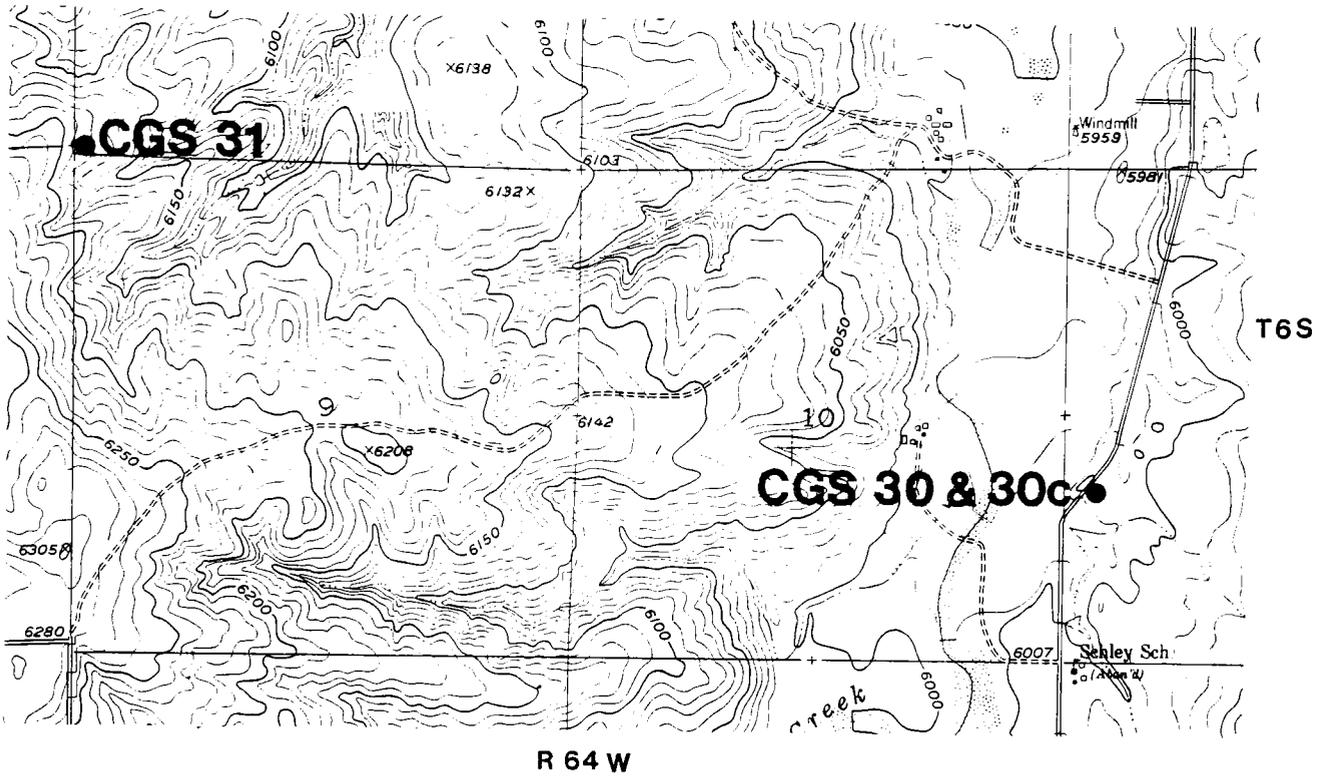


Figure 7.--Location of drill holes in the Deer Trail quadrangle



39° 32' 25"
 104° 31' 49"

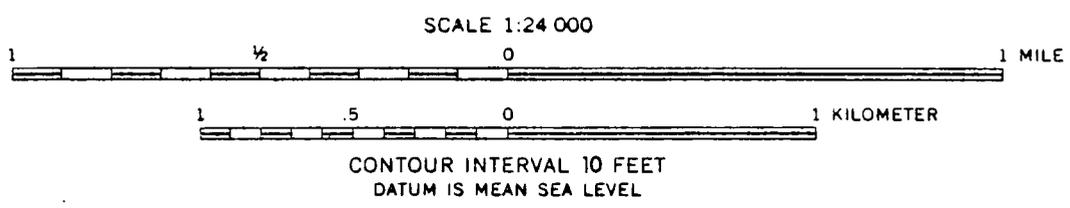


Figure 8.--Location of drill holes in the Watkins SE quadrangle

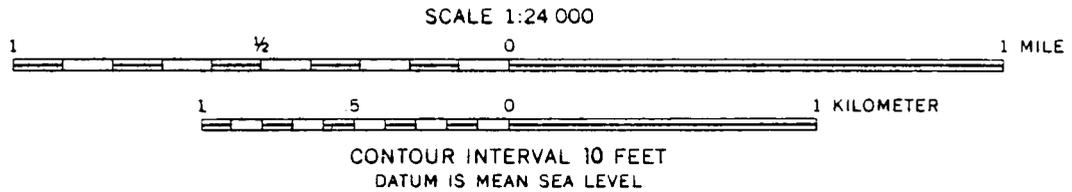
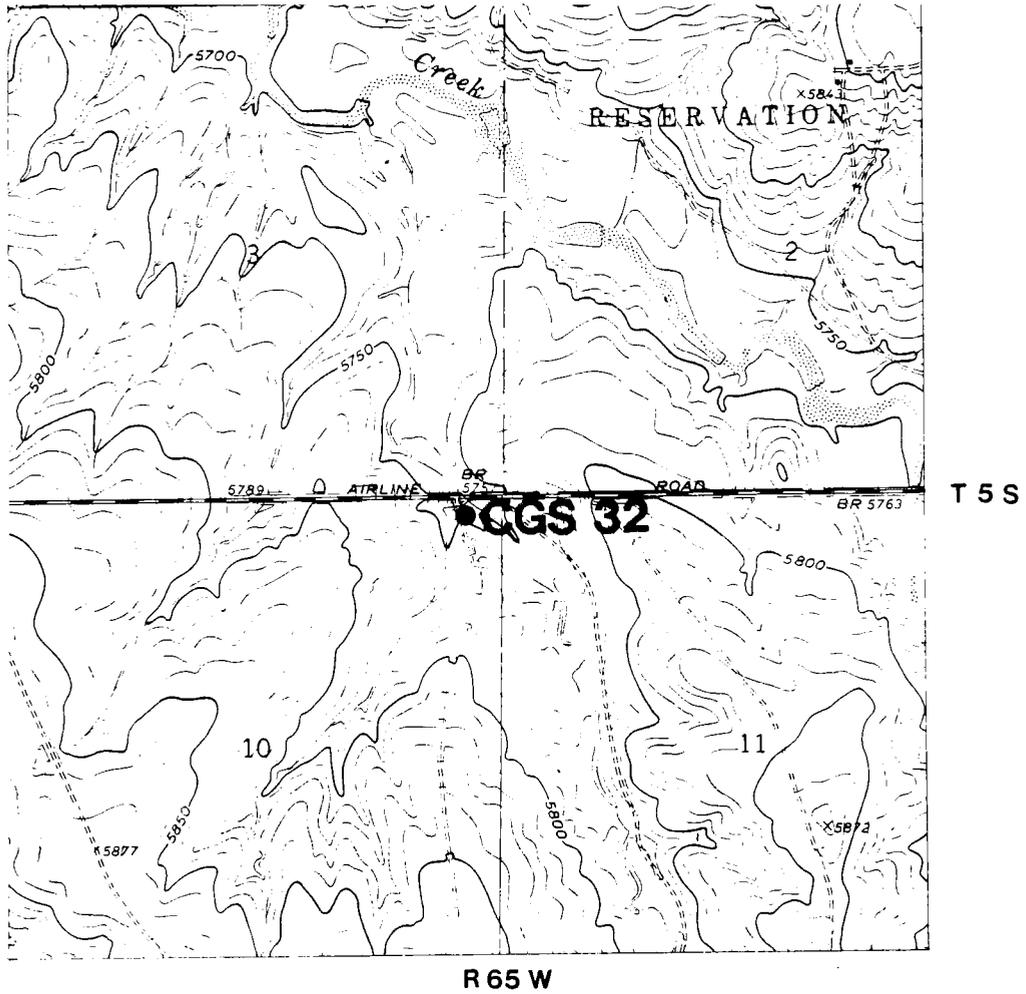


Figure 9.--Location of drill holes in the Coal Creek quadrangle

COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-17 State Colorado County Arapahoe Date logged 3/19/80 Elev.(ft) 5692

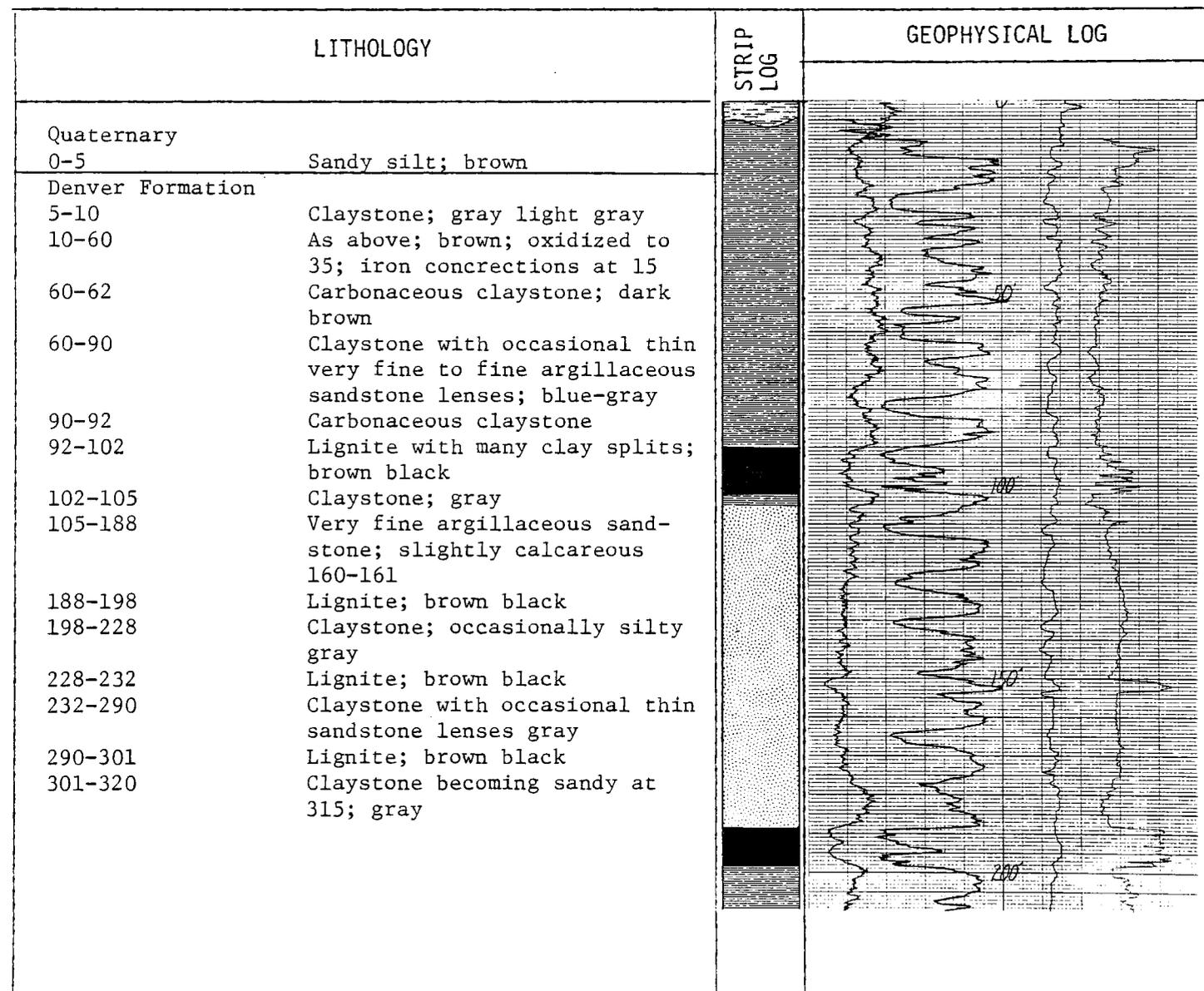
Location: T. 4 S., R. 64 W., secs. SESE18 Cored: Yes No X

Drilled depth 320 Logged depth 320 Drilling Medium Mud Fluid level G.L.

