ENT00575J
Submitted: October 2, 2012

WELL ID: MW 62 - 182

SAMPLE ID: 018

GZA GeoEnvironmental of New York
Waterloo Sampling Data Sheet

MID QUARTER SAMPLES

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: SUNNY, 90's

PROJECT NO: 01.0017869.92
DATE: 7/27/11
SAMPLER(S): SK, CB

SAMPLING INTERVAL (depth in ft below top of casing)
177.6 to 198.7

SAMPLING PORT
182

TOTAL VOLUME PURGED: 1.10 gal

PURGE RATE: variable (gal / min)

PURGE METHOD: Double Valve Pump

WATER QUALITY:

Time	Purged Volume (gal)	Temp (°C) (3%)	Specific Conductivity (mS/m) (3%)	Dissolved Oxygen (mg/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Drive/Vent Cycle (seconds)	Drive Pressure (psi)
1053	0	Pump	ON					6/4	30
1057	0.01	24.44	1.361	5.58	7.51	-156.2	1.35		
1102	0.10	24.10	1.341	0.61	6.68	-143.8	0.92		
1107	0.20	23.87	1.342	0.27	6.33	-143.6	0.81		
1112	0.30	23.60	1.349	0.22	6.33	-179.8	0.33		
1117	0.40	23.75	1.346	0.20	6.32	-142.6	0.37		
1122	0.50	23.33	1.352	0.20	6.45	-153.4	0.17		
1127	0.100	23.30	1.351	0.19	6.45	-126.5	0.27		
1132	0.70	23.12	1.349	0.18	6.50	-122.3	0.32		
1137	0.80	23.25	1.354	0.19	6.56	-116.8	0.34		
1139	START SAMPLE COLLECTION								
1202	END SAMPLE COLLECTION: 2L IPEC								
	Pump OFF								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	5
turbidity meter	10070 1254

NOTES AND OBSERVATIONS:

Measured Well Depth N/A (feet from top of casing)

Well Vault Condition GOOD

WELL ID: MW-63-18
SAMPLE ID: 018

GZA GeoEnvironmental of New York
Low-Flow Sampling Data Sheet

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: Overcast 80-90's
PROJECT NO: 01.0017869.92
DATE: 7/21/11
SAMPLER(S): SL, CB
PUMP DEPTH: _____ ft

MID-QUARTER SAMPLING

WATER QUALITY: DTW = 12.14 GW Elevation = 0.919 ACTUAL DEPTH = 5.091

Time	DTW or GW Elevation ACTUAL DEPTH (< 0.3 ft)	Temp (^{0}C) (3%)	Specific Conductivity (S/cm) (3%)	Dissolved Oxygen (g/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Flow Rate (gal/hr)	Notes gal
0913		PUMP	ON						0
0925	4.808	22.07	1.919	2.32	7.01	-120.1	6.93		0.12
0930	4.772	21.93	1.844	2.03	7.12	-110.5	2.14		0.29
0935	4.755	22.44	1.739	1.69	7.18	-124.1	2.29		0.40
0940	4.724	22.63	1.730	1.56	7.20	-136.7	1.39		0.48
0945	4.694	22.33	1.669	1.43	7.26	-145.7	1.16		0.59
0950	4.669	22.18	1.607	1.25	7.31	-135.0	1.42		0.73
0955	4.637	22.05	1.565	1.09	7.35	-127.5	1.16		0.88
1000	4.621	22.06	1.539	0.96	7.39	-126.9	0.61		1.00
1005	4.596	22.21	1.520	0.84	7.43	-127.2			1.10
1007	START	SAMPLE	COLLECTION						
1026	END	"	"	"	"	IPEC			
	PUMP OFF								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	2
flow meter	~~#5~~
turbidity meter	3007011254

Measured Well Depth _____ **(feet from top of casing)** **Well Vault Condition** Good

NOTES AND OBSERVATIONS: Total volume purged ~~1.5~~ 1.25 gal

Depth and Depth to Water (DTW) measurements are given in feet from top of casing.

Groundwater Elevation measurements are given in feet msl.

WELL ID: MW-63-34
SAMPLE ID: 018

GZA GeoEnvironmental of New York
Low-Flow Sampling Data Sheet

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: Overcast 80-90s
MID-QUARTER SAMPLING

PROJECT NO: 01.0017869.92
DATE: 7/21/11
SAMPLER(S): SL, CB
PUMP DEPTH: _____ ft

WATER QUALITY: DTW = 12.08 GW Elevation = 0.979 ACTUAL DEPTH = 12.587

Time	DTW or GW Elevation ACTUAL DEPTH (< 0.3 ft)	Temp (^{0}C) (3%)	Specific Conductivity (S/cm) (3%)	Dissolved Oxygen (g/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Flow Rate (gal/hr)	Notes gal
0913	12.587	PUMP	ON						0
0925	12.351	21.03	1.333	0.32	7.48	-110.2	2.93		0.15
0930	12.321	21.14	1.324	0.21	7.54	-121.1	2.29		0.31
0935	12.314	21.70	1.323	0.22	7.55	-139.1	1.32		0.41
0940	12.277	21.66	1.326	0.20	7.56	-143.0	1.73		0.52
0945	12.254	21.51	1.326	0.19	7.56	-139.0	0.98		0.61
0947	START	SAMPLE	COLLECTION						
1008	END	"	"	~ 2L	IPEC				
	PUMP	OFF							

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	17594 AG
flow meter	
turbidity meter	200701254

Measured Well Depth _____ **(feet from top of casing)** **Well Vault Condition** Good

NOTES AND OBSERVATIONS: Total volume purged 0.76 gal

Depth and Depth to Water (DTW) measurements are given in feet from top of casing.

Groundwater Elevation measurements are given in feet msl.

WELL ID: MW 63 - 50

SAMPLE ID: 018

GZA GeoEnvironmental of New York
Waterloo Sampling Data Sheet

MID-QUARTER SAMPLES

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: SUNNY, 90's

PROJECT NO: 01.0017869.92
DATE: 7/21/11
SAMPLER(S): SL, CB

SAMPLING INTERVAL (depth in ft below top of casing)

41.5 to 58.0

SAMPLING PORT

50 7

TOTAL VOLUME PURGED: 1.15 gal

PURGE RATE: variable (gal / min)

PURGE METHOD: Double Valve Pump

WATER QUALITY:

Time	Purged Volume (gal)	Temp (°C) (3%)	Specific Conductivity (mS/m) (3%)	Dissolved Oxygen (mg/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Drive/Vent Cycle (seconds)	Drive Pressure (psi)
1046	0	PUMP	ON					7/7.4	20
1048	0.10	21.70	1.091	0.64	7.18	-55.7	7.85		
1053	0.30	21.37	1.084	0.47	7.20	-49.1	5.33		
1058	0.50	21.14	1.088	0.46	7.22	-46.4	4.35		
1103	0.75	21.30	1.088	0.47	7.25	-46.3	3.36		
1108	0.90	21.12	1.091	0.46	7.27	-47.7	3.01		
1112	START SAMPLE COLLECTION								
1125	END SAMPLE COLLECTION: 2L IPEC								
	PUMP OFF								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	16
turbidity meter	20070429 3

NOTES AND OBSERVATIONS:

Measured Well Depth N/A (feet from top of casing)

Well Vault Condition GOOD

WELL ID: MW 63-93

SAMPLE ID: 019

GZA GeoEnvironmental of New York
Waterloo Sampling Data Sheet

MCD-QUARTER SAMPLES

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: SUNNY, 90's

PROJECT NO: 01.0017869.92
DATE: 7/21/11
SAMPLER(S): SL, CB

SAMPLING INTERVAL (depth in ft below top of casing)

81.5 to 100.5

SAMPLING PORT

93 5

TOTAL VOLUME PURGED: 0.70 gal

PURGE RATE: variable (gal / min)

PURGE METHOD: Double Valve Pump

WATER QUALITY:

Time	Purged Volume (gal)	Temp (°C) (3%)	Specific Conductivity (mS/m) (3%)	Dissolved Oxygen (mg/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Drive/Vent Cycle (seconds)	Drive Pressure (psi)
1042	0	PUMP	ON					7/7.4	20
1048	0.01	23.83	1.168	1.36	6.96	-101.8	2.51		
1053	0.10	23.55	1.177	0.42	6.47	-93.2	1.07		
1058	0.25	23.37	1.181	0.29	6.40	-86.2	1.47		
1103	0.35	23.51	1.181	0.23	6.42	-81.4	1.45		
1108	0.45	23.27	1.184	0.20	6.52	-83.10	1.32		
1113	START SAMPLE COLLECTION								
1132	END SAMPLE COLLECTION: IPEC PUMP								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	5
turbidity meter	20070429

NOTES AND OBSERVATIONS:

Measured Well Depth N/A (feet from top of casing)

Well Vault Condition GOOD

WELL ID: MW 63 - 112

SAMPLE ID: 018

GZA GeoEnvironmental of New York
Waterloo Sampling Data Sheet

MID-QUARTER SAMPLES

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: SUNNY, 90s

PROJECT NO: 01.0017869.92
DATE: 7/21/14
SAMPLER(S): SL, CB

SAMPLING INTERVAL (depth in ft below top of casing)

106.5 to 112.0

SAMPLING PORT

112 4

TOTAL VOLUME PURGED: 1.0 gal

PURGE RATE: variable (gal / min)

PURGE METHOD: Double Valve Pump

WATER QUALITY:

Time	Purged Volume (gal)	Temp (°C) (3%)	Specific Conductivity (mS/m) (3%)	Dissolved Oxygen (mg/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Drive/Vent Cycle (seconds)	Drive Pressure (psi)
1042	0	PUMP	ON					7/7.4	20
1048	0.01	23.84	1.112	0.78	7.17	-284.7	1.42		
1053	0.10	23.56	1.091	0.06	7.25	-229.1	0.68		
1058	0.20	23.23	1.085	0.05	7.25	-222.3	0.68		
1103	0.30	23.21	1.113	0.05	7.25	-214.8	0.57		
1108	0.40	23.14	1.142	0.04	7.26	-204.1	0.59		
1113	0.50	23.14	1.157	0.05	7.26	-194.5	0.54		
1118	0.60	23.02	1.157	0.07	7.27	-191.2	0.56		
1123	0.70	22.98	1.161	0.07	7.26	-184.9	0.58		
1125	START SAMPLE COLLECTION								
1146	END SAMPLE COLLECTION: 2L IPEC								
	PUMP OFF								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	4
turbidity meter	20070493

NOTES AND OBSERVATIONS:

Measured Well Depth N/A (feet from top of casing)

Well Vault Condition GOOD

WELL ID: MW 63 - 121

SAMPLE ID: 018

GZA GeoEnvironmental of New York
Waterloo Sampling Data Sheet

MID-QUARTER SAMPLES

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: SUNNY, 90's

PROJECT NO: 01.0017869.92
DATE: 7/21/11
SAMPLER(S): SL, CB

SAMPLING INTERVAL (depth in ft below top of casing)

118 to 127.5

SAMPLING PORT

121 3

TOTAL VOLUME PURGED: 1.50 gal

PURGE RATE: variable (gal / min)

PURGE METHOD: Double Valve Pump

WATER QUALITY:

Time	Purged Volume (gal)	Temp (^{0}C) (3%)	Specific Conductivity (mS/m) (3%)	Dissolved Oxygen (mg/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Drive/Vent Cycle (seconds)	Drive Pressure (psi)
0913	0	PUMP	ON					8/8.2	35
0918	0.10	22.08	1.370	3.70	6.73	-70.5	24.49		
0923	0.25	21.47	1.403	1.14	6.80	-60.0	17.92		
0928	0.50	21.09	1.450	0.68	6.86	-57.1	13.23		
0933	0.75	20.80	1.488	0.52	6.92	-55.8	8.06		
0938	1.00	20.60	1.511	0.44	6.96	-53.3	8.66		
0943	1.25	20.45	1.512	0.43	6.99	-55.5	8.68		
0945	START SAMPLE COLLECTION								
0958	END SAMPLE COLLECTION: 2L TEC								
	PUMP OFF								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	6
turbidity meter	20070429 3

NOTES AND OBSERVATIONS:

Measured Well Depth N/A (feet from top of casing)

Well Vault Condition (GOOD)

WELL ID: MW 63- 163

SAMPLE ID: 018

GZA GeoEnvironmental of New York
Waterloo Sampling Data Sheet

MID-QUARTER SAMPLES

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: SUNNY, 90's

PROJECT NO: 01.0017869.92
DATE: 7/21/11
SAMPLER(S): SL/CB

SAMPLING INTERVAL (depth in ft below top of casing)

150.5 to 165

SAMPLING PORT

163 2

TOTAL VOLUME PURGED: 1.40 gal

PURGE RATE: variable (gal / min)

PURGE METHOD: Double Valve Pump

WATER QUALITY:

Time	Purged Volume (gal)	Temp (°C) (3%)	Specific Conductivity (mS/m) (3%)	Dissolved Oxygen (mg/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Drive/Vent Cycle (seconds)	Drive Pressure (psi)
0913	0	PUMP	ON					8/8.2	35
0918	0.05	22.68	1.066	2.11	7.02	-112.2	4.07		
0923	0.24	21.81	1.041	0.58	6.25	-126.0	1.21		
0928	0.40	21.39	1.033	0.48	6.00	-110.4	3.54		
0933	0.60	21.11	1.034	0.44	5.91	-100.1	1.53		
0938	0.75	20.80	1.038	0.40	5.93	-98.5	1.20		
0943	0.85	20.72	1.039	0.37	5.90	-81.2	1.87		
0948	1.10	20.67	1.041	0.34	5.96	-88.9	1.66		
0953	1.25	20.55	1.042	0.31	6.04	-84.3	1.43		
0959	START	SAMPLE	COLLECTION						
1009	END SAMPLE	COLLECTION: 2L IPEC							
	PUMP OFF								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	5
turbidity meter	200704293

NOTES AND OBSERVATIONS:

Measured Well Depth N/A (feet from top of casing)

Well Vault Condition GOOD

WELL ID: MW 63-174

SAMPLE ID: 018

GZA GeoEnvironmental of New York
Waterloo Sampling Data Sheet

MID - QUARTER SAMPLES

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: SUNNY, 90's

PROJECT NO: 01.0017869.92
DATE: 7/21/11
SAMPLER(S): SL, CB

SAMPLING INTERVAL (depth in ft below top of casing)

168.0 to 191.1

SAMPLING PORT

174 1

TOTAL VOLUME PURGED: 1.0 gal

PURGE RATE: variable (gal / min)

PURGE METHOD: Double Valve Pump

WATER QUALITY:

Time	Purged Volume (gal)	Temp (°C) (3%)	Specific Conductivity (mS/m) (3%)	Dissolved Oxygen (mg/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Drive/Vent Cycle (seconds)	Drive Pressure (psi)
0913	0	PUMP	ON					8/8.2	35
0918	0.05	22.73	1.043	1.28	6.67	-209.3	2.69		
0923	0.18	21.95	1.008	0.16	6.92	-185.0	2.21		
0928	0.40	21.55	0.987	0.14	6.97	-170.3	2.30		
0933	0.60	21.27	0.977	0.13	7.00	-165.3	2.17		
0938	0.80	20.93	0.979	0.09	7.02	-164.5	2.23		
0941	START SAMPLE COLLECTION								
0957	END SAMPLE COLLECTION: 2L IPEC								
	PUMP OFF								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	4
turbidity meter	200704293

NOTES AND OBSERVATIONS:

Measured Well Depth N/A (feet from top of casing)

Well Vault Condition GOOD

WELL ID: MW-65-48
SAMPLE ID: 002

GZA GeoEnvironmental of New York
Low-Flow Sampling Data Sheet

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: SUNNY, 80's

PROJECT NO: 01.0017869.92
DATE: 7/7/11
SAMPLER(S): CB, SL
PUMP DEPTH: _____ ft

MID-QUARTER SAMPLES

WATER QUALITY: DTW = 14.85 GW Elevation

Time	DTW or GW Elevation (< 0.3 ft)	Temp (°C) (3%)	Specific Conductivity (S/cm) (3%)	Dissolved Oxygen (g/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Flow Rate (gal/hr)	Notes (gal)
1128	14.85	PUMP ON							
1135	15.21	17.16	0.474	2.17	9.60	102.4	381.8		0.1
1143	15.96	19.41	0.474	0.86	10.20	97.9	349.8		0.2
1150	16.09	21.13	0.476	0.67	10.36	88.9	338.4		0.24
1155	16.17	22.43	0.477	0.79	10.47	81.0	333.1		0.26
1200	16.27	22.92	0.479	0.74	10.51	80.2	338.6		0.28
1205	16.37	22.75	0.482	0.76	10.48	81.2	343.2		0.35
1207	START SAMPLE COLLECTION								
1219	END SAMPLE COLLECTION: 2L IPEC								
	PUMP OFF								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	1
flow meter	
turbidity meter	2007 04293

Measured Well Depth _____ **(feet from top of casing)**

Well Vault Condition POOR-COVER BROKEN SEE BELOW.

NOTES AND OBSERVATIONS:

Total volume purged 0.5 gal

Depth and Depth to Water (DTW) measurements are given in feet from top of casing.

Groundwater Elevation measurements are given in feet msl.

WELL VAULT CONDITION: POOR - COVER BROKEN, COVER LOCK MECHANISM MISSING PROVIDING LARGE OPENING FOR SURFACE WATER AND DEBRIS INFILTRATION. EVIDENCE OF SURFACE WATER INFILTRATION. BOTTOM OF WELL VAULT MUCKY.

GZA GeoEnvironmental of New York
Modified Traditional Purge
Sampling Data Sheet

WELL ID: MW-165-80
SAMPLE ID: 003

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER:
MID-QUARTER SAMPLES

PROJECT NO: 01.0017869.92
DATE: 7/13/11
SAMPLER(S): CB, SL

Measured Well Depth _____ **(feet from top of casing)**

Well Vault Condition POOR

Well Diameter: 1 in

WATER COLUMN HEIGHT (ft)

83 (DTB) - 34.87 (DTW) = 48.13 ft (Well Column Height)

Diameter	Multipliers
1	0.041
2	0.163
4	0.653

GALLONS OF WATER PER WELL VOLUME:

Water Column Height 48.13 x 0.041 (Multiplier) = 1.97 (Well Volume) gal

1.97 x 1.5 = 2.96 (Designed Purge Volume) gal

TOTAL VOLUME PURGED: 3.15 gal

WATER QUALITY: DTW = 34.87 GW Elevation = 33.971

Time	Volume Purged (gal)	DTW or GW Elevation (< 0.3 ft)	Temp (^{0}C) (3%)	Specific Conductivity (S/cm) (3%)	Dissolved Oxygen (g/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Notes
0919	PUMP ON								
0926	0.4	—	18.34	2.523	2.71	7.12	171.2	302.5	
0930	0.75	—	18.07	2.775	1.61	7.01	111.4	359.4	
0935	1.00	—	18.45	2.854	1.57	7.00	101.7	415.7	
0942	1.35	—	17.69	2.929	1.48	6.93	98.7	148.5	
0950	1.75	—	17.34	2967	1.31	6.90	107.1	124.1	
0953	2.00	—	17.06	2.992	1.22	6.88	111.2	190.8	
0959	2.50	—	17.05	3.001	1.14	6.89	117.5	220.0	
1005	2.80	—	17.70	3.006	1.13	6.96	116.8	255.8	
1008	3.00	—	17.19	3.006	1.15	6.95	118.7	331.9	
1008	START SAMPLE COLLECTION								
1012	END SAMPLE COLLECTION: 2L IPEC								
	PUMP OFF								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	1
turbidity meter	2007042 93

Signs of water infiltration into PVC casing from surface.

NOTES AND OBSERVATIONS:

Depth and Depth to Water (DTW) measurements are given in feet from top of casing.

Groundwater Elevation measurements are given in feet msl.

WELL ID: MW-108
SAMPLE ID: 005

GZA GeoEnvironmental of New York
Low-Flow Sampling Data Sheet

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: Sunny 80's
MID-QUARTER SAMPLING

PROJECT NO: 01.0017869.92
DATE: 7/5/11
SAMPLER(S): SL, CB
PUMP DEPTH: _____ ft

WATER QUALITY: DTW = 4.59 GW Elevation = 9.64 ACTUAL DEPTH = 6.569

Time	DTW or GW Elevation ACTUAL DEPTH (< 0.3 ft)	Temp (°C) (3%)	Specific Conductivity (S/cm) (3%)	Dissolved Oxygen (g/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Flow Rate (gal/hr)	Notes (Gal)
1355	6.569	PUMP ON							
1400	6.510	20.79	0.713	2.06	6.56	-92.9	40.05		0.10
1403	6.515	20.89	0.787	1.39	6.30	-97.3	22.10		0.18
1406	6.524	20.91	0.901	1.00	6.09	-107.4	18.66		0.28
1414	6.520	20.92	0.995	0.46	5.72	-117.0	15.39		0.62
1420	6.520	21.20	1.071	0.32	5.81	-119.1	5.95		0.80
1425	6.520	20.84	1.073	0.26	5.80	-156.4	6.82		1.03
1429	6.507	20.76	1.083	0.22	5.75	-166.7	4.29		1.14
1435	6.518	20.68	1.098	0.21	5.97	-177.9	3.58		1.47
1439	6.511	20.64	1.117	0.20	6.16	-188.9	3.30		1.55
1442	6.513	20.54	1.125	0.21	6.23	-192.9	3.72		1.70
1445	6.509	20.64	1.125	0.21	6.36	-190.7	3.10		1.83
1448	6.511	20.59	1.133	0.20	6.44	-197.2	2.19		1.93
1451	6.511	20.60	1.137	0.19	6.49	-196.4	2.16		2.00
1454	6.511	20.49	1.147	0.21	6.53	-204.4	2.23		2.10
1455	START	SAMPLE COLLECTION							
1508	END	"	"		: 2L	IPEC			
	PUMP	OFF							

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	1
flow meter	1
turbidity meter	20070429 3

Measured Well Depth _____ **(feet from top of casing)**

Well Vault Condition No bolts; evidence of surface water infiltration

NOTES AND OBSERVATIONS:

Total volume purged 2.25 gal

Depth and Depth to Water (DTW) measurements are given in feet from top of casing.

Groundwater Elevation measurements are given in feet msl.

WELL ID: MW-109
SAMPLE ID: 005

GZA GeoEnvironmental of New York
Low-Flow Sampling Data Sheet

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: Sunny 80's
MID-QUARTER SAMPLING

PROJECT NO: 01.0017869.92
DATE: 7/5/11
SAMPLER(S): SL, CB
PUMP DEPTH: _____ ft

WATER QUALITY: DTW = 6.36 GW Elevation

Time	DTW or GW Elevation (< 0.3 ft)	Temp (°C) (3%)	Specific Conductivity (S/cm) (3%)	Dissolved Oxygen (g/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Flow Rate (gal/hr)	Notes (Gal)
11.59	6.36	PUMP ON							
1205	6.38	21.43	1.832	2.04	6.70	40.4	4.17		0.07
1210	6.38	21.27	1.798	1.40	6.73	42.4	3.25		0.19
1215	6.38	21.17	1.783	1.07	6.76	38.2	2.47		0.36
1220	6.38	21.03	1.763	0.79	6.77	39.1	1.50		0.55
1225	6.38	21.04	1.757	0.61	6.78	37.4	1.24		0.75
1230	6.38	20.97	1.750	0.49	6.77	40.3	0.98		0.93
1232	START	SAMPLE	COLLECTION						
1245	END	"	"	:2L	IPEC				
	PUMP	OFF							

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	1
flow meter	1
turbidity meter	200704793

Measured Well Depth 11.78 **(feet from top of casing)** **Well Vault Condition** Rusty lid

NOTES AND OBSERVATIONS: Total volume purged 1.08 gal

Depth and Depth to Water (DTW) measurements are given in feet from top of casing.

