A Reinterpretation of Bedrock Contours Using Glacial Deposits

A Thesis

Presented in Partial Fulfillment of the Requirements

for the Degree Bachelor of Science

By

Jeff L. Reese

1973

Approved By:

Sidney E. White

Advisor

Department of Geology

Introduction

Field geologists, in many facets of research, need top-of-rock maps to aid them in their interpretation of ancient drainages, bedrock control of glacial deposits, and water resources. These maps are generally prepared using gas and water well data to determine at what elevation the drillers contacted bedrock. Although other means, such as electrical resistivity and seismic measurements are used to a degree, they are primarily utilized for estimation of bedrock depth.

The data ~~is~~ are plotted, and contours of bedrock elevations drawn. The accuracy of such determinations relies heavily upon the number of points plotted, the exactness of drillers' records, and, of course, the ability of the geologists to interpret the data. The purpose of this thesis is to reinterpret bedrock contours on a portion of a map of Licking County.

Location of Region of Study

Licking County is the third largest county in Ohio, covering 686 square miles in the east-central part of the state. It occupies part of two physiographic provinces, the Kanawha section of the Appalachian Plateau in the east, and the Till Plains section of the Central Lowlands in the west.[1]

Monroe Township, the area with which this study is concerned, lies in the west-central portion of the county, bordered by Hartford Township to the north, Liberty Township to the east, Jersey Township to the south, and Harlem Township, Delaware County, to the west.

[1] Dove, George D., 1960, Water Resources of Licking County: Ohio Dept. Nat. Res., Div. of Water, Bull. 36, p. 1.

Location of Area of Study

The principle stream is Raccoon Creek, which flows southeasterly.

Buried valleys underlie parts of Monroe Township. The largest of these extends from the northeast corner of the township south into Jersey Township, passing under the municipality of Johnstown. The bedrock floor of this valley lies more than 450 feet below the general land surface.[2] The bedrock of the township is the Raccoon shale Member of the Cuyahoga Formation, which is Mississippian.[3]

Previous Investigations

The Illinoian and Wisconsin glacial deposits in Licking County were described and mapped by Frank Leverett, in 1902. In their presentation of 1943, Wilbur Stout, Karl Ver Steeg, and G. F. Lamb discussed groundwater conditions at specific localities in Licking County. Also described, in general terms, were the water-bearing properties of the consolidated and unconsolidated deposits. Dove, in his 1960 report of the Division of Water, for the State of Ohio Department of Natural Resources, presented the water resources of Licking County. In his report, he also included the bedrock contours of pre-glacial drainages.

Purpose

As stated previously, the purpose of this investigation is to reinterpret bedrock contours on a portion of a map of Licking County, near Johnstown, using well log data in conjunction with cross-sections of glacial deposits of the area. The cross-sections provide information enabling interpretations of possible elevations of bedrock for those wells which do not reach bedrock. With the additional,

[2] Ibid. p.70
[3] Ibid. p.52

albeit questionable data, a more accurate contour map is feasible.

Method of Investigation

The procedures used in this investigation were formulated after the construction of three cross-sections for the use in the determination of bedrock control of glacial deposits. Using water well logs obtained from the Ohio Division of Water, cross-section 1., Appendix B, a bedrock "high" was observed where, according to Dove's contours[4], a buried valley exists. Upon further examination of additional cross-sections, the differences of highs and lows became more apparent.

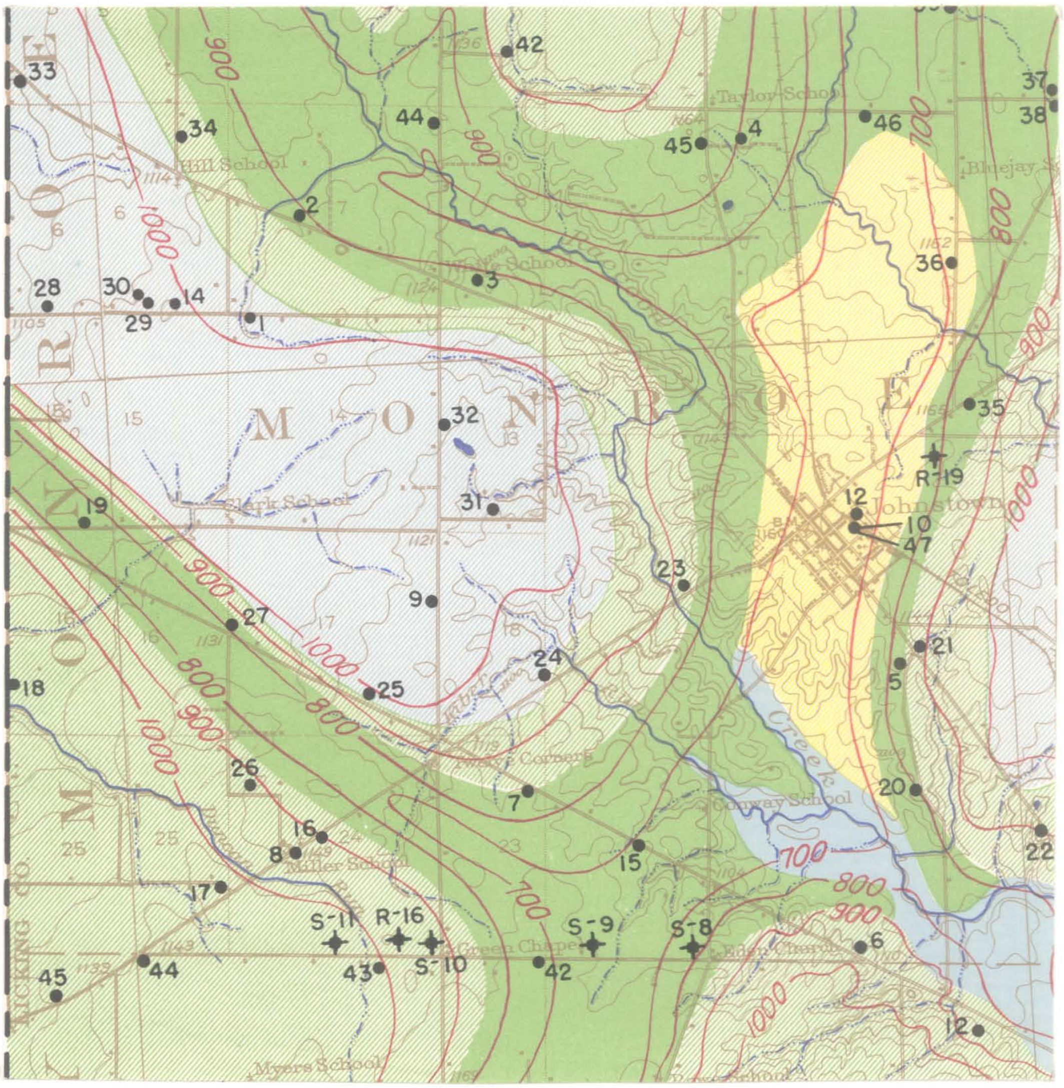
Well logs of the Division of Water were used to construct additional cross-sections enabling a more complete and accurate image of the structure of the subsurface. Many of these wells, however, did not reach bedrock, and I was therefore forced to locate other wells which were on record, but not located on the Division's index map for the townships involved. Although these additional wells proved helpful, they did not give as much bedrock control as desired. In view of this, I correlated various sand and gravel, and till bodies of wells with those of wells that were geographically nearby. From this, I interpreted possible bedrock elevations for those wells which had not originally reached bedrock. These are shown in Appendix B, with known bedrock indicated as solid lines and interpreted bedrock as dashed lines. A surprisingly close estimation of bedrock elevations from different cross-sections containing the same wells resulted, with a maximum difference of approximately 10 feet, these being attained from two entirely unrelated sources.

4 Ibid. Plate 1.

These wells, of both known and assumed bedrock elevations, were plotted, along with selected data from Dave's original map (Plate 1), on a mylar overlay (Plate 2). The elevations were then plotted (Plate 3) and the area contoured (Plate 4). The valleys shown are clearly displaced from Dove's valleys; but, it must be noted that Dove's work is amazingly accurate, considering the few wells used and the fact that he was contouring on a general scale.

As can be seen from cross-section #1, wells W-63, W-U, W-V, W-T, W-66, and W-14 (Appendix A) are in close proximity to each other. The elevations of the upper sand bodies of W-63, W-V, and W-T indicate that these are contemporaneous, and tend to parallel the bedrock. Likewise, the lower sand bodies, including those of W-66 and W-14, also tend to follow varying bedrock depths. The clays between the upper and lower sands are described as "sandy clay", "clay", or "blue clay and gravel", which can only be inferred as different drillers' terms for essentially the same till. In some cross-sections of Appendix A, sand, gravel or hardpan layers are missing in the drillers' records, but should have been noticed and recorded. In these cases, I assumed that they were indeed present, and simply not recorded.

It is on this basis that I have interpreted and shown various bedrock elevations, as on Plate 4. There may be a considerable amount of error in my interpretations due to the small scope with which I am concerned and the assumptions that the drillers' were not entirely accurate. Investigations on a finer scale would give one a greater degree of accuracy, due to the increased amount of information. A study of larger scope would also give the investigator more knowledge of the surrounding areas. In addition, standardization of terminology among well drillers would aid other investigators immensely.



