OGMCOAL DNR <ogmcoal@utah.gov>

Grassy Trail / UT000126 Monitoring update (January 7-February 4, 2017)

Brad Price <Bprice@rbgengineering.com> Mon, Mar 13, 2017 at 11:20 AM
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All,
See attached
Brad

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3 attachments

GrassyTrail ProjectRpt 2-4-17.pdf
1462K

UT EQ 1962-2017 Epicenters.pdf
1089K

Ware Surveying - Grassy dam 01-16-17.PDF
286K

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PROJECT REPORT

Project No.	201404-006		
Project	Grassy Trail – West Ridge Mine Monitoring		
Dates	Site Visits and readings - January 7, 14, 20, 27 and February 4, 2017		
Report By	Michael N. Hansen	**Position**	Engineering Geologist

Observations / Activities

New readings from Inclinometers I-2 and 1-3 have not shown any significant movement. Plots of the inclinometer readings taken on February 4, 2017 are attached. Due to ice buildup over I-4 and frozen ground and ice at I-1, these two inclinometers could not be read.

Due to snow and road conditions on January 27th, our vehicle became stuck and we were unable to make it up to the dam. A backhoe from the City was used to pull the truck out. Due to these conditions Inclinometers, which were to be read at the end of January, were not read until February 4.

One accelerometer is located on the crest of the dam. This accelerometer has been continuously monitoring since the middle of August, 2015. The instrument has not detected any mining induced seismic (MIS) activity between August, 2015 and February 4, 2017. The "events" which have been recorded take place while removing and putting the cover back on the instrument as part of downloading and resetting the Accelerometer.

Since the last report on December 31, 2016, one seismic event has been reported within the area of the mine by the University of Utah Seismograph Stations (UUSS). The event occurred on February 8, 2017. The event had a magnitude of 1.7, and was located about 0.56 miles northwest of the dam. A copy of the event data is attached.

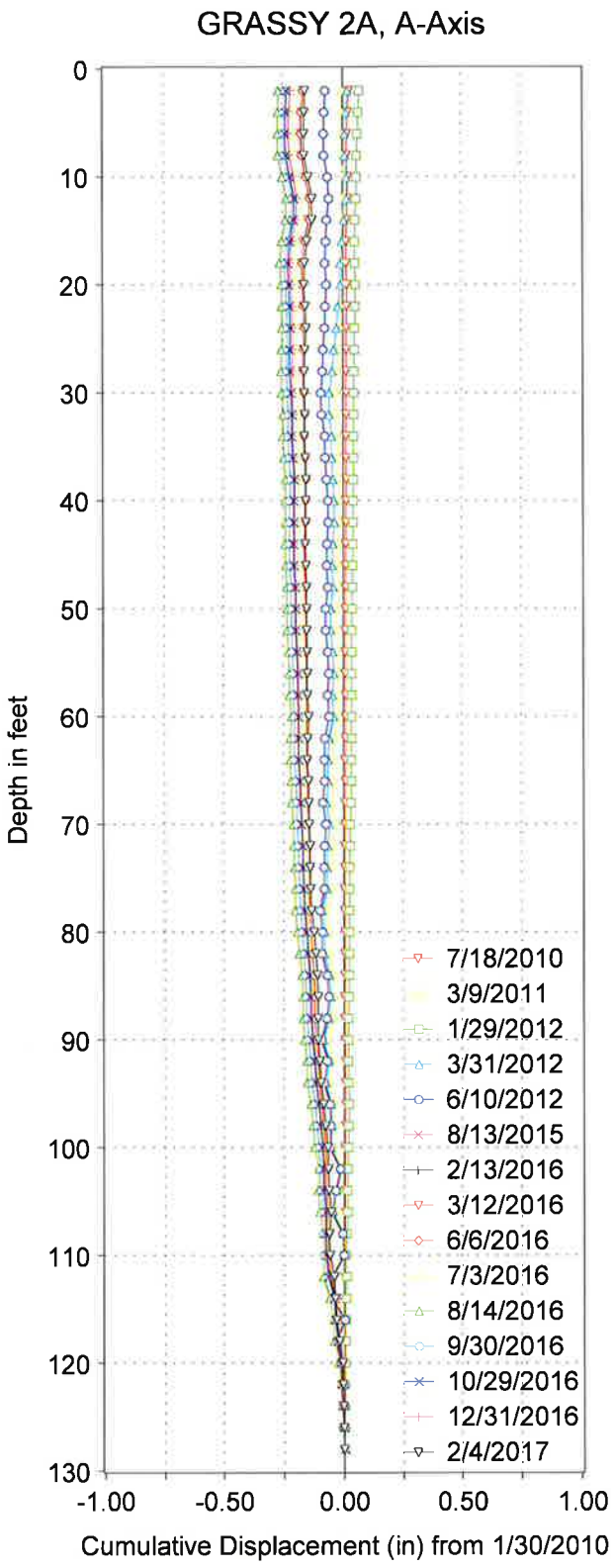
Attached as a separate PDF are charts showing the locations of the seismic epicenters as reported by the University of Utah Seismograph Stations between 1962 to 2017. Mining at West Ridge began in about 2001. Various Charts also show the locations of events for various years and groups of years. It should be noted that the epicenters reported by the UUSS do not match exactly with the locations where the mining occurred. The cluster of events to the east of the reservoir would be more accurately located if shown to the west of the reservoir. A cluster of events shown to the far northwest are likely related to mining near the Dugout Canyon Mine. The area shown on the Charts is approximately 16 miles wide (east-west) and 12 miles (north-south). Also included is a chart showing the total number of events reported per year within the study area.

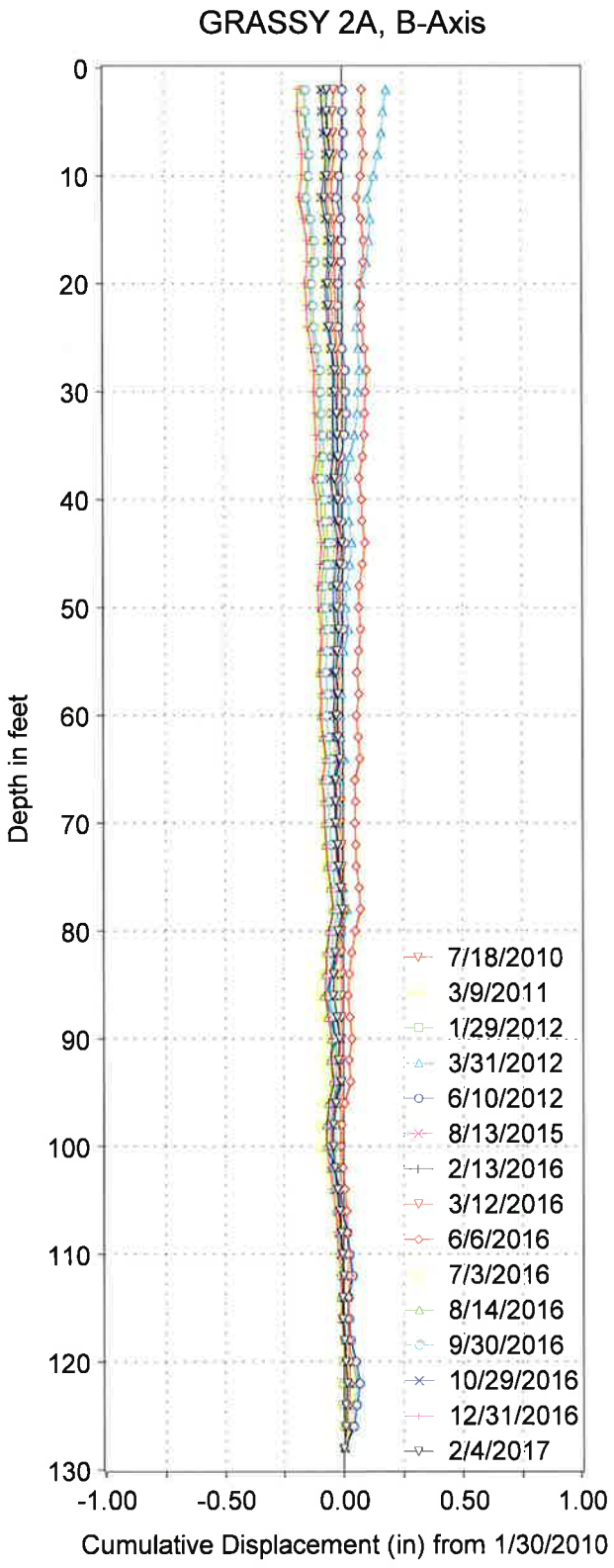
Reservoir elevation, seepage and piezometer readings have been taken weekly by RB&G since September 5. Plots of the reservoir elevations, piezometer and seepage readings are attached. It should be noted that during the past few months while RB&G Engineering has been reading piezometers on a weekly basis, there has been some minor up and down fluctuation in the piezometer readings which do not always appear to correlate with the elevation of the reservoir. Due to snow cover some piezometers could not be read.

Due to the depth of snow "Ware Surveying" could not conduct a survey at the dam.

During the site visits, reconnaissance of the area found no signs of significant landslide movement on the hillsides or at the dam. During site visits from January through February 4, 2017, the reservoir was covered with ice.

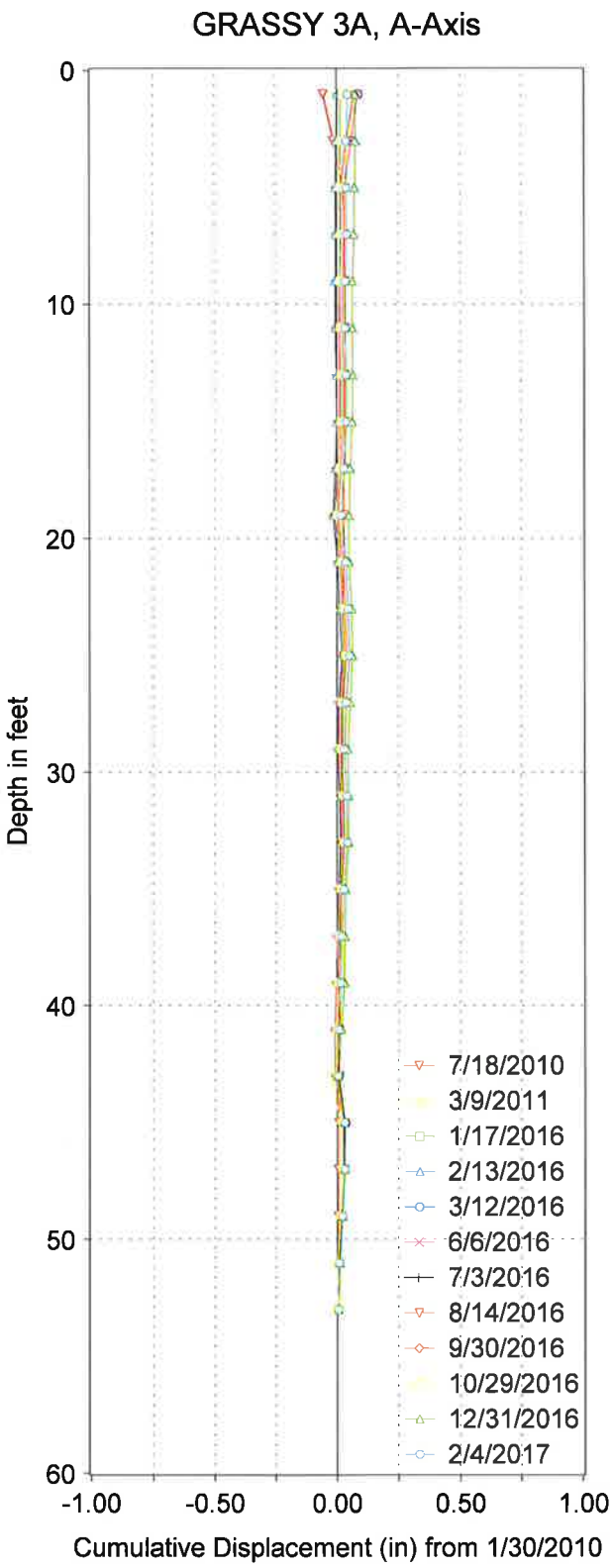
Michael Hansen P.G.
Engineering Geologist
RB&G Engineering Inc.

