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Grassy Trail / UT000126 Monitoring update September 30, 2017

Michael Hansen <mhansen@rbgengineering.com> Wed, Oct 11, 2017 at 10:05 AM
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Here is the Monitoring and Survey update as of September 30, 2017.

Michael N. Hansen, P.G.
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2 attachments

GrassyTrail Project Rpt 9-30-17.pdf
1948K

Site photos Sept 11 to 30 17.pdf
1786K

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PROJECT REPORT

Project No.	201404-006		
Project	Grassy Trail – West Ridge Mine Monitoring		
Dates	Site Visits and readings - September 11, 16, 24, and 30, 2017		
Report By	Michael N. Hansen	**Position**	Engineering Geologist

Observations / Activities

New readings from Inclinometers I-1, I-4, and the new 17-I-2 and 17-I-3 have not shown any significant movement. Plots of the inclinometer readings for I-1 and I-4 were taken on September 7 and 30th. The new inclinometers 17-I-2 and 17-I-3 installed at the beginning of the month to replace I-2 and I-3 were read on September 13, 18, and 30th. The extra readings were taken in order to establish a better baseline for these two new inclinometers. A copy of the readings are attached.

The small amount of movement showing less than an 1/8 inch is within the range of error for the instrument and does not currently appear to be significant. This will be watched in future readings.

New covers were placed on inclinometers I-1 and I-4 as the previous covers were damaged.

One accelerometer is located on the crest of the dam. This instrument has not detected any mining induced seismic (MIS) activity between May 13, 2016 to September 30, 2017. The "events" which have been recorded take place while removing and replacing the cover on the instrument as part of downloading and resetting the Accelerometer.

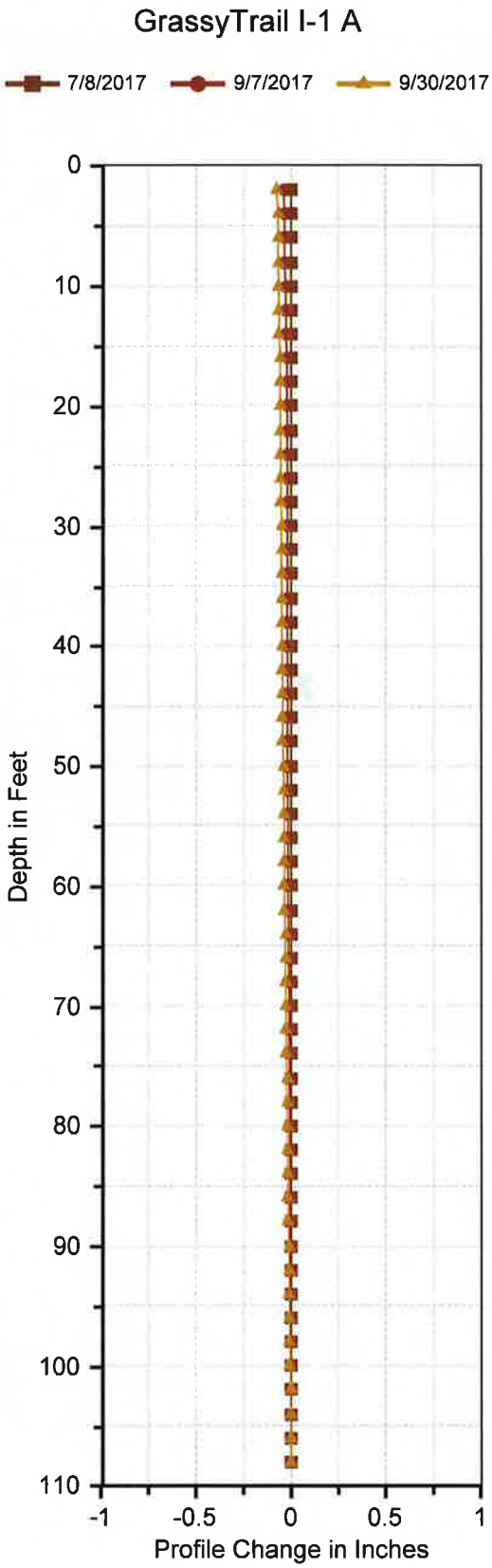
Since the last report on September 5, 2017, no seismic events have been reported within the area of the mine by the University of Utah Seismograph Stations (UUSS).

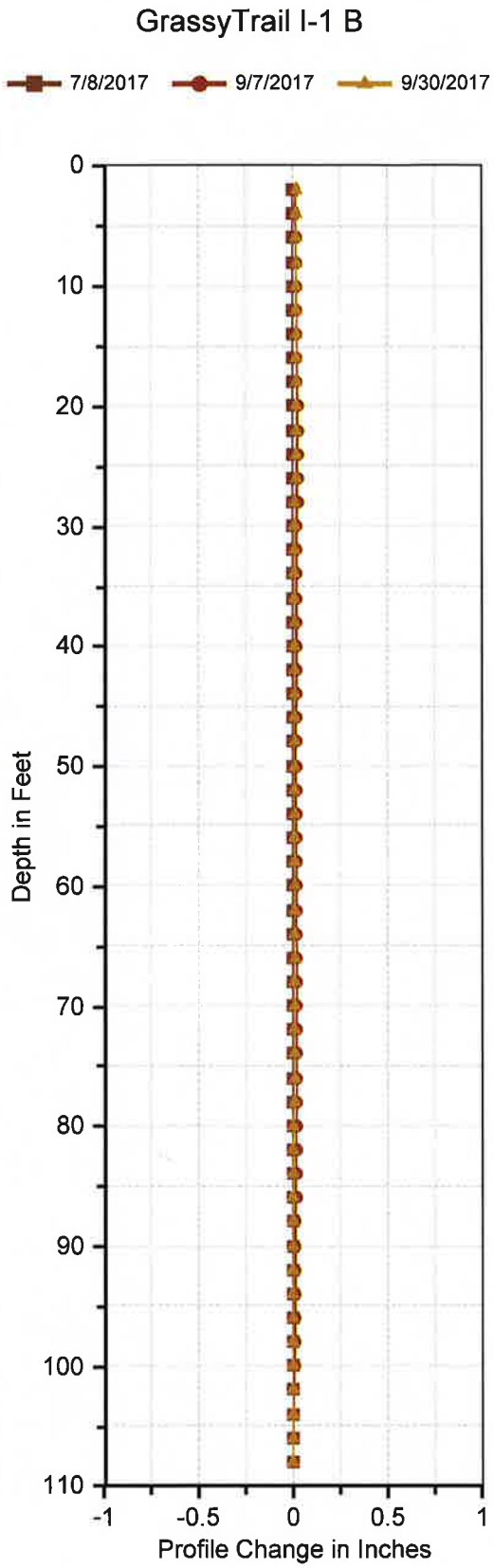
The Observation Well #OW-4 which had been prone to giving inaccurate reads has now been abandoned as requested. Reservoir elevation, seepage and piezometer readings have been taken weekly by RB&G since September 5, 2016. Plots of the reservoir elevations, piezometer and seepage readings are attached.

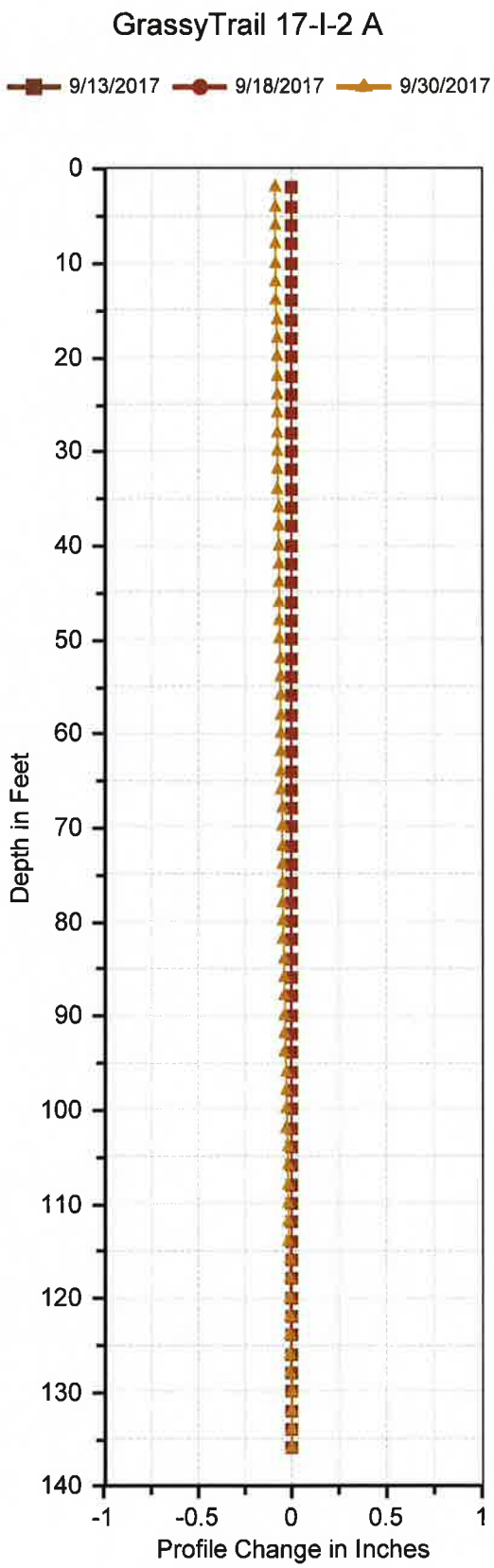
Survey data of the dam provided by Ware Surveying LLC. is included in this report. The survey data was gathered on September 29, 2017, and does not show any current significant movement on the dam.

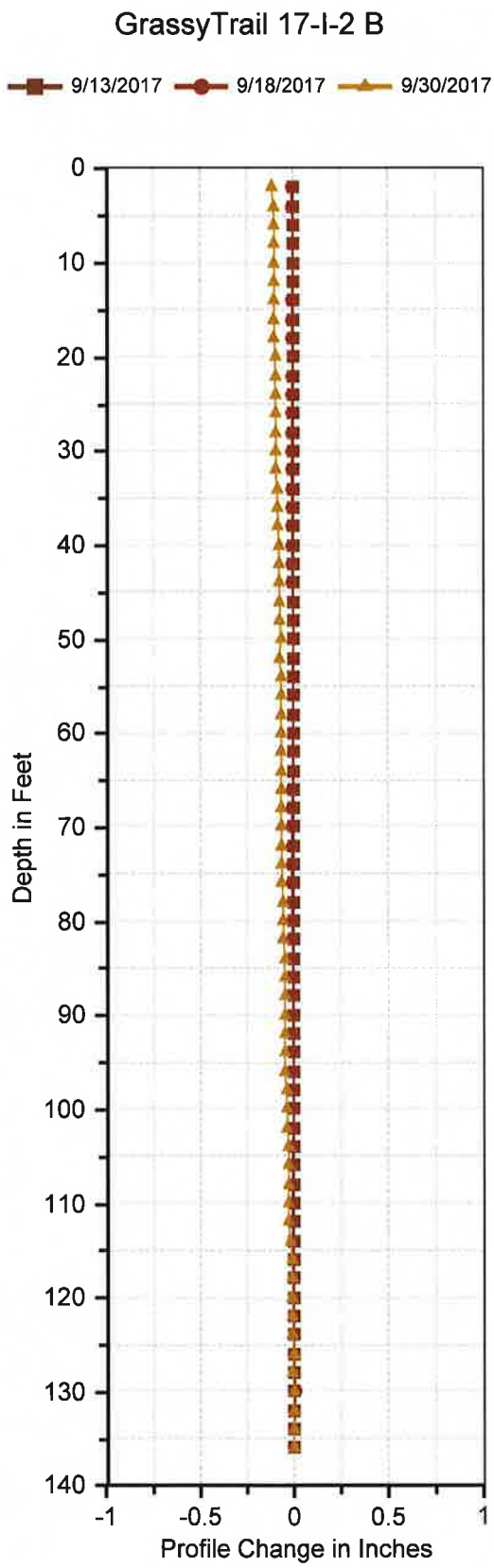
No evidence of landslide movement was noted on the dam or within the hillsides of the dam abutments.