Groundwater Elevation measurements are given in feet msl.

WELL ID: MI-CSS
SAMPLE ID: 017

GZA GeoEnvironmental of New York
Low-Flow Sampling Data Sheet

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: SUNNY, 80's

PROJECT NO: 01.0017869.92
DATE: 7/8/14
SAMPLER(S): SL, CB
PUMP DEPTH: _____ ft

WATER QUALITY: DTW = 5.77 GW Elevation 14.303 ACTUAL DEPTH = 8.500

Time	DTW or GW Elevation (< 0.3 ft)	Temp (^{0}C) (3%)	Specific Conductivity (S/cm) (3%)	Dissolved Oxygen (g/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Flow Rate (gal/hr)	Notes
									gal
1228	8.500	PUMP ON							
1233	7.697	23.19	2.382	9.32	7.63	83.4	5.49		0.05
1238	7.501	22.84	2.393	6.59	7.63	40.1	5.23		0.15
1243	7.431	22.65	2.397	6.54	7.65	31.9	4.79		0.25
1248	7.398	22.52	2.401	7.49	7.71	34.7	4.46		0.35
1253	7.353	22.44	2.431	7.40	7.75	39.1	3.60		0.45
1258	7.346	22.36	2.467	7.45	7.79	42.0	3.22		0.55
1303	7.360	22.28	2.499	7.47	7.82	48.1	3.54		0.65
1304	START SAMPLE COLLECTION								
1333	END SAMPLE COLLECTION: 2L IPEC								
	PUMP OFF								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	2
flow meter	
turbidity meter	200704293

Measured Well Depth _____ **(feet from top of casing)** **Well Vault Condition** GOOD

NOTES AND OBSERVATIONS: Total volume purged 0.80 gal

Depth and Depth to Water (DTW) measurements are given in feet from top of casing.

Groundwater Elevation measurements are given in feet msl.

WELL ID: U3-3
SAMPLE ID: 014

GZA GeoEnvironmental of New York
Low-Flow Sampling Data Sheet

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: Partly Cloudy, 80's
MID-QUARTER SAMPLES

PROJECT NO: 01.0017869.92
DATE: 7/13/11
SAMPLER(S): SL, CB
PUMP DEPTH: 11 ft

WATER QUALITY: DTW = GW Elevation

Time	DTW or GW Elevation (ACTUAL DEPTH) (< 0.3 ft)	Temp (°C) (3%)	Specific Conductivity (S/cm) (3%)	Dissolved Oxygen (g/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Flow Rate (gal/hr)	Notes (Gal)
1150	10.469	PUMP ON							
1155	10.440	24.07	1.483	1.94	7.53	120.6	3.33		0.15
1200	10.443	24.12	1.480	1.79	7.54	103.1	3.03		0.31
1205	10.440	24.11	1.478	1.07	7.53	95.3	2.06		0.53
1208	10.441	24.10	1.476	1.05	7.58	96.3	2.09		0.67
1211	10.441	24.10	1.474	1.00	7.59	94.4	2.44		0.80
1212	START	SAMPLE COLLECTION							
1218	END	"	"		: 7L IPEC				
					500mL	IN HOUSE (BORON)			
	PUMP	OFF							

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	2
flow meter	—
turbidity meter	200701254

Measured Well Depth _____ **(feet from top of casing)** **Well Vault Condition** Fair, bolts stripped

NOTES AND OBSERVATIONS: Total volume purged 0.95 gal

Depth and Depth to Water (DTW) measurements are given in feet from top of casing.

Groundwater Elevation measurements are given in feet msl.

GZA GeoEnvironmental of New York
Modified Traditional Purge
Sampling Data Sheet

WELL ID: MW-40
SAMPLE ID: 029

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: Sunny 70's
MID-QUARTER SAMPLE

PROJECT NO: 01.0017869.92
DATE: 7/14/11
SAMPLER(S): SL/CB

Measured Well Depth _____ **(feet from top of casing)**

Well Vault Condition fair, bolts stripped.

Well Diameter: 4 in

WATER COLUMN HEIGHT (ft)

27.25 (DTB) - 9.72 (DTW) = 17.53 ft **Well Column Height**

Diameter	Multipliers
1	0.041
2	0.163
4	0.653

GALLONS OF WATER PER WELL VOLUME:

Water Column Height 17.53 x 0.653 (**Multiplier**) = 11.447 (**Well Volume**) gal

11.447 x 1.5 = 17.2 (**Designed Purge Volume**) gal

TOTAL VOLUME PURGED: _____ gal

WATER QUALITY: DTW = GW Elevation

Time	Volume Purged (gal)	DTW or GW Elevation (ACTUAL DEPTH) (< 0.3 ft)	Temp (^{0}C) (3%)	Specific Conductivity (S/cm) (3%)	Dissolved Oxygen (g/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Notes
1005	0	51.667	PUMP ON						
1015	1	49.776	29.54	0.917	1.92	8.44	183.2	1.64	
1019	2	48.431	29.54	0.890	1.84	8.47	178.2	1.28	
1023	3	46.916	30.06	0.793	2.13	8.41	175.9	1.04	
1027	4	45.220	30.42	0.753	2.23	8.41	174.6	2.08	
1032	5	43.877	30.40	0.754	2.35	8.40	173.0	0.89	
1037	6	42.335	30.37	0.777	2.25	8.40	170.3	0.49	
1042	7	38.203	30.16	0.768	2.32	8.40	169.0	0.96	
1047	8	35.914	30.09	0.754	2.44	8.40	167.3	0.59	
1051	8.5	PUMP OFF, WELL WENT DRY.		WILL LET RECHARGE					
1125		START	SAMPLE COLLECTION						
1155		END	"	"	: 2L	IPEC			
		PUMP OFF			0.5L	IPEC	(BORON	ANALYSIS	-IN HOUSE)

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	3
turbidity meter	20070254

NOTES AND OBSERVATIONS:

Depth and Depth to Water (DTW) measurements are given in feet from top of casing.

Groundwater Elevation measurements are given in feet msl.

WELL ID: U3-45
SAMPLE ID: 004

GZA GeoEnvironmental of New York
Low-Flow Sampling Data Sheet

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: SUNNY, 70's

PROJECT NO: 01.0017869.92
DATE: 7/14/11
SAMPLER(S): SL, CB
PUMP DEPTH: _____ ft

MID-QUARTER SAMPLES

WATER QUALITY: DTW = 8.88 GW Elevation

Time	DTW or GW Elevation (< 0.3 ft)	Temp (^{0}C) (3%)	Specific Conductivity (S/cm) (3%)	Dissolved Oxygen (g/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Flow Rate (gal/hr)	Notes
10:10	8.88	PUMP ON							gal D
10:20	8.89	28.58	1.117	0.82	7.16	-193.9	7.85		0.05
1026	8.87	29.03	1.092	0.57	7.25	-182.1	5.89		0.20
1032	8.88	29.48	1.188	0.43	7.28	-195.7	5.37		0.34
1037	8.86	29.47	1.185	0.33	7.30	-226.0	5.35		0.45
1042	8.85	29.62	1.186	0.23	7.31	-194.6	5.24		0.65
1047	8.84	29.65	1.184	0.20	7.31	-195.3	4.86		0.75
1052	8.83	29.58	1.184	0.26	7.32	-200.1	4.71		0.85
1057	8.82	29.18	1.181	0.27	7.32	-202.4	4.65		0.95
1102	START SAMPLE COLLECTION								
1127	END SAMPLE COLLECTION: 2L IPEC; 0.5L IPEC (BORON IN-HOUSE)								
	PUMP OFF								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	4
flow meter	
turbidity meter	20070429Z

Measured Well Depth _____ **(feet from top of casing)**

Well Vault Condition FAIR - BOLTS STRIPPED

NOTES AND OBSERVATIONS:

Total volume purged 1.15 gal

Depth and Depth to Water (DTW) measurements are given in feet from top of casing.

Groundwater Elevation measurements are given in feet msl.

WELL ID: U3-T2
SAMPLE ID: 0.38

GZA GeoEnvironmental of New York
Low-Flow Sampling Data Sheet

CLIENT: Entergy - IPEC
SITE: Buchanan, NY
WEATHER: CLOUDY, 70's, SOME PRECIPITATION NIGHT BEFORE
MID-QUARTER SAMPLES

PROJECT NO: 01.0017869.92
DATE: 7/8/11
SAMPLER(S): SL/CB
PUMP DEPTH: _____ ft

WATER QUALITY: DTW = 3.73 GW Elevation 4.782 TRANSDUCER ACTUAL DEPTH = 3.035

Time	DTW or GW Elevation (< 0.3 ft)	Temp (^{0}C) (3%)	Specific Conductivity (S/cm) (3%)	Dissolved Oxygen (g/l) (10%)	pH (SU) (+/- 0.1)	ORP (m/Volts) (+/- 10)	Turbidity (NTU) (10%)	Flow Rate (gal/hr)	Notes (gal)
0943	3.030	PUMP ON							
0952	2.983	29.45	1.371	4.97	7.79	-91.0	12.02		0.01
0957	2.978	29.57	1.345	3.01	7.84	-115.9	4.11		0.10
1002	2.971	29.76	1.333	2.55	7.85	-137.5	2.89		0.20
1007	2.962	29.93	1.332	1.91	7.85	-107.6	2.11		0.30
1012	2.960	29.89	1.318	1.36	7.86	-140.2	2.17		0.45
1017	2.951	29.92	1.300	1.01	7.87	-159.0	1.47		0.60
1022	2.947	30.01	1.292	0.69	7.87	-168.0	1.40		0.72
1027	2.940	30.13	1.285	0.72	7.87	-170.2	1.40		0.85
1032	2.938	29.99	1.279	0.68	7.88	-174.9	1.39		1.00
1034	START SAMPLE COLLECTION								
1055	END SAMPLE COLLECTION; 2L JPEC								
	PUMP OFF								

Equipment Used	Equipment Identification #
YSI 556 MPS Reader and 5563 Sonde	2
flow meter	
turbidity meter	20070H293

Measured Well Depth _____ **(feet from top of casing)** **Well Vault Condition** GOOD

NOTES AND OBSERVATIONS: Total volume purged 1.15 gal

Depth and Depth to Water (DTW) measurements are given in feet from top of casing.

Groundwater Elevation measurements are given in feet msl.

APPENDIX E: Q4-2011 MID-QUARTER SAMPLING DATA SHEETS

NO POST QUARTER 4-2011 SAMPLES COLLECTED

APPENDIX F: Q4 2011 DOSE CALCULATIONS

Facility Groundwater Flux Calculation

Site Indian Point
Job No. 17869.92

Prepared By: JAS
Reviewed By: mjb

Parameter Values:

year
2011

Totals

Total Catchment Zone (ft^2)	Total Improved Zone (ft^2)	Recharge (ft/yr)	Precipitation (ft/yr)
3,969,765	1,432,972	1.31	5.06

Surface Area

Northern Clean Zone Improved (ft^2)	Unit 2 North Improved Zone (ft^2)	Unit 1/2 Improved Zone (ft^2)	Unit 3 North Improved Zone (ft^2)	Unit 3 South Improved Zone (ft^2)	Southern Clean Improved Zone (ft^2)
0	148,214	433,904	316,210	321,290	213,354
Northern Clean Unimproved Zone (ft^2)	**Unit 2 North Unimproved Zone (ft^2)**	**Unit 1/2 Unimproved Zone (ft^2)**	**Unit 3 North Unimproved Zone (ft^2)**	**Unit 3 South Unimproved Zone (ft^2)**	**Southern Clean Zone Unimproved (ft^2)**
106,429	204,317	438,221	323,116	268,862	585,600
Discounted Area Within Zone	**Discounted Area Within Zone**	**Discounted Area Within Zone**	**Discounted Area Within Zone**	**Discounted Area Within Zone**	**Discounted Area Within Zone**
50,265	0	291,186	106,718	17,730	144,347
Northern Clean Zone Catchment (ft^2)	**Unit 2 North Catchment Zone (ft^2)**	**Unit 1/2 Catchment Zone (ft^2)**	**Unit 3 North Catchment Zone (ft^2)**	**Unit 3 South Zone (ft^2)**	**Southern Clean Zone (ft^2)**
156,694	352,531	1,163,311	746,044	607,882	943,302

Activity (pCi/L)

Groundwater

	Northern Clean Zone Catchment	Unit 2 North	Unit 1/2	Unit 3 North	Unit 3 South Zone	Southern Clean Zone
Upper Zone Before Canal	150	0	9,781	1,914	1,711	0
Lower Zone Before Canal	150	516	3,303	2,681	740	0
	Northern Clean Zone	**Unit 2 North**	**Unit 1/2**	**Unit 3 North**	**Unit 3 South Zone**	**Southern Clean Zone**
Upper Zone After Canal	150	499	3,684	436	1,711	0
Lower Zone After Canal	150	673	903	880	740	0

Stormwater Discharging to Canal (pCi/L)

Storm Water for Northern Clean Zone	Storm Water for Unit 2 North	Storm Water for Unit 1/2	Storm Water for Unit 3 North	Storm Water for Unit 3 South	Storm Water for Southern Clean Zone
	3,256		0	2,093	1,053
NA	*Avg MH-4*	*NA*	*Avg CB-14 and CB-34*	*Avg U3-CB-B8*	*Avg D1, C3, E6, & E10*

Stormwater Discharging to River (pCi/L)

Storm Water for Northern Clean Zone	Storm Water for Unit 2 North	Storm Water for Unit 1/2	Storm Water for Unit 3 North	Storm Water for Unit 3 South	Storm Water for Southern Clean Zone
	0	0	780		0
NA	*Avg. MH-1 and MH-12*	*Avg MH-14*	*Avg CB-15*	*NA*	*Avg E13,CB-C2*

Potential Water Received by Storm Drain System

=(Improved Area) x Precipitation

Northern Clean Area	Unit 2 North	Unit 1/2	Unit 3 North	Unit 3 South	Southern Clean Zone	Units
0	749,221	2,193,386	1,598,443	1,624,119	1,078,507	ft^3/yr
0	2,053	6,009	4,379	4,450	2,955	ft^3/day
0.00	10.66	31.22	22.75	23.12	15.35	GPM
0	21,215,582	62,109,760	45,262,866	45,989,919	30,539,914	L/Yr

The total amount of water available to be received by the storm system is computed as the combined area of buildings and paved areas in the catchment multiplied by the annual precipitation rate. Note this conservatively assumes that the amount of water lost to the atmosphere or other sinks after precipitation has fallen on paved or built up surfaces is zero.

Water Directly Recharged to Aquifer from Precipitation

=Unimproved Area x Recharge

Northern Clean Area	Unit 2 North	Unit 1/2	Unit 3 North	Unit 3 South	Southern Clean Zone	Units
139,880	268,534	575,954	424,671	353,366	769,654	ft^3/yr
383	736	1,578	1,163	968	2,109	ft^3/day
1.99	3.82	8.20	6.04	5.03	10.95	GPM
3,960,956	7,604,042	16,309,205	12,025,336	10,006,208	21,794,184	L/Yr

Facility Groundwater Flux Calculation

Site Indian Point
Job No. 17869.92

Prepared By: JAS
Reviewed By: mjb

Water Recharged to Aquifer (Direct Recharge Plus Storm Water Leakage Minus Building Drain Removal)

=(Direct Recharge + X% Water Received by Storm System) - (Y% x Water Removed by Building Drains)

Total Water Discharged to Aquifer

Upper and Lower Zone	[Northern Clean Area Catchment + (0% Storm Drain Water)][1]	[Unit 2 North + (50% Storm Drain Water)]-[5gpm]	[Unit 1/2 Area Catchment + (30% Storm Drain Water)]-[7.5 gpm]	[Unit 3 North Area Catchment + (60% Storm Drain Water)]-[7.5gpm]	[Unit 3 South Area + (10% Storm Drain Water)]	[Southern Clean Zone Area + (40% Storm Drain Water)]	Units
	139,880	291,832	707,001	856,768	515,778	1,201,057	ft^3/yr
	383	800	1,937	2,347	1,413	3,291	ft^3/day
	1.99	4.15	10.06	12.19	7.34	17.09	GPM
	3,960,956	8,263,771	20,020,040	24,260,962	14,605,200	34,010,150	L/Yr

[1] There are no improved surfaces in Northern Clean Zone.

Groundwater Discharged to Canal

=Water Recharged to Aquifer x X% flowing to Canal

Upper and Lower Zone	Northern Clean Area Catchment x 0%	Unit 2 North x 15.2%	Unit 1/2 Area Catchment 24.2%	Unit 3 North Area Catchment x 22.9%	Unit 3 South Area x68.4%	Southern Clean Zone Area x 0%	Units
	0	44,359	171,094	196,200	352,792	0	ft^3/yr
	0	122	469	538	967	0	ft^3/day
	0.00	0.63	2.44	2.79	5.02	0.00	GPM
	0	1,256,093	4,844,850	5,555,760	9,989,957	0	L/Yr

Groundwater Discharged to River

=Water Recharged to Aquifer x X% flowing to River x Y% Flowing in Appropriate Vertical Zone

	Northern Clean Area Catchment x 100% x 59.3%	Unit 2 North x 84.8% x 15.1%	Unit 1/2 Area Catchment x 75.8% x 11.7%	Unit 3 North Area Catchment x 77.1% x 47.9%	Unit 3 South Area x 31.6% x 31.3%	Southern Clean Zone Area x 100% x 55.2%	Units
Upper Zone	82,949	37,369	62,701	316,412	51,015	662,984	ft^3/yr
	227	102	172	867	140	1,816	ft^3/day
	1.18	0.53	0.89	4.50	0.73	9.44	GPM
	2,348,847	1,058,159	1,775,497	8,959,792	1,444,571	18,773,603	L/Yr
	Northern Clean Area Catchment x 100% x 40.7%	**Unit 2 North x 84.8% x 84.9%**	**Unit 1/2 Area Catchment 75.8% x 88.3%**	**Unit 3 North Area Catchment x 77.1% x 52.1%**	**Unit 3 South Area x 31.6% x 68.7%**	**Southern Clean Zone Area x 100% x 44.8%**	**Units**
Lower Zone	56,931	210,105	473,206	344,156	111,971	538,074	ft^3/yr
	156	576	1,296	943	307	1,474	ft^3/day
	0.81	2.99	6.73	4.90	1.59	7.66	GPM
	1,612,109	5,949,519	13,399,693	9,745,410	3,170,672	15,236,547	L/Yr

Water Remaining in Storm Drains and Discharged to Canal

=Storm Drain Water x X% Not Leaking to Groundwater and Not Discharging to River

Northern Clean Area Catchment (0% Storm Drain Water)	Unit 2 North (45% Unit 2 North and 30% of Unit 1/2 Storm Drain Water). Plus 5 gpm (351k cf/yr) from U2 footing drain.	Unit 1/2 Area Catchment (0% Storm Drain Water)	Unit 3 North Area Catchment (3% Unit 3 North Storm Drain Water)	Unit 3 South Area (3% Unit 3 North and 42% Unit 3 South Storm Drain Water)	Southern Clean Zone Area (30% Unit 1/2, 27% Unit 3 North, 43% Unit 3 South, and 55% Southern Clean Zone Storm Drain Water)	Units
0	1,346,165	0	47,953	730,083	2,381,145	ft^3/yr
0	3,688	0	131	2,000	6,524	ft^3/day
0	19.16	0.00	0.68	10.39	33.89	GPM
0	38,120,999	0	1,357,886	20,673,652	67,426,519	L/Yr

Water Remaining in Storm Drains and Discharged to River

Northern Clean Area Catchment (0% Storm Drain Water)	Unit 2 North (5% Storm Drain Water)	Unit 1/2 Area Catchment (10% Storm Drain Water)	Unit 3 North Area Catchment (7% Storm Drain Water)	Unit 3 South Area (5% Storm Drain Water)	Southern Clean Zone Area (5% Storm Drain Water)	Units
0	37,461	219,339	111,891	81,206	53,925	ft^3/yr
0	103	601	307	222	148	ft^3/day
0	0.53	3.12	1.59	1.16	0.77	GPM
0	1,060,779	6,210,976	3,168,401	2,299,496	1,526,996	L/Yr

Facility Groundwater Flux Calculation

Site Indian Point
Job No. 17869.92

Prepared By: JAS
Reviewed By: mjb

Flux Calculations

Conceptual Model: Migration Pathway Summary

	Northern Clean Area	Unit 2 North	Unit 1/2	Unit 3 North	Unit 3 South	Southern Clean Zone
GW	100% Upper and Lower Zone To River	84.8% Upper Zone and Lower Zone Flow To River. 15.2% Upper Zone and Lower Zone Flow to Canal	75.8% Upper Zone and Lower Zone To River. 24.2% Upper Zone and Lower Zone to Canal	77.1% Upper Zone and Lower Zone To River. 22.9% Upper Zone and Lower Zone to Canal	31.6% Upper Zone and Lower Zone To River. 68.4% Upper Zone and Lower Zone to Canal	100% Upper and Lower Zone To River
SW	NA	To Canal (Storm Water Considered Clean; Estimated at 5.5 GPM) and To River (5% Storm Water)	To Canal (60% Storm Water) and To River (10% Storm Water)	To Canal (33% Storm Water) and To River (7% Storm Water)	To Canal (85% Storm Water) and To River (5% Storm Water)	To Canal (55% Storm Water) and To River (5% Storm Water)

Flux (pCi/Yr)

	North Clean Area	Unit 2 North	Unit 1/2	Unit 3 North	Unit 3 South	South Clean Zone	Total
GW to River-Upper Zone	3.52E+08	5.28E+08	6.54E+09	3.90E+09	2.47E+09	0.00E+00	**1.38E+10**
GW to River-Lower Zone	2.42E+08	4.00E+09	1.21E+10	8.58E+09	2.35E+09	0.00E+00	**2.73E+10**
GW to Canal	0.00E+00	0.00E+00	4.74E+10	1.06E+10	1.71E+10	0.00E+00	**7.51E+10**
SW to Canal	NA	1.24E+11	0.00E+00	0.00E+00	4.33E+10	7.10E+10	**2.38E+11**
SW to River	NA	0.00E+00	0.00E+00	2.47E+09	0.00E+00	0.00E+00	**2.47E+09**
						Curies/Yr ==>	**0.36**

Notes:

The recharge rate used herein, 26% of precipitation (~10 in/yr), is within the range of values discussed in the USGS modeling report[1]. The reported recharge ranged from 3.6 inches/year to 7.5 inches/year for a till to 20 inches per year for coarse grained glacially stratified deposits. A yearly rolling average precipitation value measured at the Facility meteorological station is also used in the computations. The catchment area was defined using an AutoCAD topo map for the Site and surrounding area. The catchment was defined by starting at the area marked "line of water grant" and tracking east, away from the River, to define portions of the land surface contributing water to the selected discharge zone. Calculations assume that run-off or overland flow in unimproved areas of the Site is negligible, there are no changes in storage and the Hudson River is a gaining stream.