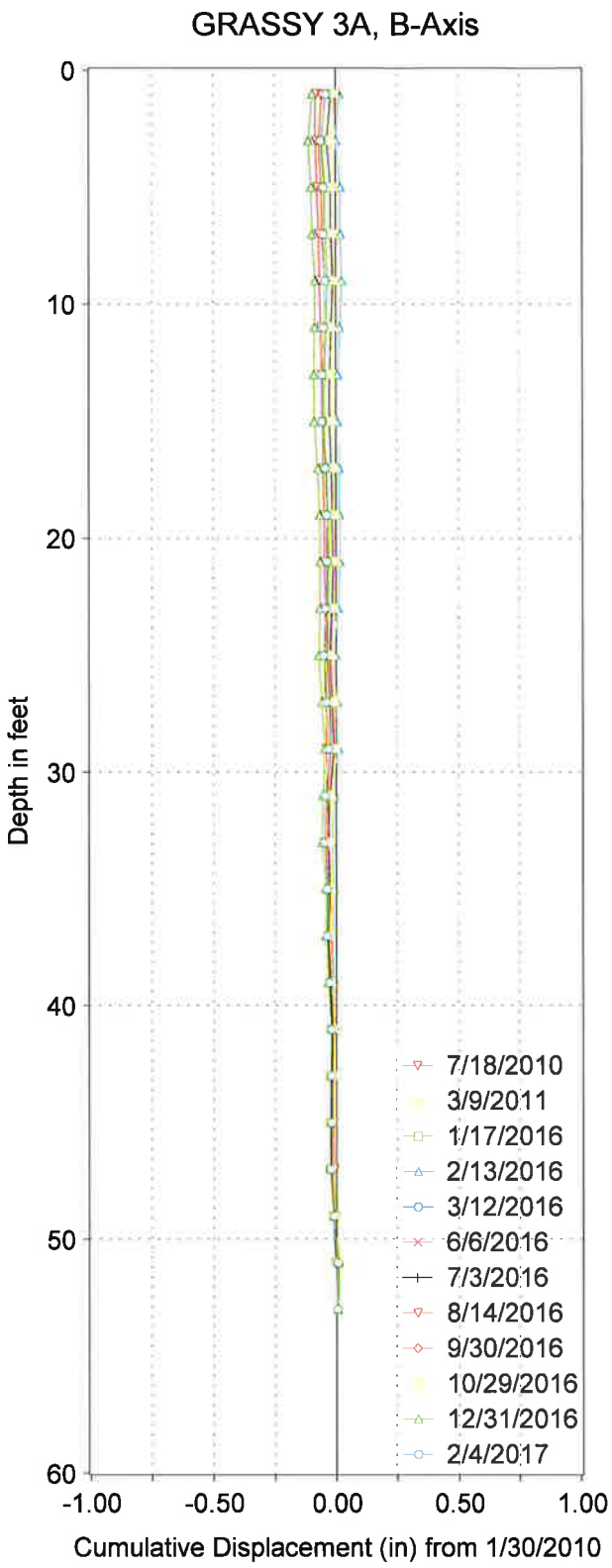




-15 dergree skew
Bias-shift correction

Figure
Inclinometer 2 - Deflection Profile
Grassy Trail Dam, Carbon County, Utah





-30 degree skew

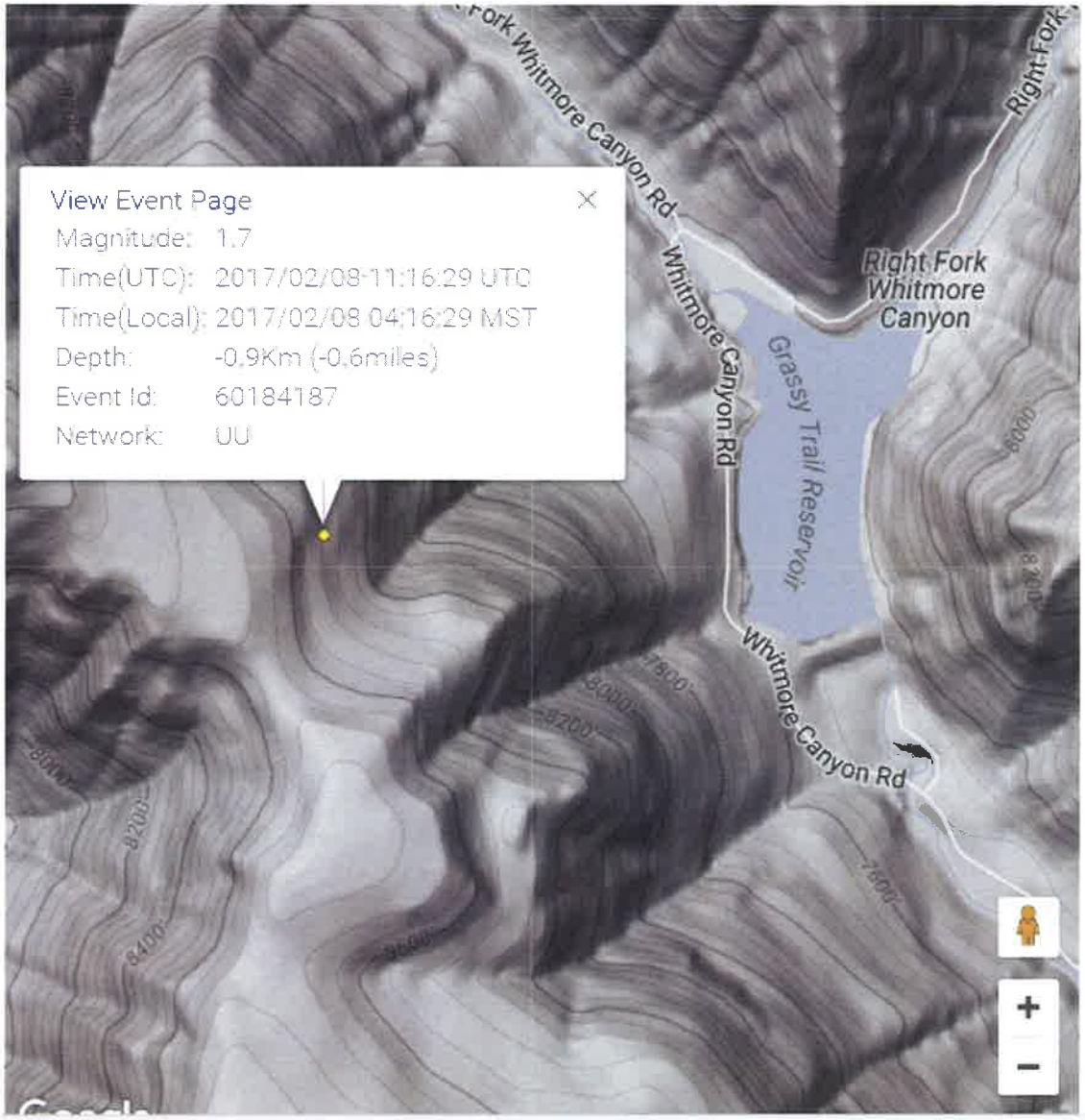
Figure B-5
Inclinometer 3 - Deflection Profile
Grassy Trail Dam, Carbon County, Utah

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	31-Dec-16	12:55:36	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	31-Dec-16	12:55:54	3	Vert	0.06	0.18	0.035	0.08	0.186	0.053	85.33	64	73.14	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	31-Dec-16	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	31-Dec-16	23:59:36	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	1-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	1-Jan-17	23:59:36	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	2-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	2-Jan-17	23:59:36	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	3-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	3-Jan-17	23:59:36	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	4-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	4-Jan-17	23:59:36	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	5-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	5-Jan-17	23:59:36	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	6-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	6-Jan-17	23:59:36	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	7-Jan-17	12:07:25	3	Vert	0.125	0.31	0.085	0.186	0.451	0.133	>100	85.33	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	7-Jan-17	12:07:31	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	7-Jan-17	12:25:17	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	7-Jan-17	12:25:52	3	Vert	0.055	0.135	0.035	0.08	0.239	0.04	28.44	85.33	34.13	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	7-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	7-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	8-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	8-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	9-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	9-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	10-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	10-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	11-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	11-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	12-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	12-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	13-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	13-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	14-Jan-17	15:11:28	3	Vert	0.02	0.055	0.01	0.027	0.093	0.027	51.2	73.14	>100	GrassyTrailDam2015	*Man Made event, cover, snow removal*
W	BE9690	14-Jan-17	15:15:41	3	Vert	0.2	0.445	0.11	0.278	0.583	0.199	64	34.13	32	GrassyTrailDam2015	*Man Made event, cover, snow removal*
W	BE9690	14-Jan-17	15:21:49	3	Vert	0.05	0.12	0.02	0.093	0.239	0.053	85.33	23.27	>100	GrassyTrailDam2015	*Man Made event, cover, snow removal*
LOG	BE9690	14-Jan-17	15:21:59	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	14-Jan-17	15:52:56	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	14-Jan-17	15:53:43	3	Vert	0.025	0.05	0.015	0.013	0.04	0.013	13.47	12.19	30.12	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	14-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	14-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	15-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	15-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	16-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	16-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	17-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	17-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	18-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	18-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	19-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	19-Jan-17	23:59:29	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	20-Jan-17	10:12:08	3	Vert	0.06	0.135	0.035	0.08	0.199	0.053	19.69	85.33	22.26	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	20-Jan-17	10:12:44	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	20-Jan-17	10:59:02	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	20-Jan-17	10:59:08	3	Vert	0.02	0.05	0.015	0.027	0.066	0.013	85.33	51.2	73.14	GrassyTrailDam2015	*Man Made event while opening or closing cover*
W	BE9690	20-Jan-17	11:01:36	3	Vert	0.01	0.045	0.01	0.013	0.093	0.027	>100	>100	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	20-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	20-Jan-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	21-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	21-Jan-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	22-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	22-Jan-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	23-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	23-Jan-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	24-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	24-Jan-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	25-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	25-Jan-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	26-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	26-Jan-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	27-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	27-Jan-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	28-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	28-Jan-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	29-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	29-Jan-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	30-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	30-Jan-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	31-Jan-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	31-Jan-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	1-Feb-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	1-Feb-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	2-Feb-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	2-Feb-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	3-Feb-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	3-Feb-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	4-Feb-17	11:56:48	3	Vert	0.065	0.14	0.03	0.093	0.186	0.053	46.55	46.55	56.89	GrassyTrailDam2015	*Man Made event, cover, snow removal*
W	BE9690	4-Feb-17	11:58:36	3	Vert	0.03	0.07	0.015	0.053	0.119	0.013	26.95	>100	46.55	GrassyTrailDam2015	*Man Made event, cover, snow removal*
W	BE9690	4-Feb-17	11:59:11	3	Vert	0.025	0.07	0.01	0.027	0.053	0.013	42.67	30.12	>100	GrassyTrailDam2015	*Man Made event, cover, snow removal*
W	BE9690	4-Feb-17	11:59:19	3	Tran	2.665	2.27	0.81	2.32	3.606	0.49	11.91	16.52	1.977	GrassyTrailDam2015	*Man Made event, cover, snow removal*
W	BE9690	4-Feb-17	12:09:38	3	Tran	1.66	3.095	0.825	2.731	4.136	1.578	46.55	73.14	73.14	GrassyTrailDam2015	*Man Made event, cover, snow removal*
W	BE9690	4-Feb-17	12:15:04	3	Tran	0.455	0.485	0.58	0.954	1.962	1.551	64	>100	>100	GrassyTrailDam2015	*Man Made event, cover, snow removal*
LOG	BE9690	4-Feb-17	12:31:44	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)