Geophysical logs:

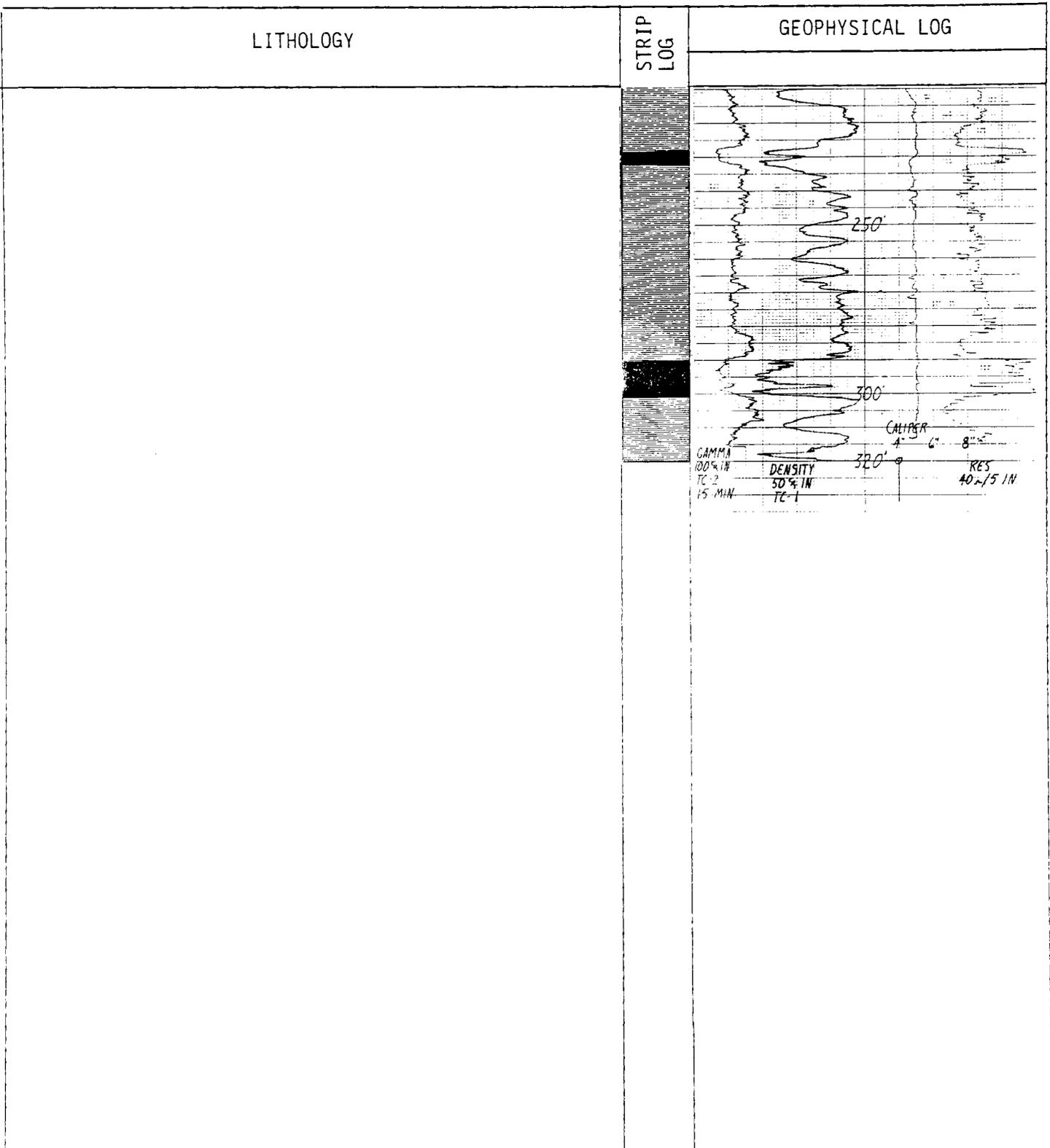
Gamma (G):	T.C. 2	Scale 10/cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 50 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 2 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/5in	Logging speed 15	fpm

Remarks: Watkins Quadrangle



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-17 - Continued



COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-22 State Colorado County Adams Date logged 3/19/80 Elev.(ft)5324

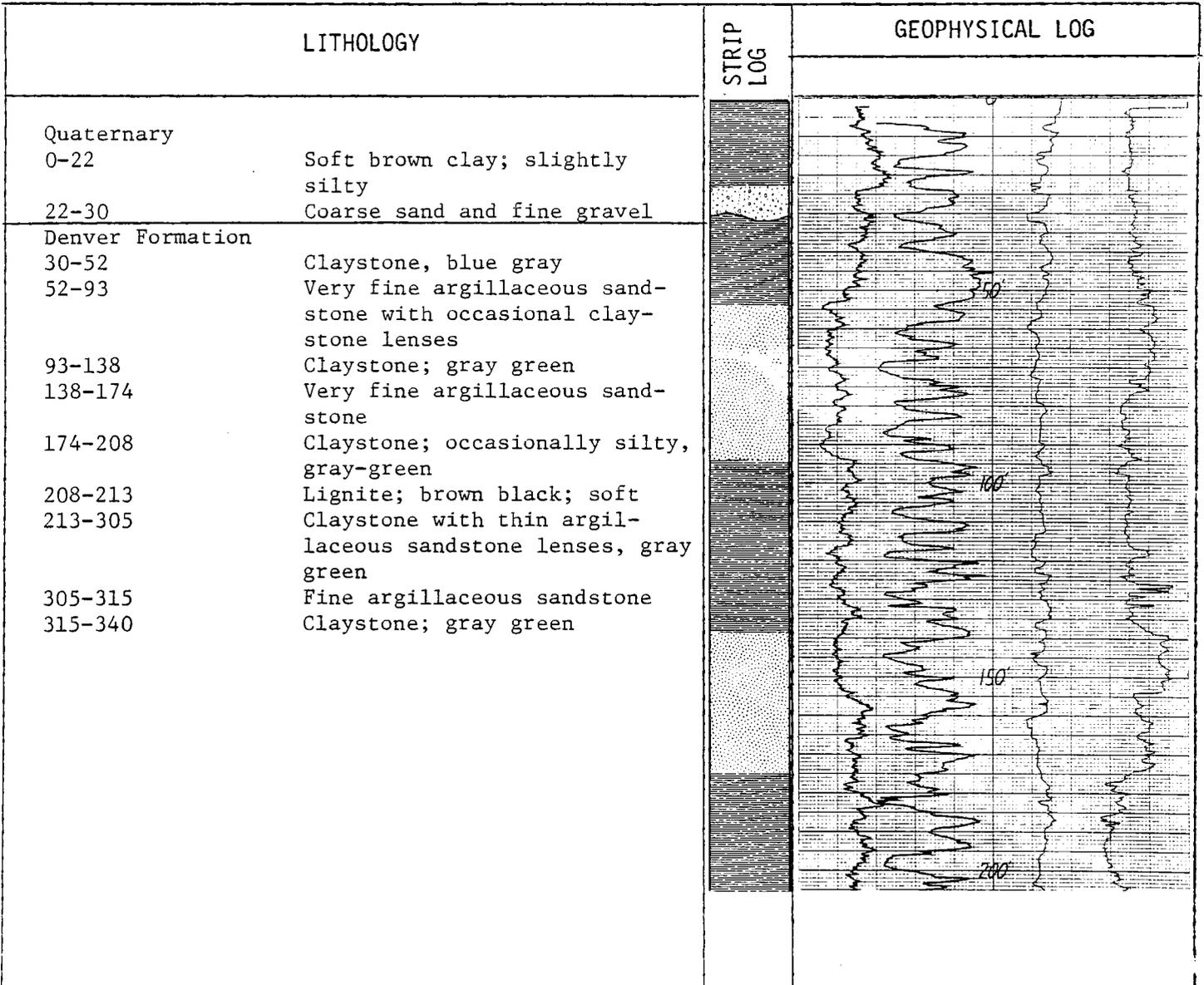
Location: T. 3 S., R.66 W., secs. SWSW 36 Cored: Yes No X

Drilled depth 380 Logged depth 340 Drilling Medium Mud Fluid level 2.5

Geophysical logs:

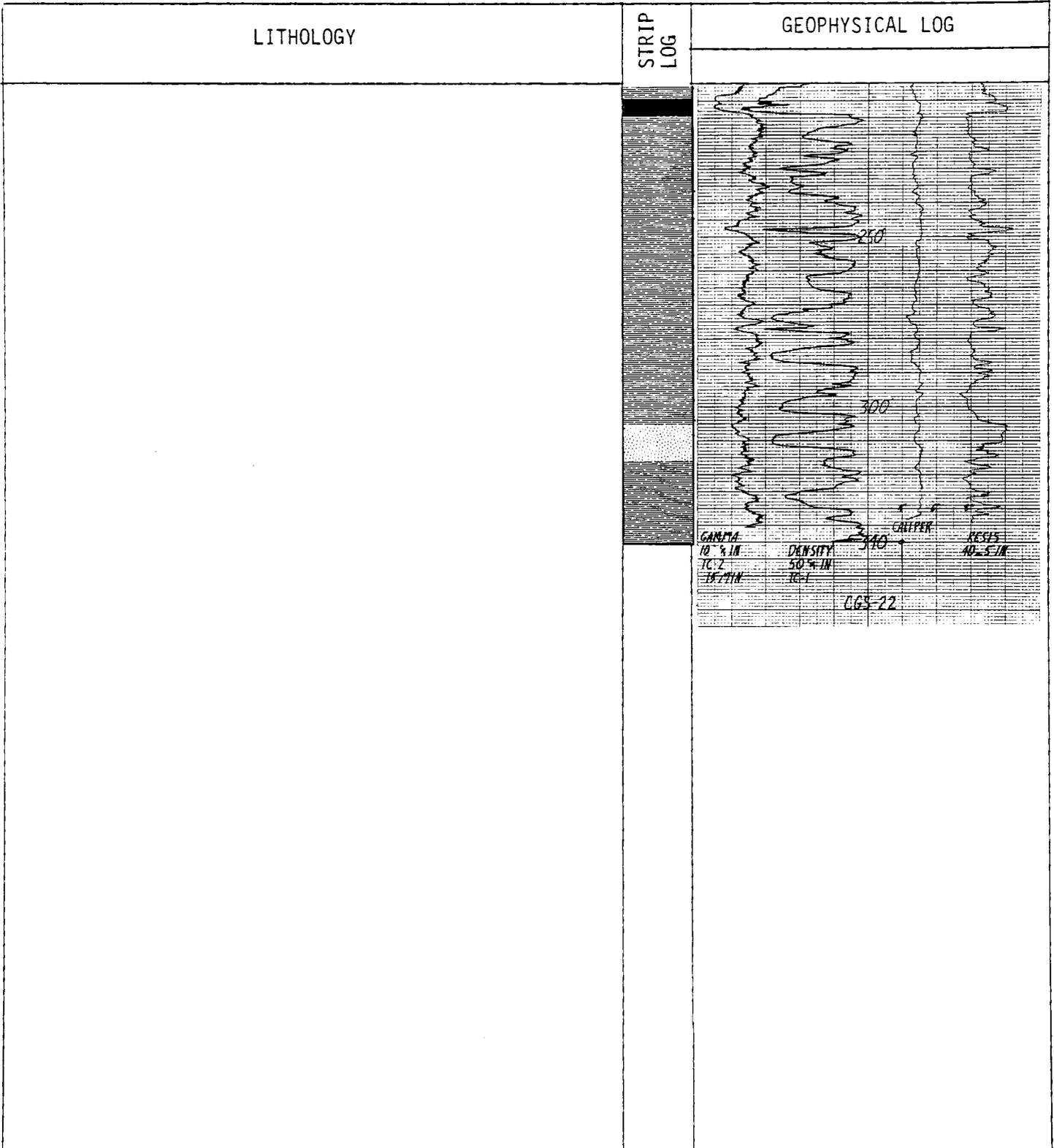
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 50 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 2 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/5in	Logging speed 15	fpm

Remarks: Box Elder School Quadrangle



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-22 - Continued



COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-25 State Colorado County Adams Date logged 3/26/80 Elev.(ft)4893

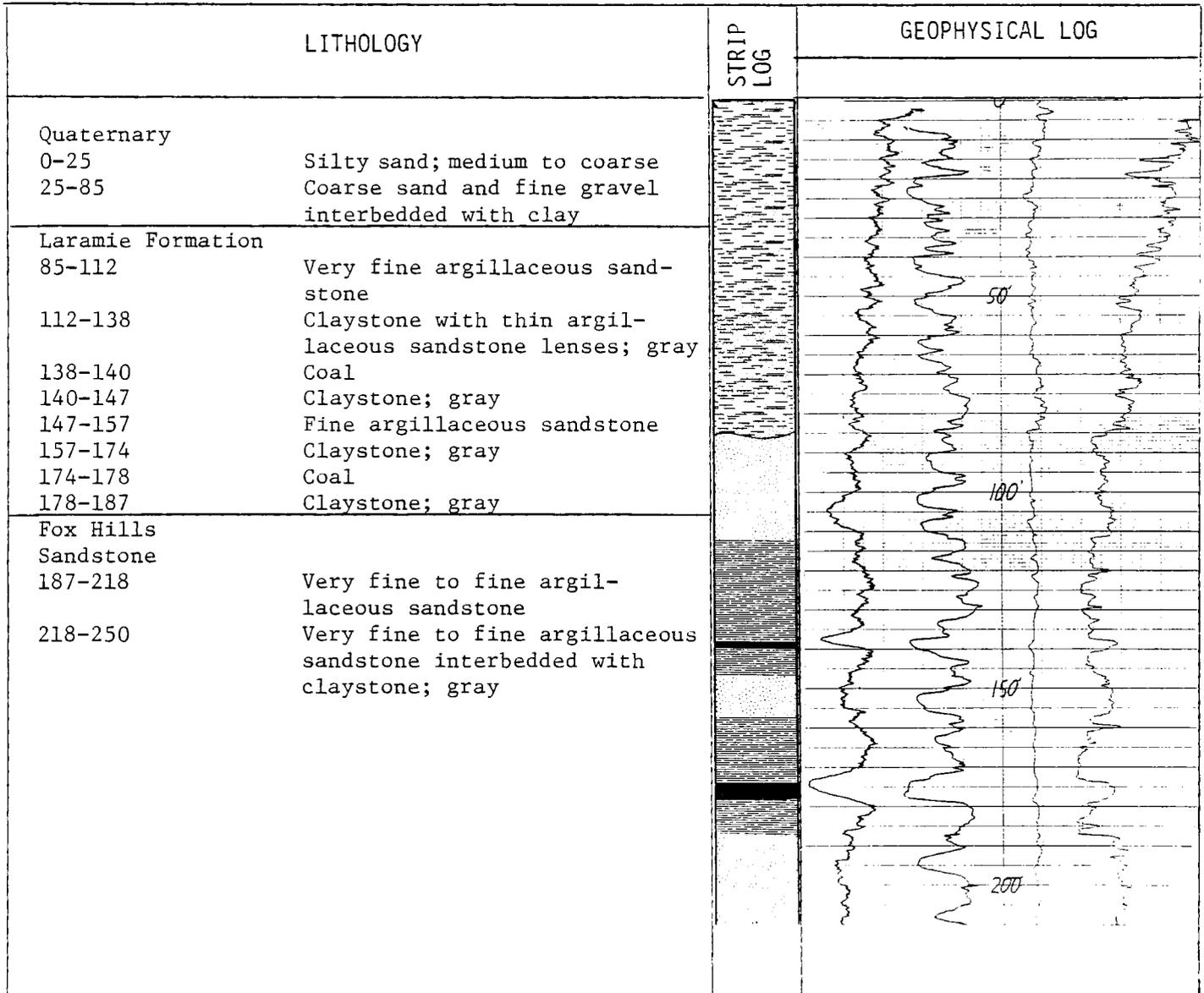
Location: T. 1 S., R. 61 W., secs. SESE 36 Cored: Yes No X