Taylor School
Hill School
Clark School
Johnstown
Conway School
Miller School
Green Chapel
Myers School
Creek
M O N R O E
900
1000
800
700
33
42
34
44
45
4
46
37
38
2
3
36
28
30
29
14
1
32
35
R-19
19
31
12
10
47
23
9
27
21
5
18
24
25
26
20
7
16
8
15
22
17
S-11
R-16
S-10
S-9
S-8
6
43
42
44
45
12

Plate 1

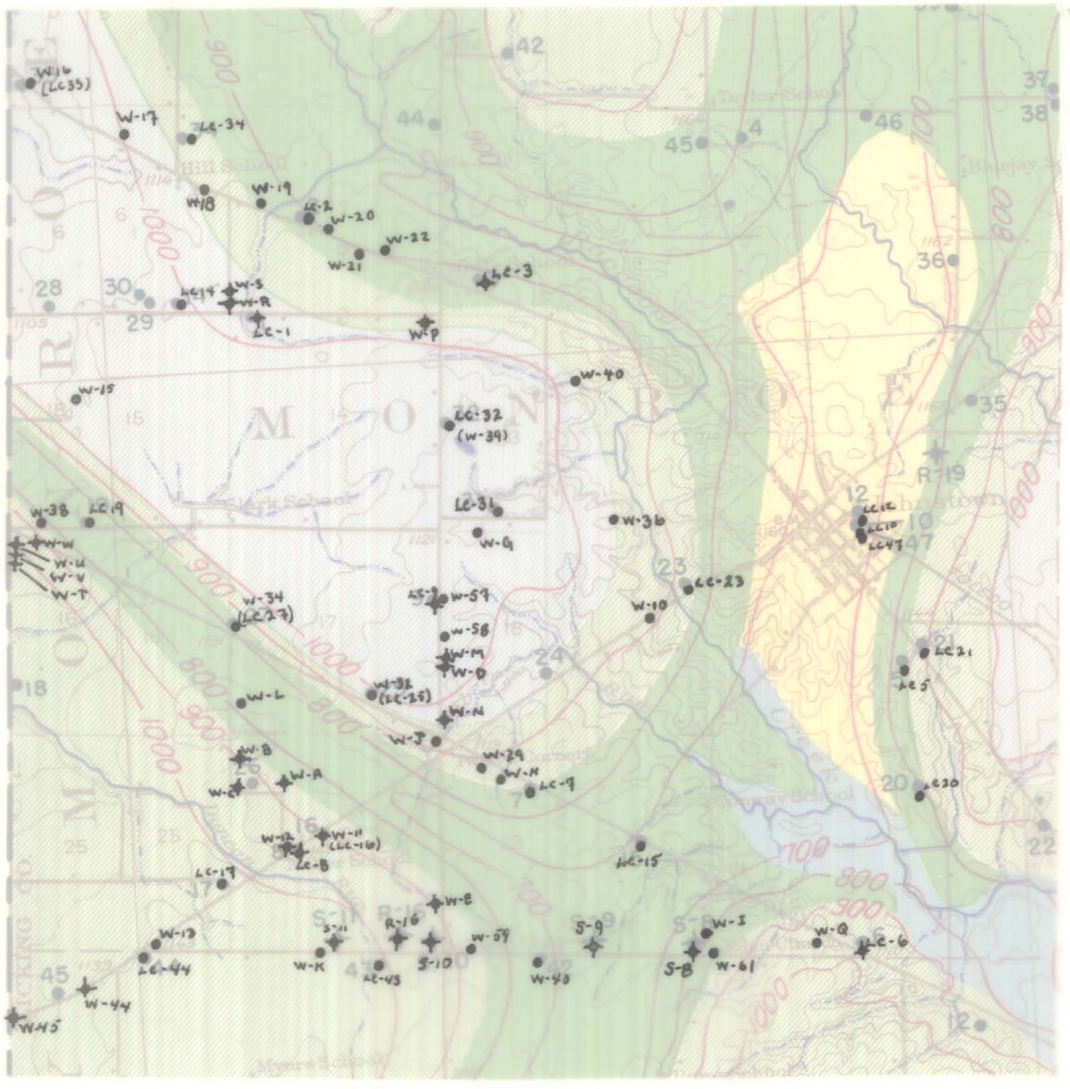

W-16 (LC-35)
W-17
LC-34
W-18
W-19
LC-2
W-20
W-22
W-21
LC-3
LC-14
W-S
W-R
LC-1
W-P
W-15
W-40
LC-32 (W-39)
W-38
LC-13
LC-31
W-36
W-Q
W-W
W-U
W-V
W-T
W-34 (LC-27)
W-57
W-10
LC-23
W-58
W-M
W-O
W-33 (LC-25)
W-L
W-N
W-J
W-29
W-H
LC-9
W-B
W-A
W-C
W-12
W-11 (LC-16)
LC-8
LC-15
LC-17
W-E
R-16
W-13
LC-44
W-K
S-11
S-10
W-59
LC-43
W-43
S-9
W-I
S-8
W-61
W-Q
LC-6
W-44
W-45
R-19
LC-12
LC-10
LC-47
LC-21
LC-5
LC-20
100
800
900
1000