M 1.7 – 8km N of East Carbon City, Utah

2017-02-08 11:16:29 UTC | 39.623°N 110.406°W | -0.9 km depth



Time
Depth
Display boundaries

Analyze

Reset All

Events on map

View UTC | View miles

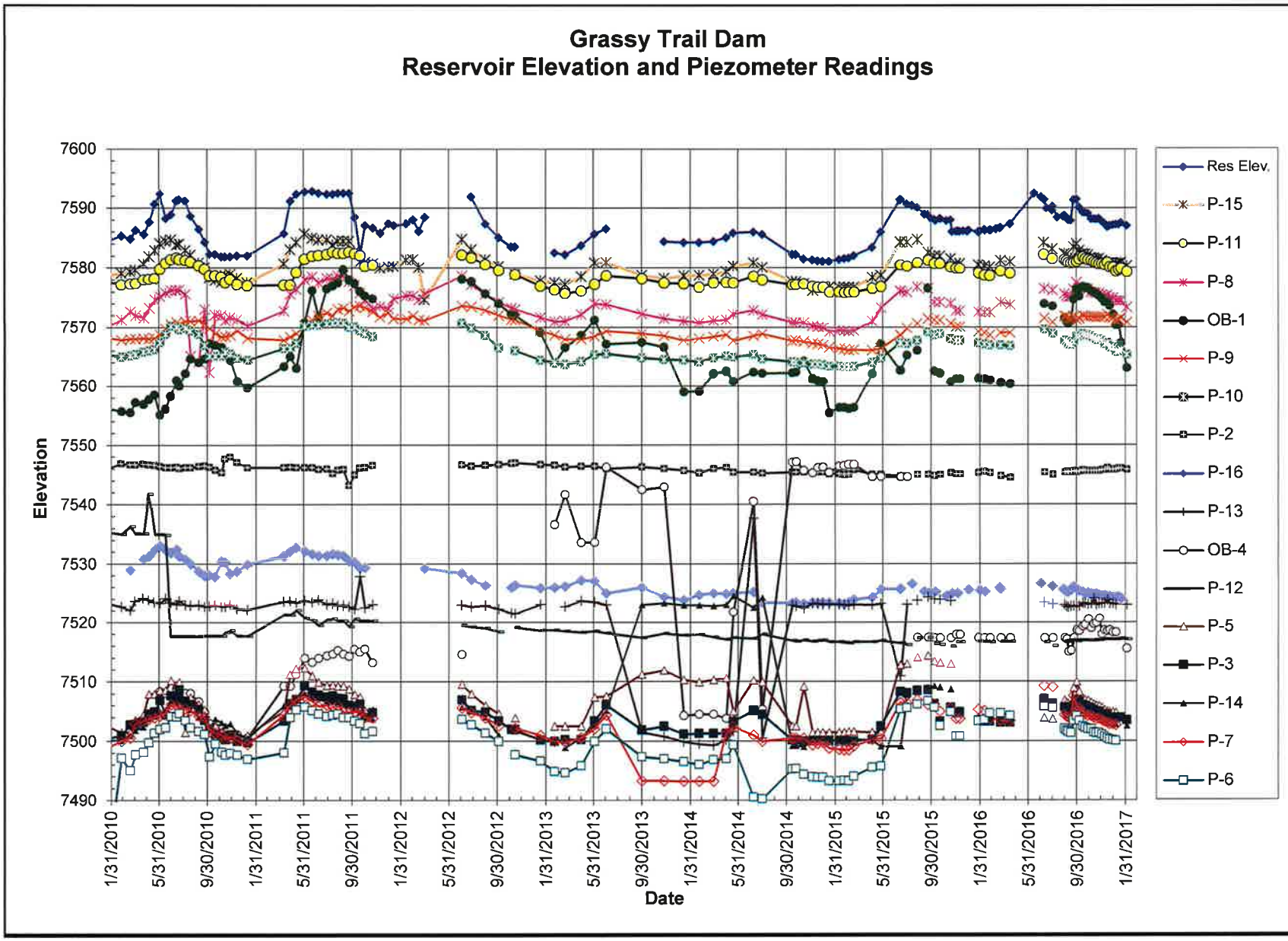
Mag	Time (Local)	Depth (Km)
1.7	2017/02/08 04:16:29 MST	-0.9
1.7	2017/02/08 01:41:11 MST	11.2
2.4	2017/02/08 01:39:30 MST	4.3
1.3	2017/02/07 10:32:06 MST	8.8
0.6	2017/02/06 22:31:44 MST	5.6
1.1	2017/02/06 20:36:01 MST	-0.3
1.4	2017/02/06 20:13:53 MST	8.2
0.7	2017/02/06 03:59:00 MST	0.6
0.4	2017/02/06 02:43:09 MST	16.8
2.4	2017/02/05 23:27:54 MST	11.1
1.4	2017/02/05 19:31:27 MST	5.0

GRASSY TRAIL DAM PIEZOMETER & OBSERVATION WELL READINGS

TAKE READINGS AT RIM ELEV.

Dam Crest Elev. 7600.0
Spillway Elev. 7592.5

			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						
			PIEZ.	PIEZ.	O.W.	PIEZ.		PIEZ.		O.W.	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ
			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	7521.0	7499.5	7491.7	7550.8	7572.0	7529.5	7501.5	7479.5	7493.0		
Piezometer Location:			CREST	CREST	CREST	CREST	CREST	D.S. SLOPE	D.S. SLOPE	CREST	CREST	CREST	CREST	TOE	TOE	TOE	CREST	CREST
			EMBANK.	FOUND	EMBANK/FOUND	EMBANK.	FOUND	EMBANK	FOUND	EMBANK/FOUND	EMBANK.	EMBANK.	FOUND	FOUND.	FOUND	FOUND.	FOUND	BED ROCK
Date	Initials	Reservoir Elevation	45.75' (47')	65' (66.4')	110'	76.2' (75.3')	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'
12/05/14	Values taken from Dam Safety web page submitted by East Carbon City (ECC)	7581.50	7570.3	7567.3	7561.3	7545.3	7500.0	7523.2	7500.1	7545.3	7563.8	7576.9	7516.8	7501.5	7494	7499.4	7576.2	7523.3
12/18/14		7581.33	7570.1	7567.2	7560.9	7545.4	7500.0	7523.2	7500.1	7546.2	7563.8	7576.7	7516.9	7501.5	7493.9	7499.6	7576.9	7523.5
12/31/14		7581.25	7570.0	7567.0	7560.8	7545.4	7500.0	7523.1	7500.0	7546.3	7563.7	7576.7	7517.0	7501.5	7493.9	7499.8	7576.9	7523.4
01/16/15		7581.25	7569.3	7566.6	7555.5	7545.1	7500.0	7523.1	7500.0	7545.4	7563.4	7575.9	7516.7	7501.5	7493.3	7498.8	7576.8	7523.5
02/10/15		7581.50	7569.5	7566.4	7556.4	7545.1	7500.0	7523.1	7500.0	7546.4	7563.5	7576.0	7516.7	7501.5	7493.3	7498.6	7576.8	7523.5
02/23/15		7581.67	7569.4	7566.3	7556.4	7545.0	7500.0	7523	7500.0	7546.5	7563.4	7575.9	7516.6	7501.5	7493.4	7498.5	7576.8	7523.4
03/06/15		7581.75	7569.3	7566.1	7556.2	7545.1	7500.0	7522.9	7500.1	7546.7	7563.4	7576.0	7516.5	7501.6	7493.3	7498.5	7576.8	7523.2
03/19/15		7582.17	7569.4	7566.2	7556.4	7545.8	7500.0	7523.1	7500.3	7546.7	7563.5	7576.0	7516.7	7501.6	7494.1	7499.2	7576.8	7523.5
05/04/15		7583.50	7571.1	7566.1	7562.2	7545.0	7500.3	7523	7500.1	7544.7	7564.2	7576.6	7516.7	7501.5	7495.6	7500.3	7578.4	7524
05/26/15		7586.08	7573.3	7566.4	7567.2	7545.0	7502.5	7523.2	7499.1	7544.7	7564.8	7576.9	7516.9	7501.5	7495.8	7500.4	7578.8	7524.4
07/14/15		7591.50	7576.2	7568.7	7562.7	7544.8	7508.3	7510.9	7499.2	7544.7	7567.4	7580.5	7516.5	7512.8	7505.4	7506.5	7584.3	7525.8
07/15/15		7591.50	7576.2	7568.7	7562.7	7544.8	7508.3	7510.9	7499.2	7544.7	7567.4	7580.5	7516.5	7512.8	7505.4	7506.5	7584.3	7525.8
07/31/15		7590.75	7576.0	7569.9	7565.3	7544.7	7508.1	7523.1	7507.6	7544.7	7567.3	7580.3	7516.2	7513	7505.6	7506.4	7584.3	7525.9
08/13/15		7590.50																
08/26/15		7590.13	7576.9	7570.7	7566.1	7545.0	7508.5	7523.8	7508.2	7517.5	7567.8	7580.9	7517.4	7514.2	7506.2	7506.9	7584.7	7526.7
09/13/15	MH	7588.95																
09/22/15	ECC	7588.92	7576.6	7571.5	7576.7	7545	7508.6	7524.3	7509	7517.5	7569.3	7581.3	7517.4	7514.4	7506.8	7506.1	7582.6	7525.4
09/27/15	MH	7588.50																
10/08/15	ECC	7588.17	7574.3	7571.3	7562.6	7544.8	7506.3	7524	7509.2	7517.4	7568.7	7580.7	7516.4	7513.5	7505.7	7506.2	7582	7525.2
10/11/15	MH	7587.95																
10/22/15	ECC	7588.33	7574.3	751.2	7562.3	7545	7506.3	7523.9	7509	7517.4	7568.9	7580.7	7516.3	7513.3	7502.6	7505	7582	7525.4
10/24/15	MH	7588.30																
11/08/15	MH	7588.00																
11/18/15	ECC	7588.08	7574.1	750.7	7562.8	7544.3	7506.7	7523.7	7508.7	7517.4	7568.1	7580.1	7516	7513.1	7504.9	7505.6	7581.6	7524.6
11/22/15	MH	7586.10																
12/02/15	ECC	7586.17	7572.8	7570.1	7561.3	7545.1	7504.9	NA	NA	7518	7567.8	7579.9	7516.7	7504.6	7500.9	7503.8	7580.7	7525.1
12/06/15	MH	7586.18																
12/11/15	ECC	7586.17	7572.8	7570.1	7561.3	7545.1	7504.9	NA	NA	7518	7567.8	7579.9	7516.7	7504.6	7500.9	7503.8	7580.7	7525.1
12/20/15	MH	7586.25																
12/30/15	ECC	7586.167																
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															
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

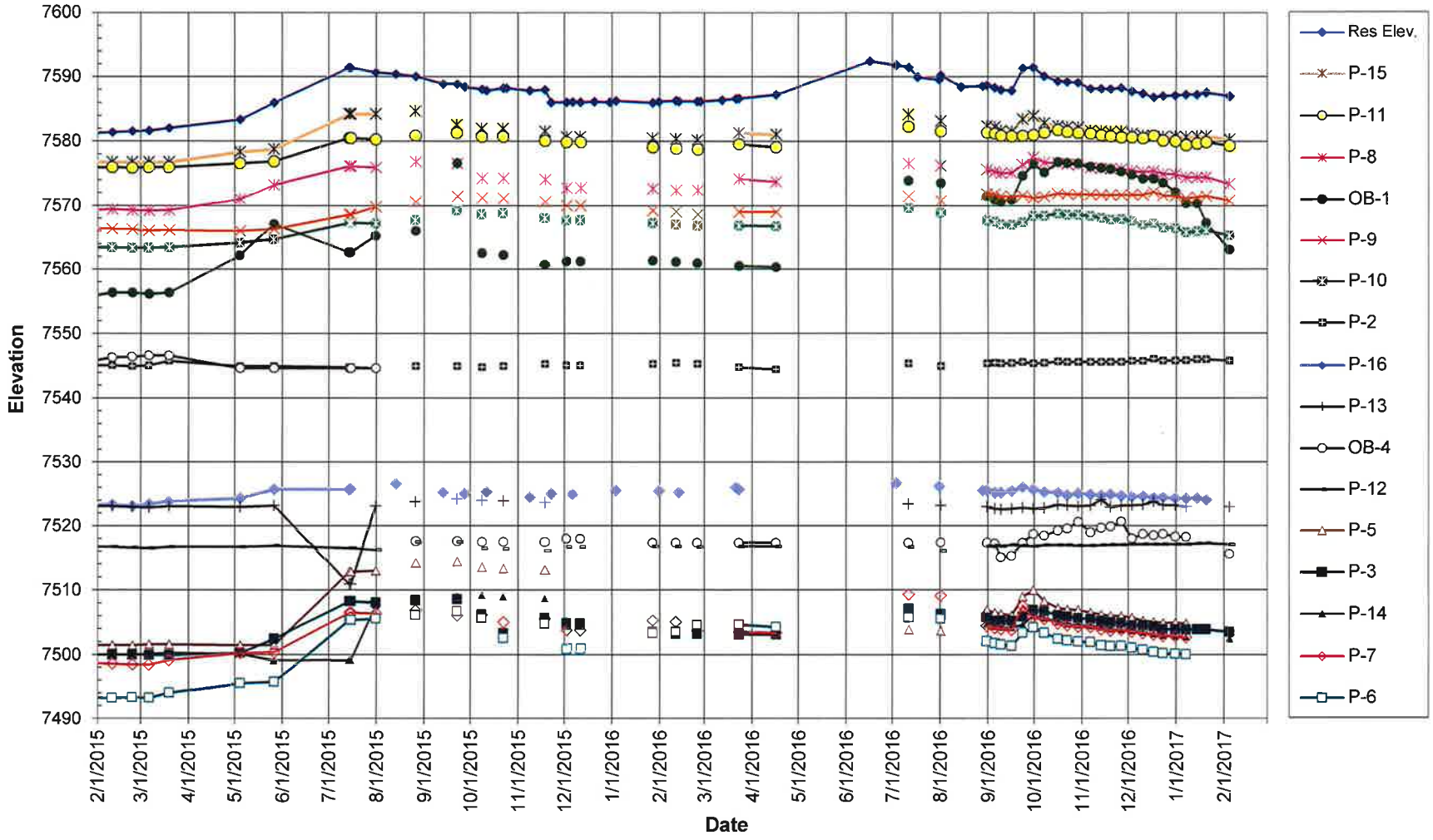


RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Piezometer Readings
January 2010 to February 4, 2017

Grassy Trail Dam and Reservoir

Grassy Trail Dam
Reservoir Elevation and Piezometer Readings



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Piezometer Readings
February 2015 to February 4, 2017