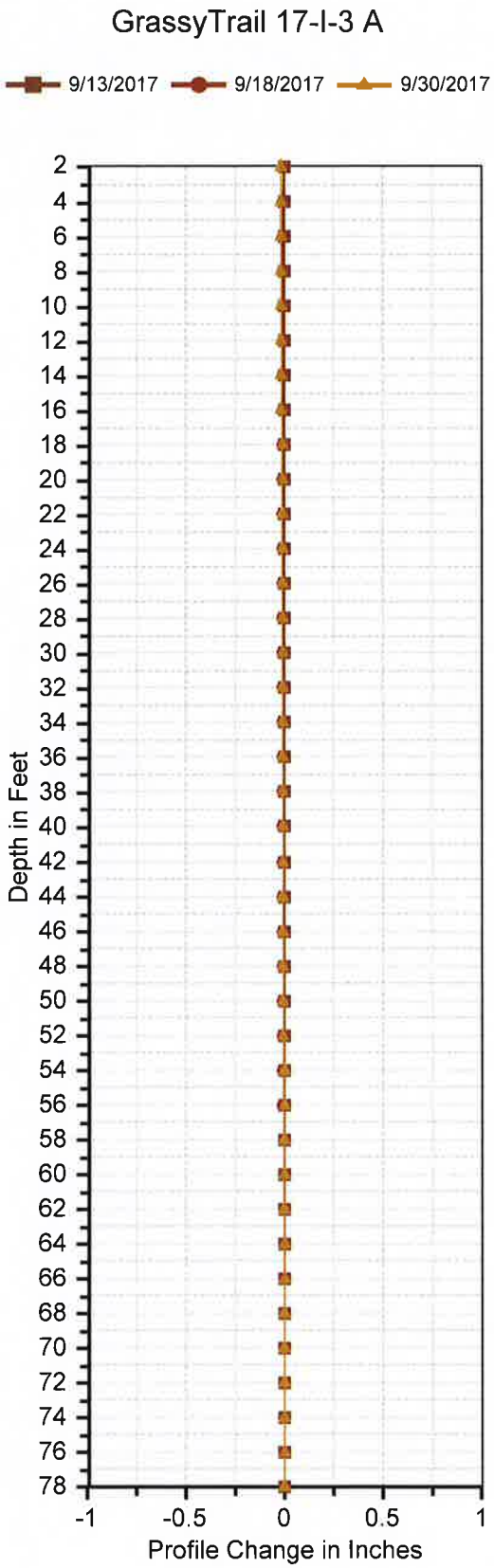
Michael Hansen P.G.
Engineering Geologist
RB&G Engineering Inc.

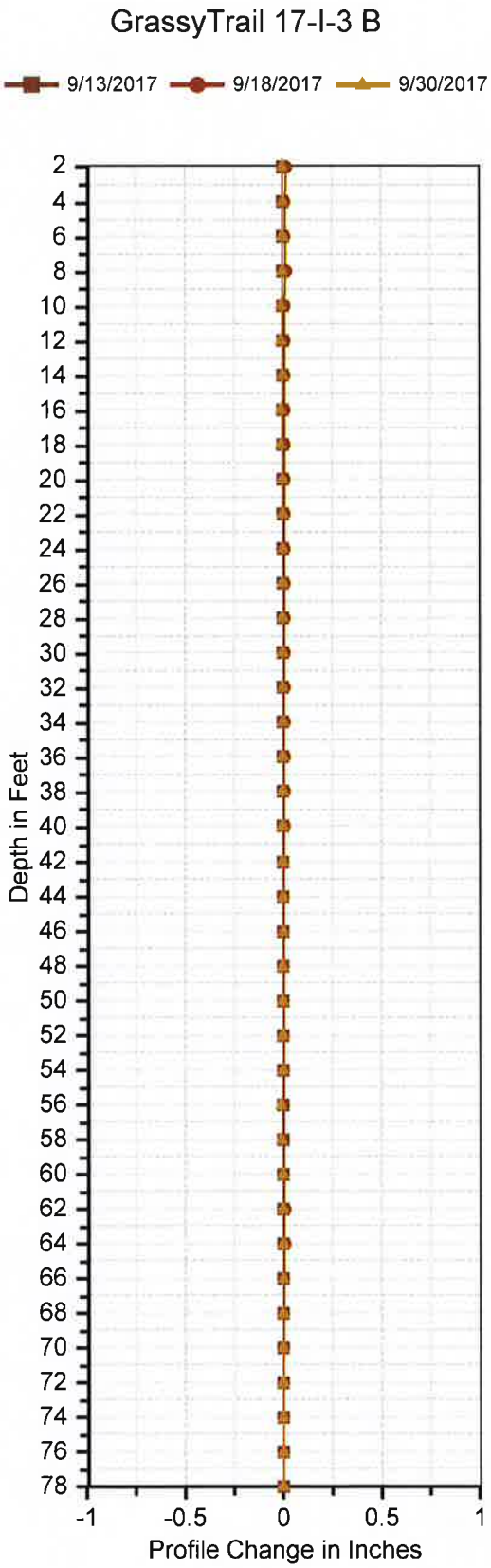

GrassyTrail I-1 A
7/8/2017
9/7/2017
9/30/2017
Depth in Feet
0
10
20
30
40
50
60
70
80
90
100
110
-1
-0.5
0
0.5
1
Profile Change in Inches

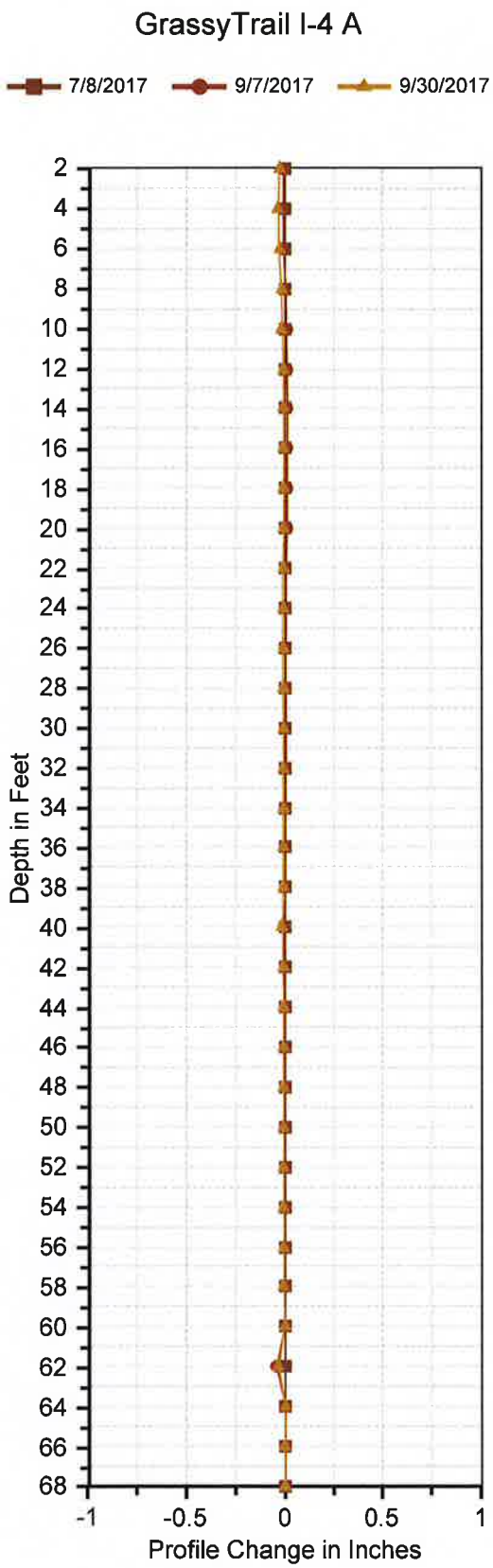

GrassyTrail I-1 B
7/8/2017
9/7/2017
9/30/2017
Depth in Feet
0
10
20
30
40
50
60
70
80
90
100
110
-1
-0.5
0
0.5
1
Profile Change in Inches

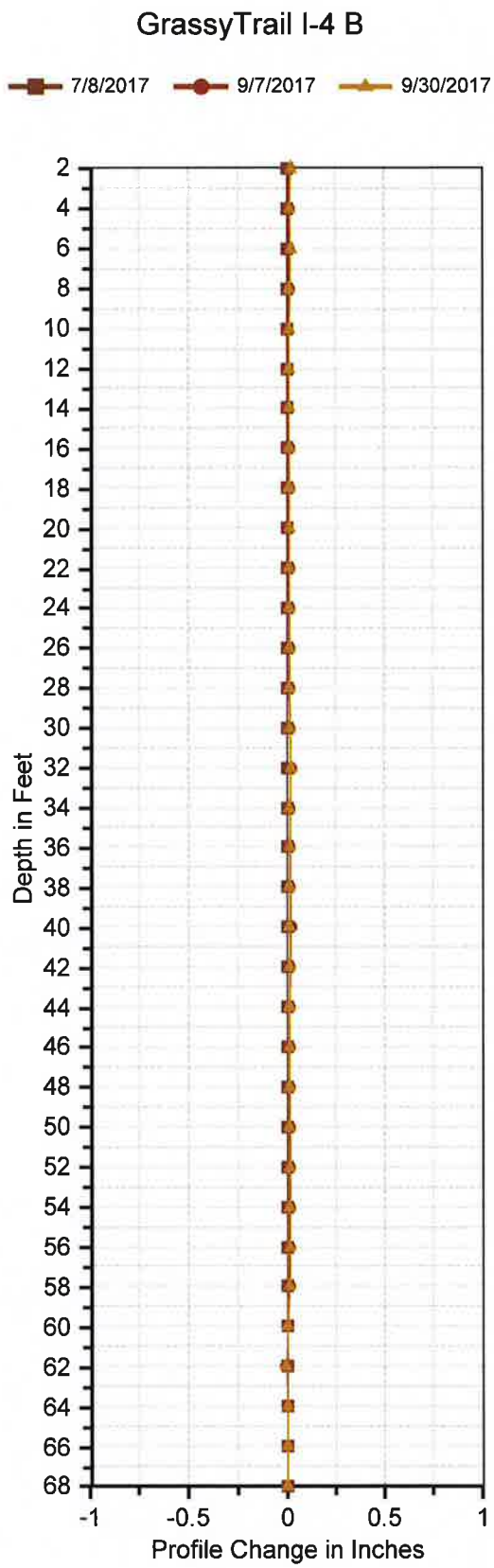

GrassyTrail 17-I-2 A
9/13/2017
9/18/2017
9/30/2017
Depth in Feet
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
-1
-0.5
0
0.5
1
Profile Change in Inches


GrassyTrail 17-I-2 B
9/13/2017
9/18/2017
9/30/2017
Depth in Feet
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
-1
-0.5
0
0.5
1
Profile Change in Inches


GrassyTrail 17-I-3 A
9/13/2017
9/18/2017
9/30/2017
Depth in Feet
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
-1
-0.5
0
0.5
1
Profile Change in Inches


GrassyTrail 17-I-3 B
9/13/2017
9/18/2017
9/30/2017
Depth in Feet
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
-1
-0.5
0
0.5
1
Profile Change in Inches


GrassyTrail I-4 A
7/8/2017
9/7/2017
9/30/2017
Depth in Feet
Profile Change in Inches