Drilled depth 250 Logged depth 250 Drilling Medium Mud Fluid level 5

Geophysical logs:

Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 100 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 4 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/5in	Logging speed 15	fpm

Remarks: Leader NW Quadrangle



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-25 - Continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG			
		GAMMA 10% IN. TC-2 157PHN	DENSITY 100% IN. TC-1	250 CALIPER	RESISTANCE 40-5 IN.
		CGS-25			

COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 10° QUADRANGLE

Hole No. CGS-26 State Colorado County Adams Date logged 3/26/80 Elev.(ft) 4968

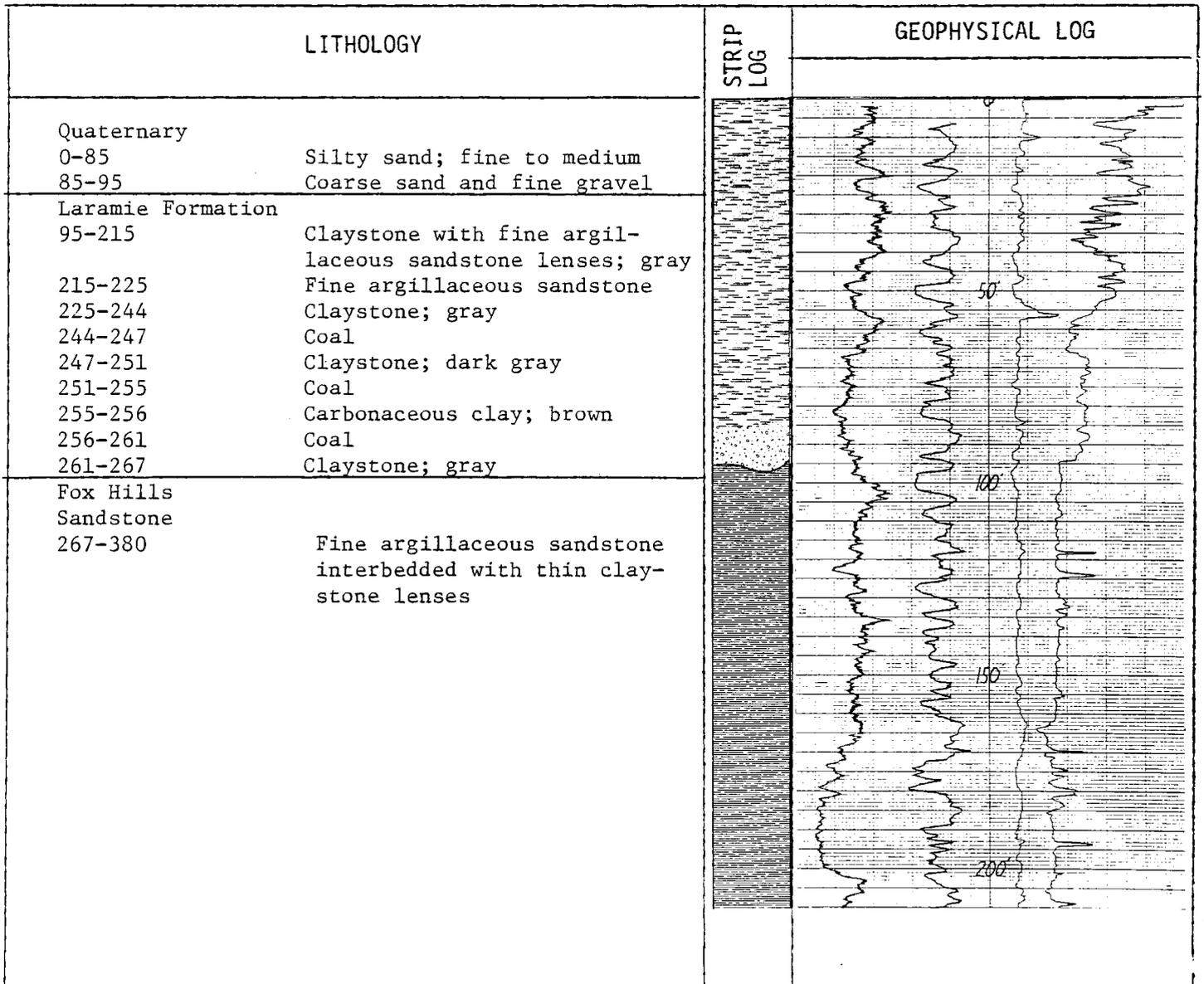
Location: T. 2 S., R. 61 W., secs. NENE 36 Cored: Yes No X

Drilled depth 380 Logged depth 380 Drilling Medium Mud Fluid level 2

Geophysical logs:

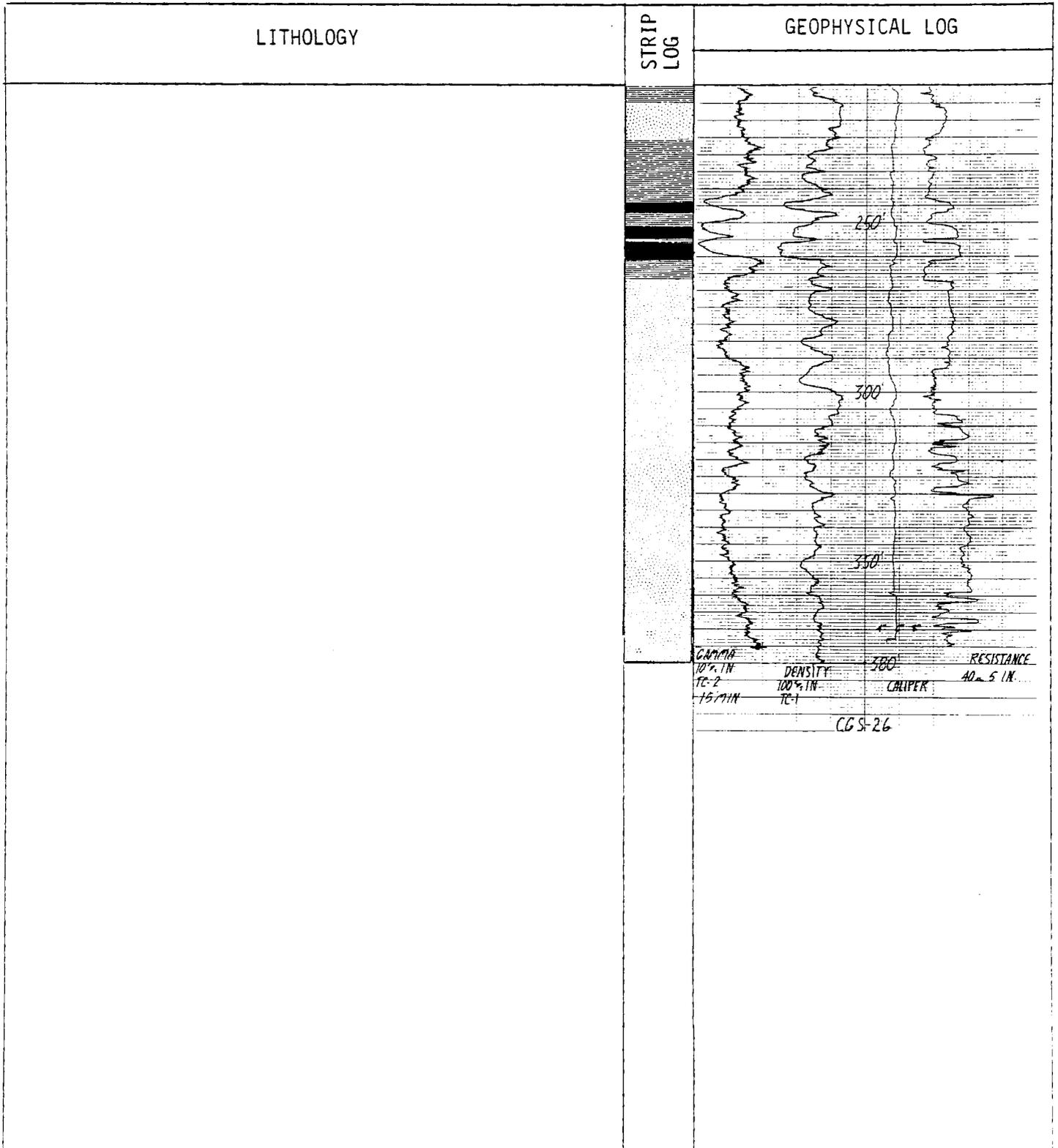
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 100 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 4 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/5in	Logging speed 15	fpm

Remarks: Leader SW Quadrangle



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-26 - Continued



COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-27 State Colorado County Adams Date logged 3/25/80 Elev.(ft) 5154

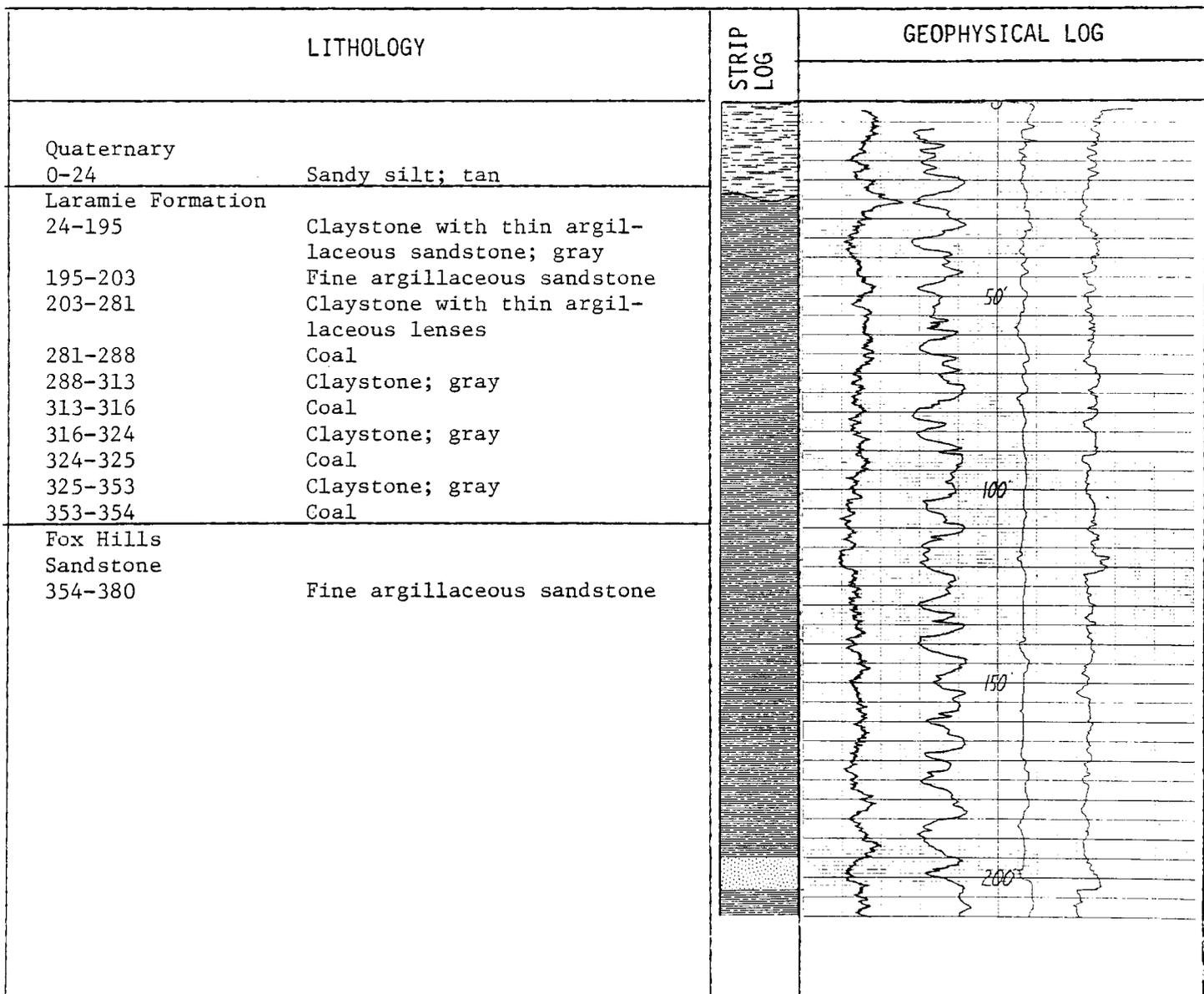
Location: T. 3 S., R. 60 W., secs. SWSW 22 Cored: Yes No x