Plate 2

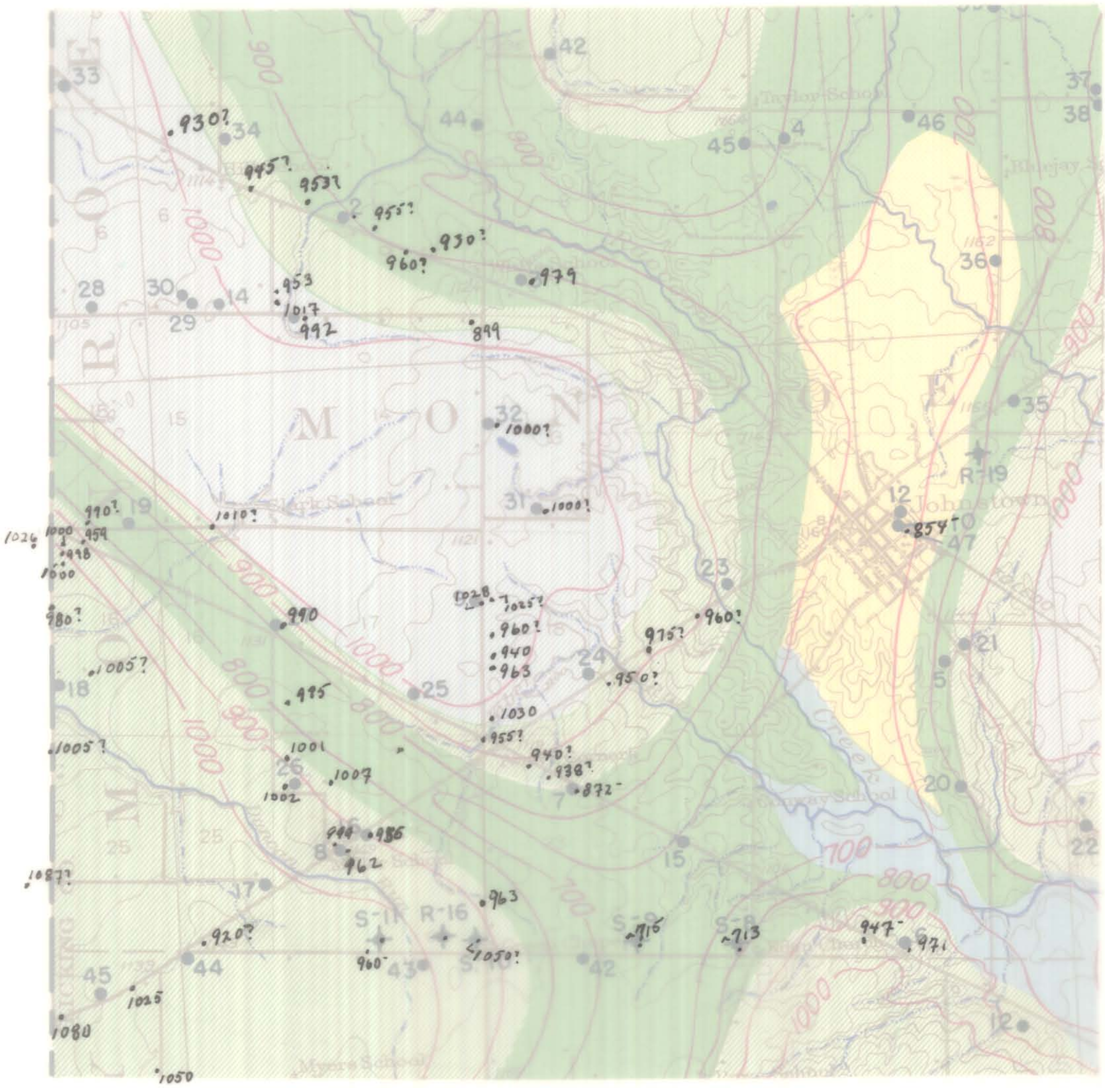


Plate 3

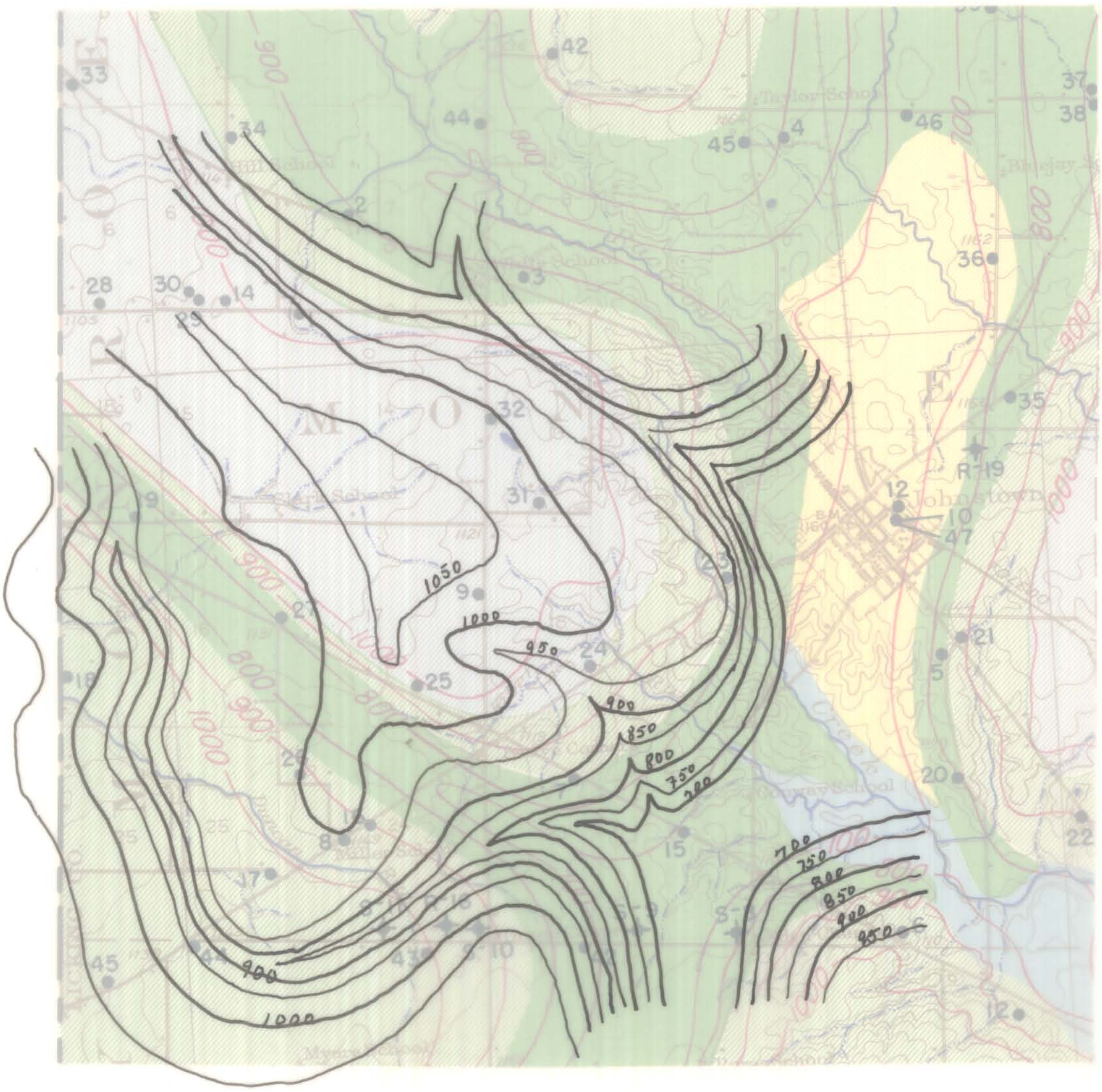


Plate 4

APPENDIX A

WATER WELL LOGS

LICKING COUNTY - MONROE TOWNSHIP

Formations	From	To
Sandstone, shale, limestone, gravel, and clay		

1.) W-#8 Depth to Bedrock 106* feet

Yellow Clay	0 ft.	12 ft.
Blue Clay	12 ft.	28 ft.
Muddy Sand	28 ft.	58 ft.
Blue Clay	58 ft.	103 ft.
Sand and Gravel	103 ft.	106 ft.

2.) W-#9 Depth to Bedrock 84* feet

Yellow Clay	0 ft.	10 ft.
Sandy Blue Clay	10 ft.	40 ft.
Muddy Gravel	40 ft.	66 ft.
Muddy Sand	66 ft.	75 ft.
Shooty Gravel	75 ft.	84 ft.

3.) W-#10 Depth to Bedrock 88* feet

	From	To
Yellow Clay	0 ft.	19 ft.
Blue Clay	19 ft.	80 ft.
Gravel	80 ft.	88 ft.

4.) W-#11 Depth to Bedrock 194 feet

Top Soil	0 ft	2 ft.
Yellow Clay	2 ft.	10 ft.
Sandy Blue Clay	10 ft.	105 ft.
Yellow Sand	105 ft.	108 ft.
Sandy Blue Clay	108 ft.	137 ft.
Yellow Clay	137 ft.	141 ft.
Sandy Blue Clay	141 ft.	194 ft.
Rock	194 ft.	215 ft.

5.) W-#12 Depth to Bedrock 151 feet

Yellow Clay	0 ft.	10 ft.
Blue Clay	10 ft.	30 ft.
Potters Clay	30 ft.	70 ft.
Sandy Blue Clay	70 ft.	86 ft.
Sand and Gravel	86 ft.	100 ft.
Sandy Clay	100 ft.	151 ft.
Shale	151 ft.	158 ft.

6.) W-#13 Depth to Bedrock 222* feet

	From	To
Yellow Clay	0 ft.	10 ft.
Blue Clay	10 ft.	102 ft.
Sand	102 ft.	104 ft.
Quick Sand	104 ft.	105 ft.
Sandy Clay	105 ft.	138 ft.
Quick Sand	138 ft.	148 ft.
Sandy Blue Clay	148 ft.	217 ft.
Sand and Gravel	217 ft.	222 ft.

7.) W-#14 Depth to Bedrock 94* feet

Yellow Clay	0 ft.	5 ft.
Sandy Clay	5 ft.	91 ft.
Sand	91 ft.	94 ft.

8.) W-#16 Depth to Bedrock 58* feet

Yellow Clay	0 ft.	11 ft.
Blue Clay	11 ft.	58 ft.

9.) W-#17 Depth to Bedrock 123* feet

	From	To
Clay	0 ft.	24 ft.
Gravel	24 ft.	26 ft.
Clay	26 ft.	37 ft.
Sand	37 ft.	39 ft.
Clay	39 ft.	82.5ft.
Fine Sand	82.5 ft.	95.5ft.
Clay	95.5 ft.	104 ft.
Sand and Gravel	104 ft.	109 ft.
Clay	109 ft.	121 ft.
Sand and Gravel	121 ft.	123 ft.

10.) W-#18 Depth to Bedrock 45* feet

Yellow Clay	0 ft.	7 ft.
Blue Clay and Gravel	7 ft.	22 ft.
Quick Sand	22 ft.	39 ft.
Blue Clay	39 ft.	43 ft.
Gravel	43 ft.	45 ft.

11.) W-#19 Depth to Bedrock 89* feet

Yellow Clay	0 ft.	8 ft.
Blue Clay	8 ft.	28 ft.
Quick Sand	28 ft.	37 ft.
Blue Clay	37 ft.	87 ft.
Gravel	87 ft.	89 ft.

12.) W-#20 Depth to Bedrock 95* feet

	From	To
Clay	0 ft.	65 ft.
Sand	65 ft.	70 ft.
Dirty Sand	70 ft.	92 ft.
Sand	92 ft.	93 ft.
Gravel	93 ft.	95 ft.

13.) W-#21 Depth to Bedrock 96* feet

Pit	0 ft.	4 ft.
Yellow Clay	4 ft.	10 ft.
Blue Clay	10 ft.	92 ft.
Sand	92 ft.	94 ft.
Gravel	94 ft.	96 ft.

14.) W-#22 Depth to Bedrock 202* feet

Yellow Clay	0 ft.	8 ft.
Blue Clay	8 ft.	73 ft.
Sandy Clay	73 ft.	130 ft.
Sand	130 ft.	131 ft.
Blue Clay	131 ft.	171 ft.
Yellow Quick Sand	171 ft.	175 ft.
Potters Clay	175 ft.	191 ft.
Sand	191 ft.	202 ft.

15.) W-#28 Depth to Bedrock 201* feet

	From	To
Yellow Clay	0 ft.	25 ft.
Blue Clay	25 ft.	175 ft.
Fine Yellow Sand	175 ft.	180 ft.
Soft Yellow Gravel	180 ft.	190 ft.
Black Gravel	190 ft.	195 ft.
Black Pump Sand	195 ft.	201 ft.

16.) W-# 29 Depth to Bedrock 193* feet

Yellow Clay	0 ft.	12 ft.
Blue Clay	12 ft.	85 ft.
Sandy Clay	85 ft.	188 ft.
Sand and Gravel	188 ft.	193 ft.

17.) W-#34 Depth to Bedrock 117* feet

Yellow Clay	0 ft.	6 ft.
Sandy Blue Clay	6 ft.	109 ft.
Sand and Gravel	109 ft.	117 ft.

18.) W-#36 Depth to Bedrock 148* feet

Yellow Clay	0 ft.	8 ft.
Blue Clay	8 ft.	136 ft.
Quick Sand	136 ft.	139 ft.
Blue Clay	139 ft.	145 ft.
Sand and Gravel	145 ft.	148 ft.

19.) W-#37 Depth to Bedrock 121* feet

	From	To
Yellow Clay	0 ft.	10 ft.
Blue Clay	10 ft.	38 ft.
Sand	38 ft.	39 ft.
Gravel and Clay	39 ft.	48 ft.
Blue Clay	48 ft.	57 ft.
Sandy Clay	57 ft.	72 ft.
Blue Clay	72 ft.	116 ft.
Gravel	116 ft.	121 ft.

20.) W-#38 Depth to Bedrock 66* feet

Yellow Clay	0 ft.	15 ft.
Blue Clay	15 ft.	45 ft.
Clay and Gravel	45 ft.	64 ft.
Gravel	64 ft.	66 ft.

21.) W-#39 Depth to Bedrock 152* feet

Top Soil	0 ft.	2 ft.
Yellow Clay	2 ft.	5 ft.
Blue Clay	5 ft.	81 ft.
Sand	81 ft.	82 ft.
Blue Clay	82 ft.	144 ft.
Gravel	144 ft.	152 ft.

22.) W-#40 Depth to Bedrock 139* feet

	From	To
Yellow Clay	0 ft.	18 ft.
Blue Clay	18 ft.	139 ft.

23.) W-#57 Depth to Bedrock 66* feet

Yellow Clay	0 ft.	17 ft.
Blue Clay	17 ft.	66 ft.

24.) W-#58 Depth to Bedrock 56* feet

Yellow Clay	0 ft.	8 ft.
Blue Clay	8 ft.	15 ft.
Sandy Blue Clay	15 ft.	53 ft.
Sand	53 ft.	56 ft.

25.) W-#59 Depth to Bedrock 135* feet

Yellow Clay	0 ft.	10 ft.
Blue Clay	10 ft.	32 ft.
Muddy Gravel	32 ft.	39 ft.
Blue Clay	39 ft.	60 ft.
Yellow Muddy Gravel	60 ft.	65 ft.
Blue Clay	65 ft.	133 ft.
Hardpan	133 ft.	135 ft.

26.) W-#61 Depth to Bedrock 67* feet

	From	To
Yellow Clay	0 ft.	12 ft.
Blue Clay	12 ft.	63 ft.
Sand	63 ft.	67 ft.