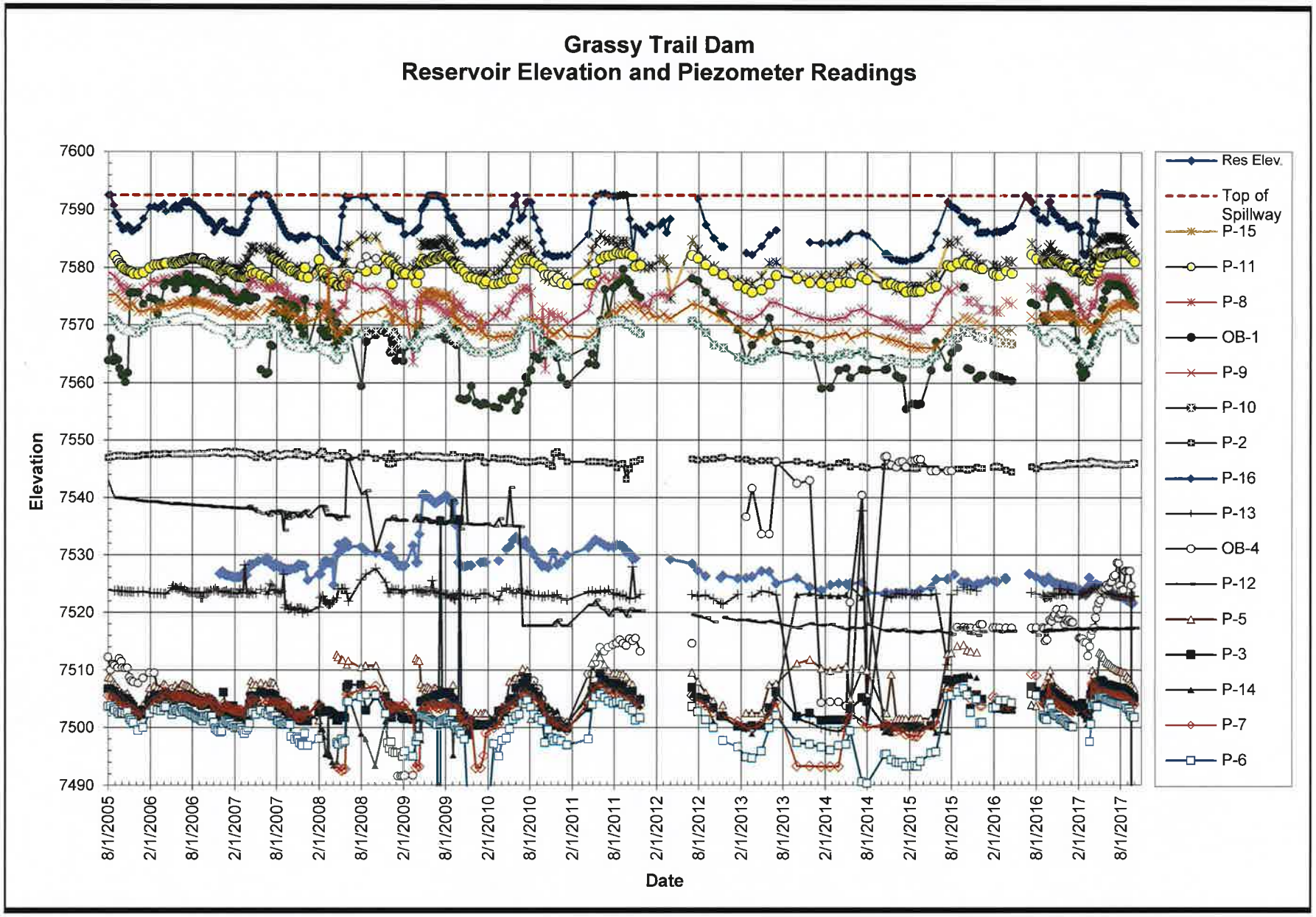

GrassyTrail I-4 B
7/8/2017
9/7/2017
9/30/2017
Depth in Feet
Profile Change in Inches

Grassy Trail Dam MIS Monitoring - Accelerometer located on the Dam Blastware (V10.72-10.74) Event Report Event List

Type	Serial No.	Date	Time	No. Chan	Trigger	Tran Peak (in/s)	Vert Peak (in/s)	Long Peak (in/s)	Tran Accel (g)	Vert Accel (g)	Long Accel (g)	Tran Freq. Hz.	Vert Freq. Hz.	Long Freq. Hz.	Description	Post Event Note first line
LOG	BE9690	5-Sep-17	16:27:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	5-Sep-17	16:27:35	3	Tran	0.045	0.025	0.02	0.04	0.04	0.027	73.14	46.55	51.2	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	5-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	5-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	6-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	6-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	7-Sep-17	9:33:00	3	Tran	0.03	0.03	0.02	0.053	0.053	0.027	18.96	23.27	85.33	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	7-Sep-17	9:33:06	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	7-Sep-17	9:33:30	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	7-Sep-17	9:33:36	3	Vert	0.05	0.08	0.02	0.053	0.08	0.04	22.26	20.48	73.14	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	7-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	7-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	8-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	8-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	9-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	9-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	10-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	10-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	11-Sep-17	16:33:16	3	Long	0.015	0.02	0.02	0.027	0.027	0.027	>100	>100	>100	GrassyTrailDam2015	Man made During Drilling
W	BE9690	11-Sep-17	20:04:29	3	Tran	0.02	0.015	0.035	0.053	0.04	0.04	>100	>100	85.33	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	11-Sep-17	20:04:51	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	11-Sep-17	20:19:36	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	11-Sep-17	20:19:46	3	Tran	0.055	0.04	0.025	0.053	0.066	0.04	56.89	56.89	73.14	GrassyTrailDam2015	*Man Made event while opening or closing cover*
W	BE9690	11-Sep-17	20:19:53	3	Tran	0.05	0.03	0.05	0.093	0.068	0.08	>100	>100	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	11-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	11-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	12-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	12-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	13-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	13-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	14-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	14-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	15-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	15-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	16-Sep-17	9:52:51	3	Vert	0.065	0.06	0.015	0.066	0.053	0.027	46.55	46.55	56.89	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	16-Sep-17	9:53:02	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	16-Sep-17	10:58:55	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	16-Sep-17	10:58:57	3	Tran	0.02	0.025	0.01	0.053	0.053	0.013	>100	>100	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	16-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	16-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	17-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	17-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
LOG	BE9690	18-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	18-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
LOG	BE9690	19-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	19-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
LOG	BE9690	20-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	20-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	21-Sep-17	9:21:17	3	Tran	0.02	0.01	0.01	0.027	0.013	0.013	73.14	>100	>100	GrassyTrailDam2015	extremly windy vibrating Solar Panel
W	BE9690	21-Sep-17	10:36:00	3	Tran	0.02	0.015	0.01	0.027	0.027	0.013	85.33	>100	>100	GrassyTrailDam2015	extremly windy vibrating Solar Panel
W	BE9690	21-Sep-17	15:21:34	3	Tran	0.02	0.015	0.01	0.04	0.027	0.027	73.14	>100	>100	GrassyTrailDam2015	extremly windy vibrating Solar Panel
W	BE9690	21-Sep-17	22:05:44	3	Tran	0.025	0.015	0.01	0.027	0.027	0.013	64	85.33	>100	GrassyTrailDam2015	extremly windy vibrating Solar Panel
LOG	BE9690	21-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	21-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	22-Sep-17	0:30:06	3	Tran	0.02	0.01	0.01	0.027	0.013	0.013	73.14	>100	>100	GrassyTrailDam2015	extremly windy vibrating Solar Panel
W	BE9690	22-Sep-17	0:36:37	3	Tran	0.02	0.01	0.01	0.027	0.027	0.027	73.14	>100	>100	GrassyTrailDam2015	extremly windy vibrating Solar Panel
W	BE9690	22-Sep-17	16:35:31	3	Tran	0.02	0.01	0.01	0.027	0.027	0.027	73.14	>100	>100	GrassyTrailDam2015	extremly windy vibrating Solar Panel
LOG	BE9690	22-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	22-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	23-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	23-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	24-Sep-17	6:18:27	3	Tran	0.15	0.125	0.03	0.172	0.106	0.04	64	64	64	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	24-Sep-17	6:18:40	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	24-Sep-17	7:13:13	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	24-Sep-17	7:13:15	3	Vert	0.045	0.05	0.025	0.04	0.053	0.027	46.55	51.2	85.33	GrassyTrailDam2015	*Man Made event while opening or closing cover*
W	BE9690	24-Sep-17	7:13:41	3	Tran	0.025	0.005	0.015	0.04	0.013	0.04	>100	>100	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	24-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	24-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	25-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	25-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
LOG	BE9690	26-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	27-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	28-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	29-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
W	BE9690	30-Sep-17	6:27:15	3	Vert	0.03	0.055	0.08	0.066	0.133	0.093	>100	>100	56.89	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	30-Sep-17	6:27:23	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)