1. USGS. Water Use, Ground-Water Recharge and Availability, and Quality of Water in the Greenwich Area, Fairfield County, Connecticut and Westchester County, New York, 2000-2002

APPENDIX G: Q4 2011 UNIT 2 TRITIUM PLUME TREND ANALYSES

TABLE G1
MANN-KENDALL TREND EVALUATION SUMMARY
TRITIUM IN GROUNDWATER NEAR UNIT 2
INDIAN POINT ENERGY CENTER
BUCHANAN, NY

Well ID	Number of Data Points	Number of Times below MDC	Minimum Tritium Activity (pCi/L)	Maximum Tritium Activity (pCi/L)	Mann-Kendall Statistic (S)	Normalized Test Statistic (Z)	Probability	Trend at 95% Level of Significance
MW-30-69	46	0	7.36E+04	6.01E+05	-221	-2.08	0.981	decreasing
MW-30-84	33	0	3.78E+03	1.25E+04	149	2.29	0.989	increasing
MW-31-49	44	0	2.98E+02	1.04E+05	58	0.58	0.718	no trend
MW-31-63	32	0	5.00E+03	7.35E+04	67	1.07	0.858	no trend
MW-31-85	32	0	3.17E+02	2.25E+04	111	1.78	0.963	increasing
MW-32-59	31	0	4.13E+02	1.55E+05	55	0.92	0.821	no trend
MW-32-85	30	0	5.42E+03	1.49E+04	166	2.94	0.998	increasing
MW-32-149	27	0	1.99E+02	1.05E+04	3	0.04	0.517	no trend
MW-32-173	25	0	4.31E+02	5.89E+03	-74	-1.70	0.956	decreasing
MW-32-190	29	0	1.21E+03	1.13E+04	-310	-5.80	1.000	decreasing
MW-33	26	0	3.69E+03	2.64E+05	-167	-3.66	1.000	decreasing
MW-35	20	0	1.04E+03	1.19E+05	-88	-2.82	0.998	decreasing
MW-36-24	22	4	1.54E+02	3.42E+04	33	0.90	0.817	no trend
MW-36-41	17	0	2.63E+03	5.52E+04	-89	-3.62	1.000	decreasing
MW-36-52	22	0	3.14E+03	2.68E+04	-173	-4.85	1.000	decreasing
MW-37-22	24	0	2.26E+03	3.49E+04	-54	-1.31	0.906	no trend
MW-37-32	24	0	2.49E+03	3.01E+04	-88	-2.16	0.985	decreasing
MW-37-40	23	0	3.92E+03	1.70E+04	-125	-3.27	0.999	decreasing
MW-37-57	24	0	4.05E+03	4.48E+04	-116	-2.85	0.998	decreasing
MW-42-49	25	0	1.12E+03	7.22E+04	-113	-2.62	0.996	decreasing
MW-42-78	20	2	3.46E+02	1.28E+03	-32	-1.01	0.843	no trend
MW-49-26	26	0	2.59E+03	1.54E+04	-210	-4.61	1.000	decreasing
MW-49-42	26	0	1.90E+03	1.13E+04	-203	-4.45	1.000	decreasing
MW-49-65	26	0	1.26E+03	5.76E+03	-140	-3.06	0.999	decreasing
MW-50-42	28	4	1.01E+02	9.75E+03	-4	-0.06	0.524	no trend
MW-50-66	32	0	2.08E+03	1.08E+04	-126	-2.03	0.979	decreasing
MW-53-82	21	1	2.27E+02	1.32E+04	-58	-1.72	0.957	decreasing
MW-53-120	24	0	3.81E+03	9.61E+03	-150	-3.70	1.000	decreasing
MW-55-24	19	0	7.82E+02	3.08E+03	-12	-0.38	0.650	no trend
MW-55-35	18	0	8.53E+02	9.04E+03	-43	-1.59	0.944	no trend
MW-55-54	19	0	5.47E+03	1.31E+04	-31	-1.05	0.853	no trend
MW-111	37	0	6.81E+03	5.78E+05	-319	-4.16	1.000	decreasing
DOWNGRADIENT WELLS								
MW-66-21	19	4	8.28E+01	3.57E+03	-55	-1.89	0.971	decreasing
MW-66-36	18	0	3.01E+03	9.10E+03	-99	-3.71	1.000	decreasing
MW-67-39	17	0	2.55E+03	5.07E+03	-36	-1.44	0.925	no trend
MW-67-105	18	0	9.94E+02	2.93E+03	-93	-3.48	1.000	decreasing
MW-67-173	18	1	4.47E+02	1.05E+03	-106	-3.98	1.000	decreasing
MW-67-219	17	0	6.41E+02	1.44E+03	-20	-0.78	0.783	no trend
MW-67-276	17	0	6.79E+02	1.18E+03	-32	-1.28	0.899	no trend
MW-67-323	17	4	3.09E+02	1.29E+03	-13	-0.49	0.689	no trend
MW-67-340	17	1	2.75E+02	6.69E+02	28	1.11	0.867	no trend

Notes: Calculations based on Mann-Kendall trend evaluations as presented in U.S. EPA Practical Methods for Data Analysis, U.S. EPA QA/G-9 QA00 UPDATE, July 2000, Section 4.3.4

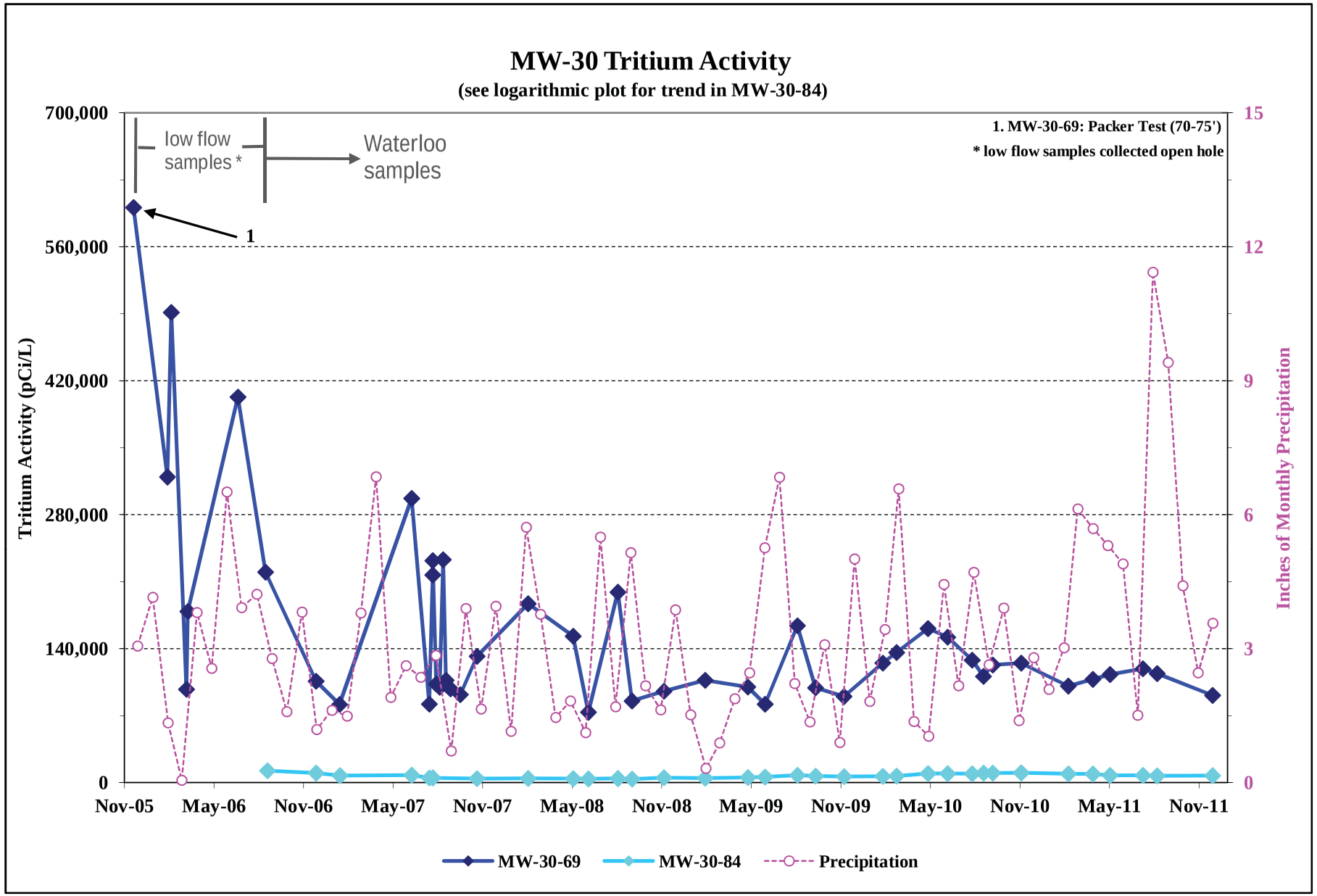

MW-30 Tritium Activity
(see logarithmic plot for trend in MW-30-84)
low flow samples *
Waterloo samples
1
1. MW-30-69: Packer Test (70-75')
* low flow samples collected open hole
Tritium Activity (pCi/L)
Inches of Monthly Precipitation
700,000
560,000
420,000
280,000
140,000
0
15
12
9
6
3
0
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
MW-30-69
MW-30-84
Precipitation

FIGURE G1

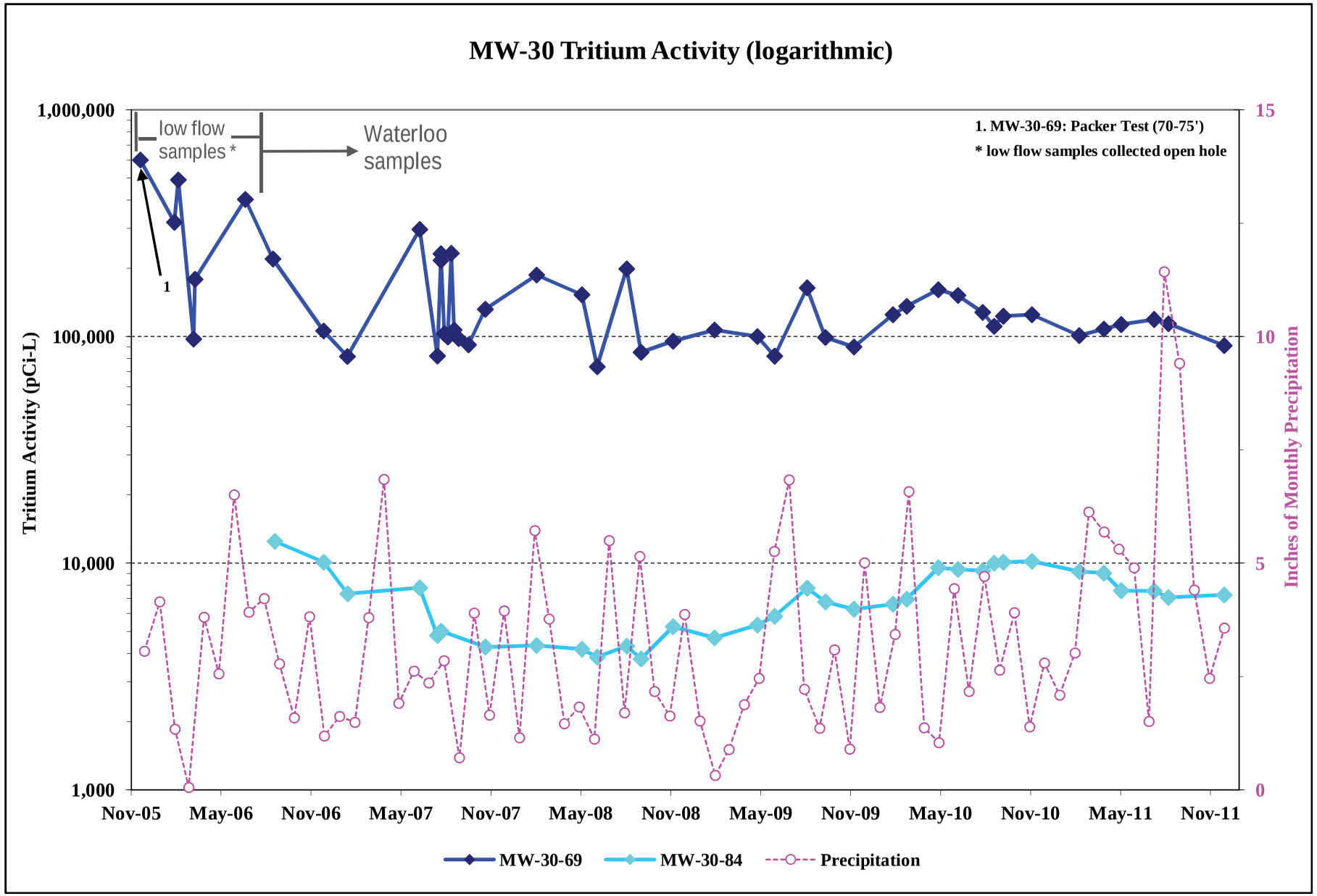

MW-30 Tritium Activity (logarithmic)
1,000,000
100,000
10,000
1,000
Tritium Activity (pCi-L)
15
10
5
0
Inches of Monthly Precipitation
low flow samples *
Waterloo samples
1
1. MW-30-69: Packer Test (70-75')
* low flow samples collected open hole
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
MW-30-69
MW-30-84
Precipitation

FIGURE G1a

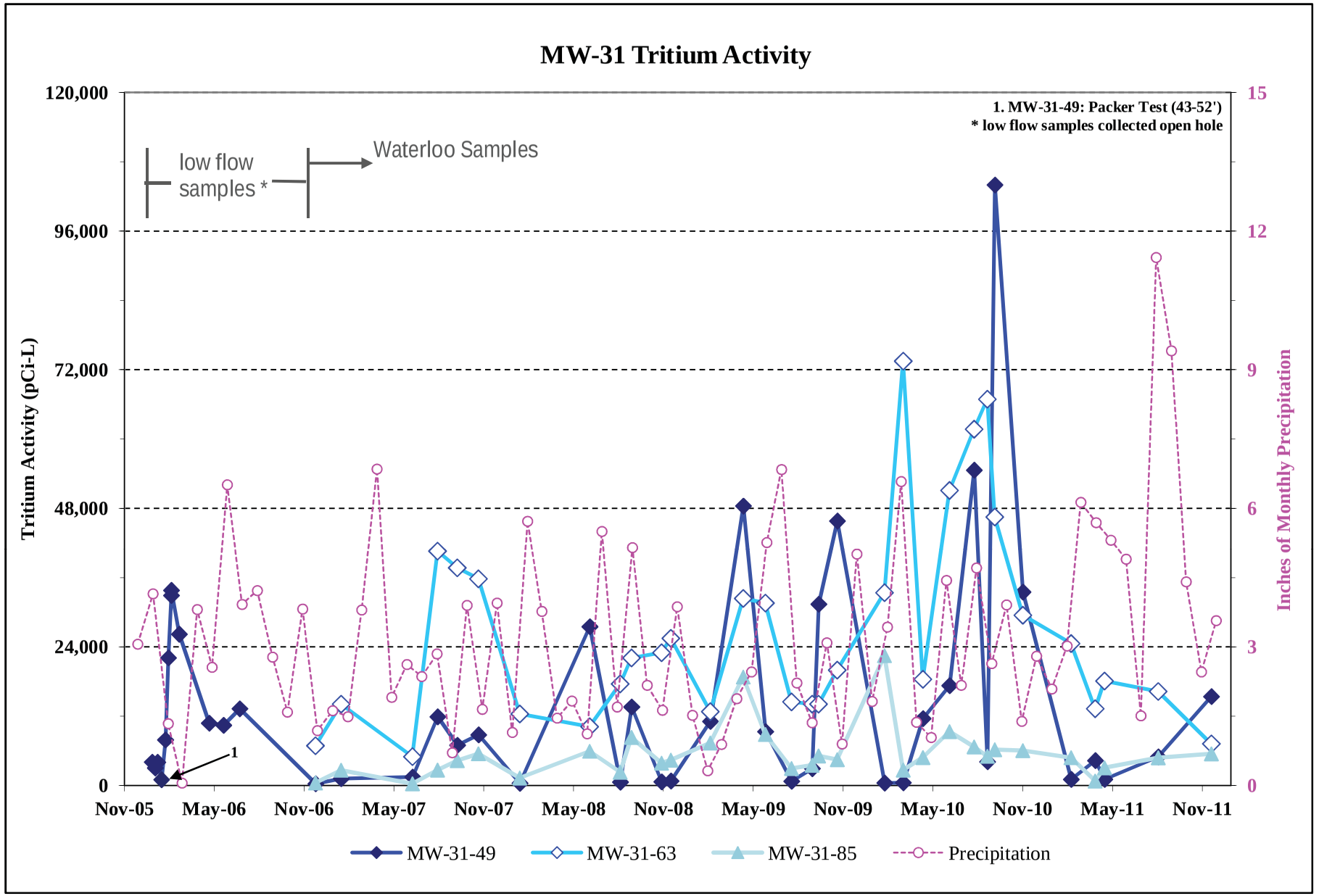

MW-31 Tritium Activity
1. MW-31-49: Packer Test (43-52')
* low flow samples collected open hole
low flow samples *
Waterloo Samples
Tritium Activity (pCi-L)
Inches of Monthly Precipitation
120,000
96,000
72,000
48,000
24,000
0
15
12
9
6
3
0
1
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
MW-31-49
MW-31-63
MW-31-85
Precipitation

FIGURE G2

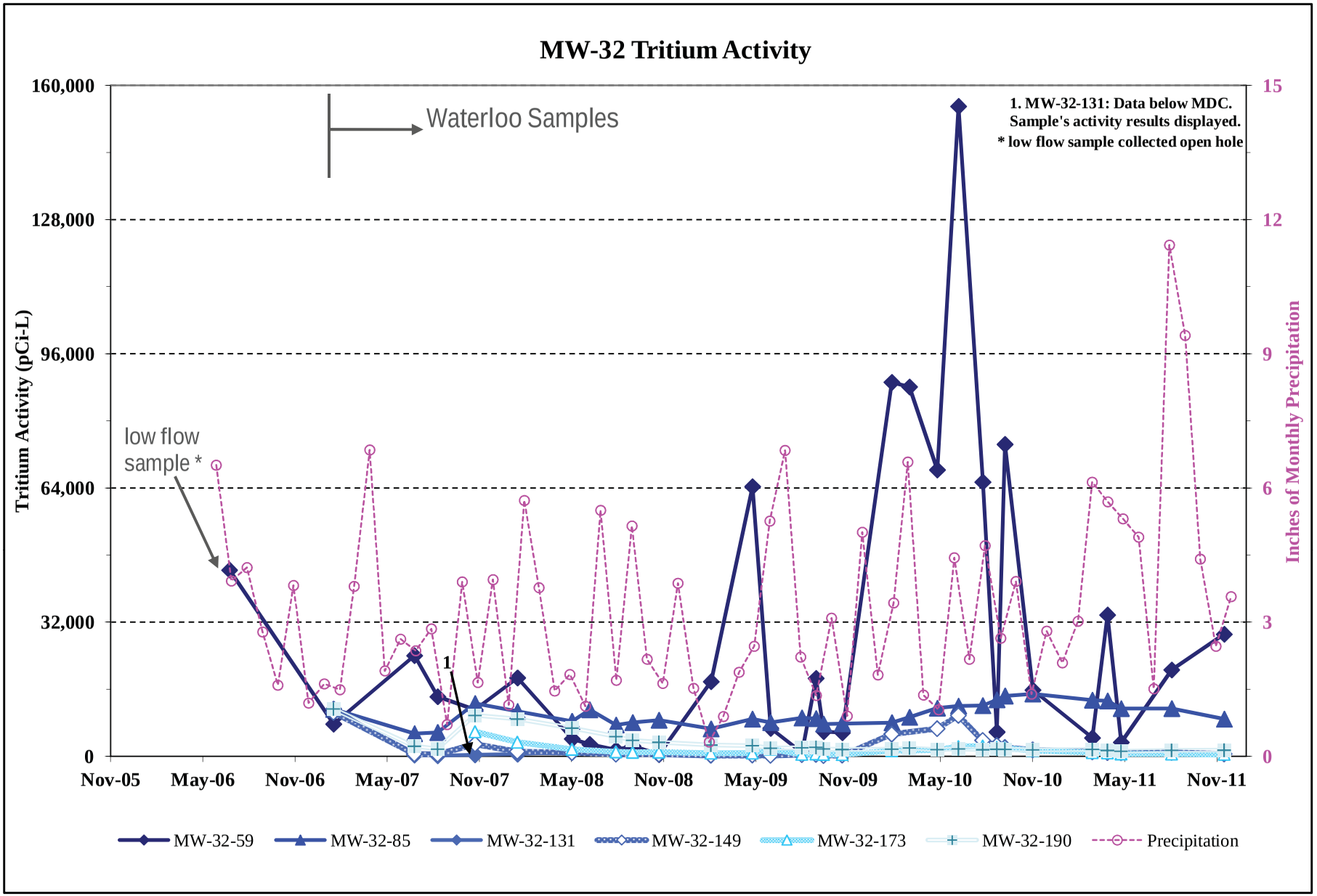

MW-32 Tritium Activity
Waterloo Samples
1. MW-32-131: Data below MDC.
Sample's activity results displayed.
* low flow sample collected open hole
low flow sample *
1
Tritium Activity (pCi-L)
Inches of Monthly Precipitation
160,000
128,000
96,000
64,000
32,000
0
15
12
9
6
3
0
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
MW-32-59
MW-32-85
MW-32-131
MW-32-149
MW-32-173
MW-32-190
Precipitation