Grassy Trail Dam and Reservoir

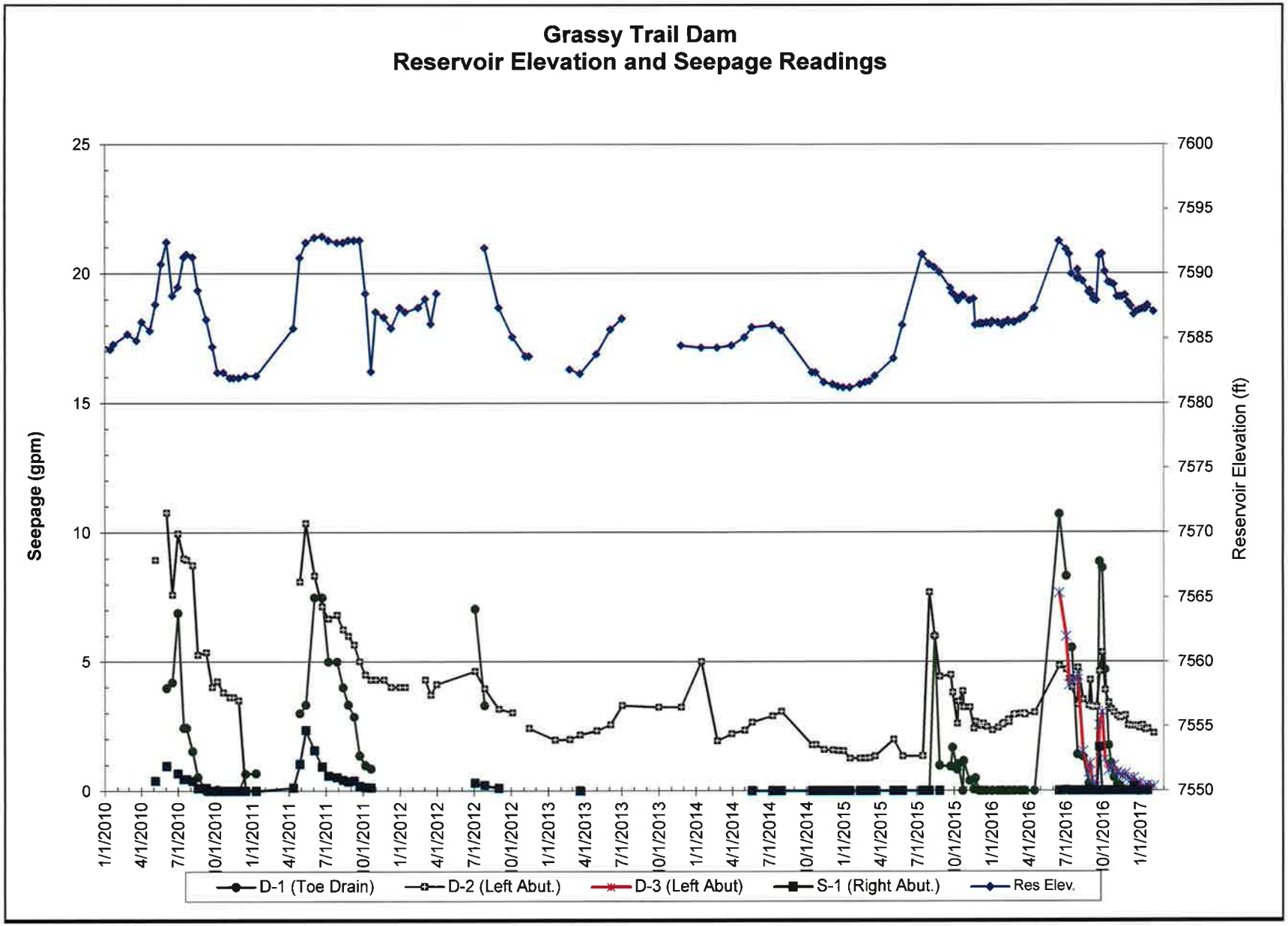
GRASSY TRAIL DAM SEEPAGE READINGS

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
11/13/14	Values taken from Dam Safety web page submitted by East Carbon City (ECC)	7581.667		0.001		1.579				0.001	
12/5/14		7581.5		0.006		1.563				0.001	
12/18/14		7581.333		0.006		1.546				0.001	
12/31/14		7581.25		0.006		1.531				0.001	
1/16/15		7581.25		0.006		1.25				0.001	
2/10/15		7581.5		0.006		1.245				0.001	
2/23/15		7581.667		0.006		1.25				0.001	
3/6/15		7581.75		0.006		1.261				0.001	
3/19/15		7582.167		0.006		1.327				0.001	
5/4/15		7583.5		0.006		1.974				0.001	
5/26/15		7586.083		0.006		1.333				0.001	
7/14/15		7591.5		0.006		1.339				0.001	
7/15/15		7591.5		0.006		1.339				0.001	
7/31/15		7590.75		0.006		7.692				0.001	
8/13/15	ECC	7590.5		6	* likely a typo	6					
8/26/15	ECC	7590.1		0.984	clear	4.412	*trace sediment			0.001	
9/22/15	ECC	7588.9		0.952	clear	4.478				0.001	
9/27/15	MH	7588.50	clear	1.67	clear	3.80	*trace sediment			NM	Not Measureab
10/8/15	ECC	7588.17		0.833		2.59	clear			0.001	
10/11/15	MH	7587.95	clear	1.03	clear	3.45	clear			NM	Not Measureab
10/22/18	ECC	7588.33		0.006		3.85				NM	
10/24/15	MH	7588.30	clear	1.15	clear	3.23	clear			NM	
11/8/15	MH	7587.95	trace ice on edges	0.39	clear	3.23	clear			NM	
11/18/15	ECC	7588.08		0.06		2.40				NM	
11/22/15	MH	7586.10	trace ice on edges	0.050	clear	2.66	clear			NM	ice
12/2/15	ECC	7586.2	frozen	0.006		2.59				NM	ice
12/6/15	MH	7586.2	frozen	Dry		2.50				NM	ice
12/11/15	ECC	7586.167	frozen	Dry		2.59				NM	ice
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	
11/6/16	MH	7588.3		0.26		2.89		0.74		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	still 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

* notes MH = Michael Hansen RB&G Engineering

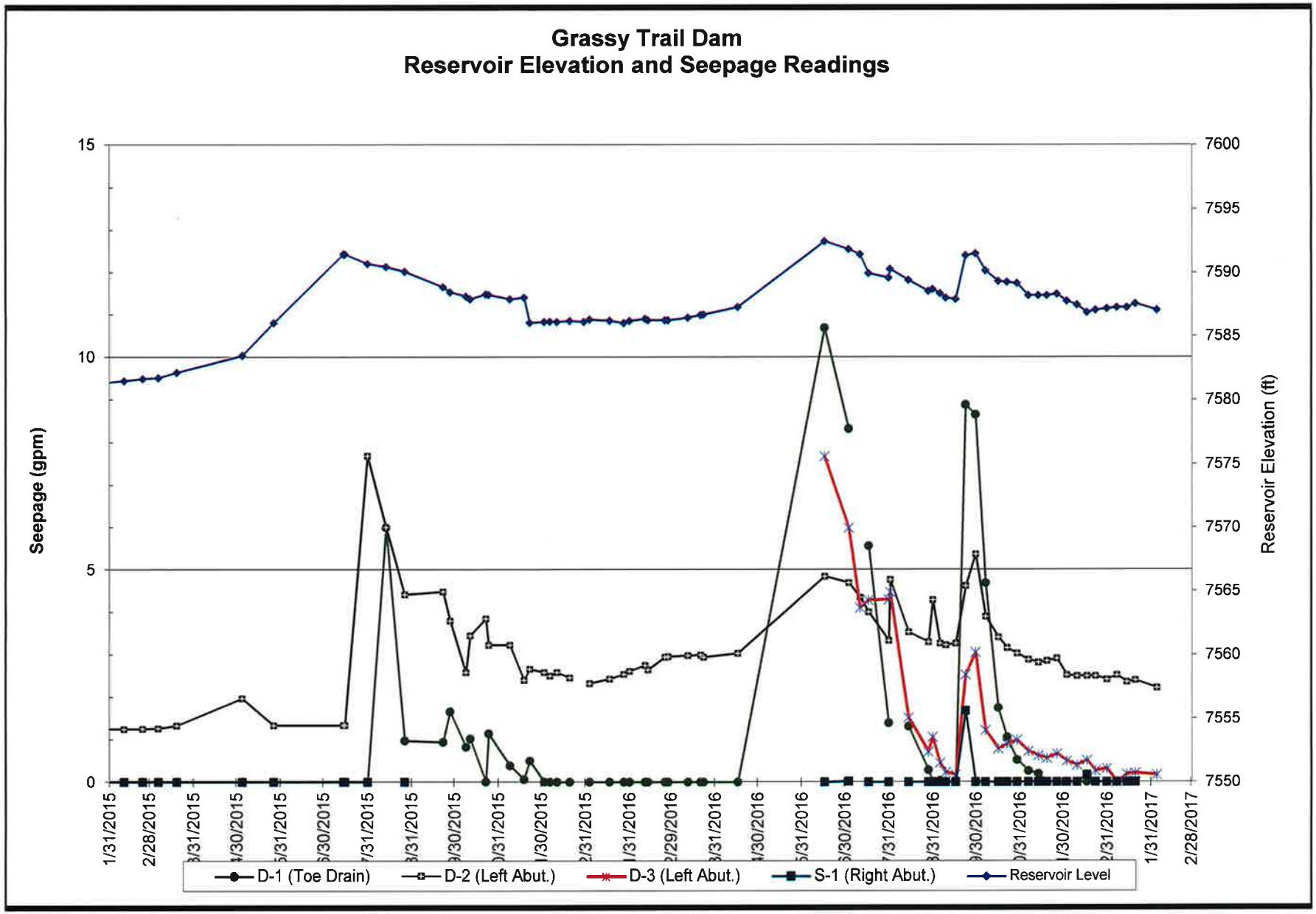
ECC= East Carbon City / Sunnyside

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



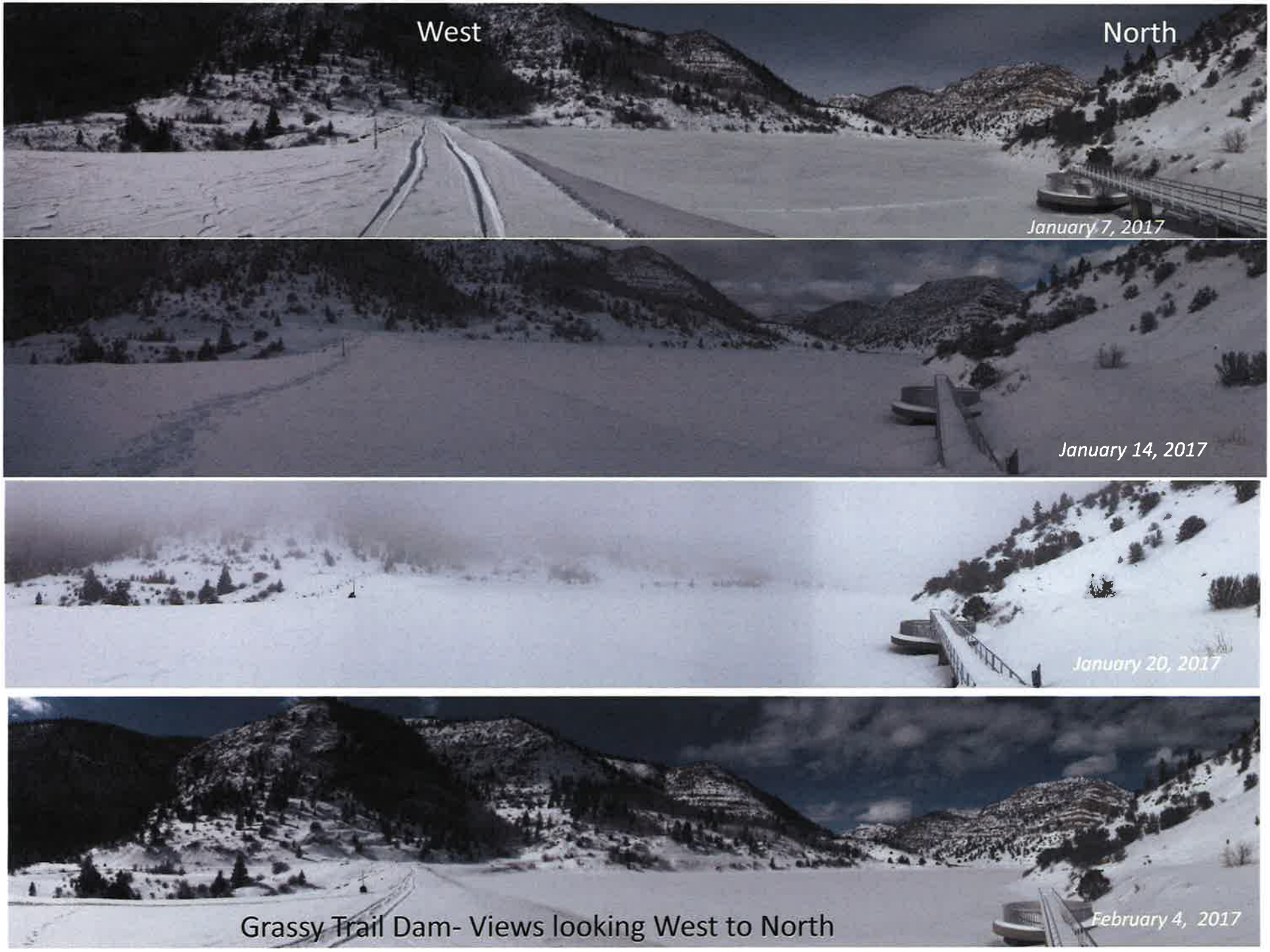
RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Seepage Readings
January 2010 to February 4, 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 February 4, 2017
Some additonal readings by RB&G Eng
Grassy Trail Dam and Reservoir