Drilled depth 380 Logged depth 380 Drilling Medium Mud Fluid level 2

Geophysical logs:

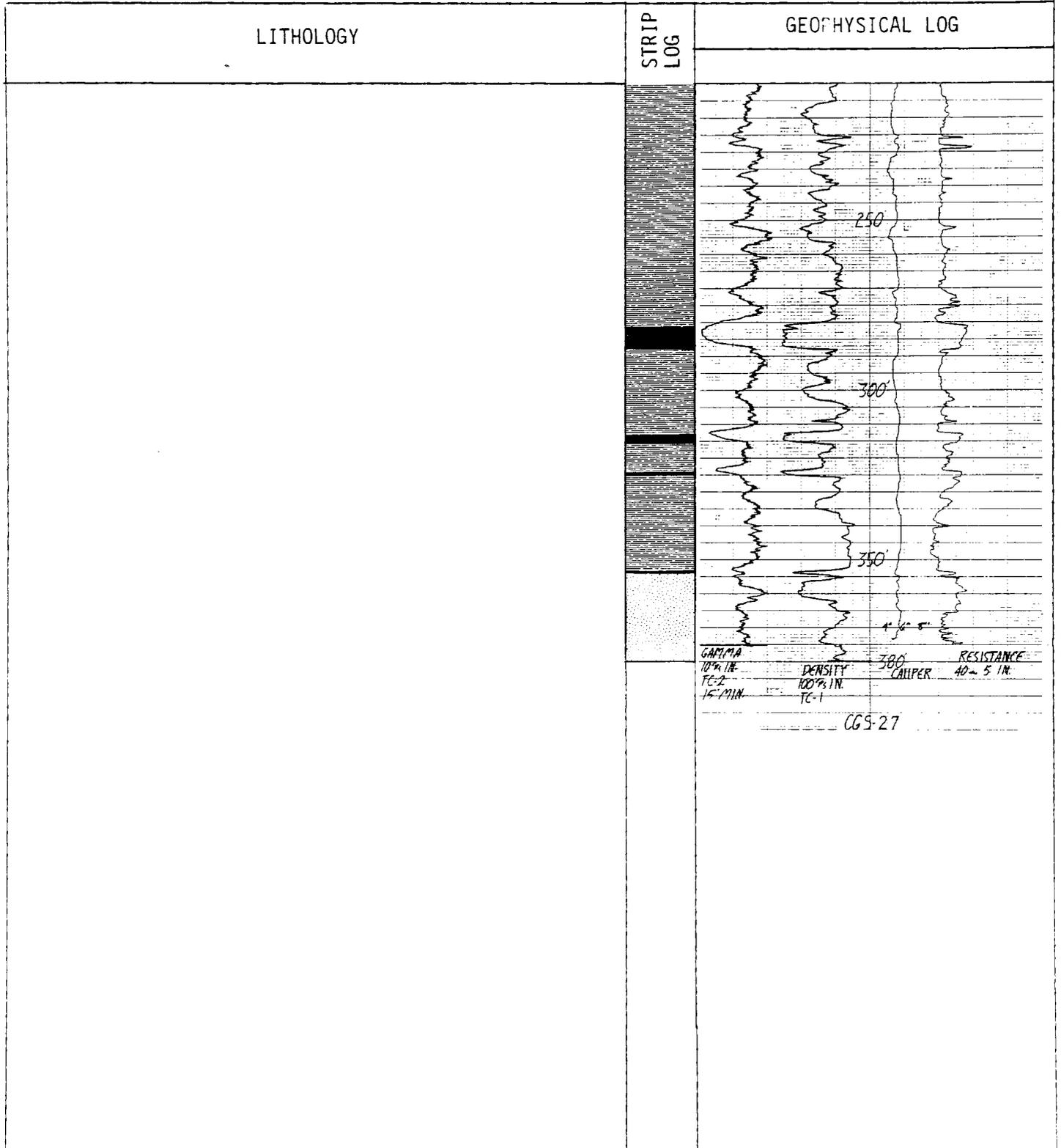
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 100 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 4 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/in	Logging speed 15	fpm

Remarks: Leader SE Quadrangle



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-27 - Continued



COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-28 State Colorado County Arapahoe Date logged 3/25/80 Elev.(ft) 5215

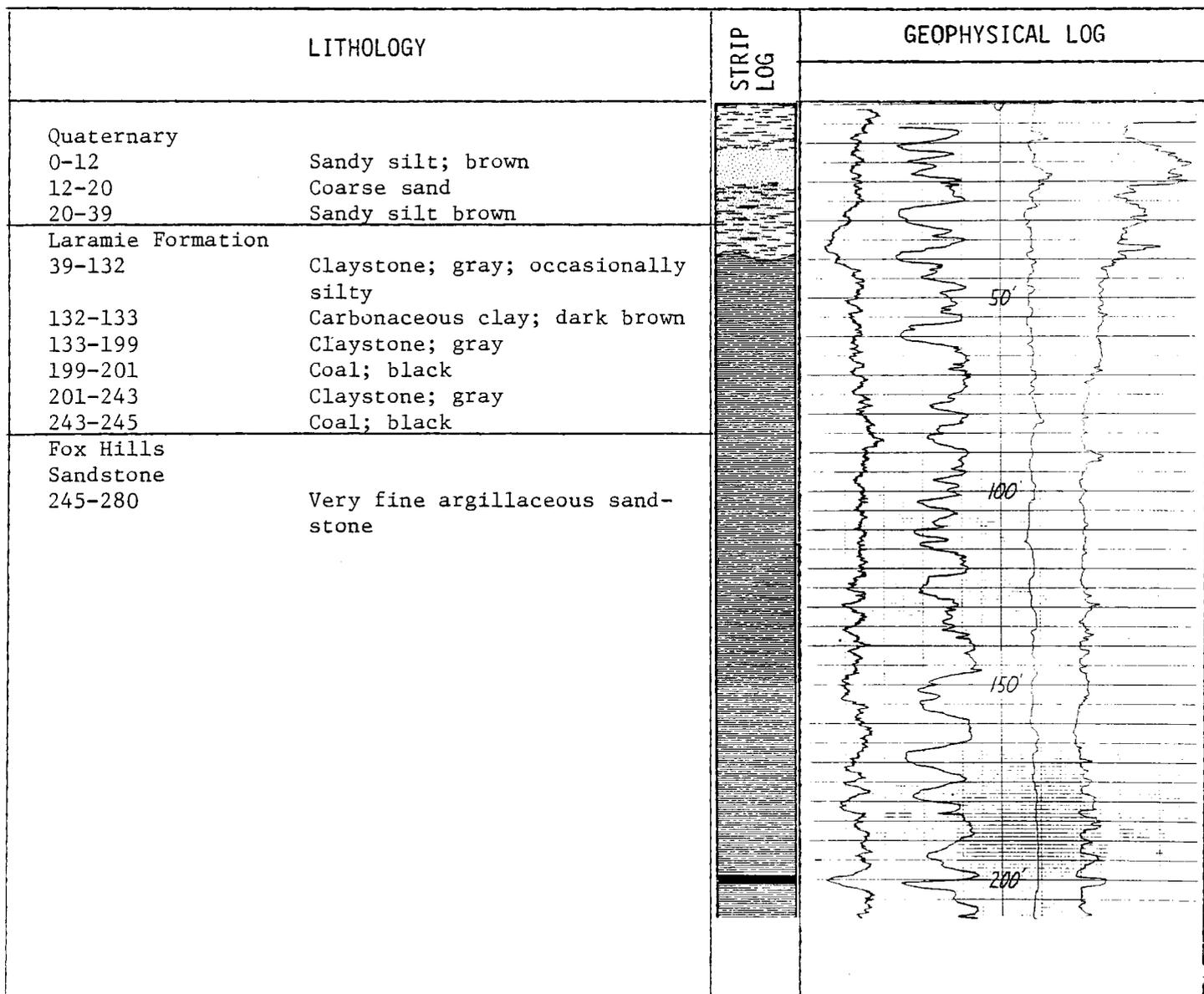
Location: T. 4 S., R.60 W., secs. NENE 36 Cored: Yes No X

Drilled depth 280 Logged depth 280 Drilling Medium Mud Fluid level 5

Geophysical logs:

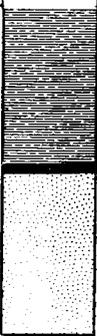
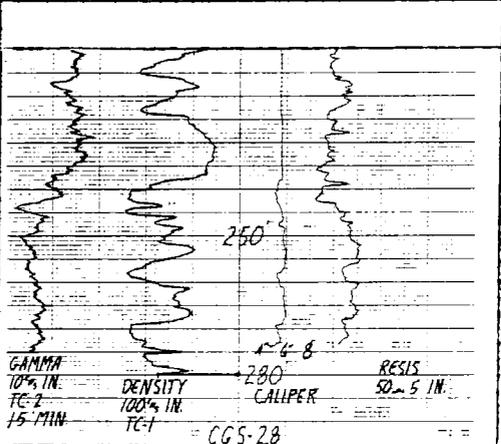
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 100 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 4 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 50 ohm/in	Logging speed 15	fpm

Remarks: Peoria Quadrangle



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-28 - Continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
		 <p>250'</p> <p>1-4-8</p> <p>GAMMA 10% IN. FE-2 15-MIN. DENSITY 100% IN. TC-1 RESIS 50% 5 IN.</p> <p>CGS-28</p>

COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 10' QUADRANGLE

Hole No. CGS-29 State Colorado County Arapahoe Date logged 3/25/80 Elev.(ft) 5414

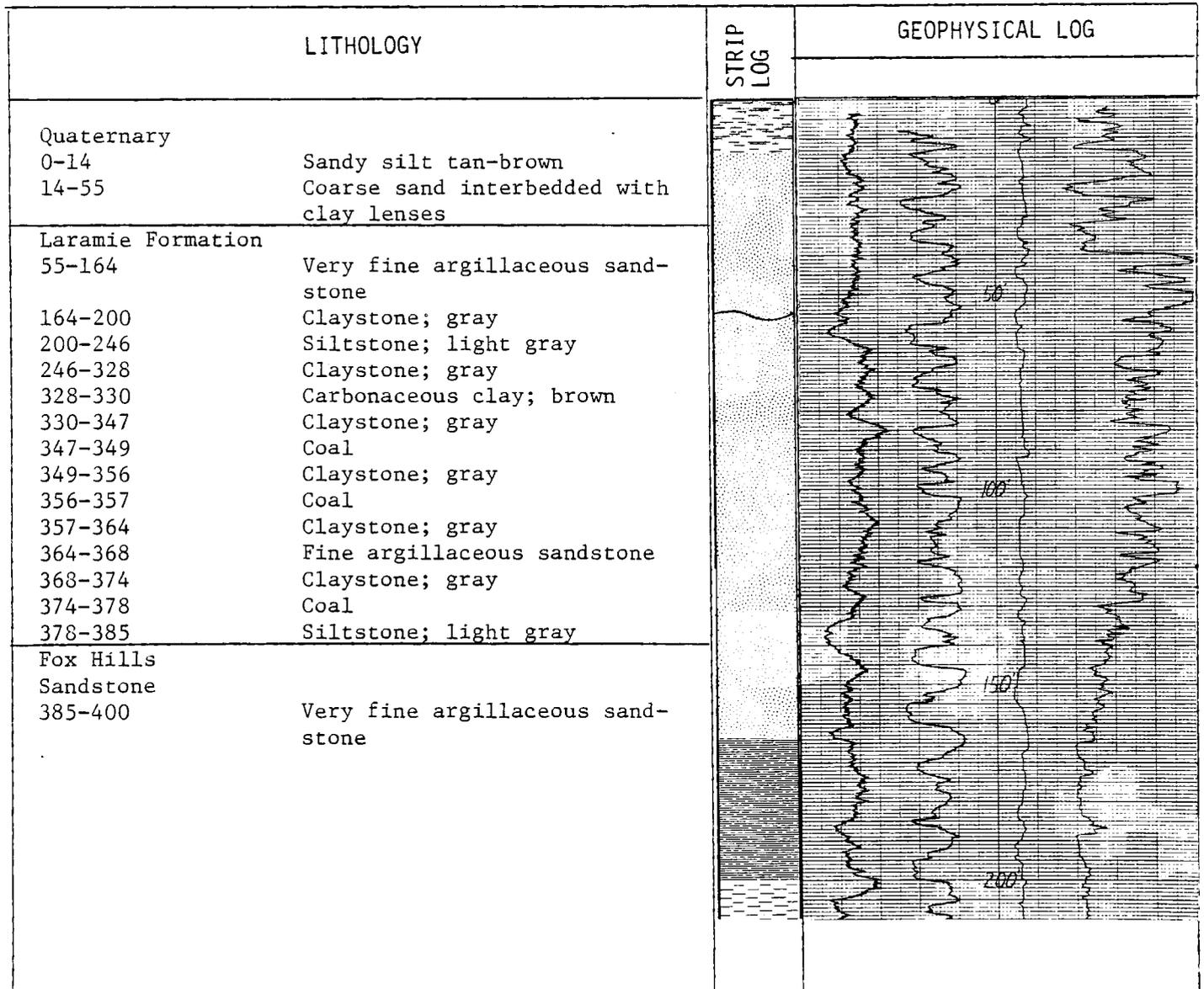
Location: T. 5 S., R.59 W., secs. SWSW 36 Cored: Yes No X