27.) W-#62 Depth to Bedrock 186* feet

Clay	0 ft.	28 ft.
Fine Sand	28 ft.	28.5ft.
Blue Clay	28.5ft.	68 ft.
Quick Sand	68 ft.	69 ft.
Blue Clay	69 ft.	161 ft.
Hardpan	161 ft.	181 ft.
Gravel	181 ft.	185 ft.
Blue Clay	185 ft.	186 ft.

28.) W-#63 Depth to Bedrock 124* feet

Yellow Clay	0 ft.	9 ft.
Blue Clay	9 ft.	34 ft.
Quick Sand	34 ft.	40 ft.
Sandy Clay	40 ft.	120 ft.
Sand	120 ft.	124 ft.

29.) W-A Depth to Bedrock 143 feet

	From	To
Yellow Clay	0 ft.	10 ft.
Blue Clay	10 ft.	46 ft.
Quick Sand	46 ft.	53 ft.
Blue Clay	53 ft.	110 ft.
Hardpan	110 ft.	111 ft.
Sandy Blue Clay	111 ft.	143 ft.
Rock	143 ft.	146 ft.

30.) W-B Depth to Bedrock 136 feet

Yellow Clay	0 ft.	9 ft.
Blue Clay	9 ft.	68 ft.
Blue Sandy Clay	68 ft.	105 ft.
Muddy Sand	105 ft.	108 ft.
Blue Sandy Clay	108 ft.	136 ft.
Yellow Shale	136 ft.	138 ft.
Rock	138 ft.	165 ft.

31.) W-C Depth to Bedrock 132 feet

Clay	0 ft.	132 ft.
Yellow Shale	132 ft.	138 ft.

32.) W-D Depth to Bedrock 172 feet

	From	To
Clay	0 ft.	172 ft.
Gray Shale	172 ft.	174 ft.

33.) W-E Depth to Bedrock 183 feet

Yellow Clay	0 ft.	18 ft.
Gray Clay	18 ft.	183 ft.
Gray Shale	183 ft.	221 ft.

34.) W-G Depth to Bedrock 59* feet

Clay	0 ft.	53 ft.
Sand and Gravel	53 ft.	59 ft.

35.) W-H Depth to Bedrock 172* feet

Yellow Clay	0 ft.	9 ft.
Blue Clay and Gravel	9 ft.	44 ft.
Muddy Sand	44 ft.	47 ft.
Blue Clay	47 ft.	132 ft.
Blue Sandy Clay	132 ft.	170 ft.
Sand	170 ft.	171 ft.
Hardpan	171 ft.	172 ft.

36.) W-I Depth to Bedrock 62* feet

	From	To
Yellow Clay	0 ft.	11 ft.
Blue Clay	11 ft.	57 ft.
Sand and Gravel	57 ft.	61 ft.
Blue Sandy Clay	61 ft.	62 ft.

37.) W-J Depth to Bedrock 153* feet

Yellow Clay	0 ft.	8 ft.
Blue Clay and Gravel	8 ft.	33 ft.
Yellow Sandy Clay	33 ft.	40 ft.
Blue Sandy Clay	40 ft.	98 ft.
Sand	98 ft.	103 ft.
Blue Sandy Clay	103 ft.	151 ft.
Yellow Sand	151 ft.	153 ft.

38.) W-K Depth to Bedrock 195* feet

Yellow Clay	0 ft.	14 ft.
Blue Clay	14 ft.	27 ft.
Yellow Clay and Gravel	27 ft.	37 ft.
Blue Clay	37 ft.	54 ft.
Quick Sand	54 ft.	60 ft.
Blue Sandy Clay	60 ft.	142 ft.
Yellow Sandy Clay	142 ft.	149 ft.
Blue Sandy Clay	149 ft.	184 ft.
Sand and Gravel	184 ft.	194 ft.
Hardpan	194 ft.	195 ft.

39.) W-L Depth to Bedrock 122* feet

	From	To
Yellow Clay	0 ft.	11 ft.
Blue Clay	11 ft.	55 ft.
Blue Sandy Clay	55 ft.	80 ft.
Blue Clay	80 ft.	95 ft.
Blue Sandy Clay	95 ft.	117 ft.
Sand and Gravel	117 ft.	122 ft.

40.) W-M Depth to Bedrock 190 feet

Yellow Clay	0 ft.	8 ft.
Blue Clay	8 ft.	70 ft.
Yellow Clay and Sand Streaks	70 ft.	83 ft.
Blue Sandy Clay	83 ft.	148 ft.
Yellow Clay	148 ft.	159 ft.
Blue Sandy Clay	159 ft.	164 ft.
Sand	164 ft.	175 ft.
Blue Sandy Clay	175 ft.	190 ft.
Yellow Shale	190 ft.	224 ft.

41.) W-N Depth to Bedrock 90 feet

Clay	0 ft.	90 ft.
Blue Sandstone	90 ft.	144 ft.

42.) W-P Depth to Bedrock 240 feet

	From	To
Yellow Clay	o ft.	16 ft.
Gray Clay	16 ft.	87 ft.
Yellow Clay	87 ft.	94 ft.
Gray Clay	94 ft.	189 ft.
Yellow Clay	189 ft.	223 ft.
Gray Clay	223 ft.	240 ft.
Gray Shale	240 ft.	285 ft.

43.) W-Q Depth to Bedrock 171* feet

Fill Dirt	0 ft.	4 ft.
Yellow Clay	4 ft.	22 ft.
Gray Clay	22 ft.	165 ft.
Sand Gravel	165 ft.	171 ft.

44.) W-R Depth to Bedrock 105 feet

Clay	0 ft.	70 ft.
Clay and Gravel	70 ft.	95 ft.
Sand and Gravel	95 ft.	102 ft.
Clay and Gravel	102 ft.	105 ft.
Sandstone	105 ft.	110 ft.

45.) W-S Depth to Bedrock 168 feet

	From	To
Clay	0 ft.	41 ft.
Sand and Gravel	41 ft.	43 ft.
Clay	43 ft.	95 ft.
Sand and Gravel	95 ft.	100 ft.
Clay	100 ft.	132 ft.
Gravel	132 ft.	133 ft.
Clay	133 ft.	168 ft.
Sandstone	168 ft.	174 ft.

46.) W-T Depth to Bedrock 126 feet

Clay	0 ft.	49 ft.
Sand	40 ft.	51 ft.
Clay	51 ft.	98 ft.
Sand	98 ft.	105 ft.
Clay	105 ft.	125 ft.
Gravel	125 ft.	126 ft.
Sandstone	126 ft.	175 ft.

47.) W-U Depth to Bedrock 124 feet

Clay	0 ft.	100 ft.
Sand	100 ft.	104 ft.
Clay	104 ft.	124 ft.
Sandstone	124 ft.	152 ft.

48.) W-V Depth to Bedrock 124 feet

	From	To
Clay	0 ft.	40 ft.
Sand	40 ft.	46 ft.
Clay	46 ft.	124 ft.
Sandstone	124 ft.	168 ft.

49.) W-W Depth to Bedrock 166 feet

Clay	0 ft.	75 ft.
Sand	75 ft.	89 ft.
Clay	89 ft.	96 ft.
Sand	96 ft.	115 ft.
Clay	115 ft.	160 ft.
Sand	160 ft.	166 ft.
Sandstone	166 ft.	177 ft.

50.) LC-1 Depth of Bedrock 130 feet

	From	To
Clay	0 ft.	46 ft.
Sand	46 ft.	87 ft.
Clay	87 ft.	130 ft.
Sandstone	130 ft.	132 ft.

51.) LC-3 Depth of Bedrock 164 feet

Clay	0 ft.	164 ft.
Shale	164 ft.	176 ft.

52.) LC-6 Depth of Bedrock 145 feet

Clay	o ft.	145 ft.
Shale	145 ft.	162 ft.

53.) LC-7 Depth of Bedrock 268* feet

Clay	0 ft.	94 ft.
Sand	94 ft.	101 ft.
Clay	101 ft.	143 ft.
Sand	143 ft.	155 ft.
Clay	155 ft.	267 ft.
Sand	267 ft.	268 ft.

54.) LC-8 Depth of Bedrock 187 feet

	From	To
Clay	0 ft.	88 ft.
Sand	88 ft.	93 ft.
Clay	93 ft.	103 ft.
Sand	103 ft.	107 ft.
Clay	107 ft.	187 ft.
Sand	187 ft.	189 ft.
Siltstone	189 ft.	194 ft.

55.) LC-9 Depth of Bedrock 104 feet

Clay	0 ft.	224 ft.
Shale	224 ft.	243 ft.

56.) LC-10 Depth of Bedrock 309* feet

Clay	0 ft.	309 ft.

Jersey Township

	From	To
1.) W-#44 Depth of Bedrock 105 feet		
Yellow Clay	0 ft.	10 ft.
Blue Clay	10 ft.	37 ft.
Gravel	37 ft.	43 ft.
Sandy Blue Clay	43 ft.	102 ft.
Shale	102 ft.	105 ft.
2.) W-#45 Depth of Bedrock 50 feet		
Yellow Clay	0 ft.	8 ft.
Blue Clay	8 ft.	50 ft.
Rock	50 ft.	76 ft.
3.) W-#14 Depth of Bedrock 90 feet		
Top Soil	0 ft.	2 ft.
Yellow Clay	2 ft.	10 ft.
Blue Clay	10 ft.	35 ft.
Sand	35 ft.	43 ft.
Blue Clay	43 ft.	90 ft.
Rock	90 ft.	106 ft.

Delaware County - Harlem Township- Well Logs

1.) W-#34 Depth of Bedrock 120* feet

	From	To
Pit	0 ft.	5 ft.
Yellow Clay	5 ft.	12 ft.
Blue Clay	12 ft.	53 ft.
Yellow Clay	53 ft.	60 ft.
Hardpan	60 ft.	66 ft.
Sandy Clay	66 ft.	81 ft.
Blue Clay	81 ft.	93 ft.
Sandy Clay	93 ft.	110 ft.
Blue Clay	110 ft.	114 ft.
Sand	114 ft.	120 ft.

