W.R. # 1167002M00

Utah Geological Survey
Lithologic Log

Well ID: Pavant Area PA-5A

Well Location: (C-21-7)36bbb / 14.8 miles west of Fillmore, Utah

UTM: x 0361678 m, y 4312474 m NAD 83 38.95031 N 112.59624 W (NAD 83)

~~N~~ S 323 ft, ~~W~~ E 473 ft from NW Corner, Sec 36, T 21 ~~N~~ S R 7 ~~E~~ W, SLBM ~~UTM~~

Start Date 9/19/2012 Completion Date 9/24/2012 Driller USGS, Jack Hennagan

Drilling Method: Mud/Rotary from 0 to 426 ft Total Depth 426 ft

from ____ to ____ Static Water Level UNK

from ____ to ____ Water Level Date ____

Measured From ____

Borehole Diameter 7 7/8-in from 0 to 426 ft

from ____ to ____

from ____ to ____

Casing Type & Diameter 2-in sch-80 PVC (Sealed) from +1.5 to 420 ft

from ____ to ____

from ____ to ____

Screen Type & Diameter N/A from ____ to ____

N/A from ____ to ____

Ground Elevation: Approx. 4681 ft

Logged By: M.L. Gwynn, UGS

Geophysical Log ☐ Yes ☒ No Other Logs: High-precision Temperature

DEPTH	LITHOLOGY	WELL DIAGRAM	DRILLING INFO	LITHOLOGY DESCRIPTION
	-----::: -----::: -------: -------: -------: -------: -------: -------: -------: -------: -------- -------- -------- -------- -------: -------: -------: -------: -------: -------:: -------:: -------:: -------:: -------::	XX| |XX XX| 8" |XX XX| |XX \/| B |\/ \/| O |\/ \/| R |\/ \/| E |\/ \/| |\/ \/| H |\/ \/| O |\/ \/| L |\/ \/| E |\/ \/| |\/ \/| W |\/ \/| I |\/ \/| T |\/ \/| H |\/ \/| |\/ \/| 2" |\/ \/| |\/ \/| S |\/ \/| C |\/ \/| H |\/ \/| |\/ \/| 8 |\/ \/| 0 |\/ \/| |\/ \/| P |\/ \/| V |\/ \/| C |\/	7-in steel square protective monument withlocking cover cemented in with well pad (+2 to -3 ft). Annulus filled with bentonite grout (30% solids) to TD. 7.875-in drag bit used 0-104 ft, 220-412 ft. 7.875-in TCI tricone bit used 104-220 ft, 412 ft - TD. Cored 220-223 ft.	0-10': (Sfc-very fine lt tan silty sand) Gy-tan silty clay w/ minor med-coarse sand. 10-20': AA 20-30': AA at top. Transition to very lt tan-gy silty clay (soft) then med tan-gy clay (harder). 30-40': Med tan-gy clay w/ minor fine basaltic sand. 40-50': Med tan-gy silty clay w/ fine-med sand and minor crs sand. Thin zone of med gy hard clay near bottom of interval.