Drilled depth 400 Logged depth 400 Drilling Medium Mud Fluid level 2

Geophysical logs:

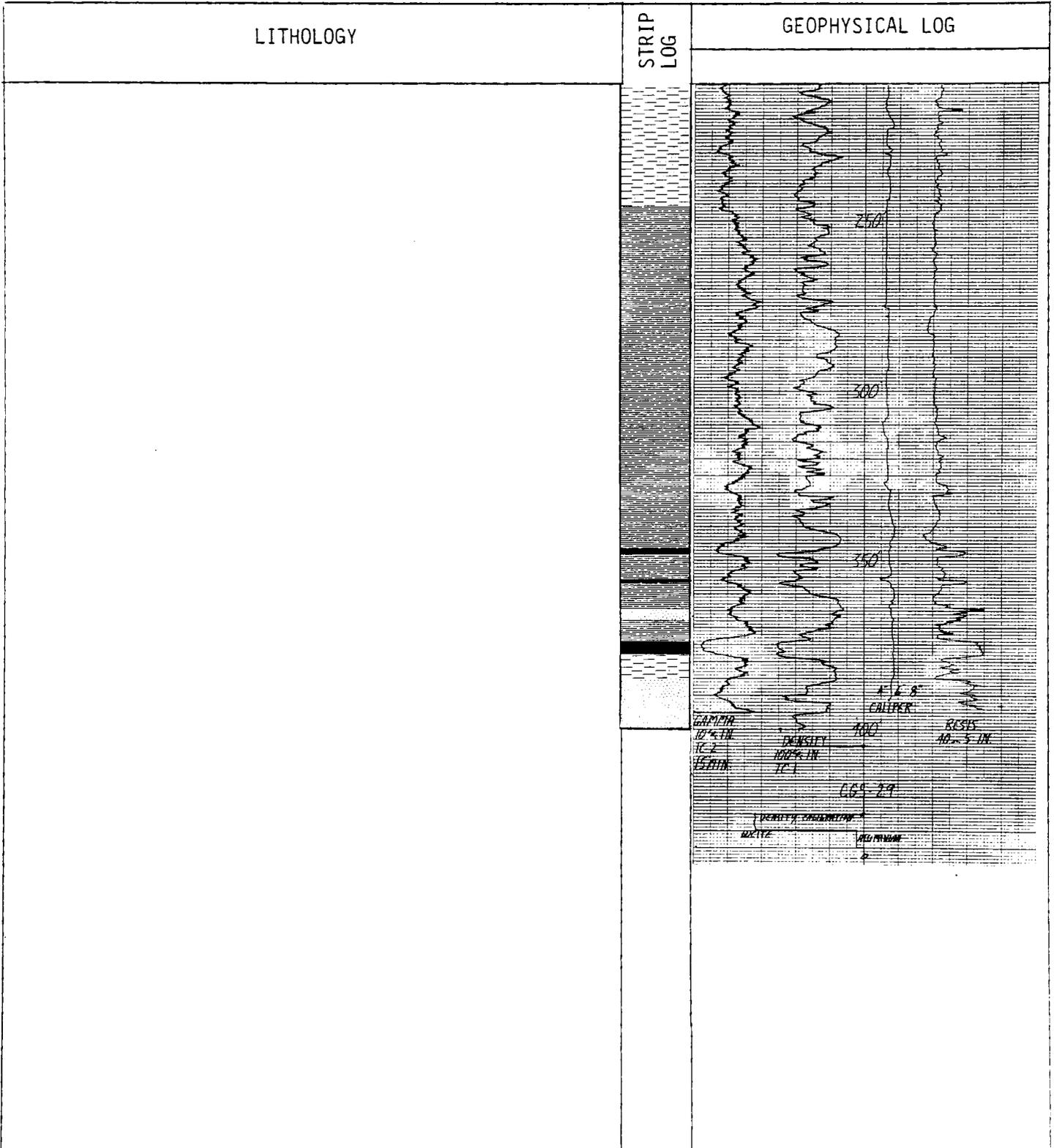
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 100 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 4 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/in	Logging speed 15	fpm

Remarks: Deer Trail Quadrangle



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-29 - Continued



COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-30 State Colorado County Elbert Date logged 3/23/80 Elev. (ft) 5993

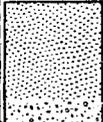
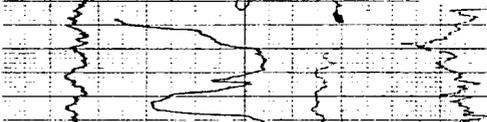
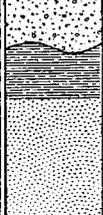
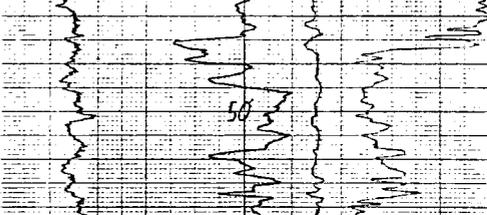
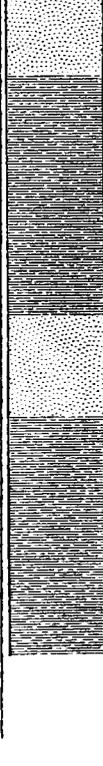
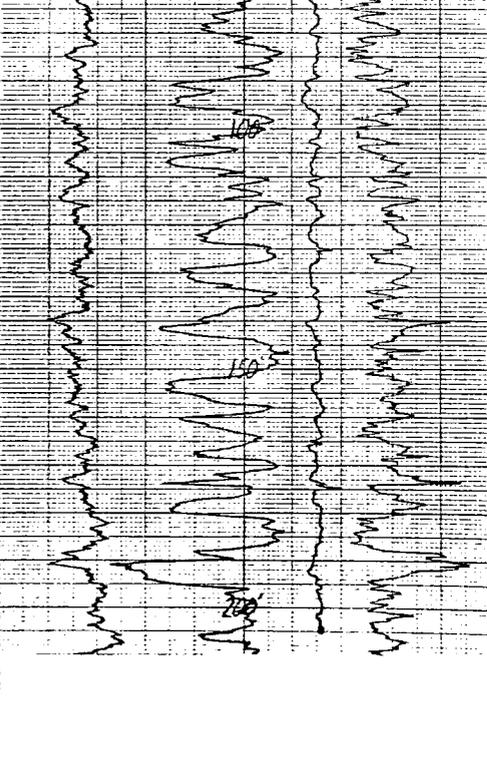
Location: T. 6 S., R. 63 W., secs. SWSW 11 Cored: Yes X No

Drilled depth 720 Logged depth 720 Drilling Medium Mud Fluid level G.L.

Geophysical logs:

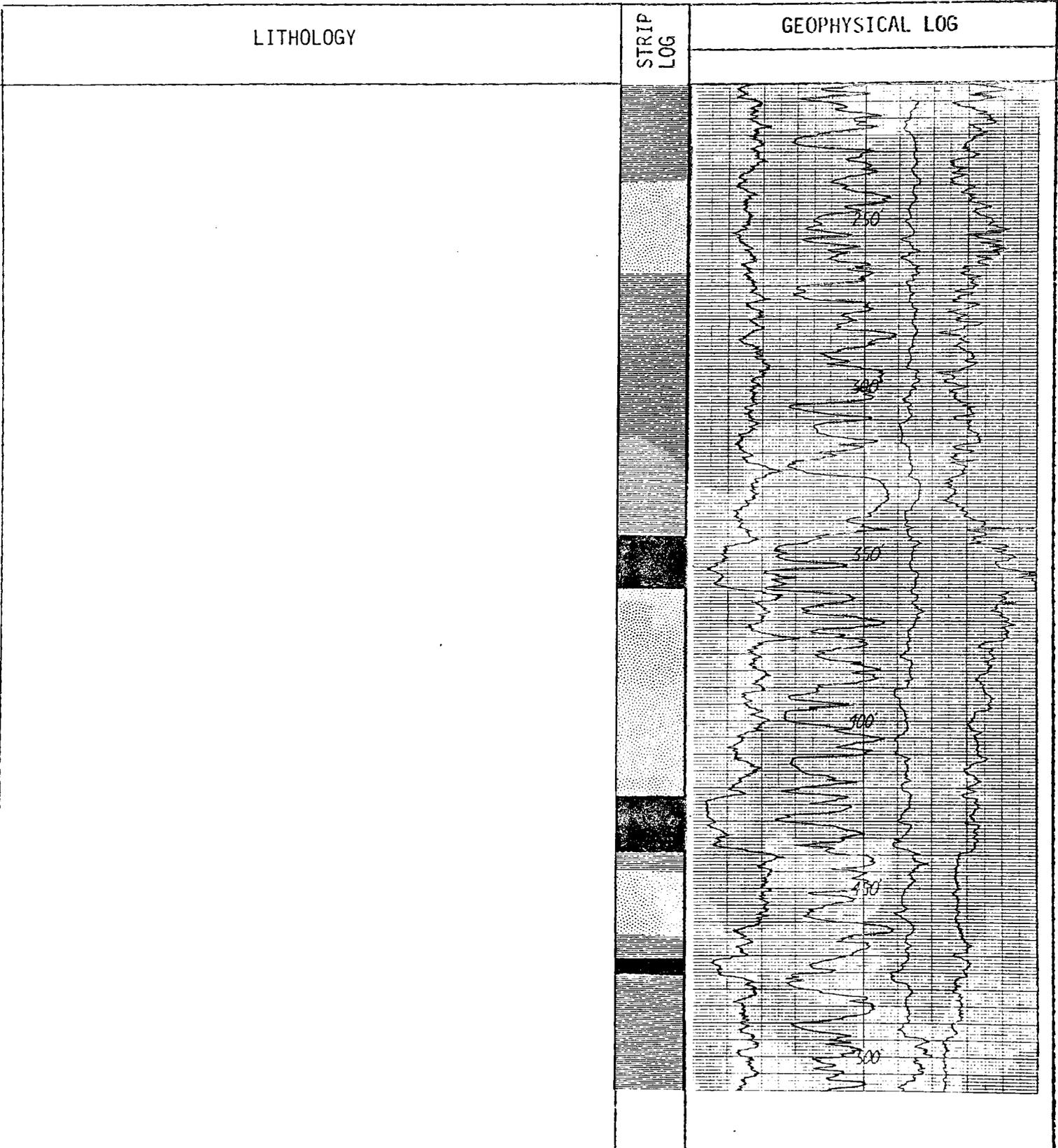
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 50 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 2 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 60 ohm/5in	Logging speed 15	fpm

Remarks: CGS-30c offset 20ft and cored
Watkins SE Quadrangle

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
Quaternary 0-21 Fine to medium sand 21-37 Coarse sand and fine gravel		
Dawson Arkose 37-48 Claystone; gray green 48-89 Very fine to fine argillaceous sandstone with occasional siltstone lenses		
Denver Formation 89-139 Claystone gray green 139-160 Fine argillaceous sandstone 160-239 Claystone gray green 239-266 Fine to medium argillaceous sandstone; coarsening downward 266-345 Claystone with occasional sandstone lenses 345-361 Lignite brown black 361-423 Fine argillaceous sandstone 423-439 Lignite; brown black; many clay-splits 439-445 Claystone; gray 445-464 Fine to medium argillaceous sandstone 464-471 Claystone; gray 471-476 Lignite; brown black 476-591 Claystone with thin argillaceous sandstone lenses 591-620 Lignite; brown black; many clay splits 620-687 Claystone with thin argillaceous sandstone lenses 687-693 Lignite; brown black 693-720 Claystone with thin argillaceous sandstone lenses		