2.) W-#63 Depth of Bedrock 104 feet

Yellow Clay	0 ft.	6 ft.
Blue Clay	6 ft.	29 ft.
Sandy	29 ft.	33 ft.
Blue Clay	33 ft.	55 ft.
Sandy Clay	55 ft.	100 ft.
Sand	100 ft.	104 ft.
Shale	104 ft.	105 ft.

3.) W-#66 Depth of Bedrock 108* feet

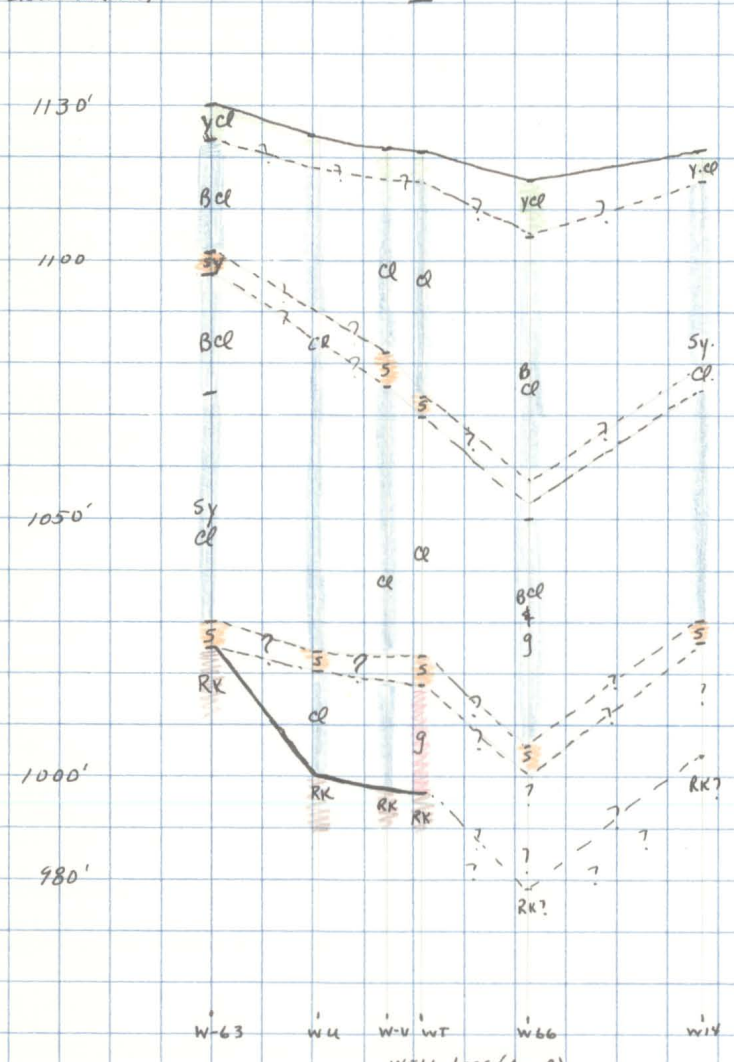
	From	To
Yellow Clay	0 ft.	10 ft.
Blue Clay	10 ft.	65 ft.
Blue Clay and Gravel	65 ft.	108 ft.
Sand	108 ft.	

4.) W-#72 Depth of Bedrock 45 feet

Yellow Clay	0 ft.	4 ft.
Blue Clay	4 ft.	18 ft.
Sandy	18 ft.	24 ft.
Blue Clay	24 ft.	44 ft.
Sand	44 ft.	45 ft.
Shale	45 ft.	60 ft.

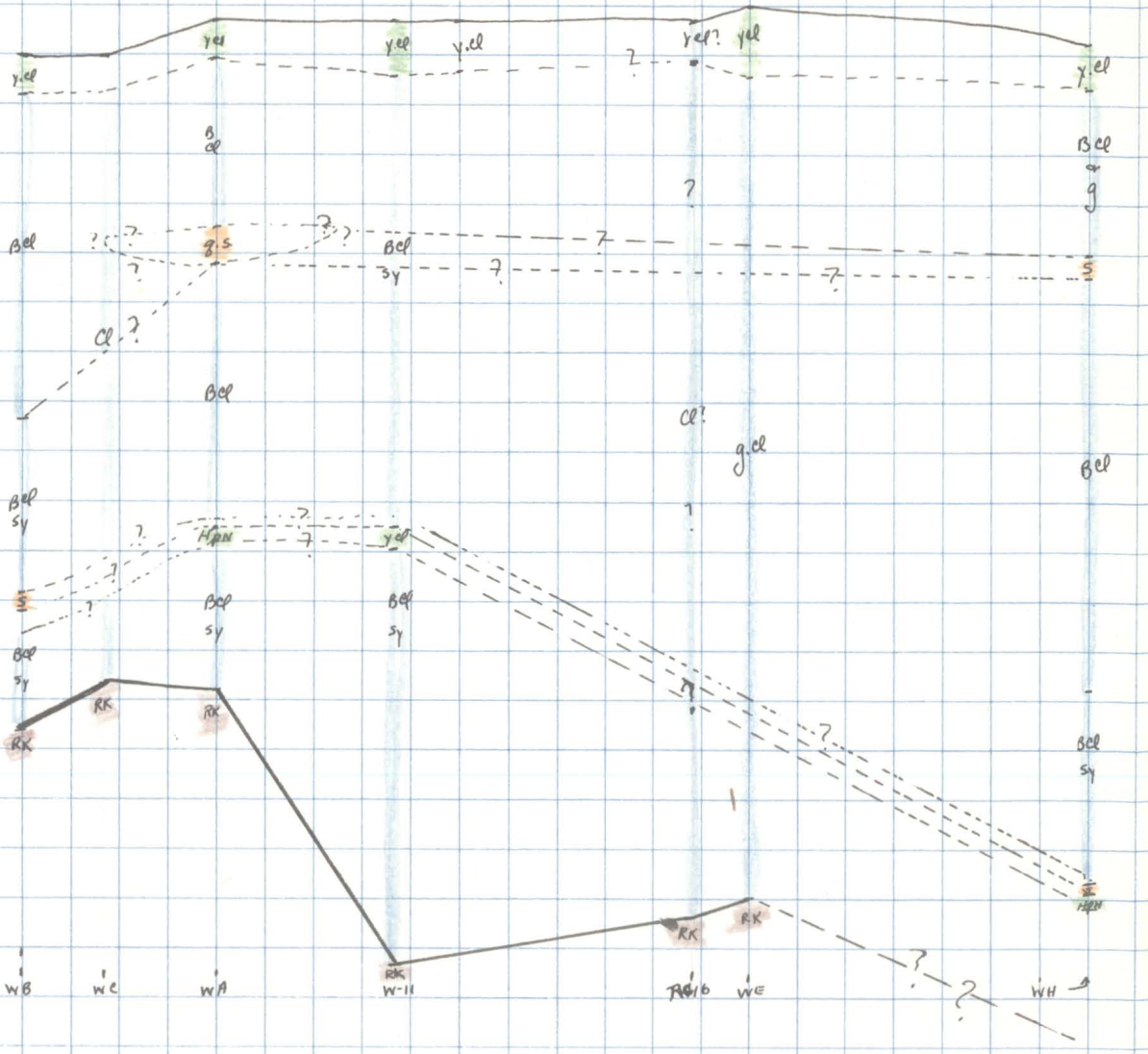
APPENDIX B

#1



Well Logs (App. A)

#2



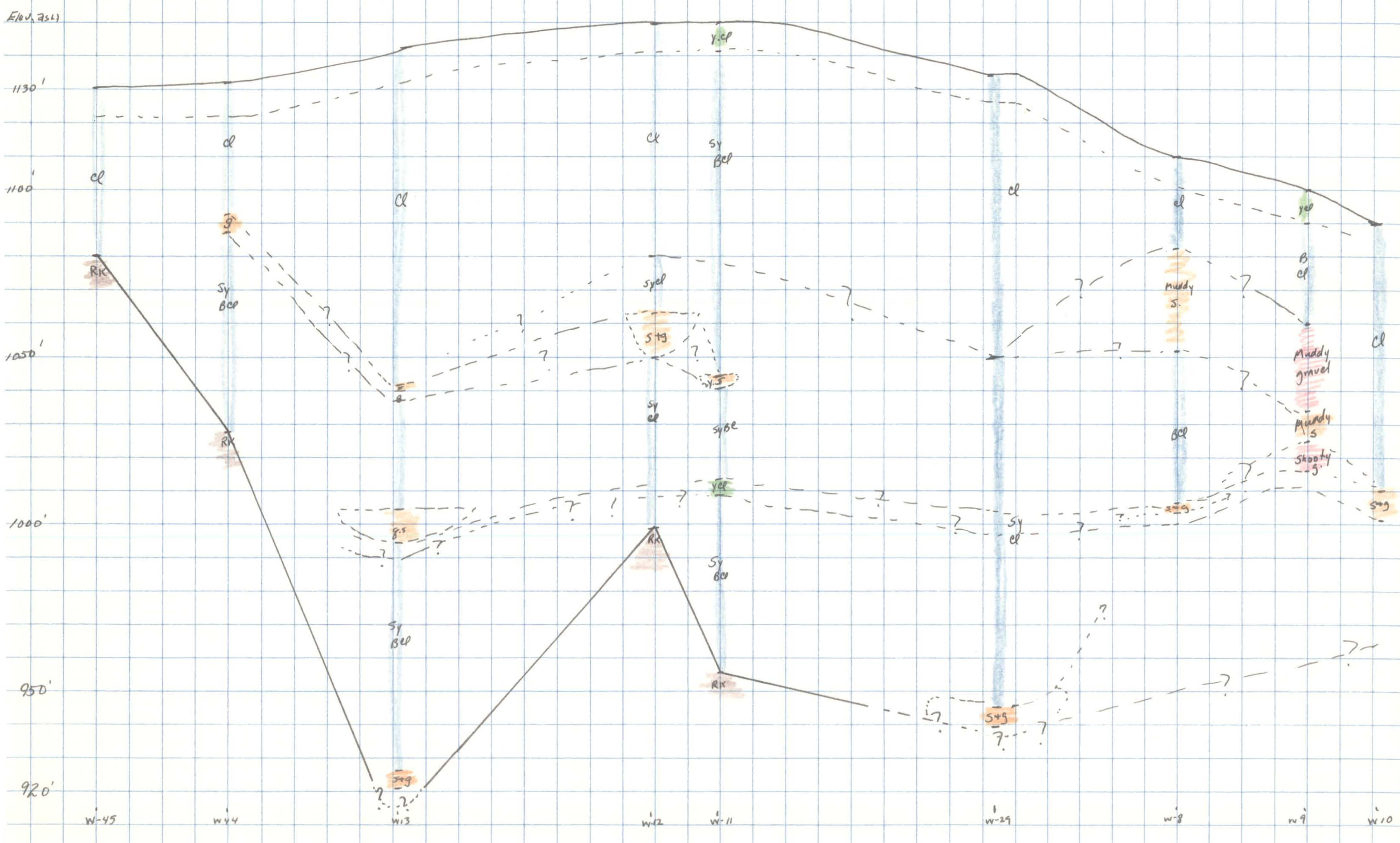
Legend for all Cross-Sections:

- cl = Clay
- ycl = Yellow Clay
- Bcl = Blue Clay
- sy = Sandy
- g.cl = gravelly clay
- Hpn = "Hardpan" (yellow Clay)
- s = sand
- g = gravel
- RK = Bedrock
- q.s. = quicksand

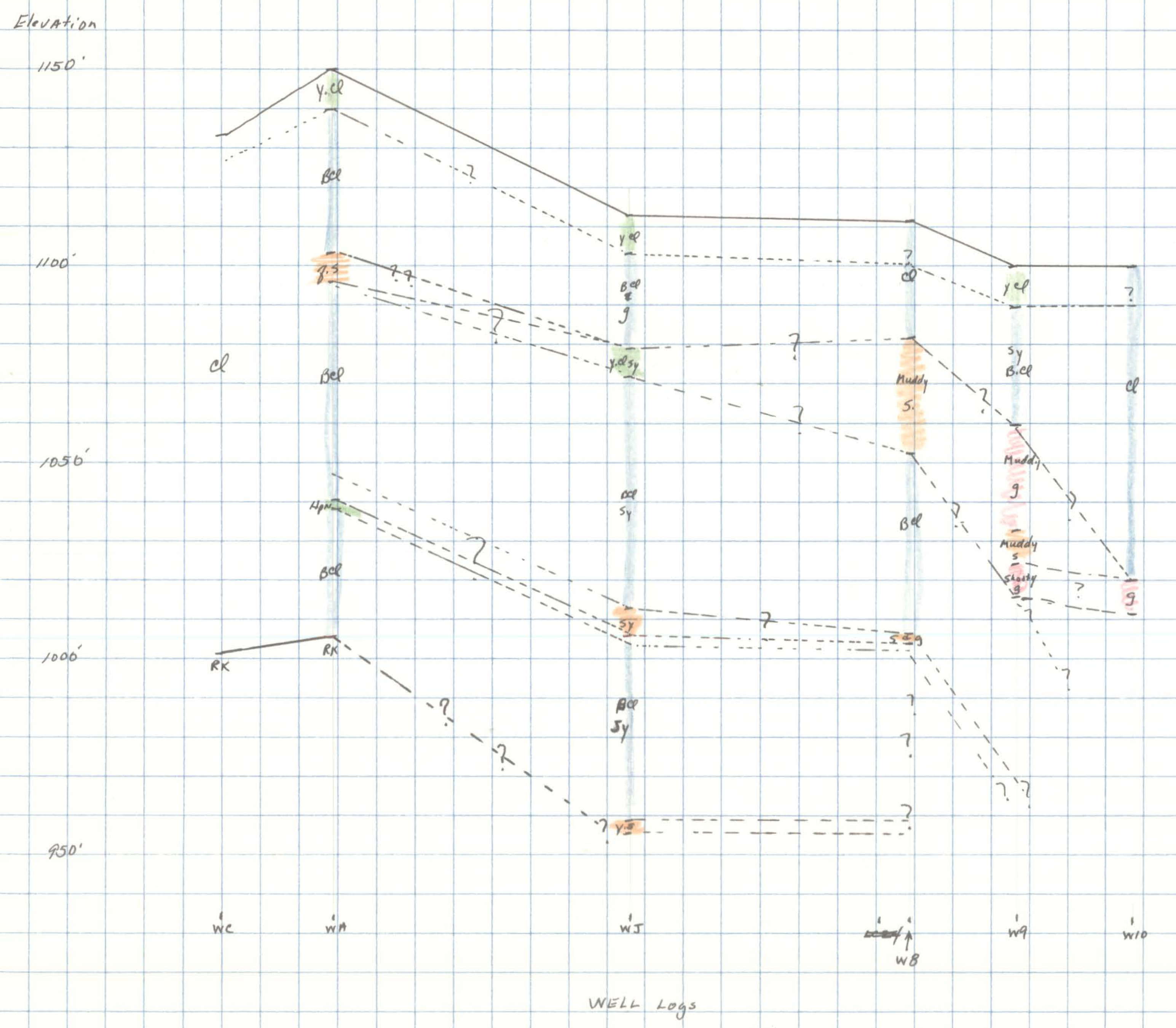
Appendix B

Note: vertical greatly Exaggerated & Cross-sections Drawn to scale of STANDARD 7½ Minute Quadrangle (1:24,000).

#3.

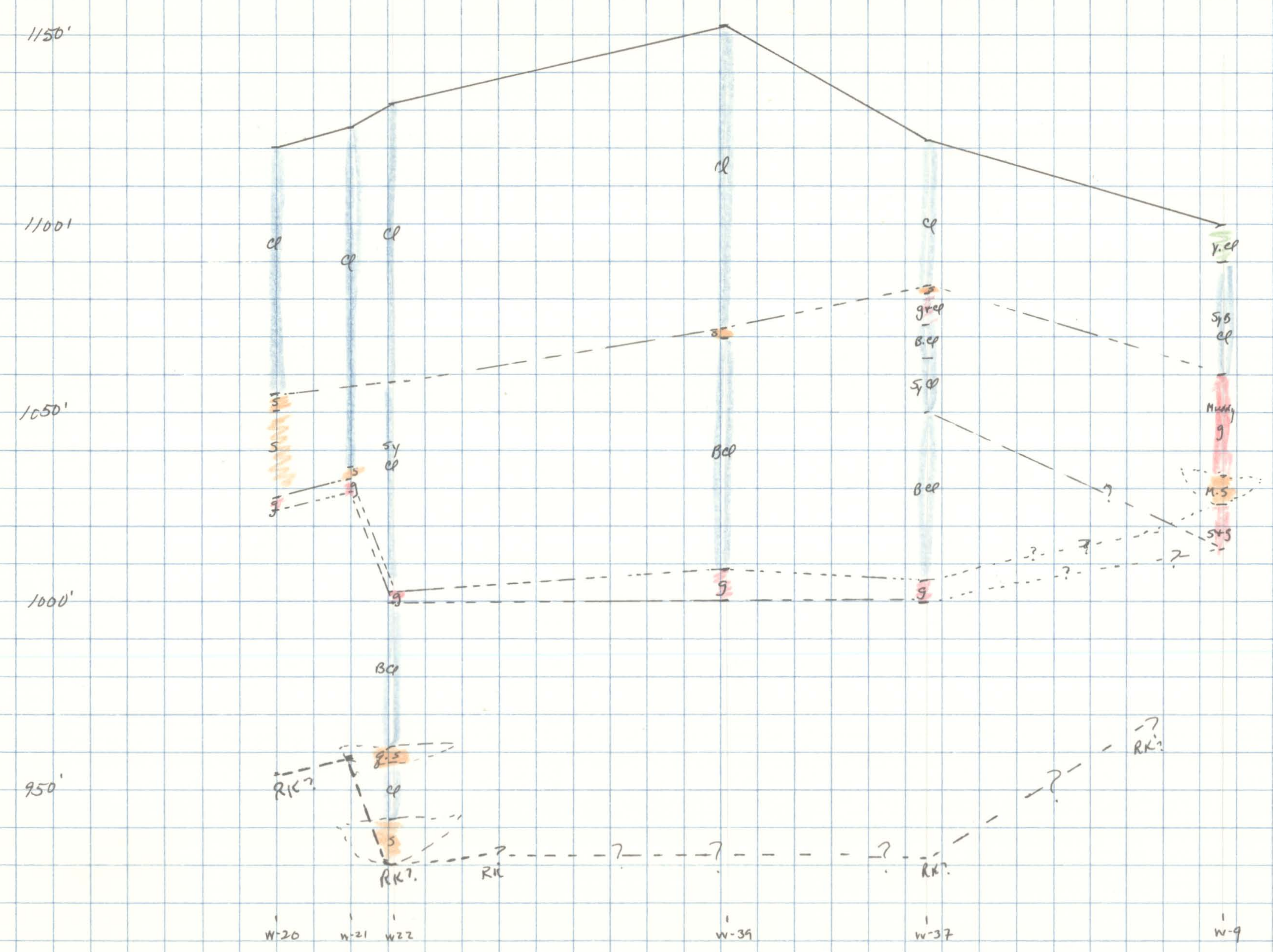

Elev. asl)
1130'
1100'
1050'
1000'
950'
920'
W-45
W-44
W13
W-12
W-11
W-29
W-8
W9
W10
RK
Sy Bcl
Sy Bcl
Sy Bcl
Muddy S.
Muddy gravel
Muddy S
Shooty g.
S+g
S+g
S+g
g.s
yel
ycl
y.cl
Sy cl
sybe
B cl
Bcl

#4.