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DEPTH	LITHOLOGY	WELL DIAGRAM	DRILLING INFO	LITHOLOGY DESCRIPTION
	-------:	\/| |\/		50-60': Lt tan-gy silty clay w/ very minor fine sand.
	--------	\/| 8"|\/		
55	-------:	\/| |\/		
	--------	\/| B |\/		
	-------:	\/| O |\/		
60	--------	\/| R |\/		60-70': 20% gy-tan silty clay, 80% lt-med gy cohesive clay (hard).
	--------	\/| E |\/		
	--------	\/| |\/		
65	--------	\/| H |\/		
	--------	\/| O |\/		
	--------	\/| L |\/		
70	-------:	\/| E |\/		70-80': Med gy cohesive clay (hard) w/ minor silt and very fine sand.
	-------:	\/| |\/		
	-------:	\/| W |\/		
75	-------:	\/| I |\/		
	-------:	\/| T |\/		
	-------:	\/| H |\/		
80	-------:	\/| |\/		80-90': AA
	-------:	\/| 2"|\/		
	-------:	\/| |\/		
85	-------:	\/| S |\/		
	-------:	\/| C |\/		
	-------:	\/| H |\/		90-100': AA until about 96'. Then hard layers alternating with softer clay. Hard layers are semi-lithified, well sorted, very-fine-fine brn sandstone. Some crs-very crs sand (mainly basaltic) and minor very fine-fine pebble gravel also present. (99-100') Med gy clay and med-very crs angular-subangular sand (mostly basaltic).
90	-------:	\/| |\/		
	-------:	\/| 8 |\/		
	-------:	\/| 0 |\/		
95	:::::::o	\/| |\/		
	--------	\/| P |\/	Hard drilling about 96 ft.	
	----::::	\/| V |\/		
100	||||||--	\/| C |\/	Top of basalt flow 99-100 ft.	100-110': Dk gy vesicular basalt w/ some calcite infilling. Lt-med gy clay also present near top and decreasing with depth
	||||||--	\/| |\/		
105	|||||||-	\/| |\/	Switch from 7.875" drag bit to 7.875" TCI tricone bit at 104 ft.	
	||||||||	\/| |\/		
110	|||||||-	\/| |\/		110-120': Basalt AA w/ minor gy clay.
	||||||||	\/| |\/		
115	|||||||-	\/| |\/		
	||||||||	\/| |\/		
120	|||||||-	\/| |\/		
	||||||||	\/| |\/		120-130': AA
125	|||||||-	\/| |\/		
	||||||||	\/| |\/		
130	|||||||-	\/| |\/		
	||||||||	\/| |\/		130-140': Basalt AA w/o clay.
135	||||||||	\/| |\/		
	||||||||	\/| |\/		
140	|||||||-	\/| |\/		140-150': Basalt AA w/ minor gy clay.
	||||||||	\/| |\/		
145	|||||||-	\/| |\/		
	||||||||	\/| |\/		
	|||||||-	\/| |\/		

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DEPTH	LITHOLOGY	WELL DIAGRAM	DRILLING INFO	LITHOLOGY DESCRIPTION
		8" BORE HOLE WITH 2" SCH 80 PVC		150-160': Basalt AA w/o clay.
155				
160				160-170': AA
165				
170				170-180': AA to 179', then as described for 180-190'.
175				
180				180-190': Mix of lt tan-white shale chips, orng-brn shale chips, and orng-brn clay. Most chips 2-3mm.
185				
190				190-200': Gy-tan and lt gy clay w/ some crs grains of shale and basalt (probably from flow above).
195				
200				200-210': Lt gy cohesive clay.
205				
210				210-220': 50% lt gy cohesive clay, 50% brn-tan silty clay. Minor small shale chips.
215				
220			Cored (Shelby Tube) 220-223'. Switch from 7.875" TCI tricone bit to 7.875" drag bit at 220 ft.	220-230': AA
225				
230				230-240': AA
235				
240				240-250': (Poor returns) Clay AA w/ some med-crs sand and minor very crs subangular-subrounded sand (basaltic and other types).
245				

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DEPTH	LITHOLOGY	WELL DIAGRAM	DRILLING INFO	LITHOLOGY DESCRIPTION
				250-260': (Poor returns) AA
255		8" BORE HOLE WITH 2" SCH 80 PVC		
260	O			260-270': (Poor returns) 65% tan-brn and lt gy clay. 35% crs-very crs sand w/ some fine and med sand and poor-med sorted pebble gravel (LS, SS, Qtz, basalt, etc.). Gravel clasts are subangular-subrounded.
265	O			
270	O			270-280': (Poor returns) Tan-brn silty clay w/ moderate very fine-fine sand and minor med-crs sand.
275				
280				280-290': AA
285				
290				290-300': Tan-brn silty clay (more cohesive than previous) and some small shale flecks.
295				
300				300-310': AA (also some basalt chips from ditch/ sump)
305				
310				310-320': AA with some very-fine-fine sand.
315				
320				320-330': 75% tan-brn clay, 25% lt tan-gy clay (mainly semi-lithified in small flecks). Moderate qty very fine sand and silt.
325				
330				330-340': 50% gy-tan silty clay, 15% lt gy silty clay, 35% Moderately sorted med-crs sand of basalt, qtz, LS, etc. origins (most subangular-subrounded and some rounded). Also some very fine-fine and very crs sand.
335				
340				340-350': 50% tan silty clay, 50% lt gy-gn silty clay. Interval also contains some very fine sand and coarser grains as described above.
345				