FIGURE G3

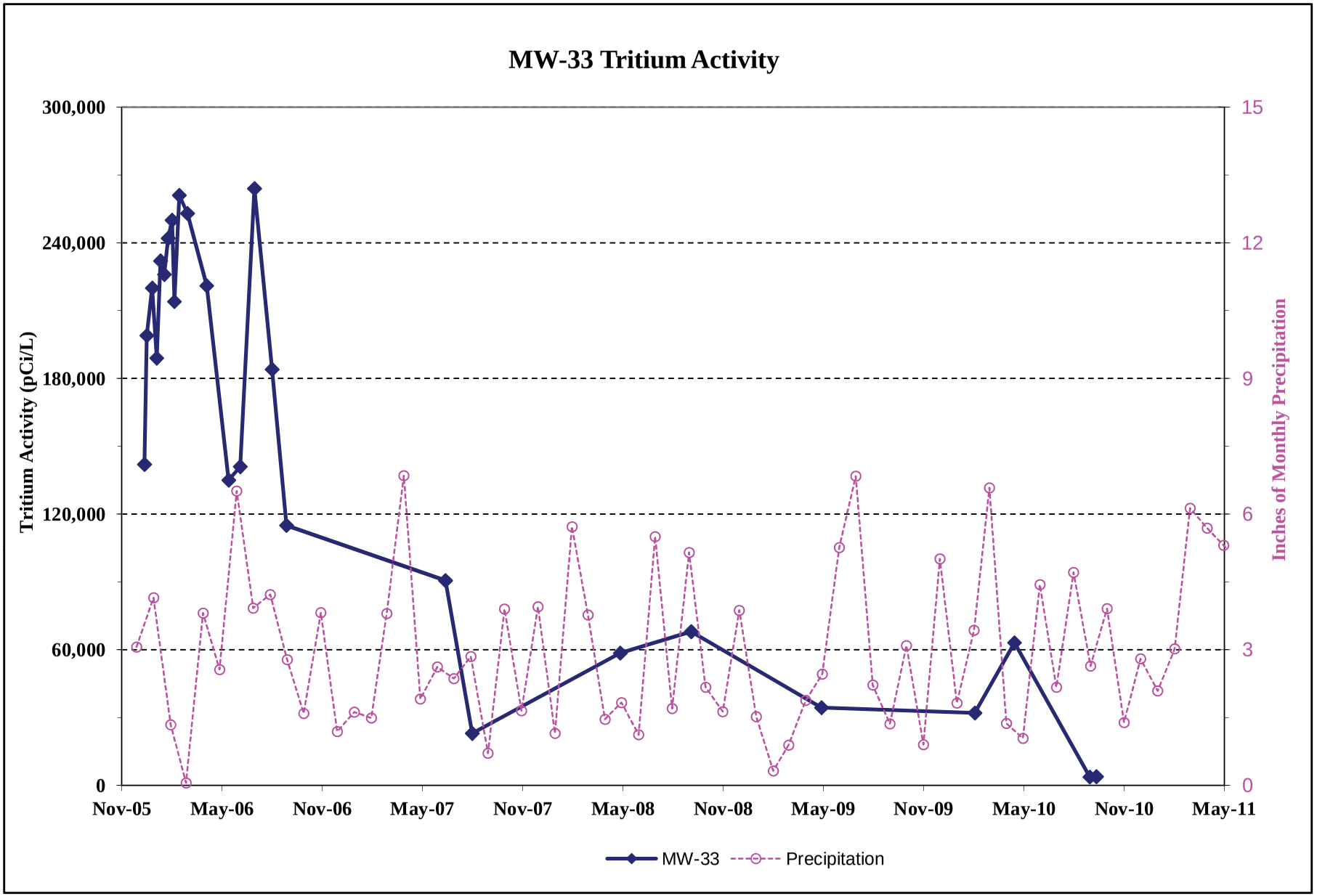

MW-33 Tritium Activity
300,000
240,000
180,000
120,000
60,000
0
Tritium Activity (pCi/L)
15
12
9
6
3
0
Inches of Monthly Precipitation
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
MW-33
Precipitation

FIGURE G4

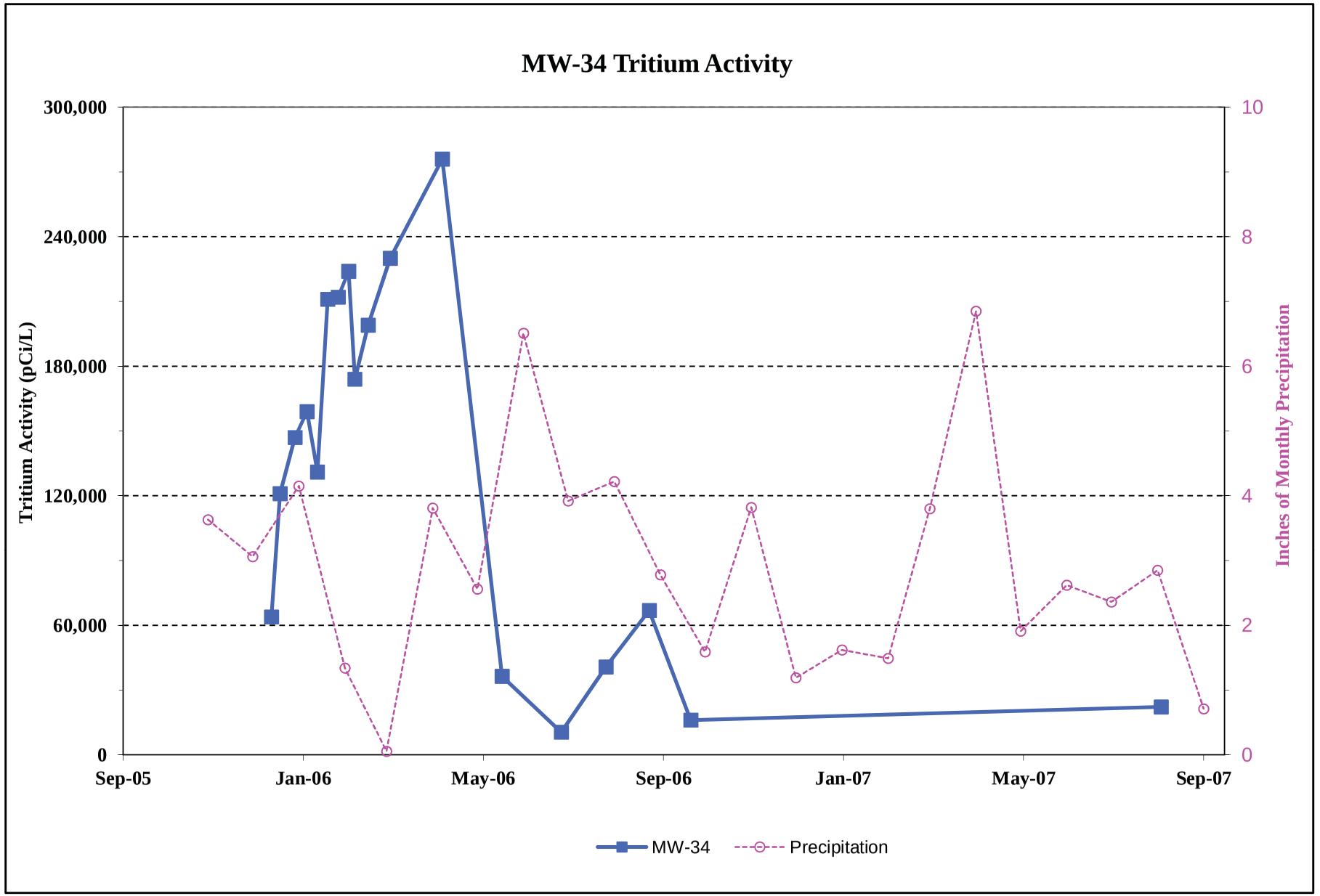

MW-34 Tritium Activity
300,000
240,000
180,000
120,000
60,000
0
Tritium Activity (pCi/L)
10
8
6
4
2
0
Inches of Monthly Precipitation
Sep-05
Jan-06
May-06
Sep-06
Jan-07
May-07
Sep-07
MW-34
Precipitation

FIGURE G5

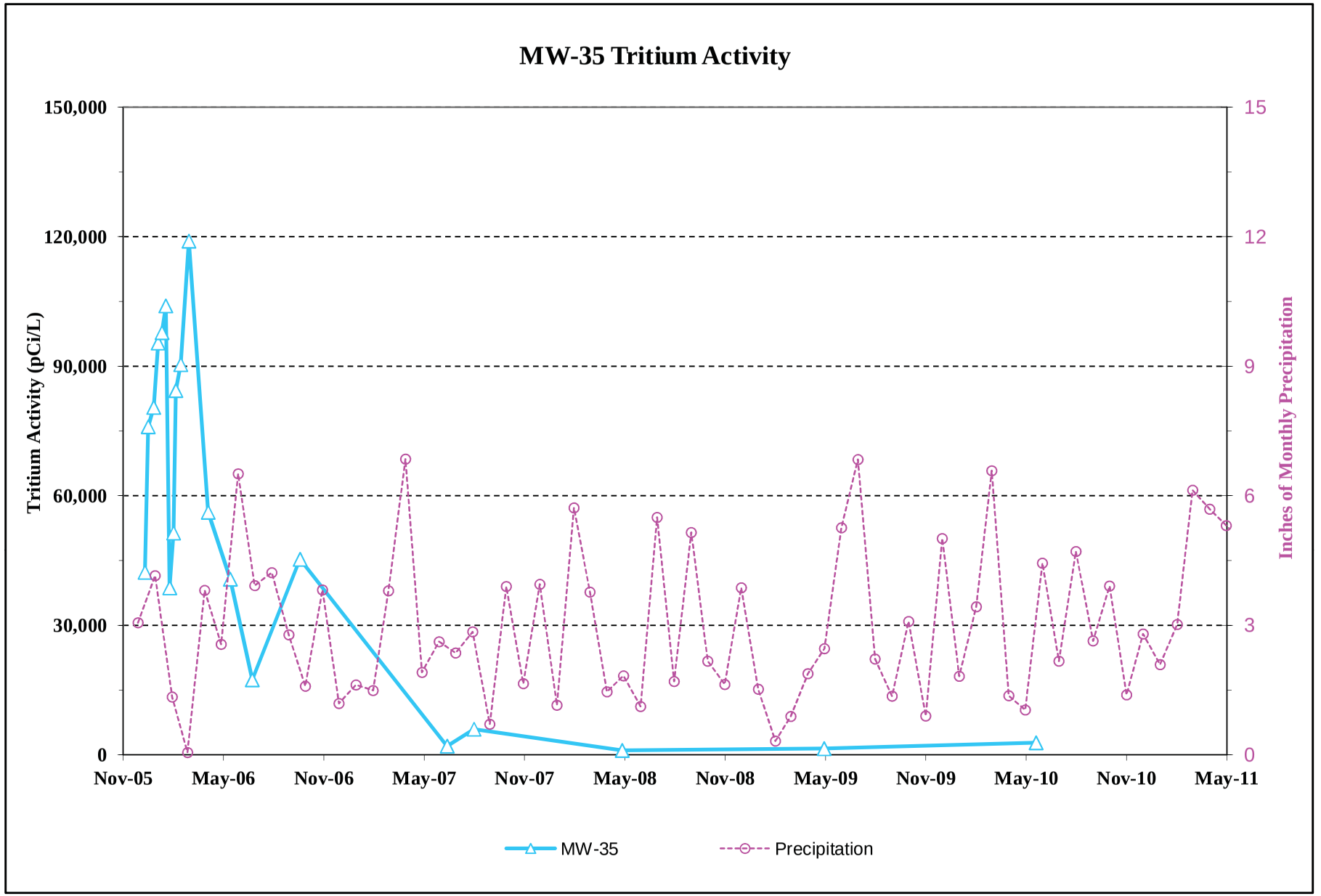

MW-35 Tritium Activity
150,000
120,000
90,000
60,000
30,000
0
Tritium Activity (pCi/L)
15
12
9
6
3
0
Inches of Monthly Precipitation
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
MW-35
Precipitation

FIGURE G6

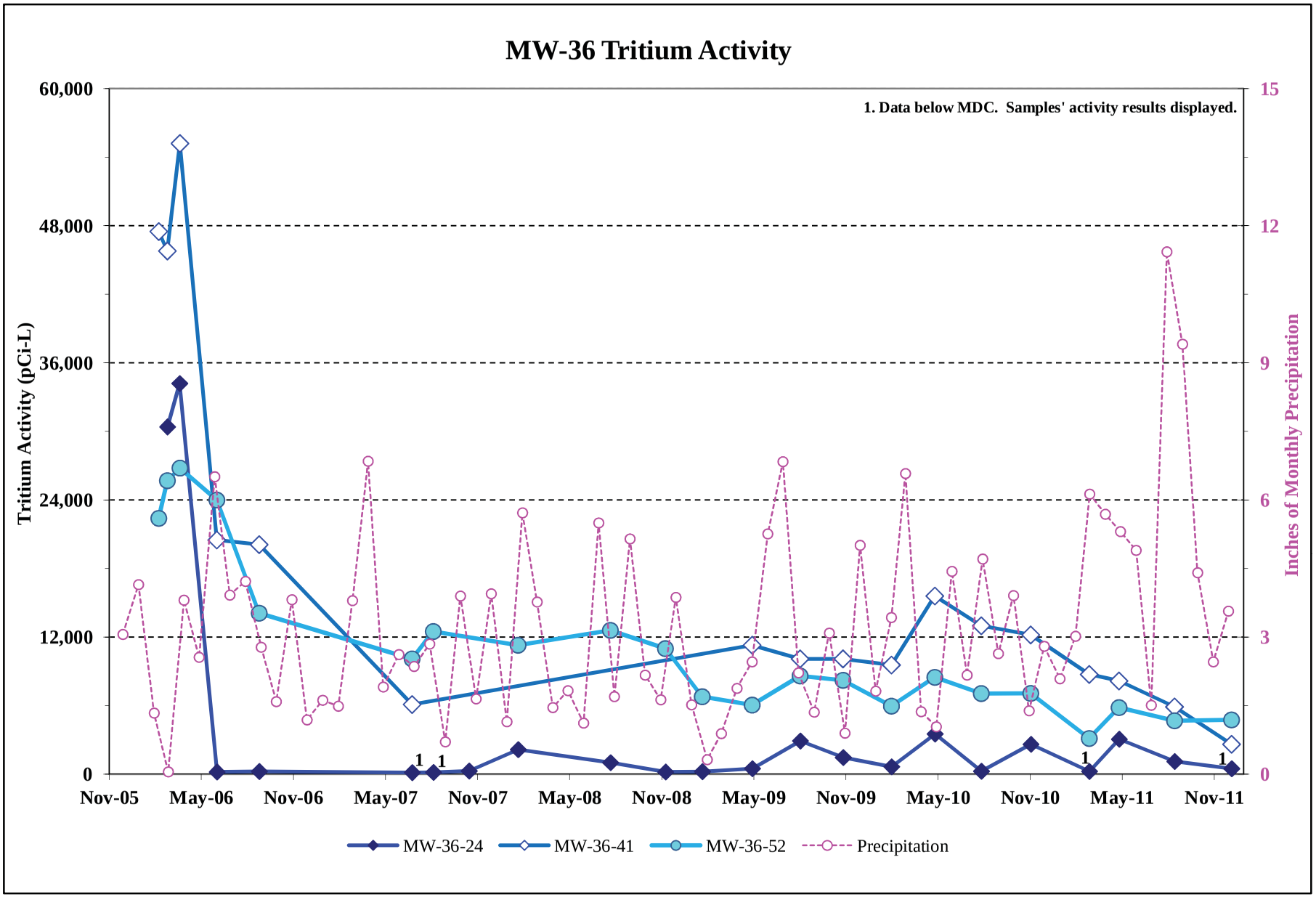

MW-36 Tritium Activity
1. Data below MDC. Samples' activity results displayed.
Tritium Activity (pCi-L)
Inches of Monthly Precipitation
60,000
48,000
36,000
24,000
12,000
0
15
12
9
6
3
0
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
1
1
1
1
MW-36-24
MW-36-41
MW-36-52
Precipitation

FIGURE G7

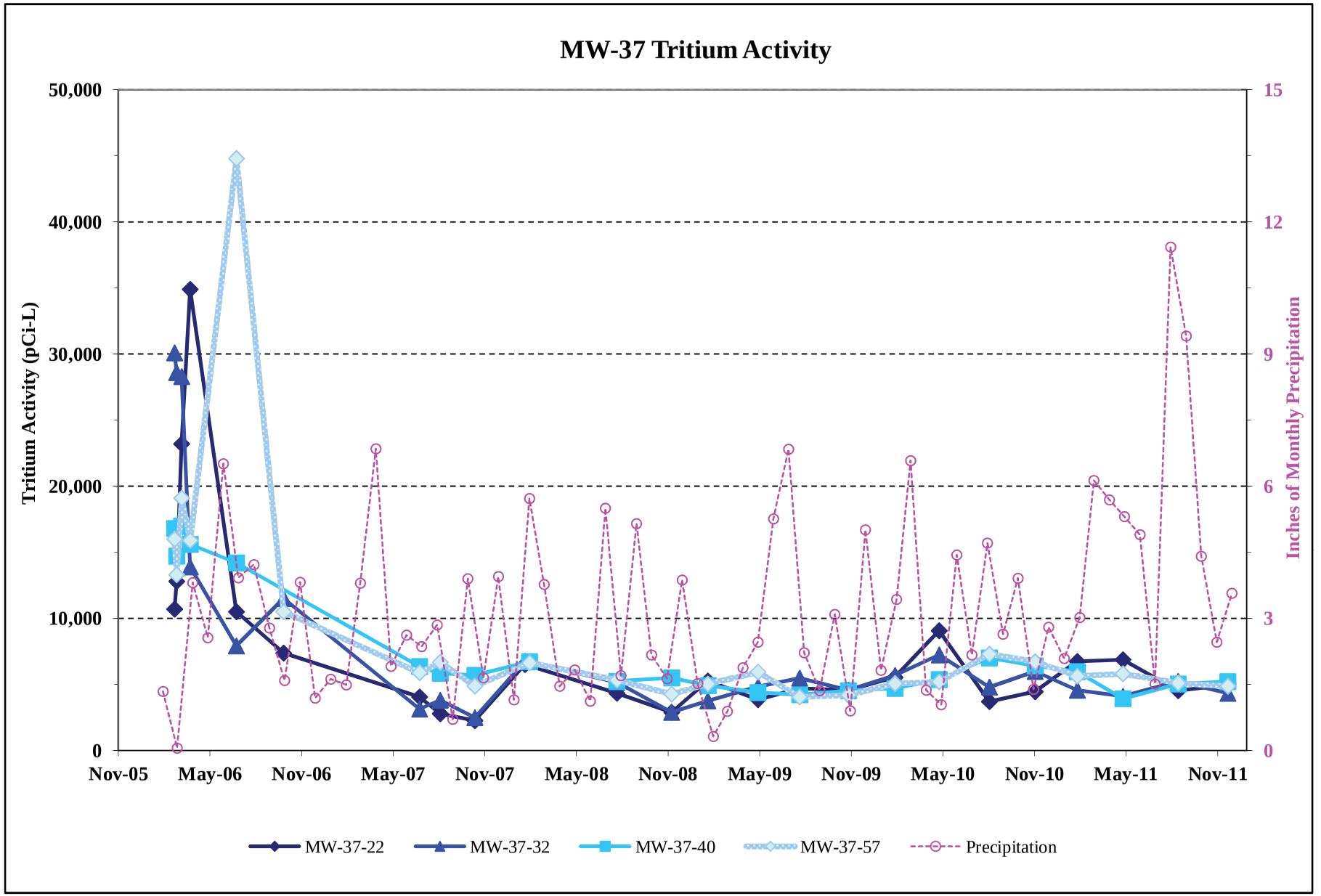

MW-37 Tritium Activity
Tritium Activity (pCi-L)
Inches of Monthly Precipitation
50,000
40,000
30,000
20,000
10,000
0
15
12
9
6
3
0
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
MW-37-22
MW-37-32
MW-37-40
MW-37-57
Precipitation

FIGURE G8

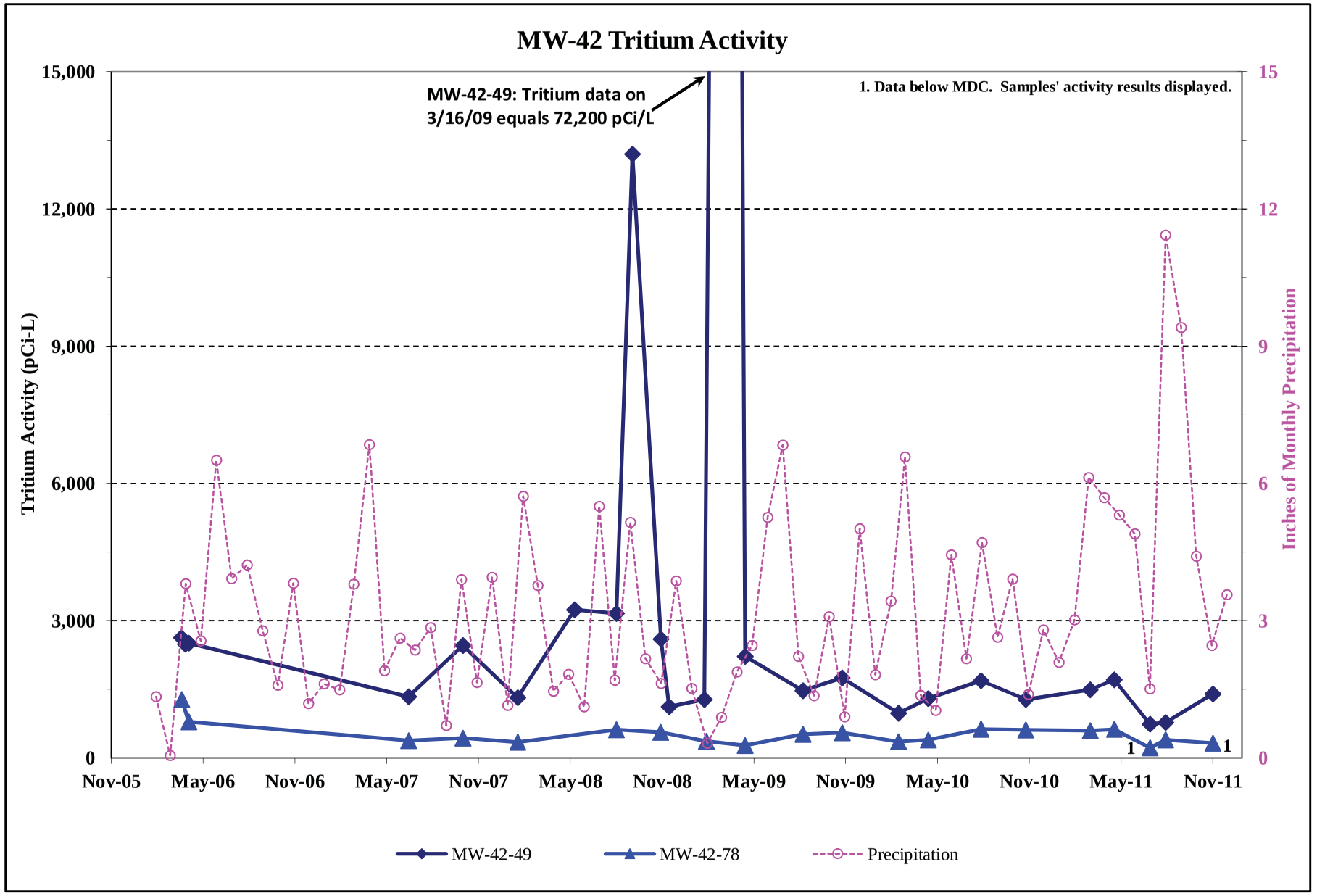

MW-42 Tritium Activity
MW-42-49: Tritium data on 3/16/09 equals 72,200 pCi/L
1. Data below MDC. Samples' activity results displayed.
Tritium Activity (pCi-L)
Inches of Monthly Precipitation
15,000
12,000
9,000
6,000
3,000
0
15
12
9
6
3
0
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
1
1
MW-42-49
MW-42-78
Precipitation

