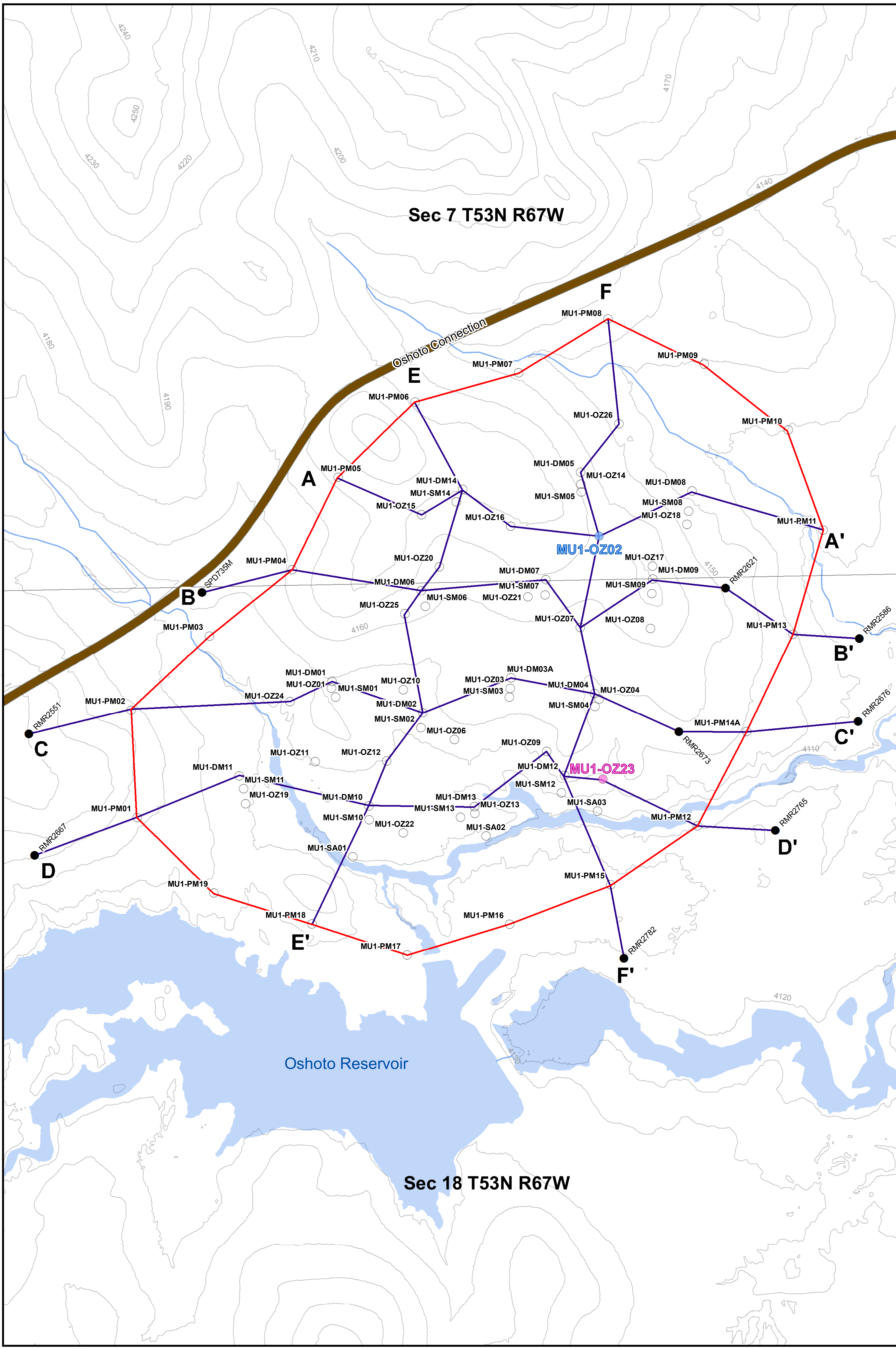
ATTACHMENT 1

MU1 Geologic Cross-Sections, Isopach Maps and Structure Contour Maps



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Legend

- First Pump Test Pumping Well
- Second Pump Test Pumping Well
- Installed Monitor Wells
- Delineation Holes
- MU1 Cross-Sections
- Mine Unit 1 Boundary

N

0 100 200 350 Feet

1 inch = 350 Feet

Att. 1 Fig. 1

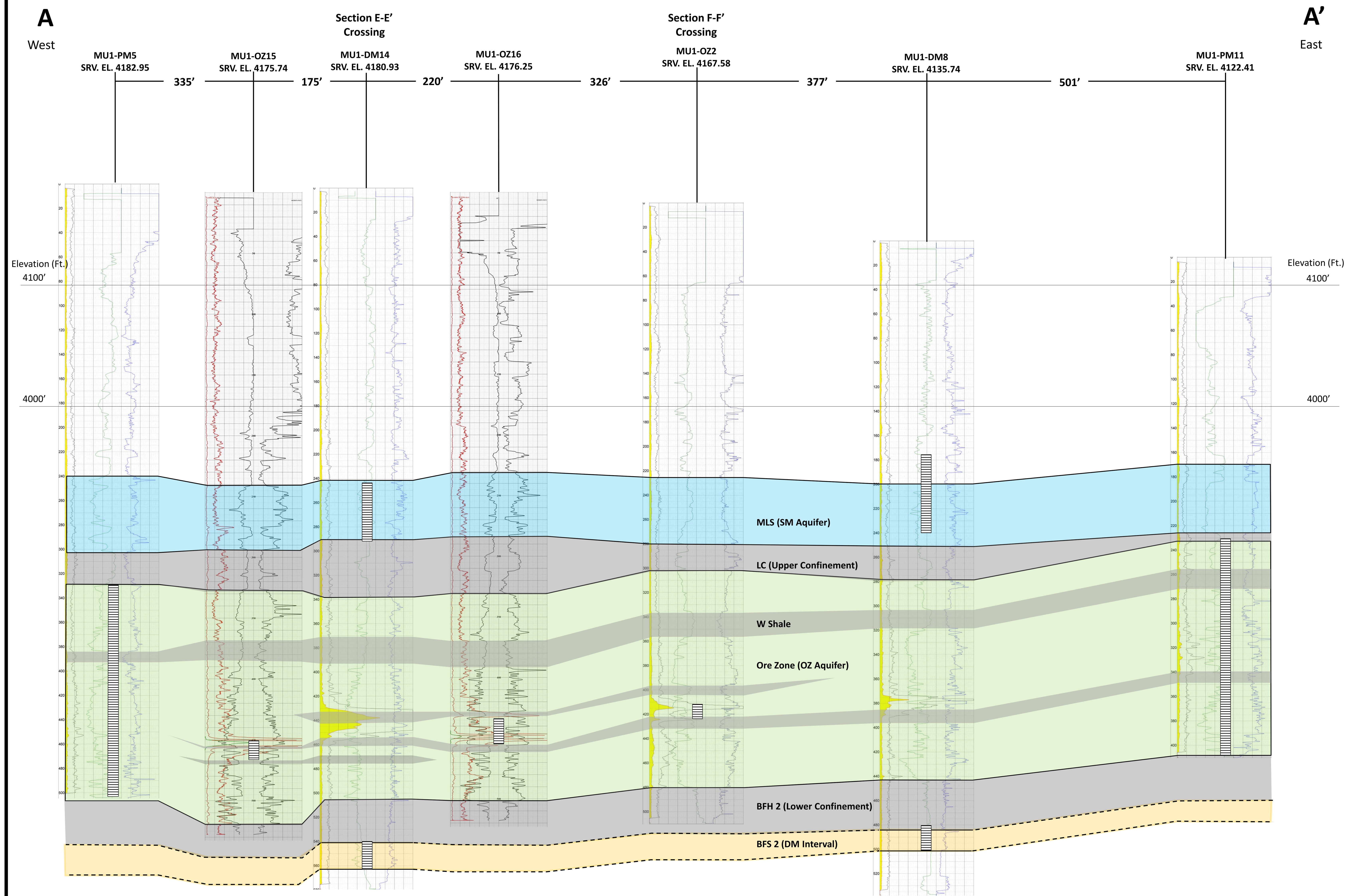
Mine Unit 1: Cross-Sections Location Map

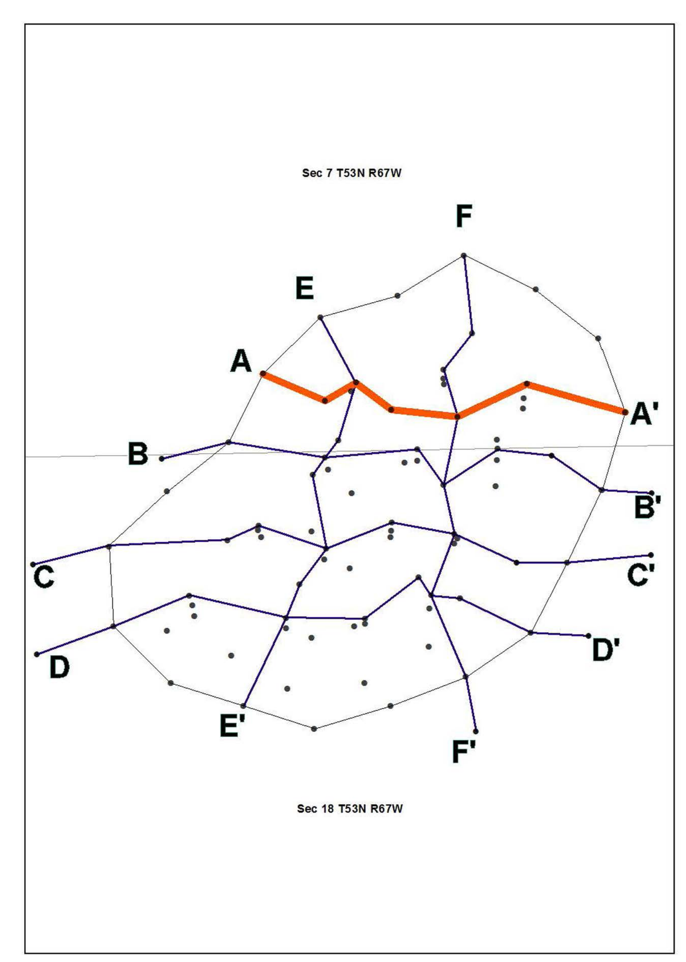
REVISIONS	
Date	Description

Drawn: July 7, 2015

Drawn By: DL
Checked By: JCH

Source: O:\Mining\MU_1_Well_Field_Package\MU1_CrossSection_Locations.mxd





LEGEND

APPROXIMATE SCREEN INTERVAL LOCATIONS. SM WELL SCREENS ARE SHOWN ON THE ADJACENT DM WELL AND ADJUSTED TO DM WELL ELEVATION.

AQUITARDS: SHALE-RICH, LOW PERMEABILITY INTERVALS.

SHALLOW MONITORING INTERVAL: SATURATED SAND INTERVAL OVERLYING AQUITARDS ABOVE THE UPPERMOST MINERALIZATION

ORE ZONE: INTERVAL CONTAINING LOWER LANCE/FOX HILLS SANDSTONE ROLL FRONTS

DEEP MONITORING INTERVAL: SAND INTERVAL BENEATH BASAL SHALE CONTACT

Horizontal Scale 1" = 100'

Vertical Scale 1" = 50'

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ROSS ISR PROJECT

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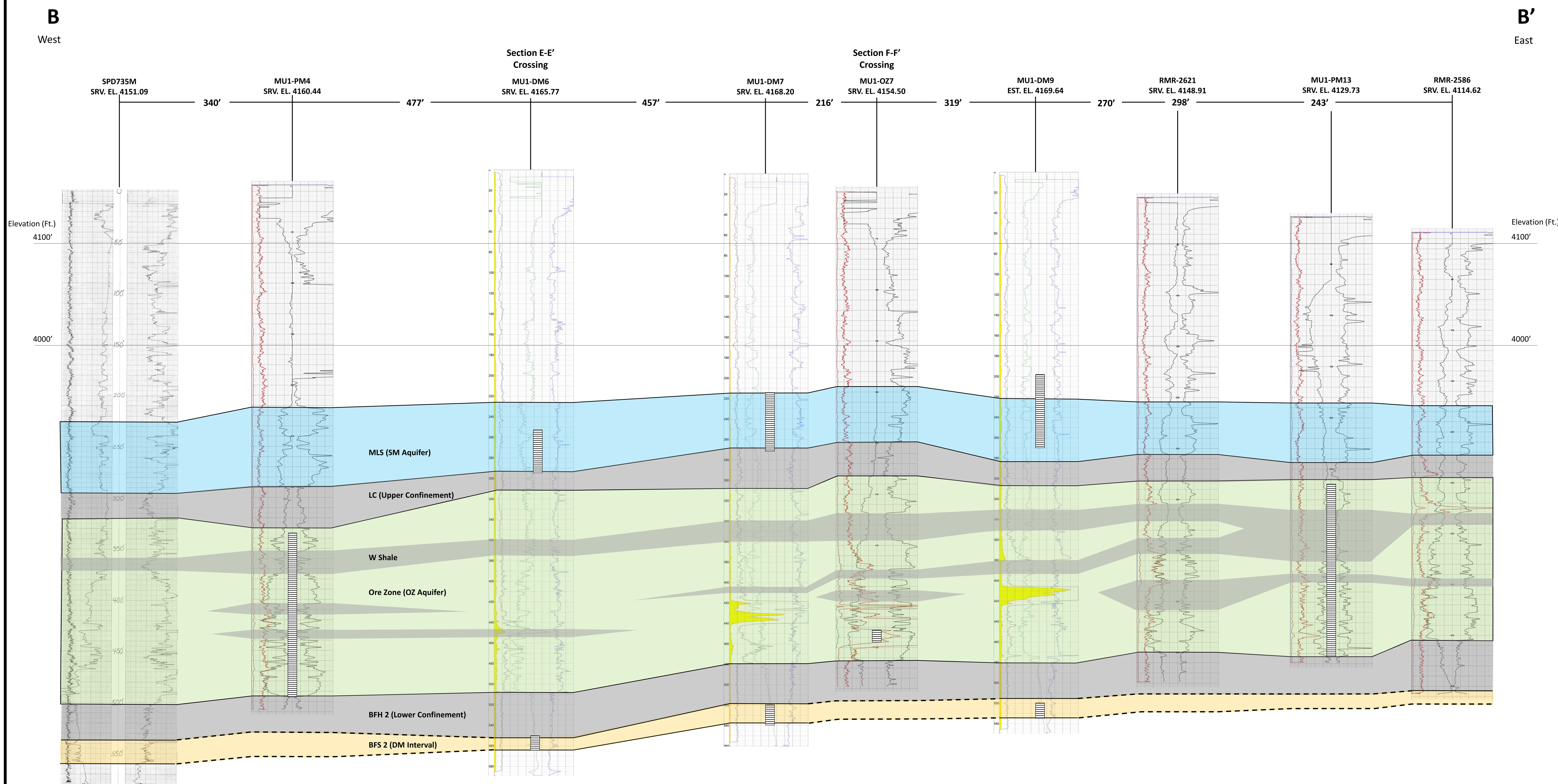
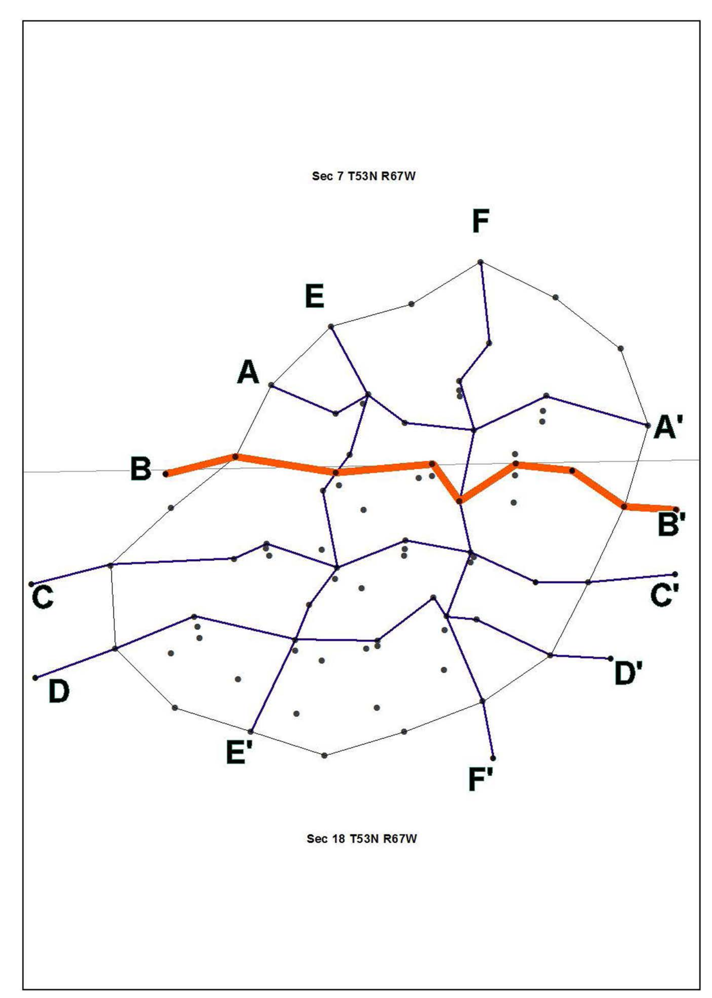
REVISIONS	
Date	Description

Att. 1, Fig. 2

MU1 CROSS SECTION A-A'

Drawn By:	JCH
Checked By:	MB
Date:	07-15





LEGEND

- APPROXIMATE SCREEN INTERVAL LOCATIONS. SM WELL SCREENS ARE SHOWN ON THE ADJACENT DM WELL AND ADJUSTED TO DM WELL ELEVATION.
- AQUITARDS: SHALE-RICH, LOW PERMEABILITY INTERVALS.
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- ORE ZONE: INTERVAL CONTAINING LOWER LANCE/FOX HILLS SANDSTONE ROLL FRONTS
- DEEP MONITORING INTERVAL: SAND INTERVAL BENEATH BASAL SHALE CONTACT

Horizontal Scale 1" = 100'

Vertical Scale 1" = 50'

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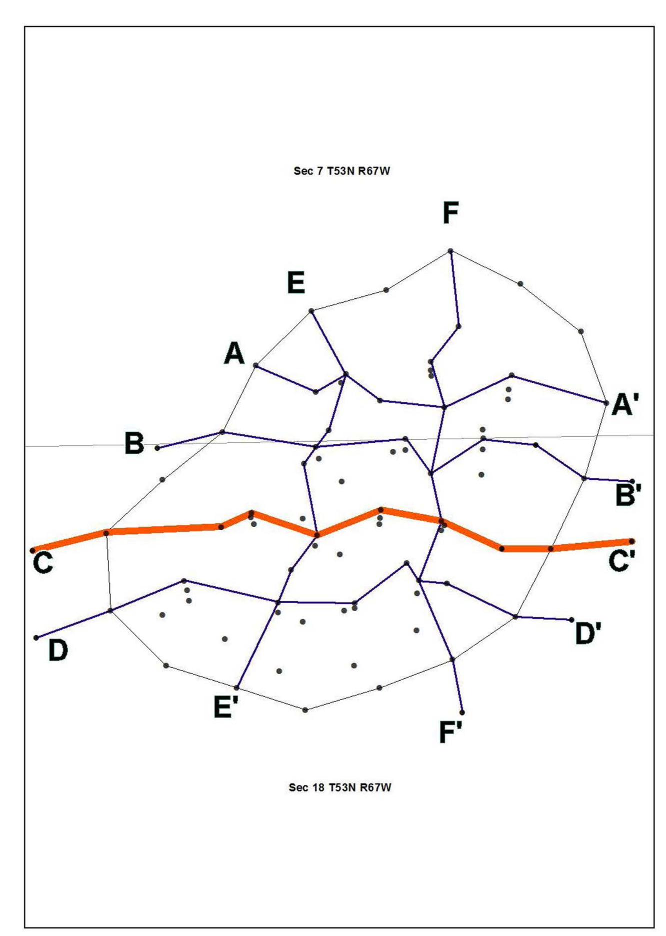
REVISIONS	
Date	Description

Att. 1, Fig. 3

MU1 CROSS SECTION B-B'

Drawn By:	JCH
Checked By:	MB
Date:	07-15



LEGEND

APPROXIMATE SCREEN INTERVAL LOCATIONS. SM WELL SCREENS ARE SHOWN ON THE ADJACENT DM WELL AND ADJUSTED TO DM WELL ELEVATION.

AQUITARDS: SHALE-RICH, LOW PERMEABILITY INTERVALS.

SHALLOW MONITORING INTERVAL: SATURATED SAND INTERVAL OVERLYING AQUITARDS ABOVE THE UPPERMOST MINERALIZATION

ORE ZONE: INTERVAL CONTAINING LOWER LANCE/FOX HILLS SANDSTONE ROLL FRONTS

DEEP MONITORING INTERVAL: SAND INTERVAL BENEATH BASAL SHALE CONTACT

Horizontal Scale 1" = 100'

Vertical Scale 1" = 50'

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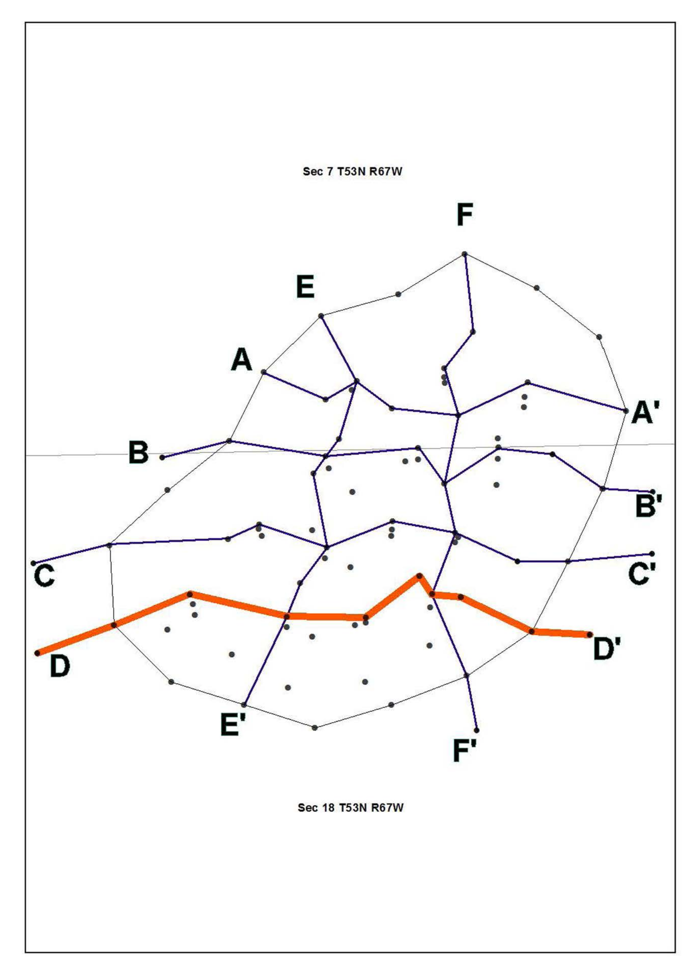
REVISIONS	
Date	Description

Att. 1, Fig. 4

MU1 CROSS SECTION C-C'

Drawn By:	JCH
Checked By:	MB
Date:	07-15



LEGEND

APPROXIMATE SCREEN INTERVAL LOCATIONS. SM WELL SCREENS ARE SHOWN ON THE ADJACENT DM WELL AND ADJUSTED TO DM WELL ELEVATION.

AQUITARDS: SHALE-RICH, LOW PERMEABILITY INTERVALS.