GRASSY TRAIL DAM PIEZOMETER & OBSERVATION WELL READINGS

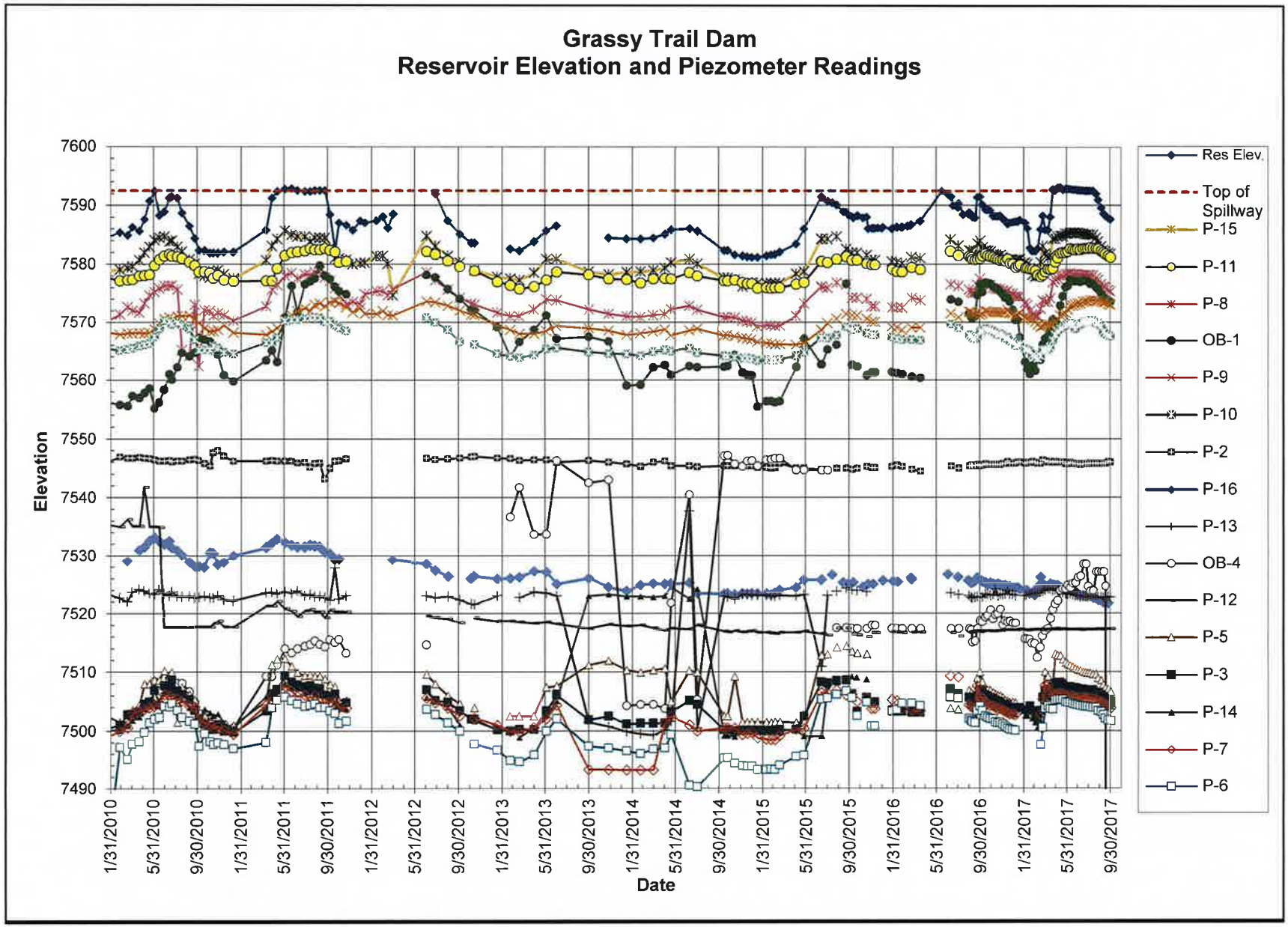
TAKE READINGS AT RIM ELEV			05-2		79-4	98-3		05-4		79-3	05-3A	05-3		98-2	98-4	98-6	06-1	06-1
			5+62		5+15	4+14		~4+14		3+63	2+77	2+71						
Dam Crest Elev		7600.0	PIEZ.	PIEZ.	O.W.	PIEZ.		PIEZ.		O.W.	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ
Spillway Elev.		7592.5	8	9	1	2	3	13	14	4	10	11	12	5	6	7	15	16
Rim Elev. (ft)			7601.5		7601.8	7601.7		7558.9	7558.9	7601.7	7601.8	7601.7	7601.7	7528.8	7512.0	7519.5	7601.5	7601.5
Tip Elev. (ft		(actual)	7554.5	7535.1	7491.8	7525.4	7491.0	7621.0	7499.5	7491.7	7550.8	7572.0	7529.5	7501.5	7479.5	7493.0		
Piezometer Location:			CREST EMBANK	CREST FOUND	CREST EMBANKFOUND	CREST EMBANK	CREST FOUND	D.S. SLOPE EMBANK	D.S. SLOPE FOUND	CREST EMBANKFOUND	CREST EMBANK	CREST EMBANK	CREST FOUND	TOE FOUND	TOE FOUND	TOE FOUND	CREST FOUND	CREST BED ROCK
Date	Initials	Reservoir Elevation	45.75' (47')	65' (68.4')	110'	76.2' (76.3')	110.7'	36.5' (37.9')	58.8' (59.4')	110'	49.5' (51')	28.5' (29.7')	84.0' (72.2')	27.3'	32.5'	26.5'	35.5'	100.0'
01/03/16	MH	7586.35																
01/17/16	MH	7586.26																
01/27/16	ECC	7586.083	7572.7	7569.3	7561.4	7545.3	7503.5			7517.4	7567.4	7579.1	7516.8	7504	7503.4	7505.3	7580.5	7525.7
01/31/16	MH	7586.25																
02/11/16	ECC	7586.417	7572.5	7569.1	7561.2	7545.5	7503.3			7517.4	7567.2	7578.8	7516.8	7503.8	7503.6	7505.1	7580.4	7525.6
02/13/16	MH	7586.30																
02/25/16	ECC	7586.30	7572.5	7567	7561	7545.3	7503.3			7517.4	7567	7578.7	7516.7	7503.3	7504.7	7503.7	7580.2	7525.4
02/27/16	MH	7586.30																
03/12/16	MH	7586.50																
03/21/16	MH	7586.70																
03/23/16	ECC	7586.75	7574.2	7567	7560.6	7544.8	7503.2			7517.4	7567	7579.5	7516.8	7503.1	7504.7	7503.5	7581.3	7526.1
04/16/16	ECC	7587.33	7573.8	7566.9	7560.4	7544.5	7503.2			7517.4	7566.9	7579.1	7516.8	7503.1	7504.3	7503.4	7581.1	7525.8
06/16/16	MH	7592.52																
07/03/16	ECC	7591.90																
07/11/16	ECC	7591.50	7576.6	7569.7	7574	7545.4	7507.1	7523.5	7505.6	7517.4	7569.7	7582.3	7516.7	7503.9	7505.8	7509.3	7584.2	7526.8
07/17/16	MH	7590.00																
07/31/16	MH	7589.65																
08/01/16	ECC	7590.33	7576.3	7569	7573.6	7545	7506.3	7523.2	7505.5	7517.4	7569	7581.6	7516.1	7503.7	7505.6	7509.1	7583.2	7526.3
08/14/16	MH	7588.46																
08/28/16	MH	7588.6																
08/31/16	EEC	7588.75	7575.7	7571.9	7571.6	7545.4	7505.7	7523	7504.7	7517.4	7567.8	7581.4	7516.8	7506.9	7502.1	7504.4	7582.4	7525.7
09/05/16	MH	7588.40	7575.4	7571.9	7571.0	7545.5	7505.2	7522.7	7504.3	7515.2	7567.6	7581.2	7516.9	7506.5	7501.8	7504.1	7582.1	7525.5
09/09/16	MH/KM	7588.05	7575.1	7571.6	7570.7	7545.4	7505.3	7522.6	7504.2	7515.1	7567.2	7580.9	7516.8	7506.3	7501.6	7504.0	7581.7	7525.3
09/16/16	MH	7587.95	7575.2	7571.5	7571.0	7545.5	7505.2	7522.7	7504.1	7515.3	7567.1	7580.8	7517.0	7506.1	7501.4	7503.8	7581.6	7525.3
09/23/16	MH	7591.40	7576.5	7571.7	7574.8	7545.6	7505.9	7522.9	7504.6	7517.4	7567.5	7580.9	7516.9	7509.0	7503.4	7507.6	7583.5	7525.6
09/30/16	MH	7591.55	7577.6	7571.3	7576.6	7545.4	7506.9	7522.7	7506.0	7518.7	7568.5	7581.0	7516.8	7510.0	7504.2	7505.8	7584.0	7526.2
10/07/16	MH	7590.20	7576.8	7571.5	7575.3	7545.5	7506.7	7522.8	7505.6	7518.5	7568.5	7581.4	7517.0	7508.3	7503.4	7505.5	7582.9	7525.8
10/16/16	MH	7589.38	7576.7	7572.0	7576.9	7545.7	7506.1	7523.3	7505.0	7519.3	7568.9	7581.8	7517.0	7507.2	7502.5	7504.8	7582.4	7525.5
10/22/16	MH	7589.30	7576.6	7571.9	7576.8	7545.6	7505.9	7523.2	7504.7	7519.6	7568.7	7581.5	7517.0	7507.0	7502.3	7504.5	7582.3	7525.3
10/29/16	MH	7589.20	7576.5	7571.9	7576.7	7545.6	7505.7	7523.1	7504.5	7520.6	7568.7	7581.4	7516.9	7506.9	7502.1	7504.3	7582.2	7524.9
11/06/16	MH	7588.25	7576.0	7571.9	7576.2	7545.6	7505.5	7523.2	7504.4	7519.0	7568.5	7581.2	7516.9	7506.5	7502.0	7504.3	7581.7	7525.2
11/13/16	MH	7588.25	7575.9	7571.8	7576.0	7545.6	7505.2	7524.1	7504.2	7519.7	7568.2	7581.0	7517.0	7506.2	7501.5	7503.9	7581.7	7525.0
11/19/16	MH	7588.20	7575.8	7571.8	7575.8	7545.6	7505.0	7523.0	7503.9	7519.9	7567.9	7580.8	7517.0	7506.0	7501.4	7503.7	7581.5	7524.9
11/26/16	MH	7588.35	7575.8	7571.8	7575.4	7545.6	7504.9	7523.2	7503.8	7520.7	7568.0	7580.7	7517.0	7506.0	7501.4	7503.8	7581.6	7525.0
12/03/16	MH	7587.80	7575.6	7571.8	7574.9	7545.8	7504.5	7523.3	7503.7	7518.0	7567.8	7580.7	7517.1	7505.7	7501.1	7503.6	7581.3	7524.8
12/10/16	MH	7587.50	7575.3	7571.8	7574.3	7545.8	7504.5	7523.3	7503.4	7518.7	7567.2	7580.5	7517.1	7505.2	7500.8	7503.3	7581.0	7524.7
12/17/16	MH	7586.90	7575.5	7572.2	7574.3	7546.1	7504.4	7523.8	7503.2	7518.5	7567.4	7580.9	7517.1	7505.1	7500.5	7503.1	7580.8	7524.8
12/23/16	MH	7587.10	7575.0	7571.7	7573.7	7545.8	7503.9	7523.3	7502.9	7518.7	7566.7	7580.2	7517.1	7504.9	7500.3	7502.9	7580.8	7524.5
12/31/16	MH	7587.20	7575.0	7571.6	7572.2	7545.8	7503.9	7523.3	7502.8	7518.3	7566.6	7580.1	7517.1	7504.9	7500.2	7502.9	7580.8	7524.6
01/07/17	MH	7587.30	7574.5	7571.2	7570.5	7545.9	7503.9	7523.1	7502.7	7518.3	7565.9	7579.5	7517.1	7504.8	7500.1	7502.7	7580.7	7524.4
01/14/17	MH	7587.30	7574.5	7571.4	7570.5	7546.0	7503.9	7523.1			7566.1	7579.7	7517.2				7580.8	7524.4
01/20/17	MH	7587.60	7574.6	7571.6	7567.4	7546.0	7503.9	7523.1	Covered with snow		7566.2	7579.9	7517.3	Covered with snow			7580.9	7524.5
01/27/17	MH		unable to make it to dam due to snow, got stuck															
02/04/17	MH	7587.10	7573.4	7570.9	7563.1	7545.8	7503.5	7523.0	7502.5	7515.6	7565.4	7579.4	7517.1				7580.4	7524.2
02/10/17	MH	7586.15	7573.1	7570.8	7561.9	7545.9	7503.5	7523.1	7502.5	7515.6	7565.3	7579.4	7517.1				7580.1	7524.0
02/17/17	MH	7582.80	7572.1	7570.8	7561.0	7545.9	7504.2	7523.2	7503.4	7515.5	7565.1	7579.2	7517.2				7579.4	7523.9
02/24/17	MH	7582.30	7571.4	7570.5	7562.5	7546.1	7503.4	7523.4	7502.1	7514.9	7564.4	7579.2	7517.2				7578.2	7523.4
03/04/17	MH	7582.30	7571.2	7570.1	7561.6	7545.9	7502.5	7523.4	7501.4	7514.8	7564.1	7578.9	7517.2	Dry @			7577.9	7523.4
03/11/17	MH	7582.70	7571.1	7569.6	7563.9	7545.8	7501.9	7523.4	7500.6	7512.5	7563.7	7578.2	7517.2	7502.3	7497.6	7502.8	7578.1	7523.1
03/19/17	MH	7585.95	7572.4	7569.3	7563.5	7545.8	7503.4	7523.5	7502.7	7514.2	7564.2	7577.9	7517.1	7506.1	7500.6	7505.4	7580.4	7524.5
03/25/17	MH	7588.30	7573.9	7569.4	7566.2	7546.4	7505.7	7523.8	7505.2	7516.1	7565.3	7578.2	7517.2	7510.0	7503.8	7507.7	7583.1	7526.2
04/01/17	MH	7585.90	7573.6	7569.6	7567.2	7546.2	7506.8	7524.0	7506.0	7517.0	7565.3	7578.7	7517.2	7509.2	7504.2	7507.7	7581.9	7525.0
04/09/17	MH	7585.85	7573.6	7569.7	7567.6	7546.0	7507.0	7524.2	7505.8	7517.4	7565.3	7579.2	7517.2	7508.0	7503.8	7506.8	7581.1	7524.7
04/15/17	MH	7588.08	7574.2	7569.6	7568.4	7546.1	7506.7	7524.2	7505.6	7519.2	7565.7	7579.2	7517.3	7508.2	7503.7	7506.1	7581.5	7524.6
04/22/17	MH	***7592.70***	7577.0	7569.6	7570.5	7546.0	7507.5	7523.9	7506.7	7520.6	7566.9	7579.3	7517.2	7513.1	7505.2	7506.1	7584.3	7525.0
04/29/17	MH	***7592.60***	7577.4	7570.2	7570.1	7546.1	7508.0	7524.0	7507.0	7521.6	7567.9	7580.4	7517.4	7512.9	7505.3	7506.2	7584.4	7524.9
05/06/17	MH	***7592.95***	7577.6	7570.7	7568.8	7546.0	7508.2	7523.9	7507.1	7522.2	7568.5	7581.1	7517.2	7512.8	7505.4	7506.2	7584.7	7524.7
05/13/17	MH	***7593.00***	7578.1	7571.3	7573.0	7546.0	7508.2	7523.9	7507.1	7523.9	7569.0	7581.9	7517.3	7512.2	7505.3	7506.2	7584.9	7524.8
05/20/17	MH	***7592.70***	7578.1	7571.5	7574.6	7546.0	7507.9	7523.5	7506.8	7524.2	7569.0	7582.0	7517.3	7511.6	7505.0	7506.0	7584.8	7524.4
05/28/17	MH	***7592.85***	7578.3	7571.6	7576.1	7545.7	7507.4	7523.3	7506.6	7524.2	7569.5	7582.1	7517.2	7511.3	7504.8	7505.8	7585.2	7524.1
06/03/17	MH	***7592.85***	7578.4	7572.3	7576.3	7545.7	7507.5	7523.2	7506.6	7524.8	7569.7	7582.2	7517.2	7511.2	7504.8	7505.8	7585.2	7524.0
06/10/17	MH	***7592.80***	7578.6	7572.9	7577.4	7545.9	7507.5	7523.4	7506.6	7524.4	7569.8	7582.7	7517.2	7510.9	7504.6	7505.8	7585.4	7524.0
06/17/17	MH	***7592.75***	7578.4	7573.0	7577.2	7545.8	7507.3	7523.2	7506.5	7525.2	7569.6	7582.6	7517.2	7510.6	7504.5	7505.7	7585.4	7524.0
06/24/17	MH	***7592.73***	7578.4	7573.1	7577.1	7545.7	7507.3	7523.0	7506.4	7525.3	7568.9	7582.5	7517.2	7510.4	7504.4	7505.6	7585.4	7523.8
07/01/17	MH	***7592.67***	7578.4	7573.3	7577.2	7545.7	7507.2	7523.0	7506.3	7526.2	7569.5	7582.6	7517.3	7510.3	7504.3	7505.6	7585.4	7523.8
07/08/17	MH	***7592.62***	7578.2	7573.3	7577.0	7545.6	7507.1	7522.8	7506.2	7526.5	7569.7	7582.5	7517.1	7510.1	7504.2	7505.5	7585.3	7523.2
07/16/17	MH	***7592.56***	7578.3	7573.6	7577.3	7545.7	7507.1	7522.9	7506.1	7528.6	7570.1	7582.7	7517.2	7509.9	7504.1	7505.5	7585.3	7523.1
07/23/17	MH	***7592.54***	7578.3	7573.7	7577.2	7545.7	7506.9	7522.8	7506.1	7528.6	7570.1	7582.7	7517.2	7509.8	7504.1	7505.5	7585.1	7523.1
07/29/17	MH	***7592.54***	7578.2	7573.7	7577.2	7545.7	7506.9	7522.8	7506.1	7524.7	7570.1	7582.7	7517.2	7509.8	7504.1	7505.5	7585.1	7523.0
08/05/17	MH	***7592.51***	7578.2	7573.9	7576.7	7545.8	7506.9	7522.8	7506.0	7523.9	7570.3	7582.8	7517.2	7509.6	7504.0	7505.5	7585.0	7523.1
08/13/17	MH	***7592.52***	7578.2	7573.9	7576.7	7545.8	7506.9	7522.8	7506.0	7523.9	7570.3	7582.8	7517.2	7509.6	7504.0	7505.5	7585.0	7523.1
08/21/17	MH	7592.00	7577.7	7573.8	7576.1	7545.8	7506.5	7522.7	7505.7	7527.2	7569.8	7582.7	7517.3	7509.0	7503.4	7505.2	7584.5	7522.8
08/27/17	MH	7590.95	7577.4	7573.8	7575.8	7545.8	7506.4	7522.7	7505.4	7527.2	7569.8	7582.6	7517.3	7508.6	7503.2	7504.9	7583.9	7522.5
09/05/17	MH	7589.65	7576.7	7573.7	7575.1	7545.8	7506.1	7522.7	7505.2	7527.2	7569.4	7582.3	7517.2	7507.8	7502.7	7504.7	7583.1	7522.2
09/11/17	MH	7588.70	7576.2	7573.5	7574.4	7545.8	7505.8	7522.7	7504.9	7527.2	7568.5	7582.1	7517.3	7507.3	7502.1	7504.5	7582.5	7522.1
09/16/17	MH	7588.35	7576.2	7573.5	7574.2	7545.8	7505.5	7522.8	7504.6	7524.7	7568.0	7581.8	7517.3	7507.1	7501.8	7504.2	7582.3	7521.9
09/24/17	MH	7587.90	7575.6	7573.3	7573.8	7546.1	7505.3	7522.8	7504.4	Abandoned	7567.8	7581.5	7517.3	7506.7	7501.8	7504.0	7581.9	7521.8
09/30/17	MH	7587.70	7575.4	7573.1	7573.6	7546.0	7505.1	7522.8	7504.2		7567.7	7581.2	7517.3	7506.6	7501.7	7503.8	7581.8	7521.8