FIGURE G9

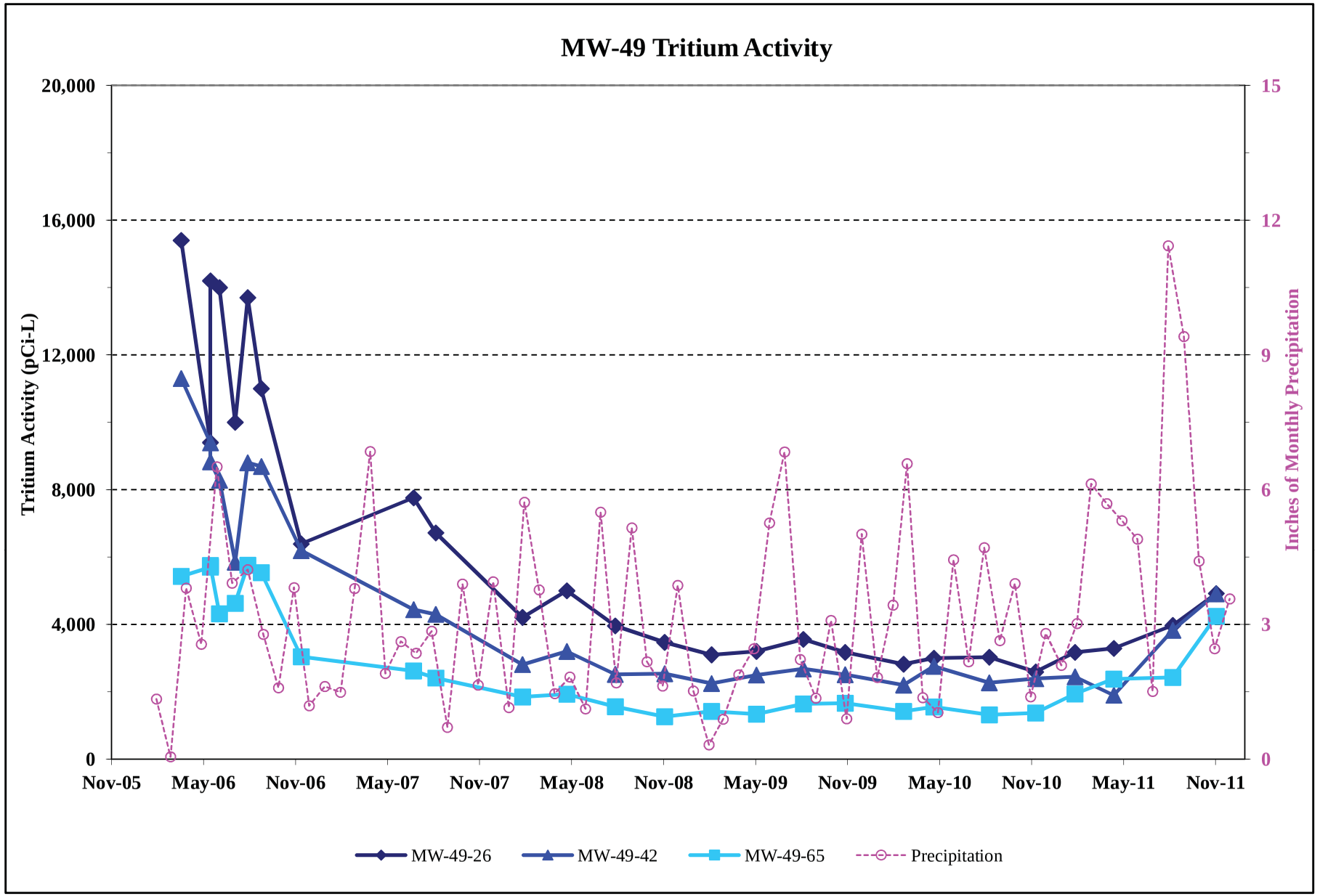

MW-49 Tritium Activity
20,000
16,000
12,000
8,000
4,000
0
Tritium Activity (pCi-L)
15
12
9
6
3
0
Inches of Monthly Precipitation
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
MW-49-26
MW-49-42
MW-49-65
Precipitation

FIGURE G10

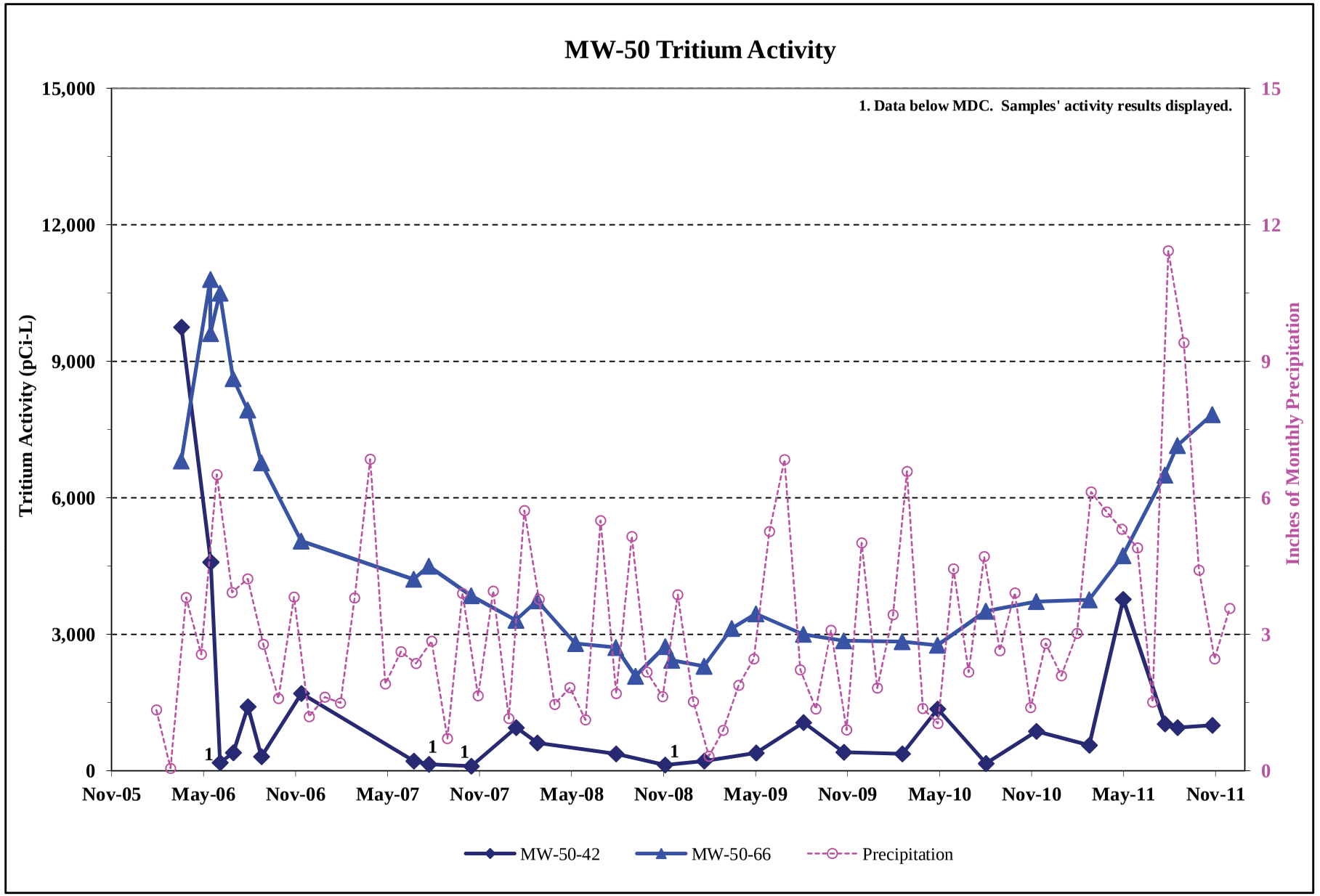

MW-50 Tritium Activity
1. Data below MDC. Samples' activity results displayed.
Tritium Activity (pCi-L)
Inches of Monthly Precipitation
15,000
12,000
9,000
6,000
3,000
0
15
12
9
6
3
0
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
1
1
1
1
MW-50-42
MW-50-66
Precipitation

FIGURE G11

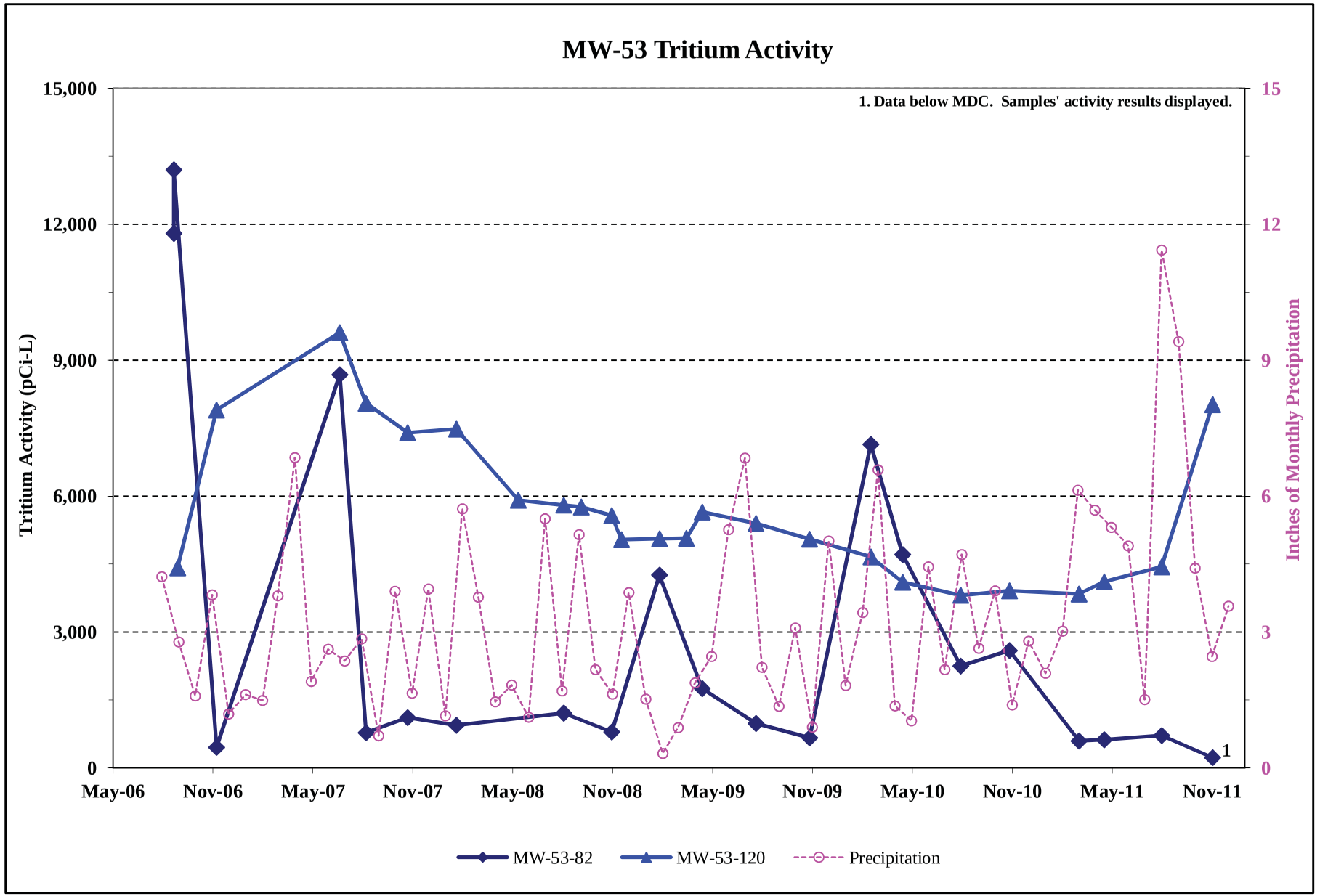

MW-53 Tritium Activity
1. Data below MDC. Samples' activity results displayed.
Tritium Activity (pCi-L)
Inches of Monthly Precipitation
15,000
12,000
9,000
6,000
3,000
0
15
12
9
6
3
0
1
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
MW-53-82
MW-53-120
Precipitation

FIGURE G12

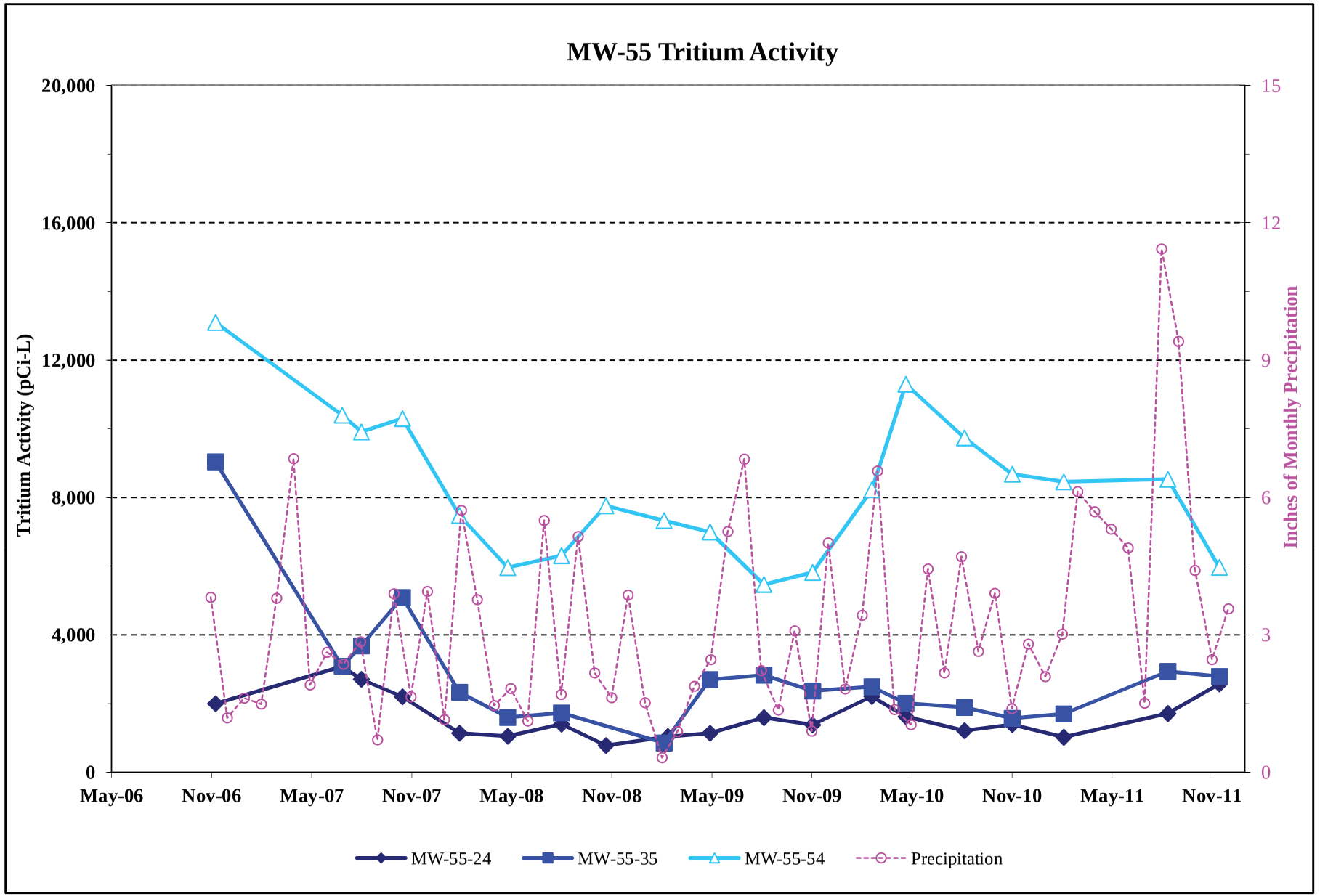

MW-55 Tritium Activity
Tritium Activity (pCi-L)
Inches of Monthly Precipitation
20,000
16,000
12,000
8,000
4,000
0
15
12
9
6
3
0
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
MW-55-24
MW-55-35
MW-55-54
Precipitation

FIGURE G13

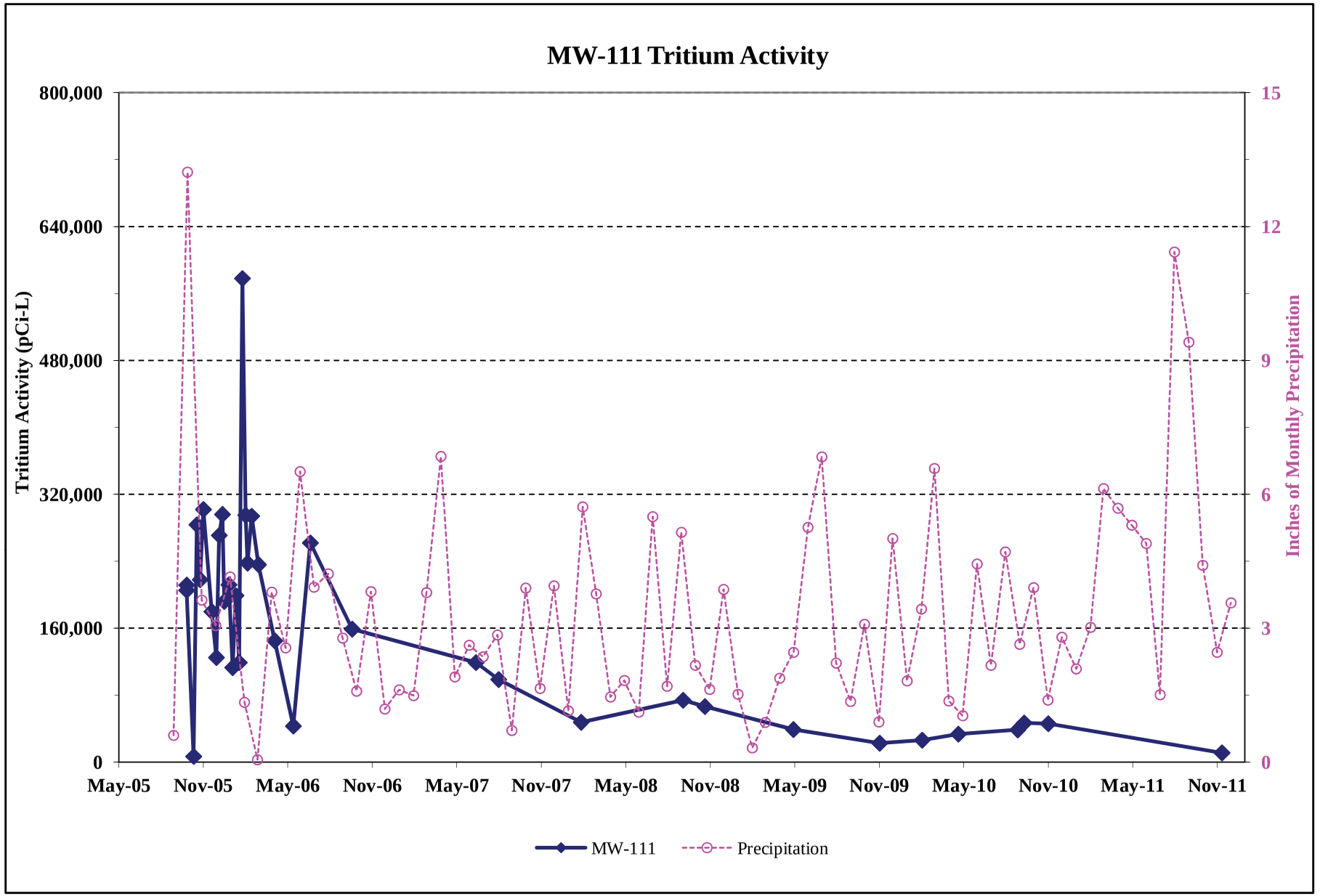

MW-111 Tritium Activity
800,000
640,000
480,000
320,000
160,000
0
Tritium Activity (pCi-L)
15
12
9
6
3
0
Inches of Monthly Precipitation
May-05
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
MW-111
Precipitation

FIGURE G14

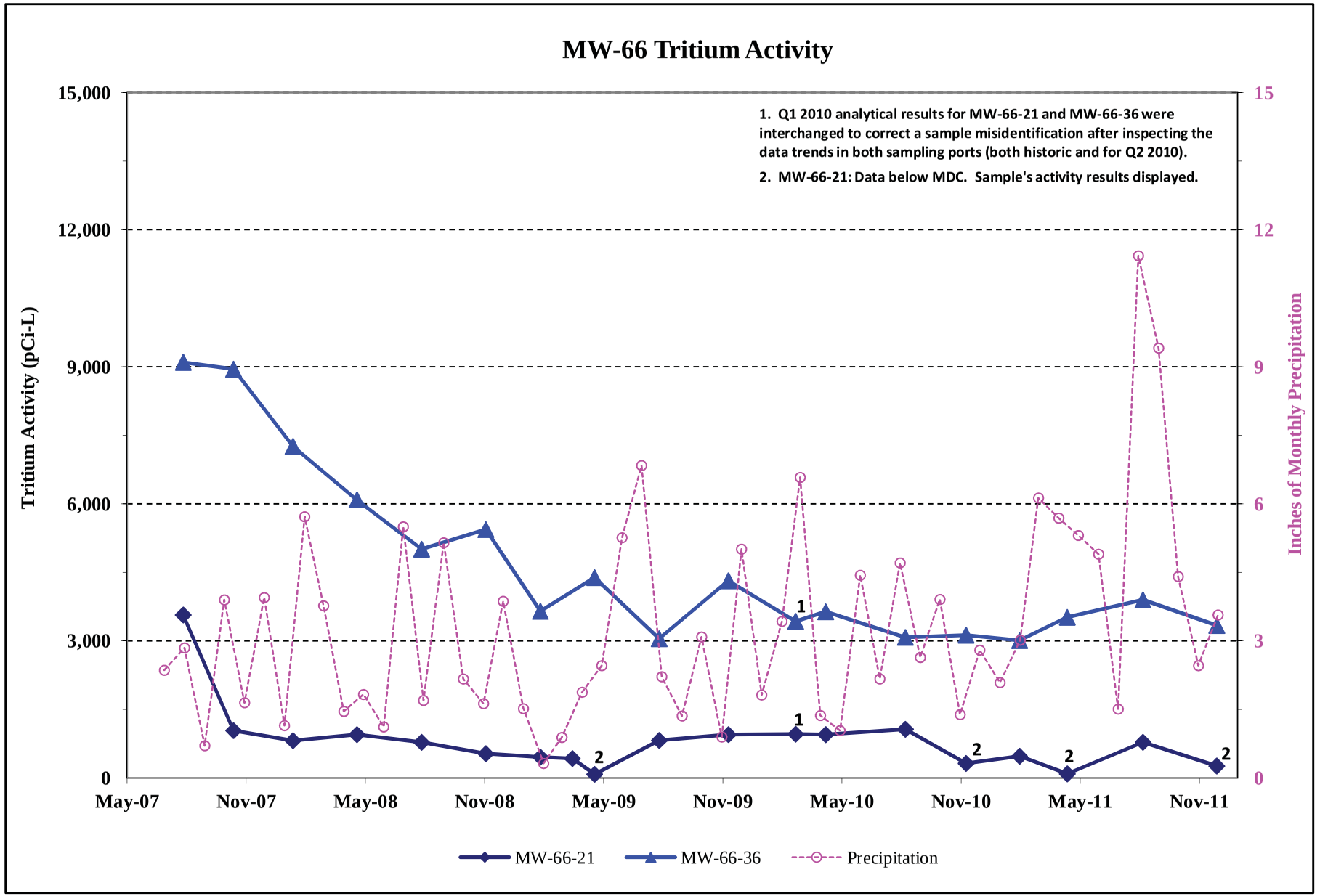

MW-66 Tritium Activity
1. Q1 2010 analytical results for MW-66-21 and MW-66-36 were interchanged to correct a sample misidentification after inspecting the data trends in both sampling ports (both historic and for Q2 2010).
2. MW-66-21: Data below MDC. Sample's activity results displayed.
Tritium Activity (pCi-L)
Inches of Monthly Precipitation
15,000
12,000
9,000
6,000
3,000
0
15
12
9
6
3
0
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
1
2
MW-66-21
MW-66-36
Precipitation