SHALLOW MONITORING INTERVAL: SATURATED SAND INTERVAL OVERLYING AQUITARDS ABOVE THE UPPERMOST MINERALIZATION

ORE ZONE: INTERVAL CONTAINING LOWER LANCE/FOX HILLS SANDSTONE ROLL FRONTS

DEEP MONITORING INTERVAL: SAND INTERVAL BENEATH BASAL SHALE CONTACT

Horizontal Scale 1" = 100'

Vertical Scale 1" = 50'

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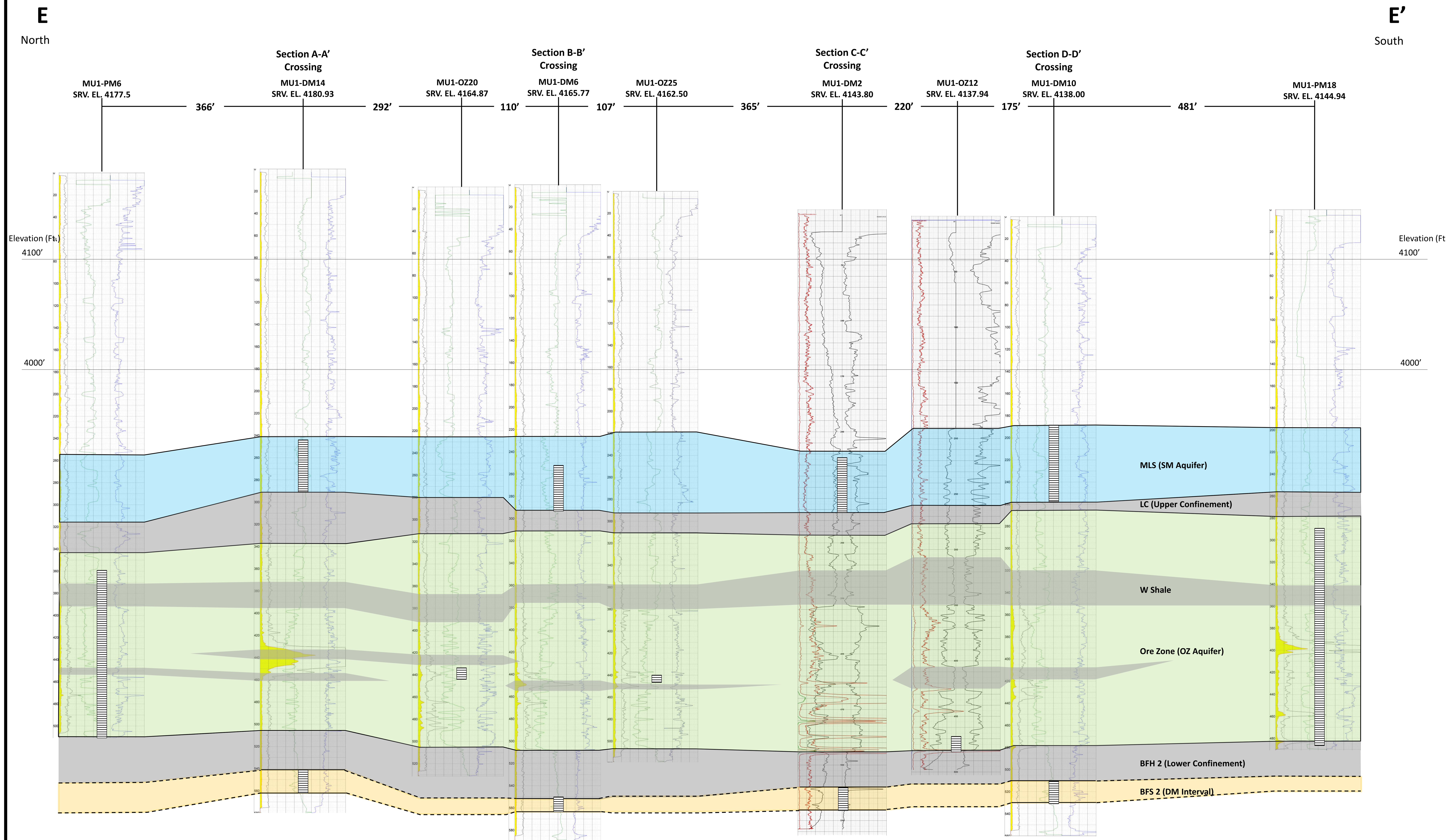
GILLETTE, WY 82716

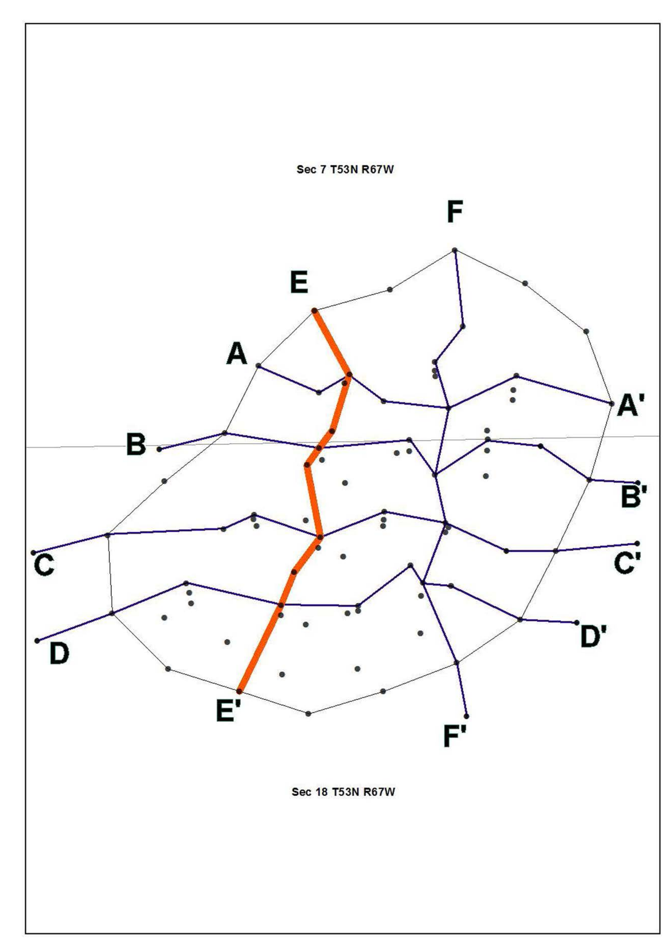
REVISIONS	
Date	Description

Att. 1, Fig. 5

MU1 CROSS SECTION D-D'

Drawn By:	JCH
Checked By:	MB
Date:	07-15





LEGEND

- APPROXIMATE SCREEN INTERVAL LOCATIONS. SM WELL SCREENS ARE SHOWN ON THE ADJACENT DM WELL AND ADJUSTED TO DM WELL ELEVATION.
- AQUITARDS: SHALE-RICH, LOW PERMEABILITY INTERVALS.
- SHALLOW MONITORING INTERVAL: SATURATED SAND INTERVAL OVERLYING AQUITARDS ABOVE THE UPPERMOST MINERALIZATION
- ORE ZONE: INTERVAL CONTAINING LOWER LANCE/FOX HILLS SANDSTONE ROLL FRONTS
- DEEP MONITORING INTERVAL: SAND INTERVAL BENEATH BASAL SHALE CONTACT

Horizontal Scale 1" = 100'

Vertical Scale 1" = 50'

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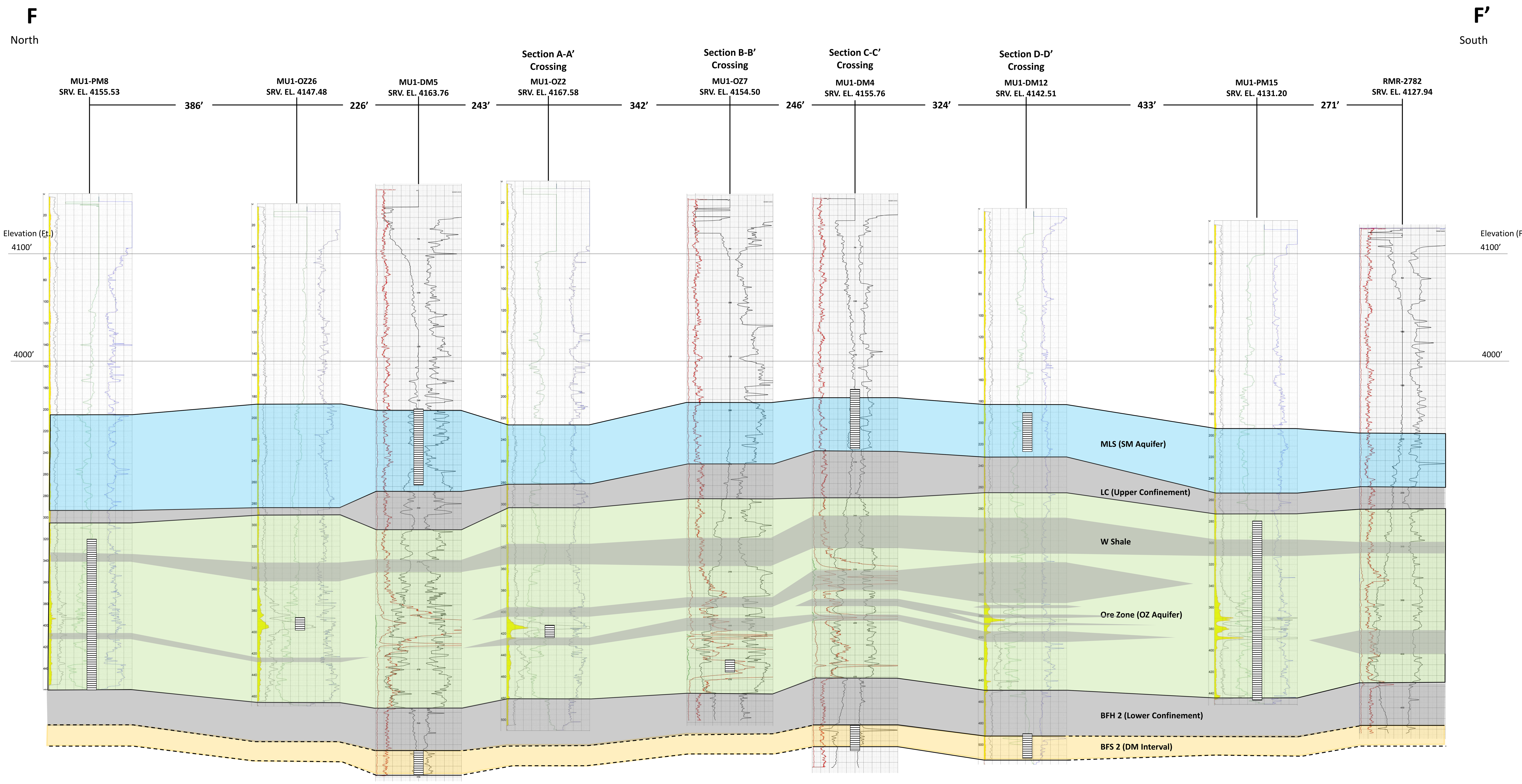
Att. 1, Fig. 6

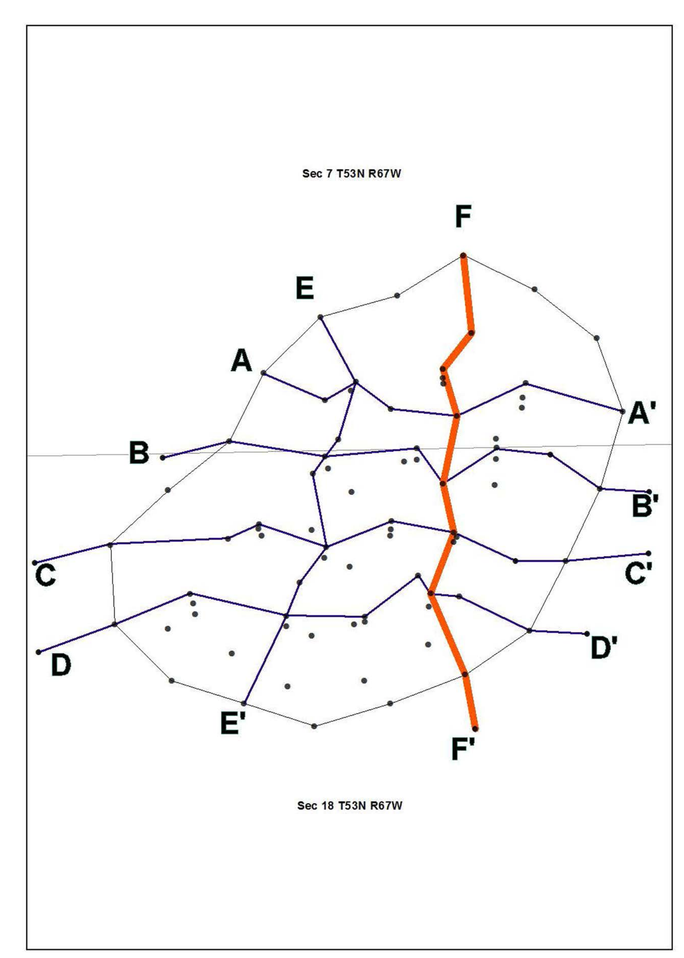
MU1 CROSS SECTION E-E'

REVISIONS

Date	Description

Drawn By:	JCH
Checked By:	MB
Date:	07-15





LEGEND

- APPROXIMATE SCREEN INTERVAL LOCATIONS. SM WELL SCREENS ARE SHOWN ON THE ADJACENT DM WELL AND ADJUSTED TO DM WELL ELEVATION.
- AQUITARDS: SHALE-RICH, LOW PERMEABILITY INTERVALS.
- SHALLOW MONITORING INTERVAL: SATURATED SAND INTERVAL OVERLYING AQUITARDS ABOVE THE UPPERMOST MINERALIZATION
- ORE ZONE: INTERVAL CONTAINING LOWER LANCE/FOX HILLS SANDSTONE ROLL FRONTS
- DEEP MONITORING INTERVAL: SAND INTERVAL BENEATH BASAL SHALE CONTACT

Horizontal Scale 1" = 100'

Vertical Scale 1" = 50'

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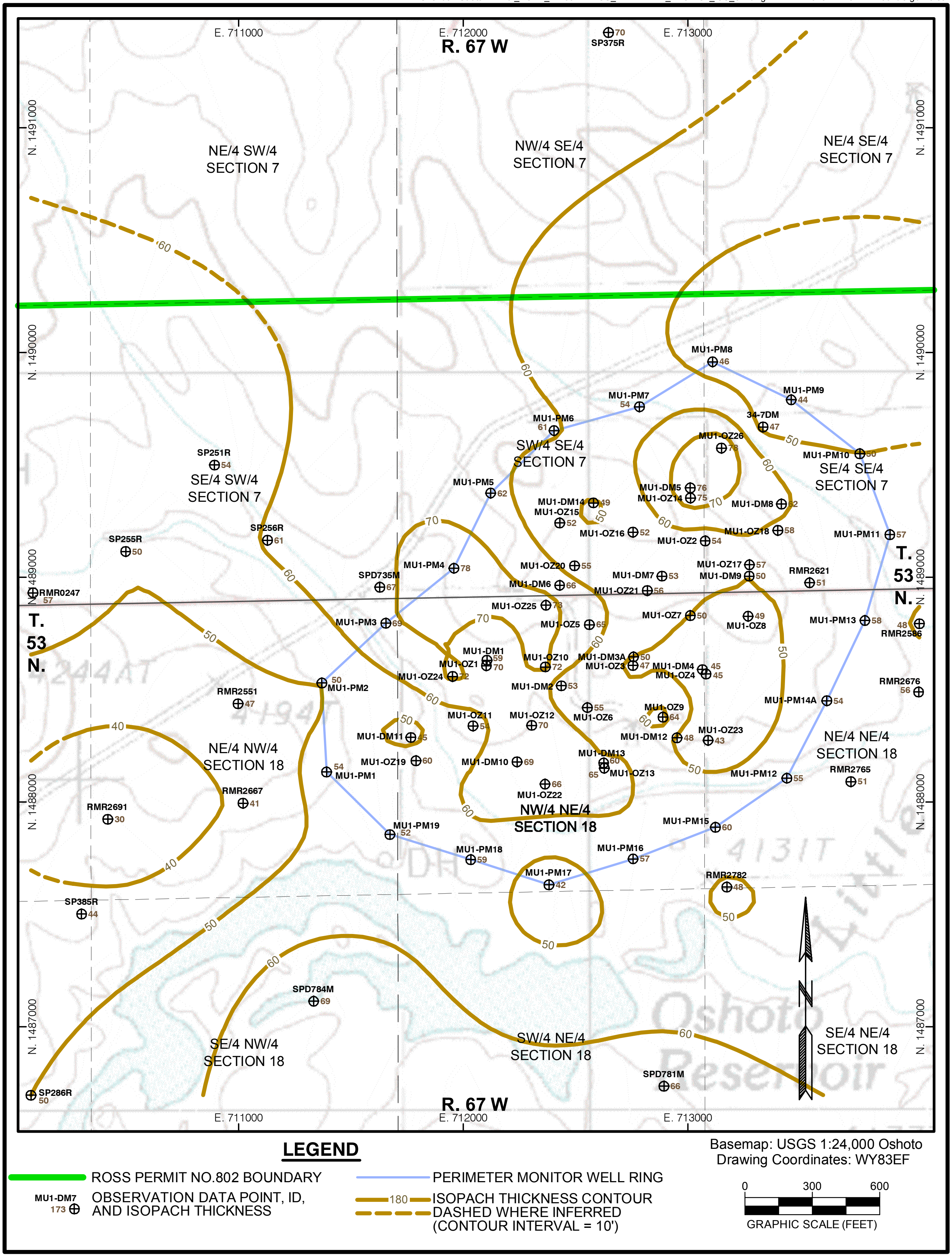
REVISIONS	
Date	Description

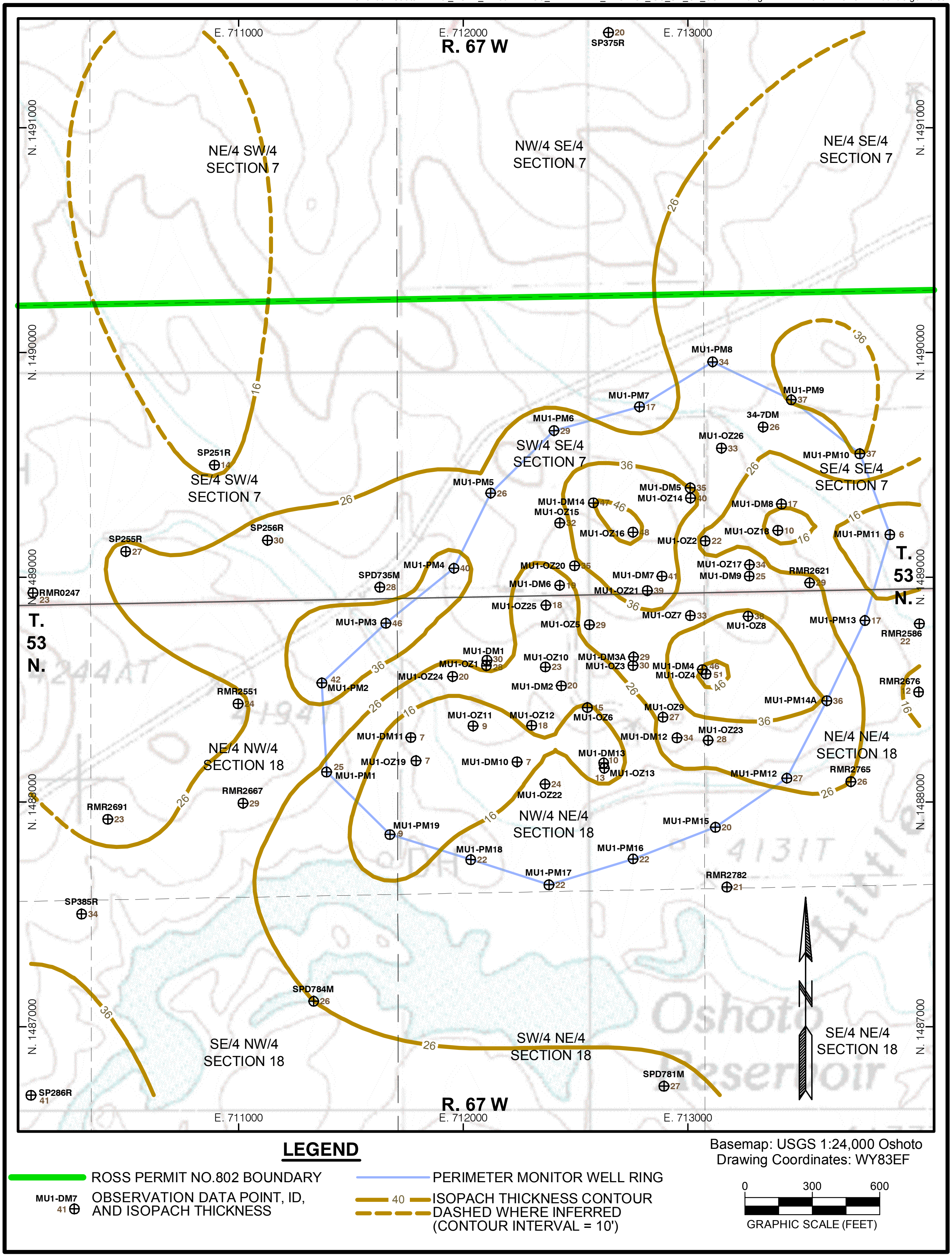
Att. 1, Fig. 7

MU1 CROSS SECTION F-F'

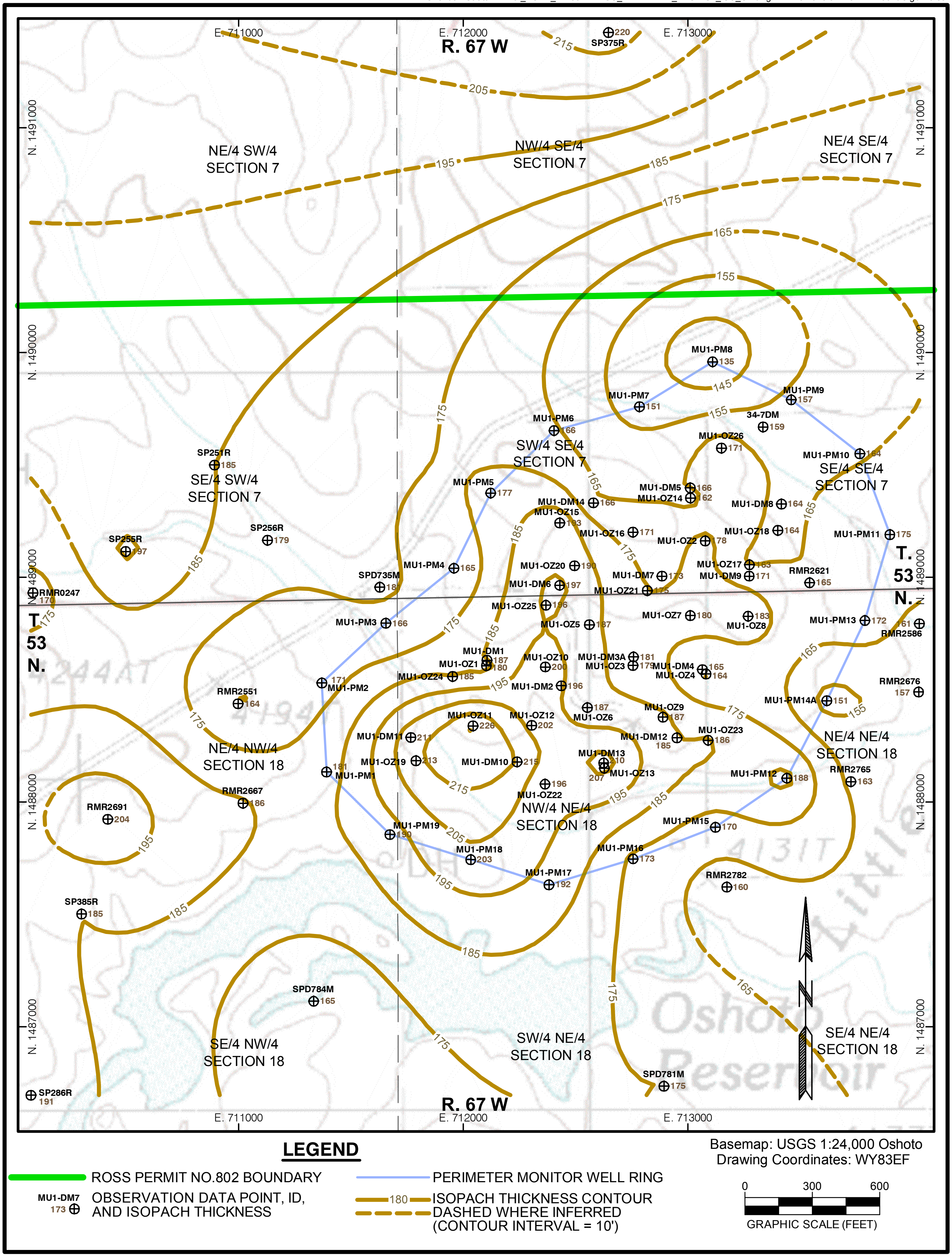
Drawn By:	JCH
Checked By:	MB
Date:	07-15



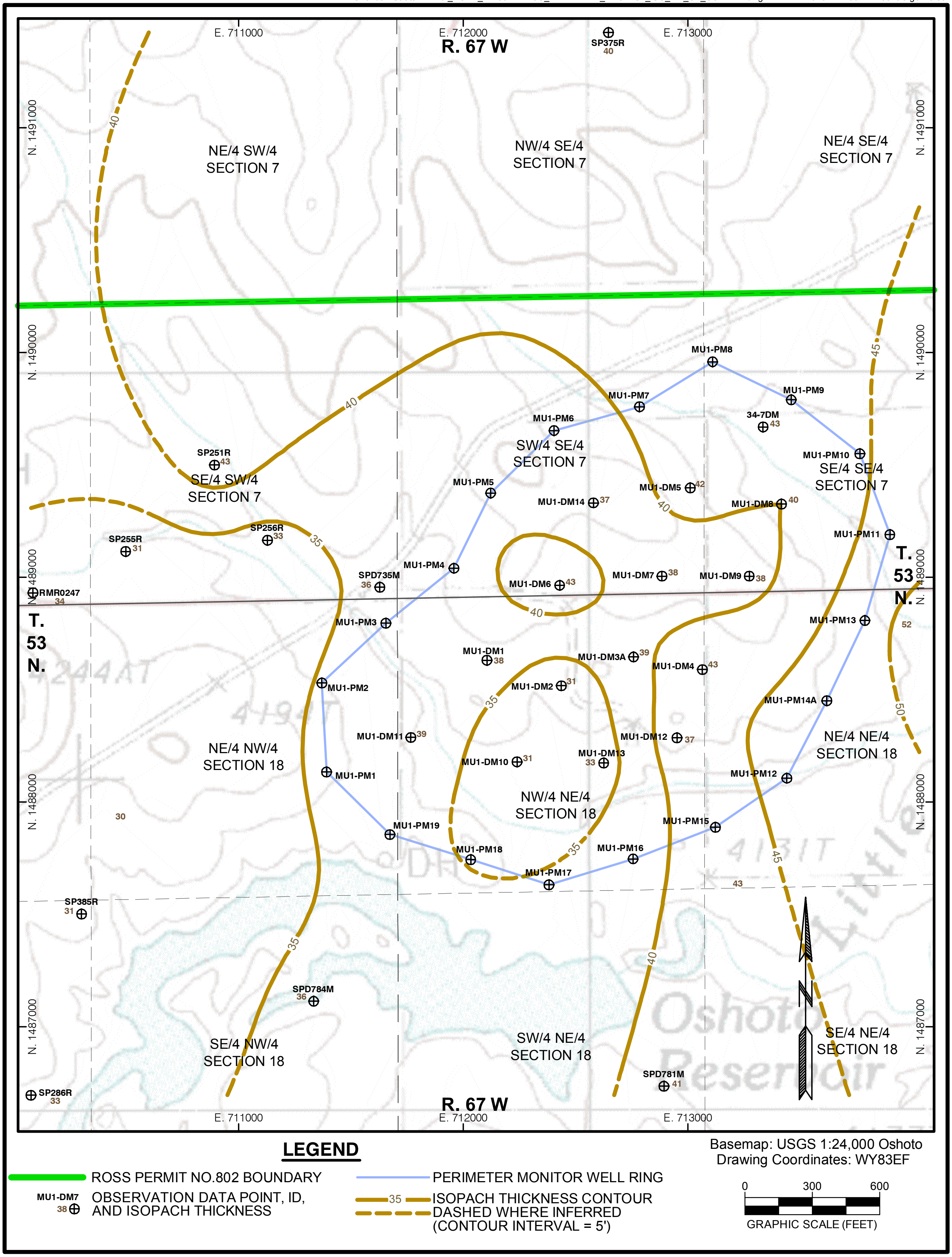
Att. 1, Fig. 8. Mine Unit 1 SM Zone Isopach.