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Piezometer Readings
August 2005 to Sept 30, 2017 (some Res Elevations taken by RB&G Eng)

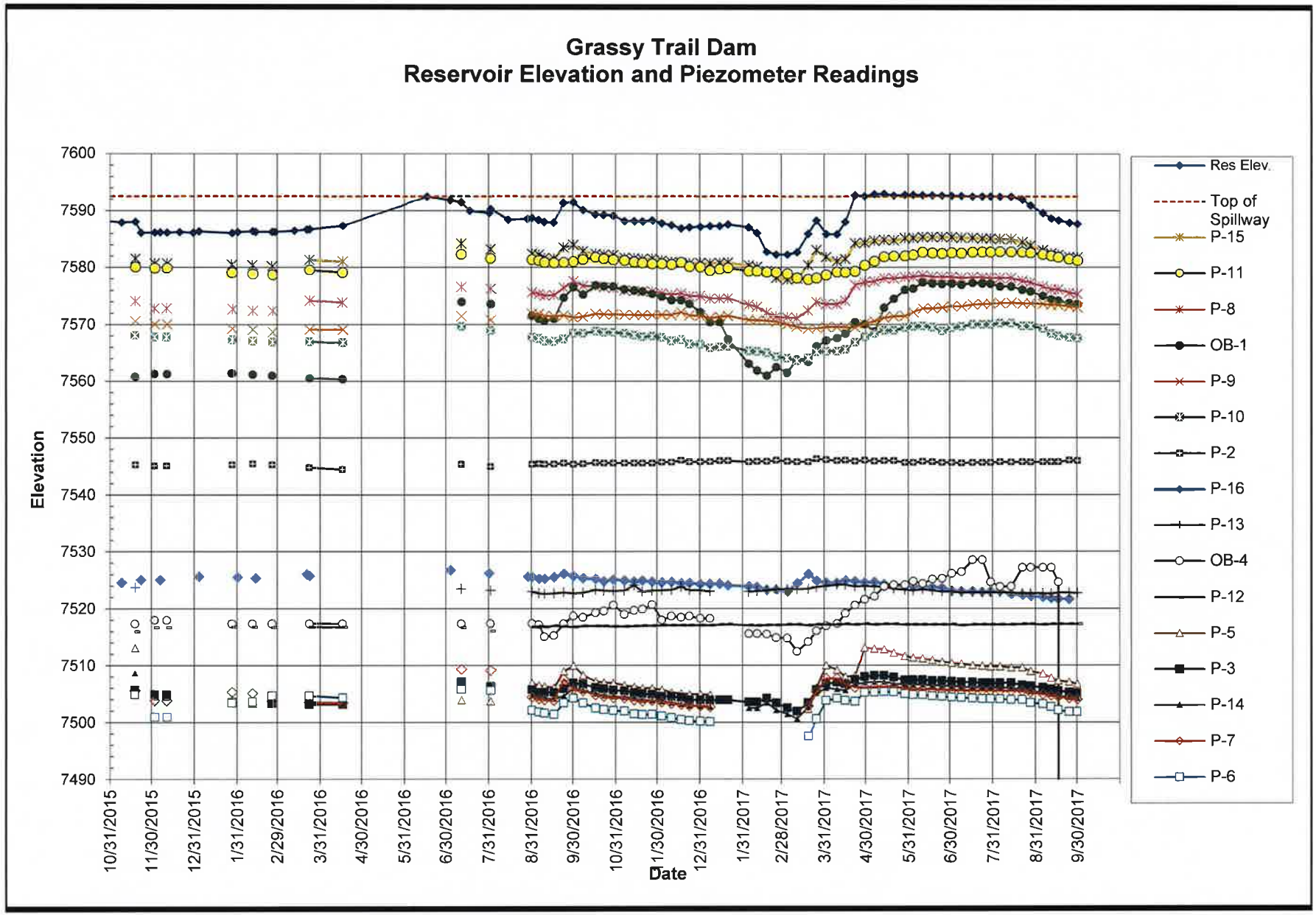
Grassy Trail Dam and Reservoir



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Piezometer Readings
January 2010 to Sept 30, 2017

Grassy Trail Dam and Reservoir



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Piezometer Readings
May 2015 to Sept 30, 2017