FIGURE G15

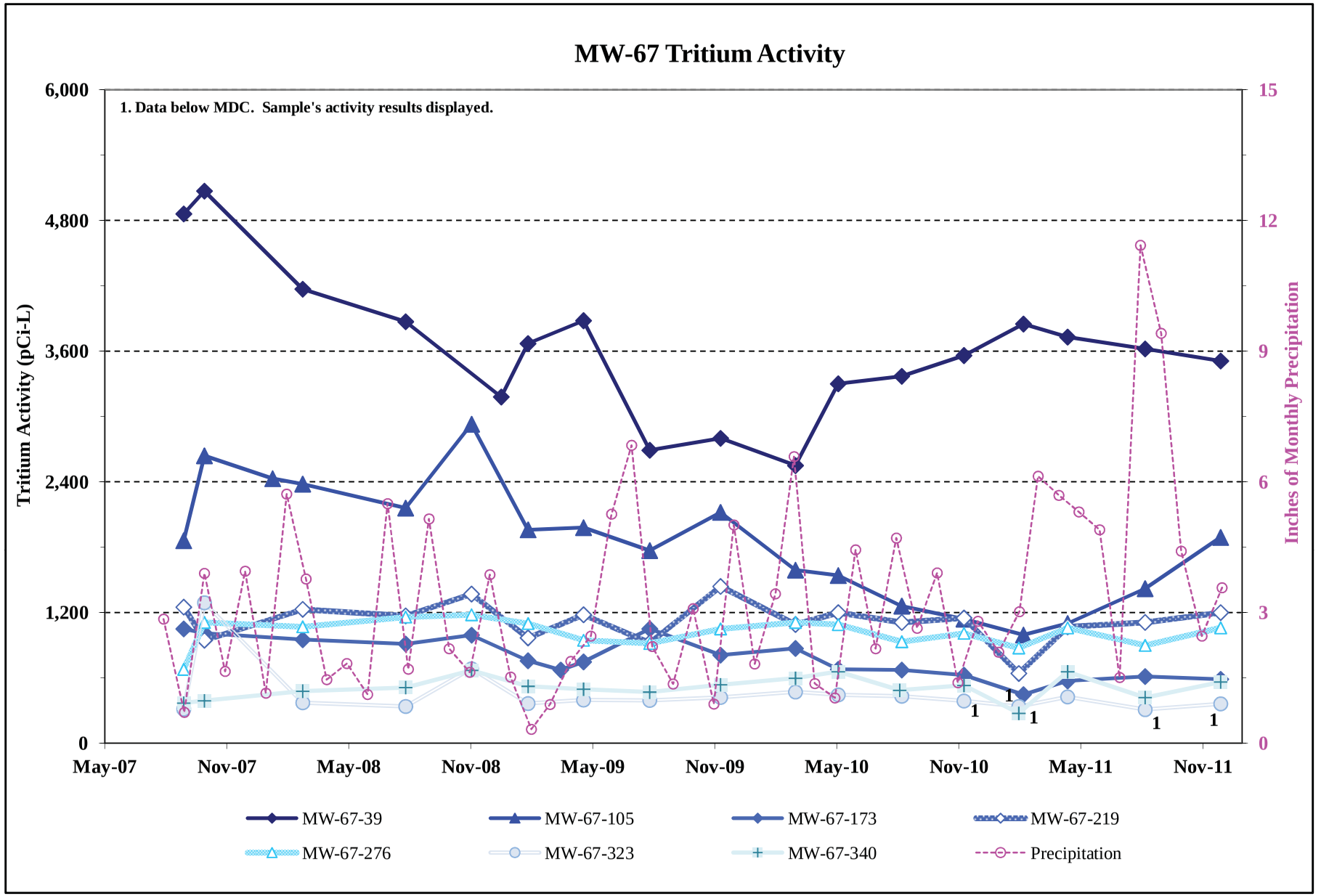
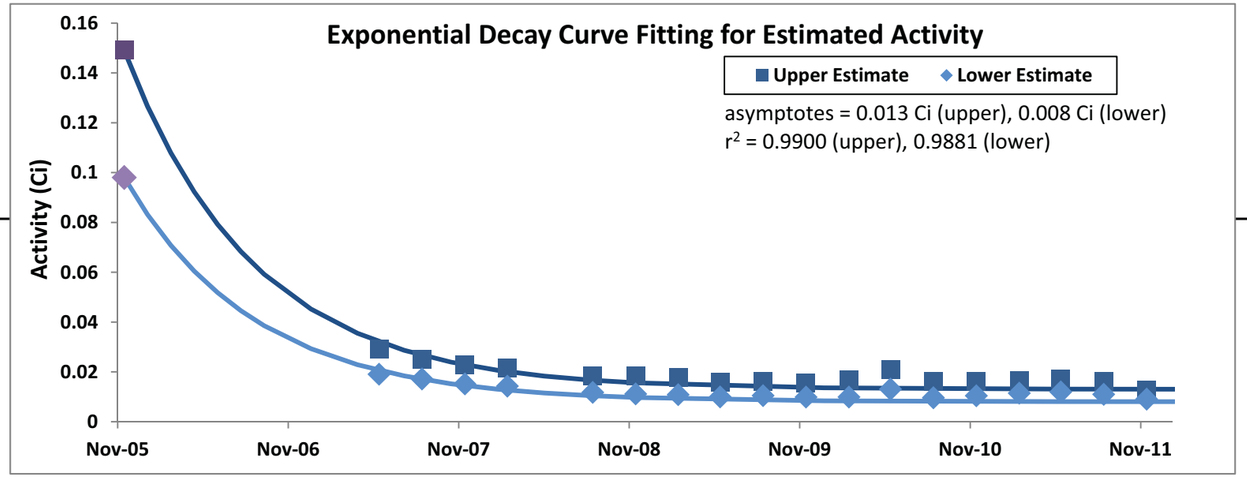

MW-67 Tritium Activity
1. Data below MDC. Sample's activity results displayed.
Tritium Activity (pCi-L)
Inches of Monthly Precipitation
6,000
4,800
3,600
2,400
1,200
0
15
12
9
6
3
0
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
1
1
1
1
1
MW-67-39
MW-67-105
MW-67-173
MW-67-219
MW-67-276
MW-67-323
MW-67-340
Precipitation

FIGURE G16

Changes in Total Estimated Tritium Plume Activity Over Time - Q4 2011

The bounding curve of total Unit 2 Tritium plume activity as a function of time approximates a first order decay approaching a positive, horizontal asymptote. The beginning of the curve is consistent with that expected after elimination of all leaks from the Unit 2 SFP. The middle, more horizontal portion of the curve is reflective of Tritium addition to the groundwater from the transient R.O. Skid spill (Q4 2009). The later portion of the curve shows re-establishment of the decreasing trend with dissipation of the R.O. Skid spill. The curve is expected to trend to a new, lower horizontal asymptote reflecting a small continuing release of Tritium to the groundwater from retention mechanism(s) storage of historical and more recent releases. A relatively horizontal asymptote would be expected to persist until the majority of this stored Tritium is purged from the retention mechanism(s).



91% overall reduction

55% reduction since Q2 2007

Bounding* Total Tritium Plume Activity (Ci)

Quarterly Total Tritium Activity (Ci)

0.15 | 0.12 | 0.09 | 0.06 | 0.03 | 0.00

0.05 | 0.04 | 0.03 | 0.02 | 0.01 | 0.00

Bounding*	Q2 2007	Q3 2007	Q4 2007	Q1 2008	Q3 2008	Q4 2008	Q1 2009	Q2 2009	Q3 2009	Q4 2009	Q1 2010	Q2 2010	Q3 2010	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011
0.149	0.098	0.029	0.025	0.023	0.022	0.019	0.018	0.018	0.016	0.016	0.016	0.017	0.021	0.016	0.016	0.017	0.017	0.015	0.013	0.009
		0.019	0.017	0.015	0.014	0.012	0.011	0.011	0.010	0.011	0.010	0.010	0.013	0.010	0.010	0.012	0.012	0.009	0.009	

Upper Estimate of Total H3 Activity

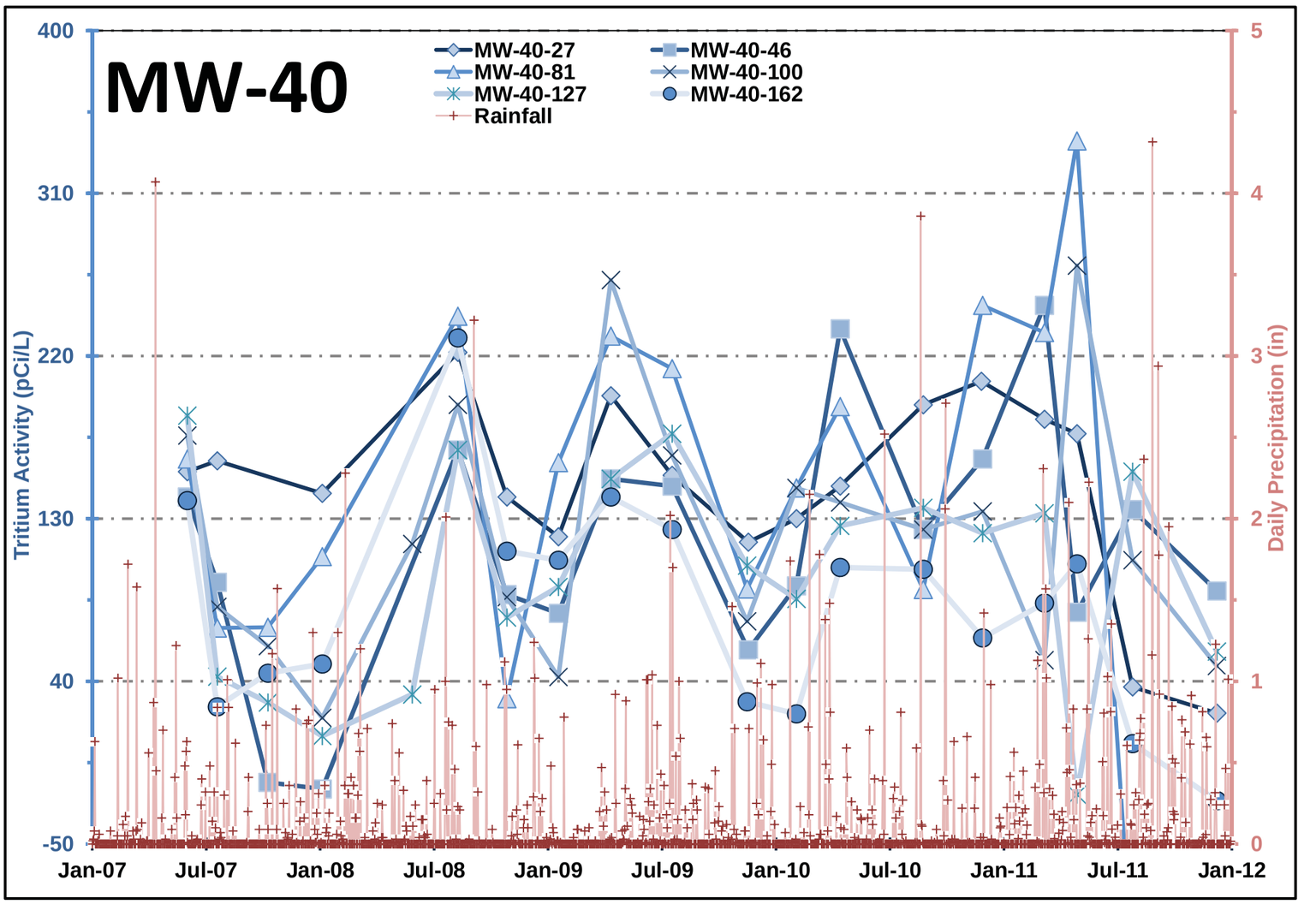
Lower Estimate of Total H3 Activity

Note: Lower estimate is based on a porosity of 0.0003 which was derived from a pumping test conducted in 2006. Upper estimate is based on a porosity of 0.003 derived from a tracer test conducted in 2007. The Q2 2007 to Q4 2011 Tritium plume activity estimates are each based on Tritium levels measured in the groundwater monitoring installations at individual, quarterly "snapshots" in time.
*The bounding activity estimate, however, encompasses a longer period of time, and is focused on the Tritium levels existing during the earliest portions of the groundwater investigation. During this period of time, before termination of all the identified SFP leaks, Tritium concentrations were at their highest levels, but the network of monitoring installations was still being installed. Therefore, measurements made at a multiple times were required to capture early data covering the full extent of the Tritium plume; primarily over the period from Nov 2005 through Nov 2006 (a smaller percentage of the Tritium levels required inclusion of measurements through Sept 2007). For the bounding Tritium plume activity estimate, the highest value recorded for each monitoring location during this time period was used in the analysis. For further discussion see Sections 6.0, 7.0 and 8.0 of the Final Hydrogeologic Site Investigation Report, prepared by GZA and dated January 7, 2008.

Figure G-17

APPENDIX H: SOUTHERN BOUNDARY WELLS

TEMPORAL TRITIUM TRENDS IN SOUTHERN BOUNDARY WELLS (Q4 2011)



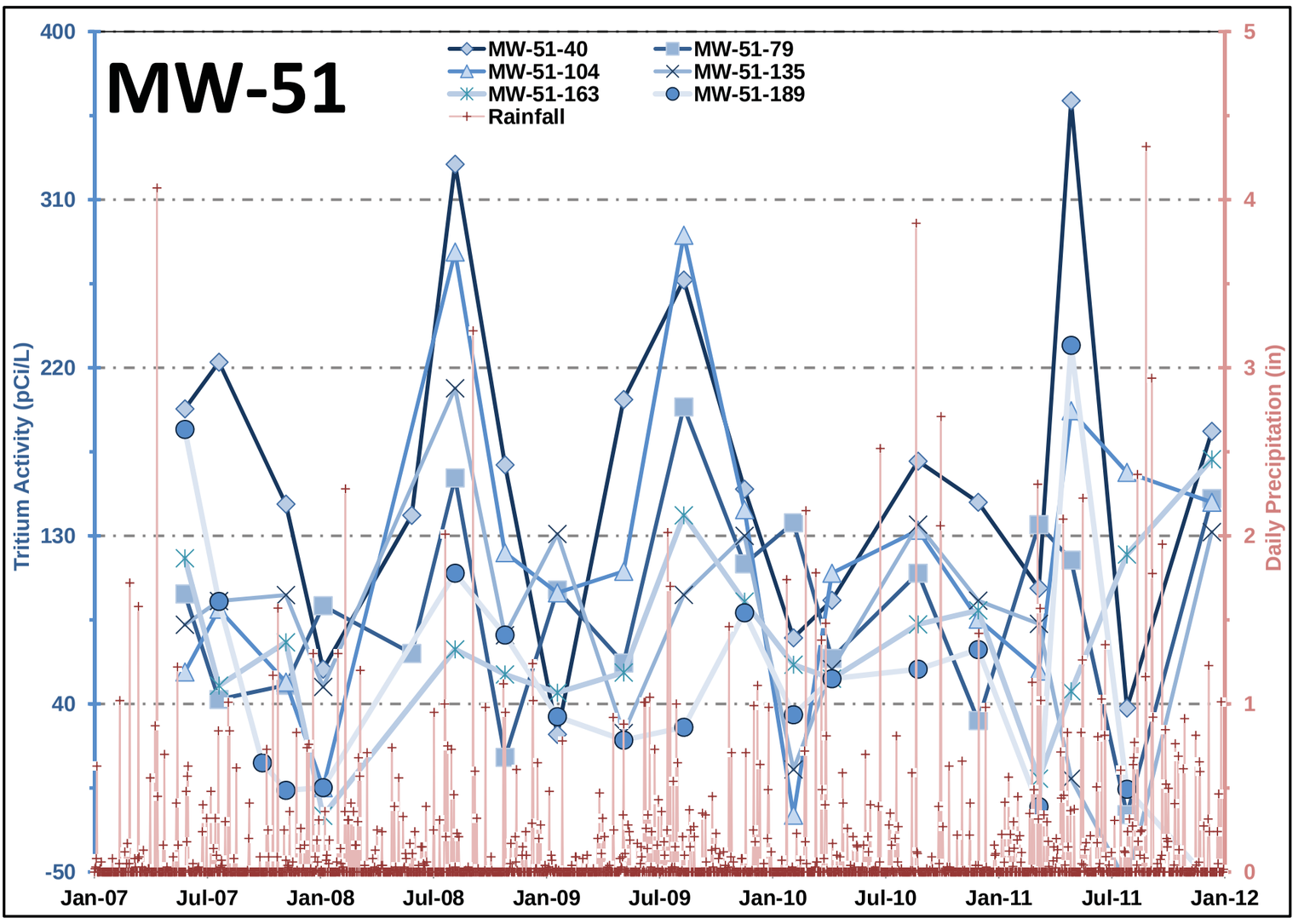


FIGURE H1

APPENDIX I: MW-68 BOREHOLE, WELL COMPLETION AND GEOPHYSICAL LOGS

PRELIMINARY BORING LOG

Indian Point Energy Center
Buchanan, NY

BORING NO. MW-68 REV. 1 MAP

REVIEWED BY:			
PROJECT NO:	01.0017869.92	COORDINATES:	
G. SURF. EL.	18.49'	NORTH:	
DATUM		EAST:	
FINAL BORING DEPTH (FT)	150'		

SAMPLER: 6" hand auger, 2" O.D. split spoon, PQ core barrel	BORING CO.: Aquifer Drilling and Testing	GROUND WATER READINGS			
SAMPLER HAMMER: 140 lbs Automatic/300 lbs Donut	FOREMAN: David Carter	DATE	DEPTH		STABILIZATION TIME
CASING SIZE: 8"	ENGINEER: Josh Simpson	11/2/11	10.2'		open borehole - 1 day
CASING HAMMER: spun (4" core) and reamed to 8"	DATE START: 10/13/2011				
ROCK CORE: PQ core barrel	DATE END : 12/22/2011				

	DEPTH (FT)	CORING (MIN/FT)	SAMPLE / CORE NO.	SAMPLE DEPTH (FT)	BLOWS / 6 INCH	N VALUE	SOIL PEN. / REC.(IN / IN) ROCK PEN. / REC.(FT/FT)	TOTAL CORE REC (%)	RQD (%)	DRILLING FLUIDS LOST (GALLONS)	SAMPLE DESCRIPTION	STRATIGRAPHY/ FRACTURE ZONE	NOTES	INSITU PROPERTIES HARDNESS see below for values 1 2 3 4 5	INSITU PROPERTIES WEATHERING see below for values 1 2 3 4 5	NO. OF FRACTURES PER FOOT see below for values 1 2 3 4 5
1												SAND	1, 2			
2													3			
3			S1	2.0 - 2.5							S1: Brown, fine to medium SAND and GRAVEL, trace silt.					
4																
5			S2	4.0 - 4.5							S2: Gray and black, GRAVEL and COBBLES, little(-) fine sand, trace silt.					
6																
7			S3	5.5 - 6.0							S3: NO RECOVERY.		4, 5			
8																
9			S4	8.0 - 8.2	>100		3/tip				S4: Very dense, gray, fine to medium SAND, little gravel, trace(+) silt.		6			
10										200			7			
11			S5	10.0 - 10.2	>100		3/1.5			50	S5: Potential slough from above. Gray, GRAVEL, little fine to medium sand, trace silt.	BEDROCK				
12																
13													8			
14	4		R1	14.3 - 17.8			3.5/3.0	85.7	23.8	50	R1: Moderately hard to hard, moderate to slight weathering, fine to medium grained, gray and brown, MARBLE.			X	X	
15	5									60	15.8-16.5 ft: Moderately weathered, rough, sub-vertical fractures. Rock sub-angular with fine sand on fracture faces.			X	X	X
16	7									30		FZ		X	X	X
17	4	(1/2 foot)								30				X	X	X
18	4		R2	17.8 - 22.8			5.0/4.5	89.4	83	100	R2: Hard, moderate to slight weathering, fine grained, gray, MARBLE.			X	X	X
19	5									50	Fracture Zone: 21.4-22.2 ft. Smooth to rough, very close, sub-horizontal, mineralization in fracture.			X	X	X
20	5									25				X	X	X
21	5													X	X	X
22	5									25		FZ		X	X	X
23	6		R3	22.8 - 27.8			5.0/4.0	80	64.5	10	R3: Hard to moderately hard, slight to moderate weathering, fine grained, gray, MARBLE.			X	X	X
24	3									40	Fracture Zone: 25.0-26.0 ft. Rough, sub-vertical to sub-horizontal, sub-angular to sub-rounded pebbles with fine sand on surfaces.	FZ		X	X	X
25	1											FZ		X	X	X
26	3									20				X	X	X
27	4									40				X	X	X
28	6		R4	27.8 - 32.8			5.0/5.0	100	41.6	55	R4: Moderately hard to hard, moderate to slight weathering, fine grained, gray, MARBLE.			X	X	X
29	3													X	X	X
30	4									25				X	X	X

GRANULAR SOILS		COHESIVE SOILS		ROCK CORE CHARACTERISTICS				JOINT/FRACTURE CHARACTERISTICS			
BPF	DENSITY	BPF	CONSISTENCY	HARDNESS		WEATHERING		NO. PER FT		SPACING/THICKNESS		ATTITUDE
0-4	VERY LOOSE	<2	VERY SOFT	1	VERY SOFT	1	COMPLETE	(1)	0	<2"	VERY CLOSE/VERY THIN	HORIZONTAL
4-10	LOOSE	2-4	SOFT	2	MEDIUM	2	SEVERE	(2)	1-2	2"-1'	CLOSE/THIN	SUB-HORIZONTAL
10-30	MEDIUM DENSE	4-8	M. STIFF	3	MODERATELY HARD	3	MODERATE	(3)	3-10	1'-3'	MOD CLOSE/MOD THICK	MOD DIPPING
30-50	DENSE	8-15	STIFF	4	HARD	4	SLIGHT	(4)	11-20	3'-10'	WIDE/THICK	SUB-VERTICAL
>50	VERY DENSE	15-30	V.STIFF	5	VERY HARD	5	MECHANICAL BREAK			>10'	VERY WIDE/VERY THICK	VERTICAL
		>30	HARD									

NOTES:
1) Water level readings have been made at times and under conditions stated. Fluctuations of groundwater levels may occur due to other factors than those present at the time measurements were made.
2) Stratification lines represent approximate boundaries between soil and rock types, transitions may be gradual.
3) Vacuum excavated completed to 6 feet below ground surface. Samples S1 through S3 were collected with a hand auger.
4) Saturated soil observed at approximately 6 ft below ground surface. Possibly perched water above mud mat.
5) Unable to collect a sample with hand auger for S3 due to numerous cobbles/gravel and limited sand/fines at 5.5 to 6 feet below ground surface.
6) Grout/mud mat possibly observed in sample S4. After grinding with the roller bit for approximately 10 minutes, the rods dropped approximately one foot without resistance. Additionally, no return water recirculated back into the wash tub. 8.2 to 9.2 ft bgs.
7) Top of bedrock at approximately 10 feet below ground surface.
8) 10 inch ID augers advanced into bedrock to 14.2 feet below ground surface. Eight inch casing place inside the augers, grouted into rock and and the augers were removed from the hole. Spun the augers out in reverse through 7 feet below ground surface.