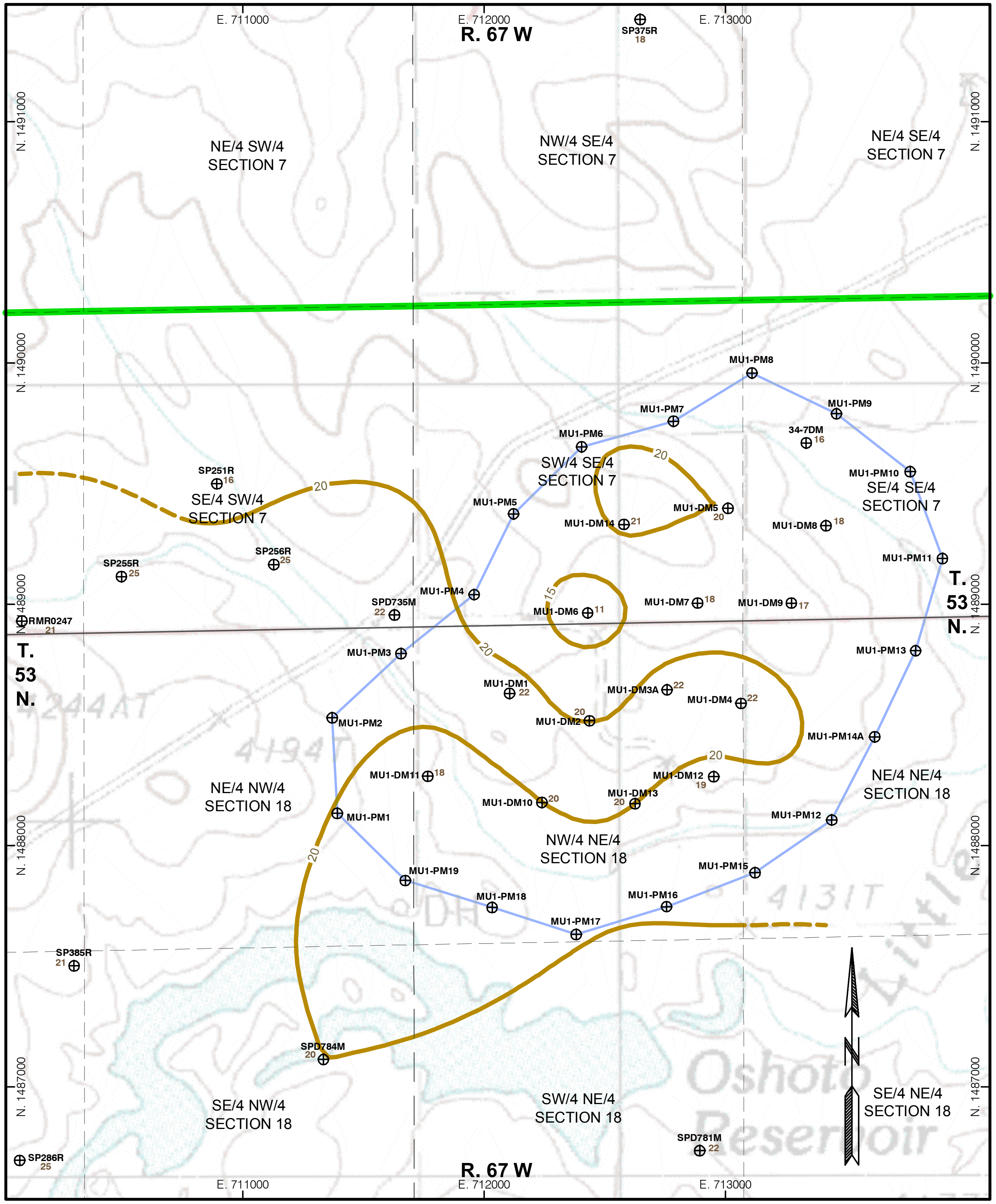
Att. 1, Fig. 9. Mine Unit 1 Isopach of LCS Confining Unit above Ore Zone Sand.



Att. 1, Fig. 10. Mine Unit 1 Ore Zone Sand Isopach.



Att. 1, Fig. 11. Mine Unit 1 Isopach of BFH2 Shale Confining Unit below Ore Zone Sand.



LEGEND

ROSS PERMIT NO.802 BOUNDARY

MU1-DM7 18 OBSERVATION DATA POINT, ID, AND ISOPACH THICKNESS

PERIMETER MONITOR WELL RING

20 ISOPACH THICKNESS

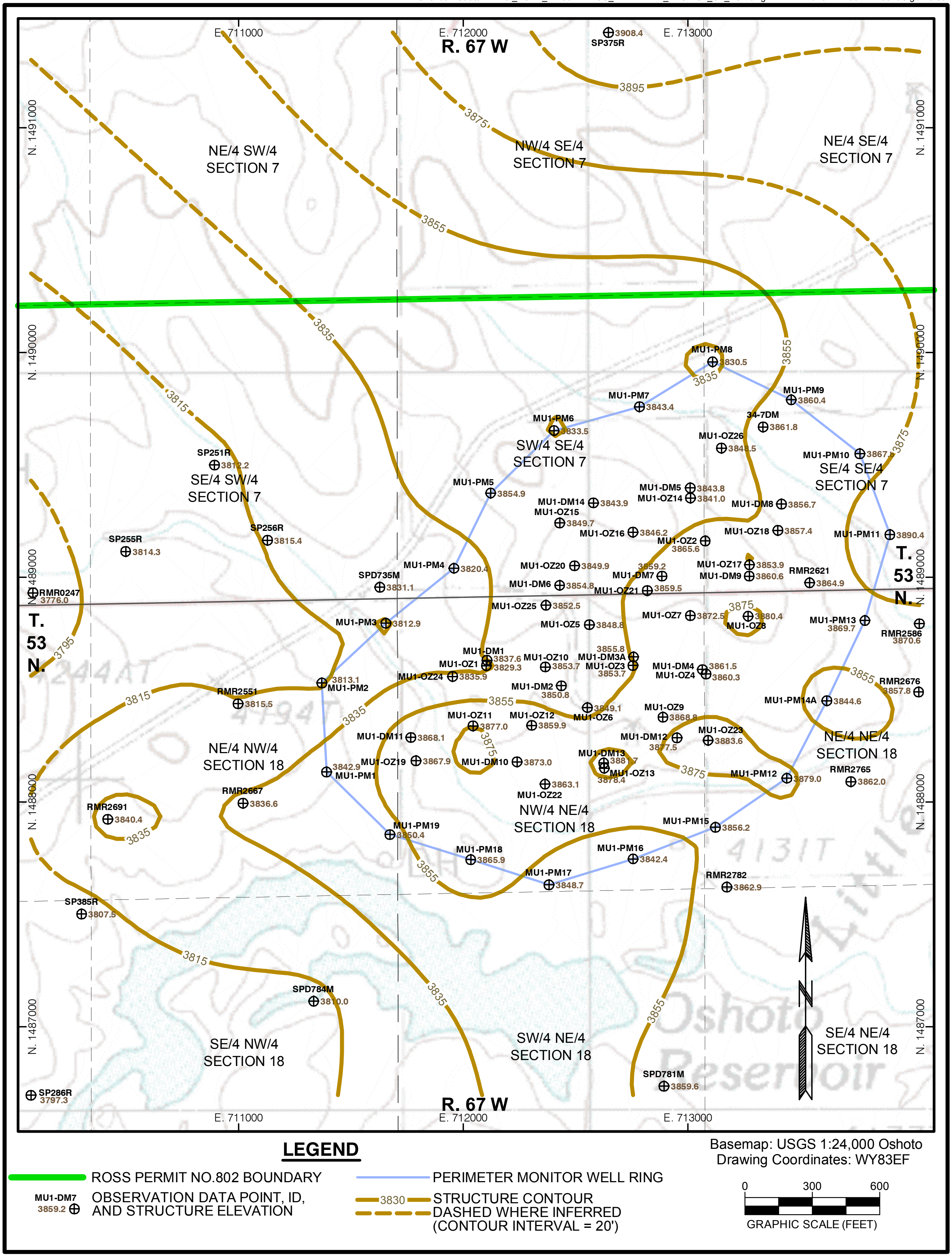
DASHED WHERE INFERRED (CONTOUR INTERVAL = 5')

Basemap: USGS 1:24,000 Oshoto
Drawing Coordinates: WY83EF

0 300 600
GRAPHIC SCALE (FEET)

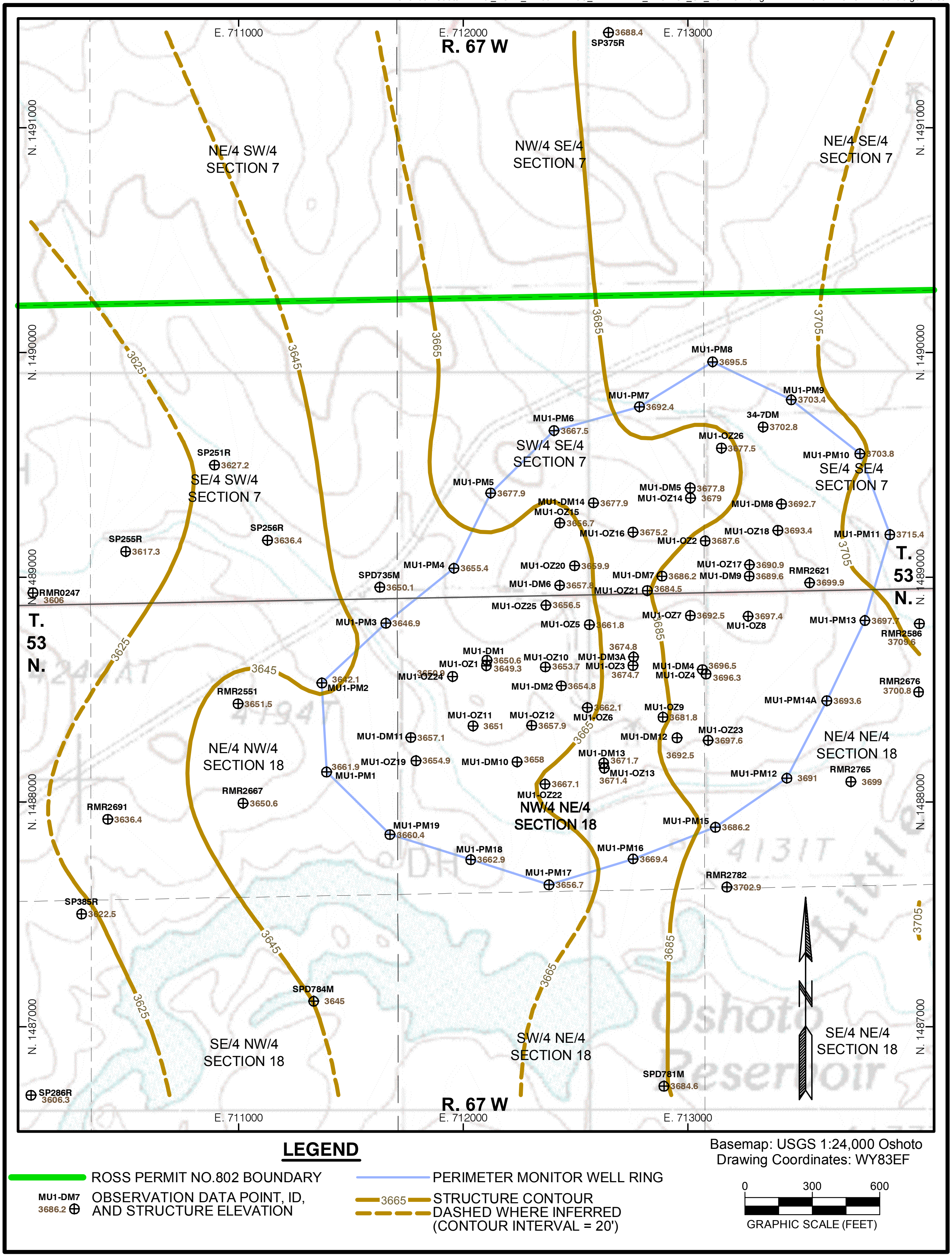
Att. 1, Fig. 12. Mine Unit 1 DM Zone Isopach.

K:\Sheridan\Strata\14143_ACAD_WY83E\DWGS_WELLFIELD_PKG\MU1_OZ_TOP.dwg 7/14/2015 2:21:00 PM condia gonzales



Att. 1, Fig. 13. Mine Unit 1 Structure Contours of Top of OZ Sand.

K:\Sheridan\Strata\14143_ACAD_WY83E\DWGS_WELLFIELD_PKG\MU1_OZ_BOTTOM.dwg 7/14/2015 2:28:48 PM condia gonzales



Att. 1, Fig. 14. Mine Unit 1 Structure Contours of Bottom of OZ Sand.

ATTACHMENT 2

MU1 Groundwater Level/Elevation Data

Well Identification	Easting (WY East)	Northing (WY East)	Top of Casing Elevation (ft amsl)	Water Level (ft btoc)	Water Surface Elevation (ft amsl)
MU1-SM01	712117.1	1488574.3	4149.9	55.45	4094.4
MU1-SM02	712428.1	1488462.7	4143.6	50.17	4093.4
MU1-SM03	712751.6	1488575.8	4155.2	60.70	4094.5
MU1-SM04	713064.4	1488542.2	4149.2	53.32	4095.9
MU1-SM05	713012.2	1489324.7	4170.4	70.25	4100.1
MU1-SM06	712443.9	1488905.9	4163.6	67.46	4096.2
MU1-SM07	712881.9	1488948.9	4166.2	67.22	4099.0
MU1-SM08	713404.9	1489256.0	4144.3	49.00	4095.3
MU1-SM09	713271.7	1488954.5	4173.5	75.41	4098.1
MU1-SM10	712240.6	1488126.4	4139.7	44.07	4095.6
MU1-SM11	711781.2	1488238.4	4143.8	49.83	4094.0
MU1-SM12	712942.7	1488225.3	4133.0	38.51	4094.5
MU1-SM13	712574.5	1488136.3	4134.3	39.93	4094.4
MU1-SM14	712556.9	1489288.4	4178.8	78.98	4099.8
MU1-OZ01	712102.1	1488606.4	4149.82	93.88	4055.9
MU1-OZ02	713076.2	1489161.6	4169.14	110.89	4058.3
MU1-OZ03	712754.8	1488607.1	4157.27	100.56	4056.7
MU1-OZ04	713079.8	1488569.5	4148.83	90.05	4058.8
MU1-OZ05	712560.8	1488788.8	4155.32	98.73	4056.6
MU1-OZ06	712551.6	1488419.8	4146.67	90.32	4056.3
MU1-OZ07	713010.1	1488829.7	4157.07	99.43	4057.6
MU1-OZ08	713267.2	1488826.7	4164.95	107.08	4057.9
MU1-OZ09	712888.1	1488377.2	4146.32	89.32	4057.0
MU1-OZ10	712364.7	1488600.9	4146.29	90.18	4056.1
MU1-OZ11	712042.7	1488338.4	4141.52	88.35	4053.2
MU1-OZ12	712303.6	1488340.8	4140.50	84.75	4055.8
MU1-OZ13	712627.0	1488150.3	4133.95	77.77	4056.2
MU1-OZ14	713010.9	1489352.5	4168.56	110.00	4058.6
MU1-OZ15	712428.8	1489241.3	4178.31	120.34	4058.0
MU1-OZ16	712754.9	1489200.1	4178.82	120.58	4058.2
MU1-OZ17	713273.1	1489055.2	4168.42	110.10	4058.3
MU1-OZ18	713399.6	1489208.5	4147.99	89.31	4058.7
MU1-OZ19	711788.4	1488183.7	4142.49	89.10	4053.4
MU1-OZ20	712494.9	1489051.1	4166.60	108.78	4057.8
MU1-OZ21	712818.5	1488940.4	4166.11	108.28	4057.8
MU1-OZ22	712363.1	1488079.6	4138.44	82.68	4055.8
MU1-OZ23	713089.1	1488274.2	4140.10	78.13	4062.0
MU1-OZ24	711951.4	1488558.7	4144.27	89.29	4055.0
MU1-OZ25	712367.1	1488875.8	4163.91	106.57	4057.3
MU1-OZ26	713148.6	1489574.6	4149.16	90.33	4058.8

Well Identification	Easting (WY83 East)	Northing (WY83 East)	Top of Casing Elevation (ft amsl)	Water Level (ft btoc)	Water Surface Elevation (ft amsl)
MU1-PM01	711390.9	1488133.5	4164.31	108.09	4056.2
MU1-PM02	711369.3	1488529.6	4163.41	113.90	4049.5
MU1-PM03	711654.5	1488795.3	4148.21	91.55	4056.7
MU1-PM04	711957.4	1489039.9	4163.01	105.59	4057.4
MU1-PM05	712121.0	1489374.4	4184.31	123.55	4060.8
MU1-PM06	712403.2	1489652.4	4179.11	120.06	4059.0
MU1-PM07	712783.6	1489758.7	4159.65	100.15	4059.5
MU1-PM08	713109.1	1489958.7	4157.21	97.85	4059.4
MU1-PM09	713459.1	1489789.5	4140.34	81.13	4059.2
MU1-PM10	713764.5	1489549.5	4131.07	71.71	4059.4
MU1-PM11	713898.2	1489189.5	4123.66	63.96	4059.7
MU1-PM12	713439.5	1488105.8	4122.28	37.74	4084.5
MU1-PM13	713787.1	1488807.2	4132.28	67.00	4065.3
MU1-PM14A	713617.5	1488450.2	4140.01	77.46	4062.5
MU1-PM15	713121.9	1487887.7	4132.58	72.50	4060.1
MU1-PM16	712755.0	1487746.8	4135.76	77.50	4058.3
MU1-PM17	712380.7	1487631.5	4138.01	65.75	4072.3
MU1-PM18	712032.1	1487743.6	4146.45	72.70	4073.7
MU1-PM19	711672.7	1487855.1	4149.68	68.55	4081.1
MU1-DM01	712104.4	1488630.7	4150.20	127.30	4022.9
MU1-DM02	712435.3	1488517.0	4146.36	244.54	3901.8
MU1-DM03A	712757.2	1488645.2	4157.62	150.42	4007.2
MU1-DM04	713063.4	1488589.1	4149.08	117.30	4031.8
MU1-DM05	713009.7	1489397.2	4166.33	215.24	3951.1
MU1-DM06	712428.3	1488964.0	4167.17	140.64	4026.5
MU1-DM07	712883.8	1489004.8	4169.68	148.78	4020.9
MU1-DM08	713415.6	1489325.4	4137.02	100.83	4036.2
MU1-DM09	713272.2	1489004.8	4171.34	326.2	3845.1
MU1-DM10	712238.6	1488178.1	4139.81	109.22	4030.6
MU1-DM11	711765.6	1488287.0	4144.49	134.97	4009.5
MU1-DM12	712950.5	1488285.8	4144.06	241.02	3903.0
MU1-DM13	712624.2	1488173.7	4133.57	145.93	3987.6
MU1-DM14	712578.7	1489330.9	4182.53	241.77	3940.8

btoc = below top of casing

ft amsl = feet above mean sea level

ATTACHMENT 3

Monitor Well Completion Details

Table 1. Monitor Well Completion Details

Well Type	Well Name	Completion Date	Geologic Unit Name	WY State Plane East NAD 1927 Easting	WY State Plane East NAD 1927 Northing	Surface Elevation	Top of Casing Elevation	Well Depth (ft)	Casing Material	Casing Inside Diameter (in)	Depth Completion Interval Top (ft)	Depth Completion Interval Bottom (ft)	Township	Range	Section	Quarter/ Quarter	Sand Unit	Under Reamed
Ore Zone Monitor (OZ) Wells	MU1-OZ01	7/1/2013	Lance/Fox Hills	712102.1	1488606.4	4147.25	4149.82	510	5" PVC SDR-17	4.86	410	431	53N	67W	18	NWNE	FH & LL1	X
	MU1-OZ02	3/24/2015	Fox Hills	713076.2	1489161.6	4167.58	4169.14	490	4.5" PVC SDR-17	4.33	413	425	53N	67W	7	SESE	FH	X
	MU1-OZ03	12/12/2013	Fox Hills	712754.8	1488607.1	4154.71	4157.27	490	5" PVC SDR-17	4.86	429	440	53N	67W	18	NWNE	FH	X
	MU1-OZ04	1/22/2015	Fox Hills	713079.8	1488569.5	4146.27	4148.83	470	5" PVC SDR-17	4.86	383	396	53N	67W	18	NENE	FH	X
	MU1-OZ06	1/23/2015	Fox Hills	712551.6	1488419.8	4144.11	4146.67	490	5" PVC SDR-17	4.86	444	475	53N	67W	18	NWNE	FH	X
	MU1-OZ07	1/23/2015	Fox Hills	713010.1	1488829.7	4154.50	4157.07	470	5" PVC SDR-17	4.86	433	444	53N	67W	18	NWNE	FH	X
	MU1-OZ08	1/29/2015	Fox Hills	713267.2	1488826.7	4162.39	4164.95	480	5" PVC SDR-17	4.86	380	397	53N	67W	18	NENE	FH	X
	MU1-OZ09	6/7/2013	Lance/Fox Hills	712888.1	1488377.2	4143.76	4146.32	470	5" PVC SDR-17	4.86	374	392	53N	67W	18	NWNE	FH & LL1	X
	MU1-OZ10	1/28/2015	Fox Hills	712364.7	1488600.9	4143.73	4146.29	500	5" PVC SDR-17	4.86	451	467	53N	67W	18	NWNE	FH	X
	MU1-OZ11	1/26/2015	Fox Hills	712042.7	1488338.4	4138.96	4141.52	500	5" PVC SDR-17	4.86	447	459	53N	67W	18	NWNE	FH	X
	MU1-OZ12	1/27/2015	Fox Hills	712303.6	1488340.8	4137.94	4140.50	490	5" PVC SDR-17	4.86	468	483	53N	67W	18	NWNE	FH	X
	MU1-OZ13	1/28/2015	Fox Hills	712627.0	1488150.3	4131.39	4133.95	470	5" PVC SDR-17	4.86	445	460	53N	67W	18	NWNE	FH	X
	MU1-OZ14	3/13/2015	Fox Hills	713010.9	1489352.5	4165.99	4168.56	490	5" PVC SDR-17	4.86	399	422	53N	67W	7	SWSE	FH	X
	MU1-OZ15	4/1/2015	Fox Hills	712428.8	1489241.3	4175.74	4178.31	530	5" PVC SDR-17	4.86	452	467	53N	67W	7	SWSE	FH	X
	MU1-OZ16	10/11/2013	Fox Hills	712754.9	1489200.1	4176.25	4178.82	510	5" PVC SDR-17	4.86	433	454	53N	67W	7	SWSE	FH	X
	MU1-OZ17	2/3/2015	Fox Hills	713273.1	1489055.2	4165.85	4168.42	480	5" PVC SDR-17	4.86	406	418	53N	67W	7	SESE	FH	X
	MU1-OZ18	3/5/2015	Fox Hills	713399.6	1489208.5	4145.42	4147.99	460	5" PVC SDR-17	4.86	378	393	53N	67W	7	SESE	FH	X
	MU1-OZ19	12/18/2013	Fox Hills	711788.4	1488183.7	4139.93	4142.49	500	5" PVC SDR-17	4.86	474	486	53N	67W	18	NWNE	FH	X
	MU1-OZ20	3/25/2015	Fox Hills	712494.9	1489051.1	4164.87	4166.60	520	4.5" PVC SDR-17	4.33	434	444	53N	67W	7	SWSE	FH	X
	MU1-OZ21	3/25/2015	Fox Hills	712818.5	1488940.4	4164.55	4166.11	500	4.5" PVC SDR-17	4.33	425	440	53N	67W	18	NWNE	FH	X
	MU1-OZ22	3/30/2015	Lance	712363.1	1488079.6	4137.06	4138.44	480	4.5" PVC SDR-17	4.33	360	370	53N	67W	18	NWNE	LL1	X
	MU1-OZ23	3/30/2015	Fox Hills	713089.1	1488274.2	4138.60	4140.10	440	4.5" PVC SDR-17	4.33	373	382	53N	67W	18	NENE	FH	X
	MU1-OZ24	3/31/2015	Fox Hills	711951.4	1488558.7	4142.95	4144.27	500	4.5" PVC SDR-17	4.33	414	426	53N	67W	18	NWNE	FH	X
	MU1-OZ25	3/27/2015	Fox Hills	712367.1	1488875.8	4162.50	4163.91	520	4.5" PVC SDR-17	4.33	440	446	53N	67W	18	NWNE	FH	X
	MU1-OZ26	3/26/2015	Fox Hills	713148.6	1489574.6	4147.48	4149.16	470	4.5" PVC SDR-17	4.33	387	398	53N	67W	7	SESE	FH	X

Table 1. Monitor Well Completion Details (cont.)

Well Type	Well Name	Completion Date	Geologic Unit Name	WY State Plane East NAD 1927 Easting	WY State Plane East NAD 1927 Northing	Surface Elevation	Top of Casing Elevation	Well Depth (ft)	Casing Material	Casing Inside Diameter (in)	Depth Completion Interval Top (ft)	Depth Completion Interval Bottom (ft)	Township	Range	Section	Quarter/ Quarter	Sand Unit	Under Reamed
Shallow Monitor (SM) Wells	MU1-SM01	2/4/2015	Lance	712117.1	1488574.3	4147.32	4149.88	276	5" PVC SDR-17	4.86	232	277	53N	67W	18	NWNE	MLS	
	MU1-SM02	2/4/2015	Lance	712428.1	1488462.7	4141.01	4143.57	269	5" PVC SDR-17	4.86	222	272	53N	67W	18	NWNE	MLS	
	MU1-SM03	2/5/2015	Lance	712751.6	1488575.8	4152.60	4155.16	265	5" PVC SDR-17	4.86	224	268	53N	67W	18	NWNE	MLS	
	MU1-SM04	2/12/2015	Lance	713064.4	1488542.2	4146.68	4149.24	234	5" PVC SDR-17	4.86	182	238	53N	67W	18	NWNE	MLS	
	MU1-SM05	9/12/2013	Lance	713012.2	1489324.7	4167.82	4170.39	274	5" PVC SDR-17	4.86	209	281	53N	67W	7	SWSE	MLS	
	MU1-SM06	3/11/2015	Lance	712443.9	1488905.9	4162.15	4163.65	287	4.5" PVC SDR-17	4.33	250	291	53N	67W	18	NWNE	MLS	
	MU1-SM07	3/16/2015	Lance	712881.9	1488948.9	4164.86	4166.25	265	4.5" PVC SDR-17	4.33	210	268	53N	67W	18	NWNE	MLS	
	MU1-SM08	3/30/2015	Lance	713404.9	1489256.0	4143.02	4144.31	237	4.5" PVC SDR-17	4.33	180	243	53N	67W	7	SESE	MLS	
	MU1-SM09	3/20/2015	Lance	713271.7	1488954.5	4171.94	4173.46	270	4.5" PVC SDR-17	4.33	200	270	53N	67W	18	NENE	MLS	
	MU1-SM10	4/1/2015	Lance	712240.6	1488126.4	4138.54	4139.68	257	4.5" PVC SDR-17	4.33	190	257	53N	67W	18	NWNE	MLS	
	MU1-SM11	4/16/2015	Lance	711781.2	1488238.4	4142.45	4143.80	266	4.5" PVC SDR-17	4.33	220	268	53N	67W	18	NWNE	MLS	
	MU1-SM12	4/2/2015	Lance	712574.5	1488136.3	4131.39	4133.03	216	4.5" PVC SDR-17	4.33	180	216	53N	67W	18	NWNE	MLS	
	MU1-SM13	4/2/2015	Lance	712942.7	1488225.3	4132.89	4134.33	235	4.5" PVC SDR-17	4.33	185	240	53N	67W	18	NWNE	MLS	
	MU1-SM14	3/25/2014	Lance	712556.9	1489288.4	4177.54	4178.81	283	4.5" PVC SDR-17	4.33	240	288	53N	67W	7	SWSE	MLS	
Deep Monitor (DM) Wells	MU1-DM01	2/6/2015	Fox Hills	712104.4	1488630.7	4147.64	4150.20	530	5" PVC SDR-17	4.86	535	558	53N	67W	18	NWNE	BFS 2	
	MU1-DM02	2/2/2015	Fox Hills	712435.3	1488517.0	4143.80	4146.36	520	5" PVC SDR-17	4.86	521	541	53N	67W	18	NWNE	BFS 2	
	MU1-DM03A	12/20/2013	Fox Hills	712757.2	1488645.2	4155.76	4157.62	520	4.5" PVC SDR-17	4.33	524	544	53N	67W	18	NWNE	BFS 2	
	MU1-DM04	3/17/2015	Fox Hills	713063.4	1488589.1	4146.52	4149.08	490	5" PVC SDR-17	4.86	495	520	53N	67W	18	NWNE	BFS 2	
	MU1-DM05	3/6/2015	Fox Hills	713009.7	1489397.2	4163.76	4166.33	520	5" PVC SDR-17	4.86	526	549	53N	67W	7	SWSE	BFS 2	
	MU1-DM06	3/12/2015	Fox Hills	712428.3	1488964.0	4165.77	4167.17	550	4.5" PVC SDR-17	4.33	550	565	53N	67W	18	NWNE	BFS 2	
	MU1-DM07	3/9/2015	Fox Hills	712883.8	1489004.8	4168.20	4169.68	520	4.5" PVC SDR-17	4.33	520	540	53N	67W	7	SWSE	BFS 2	
	MU1-DM08	3/26/2015	Fox Hills	713415.6	1489325.4	4135.73	4137.02	480	4.5" PVC SDR-17	4.33	480	502	53N	67W	7	SESE	BFS 2	
	MU1-DM09	3/19/2015	Fox Hills	713272.2	1489004.8	4169.64	4171.34	520	4.5" PVC SDR-17	4.33	520	536	53N	67W	18	NENE	BFS 2	
	MU1-DM10	3/23/2015	Fox Hills	712238.6	1488178.1	4138.00	4139.81	510	4.5" PVC SDR-17	4.33	510	531	53N	67W	18	NWNE	BFS 2	
	MU1-DM11	4/16/2015	Fox Hills	711765.6	1488287.0	4143.06	4144.49	530	4.5" PVC SDR-17	4.33	530	547	53N	67W	18	NWNE	BFS 2	
	MU1-DM12	4/1/2015	Fox Hills	712950.5	1488285.8	4142.51	4144.06	490	4.5" PVC SDR-17	4.33	490	511	53N	67W	18	NWNE	BFS 2	
	MU1-DM13	4/6/2015	Fox Hills	712624.2	1488173.7	4131.67	4133.57	490	4.5" PVC SDR-17	4.33	490	515	53N	67W	18	NWNE	BFS 2	
	MU1-DM14	3/25/2015	Fox Hills	712578.7	1489330.9	4180.93	4182.53	540	4.5" PVC SDR-17	4.33	540	563	53N	67W	7	SWSE	BFS 2	

Table 1. Monitor Well Completion Details (cont.)