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DEPTH	LITHOLOGY	WELL DIAGRAM	DRILLING INFO	LITHOLOGY DESCRIPTION
	------::	\/| |\/		350-360': 50% tan silty clay, 50% lt gy silty clay. Clay is moderately hard. Interval also contains some very fine-fine sand.
	-------:	\/| 8"|\/		
	------::	\/| |\/		
355	-------:	\/| B |\/		
	------::	\/| O |\/		
	-------:	\/| R |\/		
360	-------:	\/| E |\/		360-370': AA, except clay is softer and fewer of the coarser grains are present.
	------::	\/| |\/		
	-------:	\/| H |\/		
365	-------:	\/| O |\/		
	-------:	\/| L |\/		
	------::	\/| E |\/		
370	-------:	\/| |\/		370-380': AA, except clay is mainly tan.
	-------:	\/| W |\/		
	-------:	\/| I |\/		
375	------::	\/| T |\/		
	-------:	\/| H |\/		
	-------:	\/| |\/		
380	------::	\/| 2"|\/		380-390': AA
	-------:	\/| |\/		
	-------:	\/| S |\/		
385	-------:	\/| C |\/		
	------::	\/| H |\/		
390	:+:+:+:+	\/| 8 |\/	Thin zones of hard drilling about 391, 395, 397, and 399-401 ft.	390-400': Intervals of 60% tan and 40% lt gy silty clay w/ moderate very fine sand alternating with hard zones of crs-very crs basaltic sand and basaltic cuttings (probably from cobbles/boulders).
	------::	\/| 0 |\/		
395	:+:+:+:+	\/| P |\/		
	------::	\/| V |\/		
400	:+:+:+:+	\/| C |\/		400-410': Lt gy silty clay w/ some very fine-fine sand. Moderate angular-subangular (natural and drill-cut) clasts of dk gy, platey, vesicular basalt (1-10 mm) and some crs-very crs (more rounded) basaltic sand in cuttings, especially near top of interval. Likely penetrated basalt cobbles/ boulders at 400-401'.
	:+:+:+:+	\/| |\/		
	----:::+	\/| |\/		
405	-----++:	\/| |\/		
	-----::+	\/| |\/	Very hard drilling 410-412 ft, then somewhat easier/ faster. Switch from 7.875" drag bit to 7.875' TCI tricone bit at 412 ft'.	
410	-----++:	\/| |\/		
	:+:+:+--	\/| |\/		410-420': Angular clasts of minimally vesicular, platey, dk gy basalt with oxidation common on one or both sides. Some gn siltstone clasts about 3mm thick and minor silty lt gy clay (410-412'). Tan and lt gy silty clay w/ abundant basalt chips and some tan and lt gy shale chips and some very fine-fine sand (412-419'). Minimally vesicular, platey, dk gy basalt and some tan and gy shale flecks (419-420').
	-----++:	\/| |\/		
415	-----::+	\/| |\/		
	-----++:	\/| |\/		
	-----..+	\/| |\/		
420	|||||||-	\/| |\/		
	|||||||	\/| |\/		
425	|||||||-	\/| |\/		
430				420-426': Basalt and very minor shale clasts as described above. Encountering alternating hard and softer zones (probably highly fractured flow). Very severe loss of circulation at 426' that seems to self-seal when pulling string back to 425'.
435				
440				TD: 426 ft.
				Caving only allowed 2-in PVC casing (sealed) to be inserted to 420 ft.
445				