PRELIMINARY BORING LOG

BORING NO. MW-68

REVIEWED BY:
PROJECT NO: 01.0017869.92
G. SURF. EL. 18.49'
DATUM
FINAL BORING DEPTH (FT) 150'

SAMPLER: 6" hand auger, 2" O.D. split spoon, PQ core barrel
SAMPLER HAMMER: 140 lbs Automatic/300 lbs Donut
CASING SIZE: 8"
CASING HAMMER: spun (4" core) and reamed to 8"
ROCK CORE: PQ core barrel

BORING CO.: Aquifer Drilling and Testing
FOREMAN: David Carter
ENGINEER: Josh Simpson
DATE START: 10/13/2011
DATE END : 12/22/2011

GROUND WATER READINGS

DATE	DEPTH	CASING	STABILIZATION TIME
11/2/11	10.2'		open borehole - 1 day

DEPTH (FT)	CORING (MIN/FT)	SAMPLE / CORE NO.	SAMPLE DEPTH (FT)	BLOWS / 6 INCH	N VALUE	SOIL PEN. / REC.(IN / IN) ROCK PEN. / REC.(FT/FT)	TOTAL CORE REC (%)	RQD (%)	DRILLING FLUIDS LOST (GALLONS)	SAMPLE DESCRIPTION	STRATIGRAPHY/ FRACTURE ZONE	NOTES	INSITU PROPERTIES: HARDNESS (see below for values) 1 2 3 4 5	INSITU PROPERTIES: WEATHERING (see below for values) 1 2 3 4 5	NO. OF FRACTURES PER FOOT (see below for values) 1 2 3 4 5
31	3	R4	continued						30					4 X	4 X	3 X
32	6													4 X	4 X	3 X
33	5	R5	32.8 - 37.8			5.0/5.0	100	80	100	R5: Moderately hard to hard, moderate to slight weathering, fine grained, gray, MARBLE.				4 X	4 X	2 X
34	7								40					3 X	4 X	3 X
35	4								15					4 X	4 X	2 X
36	5								15					4 X	4 X	2 X
37	3								20					3 X	3 X	3 X
38	5	R6	37.8 - 42.8			5.0/5.0	100	70	80	R6: Hard to moderaterly hard, moderate to slight weathering, fine grained, gray, MARBLE.				4 X	4 X	2 X
39	5								15					4 X	3 X	2 X
40	3								20					4 X	4 X	3 X
41	3								20					4 X	4 X	2 X
42	5													3 X	3 X	3 X
43	4	R7	42.8 - 47.8			5.0/4.9	98	43.3	75	R7: Moderately hard to hard, moderate weathering, fine grained, gray, MARBLE.	FZ			3 X	3 X	4 X
44	3									Fracture Zone: 43.5 - 45.0 ft. Sub-vertical to sub-horizontal, rough to smooth, iron oxide stainin (oxidation) on surfaces.	FZ			3 X	3 X	4 X
45	4								50					3 X	3 X	3 X
46	4													4 X	4 X	3 X
47	4													4 X	4 X	3 X
48	4	R8	47.8 - 52.8			5.0/5.0	100	20	70	R8: Moderately hard to hard, moderate weathering, fine grained, dark gray, MARBLE.				4 X	3 X	4 X
49	4								25	Fracture Zone: 49.5 - 51.3 ft. Sub-horizontal to sub-vertical, rough to smooth, calcite healing/mineralization within fractures. Fines coating fracture surface at 51 ft below ground surface.				4 X	4 X	2 X
50	4								10		FZ			3 X	3 X	3 X
51	3								30		FZ			4 X	3 X	4 X
52	3										FZ			3 X	3 X	4 X
53	4	R9	52.8 - 57.8			5.0/5.0	100	48.8	75	R9: Moderately hard to hard, moderate to slight weathering, fine grained, gray, MARBLE.				3 X	3 X	2 X
54	4													4 X	4 X	2 X
55	3								30					4 X	4 X	3 X
56	4											9		3 X	3 X	3 X
57	4													4 X	4 X	2 X
58	5	R10	57.8 - 62.8			5.0/5.0	100	73.3	100	R10: Hard, slight weathering, fine to medium grained, dark gray, MARBLE.				4 X	4 X	3 X
59	4								50	Fracture Zone: 62.0 - 62.8 ft. Calcite healing/mineralization within fractures.				4 X	4 X	2 X
60	4								30					4 X	4 X	2 X

GRANULAR SOILS

BPF	DENSITY
0-4	VERY LOOSE
4-10	LOOSE
10-30	MEDIUM DENSE
30-50	DENSE
>50	VERY DENSE

COHESIVE SOILS

BPF	CONSISTENCY
<2	VERY SOFT
2-4	SOFT
4-8	M. STIFF
8-15	STIFF
15-30	V.STIFF
>30	HARD

ROCK CORE CHARACTERISTICS

HARDNESS		WEATHERING	
1	VERY SOFT	1	COMPLETE
2	MEDIUM	2	SEVERE
3	MODERATELY HARD	3	MODERATE
4	HARD	4	SLIGHT
5	VERY HARD	5	MECHANICAL BREAK

JOINT/FRACTURE CHARACTERISTICS

NO. PER FT		SPACING/THICKNESS		ANGLE
(1)	0	<2"	VERY CLOSE/VERY THIN	0°-5°
(2)	1-2	2"-1'	CLOSE/THIN	5°-35°
(3)	3-10	1'-3'	MOD CLOSE/MOD THICK	35°-55°
(4)	11-20	3'-10'	WIDE/THICK	55°-85°
		>10'	VERY WIDE/VERY THICK	85°-90°

NOTES:
9) 56.2 - 56.7 ft below ground surface: Dark gray marble with calcite crystals on fracture surface.

PRELIMINARY BORING LOG

BORING NO. MW-68

REVIEWED BY:
PROJECT NO: 01.0017869.92
G. SURF. EL. 18.49'
DATUM
FINAL BORING DEPTH (FT) 150'

SAMPLER: 6" hand auger, 2" O.D. split spoon, PQ core barrel
SAMPLER HAMMER: 140 lbs Automatic/300 lbs Donut
CASING SIZE: 8"
CASING HAMMER: spun (4" core) and reamed to 8"
ROCK CORE: PQ core barrel

BORING CO.: Aquifer Drilling and Testing
FOREMAN: David Carter
ENGINEER: Josh Simpson
DATE START: 10/13/2011
DATE END : 12/22/2011

GROUND WATER READINGS

DATE	DEPTH	CASING	STABILIZATION TIME
11/2/11	10.2'		open borehole - 1 day

DEPTH (FT)	CORING (MIN/FT)	SAMPLE / CORE NO.	SAMPLE DEPTH (FT)	BLOWS / 6 INCH	N VALUE	SOIL PEN. / REC.(IN / IN) ROCK PEN. / REC.(FT/FT)	TOTAL CORE REC (%)	RQD (%)	DRILLING FLUIDS LOST (GALLONS)	SAMPLE DESCRIPTION	STRATIGRAPHY/ FRACTURE ZONE	NOTES	INSITU PROPERTIES: HARDNESS (see below for values) 1 2 3 4 5	INSITU PROPERTIES: WEATHERING (see below for values) 1 2 3 4 5	NO. OF FRACTURES PER FOOT (see below for values) 1 2 3 4 5
61	6	R10	continued						20					X	X		X
62	3								30		FZ	10		X	X	X	
63	3	R11	62.8 - 67.8			5.0/5.0	100	76.7	70	R11: Hard, slight weathering, fine grained, gray, MARBLE.				X	X		X
64	4								60					X	X		X
65	5								50					X	X	X	
66	4								60					X	X		X
67	4								40					X	X		X
68	4	R12	67.8 - 72.8			5.0/5.0	100	61.7	50	R12: Hard to moderately hard, slight to moderate weathering, fine grained, gray to dark gray, MARBLE.				X	X	X	
69	5								50					X	X		X
70	4								20					X	X	X	
71	5								15					X	X		X
72	4								10			11		X	X		X
73	3	R13	72.8 - 77.8			5.0/4.8	96	68.3	70	R13: Hard to moderately hard, slight weathering, fine grained, dark gray, MARBLE.				X	X		X
74	5								60					X	X	X	
75	4								50					X	X	X	
76	6								30					X	X		X
77	4								40			12		X	X		X
78	3	R14	77.8 - 82.8			5.0/5.0	100	11.7	100	R14: Hard to moderately hard, slight to moderate weathering, fine grained, gray, MARBLE.	FZ			X	X		X
79	4								40	Fracture Zone: 79.0 - 80.9 ft. Sub-vertical to sub-horizontal, rough to	FZ			X	X		X
80	3								60	smooth, iron oxide staining and fines on fracture surfaces.	FZ			X	X		X
81	3								40					X	X		X
82	3								30					X	X		X
83	3	R15	82.8 - 87.8			5.0/5.0	100	31.7	30	R15: Hard, slight to moderate weathering, fine grained, gray, MARBLE.				X	X		X
84	4								30					X	X		X
85	6								20					X	X		X
86	4								15					X	X		X
87	4								30					X	X		X
88	4	R16	87.8 - 92.8			5.0/5.0	100	21.7	30	R16: Hard to moderately hard, slight to moderate weathering, fine grained, gray, MARBLE.				X	X		X
89	4								20					X	X		X
90	3								20					X	X		X

GRANULAR SOILS

BPF	DENSITY
0-4	VERY LOOSE
4-10	LOOSE
10-30	MEDIUM DENSE
30-50	DENSE
>50	VERY DENSE

COHESIVE SOILS

BPF	CONSISTENCY
<2	VERY SOFT
2-4	SOFT
4-8	M. STIFF
8-15	STIFF
15-30	V.STIFF
>30	HARD

ROCK CORE CHARACTERISTICS

HARDNESS		WEATHERING	
1	VERY SOFT	1	COMPLETE
2	MEDIUM	2	SEVERE
3	MODERATELY HARD	3	MODERATE
4	HARD	4	SLIGHT
5	VERY HARD	5	MECHANICAL BREAK

JOINT/FRACTURE CHARACTERISTICS

NO. PER FT		SPACING/THICKNESS		ANGLE
(1)	0	<2"	VERY CLOSE/VERY THIN	0°-5°
(2)	1-2	2"-1'	CLOSE/THIN	5°-35°
(3)	3-10	1'-3'	MOD CLOSE/MOD THICK	35°-55°
(4)	11-20	3'-10'	WIDE/THICK	55°-85°
		>10'	VERY WIDE/VERY THICK	85°-90°

NOTES:
10) Calcite mineralization (milky white and clear) in fractures at 62.0 - 63.5 ft below ground surface.
11) Dark gray MARBLE with calcite healed fractures at 71 - 72 ft below ground surface.
12) Calcite mineralization/healing in fractures at 77 - 78 ft below ground surface.

PRELIMINARY BORING LOG

BORING NO. MW-68

REVIEWED BY:

PROJECT NO: 01.0017869.92

G. SURF. EL. 18.49'

DATUM

FINAL BORING DEPTH (FT) 150'

SAMPLER: 6" hand auger, 2" O.D. split spoon, PQ core barrel

SAMPLER HAMMER: 140 lbs Automatic/300 lbs Donut

CASING SIZE: 8"

CASING HAMMER: spun (4" core) and reamed to 8"

ROCK CORE: PQ core barrel

BORING CO.: Aquifer Drilling and Testing

FOREMAN: David Carter

ENGINEER: Josh Simpson

DATE START: 10/13/2011

DATE END : 12/22/2011

GROUND WATER READINGS

DATE	DEPTH	CASING	STABILIZATION TIME
11/2/11	10.2'		open borehole - 1 day

DEPTH (FT)	CORING (MIN/FT)	SAMPLE / CORE NO.	SAMPLE DEPTH (FT)	BLOWS / 6 INCH	N VALUE	SOIL PEN. / REC.(IN / IN) ROCK PEN. / REC.(FT/FT)	TOTAL CORE REC (%)	RQD (%)	DRILLING FLUIDS LOST (GALLONS)	SAMPLE DESCRIPTION	STRATIGRAPHY/ FRACTURE ZONE	NOTES	INSITU PROPERTIES: HARDNESS (see below for values) 1 2 3 4 5	INSITU PROPERTIES: WEATHERING (see below for values) 1 2 3 4 5	NO. OF FRACTURES PER FOOT (see below for values) 1 2 3 4 5
91	4	R16	continued						20		FZ	13	X	X	X
92	3								15				X	X	X
93	3	R17	92.9 - 97.9			5.0/5.0	100	33.3	70	R17: Hard to moderately hard, slight weathering, fine to medium grained, gray, MARBLE. Sub-vertical to vertical, smooth fracture through majority of core run.			X	X	X
94	3								35				X	X	X
95	5								15				X	X	X
96	4								15				X	X	X
97	2								30				X	X	X
98	3	R18	97.9 - 102.9			5.0/5.0	100	30	40	R18: Hard to moderately hard, slight to moderate weathering, fine grained, gray, MARBLE.			X	X	X
99	3								25				X	X	X
100	4								15	Fracture Zone: 99.7 - 100.5 ft. Sub-vertical, smooth, iron oxide staining and pyrite on fracture surfaces.	FZ		X	X	X
101	5								10		FZ		X	X	X
102	5								10				X	X	X
103	5	R19	102.9 - 107.9			5.0/5.0	100	35.8	35	R19: Hard, slight weathering, fine grained, gray, MARBLE.			X	X	X
104	7								40				X	X	X
105	6								30				X	X	X
106	6								60				X	X	X
107	6								55			14	X	X	X
108	6	R20	107.9 - 111.8			3.9/3.9	100	10.7	150	R20: Hard, slight weathering, fine grained, gray, MARBLE.		15	X	X	X
109	6								90				X	X	X
110	6								70				X	X	X
111	12								100				X	X	X
112	8	R21	111.8 - 112.8			1.0/1.0	100	70.8	120	R21: Hard, slight weathering, fine grained, gray, MARBLE.			X	X	X
113	5	R22	112.8 - 117.8			5.0/5.0	100	30.5	40	R22: Hard, slight to moderate weathering, fine grained, gray, MARBLE.		16	X	X	X
114	4								70	Vertical fracture with calcite deposited at 113 - 116 ft below ground surface. Rosy quartz and pyrite deposits at 114.8 - 115.8 ft below ground surface.		17	X	X	X
115	8								90				X	X	X
116	7								70				X	X	X
117	7								60				X	X	X
118	4	R23	117.8 - 122.8			5.0/5.0	100	31	65	R23: Hard, slight weathering, fine grained, gray, MARBLE.			X	X	X
119	6								50				X	X	X
120	6								35				X	X	X

GRANULAR SOILS

BPF	DENSITY
0-4	VERY LOOSE
4-10	LOOSE
10-30	MEDIUM DENSE
30-50	DENSE
>50	VERY DENSE

COHESIVE SOILS

BPF	CONSISTENCY
<2	VERY SOFT
2-4	SOFT
4-8	M. STIFF
8-15	STIFF
15-30	V.STIFF
>30	HARD

ROCK CORE CHARACTERISTICS

	HARDNESS		WEATHERING
1	VERY SOFT	1	COMPLETE
2	MEDIUM	2	SEVERE
3	MODERATELY HARD	3	MODERATE
4	HARD	4	SLIGHT
5	VERY HARD	5	MECHANICAL BREAK

JOINT/FRACTURE CHARACTERISTICS

NO. PER FT		SPACING/THICKNESS		ANGLE
(1)	0	<2"	VERY CLOSE/VERY THIN	0°-5°
(2)	1-2	2"-1'	CLOSE/THIN	5°-35°
(3)	3-10	1'-3'	MOD CLOSE/MOD THICK	35°-55°
(4)	11-20	3'-10'	WIDE/THICK	55°-85°
		>10'	VERY WIDE/VERY THICK	85°-90°

NOTES:

13) Staining and fines on fracture surfaces at 90.3 - 91.0 ft below ground surface.
14) Approximately 0.8 ft of slough fell into the hole between R-19 and R-20.
15) Mechanical break (#5 classification for weathering) indicates zones that were possibly broken/fractured during the coring process.
16) Reduced the coring speed in last foot of R20 to potentially reduce the number of mechanical breaks in the core.
17) Pyrite observed on fracture faces of core in run R21.

PRELIMINARY BORING LOG

BORING NO. MW-68

REVIEWED BY:

PROJECT NO: 01.0017869.92

G. SURF. EL. 18.49'

DATUM

FINAL BORING DEPTH (FT) 150'

SAMPLER: 6" hand auger, 2" O.D. split spoon, PQ core barrel

SAMPLER HAMMER: 140 lbs Automatic/300 lbs Donut

CASING SIZE: 8"

CASING HAMMER: spun (4" core) and reamed to 8"

ROCK CORE: PQ core barrel

BORING CO.: Aquifer Drilling and Testing

FOREMAN: David Carter

ENGINEER: Josh Simpson

DATE START: 10/13/2011

DATE END : 12/22/2011

GROUND WATER READINGS

DATE	DEPTH	CASING	STABILIZATION TIME
11/2/11	10.2'		open borehole - 1 day

DEPTH (FT)	CORING (MIN/FT)	SAMPLE / CORE NO.	SAMPLE DEPTH (FT)	BLOWS / 6 INCH	N VALUE	SOIL PEN. / REC.(IN / IN) ROCK PEN. / REC.(FT/FT)	TOTAL CORE REC (%)	RQD (%)	DRILLING FLUIDS LOST (GALLONS)	SAMPLE DESCRIPTION	STRATIGRAPHY/ FRACTURE ZONE	NOTES	INSITU PROPERTIES: HARDNESS (see below for values) 1 2 3 4 5	INSITU PROPERTIES: WEATHERING (see below for values) 1 2 3 4 5	NO. OF FRACTURES PER FOOT (see below for values) 1 2 3 4 5
121	4	R23	continued						20				X	X	X
122	6								40				X	X	X
123	4	R24	122.8 - 127.8			5.0/5.0	100	38.3	60	R24: Hard to moderately hard, slight to moderate weathering, fine to medium grained, gray and white, MARBLE.			X	X	X
124	7								30	Fracture Zone: 126.0 - 127.8 ft. Sub-vertical to sub-horizontal, friable rock.			X	X	X
125	6								20				X	X	X
126	4								10				X	X	X
127	3								10		FZ		X	X	X
128	2	R25	127.8 - 132.8			5.0/4.3	86	7.5	50	R25: Hard to moderately hard, slight to moderate weathering, fine grained, gray to dark gray, MARBLE.	FZ		X	X	X
129	8								35	Fracture Zone: 127.8 - 128.8 ft. Sub-vertical to sub-horizontal, moderately hard, moderate weathering.			X	X	X
130	8								25				X	X	X
131	7								15				X	X	X
132	7								30				X	X	X
133	4	R26	132.8-137.3			4.5/4.5	100	0	25	R26: Hard, slight weathering, fine grained, gray, MARBLE.			X	X	X
134	7								30			18	X	X	X
135	8								10				X	X	X
136	9								5				X	X	X
137	11		(1/2 foot)						10				X	X	X
138	5	R27	137.3 - 142.3			5.0/5.0	100	23.3	30	R27: Hard, slight weathering, fine grained, gray, MARBLE.			X	X	X
139	6								15				X	X	X
140	5								15				X	X	X
141	5								10				X	X	X
142	6								15				X	X	X
143	5	R28	142.3 - 147.3			5.0/5.0	100	35.8	40	R28: Hard to moderately hard, slight weathering, fine grained, gray, MARBLE.			X	X	X
144	6								10	Fracture Zone: 145.3 - 145.6 ft. Fractures with fines on fracture surfaces. Trace pyrite and calcite mineralization.			X	X	X
145	7								5		FZ	19	X	X	X
146	7								5				X	X	X
147	7								5				X	X	X
148	5	R29	147.3 - 150.3			3.0/2.8	93.3	13.9	20	R29: Hard, slight weathering, fine grained, gray, MARBLE.			X	X	X
149	5								10				X	X	X
150	5								10				X	X	X

GRANULAR SOILS

BPF	DENSITY
0-4	VERY LOOSE
4-10	LOOSE
10-30	MEDIUM DENSE
30-50	DENSE
>50	VERY DENSE

COHESIVE SOILS

BPF	CONSISTENCY
<2	VERY SOFT
2-4	SOFT
4-8	M. STIFF
8-15	STIFF
15-30	V.STIFF
>30	HARD

ROCK CORE CHARACTERISTICS

HARDNESS		WEATHERING	
1	VERY SOFT	1	COMPLETE
2	MEDIUM	2	SEVERE
3	MODERATELY HARD	3	MODERATE
4	HARD	4	SLIGHT
5	VERY HARD	5	MECHANICAL BREAK