Well Type	Well Name	Completion Date	Geologic Unit Name	WY State Plane East NAD 1927 Easting	WY State Plane East NAD 1927 Northing	Surface Elevation	Top of Casing Elevation	Well Depth (ft)	Casing Material	Casing Inside Diameter (in)	Depth Completion Interval Top (ft)	Depth Completion Interval Bottom (ft)	Township	Range	Section	Quarter/ Quarter	Sand Unit	Under Reamed
Perimeter Monitor (PM) Wells	MU1-PM01	4/10/2015	Lance/Fox Hills	711390.9	1488133.5	4162.89	4164.31	320	4.5" PVC SDR-17	4.33	320	504	53N	67W	18	NENW	FH, LL1, & LL2	
	MU1-PM02	4/13/2015	Lance/Fox Hills	711369.3	1488529.6	4162.15	4163.41	350	4.5" PVC SDR-17	4.33	350	519	53N	67W	18	NENW	FH, LL1, & LL2	
	MU1-PM03	4/9/2015	Lance/Fox Hills	711654.5	1488795.3	4146.86	4148.21	330	4.5" PVC SDR-17	4.33	330	499	53N	67W	18	NENW	FH, LL1, & LL2	
	MU1-PM04	12/16/2013	Lance/Fox Hills	711957.4	1489039.9	4160.44	4163.01	340	5" PVC SDR-17	4.86	346	506	53N	67W	7	SWSE	FH, LL1, & LL2	
	MU1-PM05	4/15/2015	Lance/Fox Hills	712121.0	1489374.4	4182.95	4184.31	330	4.5" PVC SDR-17	4.33	330	505	53N	67W	7	SWSE	FH, LL1, & LL2	
	MU1-PM06	3/23/2015	Lance/Fox Hills	712403.2	1489652.4	4177.51	4179.11	360	4.5" PVC SDR-17	4.33	360	511	53N	67W	7	SWSE	FH, LL1, & LL2	
	MU1-PM07	3/24/2015	Lance/Fox Hills	712783.6	1489758.7	4158.37	4159.65	330	4.5" PVC SDR-17	4.33	330	481	53N	67W	7	SWSE	FH, LL1, & LL2	
	MU1-PM08	4/7/2015	Lance/Fox Hills	713109.1	1489958.7	4155.53	4157.21	320	4.5" PVC SDR-17	4.33	320	461	53N	67W	7	SESE	FH, LL1, & LL2	
	MU1-PM09	4/7/2015	Lance/Fox Hills	713459.1	1489789.5	4139.44	4140.34	280	4.5" PVC SDR-17	4.33	280	438	53N	67W	7	SESE	FH, LL1, & LL2	
	MU1-PM10	4/8/2015	Lance/Fox Hills	713764.5	1489549.5	4129.76	4131.07	240	4.5" PVC SDR-17	4.33	240	419	53N	67W	7	SESE	FH, LL1, & LL2	
	MU1-PM11	4/8/2015	Lance/Fox Hills	713898.2	1489189.5	4122.41	4123.66	230	4.5" PVC SDR-17	4.33	230	409	53N	67W	7	SESE	FH, LL1, & LL2	
	MU1-PM12	4/17/2015	Lance/Fox Hills	713439.5	1488105.8	4121.04	4122.28	260	4.5" PVC SDR-17	4.33	260	431	53N	67W	18	NENE	FH, LL1, & LL2	
	MU1-PM13	2/20/2015	Lance/Fox Hills	713787.1	1488807.2	4129.73	4132.28	260	5" PVC SDR-17	4.86	264	434	53N	67W	18	NENE	FH, LL1, & LL2	
	MU1-PM14A	4/15/2015	Lance/Fox Hills	713617.5	1488450.2	4138.59	4140.01	290	4.5" PVC SDR-17	4.33	290	449	53N	67W	18	NENE	FH, LL1, & LL2	
	MU1-PM15	4/20/2015	Lance/Fox Hills	713121.9	1487887.7	4131.20	4132.58	280	4.5" PVC SDR-17	4.33	280	449	53N	67W	18	NENE	FH, LL1, & LL2	
	MU1-PM16	4/14/2015	Lance/Fox Hills	712755.0	1487746.8	4134.37	4135.76	290	4.5" PVC SDR-17	4.33	290	461	53N	67W	18	NWNE	FH, LL1, & LL2	
	MU1-PM17	4/20/2015	Lance/Fox Hills	712380.7	1487631.5	4136.72	4138.01	290	4.5" PVC SDR-17	4.33	290	484	53N	67W	18	SWNE	FH, LL1, & LL2	
	MU1-PM18	4/14/2015	Lance/Fox Hills	712032.1	1487743.6	4144.93	4146.45	290	4.5" PVC SDR-17	4.33	290	488	53N	67W	18	NWNE	FH, LL1, & LL2	
	MU1-PM19	4/9/2015	Lance/Fox Hills	711672.7	1487855.1	4148.42	4149.68	300	4.5" PVC SDR-17	4.33	300	493	53N	67W	18	NENW	FH, LL1, & LL2	

Table 1. Monitor Well Completion Details (cont.)

Well Type	Well Name	Completion Date	Geologic Unit Name	WY State Plane East NAD 1927 Easting	WY State Plane East NAD 1927 Northing	Surface Elevation	Top of Casing Elevation	Well Depth (ft)	Casing Material	Casing Inside Diameter (in)	Depth Completion Interval Top (ft)	Depth Completion Interval Bottom (ft)	Township	Range	Section	Quarter/ Quarter	Sand Unit	Under Reamed
Surficial Aquifer (SA) Wells	MU1-SA01	3/24/2015	Alluvium	712181.0	1487990.7	4131.27	4133.62	9	Stainless Steel	2.0	0	9	53N	67W	18	NWNE	QA	
	MU1-SA02	3/24/2015	Alluvium	712667.0	1488067.7	4124.34	4127.24	13	Stainless Steel	2.0	0	13	53N	67W	18	NWNE	QA	
	MU1-SA03	3/24/2015	Alluvium	713074.2	1488159.3	4121.59	4123.50	10	Stainless Steel	2.0	0	10	53N	67W	18	NENE	QA	

Note: All wells are screened.

ATTACHMENT 4

MU1 MIT and Well/Drill Hole Abandonment Records

Table 1. Monitor Well Mechancial Integrity Test (MIT) Results

Well Type	Mine Name	Mine Unit	Well Name	Completion Date	MIT Date	Top Packer Depth	Bottom Packer Depth (ft bgs)	Initial Pressure (psi)	Pressure After 10 min. (psi)	Pass/ Fail
Ore Zone (OZ) Monitor Wells	Ross	1	MU1-OZ01	7/1/2013	8/19/2013	Surface	390	175	165	Pass
	Ross	1	MU1-OZ02	3/24/2015	4/28/2015	Surface	390	175	158	Pass
	Ross	1	MU1-OZ03	12/12/2013	6/18/2015	Surface	410	175	164	Pass
	Ross	1	MU1-OZ04	1/22/2015	5/28/2015	Surface	360	175	163	Pass
	Ross	1	MU1-OZ05*	1/30/2015	6/23/2015	Surface	445	162	110	Fail
	Ross	1	MU1-OZ06	1/23/2015	5/26/2015	Surface	425	175	165	Pass
	Ross	1	MU1-OZ07	1/23/2015	5/22/2015	Surface	410	175	163	Pass
	Ross	1	MU1-OZ08	1/29/2015	5/27/2015	Surface	355	175	165	Pass
	Ross	1	MU1-OZ09	6/7/2013	8/15/2013	Surface	350	175	160	Pass
	Ross	1	MU1-OZ10	1/28/2015	5/26/2015	Surface	430	175	159	Pass
	Ross	1	MU1-OZ11	1/26/2015	4/30/2015	Surface	425	175	163	Pass
	Ross	1	MU1-OZ12	1/27/2015	5/27/2015	Surface	445	175	161	Pass
	Ross	1	MU1-OZ13	1/28/2015	6/10/2015	Surface	425	175	162	Pass
	Ross	1	MU1-OZ14	3/13/2015	5/22/2015	Surface	380	175	160	Pass
	Ross	1	MU1-OZ15	4/1/2015	6/3/2015	Surface	425	175	164	Pass
	Ross	1	MU1-OZ16	10/11/2013	6/12/2015	Surface	410	175	161	Pass
	Ross	1	MU1-OZ17	2/3/2015	5/28/2015	Surface	385	175	159	Pass
	Ross	1	MU1-OZ18	3/5/2015	5/27/2015	Surface	360	175	162	Pass
	Ross	1	MU1-OZ19	12/18/2013	6/17/2015	Surface	430	175	158	Pass
	Ross	1	MU1-OZ20	3/25/2015	4/30/2015	Surface	415	175	161	Pass
	Ross	1	MU1-OZ21	3/25/2015	4/28/2015	Surface	405	175	160	Pass
	Ross	1	MU1-OZ22	3/30/2015	6/19/2015	Surface	340	175	160	Pass
	Ross	1	MU1-OZ23	3/30/2015	5/13/2015	Surface	350	175	160	Pass
	Ross	1	MU1-OZ24	3/31/2015	5/20/2015	Surface	390	175	162	Pass
	Ross	1	MU1-OZ25	3/27/2015	4/30/2015	Surface	420	175	160	Pass
	Ross	1	MU1-OZ26	3/26/2015	6/12/2015	Surface	370	175	160	Pass
Regional Baseline Well	Ross	1	34-7 OZ	3/26/2010	7/2/2015	Surface	295	175	166	Pass

Table 1. Monitor Well Mechancial Integrity Test (MIT) Results (cont.)

Well Type	Mine Name	Mine Unit	Well Name	Completion Date	MIT Date	Top Packer Depth	Bottom Packer Depth (ft bgs)	Initial Pressure (psi)	Pressure After 10 min. (psi)	Pass/ Fail
Shallow Monitor (SM) Wells	Ross	1	MU1-SM01	2/4/2015	5/20/2015	Surface	210	175	168	Pass
	Ross	1	MU1-SM02	2/4/2015	5/21/2015	Surface	200	175	166	Pass
	Ross	1	MU1-SM03	2/5/2015	5/21/2015	Surface	200	175	166	Pass
	Ross	1	MU1-SM04	2/12/2015	6/11/2015	Surface	160	175	166	Pass
	Ross	1	MU1-SM05	9/12/2013	5/22/2015	Surface	175	175	159	Pass
	Ross	1	MU1-SM06	3/11/2015	4/27/2015	Surface	225	175	164	Pass
	Ross	1	MU1-SM07	3/16/2015	4/28/2015	Surface	190	175	163	Pass
	Ross	1	MU1-SM08	3/30/2015	4/24/2015	Surface	155	175	162	Pass
	Ross	1	MU1-SM09	3/20/2015	4/21/2015	Surface	170	175	162	Pass
	Ross	1	MU1-SM10	4/1/2015	6/10/2015	Surface	170	175	163	Pass
	Ross	1	MU1-SM11	4/16/2015	4/21/2015	Surface	210	175	162	Pass
	Ross	1	MU1-SM12	4/2/2015	6/11/2015	Surface	160	175	165	Pass
	Ross	1	MU1-SM13	4/2/2015	6/10/2015	Surface	165	175	166	Pass
	Ross	1	MU1-SM14	3/25/2014	4/22/2015	Surface	220	175	162	Pass
Deep Monitor (DM) Wells	Ross	1	MU1-DM01	2/6/2015	5/20/2015	Surface	510	175	164	Pass
	Ross	1	MU1-DM02	2/2/2015	5/26/2015	Surface	500	175	158	Pass
	Ross	1	MU1-DM03A	12/20/2013	6/5/2015	Surface	505	175	162	Pass
	Ross	1	MU1-DM04	3/17/2015	6/9/2015	Surface	475	175	165	Pass
	Ross	1	MU1-DM05	3/6/2015	6/12/2015	Surface	500	175	163	Pass
	Ross	1	MU1-DM06	3/12/2015	6/3/2015	Surface	525	175	160	Pass
	Ross	1	MU1-DM07	3/9/2015	6/5/2015	Surface	500	175	160	Pass
	Ross	1	MU1-DM08	3/26/2015	6/17/2015	Surface	460	175	163	Pass
	Ross	1	MU1-DM09	3/19/2015	6/5/2015	Surface	500	175	162	Pass
	Ross	1	MU1-DM10	3/23/2015	6/8/2015	Surface	490	175	161	Pass
	Ross	1	MU1-DM11	4/16/2015	6/8/2015	Surface	510	175	160	Pass
	Ross	1	MU1-DM12	4/1/2015	6/11/2015	Surface	470	175	162	Pass
	Ross	1	MU1-DM13	4/6/2015	6/8/2015	Surface	480	175	160	Pass
	Ross	1	MU1-DM14	3/25/2015	6/2/2015	Surface	525	175	161	Pass

Table 1. Monitor Well Mechancial Integrity Test (MIT) Results (cont.)

Well Type	Mine Name	Mine Unit	Well Name	Completion Date	MIT Date	Top Packer Depth	Bottom Packer Depth (ft bgs)	Initial Pressure (psi)	Pressure After 10 min. (psi)	Pass/ Fail
Perimeter Monitor (PM) Wells	Ross	1	MU1-PM01	4/10/2015	6/15/2015	Surface	300	175	166	Pass
	Ross	1	MU1-PM02	4/13/2015	5/18/2015	Surface	330	175	160	Pass
	Ross	1	MU1-PM03	4/9/2015	5/15/2015	Surface	310	175	162	Pass
	Ross	1	MU1-PM04	12/16/2013	6/15/2015	Surface	330	175	162	Pass
	Ross	1	MU1-PM05	4/15/2015	5/18/2015	Surface	310	175	160	Pass
	Ross	1	MU1-PM06	3/23/2015	5/18/2015	Surface	345	175	161	Pass
	Ross	1	MU1-PM07	3/24/2015	5/19/2015	Surface	315	175	164	Pass
	Ross	1	MU1-PM08	4/7/2015	6/15/2015	Surface	300	175	163	Pass
	Ross	1	MU1-PM09	4/7/2015	5/19/2015	Surface	260	175	166	Pass
	Ross	1	MU1-PM10	4/8/2015	5/19/2015	Surface	220	175	162	Pass
	Ross	1	MU1-PM11	4/8/2015	5/19/2015	Surface	215	175	166	Pass
	Ross	1	MU1-PM12	4/17/2015	6/2/2015	Surface	240	175	164	Pass
	Ross	1	MU1-PM13	2/20/2015	5/28/2015	Surface	245	175	164	Pass
	Ross	1	MU1-PM14A	4/15/2015	5/29/2015	Surface	270	175	166	Pass
	Ross	1	MU1-PM15	4/20/2015	6/1/2015	Surface	260	175	163	Pass
	Ross	1	MU1-PM16	4/14/2015	6/1/2015	Surface	270	175	166	Pass
	Ross	1	MU1-PM17	4/20/2015	6/1/2015	Surface	275	175	166	Pass
	Ross	1	MU1-PM18	4/14/2015	5/21/2015	Surface	270	175	166	Pass
	Ross	1	MU1-PM19	4/9/2015	5/15/2015	Surface	280	175	160	Pass

*Well MU1-OZ05 was plugged and abandoned on July 6, 2015 due to MIT failure.

Table 2. Drill Hole Abandonment Tabulation

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
SP1R	712828.5	1488816.0	53N	67W	18	NWNE	High Solids Bentonite	2/23/2015	X	Exploration
SP2R	712717.5	1488915.1	53N	67W	18	NWNE	High Solids Bentonite	2/17/2015	X	Exploration
SP3R	712925.0	1488918.3	53N	67W	18	NWNE	High Solids Bentonite	2/18/2015	X	Exploration
SP4R	712828.7	1488715.6	53N	67W	18	NWNE	Cement	6/17/2013	X	Exploration
SP5R	712830.8	1489024.0	53N	67W	7	SWSE	High Solids Bentonite	2/18/2015	X	Exploration
SP6R	712726.3	1488812.5	53N	67W	18	NWNE	High Solids Bentonite	2/19/2015	X	Exploration
SP8R	712830.7	1487934.2	53N	67W	18	NWNE	High Solids Bentonite	2/4/2015	X	Exploration
SP20V	713644.6	1488807.5	53N	67W	18	NENE	High Solids Bentonite	4/16/2015	X	Exploration
SP21V	713157.7	1488947.7	53N	67W	18	NENE	Cement	3/19/2013	X	Exploration
SP22V	713154.0	1488842.9	53N	67W	18	NENE	Cement	3/26/2013	X	Exploration
SP23V	713187.8	1488736.7	53N	67W	18	NENE	Cement	3/14/2013	X	Exploration
SP24V	713226.9	1488886.2	53N	67W	18	NENE	Cement	3/15/2013	X	Exploration
SP25V	713231.8	1489010.9	53N	67W	7	SESE	High Solids Bentonite	8/22/2013	X	Exploration
SP26V	713174.1	1488612.8	53N	67W	18	NENE	Cement	3/21/2013	X	Exploration
SP27R	711275.1	1488389.0	53N	67W	18	NENW	High Solids Bentonite	2/6/2015	X	Exploration
SP27V	713272.5	1488792.3	53N	67W	18	NENE	Cement	3/14/2013	X	Exploration
SP28V	713170.8	1489092.1	53N	67W	7	SESE	High Solids Bentonite	7/30/2013	X	Exploration
SP29V	713331.0	1489029.7	53N	67W	7	SESE	High Solids Bentonite	7/15/2013	X	Exploration
SP60V	713354.5	1488856.0	53N	67W	18	NENE	Cement	3/21/2013	X	Exploration
SP61V	713282.2	1488693.3	53N	67W	18	NENE	High Solids Bentonite	4/15/2015	X	Exploration
SP62V	713271.1	1489114.4	53N	67W	7	SESE	High Solids Bentonite	7/22/2013	X	Exploration
SP63V	713214.2	1489193.6	53N	67W	7	SESE	Cement	7/9/2013	X	Exploration
SP64V	713117.6	1489168.2	53N	67W	7	SESE	High Solids Bentonite	4/27/2015	X	Exploration
SP65V	713386.5	1489112.4	53N	67W	7	SESE	High Solids Bentonite	7/15/2013	X	Exploration
SP66V	713390.0	1488938.3	53N	67W	18	NENE	Cement	3/20/2013	X	Exploration
SP67V	713377.7	1488752.2	53N	67W	18	NENE	High Solids Bentonite	2/20/2015	X	Exploration
SP73V	711321.0	1488130.2	53N	67W	18	NENW	High Solids Bentonite	2/9/2015	X	Exploration
SP74V	711438.5	1487969.9	53N	67W	18	NENW	High Solids Bentonite	2/9/2015	X	Exploration
SP76V	711523.2	1488265.8	53N	67W	18	NENW	High Solids Bentonite	8/21/2013	X	Exploration

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
SP77V	711966.7	1488559.4	53N	67W	18	NWNE	Cement	3/19/2013	X	Exploration
SP78V	712065.9	1488433.7	53N	67W	18	NWNE	Cement	3/15/2013	X	Exploration
SP79V	712140.3	1488205.0	53N	67W	18	NWNE	High Solids Bentonite	2/9/2015	X	Exploration
SP120V	713430.2	1488307.6	53N	67W	18	NENE	High Solids Bentonite	4/28/2015	X	Exploration
SP121V	713626.2	1488378.8	53N	67W	18	NENE	High Solids Bentonite	4/30/2015	X	Exploration
SP122V	713323.2	1489214.2	53N	67W	7	SESE	Cement	7/10/2013	X	Exploration
SP123V	713425.9	1489021.6	53N	67W	7	SESE	High Solids Bentonite	7/24/2013	X	Exploration
SP124V	713441.8	1488847.7	53N	67W	18	NENE	High Solids Bentonite	4/15/2015	X	Exploration
SP125V	713245.5	1488527.0	53N	67W	18	NENE	High Solids Bentonite	2/19/2015	X	Exploration
SP126V	713128.2	1488513.7	53N	67W	18	NENE	High Solids Bentonite	2/19/2015	X	Exploration
SP127V	713439.5	1489207.0	53N	67W	7	SESE	High Solids Bentonite	4/28/2015	X	Exploration
SP128V	713265.0	1489303.4	53N	67W	7	SESE	High Solids Bentonite	4/1/2015	X	Exploration
SP130V	712201.0	1488510.7	53N	67W	18	NWNE	High Solids Bentonite	2/6/2015	X	Exploration
SP131V	712334.8	1488787.9	53N	67W	18	NWNE	High Solids Bentonite	2/11/2015	X	Exploration
SP132V	712430.2	1489011.5	53N	67W	7	SWSE	High Solids Bentonite	7/16/2013	X	Exploration
SP133V	712629.8	1489265.7	53N	67W	7	SWSE	Cement	7/10/2013	X	Exploration
SP139V	712571.9	1489184.6	53N	67W	7	SWSE	High Solids Bentonite	8/19/2013	X	Exploration
SP144V	713389.4	1489302.1	53N	67W	7	SESE	High Solids Bentonite	4/6/2015	X	Exploration
SP145V	713505.6	1489106.8	53N	67W	7	SESE	High Solids Bentonite	3/16/2015	X	Exploration
SP151R	712803.7	1488788.5	53N	67W	18	NWNE	High Solids Bentonite	2/18/2015	X	Exploration
SP210V	712508.7	1489072.7	53N	67W	7	SWSE	High Solids Bentonite	7/11/2013	X	Exploration
SP211V	712524.2	1489254.9	53N	67W	7	SWSE	Cement	7/10/2013	X	Exploration
SP212V	712552.4	1489329.3	53N	67W	7	SWSE	Cement	7/9/2013	X	Exploration
SP213V	712322.6	1489005.6	53N	67W	7	SWSE	High Solids Bentonite	4/15/2015	X	Exploration
SP214V	712457.1	1489153.1	53N	67W	7	SWSE	High Solids Bentonite	7/23/2013	X	Exploration
SP215V	712394.1	1489107.5	53N	67W	7	SWSE	Cement	7/18/2013	X	Exploration
SP216V	712427.8	1489300.4	53N	67W	7	SWSE	High Solids Bentonite	7/17/2013	X	Exploration
SP218V	712393.9	1489209.7	53N	67W	7	SWSE	High Solids Bentonite	7/11/2013	X	Exploration
SP238V	712307.3	1489270.0	53N	67W	7	SWSE	High Solids Bentonite	4/15/2015	X	Exploration

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
SP280V	712783.8	1489526.3	53N	67W	7	SWSE	High Solids Bentonite	4/13/2015	X	Exploration
SP281V	712928.1	1489613.1	53N	67W	7	SWSE	High Solids Bentonite	3/12/2015	X	Exploration
SP282V	713062.7	1489507.8	53N	67W	7	SWSE	High Solids Bentonite	8/22/2013	X	Exploration
SP283V	713059.8	1489293.8	53N	67W	7	SWSE	High Solids Bentonite	4/9/2015	X	Exploration
SP284V	713061.7	1489613.8	53N	67W	7	SWSE	High Solids Bentonite	4/1/2015	X	Exploration
SP285V	713151.1	1489552.6	53N	67W	7	SESE	High Solids Bentonite	4/1/2015	X	Exploration
SP286V	713149.5	1489452.7	53N	67W	7	SESE	High Solids Bentonite	4/1/2015	X	Exploration
SP287V	713328.2	1489354.2	53N	67W	7	SESE	High Solids Bentonite	4/2/2015	X	Exploration
SP288V	712039.1	1488681.1	53N	67W	18	NWNE	High Solids Bentonite	2/19/2015	X	Exploration
SP310V	713042.0	1488447.1	53N	67W	18	NWNE	Cement	3/26/2013	X	Exploration
SP311V	712951.1	1488354.5	53N	67W	18	NWNE	Cement	3/28/2013	X	Exploration
SP312V	712907.7	1488171.4	53N	67W	18	NWNE	High Solids Bentonite	6/1/2015	X	Exploration
SP314V	712459.0	1488271.6	53N	67W	18	NWNE	Cement	10/4/2012	X	Exploration
SP315V	712430.3	1488115.7	53N	67W	18	NWNE	High Solids Bentonite	4/7/2015	X	Exploration
SP316V	712341.1	1488064.5	53N	67W	18	NWNE	High Solids Bentonite	4/7/2015	X	Exploration
SP317V	712317.1	1488160.4	53N	67W	18	NWNE	High Solids Bentonite	4/10/2015	X	Exploration
SP318V	712376.8	1488302.0	53N	67W	18	NWNE	High Solids Bentonite	4/7/2015	X	Exploration
SP319V	712216.2	1488013.7	53N	67W	18	NWNE	High Solids Bentonite	4/9/2015	X	Exploration
SP340V	712051.8	1488145.2	53N	67W	18	NWNE	High Solids Bentonite	4/8/2015	X	Exploration
SP341V	711771.8	1488115.9	53N	67W	18	NWNE	Cement	4/2/2013	X	Exploration
SP342V	711836.6	1488039.4	53N	67W	18	NWNE	High Solids Bentonite	4/17/2015	X	Exploration
SP343V	712213.4	1487880.9	53N	67W	18	NWNE	High Solids Bentonite	4/17/2015	X	Exploration
SP346V	713051.8	1488341.3	53N	67W	18	NWNE	High Solids Bentonite	2/20/2015	X	Exploration
SP347V	711813.9	1488498.3	53N	67W	18	NWNE	High Solids Bentonite	8/21/2013	X	Exploration
SP348V	711534.8	1488391.2	53N	67W	18	NENW	High Solids Bentonite	4/16/2015	X	Exploration
SP448R	712727.4	1488710.3	53N	67W	18	NWNE	High Solids Bentonite	4/14/2015	X	Exploration
SP449R	712338.2	1488667.3	53N	67W	18	NWNE	High Solids Bentonite	2/11/2015	X	Exploration
SP469V	713342.6	1489153.3	53N	67W	7	SESE	High Solids Bentonite	7/15/2013	X	Exploration
SP480R	712621.9	1488814.1	53N	67W	18	NWNE	High Solids Bentonite	2/13/2015	X	Exploration