Grassy Trail Dam and Reservoir

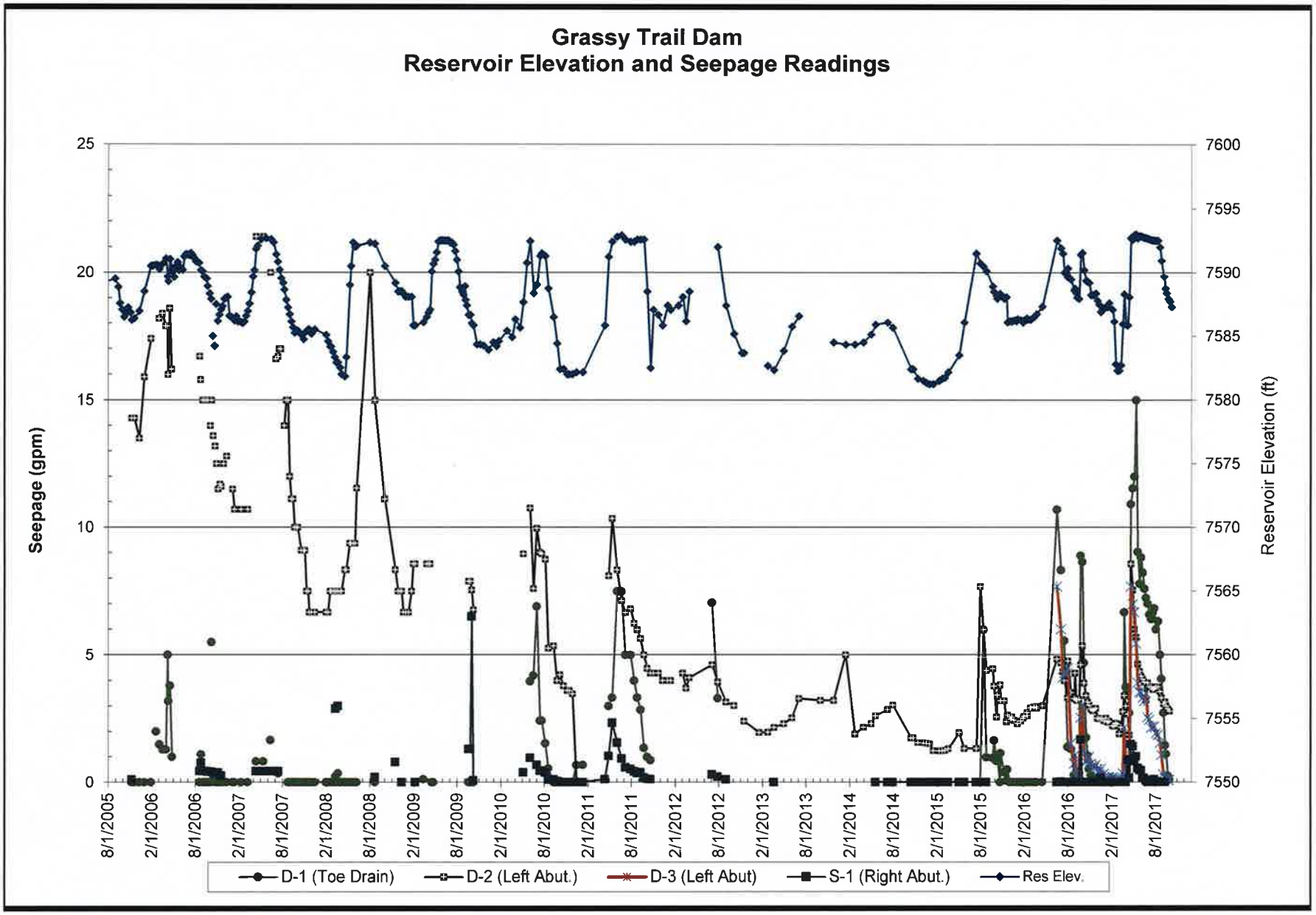
GRASSY TRAIL DAM SEEPAGE READINGS

Dam Crest Elev(ft)		7600.0		Drain1:Toe Drain		Drain 2: Left Abutment (East Seep)		Drain 3: Left Abutment (East Additional collection)		Seep 4: Right Abutment (West Seep)	
Spillway Elev. (ft)		7592.5									
		Seep Location:									
Date	Initials	Reservoir Elev.	Reservoir Characteristics	GAL/MIN	Water Characteristics	GAL/MIN	Water Characteristics	add spring 2016		GAL/MIN	Water Characteristics
12/20/15	MH	7586.25	frozen	Dry		2.46				NM	ice
12/30/15	ECC	7586.167	frozen	Dry						NM	
1/3/16	MH	7586.35	frozen	Dry		2.33				NM	ice
1/17/16	MH	7586.26	frozen	Dry		2.43				NM	ice
1/27/16	ECC	7586.083	frozen	Dry		2.54				NM	ice
1/31/16	MH	7586.25	frozen	Dry		2.61	*trace sediment			NM	ice
2/11/16	ECC	7586.417	frozen	Dry		2.75				NM	ice
2/13/16	MH	7586.3	frozen	Dry		2.64	*trace sediment			NM	ice
2/25/16	ECC	7586.3	frozen	Dry		2.94				NM	ice
2/27/16	MH	7586.3	frozen	Dry		2.95				NM	ice
3/12/16	MH	7586.5	frozen	Dry		2.98				NM	ice
3/21/16	MH	7586.7	frozen	Dry		2.99				NM	ice
3/23/16	ECC	7586.75	frozen	Dry		2.94					
4/16/16	ECC	7587.33		Dry		3.03					
6/16/16	MH	7592.52	slighty over spillway	10.70		4.84		GAL/MIN	Characteristics	0.002	
7/3/16	MH	7591.9		8.33		4.69		6.00		0.02	
7/11/16	ECC	7591.5				4.35		4.11			
7/17/16	MH	7590		5.56		4.00		4.29		0.001	
7/31/16	MH	7589.65		1.40		3.33		4.30		dry	
8/1/16	ECC	7590.33				4.76		4.48			
8/14/16	MH	7588.46		1.32		3.53		1.53		dry	
8/28/16	MH	7588.6		0.28		3.30		0.73		dry	
8/31/16	ECC	7588.75				4.29		1.07			
9/5/16	MH	7588.4		0.04	clear	3.26	clear	0.46	clear	dry	
9/9/16	MH	7588.05		dry		3.23	clear	0.23	clear	dry	
9/16/16	MH	7587.95		dry		3.26		0.17		dry	
9/23/16	MH	7591.4		8.89		4.62		2.54		1.69	
9/30/16	MH	7591.6		8.65		5.36		3.06		drip	
10/7/16	MH	7590.2		4.69		3.90		1.23		dry	
10/16/16	MH	7589.4		1.76		3.41		0.79		Dry	
10/22/16	MH	7589.3		1.06		3.16		0.90		Dry	
10/29/16	MH	7589.2		0.53		3.03		1.00		Dry	
11/4/17	MH	7588.3		0.26		0.29		0.00		Dry	
11/13/16	MH	7588.3		0.194		2.82		0.63		Dry	
11/19/16	MH	7588.3		Dry		2.86		0.57		Dry	
11/26/16	MH	7588.4		Dry		2.91		0.67		Dry	
12/3/16	MH	7587.8	some ice	Dry		2.52		0.50		Dry	
12/10/16	MH	7587.5	Frozen all ice	Dry		2.5		0.4	some sed	Dry	
12/17/16	MH	7586.9	Frozen	drip		2.5		0.52	some sed	0.17	Very wet snow melt
12/23/16	MH	7587.1	Frozen	Dry		2.5		0.27	some sed	Dry	Ice
12/31/16	MH	7587.2	Frozen	Dry		2.4		0.33	some sed	Dry	Ice
01/07/17	MH	7587.3	Frozen	Dry		2.5		Drip		Dry	ice
01/14/17	MH	7587.2	Frozen	Dry		2.36		0.19		Dry	ice
01/20/17	MH	7587.6	Frozen	Dry		2.4		0.21		Dry	ice
01/27/17	MH		unable to make it to dam due to snow, got stuck								
02/04/17	MH	7587.1	Frozen	Dry		2.22		0.17		Dry	ice
02/10/17	MH	7586.2	Frozen	Dry		2.21		0.17		Dry	ice
02/17/17	MH	7582.8	Frozen	snow covered		2.33		0.16		Dry	ice
02/24/17	MH	7582.3	Frozen	snow covered		2.29		0.08		Dry	ice
03/04/17	MH	7582.3	Frozen	snow covered		1.91		0.07		Dry	ice
03/11/17	MH	7582.70	Frozen	snow covered		2.16		0.11		trickle	snow covered
03/19/17	MH	7585.95	Frozen	snow covered		2.78		0.36		trickle	snow covered
03/25/17	MH	7588.30	Frozen	6.67		3.41		2.14		trickle	snow covered
04/01/17	MH	7585.90	Frozen	3.75		3.00		0.54		trickle	snow covered
04/09/17	MH	7585.85	mostly frozen	3.53		2.68		0.17		0.89	
04/15/17	MH	7588.08	a lot melted	2.73		1.86		0.19		0.16	
04/22/17	MH	7592.70	Ice Melted/flow over top	10.91		8.57		7.69	some sediment	1.50	
04/29/17	MH	7592.60	over top spillway	11.54		7.55		6.99	some sediment	1.42	
05/06/17	MH	7592.95	over top spillway	12.00	stream backed	6.00		6.67	some sediment	0.83	
05/13/17	MH	7593.00	over top spillway	15.00	up to pipe	5.70		5.45	some sediment	1.02	
05/20/17	MH	7592.70	over top spillway	9.04		4.64		3.92	some sediment	0.56	
05/28/17	MH	7592.85	over top spillway	7.79		4.35		3.55	some sediment	0.48	
06/03/17	MH	7592.85	over top spillway	8.82		4.17		3.53	less sediment	0.47	
06/10/17	MH	7592.80	over top spillway	8.22		4.05		3.33	less sediment	0.17	
06/17/17	MH	7592.75	over top spillway	7.59		3.94		3.19		0.16	
06/24/17	MH	7592.73	over top spillway	7.23		3.23		3.51		0.07	
07/01/17	MH	7592.67	over top spillway	7.01		3.91		2.56		wet	
07/08/17	MH	7592.62	over top spillway	6.58		3.75		2.46		0.07	
07/16/17	MH	7592.56	over top spillway	6.40		3.75		2.14		wet	
07/23/17	MH	7592.54	over top spillway	6.67		3.65		2.21		0.04	
07/29/17	MH	7592.54	over top spillway	6.82		3.70		2.19		0.11	
08/05/17	MH	7592.51	over top spillway	6.00		3.75		1.92		0.03	
08/13/17	MH	7592.52	over top spillway	6.3		3.75		1.86		0.01	
08/21/17	MH	7592.0	beow spillway	5.00		3.57		1.54		DRY	
08/27/17	MH	7591.0		4.07		3.33		0.31		DRY	
09/05/17	MH	7589.7		2.73		3.09		0.15		DRY	
09/11/17	MH	7588.35		3.16		3.16		0.15		DRY	
09/16/17	MH	7587.9		1.11		3.00		0.16		DRY	
09/24/17	MH	7587.7		0.25		2.88		0.08		DRY	
09/30/17	MH	7587.3		0.10		2.80		0.09		DRY	