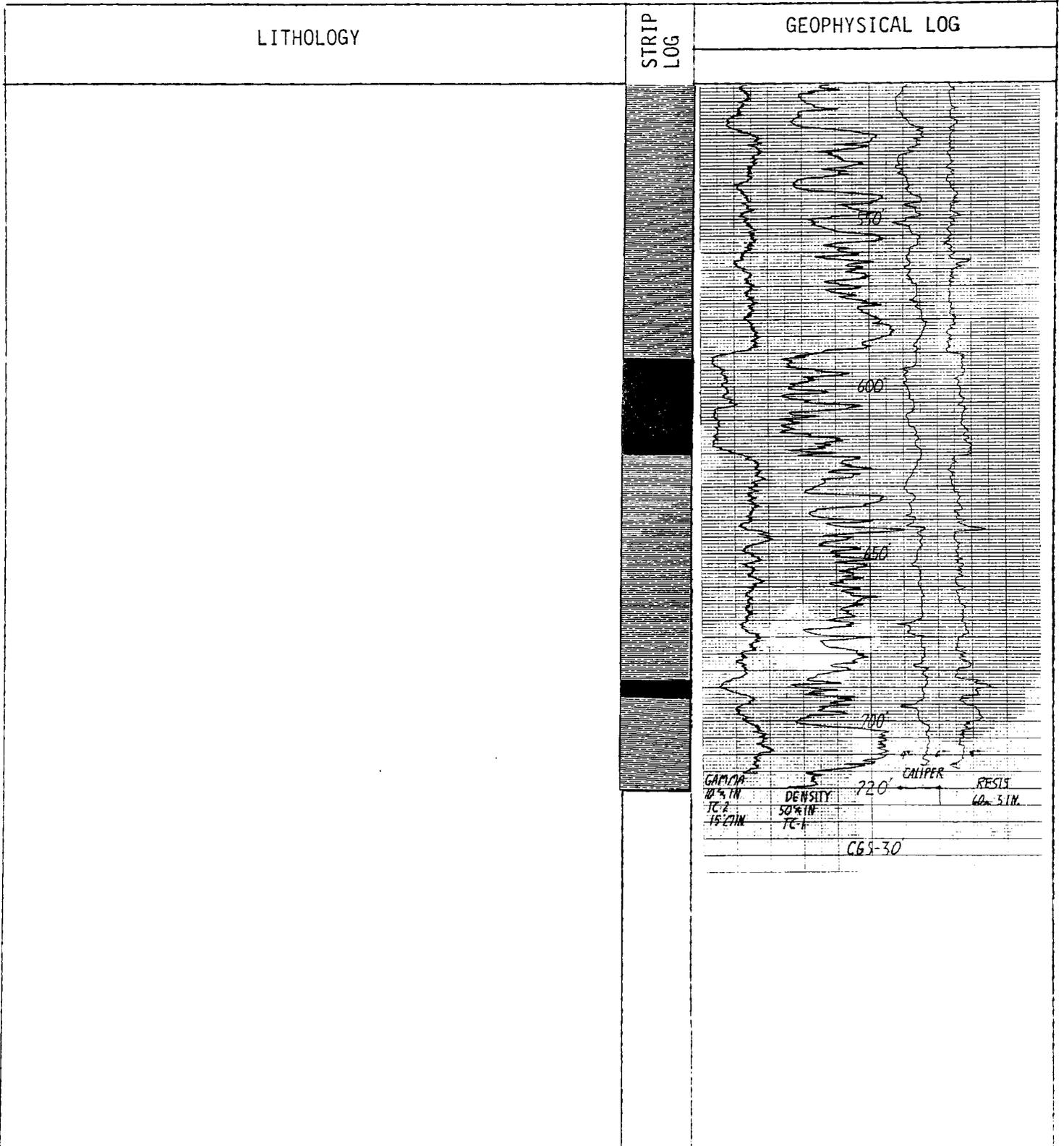
COLORADO GEOLOGICAL SURVEY

Hole No. CGS-30 - Continued



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-30 - Continued



COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-31 State Colorado County Elbert Date logged 3/21/80 Elev.(ft) 6187

Location: T. 6 S., R.64 W., secs. SWSW 4 Cored: Yes No X

Drilled depth 900 Logged depth 900 Drilling Medium Mud Fluid level G.L.

Geophysical logs:

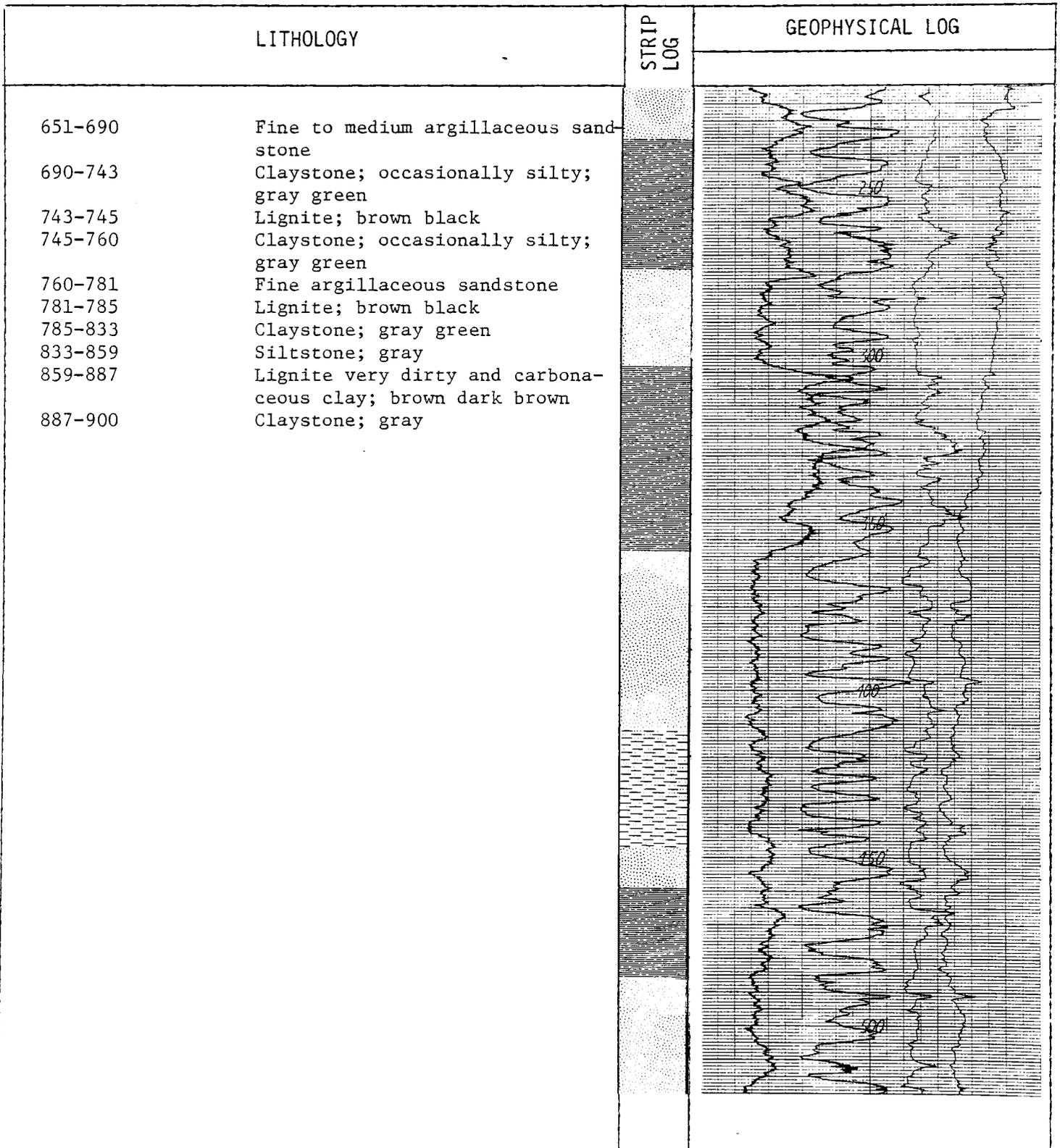
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 50 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 2 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 50 ohm/5in	Logging speed 15	fpm

Remarks: Watkins SE Quadrangle

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
Quaternary 0-6 Sandy silt; brown		
Dawson Arkose 6-30 Claystone; slightly sandy; weathered; tan yellow 30-88 Fine to medium argillaceous sandstone 88-134 Claystone; gray green 134-237 Fine to coarse argillaceous sandstone; occasionally arkosic; contains thin claystone lenses		
Denver Formation 237-276 Claystone; gray green; occasional argillaceous sandstone lenses 276-305 Very fine to medium argillaceous sandstone 305-360 Claystone with occasional argillaceous sandstone lenses 360-413 Fine to coarse argillaceous sandstone 413-448 Siltstone; gray 448-460 Fine argillaceous sandstone 460-487 Claystone gray green 487-552 Fine argillaceous sandstone 552-602 Claystone; gray green; occasionally silty with thin argillaceous sandstone lenses 602-614 Lignite; brown black 614-651 Claystone; gray green; occasionally silty with thin argillaceous sandstone lenses		

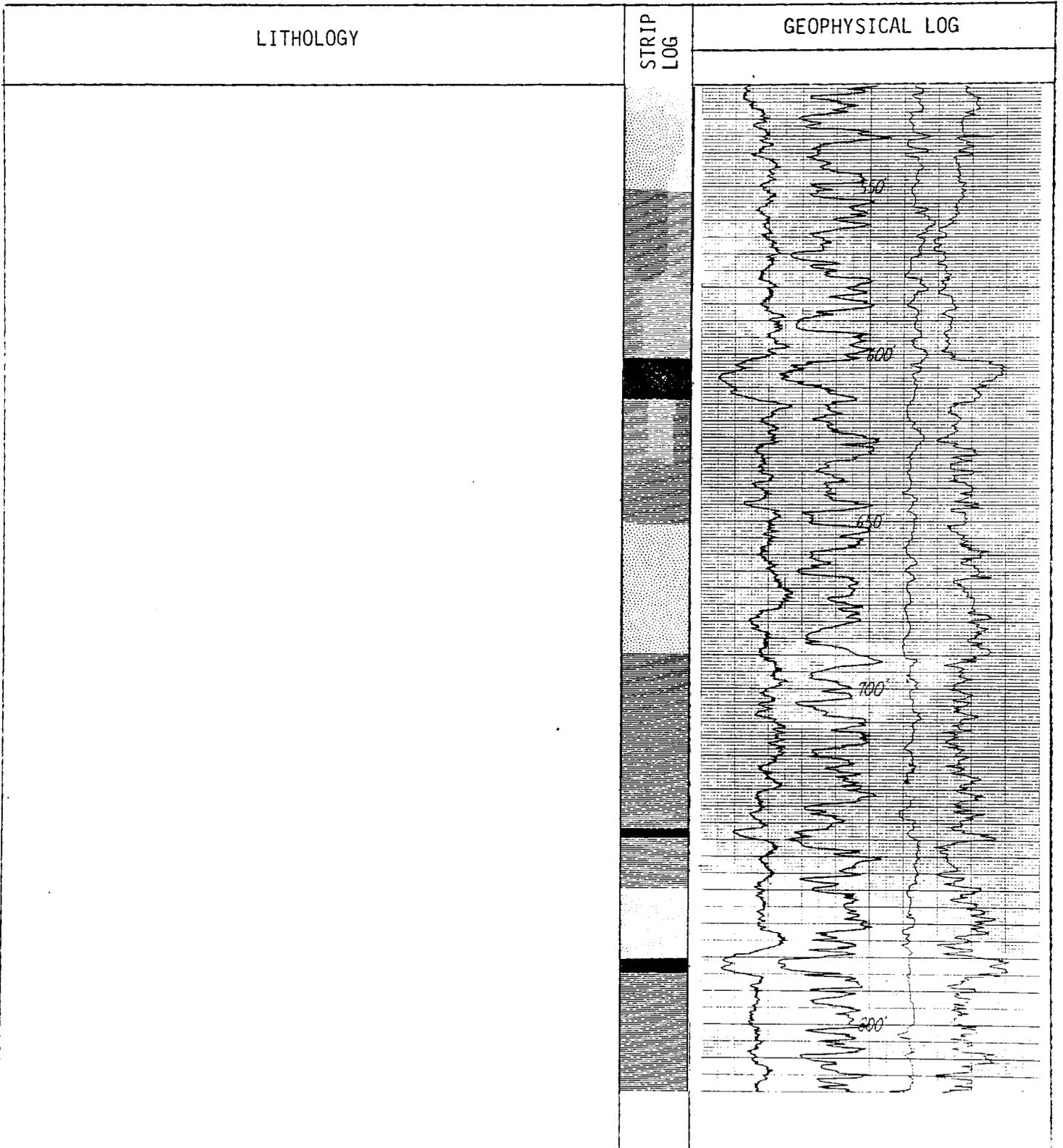
COLORADO GEOLOGICAL SURVEY

Hole No. CGS-31 - Continued



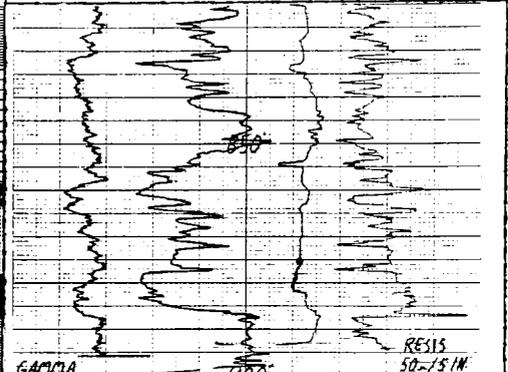
COLORADO GEOLOGICAL SURVEY

Hole No. CGS-31 - Continued



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-31 - Continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
		 <p data-bbox="970 849 1447 963"> RESIS 50-75 IN GAMMA 100 10% IN DENSITY 100 CALIPER TC-2 50% IN 4" 4" 8" 15/71N TC-1 </p>

COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-32 State Colorado County Arapahoe Date logged 3/20/80 Elev.(ft) 5755