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
SP480V	713294.7	1489153.9	53N	67W	7	SESE	High Solids Bentonite	8/22/2013	X	Exploration
SP481R	712781.0	1488628.5	53N	67W	18	NWNE	High Solids Bentonite	4/30/2015	X	Exploration
SP481V	713244.1	1489154.1	53N	67W	7	SESE	High Solids Bentonite	7/24/2013	X	Exploration
SP482R	712924.4	1488824.3	53N	67W	18	NWNE	High Solids Bentonite	3/19/2015	X	Exploration
SP482V	713189.1	1489153.0	53N	67W	7	SESE	High Solids Bentonite	7/31/2013	X	Exploration
SP483R	712678.2	1488625.0	53N	67W	18	NWNE	High Solids Bentonite	3/23/2015	X	Exploration
SP483V	712405.8	1489153.0	53N	67W	7	SWSE	High Solids Bentonite	7/17/2013	X	Exploration
SP484R	712872.4	1488625.2	53N	67W	18	NWNE	High Solids Bentonite	2/24/2015	X	Exploration
SP484V	712507.9	1489152.6	53N	67W	7	SWSE	High Solids Bentonite	4/14/2015	X	Exploration
SP485R	712624.6	1488910.1	53N	67W	18	NWNE	High Solids Bentonite	3/25/2015	X	Exploration
SP485V	712766.9	1489180.0	53N	67W	7	SWSE	High Solids Bentonite	7/23/2013	X	Exploration
SP486R	712935.5	1488721.8	53N	67W	18	NWNE	High Solids Bentonite	3/19/2015	X	Exploration
SP486V	712814.3	1489161.2	53N	67W	7	SWSE	High Solids Bentonite	7/29/2013	X	Exploration
SP487R	713002.1	1488777.5	53N	67W	18	NWNE	High Solids Bentonite	3/18/2015	X	Exploration
SP488R	712976.1	1488620.8	53N	67W	18	NWNE	High Solids Bentonite	3/20/2015	X	Exploration
SP489R	713072.2	1488624.7	53N	67W	18	NWNE	High Solids Bentonite	4/14/2015	X	Exploration
SP510R	713030.0	1488968.3	53N	67W	18	NWNE	High Solids Bentonite	3/24/2015	X	Exploration
SP511R	713082.8	1488736.8	53N	67W	18	NWNE	High Solids Bentonite	4/27/2015	X	Exploration
SP512R	712585.8	1488568.0	53N	67W	18	NWNE	High Solids Bentonite	4/14/2015	X	Exploration
SP513R	712486.1	1488573.8	53N	67W	18	NWNE	High Solids Bentonite	4/13/2015	X	Exploration
SP514R	713066.3	1489051.1	53N	67W	7	SWSE	High Solids Bentonite	3/26/2015	X	Exploration
SP515R	712926.1	1489029.7	53N	67W	7	SWSE	High Solids Bentonite	4/9/2015	X	Exploration
SP516R	712727.3	1489025.5	53N	67W	7	SWSE	High Solids Bentonite	2/19/2015	X	Exploration
SP517R	712627.5	1489024.2	53N	67W	7	SWSE	High Solids Bentonite	3/31/2015	X	Exploration
SP518R	712717.8	1489193.8	53N	67W	7	SWSE	High Solids Bentonite	3/30/2015	X	Exploration
SP519R	712976.4	1489119.0	53N	67W	7	SWSE	High Solids Bentonite	2/26/2015	X	Exploration
SP531R	713040.5	1488873.8	53N	67W	18	NWNE	High Solids Bentonite	2/17/2015	X	Exploration
SP532R	712618.3	1488709.3	53N	67W	18	NWNE	High Solids Bentonite	2/11/2015	X	Exploration
SP533R	712530.4	1488961.2	53N	67W	18	NWNE	High Solids Bentonite	4/14/2015	X	Exploration

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
SP534R	712531.5	1488857.1	53N	67W	18	NWNE	High Solids Bentonite	2/12/2015	X	Exploration
SP535R	712531.4	1488754.7	53N	67W	18	NWNE	High Solids Bentonite	2/12/2015	X	Exploration
SP536R	712537.9	1488655.5	53N	67W	18	NWNE	High Solids Bentonite	2/13/2015	X	Exploration
SP537R	712415.6	1488707.2	53N	67W	18	NWNE	High Solids Bentonite	2/12/2015	X	Exploration
SP538R	712442.8	1488797.0	53N	67W	18	NWNE	High Solids Bentonite	2/12/2015	X	Exploration
SP564V	713523.5	1489136.5	53N	67W	7	SESE	High Solids Bentonite	4/7/2015	X	Exploration
SP565V	713480.7	1489198.4	53N	67W	7	SESE	High Solids Bentonite	3/12/2015	X	Exploration
SP566V	713442.7	1489285.4	53N	67W	7	SESE	Cement	7/9/2013	X	Exploration
SP580R	712872.1	1489112.3	53N	67W	7	SWSE	High Solids Bentonite	2/18/2015	X	Exploration
SP581R	712770.9	1489110.2	53N	67W	7	SWSE	High Solids Bentonite	3/2/2015	X	Exploration
SP582R	712675.8	1489103.4	53N	67W	7	SWSE	High Solids Bentonite	4/14/2015	X	Exploration
SP583R	712810.2	1489224.9	53N	67W	7	SWSE	High Solids Bentonite	3/30/2015	X	Exploration
SP584R	712919.3	1489217.5	53N	67W	7	SWSE	High Solids Bentonite	3/27/2015	X	Exploration
SP585R	713006.4	1489197.4	53N	67W	7	SWSE	High Solids Bentonite	3/26/2015	X	Exploration
SP586R	712975.4	1489299.8	53N	67W	7	SWSE	High Solids Bentonite	3/27/2015	X	Exploration
SP588R	712740.0	1489296.3	53N	67W	7	SWSE	High Solids Bentonite	4/27/2015	X	Exploration
SP620R	712964.5	1489411.9	53N	67W	7	SWSE	High Solids Bentonite	4/9/2015	X	Exploration
SP621R	712884.4	1489510.1	53N	67W	7	SWSE	High Solids Bentonite	4/10/2015	X	Exploration
SP622R	712974.0	1489523.0	53N	67W	7	SWSE	High Solids Bentonite	3/6/2015	X	Exploration
SP623R	712711.2	1487922.9	53N	67W	18	NWNE	High Solids Bentonite	2/3/2015	X	Exploration
SP624R	713083.8	1489405.5	53N	67W	7	SWSE	High Solids Bentonite	3/16/2015	X	Exploration
SP625R	712374.3	1488567.1	53N	67W	18	NWNE	High Solids Bentonite	4/14/2015	X	Exploration
SP626R	712289.5	1488559.4	53N	67W	18	NWNE	High Solids Bentonite	4/15/2015	X	Exploration
SP627R	712707.7	1488259.5	53N	67W	18	NWNE	Cement	10/5/2012	X	Exploration
SP629R	712729.4	1488435.9	53N	67W	18	NWNE	High Solids Bentonite	2/13/2015	X	Exploration
SP660R	712780.9	1488520.3	53N	67W	18	NWNE	High Solids Bentonite	2/12/2015	X	Exploration
SP661R	712924.3	1488455.8	53N	67W	18	NWNE	High Solids Bentonite	2/12/2015	X	Exploration
SP662R	712881.8	1488530.0	53N	67W	18	NWNE	High Solids Bentonite	2/12/2015	X	Exploration
SP663R	712659.5	1488524.6	53N	67W	18	NWNE	High Solids Bentonite	4/10/2015	X	Exploration

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
SP664R	712573.7	1488276.4	53N	67W	18	NWNE	High Solids Bentonite	4/9/2015	X	Exploration
SP665R	712662.4	1488344.7	53N	67W	18	NWNE	High Solids Bentonite	4/9/2015	X	Exploration
SP666R	712579.3	1488472.1	53N	67W	18	NWNE	High Solids Bentonite	4/10/2015	X	Exploration
SP667R	712757.5	1488141.5	53N	67W	18	NWNE	Cement	6/18/2013	X	Exploration
SP668R	712650.2	1488148.6	53N	67W	18	NWNE	High Solids Bentonite	4/23/2015	X	Exploration
SP669R	712850.2	1488257.1	53N	67W	18	NWNE	Cement	3/29/2013	X	Exploration
SP683V	713538.8	1489304.5	53N	67W	7	SESE	High Solids Bentonite	3/16/2015	X	Exploration
SP684V	713584.6	1489225.0	53N	67W	7	SESE	High Solids Bentonite	3/23/2015	X	Exploration
SP685V	713611.2	1489063.4	53N	67W	7	SESE	High Solids Bentonite	4/8/2015	X	Exploration
SP690R	712986.8	1488533.6	53N	67W	18	NWNE	High Solids Bentonite	3/20/2015	X	Exploration
SP691R	712612.7	1488060.9	53N	67W	18	NWNE	High Solids Bentonite	4/24/2015	X	Exploration
SP692R	712542.4	1488145.4	53N	67W	18	NWNE	High Solids Bentonite	4/24/2015	X	Exploration
SP693R	712824.7	1488395.8	53N	67W	18	NWNE	High Solids Bentonite	4/10/2015	X	Exploration
SP694R	712476.9	1488473.1	53N	67W	18	NWNE	High Solids Bentonite	4/13/2015	X	Exploration
SP695R	712381.5	1488468.7	53N	67W	18	NWNE	High Solids Bentonite	4/13/2015	X	Exploration
SP696R	712281.7	1488459.9	53N	67W	18	NWNE	High Solids Bentonite	2/6/2015	X	Exploration
SP697R	712284.8	1488361.6	53N	67W	18	NWNE	High Solids Bentonite	4/8/2015	X	Exploration
SP698R	712270.9	1488253.6	53N	67W	18	NWNE	High Solids Bentonite	2/11/2015	X	Exploration
SP699R	712136.4	1488057.1	53N	67W	18	NWNE	High Solids Bentonite	4/8/2015	X	Exploration
SP730R	712024.9	1488042.1	53N	67W	18	NWNE	High Solids Bentonite	4/17/2015	X	Exploration
SP731R	711984.4	1487943.5	53N	67W	18	NWNE	High Solids Bentonite	4/17/2015	X	Exploration
SP732R	711887.5	1487942.6	53N	67W	18	NWNE	High Solids Bentonite	4/16/2015	X	Exploration
SP735R	711928.2	1488085.0	53N	67W	18	NWNE	High Solids Bentonite	4/22/2015	X	Exploration
SP736R	711855.3	1488170.0	53N	67W	18	NWNE	High Solids Bentonite	4/21/2015	X	Exploration
SP737R	711682.2	1488237.5	53N	67W	18	NENW	High Solids Bentonite	4/20/2015	X	Exploration
SP738R	711597.0	1488171.6	53N	67W	18	NENW	High Solids Bentonite	4/16/2015	X	Exploration
SP758R	712783.6	1488365.0	53N	67W	18	NWNE	High Solids Bentonite	7/30/2013	X	Exploration
SP773R	712435.1	1488393.0	53N	67W	18	NWNE	High Solids Bentonite	4/9/2015	X	Exploration
SP780R	711639.2	1488339.1	53N	67W	18	NENW	High Solids Bentonite	4/15/2015	X	Exploration

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
SP781R	711405.8	1488183.2	53N	67W	18	NENW	High Solids Bentonite	4/22/2015	X	Exploration
SP788R	711622.0	1488042.8	53N	67W	18	NENW	High Solids Bentonite	4/16/2015	X	Exploration
SP789R	712204.6	1488298.8	53N	67W	18	NWNE	High Solids Bentonite	2/9/2015	X	Exploration
SP810R	712115.3	1488319.2	53N	67W	18	NWNE	High Solids Bentonite	4/10/2015	X	Exploration
SP812R	711829.9	1488343.6	53N	67W	18	NWNE	High Solids Bentonite	4/20/2015	X	Exploration
SP813R	711759.6	1488281.2	53N	67W	18	NWNE	High Solids Bentonite	4/30/2015	X	Exploration
SP873R	712918.9	1487956.1	53N	67W	18	NWNE	High Solids Bentonite	2/3/2015	X	Exploration
SP874R	713023.7	1487981.1	53N	67W	18	NWNE	High Solids Bentonite	2/2/2015	X	Exploration
SP875R	712979.1	1488067.4	53N	67W	18	NWNE	High Solids Bentonite	6/1/2015	X	Exploration
SP876R	712825.3	1487986.5	53N	67W	18	NWNE	High Solids Bentonite	4/22/2015	X	Exploration
SP877R	712891.4	1487851.8	53N	67W	18	NWNE	High Solids Bentonite	1/29/2015	X	Exploration
SP878R	712733.6	1488020.5	53N	67W	18	NWNE	High Solids Bentonite	6/9/2015	X	Exploration
SP879R	713075.5	1488078.8	53N	67W	18	NWNE	High Solids Bentonite	6/9/2015	X	Exploration
SP910R	712893.3	1487738.0	53N	67W	18	NWNE	High Solids Bentonite	2/2/2015	X	Exploration
SP911R	712601.1	1487923.2	53N	67W	18	NWNE	High Solids Bentonite	6/9/2015	X	Exploration
SP912R	712833.8	1488032.6	53N	67W	18	NWNE	High Solids Bentonite	4/23/2015	X	Exploration
SP913R	712809.0	1487798.6	53N	67W	18	NWNE	High Solids Bentonite	4/20/2015	X	Exploration
SP916R	712661.2	1487835.5	53N	67W	18	NWNE	High Solids Bentonite	4/20/2015	X	Exploration
SP917R	712786.9	1487884.5	53N	67W	18	NWNE	High Solids Bentonite	4/21/2015	X	Exploration
SP918R	712980.1	1487904.3	53N	67W	18	NWNE	High Solids Bentonite	4/21/2015	X	Exploration
SP930R	712659.6	1487733.6	53N	67W	18	NWNE	High Solids Bentonite	4/20/2015	X	Exploration
SP931R	712579.1	1487776.0	53N	67W	18	NWNE	High Solids Bentonite	4/21/2015	X	Exploration
SP932R	712483.9	1488020.3	53N	67W	18	NWNE	High Solids Bentonite	4/9/2015	X	Exploration
SP933R	713013.5	1488204.5	53N	67W	18	NWNE	High Solids Bentonite	4/13/2015	X	Exploration
SP936R	713194.2	1488019.8	53N	67W	18	NENE	High Solids Bentonite	6/1/2015	X	Exploration
SP937R	713119.7	1487853.4	53N	67W	18	NENE	High Solids Bentonite	1/26/2015	X	Exploration
SP939R	712438.3	1487961.4	53N	67W	18	NWNE	High Solids Bentonite	6/10/2015	X	Exploration
SP970R	712326.4	1487985.8	53N	67W	18	NWNE	High Solids Bentonite	4/8/2015	X	Exploration
SP971R	712307.9	1487740.1	53N	67W	18	NWNE	High Solids Bentonite	4/20/2015	X	Exploration

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
SP972R	712736.3	1487816.6	53N	67W	18	NWNE	High Solids Bentonite	1/30/2015	X	Exploration
SP973R	712762.7	1487709.1	53N	67W	18	NWNE	High Solids Bentonite	2/5/2015	X	Exploration
SP975R	713431.9	1488124.6	53N	67W	18	NENE	High Solids Bentonite	6/1/2015	X	Exploration
SP978R	713279.2	1488232.1	53N	67W	18	NENE	High Solids Bentonite	5/1/2015	X	Exploration
SP1001R	712199.5	1487782.4	53N	67W	18	NWNE	High Solids Bentonite	1/21/2015	X	Exploration
SP1002R	712012.1	1487654.3	53N	67W	18	SWNE	High Solids Bentonite	1/23/2015	X	Exploration
SP1004R	712077.0	1487739.7	53N	67W	18	NWNE	High Solids Bentonite	1/23/2015	X	Exploration
SP1009R	712137.9	1487711.2	53N	67W	18	NWNE	High Solids Bentonite	1/26/2015	X	Exploration
SP1052R	713226.4	1487930.3	53N	67W	18	NENE	High Solids Bentonite	1/28/2015	X	Exploration
SP1053R	713434.9	1488014.9	53N	67W	18	NENE	High Solids Bentonite	1/27/2015	X	Exploration
SP1054R	713532.0	1488319.8	53N	67W	18	NENE	Cement	4/4/2013	X	Exploration
SP1057R	712007.5	1487786.5	53N	67W	18	NWNE	High Solids Bentonite	6/2/2015	X	Exploration
SP1088R	713492.3	1488939.1	53N	67W	18	NENE	High Solids Bentonite	4/15/2015	X	Exploration
SPD41E	712079.0	1488558.2	53N	67W	18	NWNE	Cement	3/14/2013	X	Exploration
SPD147E	712129.7	1488559.5	53N	67W	18	NWNE	Cement	3/20/2013	X	Exploration
SPD343M	712133.3	1489059.1	53N	67W	7	SWSE	High Solids Bentonite	2/20/2015	X	Exploration
SPD344M	712219.9	1488132.9	53N	67W	18	NWNE	High Solids Bentonite	2/11/2015	X	Exploration
SPD347M	712163.8	1488418.6	53N	67W	18	NWNE	Cement	10/4/2012	X	Exploration
SPD348M	711851.0	1487841.5	53N	67W	18	NWNE	High Solids Bentonite	2/5/2015	X	Exploration
SPD736M	711762.0	1488385.3	53N	67W	18	NWNE	High Solids Bentonite	4/16/2015	X	Exploration
SPD738M	712826.6	1488916.3	53N	67W	18	NWNE	High Solids Bentonite	2/18/2015	X	Exploration
SPD739M	712831.8	1488445.3	53N	67W	18	NWNE	High Solids Bentonite	2/13/2015	X	Exploration
SPD785M	712864.9	1489414.2	53N	67W	7	SWSE	High Solids Bentonite	4/13/2015	X	Exploration
SPD786M	713290.6	1488935.3	53N	67W	18	NENE	High Solids Bentonite	2/19/2015	X	Exploration
SPD787M	713317.3	1488432.7	53N	67W	18	NENE	High Solids Bentonite	2/19/2015	X	Exploration
SPD788M	713373.2	1489433.8	53N	67W	7	SESE	High Solids Bentonite	3/3/2015	X	Exploration
RMR0005	712708.3	1487920.6	53N	67W	18	NWNE	High Solids Bentonite	2/4/2015	X	Delineation
RMR0007	712916.5	1487954.6	53N	67W	18	NWNE	High Solids Bentonite	2/3/2015	X	Delineation
RMR0008	712825.9	1488815.4	53N	67W	18	NWNE	Cement	3/19/2013	X	Delineation

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
RMR0009	712475.7	1488477.1	53N	67W	18	NWNE	Cement	3/27/2013	X	Delineation
RMR0010	712661.2	1488525.6	53N	67W	18	NWNE	Cement	3/21/2013	X	Delineation
RMR0011	712679.4	1488624.0	53N	67W	18	NWNE	Cement	3/22/2013	X	Delineation
RMR0012	712779.0	1488630.2	53N	67W	18	NWNE	Cement	3/20/2013	X	Delineation
RMR0013	712826.8	1488717.5	53N	67W	18	NWNE	Cement	6/18/2013	X	Delineation
RMR0014	712540.9	1488361.2	53N	67W	18	NWNE	Cement	3/28/2013	X	Delineation
RMR0015	712724.6	1488814.4	53N	67W	18	NWNE	Cement	3/14/2013	X	Delineation
RMR0016	712622.0	1488817.5	53N	67W	18	NWNE	Cement	3/20/2013	X	Delineation
RMR0017	712633.3	1488913.0	53N	67W	18	NWNE	Cement	3/20/2013	X	Delineation
RMR0018	712463.8	1488987.0	53N	67W	18	NWNE	Cement	3/29/2013	X	Delineation
RMR0022	712859.7	1488871.8	53N	67W	18	NWNE	Cement	3/28/2013	X	Delineation
RMR0023	712862.1	1488482.7	53N	67W	18	NWNE	Cement	3/22/2013	X	Delineation
RMR0024	712892.4	1488364.5	53N	67W	18	NWNE	Cement	3/27/2013	X	Delineation
RMR0025	712887.5	1487803.7	53N	67W	18	NWNE	High Solids Bentonite	1/30/2015	X	Delineation
RMR0026	712452.3	1488052.9	53N	67W	18	NWNE	High Solids Bentonite	3/17/2015	X	Delineation
RMR0027	712272.8	1488069.7	53N	67W	18	NWNE	High Solids Bentonite	4/9/2015	X	Delineation
RMR0028	712464.1	1488642.5	53N	67W	18	NWNE	Cement	3/21/2013	X	Delineation
RMR0037	711725.5	1488183.0	53N	67W	18	NWNE	Cement	3/28/2013	X	Delineation
RMR0076	711593.2	1488219.0	53N	67W	18	NENW	Cement	4/1/2013	X	Delineation
RMR0078	711462.2	1488156.1	53N	67W	18	NENW	Cement	4/1/2013	X	Delineation
RMR0079	711579.2	1488302.0	53N	67W	18	NENW	Cement	6/18/2013	X	Delineation
RMR0094	712622.0	1488189.8	53N	67W	18	NWNE	Cement	3/28/2013	X	Delineation
RMR0095	712877.0	1488773.0	53N	67W	18	NWNE	Cement	3/20/2013	X	Delineation
RMR0096	712927.5	1488622.4	53N	67W	18	NWNE	Cement	3/13/2013	X	Delineation
RMR0097	712881.6	1488717.1	53N	67W	18	NWNE	Cement	3/15/2013	X	Delineation
RMR0387	713494.2	1488889.4	53N	67W	18	NENE	Cement	3/27/2010	X	Delineation
RMR0388	713496.9	1488839.6	53N	67W	18	NENE	Cement	3/27/2010	X	Delineation
RMR0389	713499.4	1488790.5	53N	67W	18	NENE	Cement	3/27/2010	X	Delineation
RMR0390	713182.3	1489250.5	53N	67W	7	SESE	Cement	4/11/2010	X	Delineation

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
RMR0391	713209.6	1489291.6	53N	67W	7	SESE	Cement	4/11/2010	X	Delineation
RMR0392	713290.8	1489253.7	53N	67W	7	SESE	Cement	4/11/2010	X	Delineation
RMR0393	713013.9	1489458.9	53N	67W	7	SWSE	Cement	3/27/2010	X	Delineation
RMR0394	713168.6	1489613.6	53N	67W	7	SESE	Cement	4/9/2010	X	Delineation
RMR0395	713163.9	1489662.5	53N	67W	7	SESE	Cement	4/9/2010	X	Delineation
RMR0764	712318.3	1488411.8	53N	67W	18	NWNE	Cement	3/22/2013	X	Delineation
RMR0765	712021.0	1488400.4	53N	67W	18	NWNE	Cement	3/29/2013	X	Delineation
RMR0766	712718.0	1488119.4	53N	67W	18	NWNE	Cement	3/28/2013	X	Delineation
RMR0767	712519.5	1488048.8	53N	67W	18	NWNE	High Solids Bentonite	4/13/2015	X	Delineation
RMR0769	713108.6	1488164.2	53N	67W	18	NENE	Cement	4/4/2013	X	Delineation
RMR2519	711781.2	1488251.1	53N	67W	18	NWNE	Cement	1/21/2013	X	Delineation
RMR2521	711706.1	1488467.0	53N	67W	18	NENW	Cement	1/21/2013	X	Delineation
RMR2523	711416.8	1488301.0	53N	67W	18	NENW	Cement	1/21/2013	X	Delineation
RMR2525	711886.4	1488568.1	53N	67W	18	NWNE	Cement	1/22/2013	X	Delineation
RMR2527	712004.9	1488644.9	53N	67W	18	NWNE	Cement	1/22/2013	X	Delineation
RMR2529	711964.7	1488419.7	53N	67W	18	NWNE	Cement	1/22/2013	X	Delineation
RMR2531	712018.4	1488228.4	53N	67W	18	NWNE	Cement	1/28/2013	X	Delineation
RMR2532	712142.7	1488638.4	53N	67W	18	NWNE	Cement	1/21/2013	X	Delineation
RMR2533	713246.2	1488604.1	53N	67W	18	NENE	Cement	1/24/2013	X	Delineation
RMR2534	712297.0	1488720.2	53N	67W	18	NWNE	Cement	1/21/2013	X	Delineation
RMR2535	713490.8	1488474.7	53N	67W	18	NENE	Cement	1/25/2013	X	Delineation
RMR2536	712372.2	1488845.0	53N	67W	18	NWNE	Cement	1/21/2013	X	Delineation
RMR2537	713504.7	1488685.9	53N	67W	18	NENE	Cement	1/24/2013	X	Delineation
RMR2538	712380.4	1488520.2	53N	67W	18	NWNE	Cement	1/22/2013	X	Delineation
RMR2539	713639.4	1488686.6	53N	67W	18	NENE	Cement	1/25/2013	X	Delineation
RMR2540	712967.1	1488268.5	53N	67W	18	NWNE	Cement	1/22/2013	X	Delineation
RMR2541	713131.5	1488607.4	53N	67W	18	NENE	Cement	1/22/2013	X	Delineation
RMR2542	713176.6	1488435.6	53N	67W	18	NENE	Cement	1/23/2013	X	Delineation
RMR2543	713248.1	1488347.3	53N	67W	18	NENE	Cement	1/23/2013	X	Delineation