Grassy Trail Dam- Views looking West to North

Grassy Trail Dam- View looking East

January 7, 2017

January 14, 2017

January 20, 2017

View looking North at downstream slope and toe of dam
February 4, 2017

View looking Northeast at down stream slope

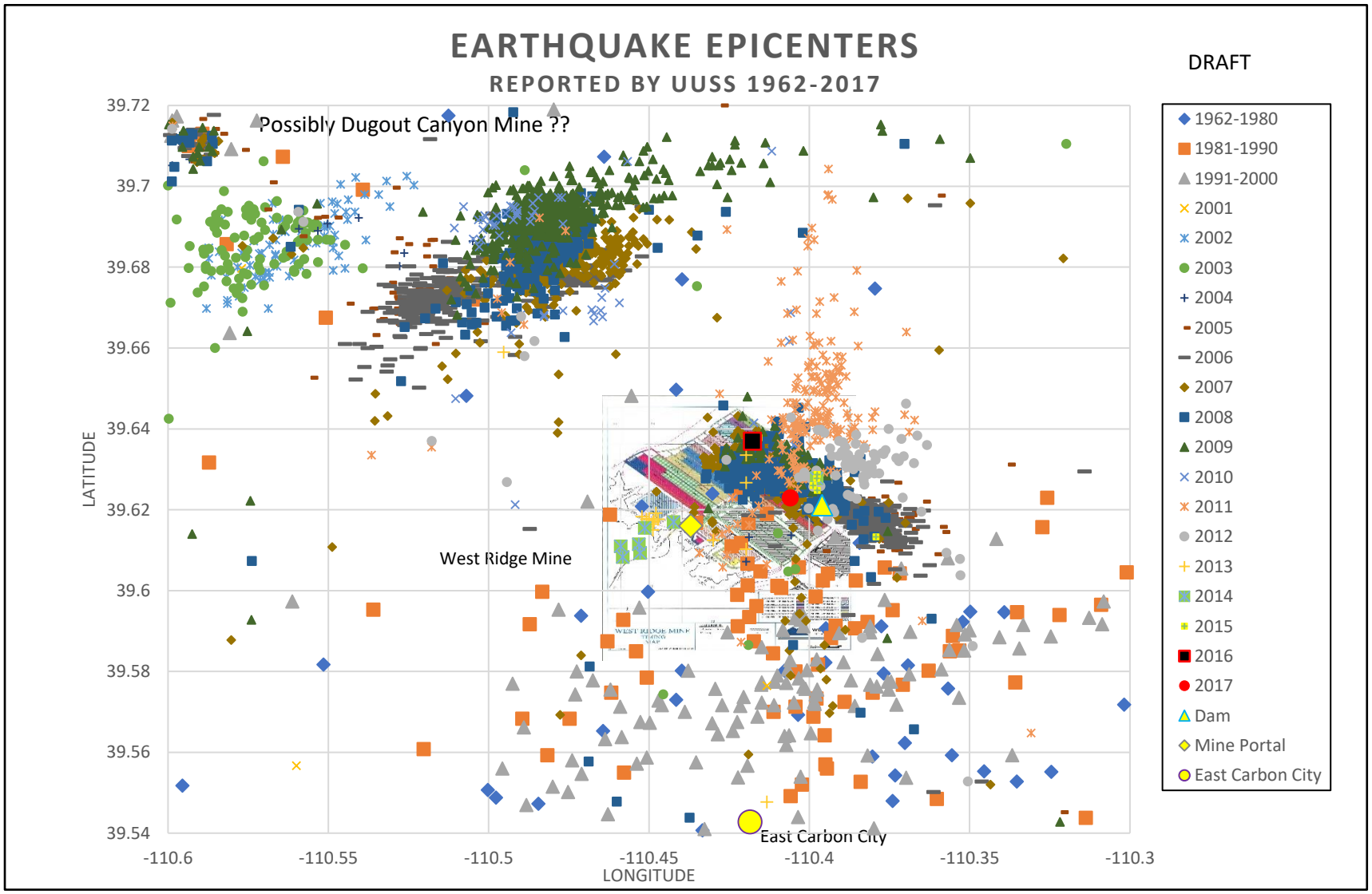


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Figure Earthquake Epicenters Reported by the University of Utah Seismograph Stations
Grassy Trail Region 1962-2017
Grassy Trail Dam and Reservoir

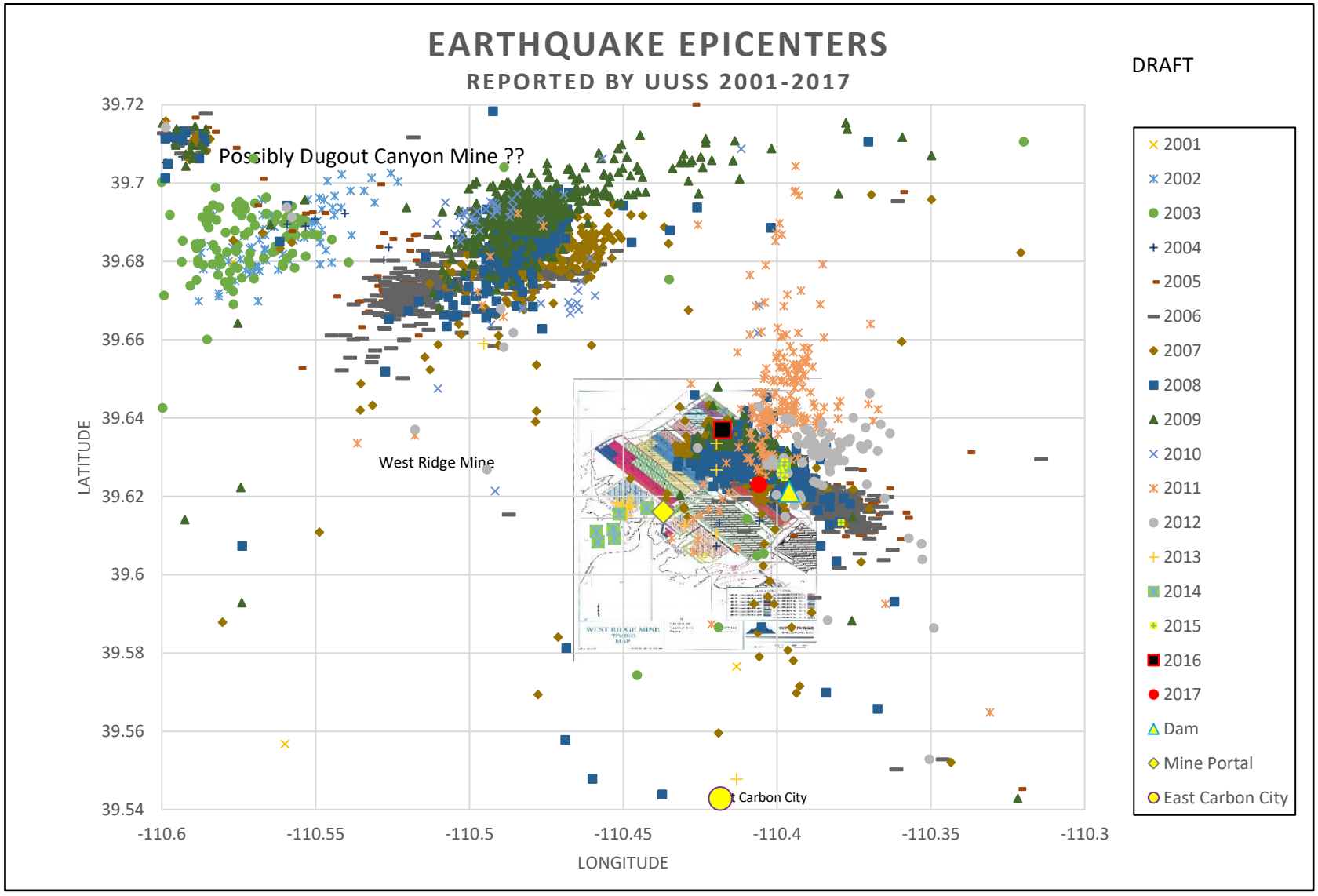

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Figure Earthquake Epicenters Reported by the University of Utah Seismograph Stations
Grassy Trail Region 2001-2017
Grassy Trail Dam and Reservoir

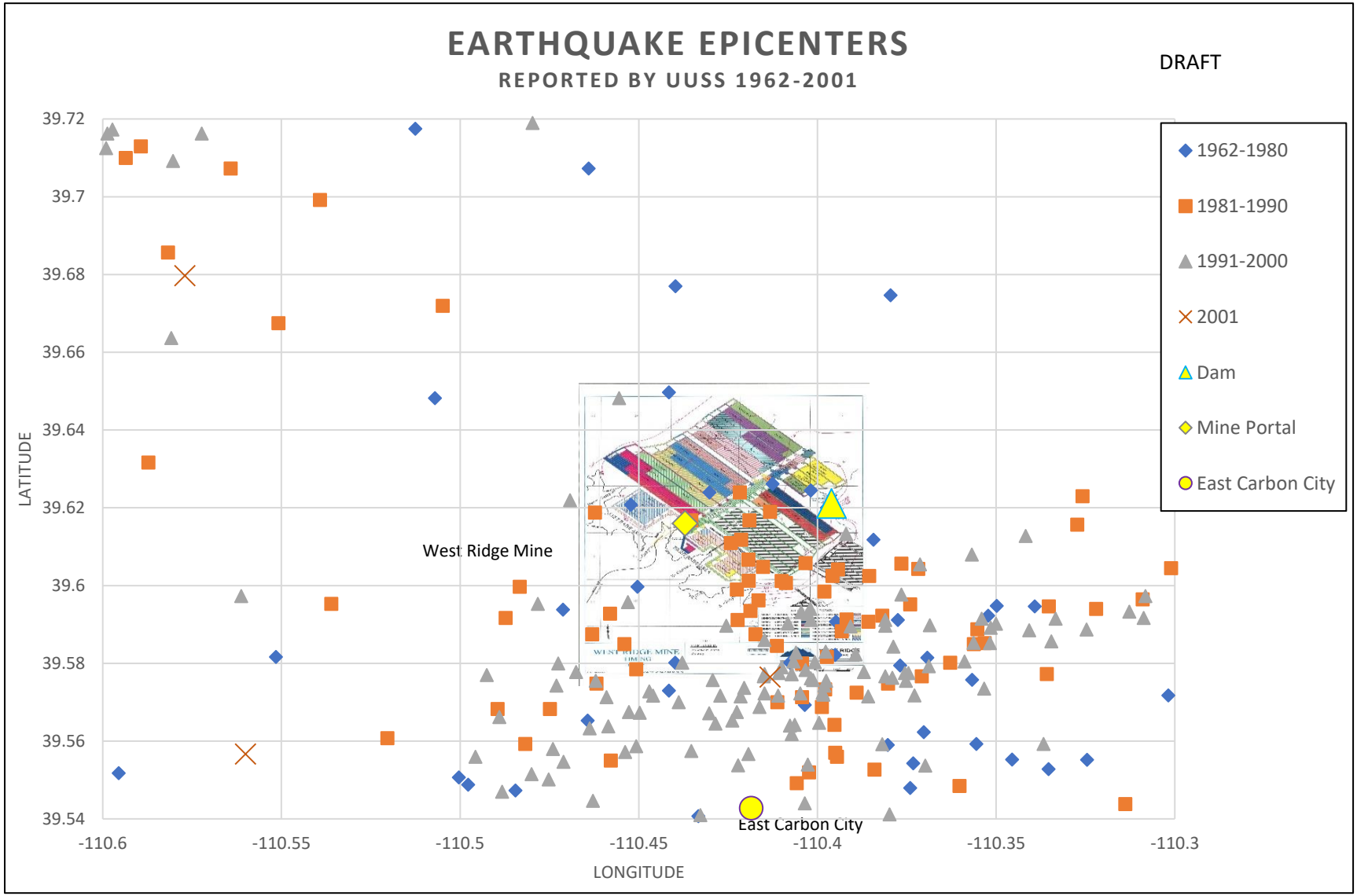

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Figure Earthquake Epicenters Reported by the University of Utah Seismograph Stations
Grassy Trail Region 1962-2001
Grassy Trail Dam and Reservoir