JOINT/FRACTURE CHARACTERISTICS

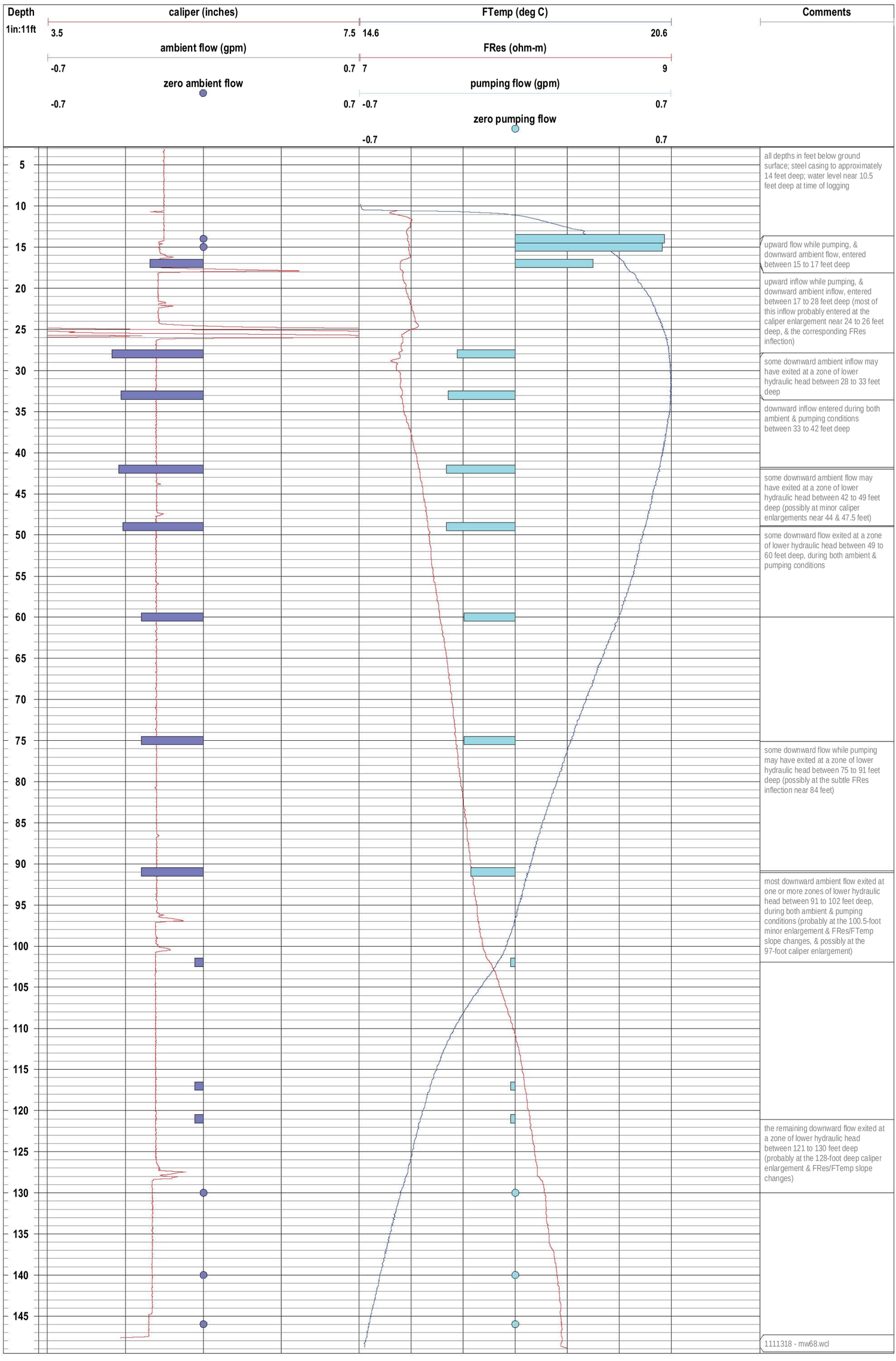
NO. PER FT		SPACING/THICKNESS		ANGLE
(1)	0	<2"	VERY CLOSE/VERY THIN	0°-5°
(2)	1-2	2"-1'	CLOSE/THIN	5°-35°
(3)	3-10	1'-3'	MOD CLOSE/MOD THICK	35°-55°
(4)	11-20	3'-10'	WIDE/THICK	55°-85°
		>10'	VERY WIDE/VERY THICK	85°-90°

NOTES:

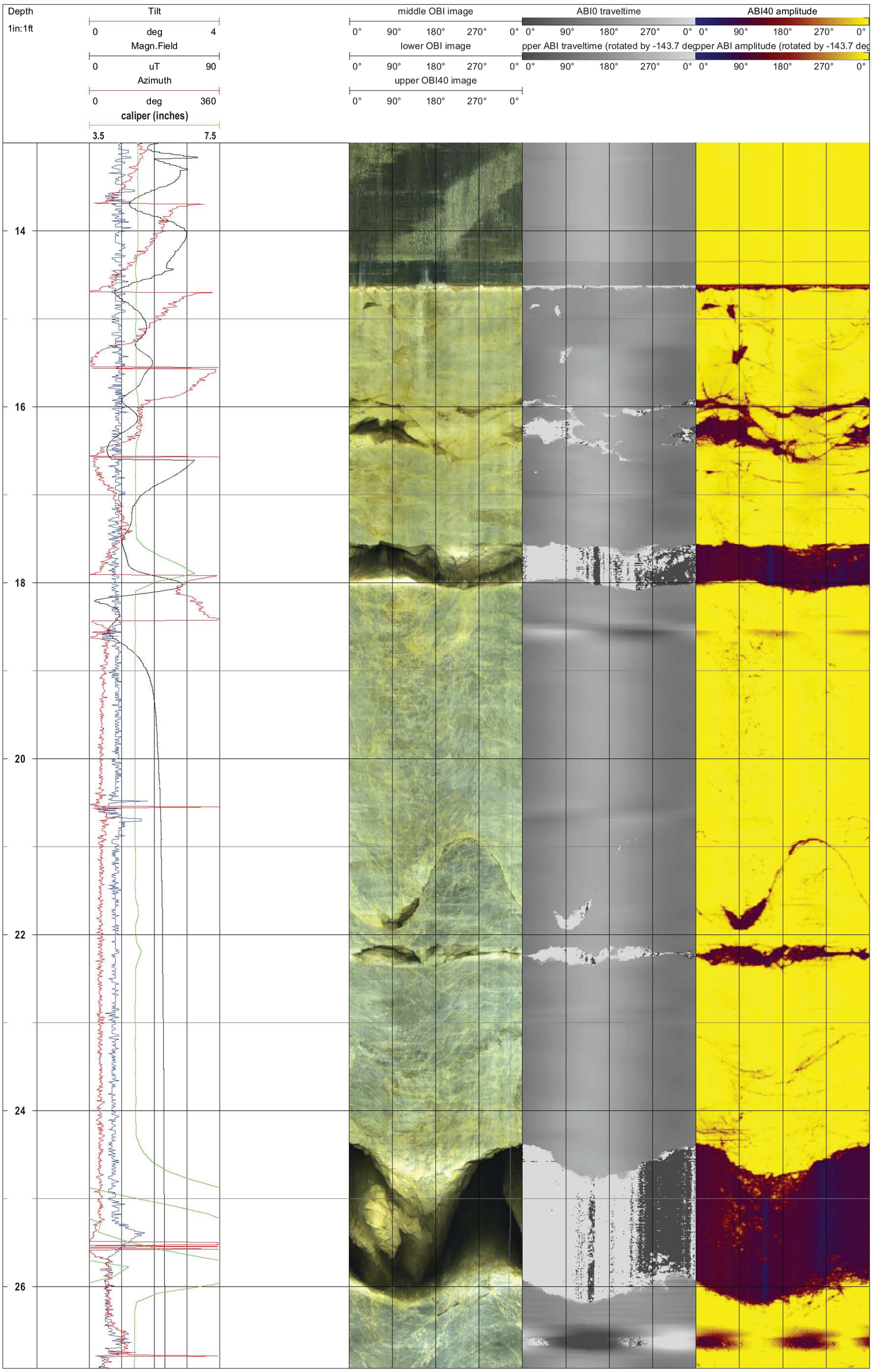
18) Only cored 4.5 feet on R-26 because approximately 6 inches of R-25 was still in the bottom of the borehole. Added the recovered legth from R-26 to the previous core from R-25.

19) Fracture at 145.5 ft below ground surface has moderate weathering and moderately hard rock.

GZA / Buchanan, NY - MW-68 conventional log plot



GZA / Buchanan, NY - MW-68 optical & acoustic televiewer log plot



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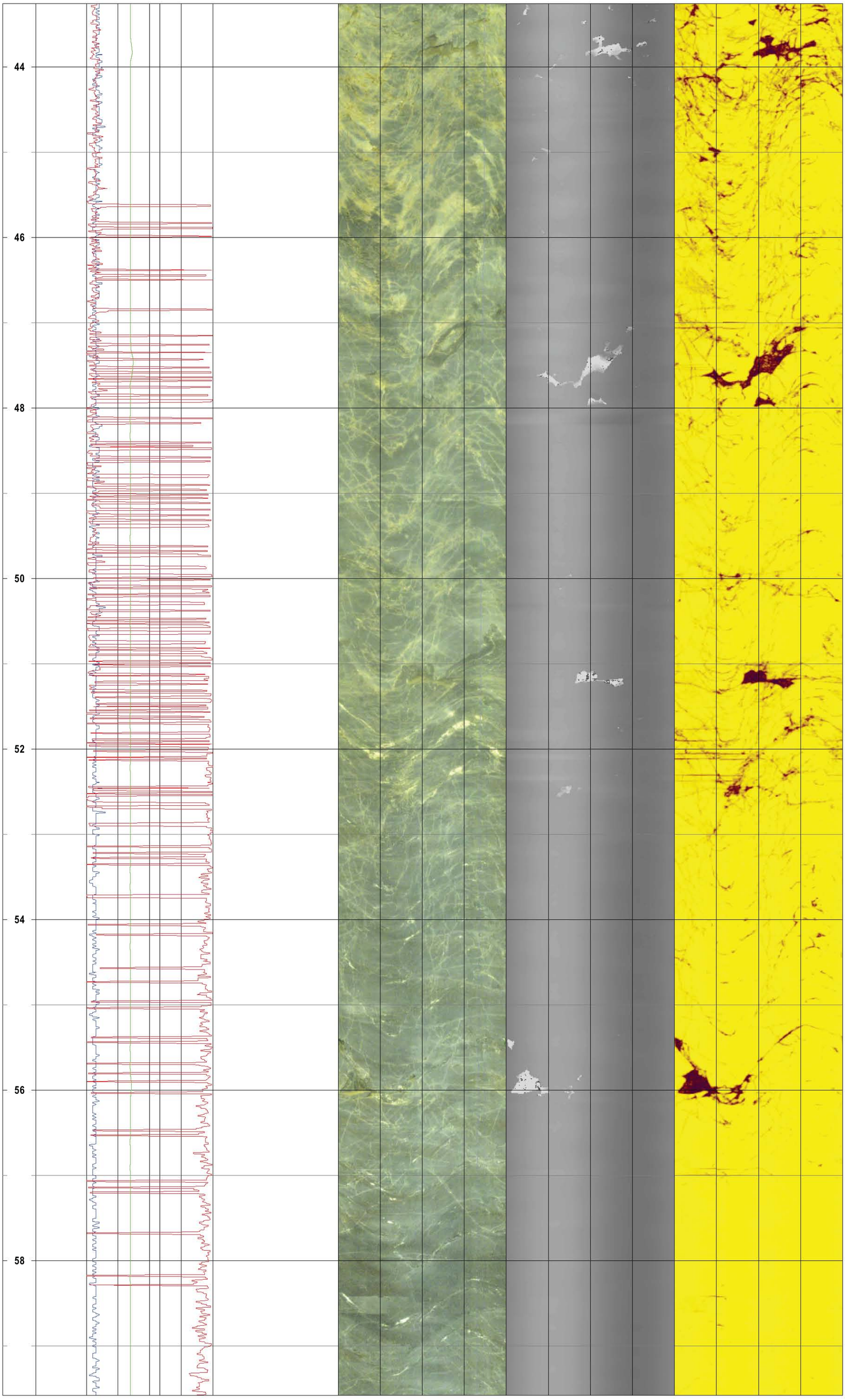
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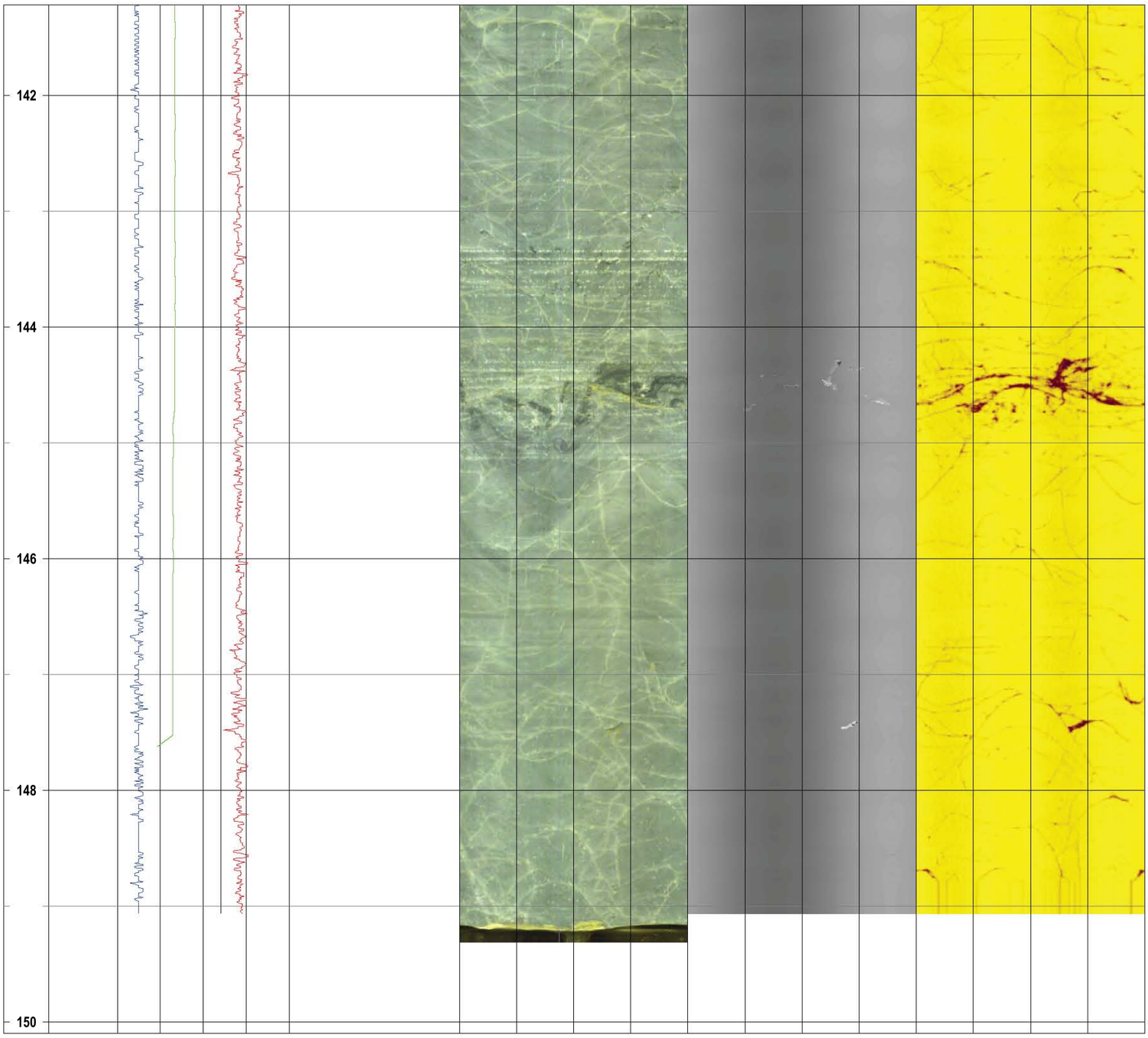
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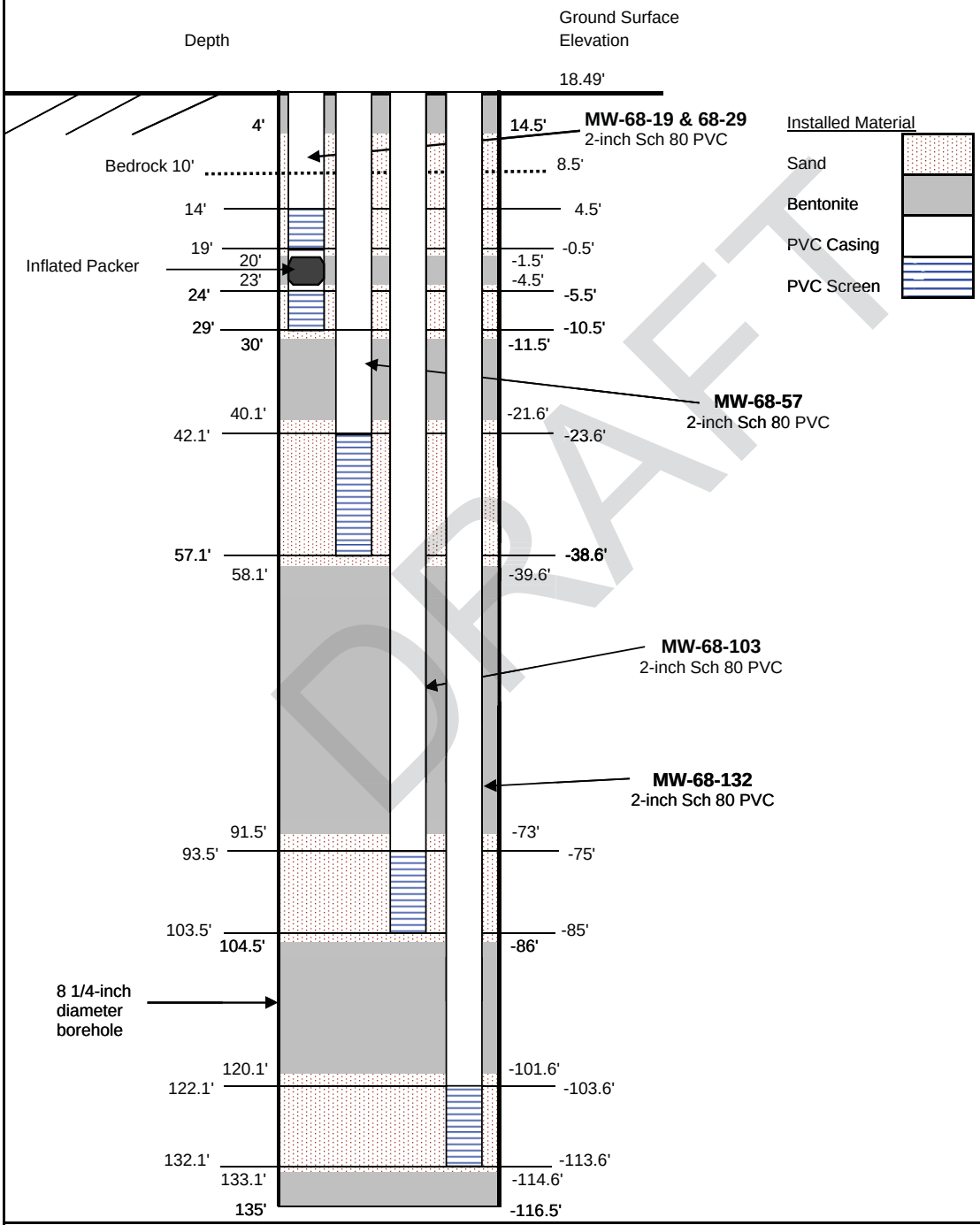
GROUNDWATER OBSERVATION WELL INSTALLATION LOG

GZA GEOENVIRONMENTAL		REPORT OF BORING NO.	MW-68
ONE EDGEWATER DRIVE	ENTERGY	SHEET	1 of 1
NORWOOD, MASSACHUSETTS 02062	Indian Point Energy Center	FILE NO.	01.0017869.92
ENGINEERS AND SCIENTISTS	Buchanan, New York	CHKD BY	

BORING CO.	Aquifer Drilling & Testing	BORING LOCATION	See Exploration Location Plan		
FOREMAN	Dave Carter	GROUND SURFACE ELEV.	18.49	DATUM	NGVD 29
GZA ENG.	Josh Simpson	DATE START	10/13/11	DATE END	12/22/11

AS-BUILT

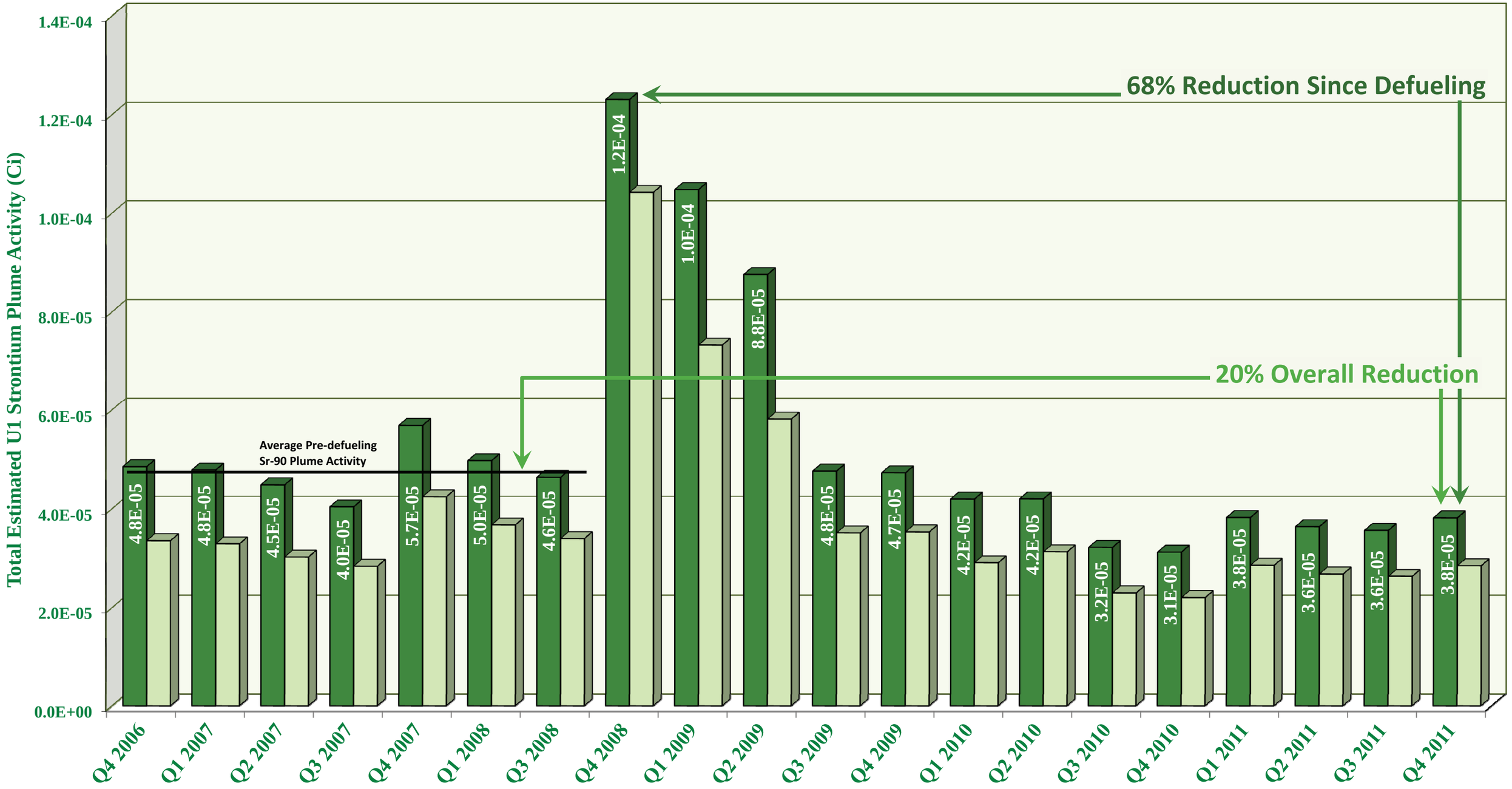


Notes:

1. 12 inch road box installed within 2 foot by 2 foot concrete pad, flush with ground surface.

APPENDIX J: Q4 2011 UNIT 1 STRONTIUM PLUME TREND ANALYSIS

CHANGES IN TOTAL ESTIMATED UNIT 1 STRONTIUM PLUME ACTIVITY OVER TIME - Q4 2011



Notes: Lower estimate is based on a porosity of 0.0003 which was derived from a pumping test conducted in 2006. Upper estimate is based on a porosity of 0.003 derived from a tracer test conducted in 2007.
The Strontium plume activity estimate is based on levels measured in the groundwater monitoring installations at individual, quarterly "snapshots" in time. or further discussion see Sections 6.0, 7.0 and 8.0 of the Final Hydrogeologic Site Investigation Report, prepared by GZA and dated January 7, 2008.

■ Upper Estimate ■ Lower Estimate

Figure J-1