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
RMR2544	713218.1	1488276.7	53N	67W	18	NENE	Cement	1/24/2013	X	Delineation
RMR2545	713326.1	1488734.9	53N	67W	18	NENE	Cement	1/23/2013	X	Delineation
RMR2547	712144.0	1488825.3	53N	67W	18	NWNE	Cement	1/28/2013	X	Delineation
RMR2548	711788.3	1488836.5	53N	67W	18	NWNE	Cement	1/28/2013	X	Delineation
RMR2550	711404.5	1488463.0	53N	67W	18	NENW	Cement	1/29/2013	X	Delineation
RMR2563	712316.1	1489079.6	53N	67W	7	SWSE	High Solids Bentonite	7/22/2013	X	Delineation
RMR2564	713612.8	1489130.0	53N	67W	7	SESE	High Solids Bentonite	8/8/2013	X	Delineation
RMR2565	713587.6	1489306.0	53N	67W	7	SESE	High Solids Bentonite	8/7/2013	X	Delineation
RMR2566	713213.1	1489665.6	53N	67W	7	SESE	High Solids Bentonite	8/7/2013	X	Delineation
RMR2567	713664.0	1489386.9	53N	67W	7	SESE	High Solids Bentonite	8/13/2013	X	Delineation
RMR2568	713507.7	1489417.2	53N	67W	7	SESE	High Solids Bentonite	8/13/2013	X	Delineation
RMR2569	713090.4	1489659.4	53N	67W	7	SESE	High Solids Bentonite	8/13/2013	X	Delineation
RMR2570	713719.1	1489119.8	53N	67W	7	SESE	High Solids Bentonite	8/12/2013	X	Delineation
RMR2571	713218.4	1489772.5	53N	67W	7	SESE	High Solids Bentonite	8/29/2013	X	Delineation
RMR2572	713612.3	1489176.0	53N	67W	7	SESE	High Solids Bentonite	8/29/2013	X	Delineation
RMR2573	712344.1	1488842.7	53N	67W	18	NWNE	High Solids Bentonite	9/3/2013	X	Delineation
RMR2574	713217.2	1489600.9	53N	67W	7	SESE	High Solids Bentonite	9/3/2013	X	Delineation
RMR2575	713013.6	1489657.9	53N	67W	7	SESE	High Solids Bentonite	9/3/2013	X	Delineation
RMR2576	713131.4	1489843.0	53N	67W	7	SESE	High Solids Bentonite	9/3/2013	X	Delineation
RMR2577	713664.4	1489226.7	53N	67W	7	SESE	High Solids Bentonite	9/16/2013	X	Delineation
RMR2578	713047.0	1489725.9	53N	67W	7	SESE	High Solids Bentonite	9/6/2013	X	Delineation
RMR2579	713280.7	1489672.3	53N	67W	7	SESE	High Solids Bentonite	9/6/2013	X	Delineation
RMR2580	713274.3	1489828.4	53N	67W	7	SESE	High Solids Bentonite	9/9/2013	X	Delineation
RMR2581	713614.5	1488903.8	53N	67W	18	NENE	Cement	1/28/2013	X	Delineation
RMR2582	713422.5	1488609.0	53N	67W	18	NENE	Cement	1/28/2013	X	Delineation
RMR2583	713479.6	1488299.5	53N	67W	18	NENE	Cement	1/29/2013	X	Delineation
RMR2584	713814.8	1488944.8	53N	67W	18	NENE	Cement	1/29/2013	X	Delineation
RMR2585	713766.8	1488817.4	53N	67W	18	NENE	Cement	1/29/2013	X	Delineation
RMR2589	713554.9	1488730.7	53N	67W	18	NENE	Cement	2/4/2013	X	Delineation

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
RMR2590	713394.9	1488511.9	53N	67W	18	NENE	Cement	2/6/2013	X	Delineation
RMR2591	713474.5	1488388.9	53N	67W	18	NENE	Cement	2/5/2013	X	Delineation
RMR2592	711650.7	1488397.5	53N	67W	18	NENW	Cement	2/1/2013	X	Delineation
RMR2593	711402.7	1488195.6	53N	67W	18	NENW	Cement	2/1/2013	X	Delineation
RMR2596	711952.2	1488536.1	53N	67W	18	NWNE	Cement	2/4/2013	X	Delineation
RMR2597	712067.6	1488625.2	53N	67W	18	NWNE	Cement	2/4/2013	X	Delineation
RMR2598	712223.1	1488766.4	53N	67W	18	NWNE	Cement	2/4/2013	X	Delineation
RMR2600	713757.7	1488568.2	53N	67W	18	NENE	Cement	2/5/2013	X	Delineation
RMR2606	713764.8	1488898.3	53N	67W	18	NENE	Cement	2/4/2013	X	Delineation
RMR2607	711745.6	1488534.6	53N	67W	18	NWNE	Cement	2/5/2013	X	Delineation
RMR2608	711820.3	1488393.6	53N	67W	18	NWNE	Cement	2/5/2013	X	Delineation
RMR2609	712130.7	1488935.0	53N	67W	18	NWNE	Cement	2/4/2013	X	Delineation
RMR2612	712086.9	1488704.8	53N	67W	18	NWNE	Cement	2/5/2013	X	Delineation
RMR2613	712363.4	1488762.3	53N	67W	18	NWNE	Cement	2/5/2013	X	Delineation
RMR2614	711641.1	1488535.7	53N	67W	18	NENW	Cement	2/6/2013	X	Delineation
RMR2615	711761.2	1488696.1	53N	67W	18	NWNE	Cement	2/6/2013	X	Delineation
RMR2616	711555.9	1488473.0	53N	67W	18	NENW	Cement	2/6/2013	X	Delineation
RMR2617	713520.2	1488620.6	53N	67W	18	NENE	Cement	2/6/2013	X	Delineation
RMR2619	713697.3	1488638.6	53N	67W	18	NENE	Cement	2/11/2013	X	Delineation
RMR2620	713654.3	1488978.7	53N	67W	18	NENE	Cement	2/8/2013	X	Delineation
RMR2621	713541.0	1488975.8	53N	67W	18	NENE	Cement	2/8/2013	X	Delineation
RMR2622	713325.0	1488646.2	53N	67W	18	NENE	Cement	2/11/2013	X	Delineation
RMR2623	713296.9	1488511.1	53N	67W	18	NENE	Cement	2/11/2013	X	Delineation
RMR2624	713067.1	1488278.6	53N	67W	18	NWNE	Cement	2/12/2013	X	Delineation
RMR2626	712233.6	1488496.9	53N	67W	18	NWNE	Cement	2/12/2013	X	Delineation
RMR2627	712225.8	1488647.7	53N	67W	18	NWNE	Cement	2/12/2013	X	Delineation
RMR2628	711919.9	1488122.4	53N	67W	18	NWNE	Cement	2/11/2013	X	Delineation
RMR2629	711844.7	1488207.7	53N	67W	18	NWNE	Cement	2/11/2013	X	Delineation
RMR2637	713679.5	1488907.6	53N	67W	18	NENE	Cement	2/14/2013	X	Delineation

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
RMR2638	713598.9	1488977.1	53N	67W	18	NENE	Cement	2/15/2013	X	Delineation
RMR2644	712182.2	1488709.3	53N	67W	18	NWNE	Cement	2/13/2013	X	Delineation
RMR2645	713039.7	1488519.1	53N	67W	18	NWNE	Cement	2/14/2013	X	Delineation
RMR2646	713022.5	1488390.4	53N	67W	18	NWNE	Cement	2/14/2013	X	Delineation
RMR2647	713342.2	1488363.9	53N	67W	18	NENE	Cement	2/15/2013	X	Delineation
RMR2649	712241.4	1489043.4	53N	67W	7	SWSE	High Solids Bentonite	7/16/2013	X	Delineation
RMR2650	712241.5	1489212.5	53N	67W	7	SWSE	High Solids Bentonite	7/17/2013	X	Delineation
RMR2651	712390.5	1489299.9	53N	67W	7	SWSE	High Solids Bentonite	7/23/2013	X	Delineation
RMR2652	712677.3	1489471.8	53N	67W	7	SWSE	High Solids Bentonite	8/6/2013	X	Delineation
RMR2653	713041.8	1489177.2	53N	67W	7	SWSE	High Solids Bentonite	9/16/2013	X	Delineation
RMR2654	713121.1	1489298.2	53N	67W	7	SESE	High Solids Bentonite	7/15/2013	X	Delineation
RMR2655	713264.6	1489387.2	53N	67W	7	SESE	High Solids Bentonite	8/7/2013	X	Delineation
RMR2656	713564.5	1489127.0	53N	67W	7	SESE	Cement	7/18/2013	X	Delineation
RMR2657	713565.4	1489384.0	53N	67W	7	SESE	High Solids Bentonite	8/6/2013	X	Delineation
RMR2658	713489.9	1489508.1	53N	67W	7	SESE	High Solids Bentonite	7/31/2013	X	Delineation
RMR2659	713635.7	1489584.9	53N	67W	7	SESE	High Solids Bentonite	7/29/2013	X	Delineation
RMR2662	713418.0	1489814.9	53N	67W	7	SESE	High Solids Bentonite	7/30/2013	X	Delineation
RMR2663	713284.7	1489738.2	53N	67W	7	SESE	High Solids Bentonite	8/9/2013	X	Delineation
RMR2664	713296.8	1489535.8	53N	67W	7	SESE	High Solids Bentonite	8/7/2013	X	Delineation
RMR2665	713115.9	1489724.1	53N	67W	7	SESE	High Solids Bentonite	8/6/2013	X	Delineation
RMR2666	713269.1	1489882.3	53N	67W	7	SESE	High Solids Bentonite	8/9/2013	X	Delineation
RMR2668	711557.4	1488377.5	53N	67W	18	NENW	Cement	2/18/2013	X	Delineation
RMR2669	711622.2	1488269.2	53N	67W	18	NENW	Cement	2/18/2013	X	Delineation
RMR2670	711744.3	1488341.4	53N	67W	18	NWNE	Cement	2/18/2013	X	Delineation
RMR2671	712893.1	1488248.1	53N	67W	18	NWNE	Cement	2/19/2013	X	Delineation
RMR2672	713172.0	1488365.1	53N	67W	18	NENE	Cement	2/18/2013	X	Delineation
RMR2673	713372.1	1488450.6	53N	67W	18	NENE	Cement	2/18/2013	X	Delineation
RMR2674	713689.0	1488749.3	53N	67W	18	NENE	Cement	2/18/2013	X	Delineation
RMR2680	713741.6	1488993.0	53N	67W	18	NENE	Cement	2/21/2013	X	Delineation

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
RMR2681	713404.2	1488374.0	53N	67W	18	NENE	Cement	2/26/2013	X	Delineation
RMR2682	711772.3	1488180.5	53N	67W	18	NWNE	Cement	3/1/2013	X	Delineation
RMR2683	711789.8	1488314.6	53N	67W	18	NWNE	Cement	3/1/2013	X	Delineation
RMR2684	712372.9	1488919.9	53N	67W	18	NWNE	Cement	2/26/2013	X	Delineation
RMR2685	713134.4	1488541.7	53N	67W	18	NENE	Cement	2/25/2013	X	Delineation
RMR2686	713187.8	1488652.0	53N	67W	18	NENE	Cement	2/25/2013	X	Delineation
RMR2687	713380.1	1488797.3	53N	67W	18	NENE	Cement	2/22/2013	X	Delineation
RMR2688	713460.9	1488976.1	53N	67W	18	NENE	Cement	2/22/2013	X	Delineation
RMR2689	713850.6	1488692.9	53N	67W	18	NENE	Cement	2/21/2013	X	Delineation
RMR2696	713548.1	1488816.7	53N	67W	18	NENE	Cement	2/27/2013	X	Delineation
RMR2697	713565.0	1488430.0	53N	67W	18	NENE	Cement	2/27/2013	X	Delineation
RMR2702	713502.6	1488260.7	53N	67W	18	NENE	Cement	2/28/2013	X	Delineation
RMR2706	713013.4	1488676.1	53N	67W	18	NWNE	Cement	3/29/2013	X	Delineation
RMR2707	712179.6	1488580.1	53N	67W	18	NWNE	Cement	3/6/2013	X	Delineation
RMR2708	711939.0	1488612.5	53N	67W	18	NWNE	Cement	3/5/2013	X	Delineation
RMR2710	712395.1	1488614.8	53N	67W	18	NWNE	Cement	3/6/2013	X	Delineation
RMR2711	712937.2	1488499.8	53N	67W	18	NWNE	Cement	3/5/2013	X	Delineation
RMR2713	711794.3	1488781.9	53N	67W	18	NWNE	Cement	3/13/2013	X	Delineation
RMR2714	711916.0	1488684.8	53N	67W	18	NWNE	Cement	3/8/2013	X	Delineation
RMR2715	712249.6	1488835.0	53N	67W	18	NWNE	Cement	3/13/2013	X	Delineation
RMR2716	712973.8	1488320.5	53N	67W	18	NWNE	Cement	3/13/2013	X	Delineation
RMR2717	713213.0	1489545.2	53N	67W	7	SESE	High Solids Bentonite	3/10/2015	X	Delineation
RMR2718	712140.3	1488346.9	53N	67W	18	NWNE	Cement	4/3/2013	X	Delineation
RMR2719	712546.1	1488098.1	53N	67W	18	NWNE	Cement	4/3/2013	X	Delineation
RMR2720	712803.2	1488305.9	53N	67W	18	NWNE	Cement	4/3/2013	X	Delineation
RMR2721	712658.1	1488747.7	53N	67W	18	NWNE	Cement	4/3/2013	X	Delineation
RMR2722	713479.0	1488511.5	53N	67W	18	NENE	Cement	4/5/2013	X	Delineation
RMR2723	713593.9	1488640.5	53N	67W	18	NENE	Cement	4/4/2013	X	Delineation
RMR2724	713628.3	1488740.7	53N	67W	18	NENE	Cement	4/4/2013	X	Delineation

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
RMR2726	711360.2	1488080.7	53N	67W	18	NENW	Cement	5/1/2013	X	Delineation
RMR2727	712432.9	1488197.6	53N	67W	18	NWNE	Cement	4/5/2013	X	Delineation
RMR2728	712349.1	1488349.8	53N	67W	18	NWNE	Cement	4/5/2013	X	Delineation
RMR2729	713259.1	1488285.7	53N	67W	18	NENE	Cement	4/4/2013	X	Delineation
RMR2731	713744.6	1488943.5	53N	67W	18	NENE	Cement	5/2/2013	X	Delineation
RMR2732	712274.4	1488762.5	53N	67W	18	NENE	High Solids Bentonite	10/3/2013	X	Delineation
RMR2734	713677.4	1488801.2	53N	67W	18	NENE	Cement	5/2/2013	X	Delineation
RMR2735	713333.6	1488396.1	53N	67W	18	NENE	Cement	5/1/2013	X	Delineation
RMR2736	713195.7	1489847.9	53N	67W	18	SESE	High Solids Bentonite	9/17/2013	X	Delineation
RMR2739	713083.2	1488434.8	53N	67W	18	NENE	High Solids Bentonite	8/8/2013	X	Delineation
RMR2740	713235.0	1488705.3	53N	67W	18	NENE	Cement	5/1/2013	X	Delineation
RMR2741	712259.0	1488593.9	53N	67W	18	NWNE	Cement	5/3/2013	X	Delineation
RMR2742	712414.8	1488728.5	53N	67W	18	NWNE	Cement	5/3/2013	X	Delineation
RMR2743	712412.5	1488858.7	53N	67W	18	NWNE	Cement	5/1/2013	X	Delineation
RMR2744	712227.8	1488919.0	53N	67W	18	NWNE	High Solids Bentonite	8/29/2013	X	Delineation
RMR2745	712018.6	1488915.5	53N	67W	18	NWNE	Cement	5/1/2013	X	Delineation
RMR2746	711994.4	1488472.1	53N	67W	18	NWNE	High Solids Bentonite	10/3/2013	X	Delineation
RMR2747	713149.4	1489497.5	53N	67W	7	SESE	High Solids Bentonite	3/11/2015	X	Delineation
RMR2748	713056.7	1489774.9	53N	67W	7	SESE	High Solids Bentonite	9/16/2013	X	Delineation
RMR2749	713322.4	1489501.9	53N	67W	7	SESE	High Solids Bentonite	9/17/2013	X	Delineation
RMR2750	713052.3	1489664.2	53N	67W	7	SWSE	High Solids Bentonite	9/17/2013	X	Delineation
RMR2751	713712.0	1489227.8	53N	67W	7	SESE	High Solids Bentonite	9/24/2013	X	Delineation
RMR2752	713146.6	1489400.6	53N	67W	7	SESE	High Solids Bentonite	3/10/2015	X	Delineation
RMR2756	713025.2	1487855.5	53N	67W	18	NWNE	High Solids Bentonite	1/22/2015	X	Delineation
RMR2757	713112.2	1487975.2	53N	67W	18	NENE	High Solids Bentonite	1/28/2015	X	Delineation
RMR2764	713116.4	1487928.6	53N	67W	18	NENE	High Solids Bentonite	1/30/2015	X	Delineation
RMR2766	713026.6	1487805.0	53N	67W	18	NWNE	High Solids Bentonite	2/2/2015	X	Delineation
RMRD0002	712828.5	1487932.8	53N	67W	18	NWNE	High Solids Bentonite	2/5/2015	X	Delineation
RMRD0003	712485.5	1488577.2	53N	67W	18	NWNE	Cement	3/22/2013	X	Delineation

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
RMRD0005	712644.6	1488158.9	53N	67W	18	NWNE	Cement	3/28/2013	X	Delineation
RMRD0007	712809.7	1488819.7	53N	67W	18	NWNE	Cement	3/20/2013	X	Delineation
RMRD0014	712842.9	1488258.2	53N	67W	18	NWNE	Cement	3/27/2013	X	Delineation
RMRD0015	712635.2	1489267.5	53N	67W	7	SWSE	High Solids Bentonite	7/9/2013	X	Delineation
RMRD0029	712894.8	1487970.0	53N	67W	18	NWNE	High Solids Bentonite	12/19/2013	X	Delineation
RMRD0030	713222.9	1489175.0	53N	67W	7	SESE	High Solids Bentonite	7/22/2013	X	Delineation
RMRD0037	712884.0	1488726.8	53N	67W	18	NWNE	Cement	5/2/2013	X	Delineation
RMRD0038	713223.3	1488876.4	53N	67W	18	NENE	Cement	5/3/2013	X	Delineation
RMRD0039	712899.5	1488356.5	53N	67W	18	NWNE	Cement	5/6/2013	X	Delineation
MU1-DM3	712757.1	1488634.9	53N	67W	18	NWNE	Cement	12/17/2013	X	Well
MU1-OZ5	712560.8	1488788.8	53N	67W	18	NWNE	High Solids Bentonite	7/6/2015	X	Well
MU1-PM14	713572.6	1488487.1	53N	67W	18	NENE	High Solids Bentonite	2/24/2015	X	Well
34-7DM	713334.1	1489668.7	53N	67W	7	SESE	High Solids Bentonite	7/6/2015	X	Well
SP68V	713515.3	1488586.1	53N	67W	18	NENE	Unknown			Exploration
SP69V	713533.4	1488436.9	53N	67W	18	NENE	Unknown			Exploration
SP138V	712679.5	1489374.3	53N	67W	7	SWSE	Unknown			Exploration
SP217V	712570.6	1489433.7	53N	67W	7	SWSE	Unknown			Exploration
SP219V	712469.2	1489390.0	53N	67W	7	SWSE	Unknown			Exploration
SP237V	712344.4	1489367.6	53N	67W	7	SWSE	Unknown			Exploration
SP239V	712298.5	1489154.2	53N	67W	7	SWSE	Unknown			Exploration
SP289V	711873.4	1488643.8	53N	67W	18	NWNE	Unknown			Exploration
SP313V	712539.9	1488360.9	53N	67W	18	NWNE	Unknown			Exploration
SP345V	711742.1	1487938.6	53N	67W	18	NWNE	Unknown			Exploration
SP539R	712443.5	1488906.0	53N	67W	18	NWNE	Unknown			Exploration
SP587R	712870.3	1489312.4	53N	67W	7	SWSE	Unknown			Exploration
SP589R	712763.3	1489423.4	53N	67W	7	SWSE	Unknown			Exploration
SP628R	712763.8	1488354.7	53N	67W	18	NWNE	Unknown			Exploration
SP733R	711760.7	1487854.1	53N	67W	18	NWNE	Unknown			Exploration
SP739R	711502.4	1488164.3	53N	67W	18	NENW	Unknown			Exploration

Table 2. Drill Hole Abandonment Tabulation (cont.)

Hole ID	WY State Plane East NAD 1927 Easting*	WY State Plane East NAD 1927 Northing*	Township	Range	Section	Quarter/ Quarter	Type of Plugging	Date Plugged	Filled to Surface with Bentonite Chips	Exploration/ Delineation/ Well
SP811R	712018.0	1488324.1	53N	67W	18	NWNE	Unknown			Exploration
SP814R	711957.6	1487719.4	53N	67W	18	NWNE	Unknown			Exploration
SP915R	712522.9	1487911.0	53N	67W	18	NWNE	Unknown			Exploration
SP934R	712431.1	1487881.3	53N	67W	18	NWNE	Unknown			Exploration
SP935R	712329.4	1487858.1	53N	67W	18	NWNE	Unknown			Exploration
SP938R	712411.6	1487787.5	53N	67W	18	NWNE	Unknown			Exploration
SP1051R	712510.2	1487735.2	53N	67W	18	NWNE	Unknown			Exploration
SP1055R	712723.6	1487670.0	53N	67W	18	NWNE	Unknown			Exploration
SP1071R	713623.6	1488592.9	53N	67W	18	NENE	Unknown			Exploration
SP1076R	712428.2	1487695.6	53N	67W	18	NWNE	Unknown			Exploration
SPD345M	712065.6	1487864.1	53N	67W	18	NWNE	Unknown			Exploration
SPD346M	712339.5	1488902.8	53N	67W	18	NWNE	Unknown			Exploration

*Coordinates for the drill holes of unknown plugging type are based on transposition of Nubeth coordinates.

ATTACHMENT 5

MU1 Aquifer Test Report

Appendix K Water Elevation Data Provided in Microsoft Excel Format on Compact Disc

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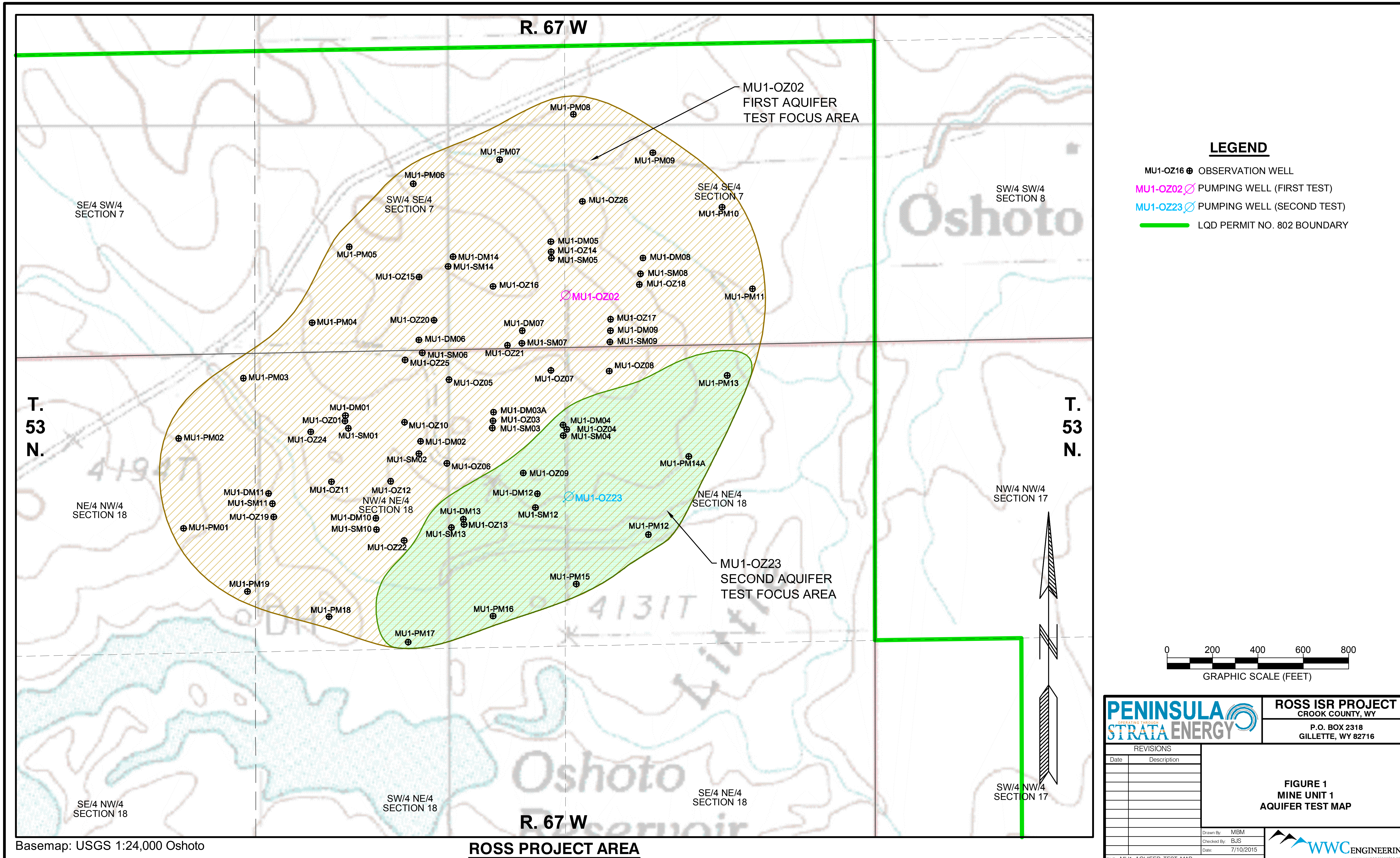
MINE UNIT 1 AQUIFER TEST RESULTS AND ANALYSIS

1.0 INTRODUCTION

This report presents the results of the aquifer test program conducted at the Strata Energy, Inc. (Strata) Ross ISR Project, Mine Unit 1 (MU1). A total of 73 wells located in MU1 were monitored during the aquifer test program, including 45 completed in the ore zone (OZ) production sand (19 of which are perimeter monitor (PM) wells), 14 completed in the shallow monitoring interval (SM – the first discrete aquifer above the ore zone), and 14 completed in the deep monitoring interval (DM – the first discrete sand interval beneath the ore zone). The MU1 aquifer test program was conducted in two phases. During the first aquifer test, it was observed that several wells on the southeast side of the mine unit had limited responses to pumping. To further characterize the aquifer and complete the objectives of the program, a second aquifer test was performed by pumping a well that had a limited response in the first test. The results of the second aquifer test demonstrate that the ore zone in the southeast side of the wellfield is in hydraulic communication with the PM wells in that portion of the wellfield and, based on a limited response, in communication with the ore zone in the rest of MU1. The results of both aquifer tests are presented in this report. The wells utilized for aquifer testing in MU1 are depicted on Figure 1.

1.1 Purpose and Scope

The purpose of the MU1 aquifer test program was to satisfy License Condition 10.13 of SUA-1601 and the commitments specified in Section 5 of Stata's approved NRC License application and Section 4.3 of the Mine Plan in Strata's WDEQ/LQD Permit to Mine No. 802. This report describes the methods and techniques used to measure the aquifer characteristics (e.g., hydraulic conductivity (K), transmissivity (T), and storage coefficient (S)) of the OZ aquifer and provides a tabulation of the test results. In addition, the hydraulic communication between the OZ wells and the vertical confinement of the OZ aquifer are discussed.



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1.2 Previous Investigations

Previous tests were conducted at the Ross site by Nubeth in 1977 (Manera 1977 and Hamilton 1977) and in 1978 (Manera 1978). In 2010, Strata conducted additional aquifer tests at the Ross site. The results of the Nubeth aquifer tests and the Ross aquifer tests are described in detail within the aquifer test report (TR Addendum 2.7-F and Permit to Mine No. 802, Addendum D6-7) in the approved Ross applications (WWC 2010). The results of the Ross 2010 and Nubeth (1977 and 1978) aquifer tests are summarized in Table 1.

