Appendix 4. Location, physical characteristics, borehole-geophysical logs and interpreted structures for well Bol 3.

This well is located at the “Regency at Bolton”. This is a condominium complex that was under construction in 2007. It is located on Rte 117 in Bolton, MA. A pump and store system was designed for the complex, which includes three bedrock wells. The wells were all drilled within 15 meters of each other on a hill above the complex at 139 meters above sea level. There is a perennial stream and a swamp on the backside of the hill. The three wells had a combined yield of less than five gallons per minute during pumping tests by the driller. One well in the suite was studied here. It is identified as bol3.053007. The yield was 1 gallon per minute. The well was logged from May 25 through May 30, 2007.

There is approximately 11.6 meters of overburden. The overburden material is glacial till composed of a nonsorted, nonstratified matrix of sand with some clay, silt and boulders The bedrock is schist of the Nashoba Formation. The Nashoba is a fine to medium grained, and well foliated, gray to silvery-gray quartz-mica schist that may contain biotite, garnet and sillimanite.

The total well depth is approximately 97 meters and has 15 meters of casing. A total of 36 fractures were identified in the well. Of the total fractures measured 21 are FPF, 10 are tectonic joints, and 5 are subhorizontal unloading joints.

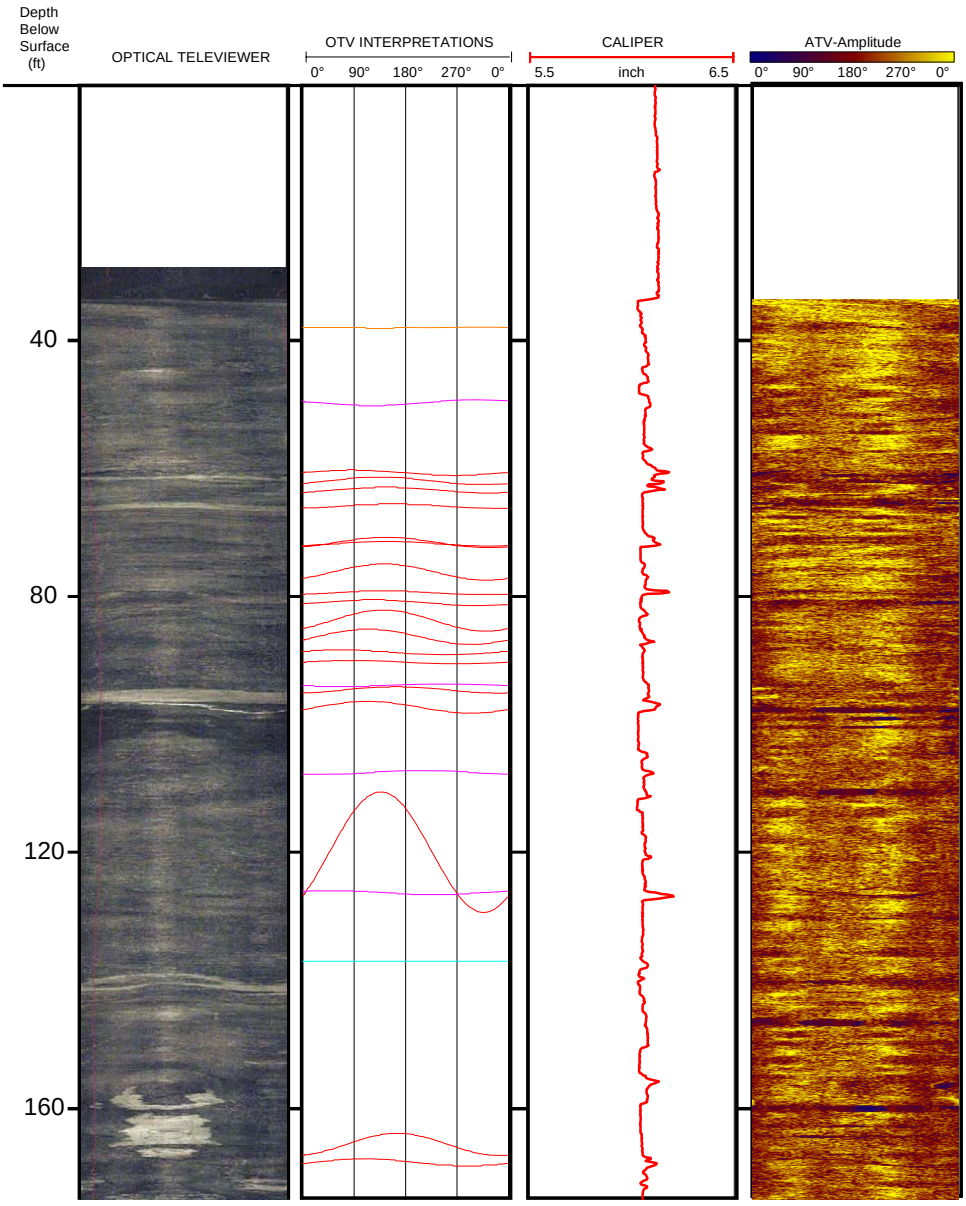
The water table in the well was at 7.84 meters depth. Heat pulse flow meter testing was conducted at the well under ambient and pumping conditions. The well was pumped for 1 hour 53 minutes at 0.5 gallons per minute and there was no measureable drawdown over that period. Four fractures in the well were identified as flowing fractures during the heat pulse flow meter test. The fractures were identified at 18.5, 41.8, 55.0, and 61.0 meters depth. Of the flowing fractures two were FPF and two were subhorizontal unloading joints.