* notes MH = Michael Hansen RB&G Engineering

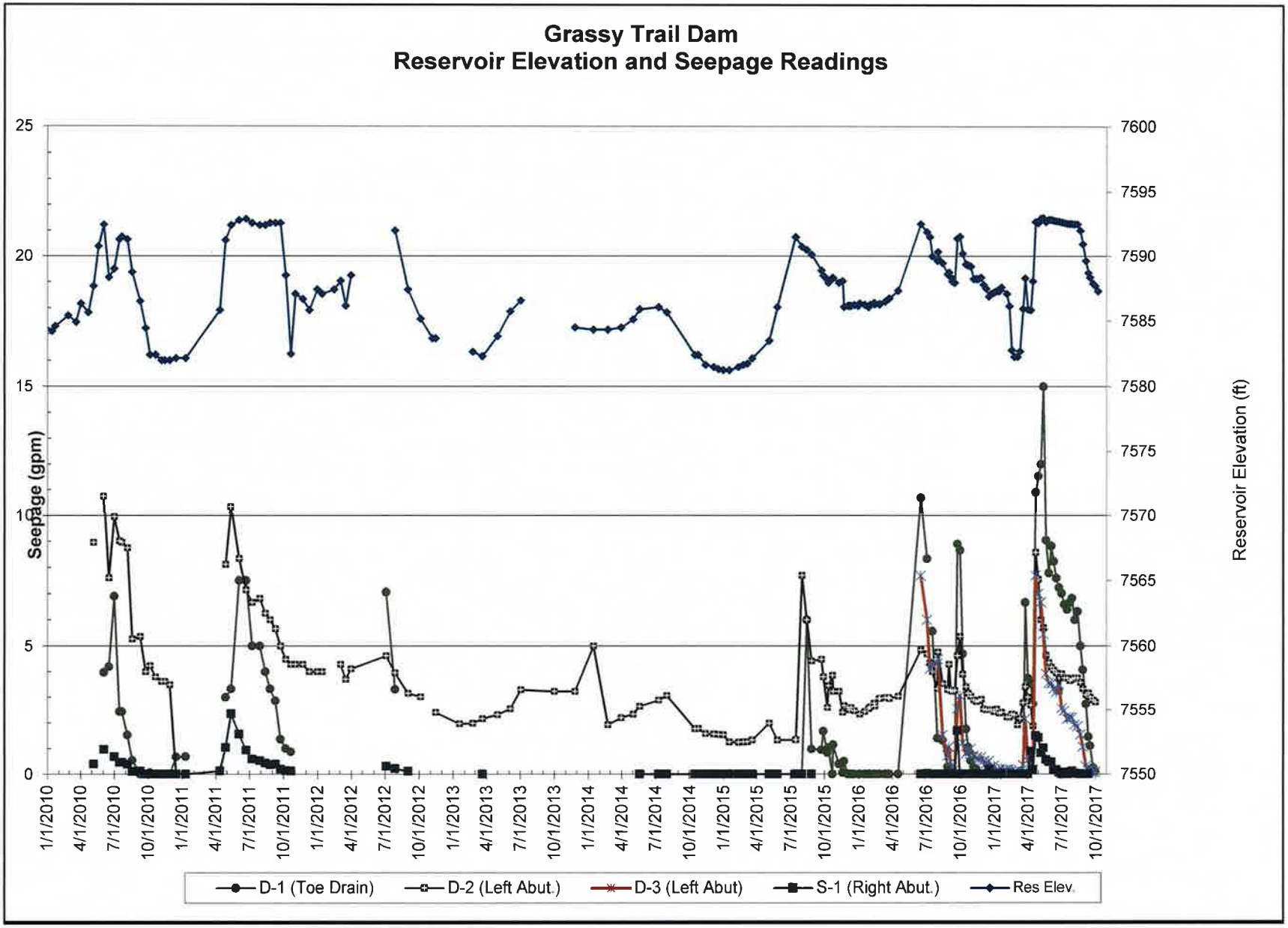
ECC= East Carbon City / Sunnyside

Left abut drain D-3 has been added, 2016, to collect more seepage



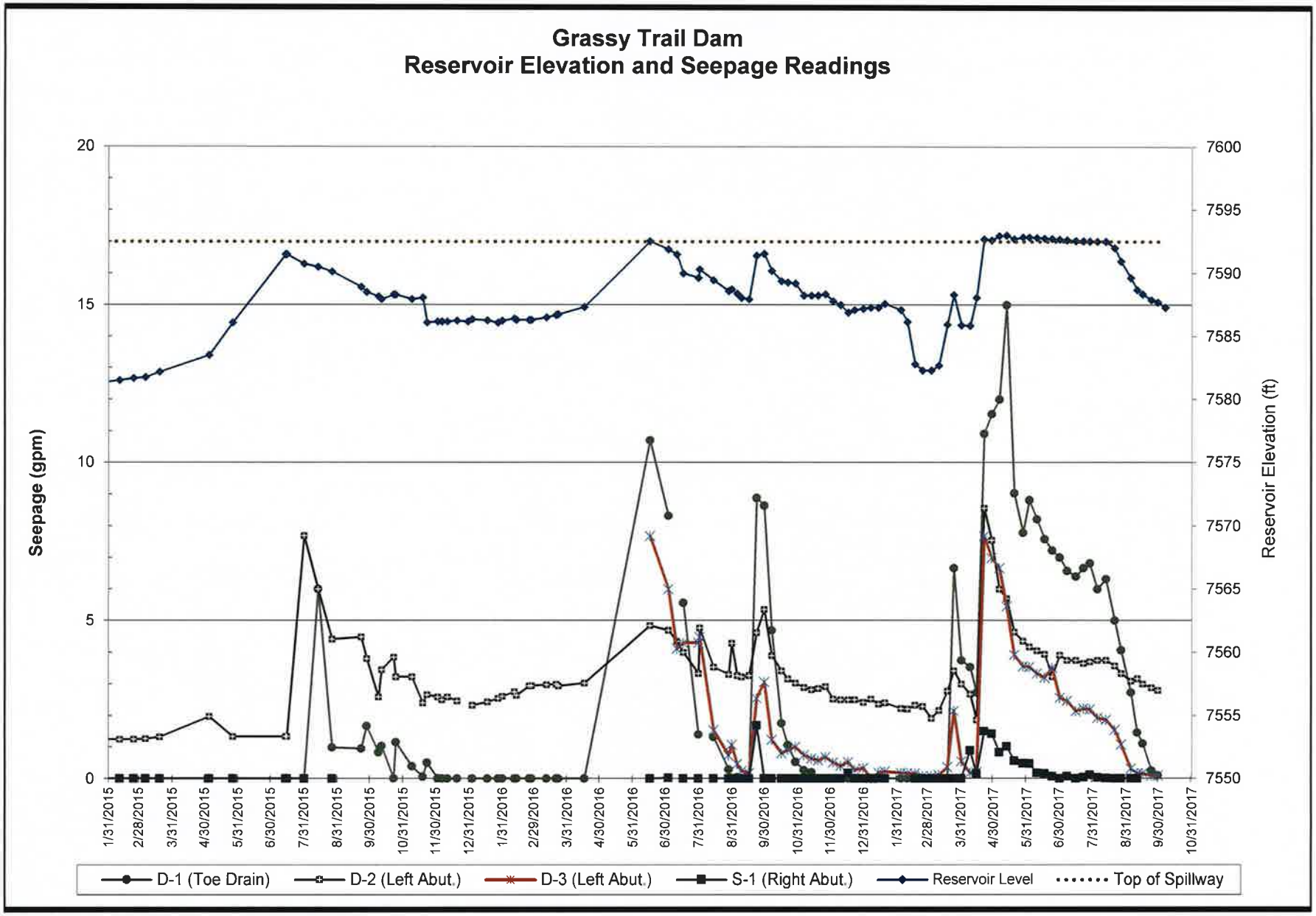
RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Seepage Readings
August 2005 to Sept 30, 2017
Some additonal readings by RB&G Eng
Grassy Trail Dam and Reservoir



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Seepage Readings
January 2010 to Sept 30, 2017
Some additonal readings by RB&G Eng
Grassy Trail Dam and Reservoir



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Seepage Readings
January 2015 to Sept 30, 2017
Some additonal readings by RB&G Eng
Grassy Trail Dam and Reservoir

UtahAmerican Energy
West Ridge Mine
Grassy Trail Reservoir
GPS Survey Data
Anticipated vertical accuracy ~ 0.08'+/-

10/4/2017

STATION	12	13	14	MID	TOE
NORTHING	38,509.85	38,555.42	38,610.87	38,828.21	38,719.59
EASTING	37,047.46	37,064.56	37,099.85	37,580.00	37,664.94
September 2004	7789.87	7771.43	7739.26		
November 2004	7789.84	7771.39	7739.21		
August 2005	7789.75	7771.30	7739.13		
April 2006	7789.46	7771.02	7738.83		
October 2006	7789.39	7770.95	7738.66		
May 2007	7789.45	7771.00	7738.77		
October 2007	7789.45	7771.01	7738.76		
May 2008	7789.57	7771.10	7738.78	7565.52	7515.69
7/13/2008	7789.54	7771.12	7738.82	7565.54	7515.68
8/29/2008	7789.51	7771.08	7738.75	7565.51	7515.63
9/27/2008	7789.49	7771.05	7738.79	7565.52	7515.66
11/24/2008	7789.52	7771.09	7738.76	7565.54	7515.67
3/31/2009	7789.52	7771.07	7738.74	7565.55	7515.65
4/27/2009	7789.50	7771.05	7738.71	7565.53	7515.64
5/29/2009	7789.39	7771.01	7738.72	7565.48	7515.62
6/28/2009	7789.44	7771.08	7738.71	7565.50	7515.63
8/6/2009	7789.49	7771.12	7738.68	7565.49	7515.64
9/9/2009	7789.50	7771.10	7738.67	7565.51	7515.66
10/25/2009	7789.48	7771.11	7738.70	7565.50	7515.67
11/20/2009	7789.49	7771.10	7738.69	7565.49	7515.65
4/15/2010	7789.35	7770.99	7738.80	7565.49	7515.66
5/26/2010	7789.32	7770.91	7738.84	7565.50	7515.66
6/24/2010	7789.36	7770.96	7738.74	7565.46	7515.64
7/22/2010	7789.33	7770.93	7738.75	7565.48	7515.64
9/2/2010	7789.32	7770.91	7738.75	7565.47	7515.64
10/15/2010	7789.34	7770.93	7738.76	7565.49	7515.66
11/18/2010	7789.33	7770.92	7738.73	7565.49	7515.65
5/5/2011	7789.44	7770.93	7738.70	7565.46	7515.62
6/3/2011	7789.46	7770.99	7738.72	7565.50	7515.61
7/21/2011	7789.40	7770.96	7738.75	7565.47	7515.64
8/29/2011	7789.36	7770.96	7738.74	7565.49	7515.62
10/4/2011	7789.33	7770.95	7738.78	7565.48	7515.65
11/7/2011	7789.38	7770.92	7738.77	7565.48	7515.63
10/5/2012	7789.35	7770.91	7738.78	7565.47	7515.62
10/22/2013	7789.37	7770.95	7738.79	7565.47	7515.65
11/19/2014	7789.36	7770.92	7738.78	7565.49	7515.63
9/10/2015	7789.63	7771.15	7739.08	7565.52	7515.65
9/24/2016	7789.54	7771.10	7738.91	7565.51	7515.62
11/29/2016	7789.50	7771.02	7738.97	7565.48	7515.63
5/31/2017	7789.54	7771.07	7738.96	7565.50	7515.65
6/24/2017	7789.49	7771.05	7738.99	7565.47	7515.65
7/30/2017	7789.56	7771.08	7739.03	7565.49	7515.64
8/18/2017	7789.54	7771.10	7739.01	7565.49	7515.66
9/29/2017	7789.48	7771.02	7738.90	7565.50	7515.68
Difference	0.06	0.08	0.11	-0.01	-0.02

WARE SURVEYING, L.L.C.

1344 North 1000 West – Price, UT 84501
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Email: waresurveying@emerytelcom.net

UtahAmerican Energy
West Ridge Mine
Grassy Trail Reservoir
"Straight line" survey data

10/4/2017

Distance from control point to face of Monitoring Well (MW) in feet									
Date of survey	**MW-1**	**MW-2**	**MW-3**	**MW-4**	**MW-5**	**MW-6**	**MW-7**	**West Mon.**	**Straight Line Movement**
12/14/2006	94.21	141.49	245.90	295.13	394.71	493.96	556.71	na	No
1/31/2007	94.21	141.49	245.90	295.13	394.71	493.96	556.71	na	No
3/1/2007	94.21	141.49	245.90	295.13	394.71	493.96	556.71	na	No
3/29/2007	94.21	141.49	245.90	295.13	394.71	493.95	556.70	na	No
5/30/2007	94.20	141.49	245.89	295.12	394.70	493.94	556.70	na	No
6/5/2007	94.20	141.49	245.89	295.12	394.69	493.94	556.68	na	No
7/2/2007	94.20	141.49	245.89	295.12	394.69	493.94	556.69	na	No
10/9/2007	94.21	141.50	245.90	295.13	394.71	493.95	556.70	na	No
11/10/2007	94.22	141.50	245.90	295.13	394.70	493.95	556.70	na	No
12/27/2007	94.21	141.50	245.91	295.13	394.71	493.95	na	710.95	No
4/28/2008	94.20	141.49	245.90	295.12	394.70	493.95	556.69	710.95	No
5/30/2008	94.20	141.49	245.90	295.12	394.70	493.94	556.69	710.94	No
7/13/2008	94.20	141.49	245.90	295.12	394.70	493.95	556.69	710.94	No
8/29/2008	94.21	141.50	245.90	295.14	394.71	493.96	556.70	710.95	No
9/27/2008	94.21	141.50	245.91	295.14	394.71	493.96	556.70	710.95	No
11/24/2008	94.21	141.51	245.91	295.14	394.71	493.96	556.70	710.95	No
1/26/2009	94.20	141.50	245.91	295.13	394.71	493.96	556.70	710.94	No
2/23/2009	94.20	141.49	245.90	295.13	394.70	493.96	556.69	710.94	No
3/31/2009	94.20	141.50	245.90	295.13	394.71	493.96	556.70	710.95	No
4/27/2009	94.21	141.50	245.90	295.13	394.70	493.95	556.70	710.95	No
5/29/2009	94.20	141.49	245.90	295.12	394.70	493.95	556.69	710.95	No
6/28/2009	94.21	141.51	245.91	295.13	394.71	493.96	556.70	710.95	No
8/6/2009	94.21	141.51	245.91	295.14	394.70	493.96	556.70	710.96	No
9/9/2009	94.22	141.51	245.91	295.14	394.71	493.96	556.70	710.96	No
10/25/2009	94.21	141.51	245.91	295.14	394.71	493.96	556.70	710.96	No
11/20/2009	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.95	No
3/5/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.95	No
4/15/2010	94.21	141.50	245.90	295.13	394.70	493.94	556.69	710.94	No
5/17/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.95	No
6/24/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.95	No
7/22/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.70	710.95	No
9/2/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.94	No
10/15/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.94	No
11/18/2010	94.20	141.49	245.89	295.12	394.70	493.95	556.68	710.94	No
5/5/2011	94.21	141.49	245.89	295.12	394.69	493.94	556.68	710.94	No
6/3/2011	94.20	141.49	245.90	295.12	394.69	493.93	556.68	710.93	No
7/21/2011	94.21	141.50	245.90	295.13	394.69	493.94	556.68	710.94	No
8/29/2011	94.20	141.49	245.89	295.12	394.70	493.94	556.69	710.93	No
10/4/2011	94.21	141.49	245.90	295.13	394.70	493.95	556.69	710.93	No
11/7/2011	94.21	141.49	245.90	295.13	394.70	493.94	556.69	710.93	No
12/5/2011	94.21	141.50	245.90	295.13	394.70	493.94	556.69	710.94	No
1/2/2012	94.21	141.50	245.90	295.14	394.70	493.95	556.69	710.94	No
10/5/2012	94.21	141.49	245.89	295.12	394.68	493.93	556.67	710.91	No
10/22/2013	94.21	141.49	245.89	295.13	394.69	493.93	556.67	710.91	No
11/19/2014	94.22	*141.69*	245.90	295.13	394.69	493.93	556.67	710.92	No*
9/10/2015	94.21	141.69	245.89	295.12	394.68	493.92	556.66	710.90	No
9/24/2016	94.21	141.68	245.89	295.12	394.68	493.92	556.65	710.90	No
11/29/2016	94.20	141.67	245.89	295.12	394.68	493.92	556.65	710.90	No
12/22/2016	94.20	141.67	245.89	295.12	394.68	493.92	556.65	710.90	No
5/31/2017	94.19	141.66	245.88	295.10	394.66	493.91	556.64	710.89	No
6/24/2017	94.20	141.67	245.89	295.11	394.67	493.91	556.65	710.89	No
7/30/2017	94.19	141.67	245.88	295.10	394.66	493.91	556.64	710.88	No
8/18/2017	94.20	141.66	245.88	295.11	394.66	493.91	556.64	710.88	No
9/29/2017	94.20	141.67	245.88	295.11	394.67	493.91	556.64	710.88	No
Difference	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	No
Notes	*MW-2 appears to have been bumped, a new distance and straight line mark was recorded								

WARE SURVEYING, L.L.C.