Table 1. Summary of the OZ Aquifer Hydraulic Characteristics from 2010 and Nubeth Aquifer Tests

2010 Aquifer Tests (WWC 2010)						
Well ID	**Well Type**	**Interpretation Method**	**Transmissivity (sq ft/day)**	**Contributing Aquifer Thickness (ft)**	**Hydraulic Conductivity[2] (ft/day)**	**Storage Coefficient (unitless)**
34-7 OZ	Pumping	Theis Recovery	172.5	60	2.88	n/a
42-19 OZ	Pumping	Theis Recovery	13.4	90	0.15	n/a
34-18 OZ	Pumping	Theis Recovery	19.8	105	0.19	n/a
14-18 OZ	Pumping	Theis Recovery	23.8	30	0.79	n/a
21-19 OZ	Pumping	Theis Recovery	25.6	35	0.73	n/a
12-18 OZ	Pumping	Theis Recovery	70.8	94	0.75	n/a
OW1B57-1[1]	Obs. Well	Theis Recovery	96.7	25	3.86	n/a
OW1B58-1[1]	Obs. Well	Theis Recovery	80.5	18	4.47	n/a
OW1B60-1[1]	Obs. Well	Theis Recovery	84.5	16	5.28	n/a
OW1B57-1[1]	Pumping	Theis Recovery	80.3	25	3.21	n/a
12-18 OZ	Obs. Well	Theis Drawdown (Confined)	103.9	94	1.11	n/a
Minimum			13.4	16	0.15	n/a
Maximum			172.5	105	5.28	n/a
Average			70.2	53.8	2.13	n/a

Table 1. Summary of the OZ Aquifer Hydraulic Characteristics from 2010 and Nubeth Aquifer Tests (cont.)

1977 Aquifer Tests for Nubeth (Hamilton 1977, p. 4)						
Well ID	**Well Type**	**Interpretation Method**	**Transmissivity (sq ft/day)**	**Contributing Aquifer Thickness (ft)**	**Hydraulic Conductivity[2] (ft/day)**	**Storage Coefficient (unitless)**
788V	Obs. Well	Theis Recovery	19.2	121	0.16	n/a
798V	Pumping	Cooper Jacob	18.5	118	0.16	n/a
791V	Obs. Well	Theis Recovery	21.2	114	0.19	n/a
797V	Obs. Well	Theis Recovery	16.8	119	0.14	n/a
Minimum			16.8	114	0.14	n/a
Maximum			21.2	121	0.19	n/a
Average			18.9	118	0.16	n/a

1978 Aquifer Tests for Nubeth (Manera 1978)						
Well ID	**Well Type**	**Interpretation Method**	**Transmissivity (sq ft/day)**	**Contributing Aquifer Thickness (ft)**	**Hydraulic Conductivity[2] (ft/day)**	**Storage Coefficient (unitless)**
SP3X	Obs. Well	Cooper Jacob	13.9	85	0.16	5.0E-5
SP4X	Obs. Well	Cooper Jacob	12.8	85	0.15	7.5E-5
SP6X	Obs. Well	Cooper Jacob	17.5	85	0.21	4.5E-5
SP11X	Obs. Well	Cooper Jacob	24.9	85	0.29	5.0E-5
SP12X	Obs. Well	Cooper Jacob	17.3	85	0.20	4.7E-5
SP19X	Pumping	Cooper Jacob	29.4	85	0.35	n/a
SP78X	Obs. Well	Cooper Jacob	14.3	85	0.17	8.3E-5
Minimum			12.8	85	0.15	4.5E-5
Maximum			29.4	85	0.35	8.3E-5
Average			18.6	85	0.22	5.8E-5

1 Partially penetrating wells located near 12-18OZ.
2 Hydraulic conductivity values are in the horizontal direction.

2.0 AQUIFER TEST PROCEDURES

Prior to performing the aquifer tests, Strata developed a work plan to serve as an operational guide for field personnel. This plan was provided to the Wyoming Department of Environmental Quality (WDEQ) on April 16, 2015 for review and comment and is included in Appendix A. The work plan used for the first test was verbally approved by WDEQ on April 22, 2015. Prior to conducting the second aquifer test on May 12, 2015, WDEQ was consulted (through verbal communications). An updated aquifer test work plan

incorporating WDEQ's suggestions provided during verbal consultation was provided to WDEQ on May 14, 2015. The updated work plan is included as Attachment C to Appendix A.

2.1 Aquifer Test Equipment/Discharge Management

The MU1 pumping wells were equipped with either a Goulds Model 25GS50, 5-horsepower submersible pump (MU1-OZ02) or Grundfos Model 16515-14, 1.5-horsepower submersible pump (MU1-OZ23) powered by a portable generator. The pump setting depth was 340 feet below ground level (bgl) in the first pumped well (MU1-OZ02) and 345 feet bgl in the second pumped well (MU1-OZ23). During each test, the discharge rate was monitored using an in-line flow meter/totalizer and a pressure gauge. Readings were recorded periodically throughout each test and verified by bucket and stop watch measurements.

Pumped water was discharged under a temporary Wyoming Pollutant Discharge Elimination System (WYPDES) discharge permit, (authorization No. WYG720365). Discharge water was routed away from the pumped wells and released within containment pits to minimize erosion. In accordance with permit requirements, the discharge during each test was monitored daily for flow rate and pH and weekly for total dissolved solids (TDS), total suspended solids (TSS), radium-226, and uranium.

2.2 Antecedent Conditions

For several days prior to each aquifer test, background groundwater level conditions were monitored continuously to establish antecedent conditions in accordance with the work plan. All available vented and non-vented pressure transducers were installed in wells to record groundwater levels before, during, and after each aquifer test. Manual groundwater level measurements, using an electronic depth meter (e-line), were also collected in wells without transducers and used to verify the transducer data in wells where transducers were

installed. The barometric pressure in the area was continuously recorded prior to, during, and after each aquifer test.

Transducer specifications are presented in Table 2. Transducer accuracy, as stated by the manufacturer, is ±0.1 percent of the full-scale reading (which ranges from 15 to 300 psi); therefore, the limit of accuracy varies from 0.015 to 0.3 psi, or about 0.035 to 0.69 ft of water. During the test period the pressure transducers were set to record data at 5-minute intervals in the observation-type wells and at one-minute intervals in the pumped well.

Table 2. Pressure Transducer Specifications

Well Type	Transducer Pressure Rating	Accuracy/Resolution
Pumped	300 psi	Pressure ± 0.1%
Production/Observation	30 – 300 psi	Pressure ± 0.1%
Overlying-Underlying/Observation	15 – 300 psi	Pressure ± 0.1%
Perimeter/Observation	15 – 300 psi	Pressure ± 0.1%

2.3 Test Procedures and Methods of Analysis

Prior to conducting the MU1 aquifer tests, discharge rates and resulting time-drawdown data were recorded at the designated pumping wells through a step-drawdown analysis. Based on the drawdown response at each pumped well, a pumping rate was determined that would effectively stress the aquifer over an appropriate test duration.

The Aquifer^{Win32} (ESI 2003) software package was used for the analysis of the aquifer test data using various analytical methods. Raw transducer data were downloaded from the transducers using a laptop computer in the field and the data were then converted into Excel files (".xls" file extension). As necessary, transducer data were supplemented with e-line water level measurements. At wells without transducers, e-line measurements were relied on exclusively. Raw transducer data and e-line measurements are provided in electronic format on a CD enclosed in Appendix K.

3.0 MINE UNIT 1 AQUIFER TESTS

3.1 First Aquifer Test (MU1-OZ02 Pumping Well)

3.1.1 Well Locations and Completion Intervals

The first MU1 aquifer test was located in Sections 7 and 18, T53N, R67W, as depicted on Figure 1. The test area consisted of the pumped well (MU1-OZ02) completed in the OZ aquifer, 44 observation wells completed in the OZ aquifer, 14 observation wells completed in the overlying SM aquifer, and 14 observation wells completed in the underlying DM interval. Completion information for each well used in the aquifer test program is provided in Table 3.

3.1.2 Antecedent Conditions

The pressure transducers were installed and began recording water levels in all of the wells between April 29 and May 5, 2015. Prior to the aquifer test, fluctuations in the water levels were noted in several of the wells due to baseline water sampling. Smaller water level fluctuations caused by changes in barometric pressure were also noted (for confined and semi-confined aquifers, lower barometric pressures typically cause water levels to rise and higher pressures cause water levels to fall depending on the barometric efficiency of the aquifer). Hydrographs indicating a steady rise in water level typically correspond to recovery following sample collection.

All field activity associated with the collection of water quality samples ceased temporarily on April 30, 2015, six days prior to the first aquifer test. Groundwater levels at the pumped well and observation wells in the OZ aquifer continued to recover from the sampling events that occurred prior to April 30 when the first aquifer test began on May 5, 2015. However, this recovery following sampling did not affect the aquifer test, since the aquifer test induced a drawdown of a much larger magnitude than the recovery observed in the hydrographs. Further, the water levels in the OZ wells were trending

Table 3. Aquifer Test Well Completion Information

Well ID	Geologic Unit Monitored	Well Type	Radial Distance from Pumped Well (MU1-OZ02) (ft)	Depth to Top of Screen (ft bgl)	Depth to Bottom of Screen (ft bgl)	Well Screen Length (ft)
MU1-OZ01	OZ Aquifer	Production/Observation	1121	412	432	20
MU1-OZ02	OZ Aquifer	Pumped	0	411	426	15
MU1-OZ03	OZ Aquifer	Production/Observation	641	430	440	10
MU1-OZ04	OZ Aquifer	Production/Observation	592	380	390	10
MU1-OZ05	OZ Aquifer	Production/Observation	636	466	476	10
MU1-OZ06	OZ Aquifer	Production/Observation	906	446	476	30
MU1-OZ07	OZ Aquifer	Production/Observation	338	431	441	10
MU1-OZ08	OZ Aquifer	Production/Observation	386	375	395	20
MU1-OZ09	OZ Aquifer	Production/Observation	807	373	388	15
MU1-OZ10	OZ Aquifer	Production/Observation	906	450	465	15
MU1-OZ11	OZ Aquifer	Production/Observation	1321	447	457	10
MU1-OZ12	OZ Aquifer	Production/Observation	1127	465	480	15
MU1-OZ13	OZ Aquifer	Production/Observation	1107	444	459	15
MU1-OZ14	OZ Aquifer	Production/Observation	202	397	422	25
MU1-OZ15	OZ Aquifer	Production/Observation	652	453	468	15
MU1-OZ16	OZ Aquifer	Production/Observation	324	432	457	25
MU1-OZ17	OZ Aquifer	Production/Observation	224	406	416	10
MU1-OZ18	OZ Aquifer	Production/Observation	327	377	392	15
MU1-OZ19	OZ Aquifer	Production/Observation	1617	477	487	10
MU1-OZ20	OZ Aquifer	Production/Observation	592	435	445	10
MU1-OZ21	OZ Aquifer	Production/Observation	340	424	439	15
MU1-OZ22	OZ Aquifer	Production/Observation	1296	360	370	10
MU1-OZ23	OZ Aquifer	Production/Observation	827	371	381	10
MU1-OZ24	OZ Aquifer	Production/Observation	1276	411	426	15
MU1-OZ25	OZ Aquifer	Production/Observation	765	439	444	5
MU1-OZ26	OZ Aquifer	Production/Observation	419	388	398	10
MU1-PM01	OZ Aquifer	Perimeter/Observation	1974	323	503	180
MU1-PM02	OZ Aquifer	Perimeter/Observation	1820	352	517	165
MU1-PM03	OZ Aquifer	Perimeter/Observation	1468	332	497	165
MU1-PM04	OZ Aquifer	Perimeter/Observation	1125	347	507	160
MU1-PM05	OZ Aquifer	Perimeter/Observation	979	332	502	170
MU1-PM06	OZ Aquifer	Perimeter/Observation	833	363	513	150
MU1-PM07	OZ Aquifer	Perimeter/Observation	665	332	477	145
MU1-PM08	OZ Aquifer	Perimeter/Observation	798	319	459	140
MU1-PM09	OZ Aquifer	Perimeter/Observation	735	281	436	155
MU1-PM10	OZ Aquifer	Perimeter/Observation	790	242	417	175
MU1-PM11	OZ Aquifer	Perimeter/Observation	822	233	408	175
MU1-PM12	OZ Aquifer	Perimeter/Observation	1117	258	428	170
MU1-PM13	OZ Aquifer	Perimeter/Observation	794	265	435	170
MU1-PM14A	OZ Aquifer	Perimeter/Observation	894	291	446	155
MU1-PM15	OZ Aquifer	Perimeter/Observation	1275	281	446	165

Table 3. Aquifer Test Well Completion Information (cont.)

Well ID	Geologic Unit Monitored	Well Type	Radial Distance from Pumped Well (ft)	Depth to Top of Screen (ft bgl)	Depth to Bottom of Screen (ft bgl)	Well Screen Length (ft)
MU1-PM16	OZ Aquifer	Perimeter/Observation	1451	288	458	170
MU1-PM17	OZ Aquifer	Perimeter/Observation	1681	292	482	190
MU1-PM18	OZ Aquifer	Perimeter/Observation	1761	291	481	190
MU1-PM19	OZ Aquifer	Perimeter/Observation	1917	301	491	190
MU1-SM01	SM Aquifer	Observation	1125	231	276	45
MU1-SM02	SM Aquifer	Observation	953	219	269	50
MU1-SM03	SM Aquifer	Observation	670	220	265	45
MU1-SM04	SM Aquifer	Observation	619	179	234	55
MU1-SM05	SM Aquifer	Observation	175	194	274	80
MU1-SM06	SM Aquifer	Observation	682	247	287	40
MU1-SM07	SM Aquifer	Observation	288	210	263	53
MU1-SM08	SM Aquifer	Observation	341	177	237	60
MU1-SM09	SM Aquifer	Observation	283	190	268	78
MU1-SM10	SM Aquifer	Observation	1329	192	257	65
MU1-SM11	SM Aquifer	Observation	1587	221	266	45
MU1-SM12	SM Aquifer	Observation	946	181	216	35
MU1-SM13	SM Aquifer	Observation	1142	185	235	50
MU1-SM14	SM Aquifer	Observation	534	238	283	45
MU1-DM01	DM Interval	Observation	1107	529	554	25
MU1-DM02	DM Interval	Observation	909	521	541	20
MU1-DM03A	DM Interval	Observation	607	524	544	20
MU1-DM04	DM Interval	Observation	573	494	519	25
MU1-DM05	DM Interval	Observation	245	523	548	25
MU1-DM06	DM Interval	Observation	677	545	560	15
MU1-DM07	DM Interval	Observation	248	519	539	20
MU1-DM08	DM Interval	Observation	377	480	500	20
MU1-DM09	DM Interval	Observation	251	520	535	15
MU1-DM10	DM Interval	Observation	1292	509	528	19
MU1-DM11	DM Interval	Observation	1576	447	459	12
MU1-DM12	DM Interval	Observation	885	490	510	20
MU1-DM13	DM Interval	Observation	1086	499	519	20
MU1-DM14	DM Interval	Observation	526	544	562	18

asymptotically prior to the start of the test, which demonstrates that the water levels in the wells had nearly recovered from the prior sampling events.

3.1.3 Pumping Rate and Duration

The pumping phase of the constant rate test was initiated at 9:09 a.m. on May 5, 2015, and ended at 1:01 p.m. on May 8, 2015 for a total duration of

4,552 minutes (3.16 days). Well MU1-OZ02 was pumped at an average discharge rate of 31.7 gallons per minute (gpm). Discharge measurement field data sheets are included in Appendix B. After the pumping period, water levels in the pumped well and observation wells were observed for a recovery period of roughly four days.

3.1.4 Well Responses

Data collected during e-line sampling events and from the transducers installed in the observation wells were compiled into hydrographs to determine if, and to what degree, each well responded during the aquifer test. Groundwater level hydrographs for the pumped well and the 72 observation wells are presented in Appendix C. Table 4 summarizes monitoring details and the maximum amount of drawdown observed in each well.

Pumping in well MU1-OZ02 induced a hydraulic response in 37 OZ observation wells. No measurable responses were observed in wells MU1-OZ23, MU1-PM12, MU1-PM13, MU1-PM14A, MU1-PM15, MU1-PM16, and MU1-PM17. Of the OZ wells that responded to pumping drawdown ranged from 3.19 to 27.58 feet. The maximum drawdown (27.58 feet) was recorded at production/observation well MU1-OZ21, which is located 340 feet southwest of the pumped well. The minimum drawdown (3.19 feet) was recorded at perimeter/observation well MU1-PM19, which is located 1,917 feet southwest of the pumped well. Total drawdown in the pumped well was 125.01 feet.

In addition to the 44 observation wells in the OZ aquifer, 14 SM observation wells and 14 DM observation wells were monitored during the aquifer test. Table 5 includes monitoring details for the SM and DM observation wells. Fluctuations in the water elevations in the DM and SM wells before, during, and after the aquifer test were present, but the fluctuations show no correlation to the stress induced during the aquifer test.

Table 4. First Aquifer Test (MU1-OZ02) Drawdown and Response Summary

Well ID	Well Type	Water level Measurement Method	Initial Depth to Water (ft)	Initial Water Level Elevation (ft amsl)	Maximum Drawdown (ft)	Maximum Time After Pump On for First Drawdown Response (min)	Radial Distance from Pumped Well (ft)
MU1-OZ01	Production/Observation	e-line	93.54	4056.28	11.32	102 or less**	1121
MU1-OZ02	Pumped	Transducer	110.89	4058.25	125.01	0	0
MU1-OZ03	Production/Observation	e-line	100.56	4056.71	14.28	101 or less **	641
MU1-OZ04	Production/Observation	e-line	91.58	4057.25	17.56	84 or less **	592
MU1-OZ05	Production/Observation	e-line	98.73	4056.59	13.63	90 or less **	636
MU1-OZ06	Production/Observation	e-line	90.32	4056.35	13.57	10 or less **	906
MU1-OZ07	Production/Observation	e-line	99.43	4057.64	15.23	83 or less **	338
MU1-OZ08	Production/Observation	e-line	107.08	4057.87	20.53	81 or less **	386
MU1-OZ09	Production/Observation	e-line	89.32	4057.00	15.14	91 or less **	807
MU1-OZ10	Production/Observation	e-line	90.18	4056.11	11.79	100 or less **	906
MU1-OZ11	Production/Observation	Transducer	86.46	4055.06	9.18	490**	1321
MU1-OZ12	Production/Observation	e-line	84.81	4055.69	10.59	237 or less **	1127
MU1-OZ13	Production/Observation	e-line	77.81	4056.14	12.16	241 or less **	1107
MU1-OZ14	Production/Observation	e-line	110.00	4058.56	25.63	80 or less **	202
MU1-OZ15	Production/Observation	e-line	120.34	4057.97	15.38	86 or less **	652
MU1-OZ16	Production/Observation	e-line	120.58	4058.24	24.39	82 or less **	324
MU1-OZ17	Production/Observation	e-line	110.10	4058.32	26.64	78 or less **	224
MU1-OZ18	Production/Observation	e-line	89.31	4058.68	23.18	76 or less **	327
MU1-OZ19	Production/Observation	e-line	89.25	4053.24	6.96	96 or less **	1617
MU1-OZ20	Production/Observation	e-line	108.78	4057.82	16.18	88 or less **	592
MU1-OZ21	Production/Observation	e-line	108.28	4057.83	27.58	91 or less **	340
MU1-OZ22	Production/Observation	e-line	82.73	4055.71	8.70	388 or less **	1296
MU1-OZ23	Production/Observation	e-line	78.38	4061.72	No Response	n/a	827
MU1-OZ24	Production/Observation	e-line	89.38	4054.89	8.52	376 or less **	1276
MU1-OZ25	Production/Observation	e-line	106.57	4057.34	14.26	97 or less **	765
MU1-OZ26	Production/Observation	e-line	90.33	4058.83	19.45	77 or less **	419

Table 4. First Aquifer Test Drawdown and Response Summary (cont.)

Well ID	Well Type	Water Level Measurement Method	Initial Depth to Water (ft)	Initial Water Level Elevation (ft amsl)	Maximum Drawdown (ft)	Maximum Time After Pump On for First Drawdown Response (min)	Radial Distance from Pumped Well (ft)
MU1-PM01	Perimeter Observation	Transducer	108.13	4056.18	3.59	940	1974
MU1-PM02	Perimeter Observation	Transducer*	114.03	4049.38	4.28	1210	1820
MU1-PM03	Perimeter Observation	Transducer*	91.57	4056.64	7.42	260	1468
MU1-PM04	Perimeter Observation	e-line	105.65	4057.36	8.63	86 or less **	1125
MU1-PM05	Perimeter Observation	Transducer*	123.66	4060.65	7.99	100	979
MU1-PM06	Perimeter Observation	e-line	120.12	4058.99	8.51	208 or less **	833
MU1-PM07	Perimeter Observation	Transducer/ e-line	100.08	4059.57	7.06***	90	665
MU1-PM08	Perimeter Observation	e-line	97.85	4059.36	9.51	76 or less **	798
MU1-PM09	Perimeter Observation	Transducer	81.06	4059.28	13.84	30	735
MU1-PM10	Perimeter Observation	Transducer	71.71	4059.36	14.04	50	790
MU1-PM11	Perimeter Observation	Transducer	63.89	4059.77	13.35	90	822
MU1-PM12	Perimeter Observation	Transducer	38.24	4084.04	No Response	N/A	1117
MU1-PM13	Perimeter Observation	Transducer*	67.58	4064.70	No Response	N/A	794
MU1-PM14A	Perimeter Observation	Transducer*	77.20	4062.81	No Response	N/A	894
MU1-PM15	Perimeter Observation	Transducer*	72.95	4059.63	No Response	N/A	1275
MU1-PM16	Perimeter Observation	Transducer*	77.97	4057.79	No Response	N/A	1451
MU1-PM17	Perimeter Observation	Transducer*	66.13	4071.88	No Response	N/A	1681
MU1-PM18	Perimeter Observation	Transducer*	73.06	4073.39	5.87	220	1761
MU1-PM19	Perimeter Observation	Transducer*	68.78	4080.90	3.19	2780	1917

* Transducers were vented to the atmosphere.

** Time indicated is the first manual water measurement in which a drawdown was observed. The first response may have occurred prior to the time listed.

***The transducer in MU1-PM07 failed prior to the end of the pumping portion of the test. Maximum drawdown is estimated from e-line water depth measurement.

Table 5. Monitoring Details for the SM and DM Observation Wells

Well ID	Well Type	Water Level Measurement Method	Initial Depth to Water (ft)	Initial Water Level Elevation (ft amsl)
MU1-SM01	Observation	Transducer*	55.79	4094.09
MU1-SM02	Observation	Transducer	50.35	4093.22
MU1-SM03	Observation	e-line	60.92	4094.24
MU1-SM04	Observation	Transducer*	53.62	4095.62
MU1-SM05	Observation	Transducer	70.53	4099.68
MU1-SM06	Observation	Transducer	67.60	4096.05
MU1-SM07	Observation	Transducer*	67.52	4098.73
MU1-SM08	Observation	Transducer	49.18	4095.13
MU1-SM09	Observation	Transducer	75.71	4097.75
MU1-SM10	Observation	e-line	44.31	4095.37
MU1-SM11	Observation	Transducer	49.91	4093.89
MU1-SM12	Observation	e-line	38.63	4094.40
MU1-SM13	Observation	e-line	40.20	4094.13
MU1-SM14	Observation	Transducer	79.08	4099.73
MU1-DM01	Observation	Transducer	129.66	4020.54
MU1-DM02	Observation	Transducer	255.05	3891.24
MU1-DM03A	Observation	e-line	156.09	4001.53
MU1-DM04	Observation	Transducer*	119.96	4029.12
MU1-DM05	Observation	Transducer	225.56	3940.77
MU1-DM06	Observation	Transducer	141.76	4025.41
MU1-DM07	Observation	Transducer*	154.58	4015.10
MU1-DM08	Observation	Transducer	101.43	4035.59
MU1-DM09	Observation	Transducer	337.02	3843.32
MU1-DM10	Observation	e-line	109.88	4029.93
MU1-DM11	Observation	Transducer	138.31	4006.36
MU1-DM12	Observation	e-line	252.81	3891.25
MU1-DM13	Observation	Transducer	152.84	3980.73
MU1-DM14	Observation	Transducer	254.24	3928.29

* Transducers were vented to the atmosphere.

During the monitored recovery period, a small decline in the SM well water-level elevations was noted across the entire wellfield. This small decline was more than can be attributed to barometric effects. However, the water level change was consistent across the entire wellfield and did not correlate to the timing of the aquifer test. Since the water level decline does not correlate to the timing of the test and the magnitude of the change in the water level was consistent across the entire wellfield, the decline in water level is not attributed to the aquifer test. No hydraulic communication was observed between the OZ and SM interval during this test.

Prior to, during, and after the aquifer test, the DM wells were recovering from late April sampling events. The DM interval is a very poor water production interval with a very low transmissivity. Therefore, it takes weeks for most of the

DM wells to recover after a sampling event. However, the shape and the slopes of the DM hydrographs were not affected by the aquifer test. No hydraulic communication between the OZ and DM intervals was observed during this test.

3.2 Second Aquifer Test (MU1-OZ23 Pumping Well)

3.2.1 Well Locations and Completion Intervals

As noted in Table 4, six PM wells and one OZ well did not respond to the first aquifer test at MU1-OZ02. A second aquifer test was conducted at the OZ well that did not respond to further assess the hydraulic continuity of the OZ aquifer within the wellfield. The second aquifer test occurred in Section 18 of T53N, R67W, as depicted on Figure 1. The test area included the pumped well (MU1-OZ23) completed in the OZ aquifer, nine observation wells completed in the OZ aquifer, three observation wells completed in the SM aquifer, and three observation wells completed in the DM interval. Completion information for each well is provided in Table 3. As shown on Figure 1, all of the wells are located in the southeast portion of MU1.

3.2.2 Antecedent Conditions

Within the second test area, transducers were installed in all of the wells monitored during the test between May 14 and May 18, 2015. To provide continuity from the first to the second aquifer test, three OZ wells that responded during the first aquifer test were instrumented along with the PM wells that did not respond. The nearest SM and DM wells were also instrumented during the second aquifer test. Within the time period between the first and second aquifer tests, Strata did not conduct any new well drilling or completion activities within the test area. However, Strata sampled all the observation wells during this time period. The hydrographs for these wells show groundwater level recovery following the sampling events between the time that the transducers were installed and the beginning of the aquifer test. While the water level recovery muted the observed responses in the interior OZ wells, it did not impact the analyses of the aquifer parameters.

3.2.3 Pumping Rate and Duration

The pumping phase of the constant rate test was initiated at 8:21 a.m on May 19 and ended at 9:04 a.m. on May 24, for a total duration of 7,243 minutes (5.03 days). The average discharge rate was 4.8 gpm. Discharge measurement field data sheets are included in Appendix D. After the pumping period, water levels in the pumped well and observation wells were measured for a recovery period of approximately three days.

3.2.4 Well Responses

Separate groundwater level hydrographs for the pumped well and the 15 observation wells are presented in Appendix E. Table 6 summarizes the maximum amount of drawdown observed in each well.