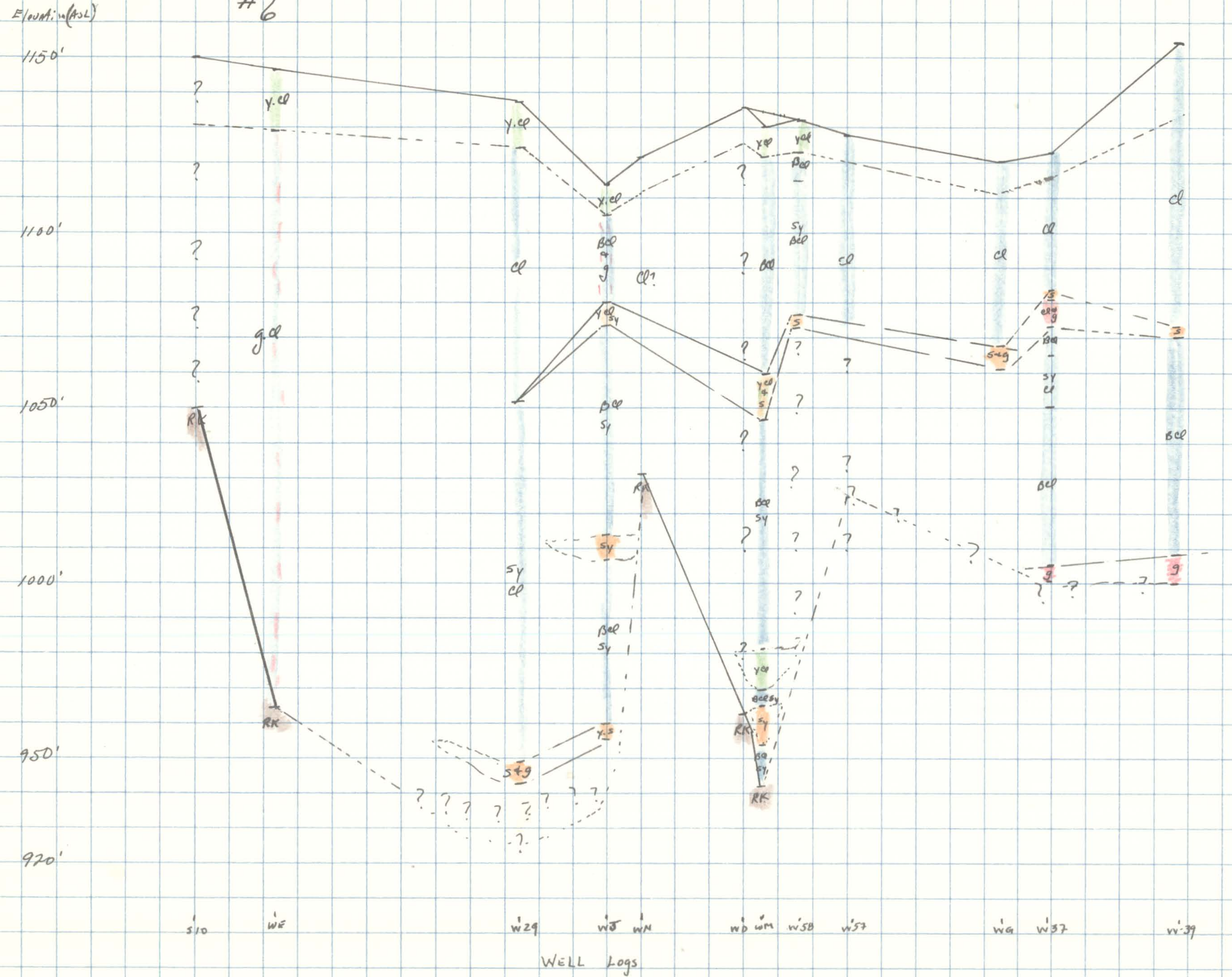
Elevation
1150'
1100'
1050'
1000'
950'
Y. cl
Bcl
cl
RK
WC
WA
WJ
WB
W9
W10
Muddy
Sy
WELL Logs

#5.



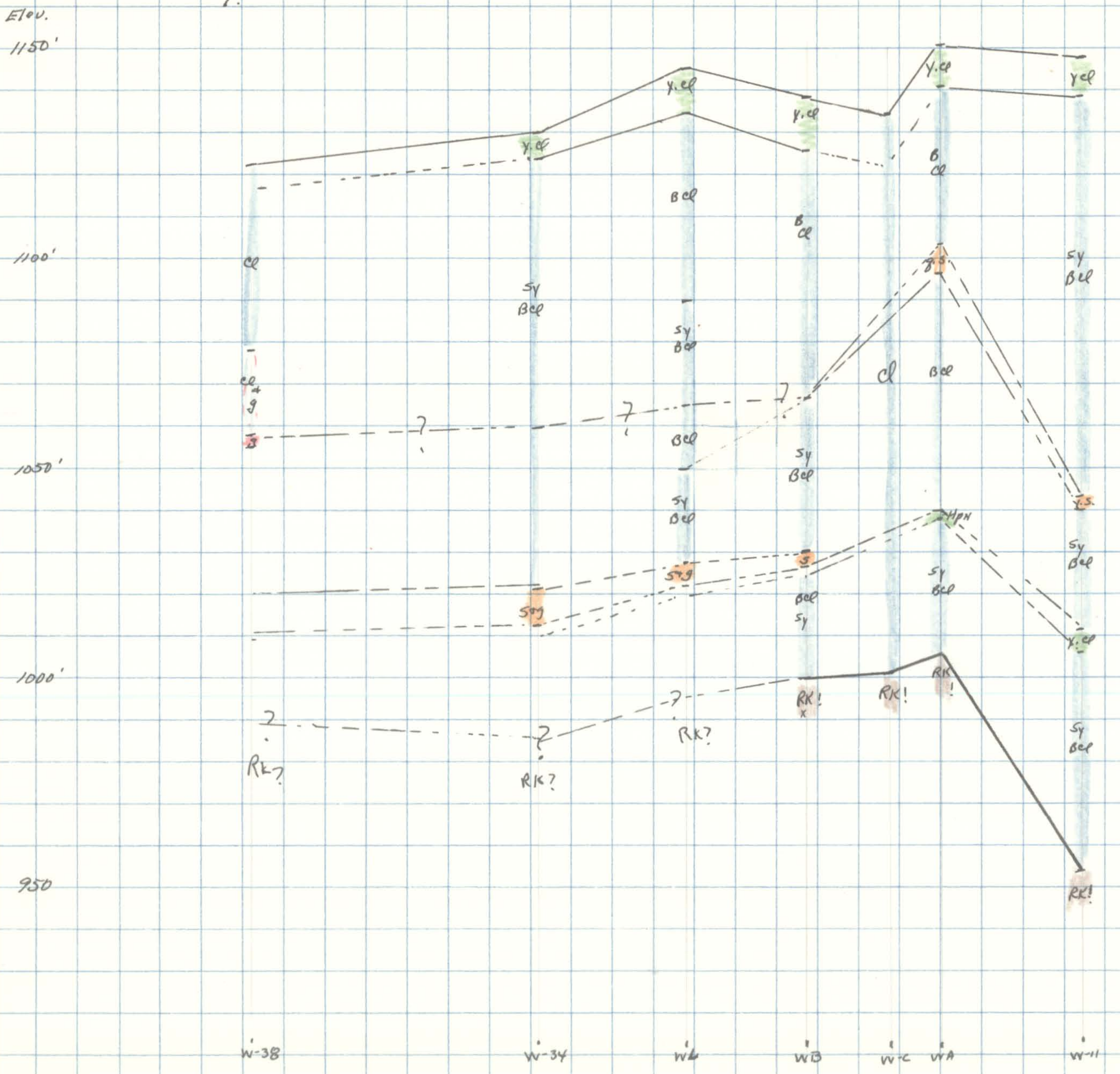
Well Logs

#6

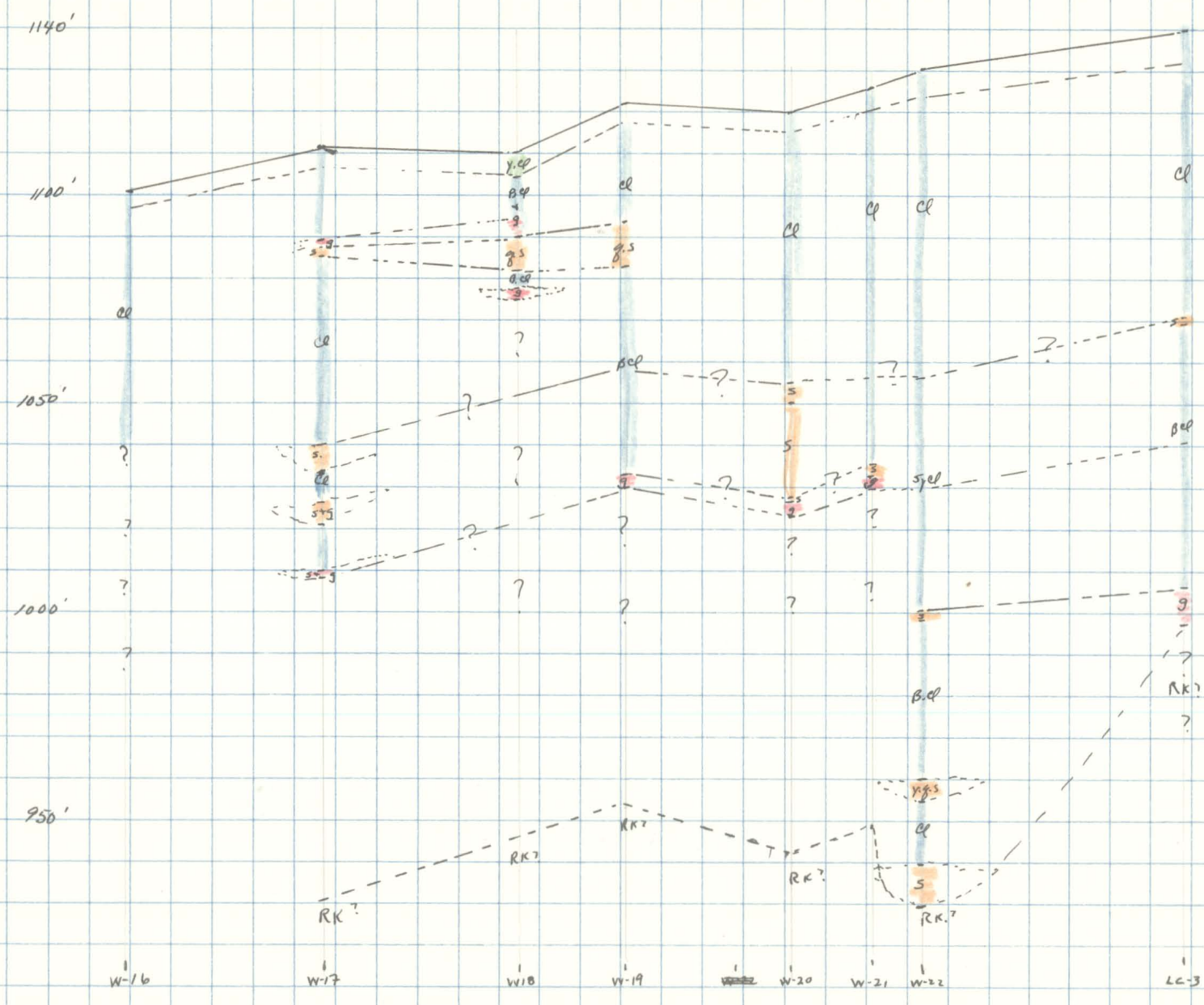


Elevation (ASL)
1150'
1100'
1050'
1000'
950'
920'
s10
wE
w29
wJ
wN
wD
wM
w58
w57
wG
w37
w39
WELL Logs