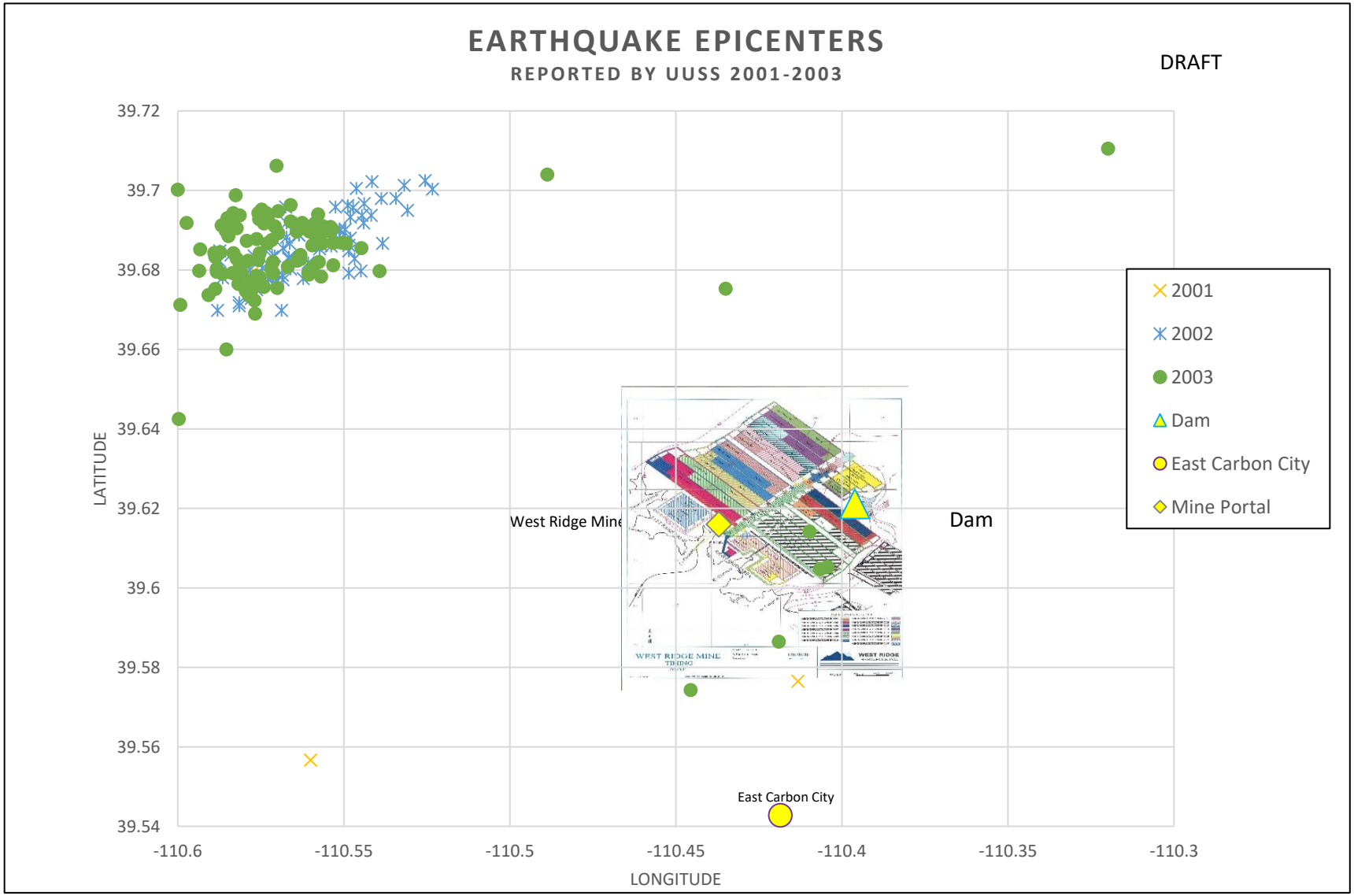

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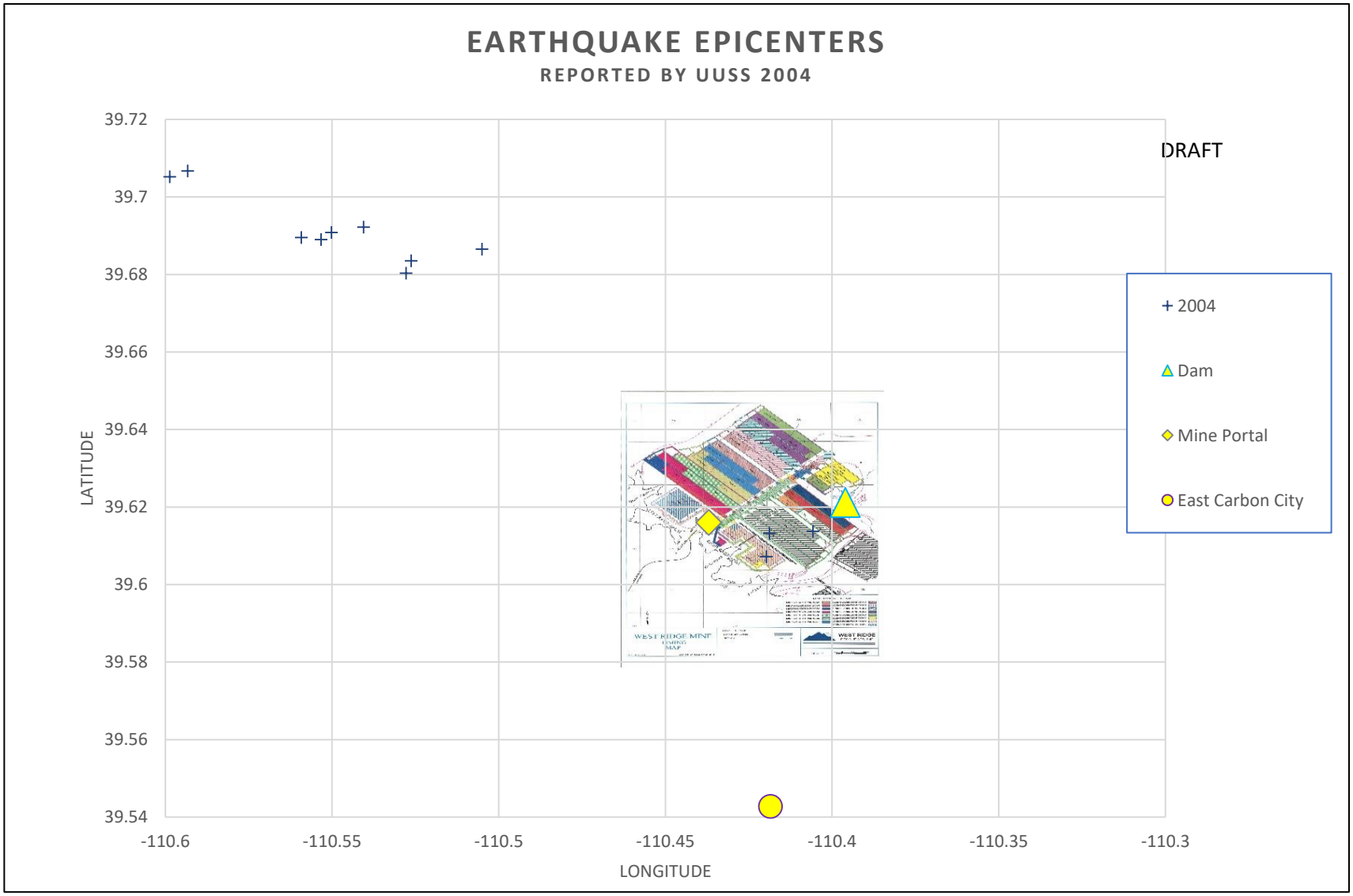
Figure Earthquake Epicenters Reported by the University of Utah Seismograph Stations
Grassy Trail Region 2001-2003
Grassy Trail Dam and Reservoir



RB&G ENGINEERING, INC.

Figure Earthquake Epicenters Reported by the University of Utah Seismograph Stations Grassy Trail Region 2004

Grassy Trail Dam and Reservoir

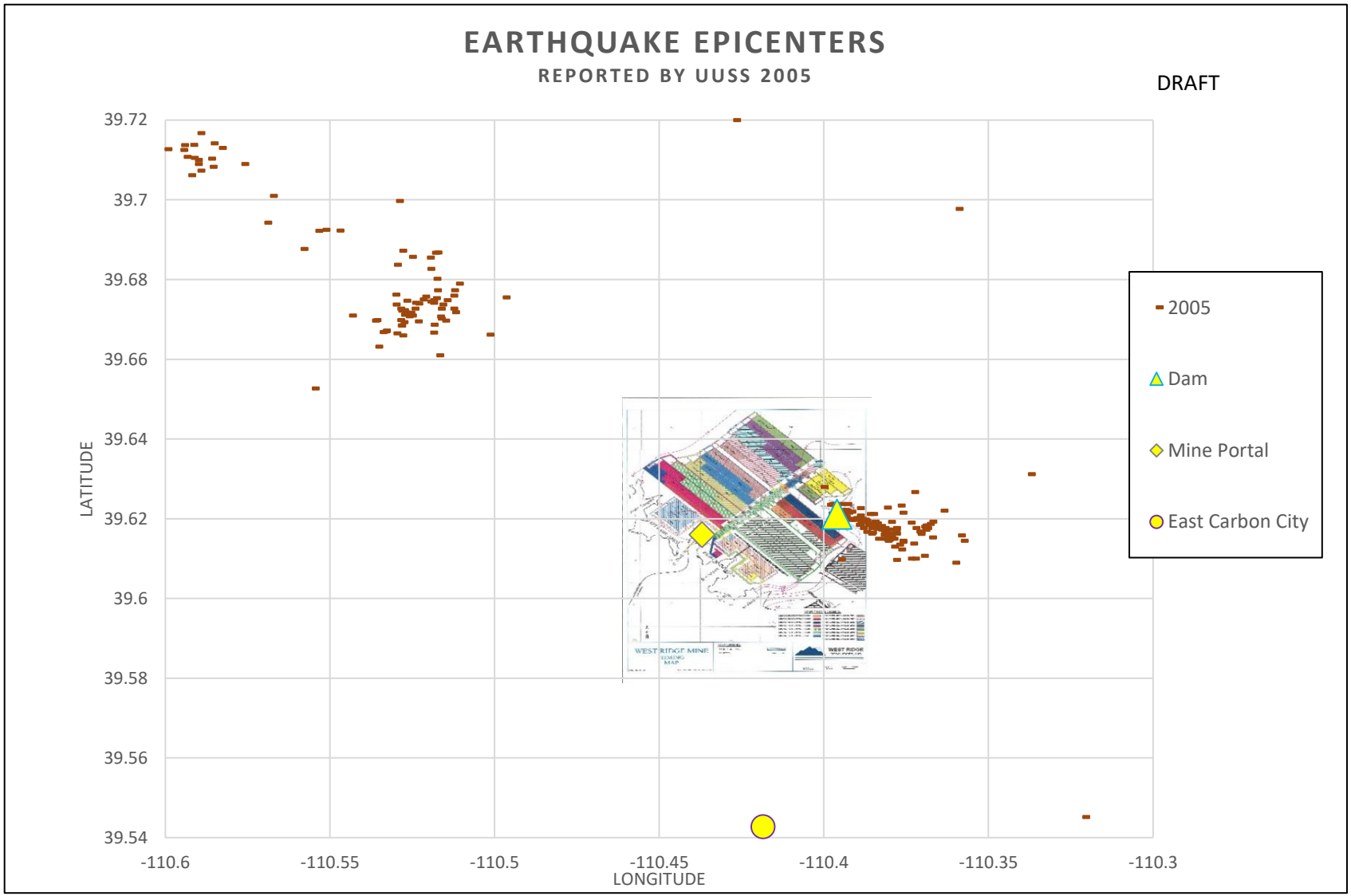


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Figure Earthquake Epicenters Reported by the University of Utah Seismograph Stations
Grassy Trail Region 2005
Grassy Trail Dam and Reservoir

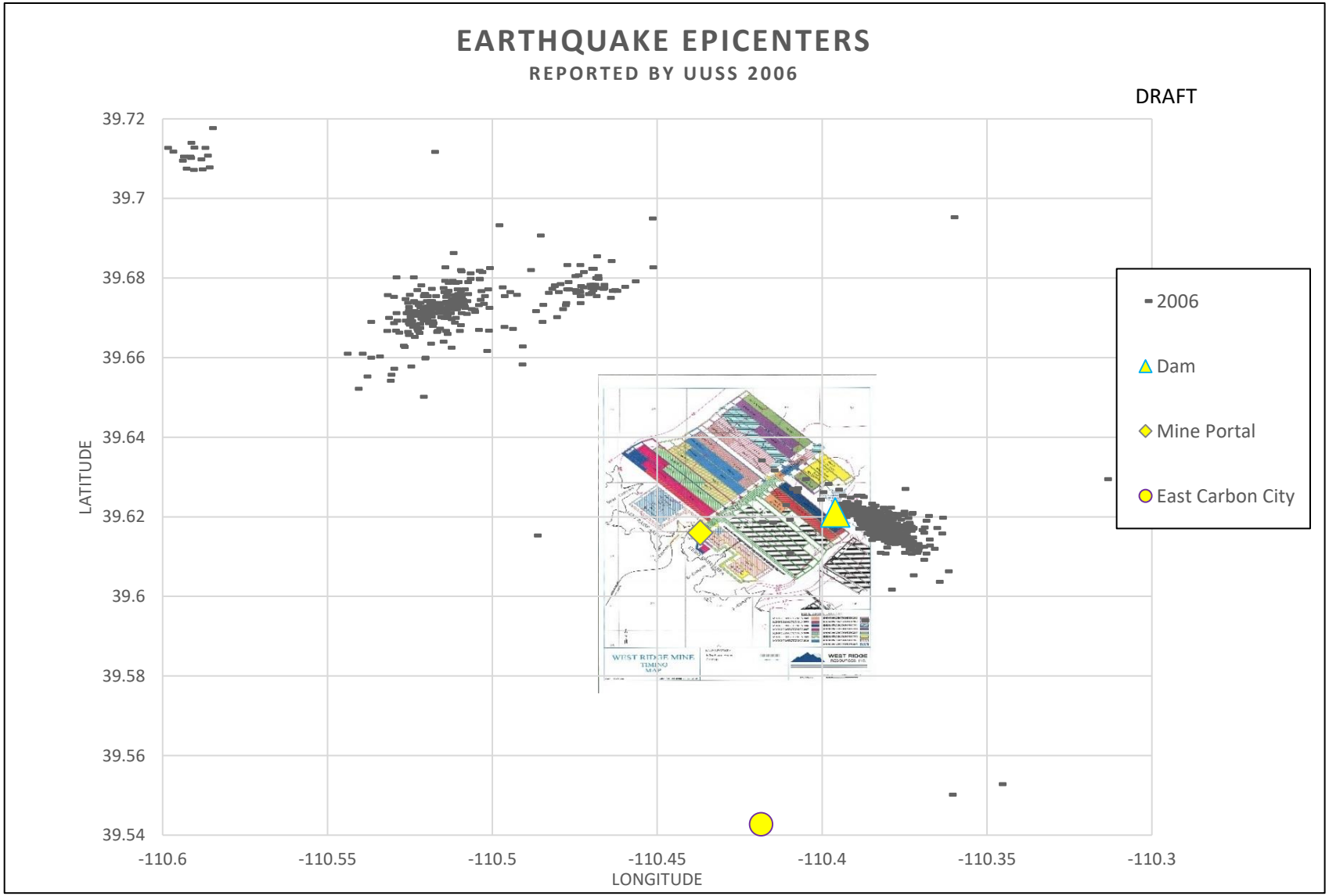

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Figure Earthquake Epicenters Reported by the University of Utah Seismograph Stations
Grassy Trail Region 2006