1344 North 1000 West – Price,
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Office: 435-820-4335

UtahAmerican Energy
West Ridge Mine
Grassy Trail Reservoir
Differential Level survey data

10/4/2017

STATION	C-1	C-2	C-3	C-4	C-5	C-6	C-7
NORTHING	38,830.55	38,865.88	38,892.13	38,917.88	38,943.74	38,969.37	38,996.01
EASTING	37,333.20	37,471.64	37,570.28	37,668.82	37,767.40	37,866.16	37,964.74
Differential level survey date.							
07/30/2002 Elevation	7593.49	7590.63	7590.29	7590.67	7590.44	7590.08	7590.08
08/29/2003 Elevation	7593.50	7590.65	7590.31	7590.69	7590.46	7590.08	7590.08
10/27/2004 Elevation	7593.50	7590.62	7590.30	7590.68	7590.45	7590.08	7590.08
08/12/2005 Elevation	7593.52	7590.66	7590.32	7590.69	7590.46	7590.09	7590.08
03/21/2006 Elevation	7593.50	7590.70	7590.30	7590.68	7590.45	7590.09	7590.08
04/14/2006 Elevation	7593.53	7590.73	7590.31	7590.67	7590.44	7590.08	7590.08
05/4/2006 Elevation	7593.54	7590.75	7590.31	7590.66	7590.43	7590.08	7590.08
05/30/2006 Elevation	7593.55	7590.78	7590.31	7590.65	7590.43	7590.07	7590.08
08/11/2006 Elevation	7593.49	7590.79	7590.31	7590.64	7590.43	7590.07	7590.08
09/18/2006 Elevation	7593.51	7590.82	7590.33	7590.66	7590.43	7590.08	7590.08
10/09/2007 Elevation	7593.54	7590.83	7590.33	7590.67	7590.44	7590.08	7590.08
04/28/2008 Elevation	7593.59	7590.84	7590.34	7590.69	7590.45	7590.09	7590.08
05/30/2008 Elevation	7593.56	7590.82	7590.32	7590.65	7590.44	7590.09	7590.08
07/13/2008 Elevation	7593.56	7590.84	7590.33	7590.66	7590.44	7590.08	7590.08
08/29/2008 Elevation	7593.57	7590.83	7590.33	7590.67	7590.44	7590.08	7590.08
09/27/2008 Elevation	7593.56	7590.84	7590.34	7590.68	7590.45	7590.09	7590.08
11/24/2008 Elevation	7593.55	7590.82	7590.32	7590.66	7590.44	7590.08	7590.08
02/23/2009 Elevation	7593.57	7590.83	7590.33	7590.67	7590.45	7590.08	7590.08
03/31/2009 Elevation	7593.57	7590.83	7590.32	7590.67	7590.44	7590.08	7590.08
04/27/2009 Elevation	7593.58	7590.83	7590.33	7590.68	7590.45	7590.08	7590.08
05/29/2009 Elevation	7593.59	7590.84	7590.33	7590.67	7590.44	7590.08	7590.08
06/28/2009 Elevation	7593.57	7590.83	7590.33	7590.67	7590.44	7590.08	7590.08
08/6/2009 Elevation	7593.57	7590.84	7590.33	7590.68	7590.45	7590.08	7590.08
09/9/2009 Elevation	7593.58	7590.84	7590.33	7590.68	7590.45	7590.08	7590.08
10/25/2009 Elevation	7593.56	7590.84	7590.33	7590.68	7590.44	7590.08	7590.08
11/20/2009 Elevation	7593.56	7590.83	7590.32	7590.67	7590.44	7590.08	7590.08
03/05/2010 Elevation	7593.58	7590.84	7590.33	7590.67	7590.45	7590.08	7590.08
04/15/2010 Elevation	7593.60	7590.84	7590.34	7590.68	7590.46	7590.08	7590.08
05/17/2010 Elevation	7593.59	7590.84	7590.33	7590.67	7590.45	7590.08	7590.08
06/24/2010 Elevation	7593.58	7590.84	7590.34	7590.68	7590.45	7590.08	7590.08
07/27/2010 Elevation	7593.56	7590.83	7590.32	7590.68	7590.45	7590.08	7590.08
09/02/2010 Elevation	7593.56	7590.84	7590.33	7590.69	7590.46	7590.08	7590.08
10/15/2010 Elevation	7593.56	7590.84	7590.33	7590.69	7590.46	7590.08	7590.08
11/18/2010 Elevation	7593.56	7590.83	7590.33	7590.67	7590.48	7590.08	7590.08
05/05/2011 Elevation	7593.58	7590.84	7590.33	7590.68	7590.45	7590.08	7590.08
06/03/2011 Elevation	7593.59	7590.84	7590.34	7590.68	7590.46	7590.08	7590.08
07/21/2011 Elevation	7593.58	7590.84	7590.33	7590.68	7590.45	7590.08	7590.08
08/29/2011 Elevation	7593.58	7590.83	7590.34	7590.67	7590.46	7590.08	7590.08
10/4/2011 Elevation	7593.57	7590.83	7590.33	7590.67	7590.45	7590.08	7590.08
11/7/2011 Elevation	7593.58	7590.84	7590.34	7590.67	7590.46	7590.08	7590.08
10/05/2012 Elevation	7593.58	7590.83	7590.33	7590.66	7590.44	7590.08	7590.08
10/22/2013 Elevation	7593.58	7590.84	7590.33	7590.66	7590.44	7590.08	7590.08
11/19/2014 Elevation	7593.59	7590.84	7590.33	7590.67	7590.44	7590.08	7590.08
09/10/2015 Elevation	7593.61	7590.85	7590.34	7590.69	7590.45	7590.08	DESTROYED?
09/24/2016 Elevation	7593.62	7590.85	7590.34	7590.68	7590.44	7590.08	DESTROYED?
11/29/2016 Elevation	7593.61	7590.84	7590.33	7590.68	7590.44	7590.08	DESTROYED?
05/31/2017 Elevation	7593.63	7590.86	7590.35	7590.70	7590.46	7590.08	DESTROYED?
06/24/2017 Elevation	7593.62	7590.87	7590.36	7590.70	7590.46	7590.08	DESTROYED?
07/30/2017 Elevation	7593.60	7590.86	7590.35	7590.69	7590.45	7590.08	DESTROYED?
08/18/2017 Elevation	7593.62	7590.86	7590.35	7590.69	7590.45	7590.08	DESTROYED?
09/29/2017 Elevation	7593.61	7590.86	7590.35	7590.68	7590.45	7590.08	DESTROYED?
Difference	0.01	0.00	0.00	0.01	0.00	0.00	

WARE SURVEYING, L.L.C.

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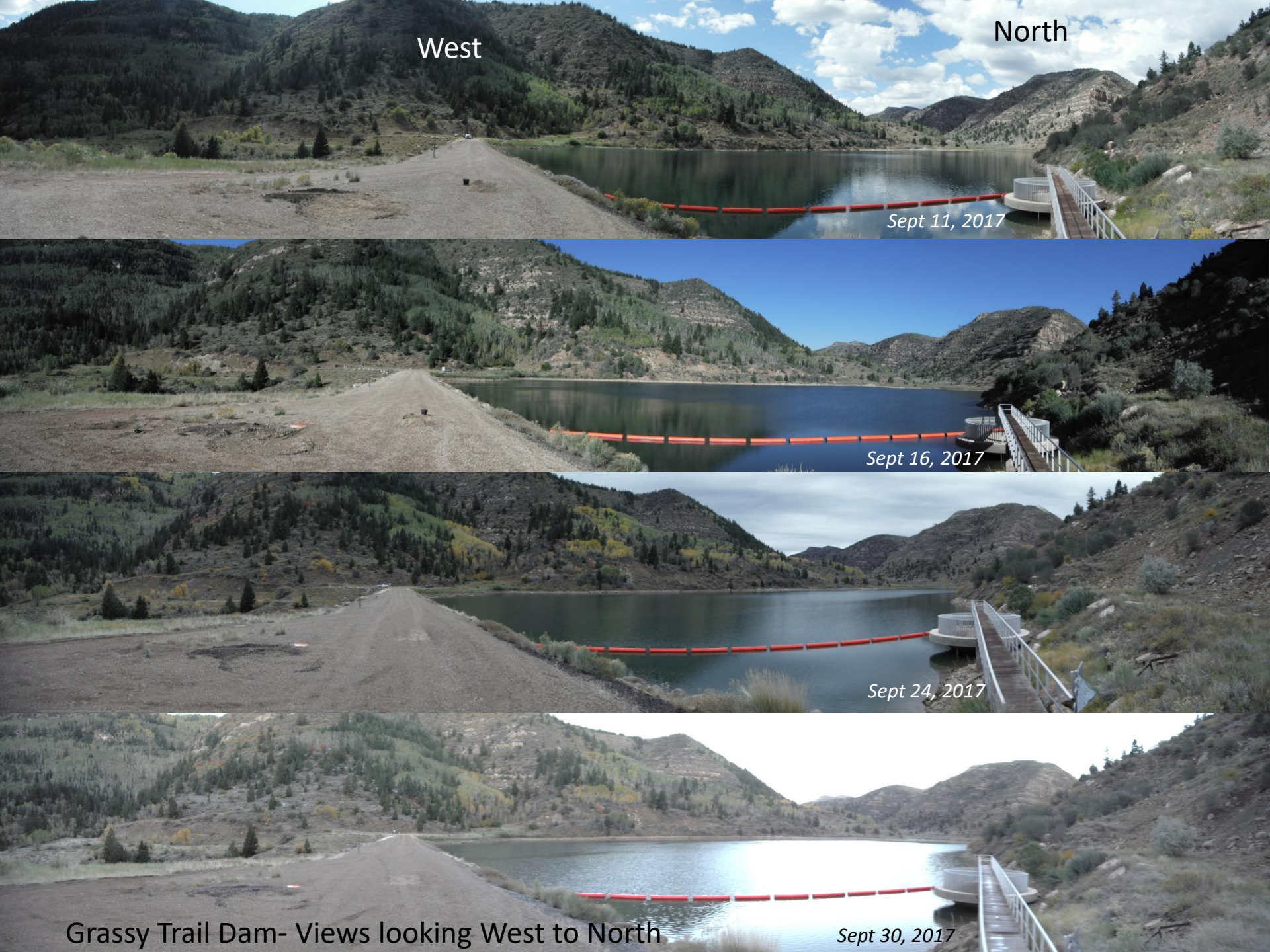
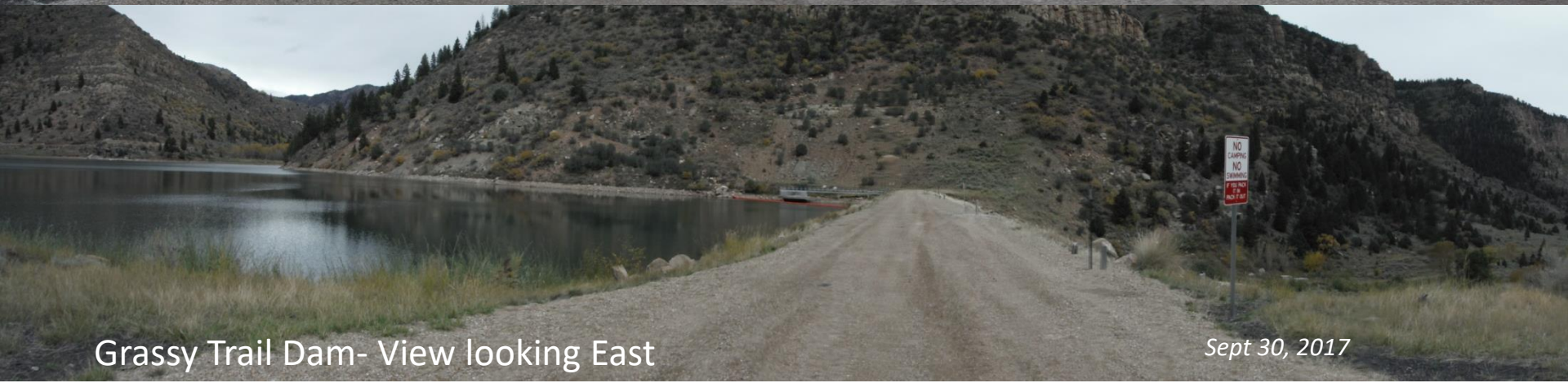


Grassy Trail Dam- Views looking West to North



Grassy Trail Dam- View looking East

Sept 11, 2017

Sept 16, 2017

Sept 24, 2017

View looking North at downstream slope and toe of dam

Sept 30, 2017
View looking Northeast at downstream slope