#7

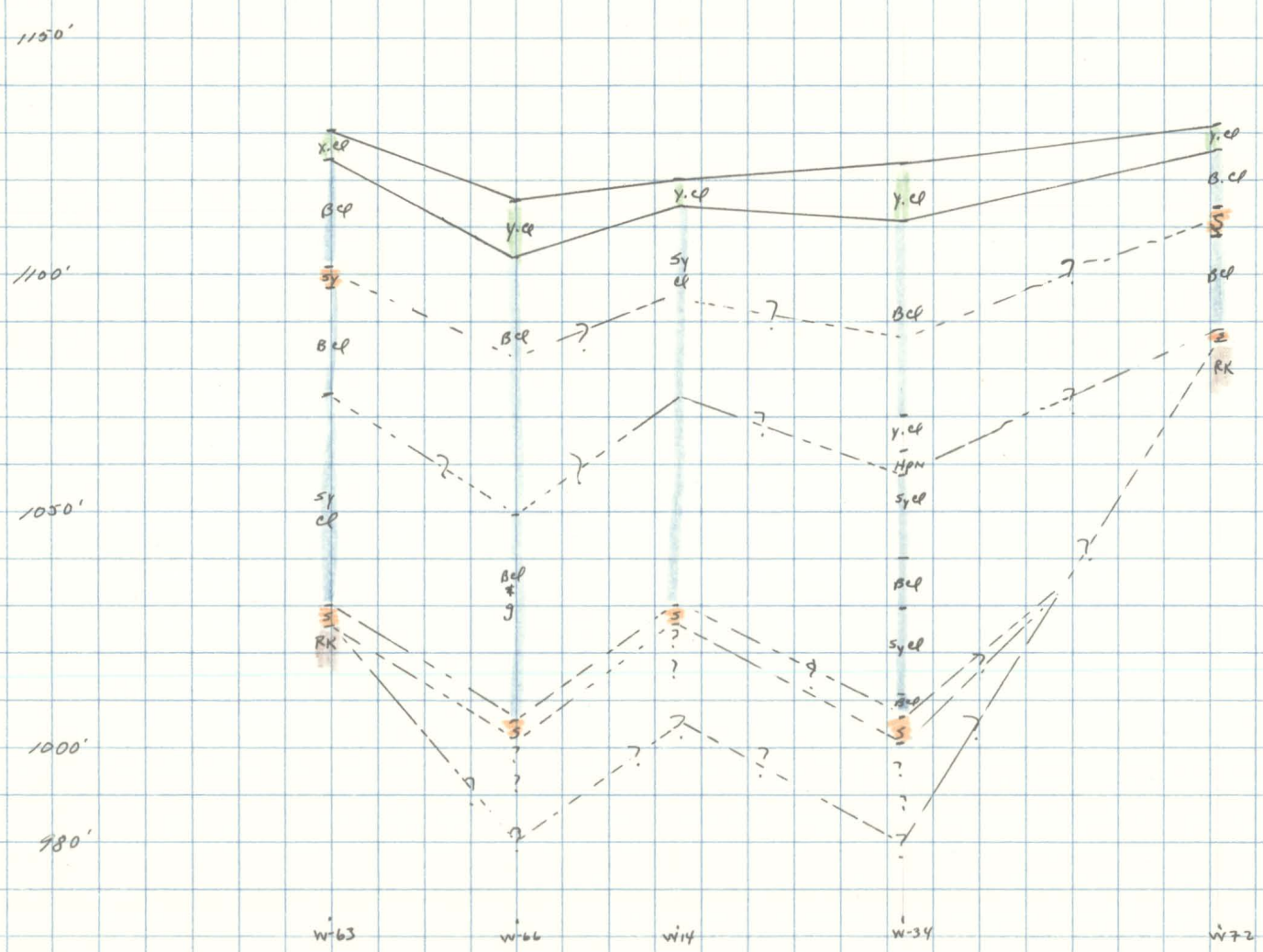

Elev.
1150'
1100'
1050'
1000'
950
W-38
W-34
W-6
WB
W-C
WA
W-11
Y.cl
Bcl
Sy
B
cl
RK!
RK?
Hpn
Syg
?

#8.


Elev. (asl)
1140'
1100'
1050'
1000'
950'
Cl
Y.Cl
B.Cl
S
Y.S
B.S
RK?
W-16
W-17
W18
W-19
W-20
W-21
W-22
LC-3

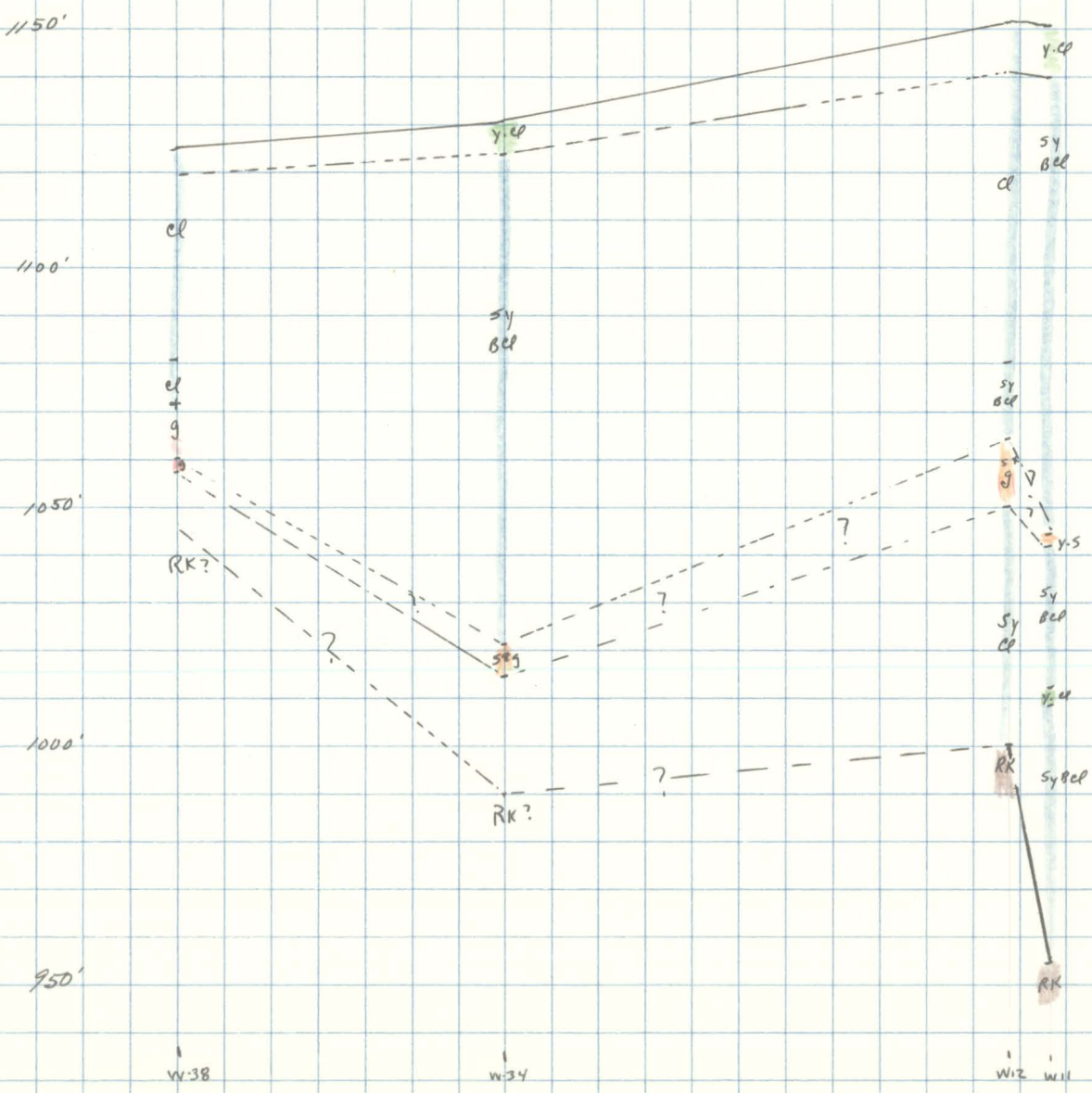
Well Logs

#9



WELL Logs. (Sunbury Quad.- Delaware Co.)

#10.


1150'
1100'
1050'
1000'
950'
Y.Cl
Sy Bcl
Cl
Cl + g
RK?
Sy Cl
Y-S
RK
W-38
W-34
W-12
W-11

WELL Logs.

Reference Cited

Dove, George D., 1960, Water Resources of Licking County: Ohio Dept. Nat. Res., Div. of Water, Bull. 36.