Grassy Trail Dam and Reservoir

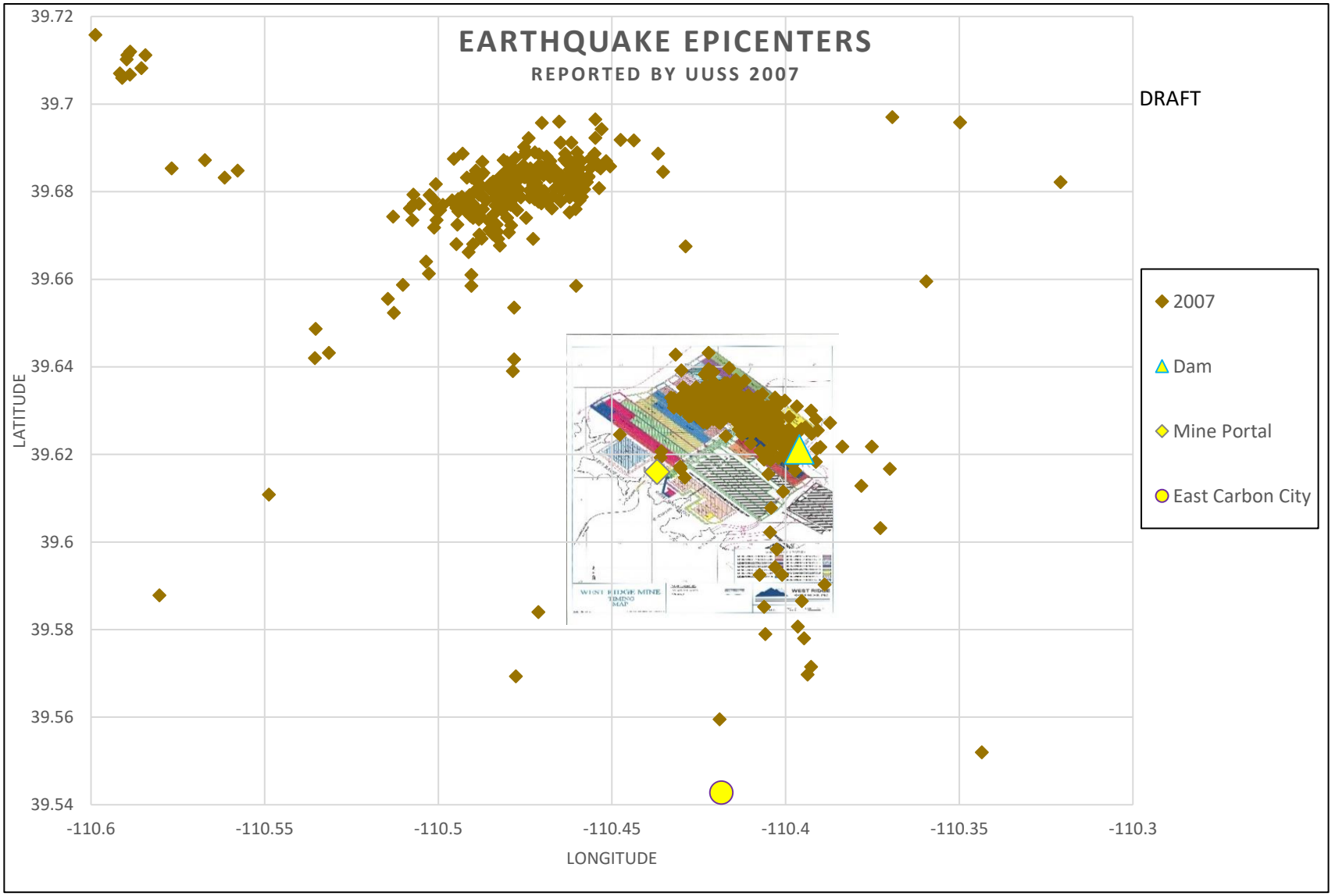

Figure Earthquake Epicenters Reported by the University of Utah Seismograph Stations
Grassy Trail Region 2007
Grassy Trail Dam and Reservoir

RB&G ENGINEERING, INC.

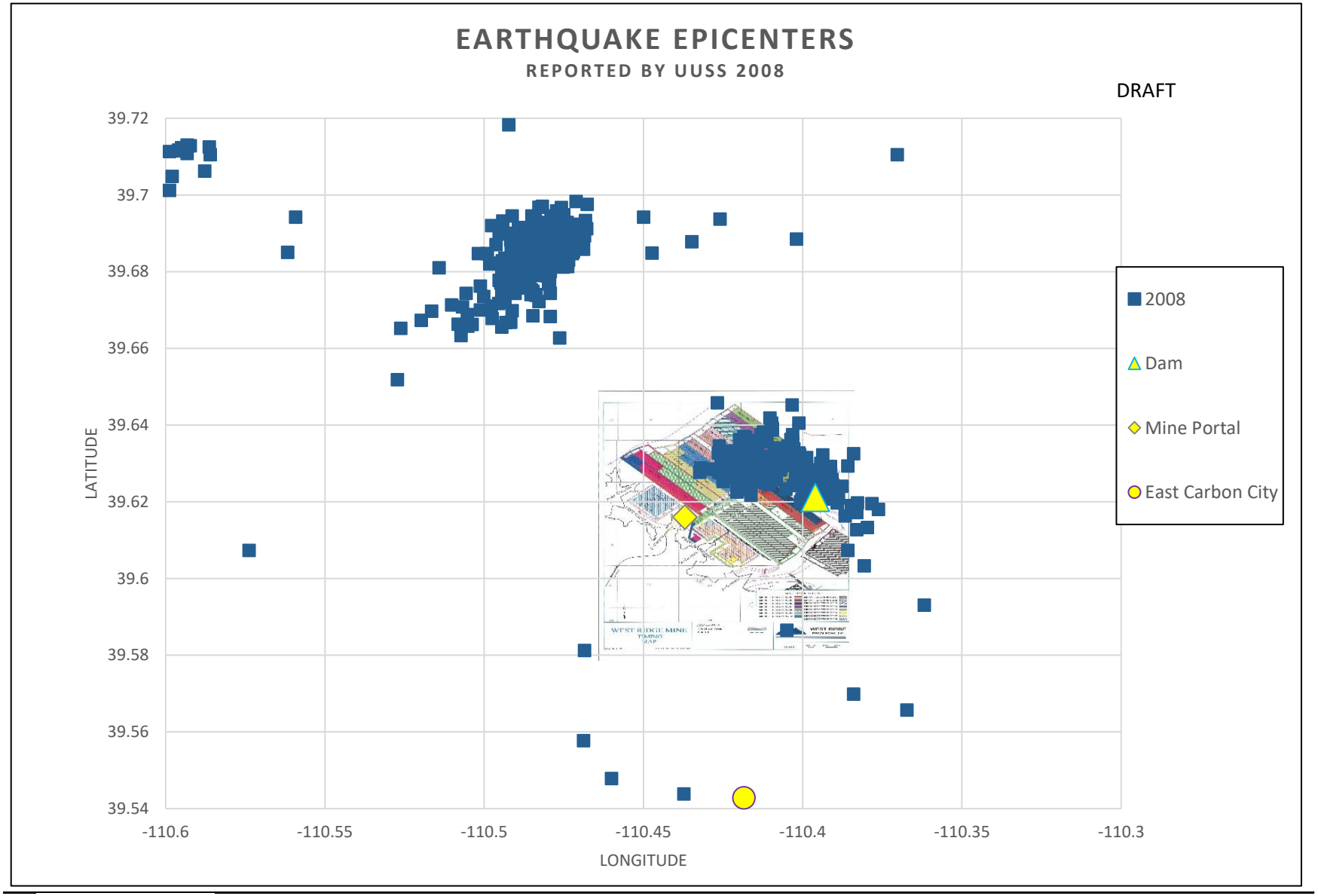

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Figure Earthquake Epicenters Reported by the University of Utah Seismograph Stations
Grassy Trail Region 2008
Grassy Trail Dam and Reservoir

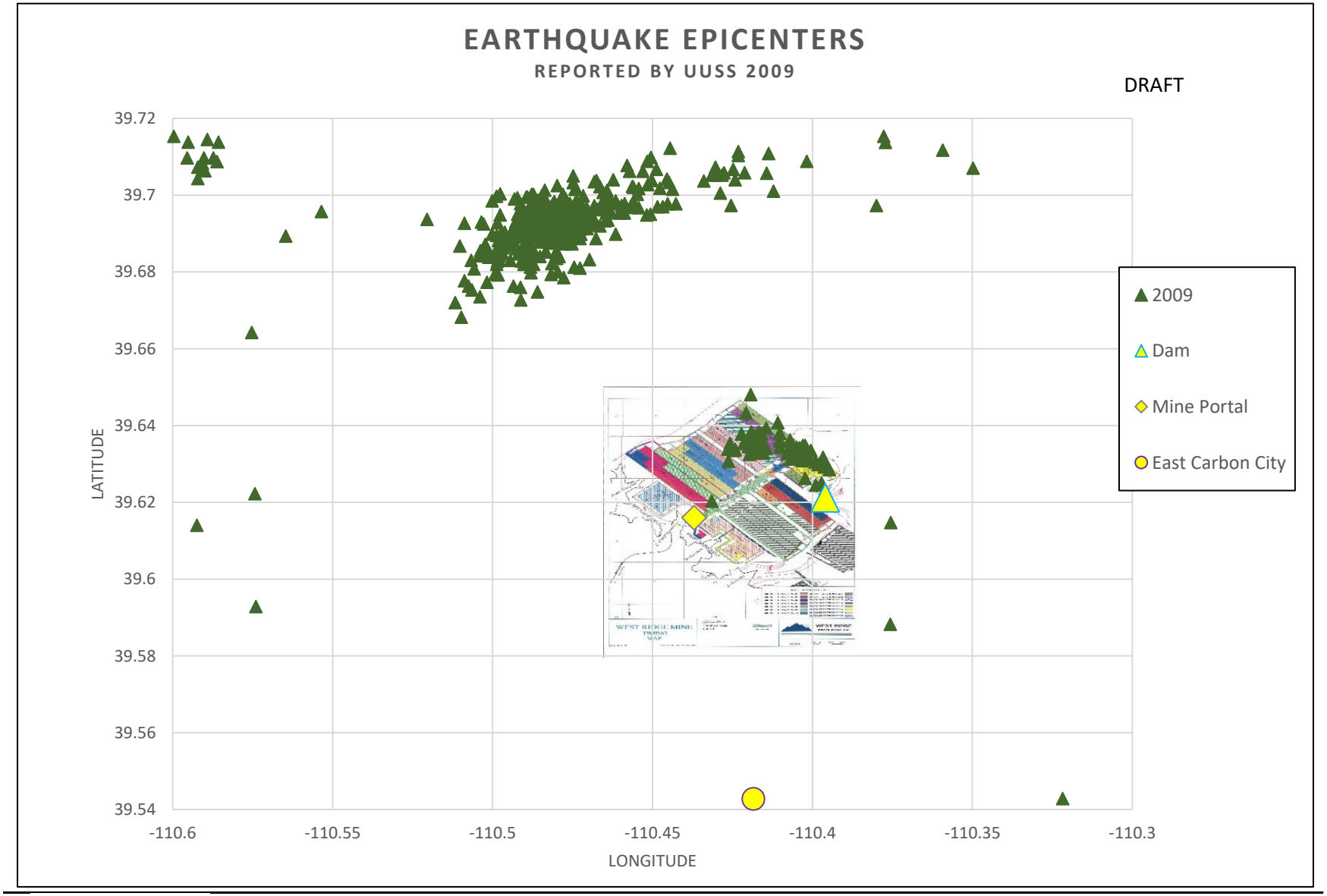

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Figure Earthquake Epicenters Reported by the University of Utah Seismograph Stations
Grassy Trail Region 2009
Grassy Trail Dam and Reservoir