Appendix 4, continued. Location, physical characteristics, borehole-geophysical logs and interpreted structures for well Bol 3 (Azimuths and dips follow right hand rule, t=tectonic, s = sheeting, p = foliation parallel fractures). Flow data shown under pumping conditions have not been normalized.

Site ID:	bol3.053007			
Location:	"Regency at Bolton" Bolton, MA			
Elevation (m)	139			
Reported Yield (gpm)	1			
Rock Type:	Schist			
Depth to water:	25.7	ft	7.83	m
Depth of casing:	50	ft	15.24	m
Depth of well:	319	ft	97.23	m
Land surface to MP:	0.7	ft	0.21	m

Fractures						Ambient			Pump		at 0.5 gpm
Number	Depth (m)	Depth (ft)	Azimuth	Dip	Type	Flow (y/n)	gpm (amb)	notes	Flow (y/n)	gpm (pump)	notes
1	11.6	38.1	45	17	s	y	0	flow in	n	0.2	
2	15.2	49.8	31	70	t	n	-0.01		n	0.2	
3	18.5	60.7	176	68	p	n	-0.01		y	0.2	flow in
4	18.9	62.0	225	74	p	n	-0.01		n	0.14	
5	19.3	63.4	235	69	p	n	-0.01		n	0.14	
6	20.1	65.9	248	65	p	n	-0.01		n	0.14	
7	21.8	71.6	236	79	p	n	-0.01		n	0.14	
8	21.9	71.8	236	64	p	n	-0.01		n	0.14	
9	23.2	76.2	232	83	p	n	-0.01		n	0.14	
10	24.2	79.5	231	62	p	y	0	flow out	n	0.14	
11	24.7	81.0	212	69	p	n	0		n	0.14	
12	25.5	83.8	231	84	p	n	0		n	0.14	
13	26.3	86.3	205	82	p	n	0		n	0.14	
14	27.1	88.8	158	66	p	n	0		n	0.14	
15	27.5	90.3	179	62	p	n	0		n	0.14	
16	28.6	93.9	337	51	t	n	0		n	0.14	
17	28.8	94.6	253	72	p	n	0		n	0.14	
18	29.7	97.3	204	80	p	n	0		n	0.14	
19	32.8	107.5	298	62	t	n	0		n	0.14	
20	36.6	120.0	227	89	p	n	0		n	0.14	
21	38.5	126.3	139	61	t	n	0		n	0.14	
22	41.8	137.0	0	0	s	y	0	flow out	y	0.14	flow in
23	50.5	165.6	255	85	p	n	0.02		n	0.1	
24	51.3	168.4	198	73	p	y	0.02		y	0.1	
25	54.9	180.0	262	77	p	n	0.02		n	0.1	
26	55.0	180.6	210	81	p	y	0.02	flow in	y	0.1	flow in
27	55.6	182.4	352	50	t	n	0		n	0.07	
28	56.5	185.5	62	39	t	n	0		n	0.07	
29	57.3	187.9	73	51	t	n	0		n	0.07	
30	59.8	196.0	324	21	s	n	0		n	0.07	
31	61.0	200.3	63	14	s	n	0		y	0.07	flow in
32	64.8	212.6	318	8	s	n	0		n	0	
33	73.1	239.8	206	72	t	n	0		n	0	
34	76.7	251.6	249	84	t	n	0		n	0	
35	83.8	274.9	230	41	t	n	0		n	0	
36	94.2	309.1	200	75	p	n	0		n	0	