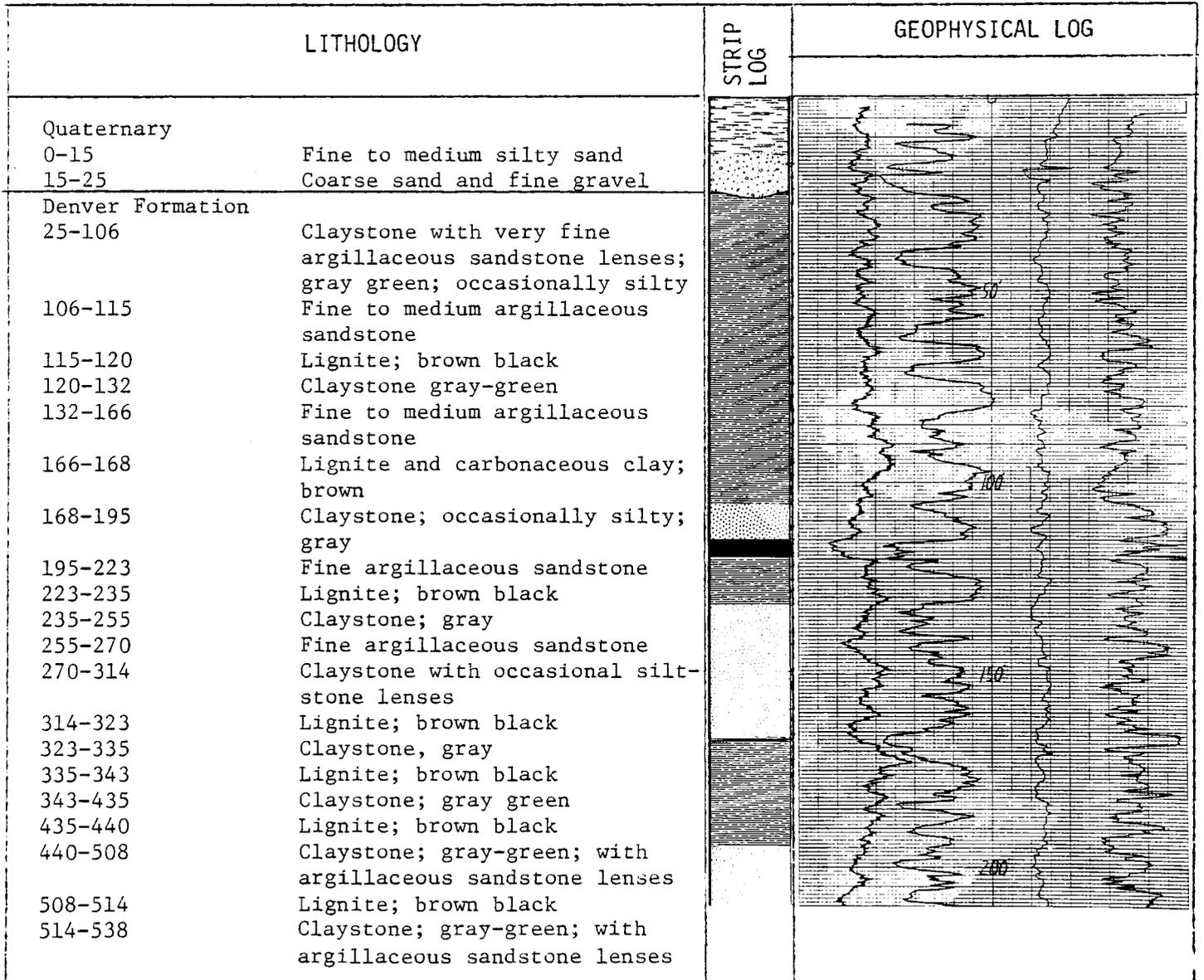
Location: T. 4 S., R. 65 W., secs. NENE 10 Cored: Yes No X

Drilled depth 580 Logged depth 580 Drilling Medium Mud Fluid level 4

Geophysical logs:

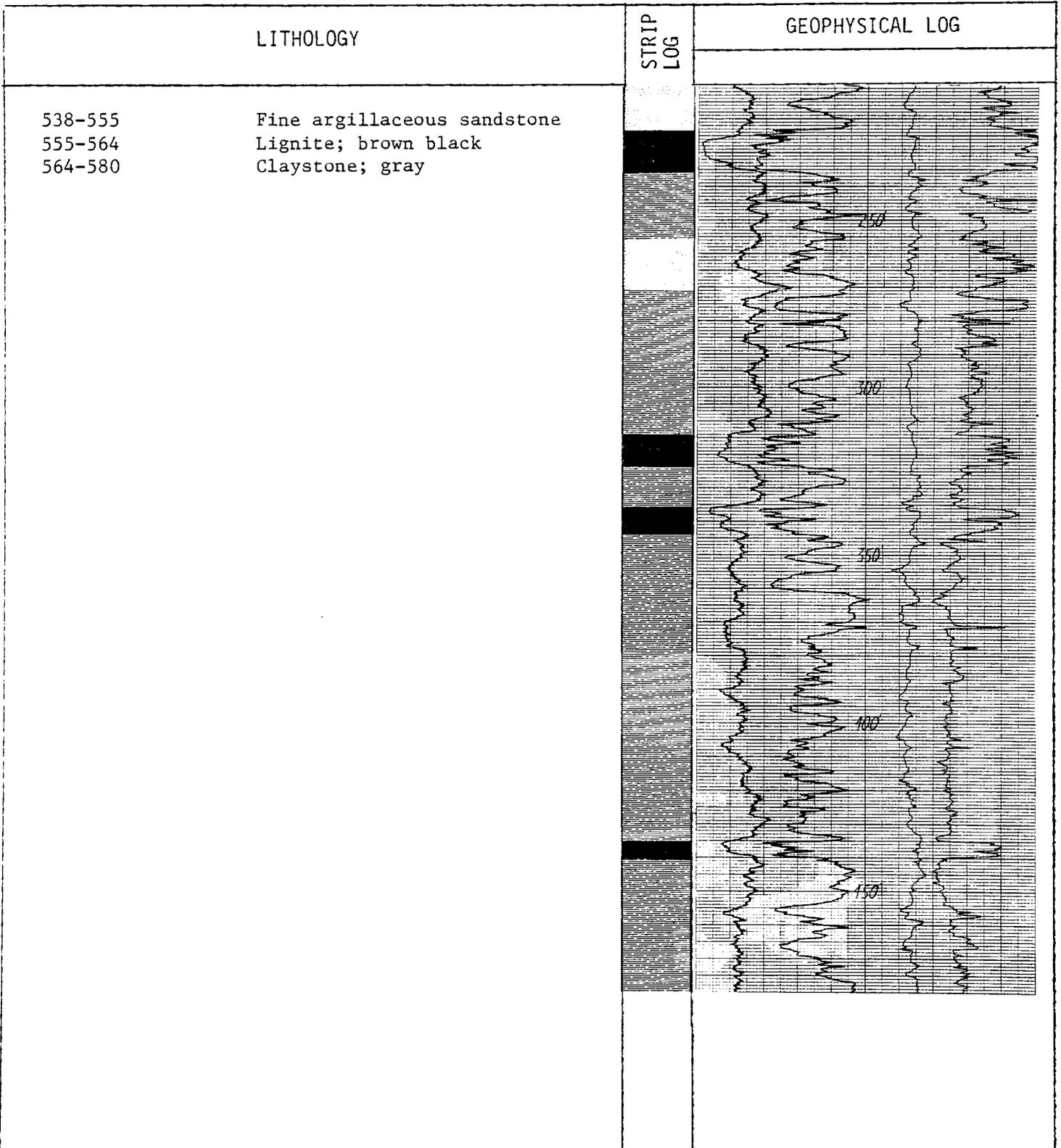
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 50 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 2 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/in	Logging speed 15	fpm

Remarks: Coal Creek Quadrangle



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-32 - Continued



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-32 - Continued

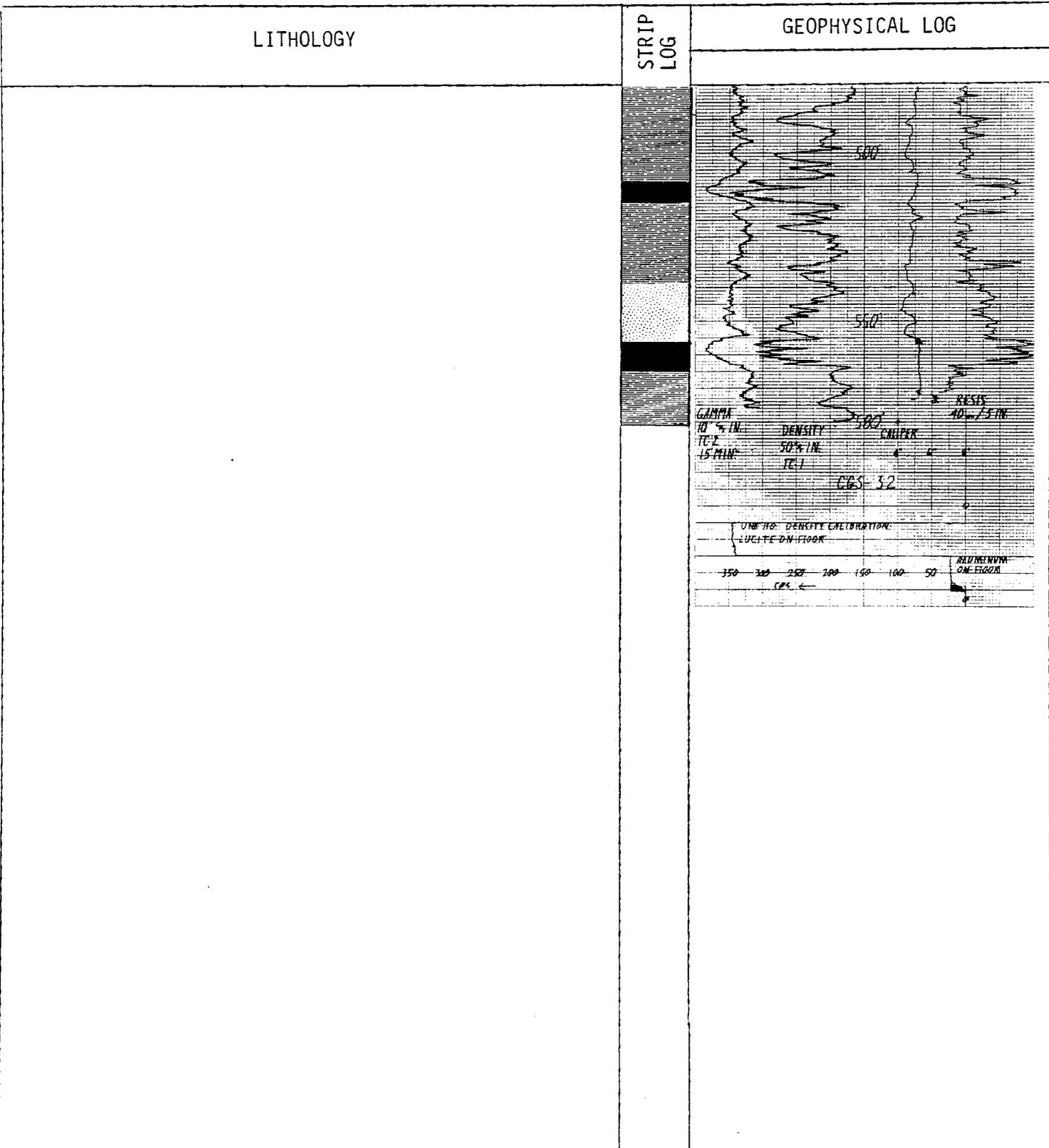


TABLE 1

COAL-ANALYSIS REPORT

ORGANIZATION: COLORADO GEOLOGICAL SURVEY
 SAMPLE ID: #1, CGS-30c CORE SAMPLE, COAL
 INTERVAL SAMPLED: 346'-362'

OPR: DENVER FMTN, PALEOCENE AGE MINE: DRILL HOLE, UNNAMED BED
 STATE: CO COUNTY: ELBERT BED: DEPTH INT.
 TOWN: -

DATE OF SAMPLING: 3/22/80 DATE RECEIVED: 6/26/80 DATE OF REPORT: 7/11/80
 COLLECTOR: K. BRAND

	COAL AS RECD.	COAL MOIST FREE
PROXIMATE ANALYSIS		
MOISTURE	27.75	N/A
VOLATILE MATTER	21.84	30.23
FIXED CARBON	14.30	19.79
ASH	36.11	49.98
ULTIMATE ANALYSIS		
	X	
HYDROGEN	2.34	3.24
CARBON	23.67	32.76
NITROGEN	0.49	0.68
SULFUR	0.51	0.71
OXYGEN (DIFF)	9.12	12.62
ASH	36.11	49.98
CHLORINE		
HEATING VALUE BTU/LB	4164	5764
SULFUR FORMS		
SULFATE		
PYRITIC		
ORGANIC		
EQUILIBRIUM MOISTURE		24.36
MOIST, MINERAL MATTER FREE, BTU	6753	
APPARENT RANK LIGNITE A		

NOTE: ANALYSIS INCLUDES ALL CLAY PARTINGS

TABLE 1 CON'T

<u>MINERAL ANALYSIS OF ASH</u>	<u>PERCENT WEIGHT IGNITED BASIS</u>
SILICA, SiO ₂	51.87
ALUMINA, Al ₂ O ₃	33.47
TITANIA, TiO ₂	1.36
FERRIC OXIDE, Fe ₂ O ₃	2.68
LIME, CaO	3.95
MAGNESIA, MgO	0.52
POTASSIUM OXIDE, K ₂ O	1.38
SODIUM OXIDE, Na ₂ O	0.37
SULFUR TRIOXIDE, SO ₃	3.49
PHOS. PENTOXIDE, P ₂ O ₅	0.20
UNDETERMINED	0.71
	<u>100.00</u>
ALKALIES AS Na ₂ O, DRY COAL BASIS	= 0.64
SILICA VALUE	= 87.89
BASE: ACID RATIO	= 0.10
ESTIMATED VISCOSITY AT CRITICAL VISCOSITY	
TEMPERATURE OF XXXXX °F = XXXXX POISES	
T ₂₅₀ TEMPERATURE = >2900 °F	
FOULING INDEX = <0.2	
SLAGGING INDEX = <0.6	

TABLE 2
COAL-ANALYSIS REPORT

ORGANIZATION: COLORADO GEOLOGICAL SURVEY
 SAMPLE ID: #2, CGS 30c CORE SAMPLE, COAL
 INTERVAL SAMPLED: 422'-442'

OPR: DENVER FMTN, PALEOCENE AGE MINE: DRILL HOLE, UNNAMED BED
 STATE: CO COUNTY: ELBERT BED: DEPTH INT.
 TOWN: -

DATE OF SAMPLING: 3/22/80 DATE RECEIVED: 6/26/80 DATE OF REPORT: 7/11/80
 COLLECTOR: K. BRAND

	COAL AS RECD.		COAL MOIST FREE	
PROXIMATE ANALYSIS				
MOISTURE	30.92	.....	N/A	.....
VOLATILE MATTER	22.67	.....	32.82	.....
FIXED CARBON	20.97	.....	30.36	.....
ASH	25.44	.....	36.82	.....
ULTIMATE ANALYSIS				
HYDROGEN	2.52	.....	3.65	.....
CARBON	30.67	.....	44.40	.....
NITROGEN	0.59	.....	0.85	.....
SULFUR	0.26	.....	0.37	.....
OXYGEN (DIFF)	9.59	.....		.....
ASH	25.44	.....	36.82	.....
CHLORINE	0.01	.....	0.01	.....
HEATING VALUE BTU/LB	5164	.....	7476	.....
SULFUR FORMS				
SULFATE	0.00	.....	0.00	.....
PYRITIC	0.01	.....	0.02	.....
ORGANIC	0.25	.....	0.35	.....