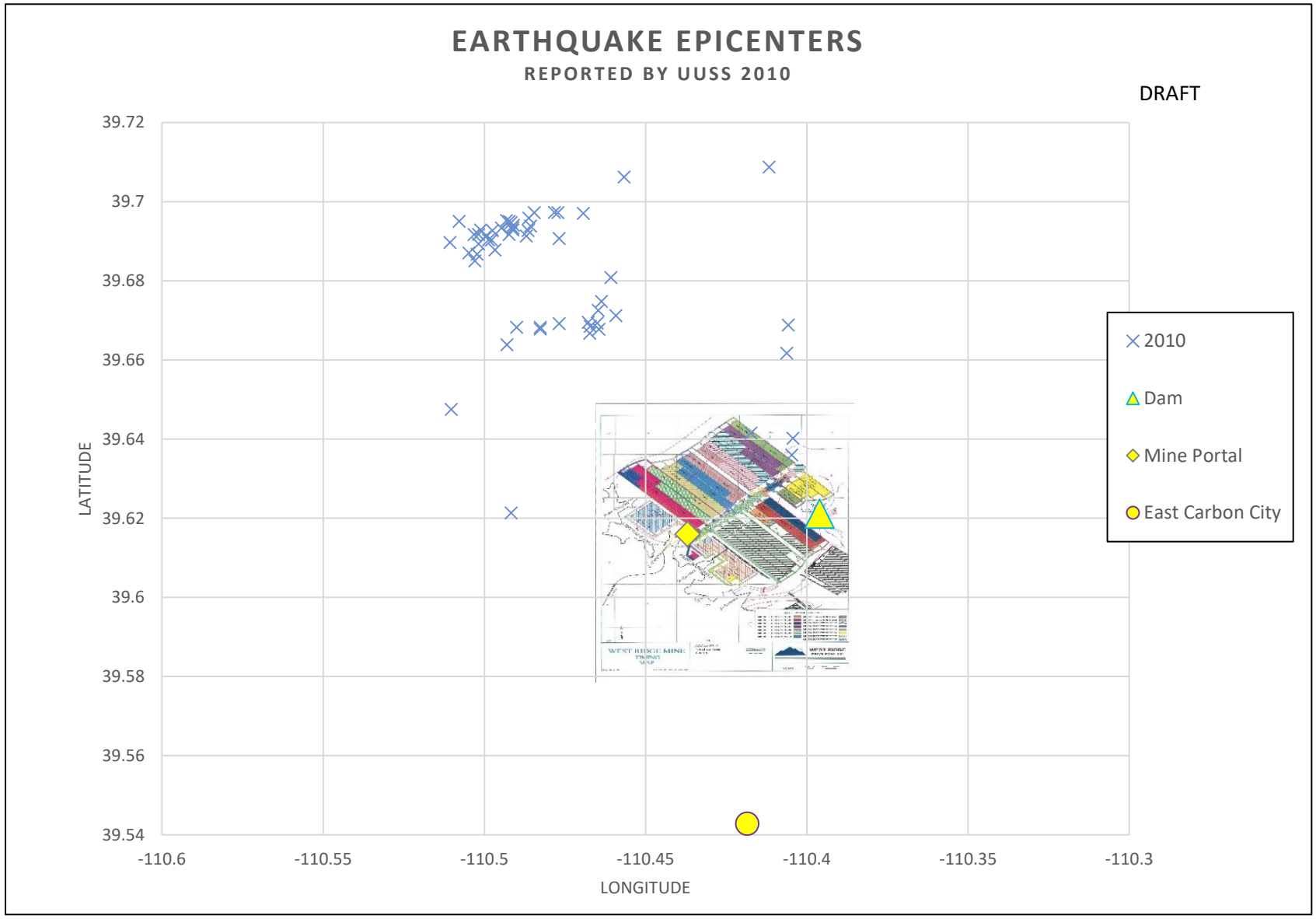

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Figure Earthquake Epicenters Reported by the University of Utah Seismograph Stations
Grassy Trail Region 2010
Grassy Trail Dam and Reservoir

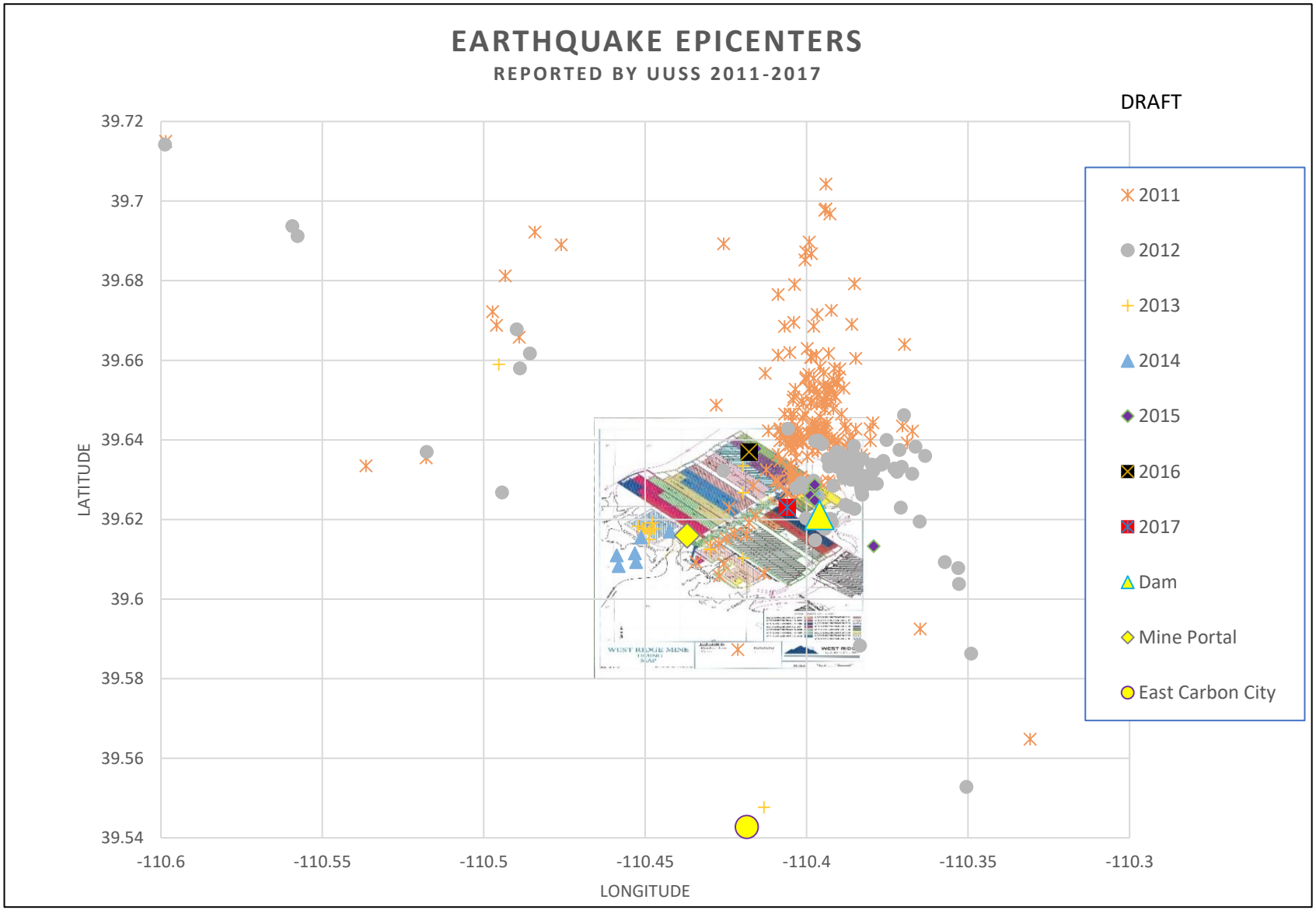

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Figure Earthquake Epicenters Reported by the University of Utah Seismograph Stations
Grassy Trail Region 2011-2017
Grassy Trail Dam and Reservoir

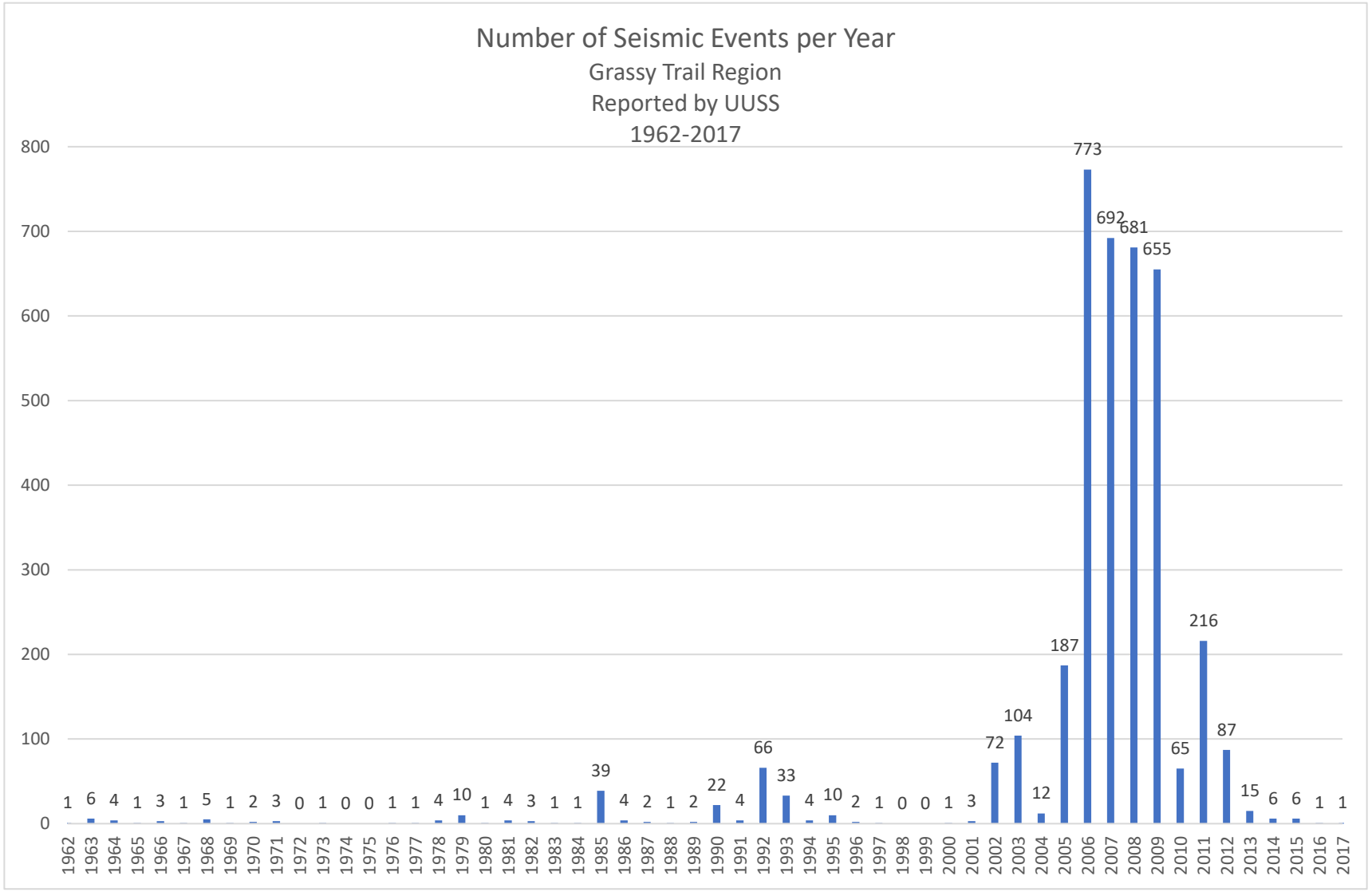

Figure Number of Seismic Events Per Year - University of Utah Seismograph Stations
Grassy Trail Region 1962-2017
Grassy Trail Dam and Reservoir

RB&G ENGINEERING, INC.

WARE SURVEYING, L.L.C.

1344 North 1000 West – Price, UT 84501
Office: 435-820-4335
Email: waresurveying@emerytelcom.net

January 16, 2017

Monitoring at the Grassy Trail Reservoir dam is not feasible at this time due to deep snow. All monuments required for the survey are at or below ground level. The site line for the straight line survey is near ground level. In order to complete the survey the entire top of the dam would need to be cleared of snow. Clearing the snow could potentially damage the vertical risers that are used for the survey. The monuments on the face of the dam and up the slope of West Ridge would also be incredibly difficult to access.

Sincerely,

Cody Ware, PLS