Appendix 4, continued. Interpreted features for Bol 3. Optical televiewer interpretations indicated by color: orange – subhorizontal sheeting joint; magenta – tectonic joint; red – foliation parallel fracture (FPF); cyan – transmissive subhorizontal sheeting joint; green – transmissive tectonic joint; grey – transmissive foliation parallel fracture (FPF). OTV – optical televiewer; ATV – acoustic televiewer.



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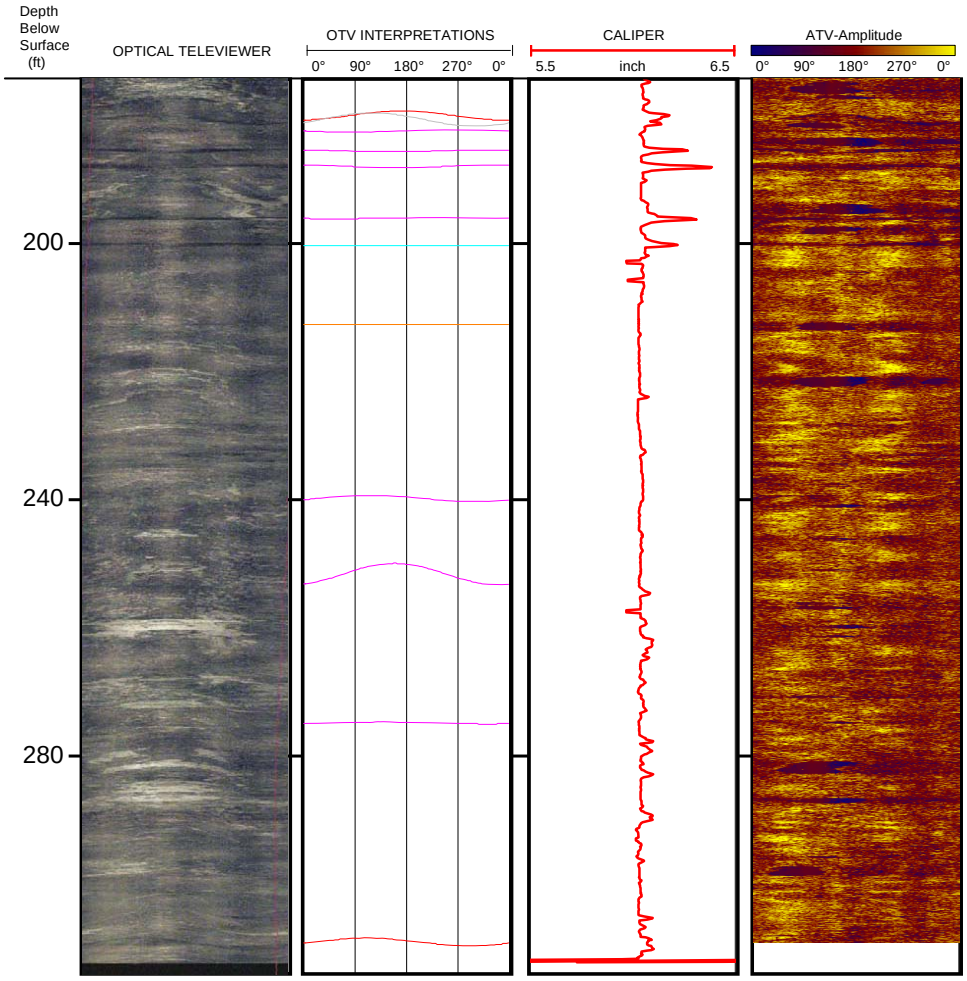
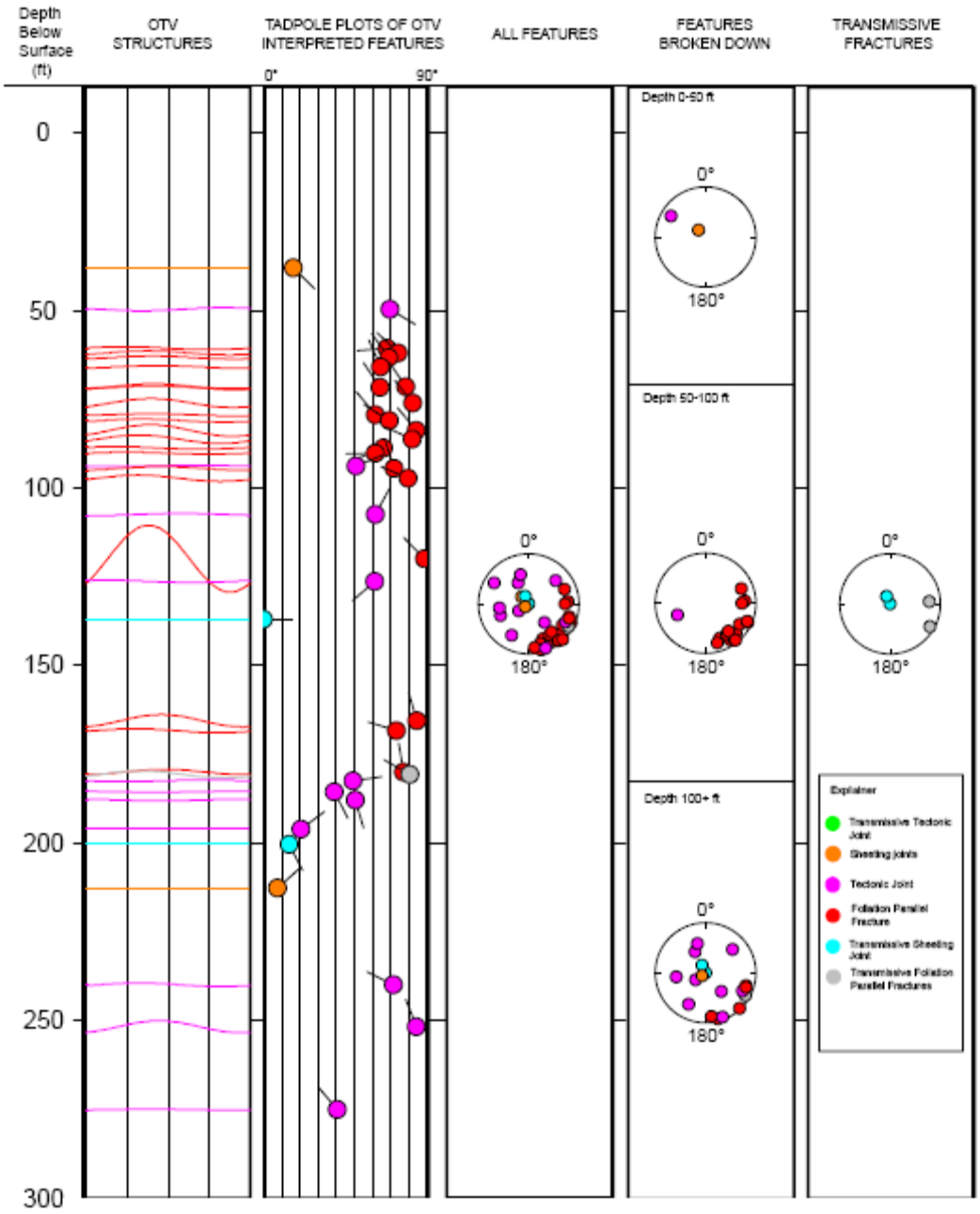


Appendix 4, continued. Tadpole plots and stereoplots of interpreted optical televiewer (OTV) structures for Bol 3. In the tadpole plot depth is plotted along the y-axis and magnitude of the dip plotted on the x-axis. The tail of the tadpole points in the direction of the dip, relative to true north, which is toward the top of the page. The stereonets represent poles to planar features plotted on a lower-hemisphere equal-area stereonet. Stereonets use right hand rule convention. Colors on the OTV structures plot correspond to those in the tadpole explanation.



Appendix 4, continued. Composite log for Bol 3 of natural gamma, fluid resistivity, fluid temperature and heat pulse flowmeter data under ambient and stressed (pumping) conditions. For the heat pulse flowmeter data collected under pumping conditions, the well was pumped at 0.5 gallons per minute and data have been normalized.