EQUILIBRIUM MOISTURE 28.87

MOIST, MINERAL MATTER FREE, BTU 7079

APPARENT RANK LIGNITE A

NOTE: ANALYSIS INCLUDES ALL CLAY PARTINGS

TABLE 2 CON'T

<u>MINERAL ANALYSIS OF ASH</u>	<u>PERCENT WEIGHT IGNITED BASIS</u>
SILICA, SiO ₂	55.32
ALUMINA, Al ₂ O ₃	28.34
TITANIA, TiO ₂	1.20
FERRIC OXIDE, Fe ₂ O ₃	2.56
LIME, CaO	6.67
MAGNESIA, MgO	0.86
POTASSIUM OXIDE, K ₂ O	1.00
SODIUM OXIDE, Na ₂ O	0.27
SULFUR TRIOXIDE, SO ₃	2.61
PHOS. PENTOXIDE, P ₂ O ₅	0.72
UNDETERMINED	<u>0.45</u>
	100.00
ALKALIES AS Na ₂ O, DRY COAL BASIS	= 0.34
SILICA VALUE	= 84.57
BASE: ACID RATIO	= 0.13
ESTIMATED VISCOSITY AT CRITICAL VISCOSITY TEMPERATURE OF XXXXX °F = XXXXX POISES	
T ₂₅₀ TEMPERATURE = >2900 °F	
FOULING INDEX = <0.2	
SLAGGING INDEX = <0.6	

TABLE 3

COAL-ANALYSIS REPORT

ORGANIZATION: COLORADO GEOLOGICAL SURVEY
 SAMPLE ID: #3, CGS 30c CORE SAMPLE, COAL
 INTERVAL SAMPLED: 595'-610'

OPR: DENVER FMTN, PALEOCENE AGE MINE: DRILL HOLE, UNNAMED BED
 STATE: CO COUNTY: ELBERT BED: DEPTH INT.
 TOWN: -

DATE OF SAMPLING: 3/22/80 DATE RECEIVED: 6/26/80 DATE OF REPORT: 7/11/80
 COLLECTOR: K. BRAND

	COAL AS RECD.	COAL MOIST FREE
PROXIMATE ANALYSIS		
MOISTURE	26.98	N/A
VOLATILE MATTER	21.91	30.00
FIXED CARBON	17.67	24.21
ASH	33.44	45.79
ULTIMATE ANALYSIS		
HYDROGEN	2.55	3.49
CARBON	25.84	35.39
NITROGEN	0.46	0.63
SULFUR	0.34	0.34
OXYGEN (DIFF)	10.38	14.22
ASH	33.44	45.79
CHLORINE	0.01	0.01
HEATING VALUE BTU/LB	4521	6192
SULFUR FORMS		
SULFATE	0.01	0.02
PYRITIC	0.04	0.06
ORGANIC	0.29	0.39

EQUILIBRIUM MOISTURE 25.94

MOIST, MINERAL MATTER FREE, BTU 7048

APPARENT RANK LIGNITE A

NOTE: ANALYSIS INCLUDES ALL CLAY PARTINGS

TABLE 3 CON'T

<u>MINERAL ANALYSIS OF ASH</u>	<u>PERCENT WEIGHT IGNITED BASIS</u>
SILICA, SiO ₂	53.46
ALUMINA, Al ₂ O ₃	31.73
TITANIA, TiO ₂	1.26
FERRIC OXIDE, Fe ₂ O ₃	2.58
LIME, CaO	4.65
MAGNESIA, MgO	0.92
POTASSIUM OXIDE, K ₂ O	1.21
SODIUM OXIDE, Na ₂ O	0.36
SULFUR TRIOXIDE, SO ₃	2.66
PHOS. PENTOXIDE, P ₂ O ₅	0.36
UNDETERMINED	<u>0.81</u>
	100.00
ALKALIES AS Na ₂ O, DRY COAL BASIS	= 0.53
SILICA VALUE	= 86.77
BASE: ACID RATIO	= 0.11
ESTIMATED VISCOSITY AT CRITICAL VISCOSITY TEMPERATURE OF XXXXX °F = XXXXX POISES T ₂₅₀ TEMPERATURE = >2900 °F	
FOULING INDEX = <0.2	
SLAGGING INDEX = <0.6	

TABLE 4

COAL-ANALYSIS REPORT

ORGANIZATION: COLORADO GEOLOGICAL SURVEY
 SAMPLE ID: #4, CGS 30c CORE SAMPLE, COAL
 INTERVAL SAMPLED: 610'-627'

OPR: DENVER FMTN, PALEOCENE AGE MINE: DRILL HOLE, UNNAMED BED
 STATE: CO COUNTY: ELBERT BED: DEPTH INT.
 TOWN: -

DATE OF SAMPLING: 3/22/80 DATE RECEIVED: 6/26/80 DATE OF REPORT: 7/11/80
 COLLECTOR: K. BRAND

	COAL AS RECD.	COAL MOIST FREE
PROXIMATE ANALYSIS		
MOISTURE	26.37	N/A
VOLATILE MATTER	20.76	28.20
FIXED CARBON	18.16	24.66
ASH	34.71	47.14

ULTIMATE ANALYSIS		
HYDROGEN	2.27	3.08
CARBON	26.64	36.18
NITROGEN	0.60	0.81
SULFUR	0.29	0.39
OXYGEN (DIFF)	9.06	12.32
ASH	34.71	47.14
CHLORINE	0.06	0.08

HEATING VALUE BTU/LB 4524 6144

SULFUR FORMS		
SULFATE	0.00	0.00
PYRITIC	0.04	0.05
ORGANIC	0.25	0.34

EQUILIBRIUM MOISTURE 25.22)

MOIST, MINERAL MATTER FREE, BTU 7195

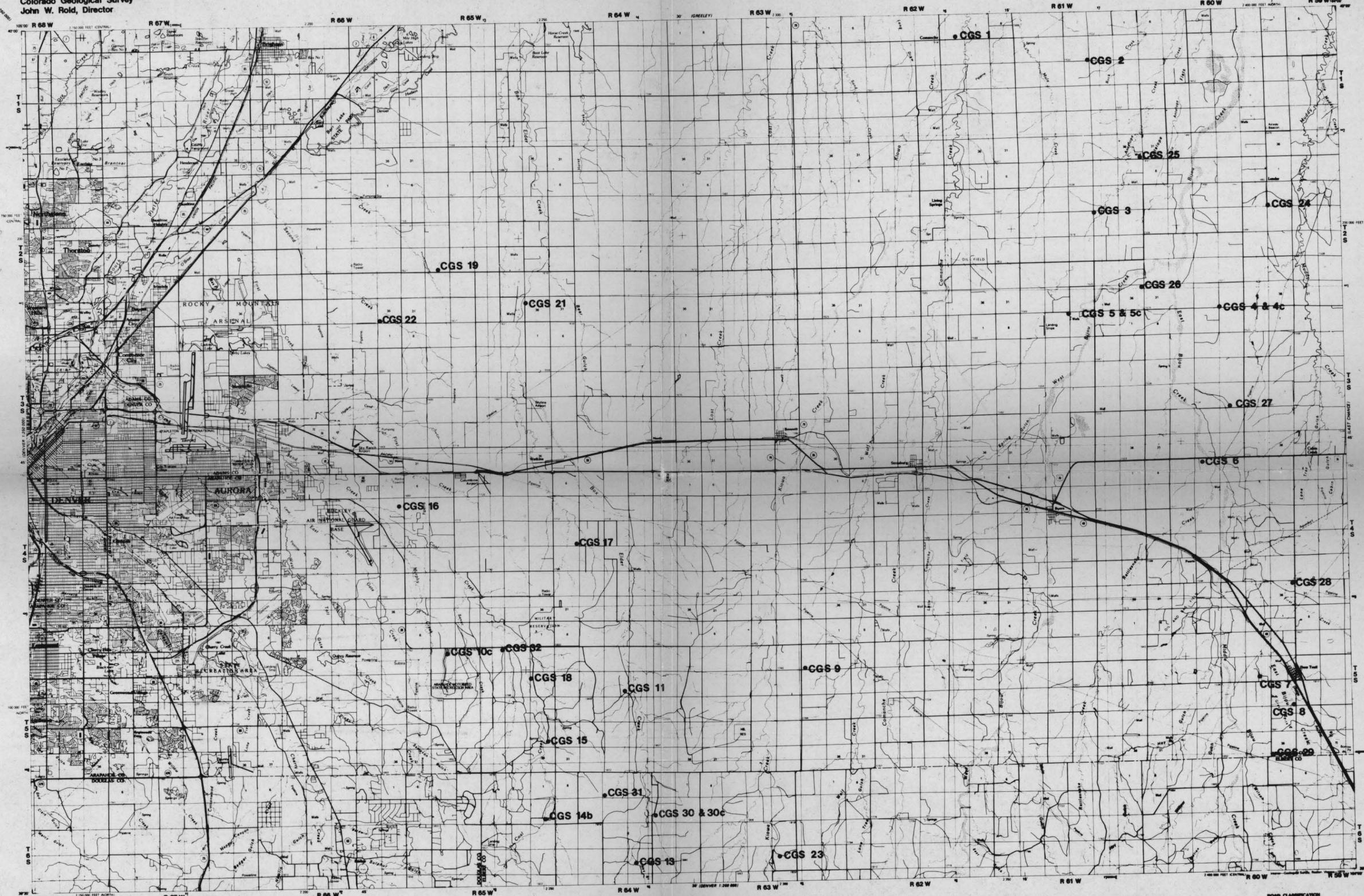
APPARENT RANK LIGNITE A

NOTE: ANALYSIS INCLUDES ALL CLAY PARTINGS

TABLE 4 CON'T

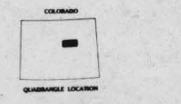
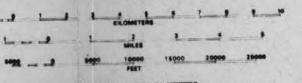
<u>MINERAL ANALYSIS OF ASH</u>	<u>PERCENT WEIGHT IGNITED BASIS</u>
SILICA, SiO_2	58.95
ALUMINA, Al_2O_3	28.15
TITANIA, TiO_2	1.07
FERRIC OXIDE, Fe_2O_3	2.43
LIME, CaO	4.27
MAGNESIA, MgO	0.98
POTASSIUM OXIDE, K_2O	1.36
SODIUM OXIDE, Na_2O	0.31
SULFUR TRIOXIDE, SO_3	2.55
PHOS. PENTOXIDE, P_2O_5	0.20
UNDETERMINED	<u>0.00</u>
	100.27
ALKALIES AS Na_2O , DRY COAL BASIS	= 0.57
SILICA VALUE	= 88.47
BASE: ACID RATIO	= 0.11
ESTIMATED VISCOSITY AT CRITICAL VISCOSITY	
TEMPERATURE OF XXXXX °F = XXXXX POISES	
T_{250} TEMPERATURE = >2900 °F	
FOULING INDEX = <0.2	
SLAGGING INDEX = <0.6	

INDEX MAP OF DRILL HOLE LOCATIONS, DENVER EAST QUADRANGLE



Produced by the Geological Survey
 in cooperation with the Soil Conservation Service
 Compiled from USGS 1:50,000-scale topographic maps
 dated 1955-1965. See index for dates of individual maps.
 Partially compiled from aerial photographs taken 1974-76
 and other source data. Revised information not field checked
 May 1979.

• Completed CGS Drill Hole Location



LEGEND

Personal access, lake	.....	○
Intermittent stream, lake	.....	○
Village or locality	.....	○
Landmark structure	.....	○
Public park or recreation area	.....	○
Fence or green land area	.....	○
Other public area or military or health reservation	.....	○

ROAD CLASSIFICATION

Primary highway, hard surface	.....
Secondary highway, hard surface	.....
Light-duty road, hard or improved surface	.....
Street or other road	.....
Trail	.....

DENVER EAST, COLORADO
 DENVER 60' BY 12.5' 1:50,000 SCALE MAP
 1979

This map complies with national map accuracy standards.