During the aquifer test, drawdown was recorded in all of the PM wells. However, only a muted response was noted at the three interior OZ wells (MU1-OZ04, MU1-OZ09, and MU1-OZ13). Measured drawdowns ranging from 1.6 to 6.0 feet were recorded in the PM wells. Well MU1-PM14A, located 557 feet east-northeast of the pumped well (MU1-OZ23), measured the most response, while well MU1-PM17, located 957 feet southwest of the pumped well, measured the least response. The pumped well (MU1-OZ23) experienced a drawdown of 179.6 feet. No measurable drawdowns were observed in the interior OZ wells during the aquifer test. However, all three of the interior OZ wells were still recovering from sampling events that occurred prior to the aquifer test. During the aquifer test, the recovery rate in these wells slowed significantly. Immediately upon cessation of pumping at MU1-OZ23, the water level recovery rate at all three wells increased. This increased recovery rate can be seen in the hydrographs and demonstrates communication between MU1-OZ23 and the interior OZ wells. However as described in Section 4, the hydraulic conductivity is significantly lower west of MU1-OZ23 than it is to the east.

Table 6. Second Aquifer Test (MU1-OZ23) Drawdown and Response Summary

Well ID	Well Type	Initial Depth to Water (ft)	Initial Water Level Elevation (ft amsl)	Maximum Drawdown (ft)	Time after Pump On for First Drawdown Response (min)	Radial Distance from Pumped Well (ft)
MU1-OZ04	Production/Observation	93.67	4055.16	Muted Response	N/A	295
MU1-OZ09	Production/Observation	91.42	4073.53	Muted Response	N/A	226
MU1-OZ13	Production/Observation	80.47	4053.48	Muted Response	N/A	478
MU1-OZ23	Pumped Well	76.50	4063.60	179.55	0	0
MU1-PM12	Perimeter/Observation	39.84	4082.44	2.98	66	389
MU1-PM13	Perimeter/Observation	66.46	4065.82	3.74	86	878
MU1-PM14A	Perimeter/Observation	76.41	4063.60	5.99	39	557
MU1-PM15	Perimeter/Observation	72.43	4060.15	4.78	61	388
MU1-PM16	Perimeter/Observation	76.58	4059.18	3.91	100	624
MU1-PM17	Perimeter/Observation	67.02	4070.99	1.64	110	957
MU1-SM04	Observation	56.02	4093.22	No Response	N/A	269
MU1-SM12	Observation	39.63	4093.40	0.41*	1765	154
MU1-SM13	Observation	42.75	4091.58	No Response	N/A	533
MU1-DM04	Observation	145.16	4003.92	No Response	N/A	316
MU1-DM12	Observation	292.96	3851.10	No Response	N/A	139
MU1-DM13	Observation	198.87	3934.70	No Response	N/A	476

* Adjusted for barometric pressure.

The timing of the recorded drawdowns within the PM wells corresponded to the timing of the aquifer test, and the magnitude of the responses was greater than can be attributed to barometric pressure effects. As such, the results of this test demonstrate that the PM wells are in hydraulic communication with the pumped well. Similarly, the muted responses observed in the interior OZ observation wells corresponded with the timing of the aquifer test and demonstrate hydraulic communication to the west and north within the OZ.

In addition to the six PM wells and three interior OZ wells, three DM wells and three SM wells were monitored during the aquifer test. A strong recharge trend is apparent in all three DM wells before, during, and after the aquifer test. The recharge trends were not affected by pumping in MU1-OZ23. Therefore, no hydraulic communication between the OZ aquifer and DM interval was observed in this aquifer test.

A slight response was noted in one of the SM wells (MU1-SM12). During the test, MU1-SM12 was instrumented with a non-vented transducer. A non-vented transducer measures the pressure of the water in addition to the atmospheric pressure exerted on the transducer in the well; therefore, if the atmospheric pressure increases, the transducer will read a higher pressure and record a higher water value in the well. In an aquifer with high barometric efficiency the changes in barometric pressure will typically cause an opposite change in physical water levels in the well (i.e., increasing barometric pressure decreases the water level in the well, and decreasing barometric pressure increases the water level in the well). As the barometric efficiency of the aquifer decreases, changes in the barometric pressure will have a lesser effect on the physical water levels in a well completed in the aquifer. As a result, in an aquifer with a low barometric efficiency, changes in barometric pressure will be recorded in the transducer, but there will be no corresponding change in the water level in the aquifer, which in a more efficient aquifer would be opposite the barometric response measured in the transducer and lessen the magnitude of the observed responses. Based on a comparison between the measured barometric pressure

variations and the hydrographs from the SM wells, the barometric efficiency of the SM aquifer is estimated to be very low. Therefore, the response observed in MU1-SM12, as reported in Table 6, was corrected for barometric pressure to eliminate barometric effects. For comparison, two hydrographs, one uncorrected and one corrected, are included in Appendix E for MU1-SM12.

Prior to the second aquifer test Strata had been unable to locate, plug, and re-abandon several historical exploration boreholes in the southeast area of MU1 due to wet conditions and difficult topography. After observing the response in MU1-SM12 during the second aquifer test, Strata re-abandoned the additional boreholes as soon as conditions improved enough that the work could be completed. A third aquifer test was then conducted with MU1-OZ23 as the pumping well. The third aquifer test was conducted at a pumping rate of 5 gpm for a total duration of 4,565 minutes (3.17 days). The third aquifer test demonstrated that re-abandoning the boreholes decreased but did not eliminate the response in MU1-SM12. A hydrograph comparing the response recorded in the third aquifer test to the response in the second aquifer test is included in Appendix F.

4.0 DETERMINATION OF AQUIFER PARAMETERS

Data from the first and second aquifer tests were used to determine the hydraulic parameters of the OZ aquifer within MU1. Aquifer^{Win32} (ESI 2003) software was used to analyze the drawdown and recovery data for all observation wells in the OZ aquifer which are spaced at varying distances from the pumped wells (Figure 1).

The aquifer parameters of transmissivity (T) and storage coefficients (S) for all observation wells in the OZ aquifer were calculated using the Cooper-Jacob (1946) and Theis (1935) methods. The Cooper-Jacob method was used to evaluate the drawdown curves and the Theis method was used to evaluate the recovery curves. The results of the first and second aquifer tests are summarized in Table 7 and Table 8, respectively. The plots of the time-drawdown data and analyses for

Table 7. First Aquifer Test (MU1-OZ02) Summary of Hydraulic Characteristics

Well ID	Well Type	Interpretation Method	Transmissivity (sq ft/day)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)	Storage Coefficient (Unitless)
MU1-OZ01	Production/ Observation	Cooper Jacob	66.6	117	0.57	8.0E-5
		Theis Recovery	67.7		0.58	
MU1-OZ02	Pumping	Theis Recovery	106.4	123	0.87	
MU1-OZ03	Production/ Observation	Cooper Jacob	61.0	122	0.50	1.8E-4
		Theis Recovery	60.9		0.50	
MU1-OZ04	Production/ Observation	Cooper Jacob	61.4	116	0.53	1.4E-4
		Theis Recovery	61.0		0.53	
MU1-OZ05	Production/ Observation	Cooper Jacob	61.4	126	0.49	2.1E-4
		Theis Recovery	61.4		0.49	
MU1-OZ06	Production/ Observation	Cooper Jacob	63.6	125	0.51	9.7E-5
		Theis Recovery	63.6		0.51	
MU1-OZ07	Production/ Observation	Cooper Jacob	59.1	116	0.51	6.0E-4
		Theis Recovery	60.5		0.52	
MU1-OZ08	Production/ Observation	Cooper Jacob	61.9	122	0.51	2.2E-4
		Theis Recovery	59.9		0.49	
MU1-OZ09	Production/ Observation	Cooper Jacob	70.4	130	0.54	8.9E-5
		Theis Recovery	69.1		0.53	
MU1-OZ10	Production/ Observation	Cooper Jacob	61.0	128	0.48	1.3E-4
		Theis Recovery	61.8		0.48	
MU1-OZ11	Production/ Observation	Cooper Jacob	67.4	122	0.55	8.4E-5
		Theis Recovery	64.1		0.53	
MU1-OZ12	Production/ Observation	Cooper Jacob	61.4	128	0.48	9.5E-5
		Theis Recovery	62.0		0.48	
MU1-OZ13	Production/ Observation	Cooper Jacob	61.2	126	0.49	8.0E-05
		Theis Recovery	62.4		0.50	
MU1-OZ14	Production/ Observation	Cooper Jacob	71.1	124	0.57	3.0E-4
		Theis Recovery	70.7		0.57	
MU1-OZ15	Production/ Observation	Cooper Jacob	74.6	124	0.60	1.2E-4
		Theis Recovery	75.7		0.61	
MU1-OZ16	Production/ Observation	Cooper Jacob	71.5	109	0.66	1.4E-4
		Theis Recovery	71.3		0.65	
MU1-OZ17	Production/ Observation	Cooper Jacob	68.4	123	0.56	2.3E-4
		Theis Recovery	68.9		0.56	
MU1-OZ18	Production/ Observation	Cooper Jacob	67.8	129	0.53	1.8E-4
		Theis Recovery	65.7		0.51	
MU1-OZ19	Production/ Observation	Cooper Jacob	66.8	119	0.56	8.1E-5
		Theis Recovery	68.4		0.58	
MU1-OZ20	Production/ Observation	Cooper Jacob	69.2	112	0.62	1.4E-4
		Theis Recovery	67.5		0.60	
MU1-OZ21	Production/ Observation	Cooper Jacob	67.7	115	0.59	9.1E-5
		Theis Recovery	62.5		0.54	
MU1-OZ22	Production/ Observation	Cooper Jacob	68.9	125	0.55	8.9E-5
		Theis Recovery	63.7		0.51	
MU1-OZ24	Production/ Observation	Cooper Jacob	67.6	118	0.57	9.6E-5
		Theis Recovery	68.2		0.58	
MU1-OZ25	Production/ Observation	Cooper Jacob	68.4	126	0.54	1.1E-4
		Theis Recovery	68.7		0.55	

Table 7. First Aquifer Test (MU1-OZ02) Summary of Hydraulic Characteristics (cont.)

Well ID	Well Type	Interpretation Method	Transmissivity (sq ft/day)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)	Storage Coefficient (Unitless)
MU1-OZ26	Production/ Observation	Cooper Jacob	70.3	113	0.62	1.7E-4
		Theis Recovery	69.1		0.61	
OZ Well Statistics*		**Minimum**	**59.1**	**109**	**0.48**	**8.0E-5**
		Maximum	**75.7**	**130**	**0.63**	**6.0E-4**
		Average	**65.9**	**121**	**0.54**	**1.6E-4**
MU1-PM01	Perimeter/ Observation	Cooper Jacob	133.1	168	0.79	1.2E-4
		Theis Recovery	156.1		0.93	
MU1-PM02	Perimeter/ Observation	Cooper Jacob	108.3	152	0.71	1.1E-4
		Theis Recovery	103.9		0.68	
MU1-PM03	Perimeter/ Observation	Cooper Jacob	126.5	145	0.87	7.5E-5
		Theis Recovery	125.7		0.87	
MU1-PM04	Perimeter/ Observation	Cooper Jacob	90.8	146	0.62	1.1E-4
		Theis Recovery	90.7		0.62	
MU1-PM05	Perimeter/ Observation	Cooper Jacob	123.8	167	0.74	1.6E-4
		Theis Recovery	133.1		0.80	
MU1-PM06	Perimeter/ Observation	Cooper Jacob	88.6	148	0.60	2.0E-4
		Theis Recovery	88.7		0.60	
MU1-PM07**	Perimeter/ Observation	Cooper Jacob	132.7	142	0.93	2.7E-4
MU1-PM08	Perimeter/ Observation	Cooper Jacob	90.8	131	0.69	1.7E-4
		Theis Recovery	91.0		0.69	
MU1-PM09	Perimeter/ Observation	Cooper Jacob	77.1	148	0.52	1.1E-4
		Theis Recovery	75.8		0.51	
MU1-PM10	Perimeter/ Observation	Cooper Jacob	75.9	152	0.50	9.7E-5
		Theis Recovery	75.6		0.50	
MU1-PM11	Perimeter/ Observation	Cooper Jacob	76.0	158	0.48	1.1E-4
		Theis Recovery	75.4		0.48	
MU1-PM18	Perimeter/ Observation	Cooper Jacob	110.6	181	0.61	8.3E-5
		Theis Recovery	111.2		0.61	
PM Well Statistics		**Minimum**	**75.4**	**131**	**0.48**	**7.5E-5**
		Maximum	**156.1**	**181**	**0.93**	**2.0E-4**
		Average	**102.7**	**153**	**0.67**	**1.3E-4**

Notes: 1) The drawdown response in PM19 could not be analyzed because the drawdown hydrograph did not fit the standard format required for analyses.
2) The Cooper Jacob analysis was used to analyze the drawdown curve and the Theis Recovery analysis was used to analyze the recovery curve.

* Statistics exclude the pumping well (MU1-OZ02)

** The transducer in PM07 failed prior to the end of the test, so a Theis Recovery analysis could not be performed for this well.

Table 8. Second Aquifer Test (MU1-OZ23) Summary of Hydraulic Characteristics

Well ID	Well Type	Interpretation Method	Transmissivity (sq ft/day)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)	Storage Coefficient (Unitless)
MU1-OZ23	Pumping	Theis Recovery	25.2	122	0.21	
MU1-PM12	Perimeter/ Observation	Cooper Jacob Drawdown	65.1	185	0.35	2.7E-4
		Theis Recovery	72.9		0.39	
MU1-PM13	Perimeter/ Observation	Cooper Jacob Drawdown	49.5	171	0.29	6.2E-5
		Theis Recovery	64.0		0.37	
MU1-PM14A	Perimeter/ Observation	Cooper Jacob Drawdown	41.9	153	0.27	4.9E-5
		Theis Recovery	57.1		0.37	
MU1-PM15	Perimeter/ Observation	Cooper Jacob Drawdown	41.1	170	0.24	2.2E-4
		Theis Recovery	59.3		0.35	
MU1-PM16	Perimeter/ Observation	Cooper Jacob Drawdown	42.4	174	0.24	1.3E-4
		Theis Recovery	56.4		0.32	
MU1-PM17	Perimeter/ Observation	Cooper Jacob Drawdown	80.9	192	0.42	1.6E-4
		Theis Recovery	75.8		0.39	
Second Aquifer Test* Well Statistics		**Minimum**	**41.1**	**153**	**0.24**	**4.9E-5**
		Maximum	**80.9**	**192**	**0.42**	**2.7E-4**
		Average	**58.9**	**174**	**0.34**	**1.5E-4**

*Excludes pumping well (MU1-OZ23)

the first and second aquifer tests are included in Appendices G and H, respectively. The transmissivity estimates resulting from the various analysis methods were consistent and range from approximately 59 to 76 ft^2/day in the OZ wells and 41 to 156 ft^2/day in the PM wells.

The geologic cross sections constructed across the MU1 wellfield demonstrate that there is a thin shale unit (the W-shale) that is continuous across the MU1 wellfield. The W-shale does thin out to the west of MU1 and therefore is not regionally confining. Nevertheless, within MU1, the W-shale is a locally confining interval. The interior OZ wells in this analysis are completed below the W-shale, although ore-bearing sands may also occur above the W-shale. Therefore, the contributing aquifer to the interior OZ wells is thinner than the contributing aquifer to the PM wells, which are completed both above

and below the W-shale. As a result, the transmissivity calculated in the PM wells is expected to be higher than the transmissivity calculated in the interior OZ wells. This expected pattern of higher transmissivities in the PM wells was observed. However, because the contributing aquifer was thicker, the hydraulic conductivity (which is calculated by dividing the transmissivity by the aquifer thickness) is relatively consistent across the entire wellfield.

In general for both aquifer tests, the drawdown and recovery curves fit the expected curves for the analysis methods for all of the wells analyzed. The hydraulic conductivity values presented in Tables 7 and 8 are considered valid. Storage coefficient values ranging from 4.9×10^{-5} to 6.0×10^{-4} were determined by the Cooper Jacob analysis, and are appropriate for a confined aquifer.

Analyses of water levels and barometric pressures indicate that relatively mild fluctuations in atmospheric pressure occurred during the test but were not of sufficient magnitude to require water level data to be adjusted for barometric pressure changes.

Theoretical models typically assume that the pumped well fully penetrates the aquifer so that flow towards the well is entirely horizontal. However, with a partially-penetrating well, the condition of horizontal flow is not satisfied, at least in the vicinity of the pumped well. Vertical flow components are induced, which result in higher flow velocities in and near the well leading to additional head loss. This effect is greatest at the well/aquifer interface and decreases with increasing distance from the pumped well. This partial-penetration effect is negligible if drawdown is measured (via observation well) at a distance that is 1½ to 2 times greater than the saturated thickness of the aquifer (Kruseman and De Ridder 1994).

The PM wells are all fully penetrating wells, while all of the interior OZ wells are partially penetrating wells targeting the portion of the aquifer containing uranium mineralization. The radial distance between the pumped well and the interior OZ wells ranged from 202 to 1,619 feet, which meets or exceeds the 1½ to 2 times the thickness of the aquifer criterion. Therefore, no

corrections for the effects of partial penetration were applied to the drawdown data, and the same methods of aquifer analysis that were used for the fully-penetrating PM wells were employed for the interior of the OZ wells. The hydraulic conductivity values presented in Tables 7 and 8 are considered representative and valid.

As previously mentioned, pumped wells MU1-OZ02 and MU1-OZ23 were designed as production/injection wells, and were therefore completed as partially-penetrating wells. The effects of partial penetration are greatest at the pumped well. Various methods of adjusting the observed drawdown in partially-penetrating pumped wells (for confined, leaky, and unconfined aquifers) have been developed and are described by Kruseman and De Ridder (1994). However, Halford and others (2006) simulated drawdowns from 628 single-well aquifer tests and determined that the Cooper-Jacob (1946) straight-line method of estimating transmissivity in confined aquifers was affected minimally by partial penetration. Using the unadjusted, observed drawdown and recovery data, the coefficients of transmissivity for the pumped wells were calculated to be approximately 106.4 ft^2/day for MU1-OZ02 using the Theis recovery method, and approximately 25.2 ft^2/day for MU1-OZ23 using the Theis recovery method. These values, which are listed in Tables 7 and 8, were excluded from the statistical summary because the values from the observation wells are more reflective of the true aquifer parameters than the measurements at the pumping wells, which were affected by wellbore inefficiency and partial penetration effects. Plots of the time-drawdown data and aquifer analyses for the pumped wells are included in Appendices G and H for the first and second aquifer tests, respectively.

5.0 ANALYSIS OF DEEP OBSERVATION WELL SWABBING

While it was not explicitly one of the goals of this testing program, the hydraulic characteristics of the DM wells were also analyzed. Strata's well sampling techniques in the DM interval allowed for the aquifer characteristics to be estimated using traditional slug analyses techniques. Since the DM

interval is a very poor water production interval, Strata was not able to employ traditional water sampling techniques for the DM wells. Traditionally during sampling, at least three casing volumes of water are removed from the well bore before a sample is collected. In the case of the DM wells, it was not possible to evacuate three casing volumes during sampling because the water level in these wells takes weeks to recover. As a result, Strata resorted to swabbing the DM wells prior to sampling to ensure the wells contained fresh formation water during the sampling event. Under this modified sampling procedure, Strata swabbed the wells in rapid fashion, which resulted in the wells being bailed nearly dry. After two to three days of water level recovery, Strata pulled a relatively small sample from the well for analysis. Because the swabbing event happened quite rapidly (over approximately 15 minutes), it is for all practical purposes a slug out event.

5.1 DM Well Slug Analyses

Swabbing of the DM wells occurred on April 25, 2015, prior to the first aquifer test. Prior to and after this DM swabbing event, water levels in the DM wells were monitored using transducers and e-lines. Hydrographs from the DM wells prior to and after the swabbing event are included in Appendix I. The recovery curve in each DM well was then analyzed using the Aquifer^{Win32} (ESI 2003) software package.

The analytical solution used to evaluate the DM well swabbing events was the solution presented by Hvorslev (1951). This analytical solution allows the hydraulic conductivity to be calculated based on water well recovery rates in the well following a slug out event. Table 9 summarizes the calculated hydraulic conductivity values at each DM well following the swabbing events. Slug test analyses from the DM swabbing events are presented in Appendix J.

As shown on Table 9, the estimated transmissivity at each of the DM wells is very low (less than 0.1 ft^2/day). Given the low transmissivities, the water yields from the DM wells are very low (typically less than 0.1 gpm) even with very large drawdowns in the well (approximately 400 ft). In comparison to

the overlying OZ and SM aquifers, the DM interval is a very poor water-bearing zone.

Table 9. Hydraulic Parameters from DM Swabbing Events

Well	Hydraulic Conductivity (ft/day) (Hvorslev 1951)	Aquifer Thickness (ft)	Transmissivity (sq ft/day)	Estimated Yield* (gpm)
MU1-DM01	0.0016	23	0.04	0.08
MU1-DM02	0.0004	20	0.01	0.02
MU1-DM03A	0.0010	20	0.02	0.04
MU1-DM04	0.0018	25	0.05	0.10
MU1-DM05	0.0005	23	0.01	0.02
MU1-DM06	0.0032	15	0.05	0.10
MU1-DM07	0.0012	20	0.003	0.01
MU1-DM08	0.0023	22	0.05	0.10
MU1-DM09	0.0005	16	0.01	0.02
MU1-DM10	0.0029	21	0.06	0.12
MU1-DM11	0.0020	21	0.04	0.08
MU1-DM12	0.0005	21	0.01	0.02
MU1-DM13	0.0008	25	0.02	0.04
MU1-DM14	0.0006	23	0.01	0.02
Minimum	**0.0001**	**15**	**0.003**	**0.01**
Maximum	**0.0032**	**25**	**0.06**	**0.12**
Average	**0.0013**	**21**	**0.03**	**0.06**

*Yield estimated using the Theis solution based on a maximum drawdown of 400 ft over 30 days and S=0.00001 (a typical value for a low yielding confined aquifer).

6.0 SUMMARY AND CONCLUSIONS

The goals of the MU1 aquifer test program were 1) to demonstrate that the PM wells and OZ wells within MU1 are in hydraulic communication, 2) to evaluate the level of hydraulic communication between the production zone and the overlying and underlying intervals, and 3) to evaluate the aquifer hydraulic characteristics of the production zone sands within the mine unit.

The aquifer tests performed for MU1 demonstrated that the PM wells and the OZ wells within MU1 are in hydraulic communication. During the first aquifer test, 73 observation wells were monitored. Of these, 26 were OZ wells,

19 were PM wells, 14 were SM wells, and 14 were DM wells. During the second aquifer test, 16 observation wells were monitored. Of these, four were OZ wells, six were PM wells, three were SM wells, and three were DM wells. An OZ well was used in both tests as the pumped well (MU1-OZ02 and MU1-OZ23 for the first and second aquifer tests, respectively).

During the first aquifer test, it was determined that there is a low permeability zone crossing the southeast side of the test area. This could be a result of a stratigraphic facies change due to a differing depositional environment, possibly an estuarine channel. Bore logs and geologic cross sections provided in the MU1 wellfield package support this explanation. The bore logs demonstrate that within the low permeability area, the ore zone sands are finer grained and contain more shale than they do outside of the low permeability area. This area of low permeability restricts hydraulic communication between the northern and southeastern parts of the wellfield. However, outside of the low permeability area, the aquifer parameters are generally homogenous. This demonstrates that the wellfield is suitable for ISR uranium production so long as the wellfields are designed to avoid moving fluids directly across the low permeability area.

The aquifer tests also demonstrate that with the exception of a minor response observed in MU1-SM12, the overlying aquifer (SM) and the underlying interval (DM) are not in hydraulic communication with the OZ aquifer. During the aquifer test, minor water level fluctuations in the SM wells before, during, and after the aquifer test mirror barometric pressure changes, and show no correlation to the aquifer test. A minor response corresponding to the second and third aquifer tests was observed in MU1-SM12. This minor response was not observed at any of the other SM observation wells and is likely due to a very local source providing negligible hydraulic connection (e.g., an unplugged borehole). The water levels in the DM interval showed water level changes due to sampling, but water level changes did not correspond with either aquifer test. This lack of communication between the OZ aquifer and the overlying and

underlying water bearing interval demonstrates the hydraulic isolation of the OZ aquifer.

As shown on Table 1, the hydraulic parameters calculated for the OZ aquifer within other areas in the Ross ISR Project area are consistent with the hydraulic parameters calculated for MU1.

7.0 REFERENCES

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Attachment 5

Appendix A

Mine Unit 1 Aquifer Test Work Plan, April 16, 2015

Ross ISR Project
Mine Unit 1 Aquifer Test Work Plan
April 16, 2015

INTRODUCTION

Per Wyoming Department of Environmental Quality – Land Quality Division (LQD) Permit to Mine No. 802 the following presents the work plan for the aquifer test associated with Strata Energy's (Strata) Mine Unit 1. This work plan details procedures to complete the aquifer test in Mine Unit 1. The goals of the aquifer test are to demonstrate hydraulic communication between the ore zone aquifer (OZ) wells and the perimeter monitor wells and evaluate the potential for communication of the OZ aquifer with the overlying sand (SM aquifer) and underlying sand (DM interval) as measured through interior monitor wells.

AQUIFER TEST PROGRAM

Wells

The monitoring well network in Mine Unit 1 for the purposes of the aquifer test will be comprised of up to 41 monitor wells consisting of 19 (Perimeter wells) and up to 22 interior monitor wells (OZ, SM and DM intervals) within the wellfield boundary. Figure 1 depicts the wells that will be utilized as part of the aquifer test.

Pumping Wells

Strata plans to complete the aquifer test by pumping one interior OZ well. The primary well chosen for the aquifer test was chosen because it is one of the highest yielding wells in the wellfield and Strata anticipates that the water quality will meet the discharge requirements in the temporary WYPDES permit. Based on preliminary evaluations, Strata believes that pumping this well will be sufficient to elicit a response in all of the perimeter monitor wells surrounding Mine Unit 1. There is a possibility that variable aquifer conditions may result in muted responses on the south end of the wellfield since some of the perimeter monitor wells are approximately 2,000' from the primary pumping well. To account for this possibility Strata has proposed an alternate pumping well within the southern portion of the wellfield. In the event that pumping in

the primary well does not elicit a sufficient response in one or more of the perimeter monitor wells, a second aquifer test will be conducted at the alternate pumping well. If a second aquifer test is conducted, Strata proposes to only monitor the perimeter monitor wells in which no response was recorded during the first aquifer test. The primary and alternate OZ well(s) proposed for pumping are provided in Table 1. Figure 1 depicts all of the pumping and monitor well locations.

Table 1. Pumping Wells

Mine Unit 1 Aquifer Test Well Type	Pumping Well*
Primary pumping well	MU1-OZ02
Alternative pumping well	MU1-OZ11

**All potential pump test wells water quality analysis will be evaluated against surface water quality standards. If water quality analysis indicates a potential exceedence of a surface water quality standard, an alternative well will be selected as the pump test well.*

Monitoring Wells

During the aquifer test, water levels will be monitored within the perimeter monitor wells as well as the monitor wells completed in the SM, DM, and OZ intervals within the wellfield boundary. The wells Strata proposes to monitor are tabulated in Attachment A.

Antecedent Conditions

Many of the DM, SM, nearby OZ observation wells, and perimeter wells will be equipped with recording pressure transducers. These transducers will collect water level data continuously. Due to availability of transducers (approximately 41) not all of the available monitor wells will be instrumented. Wells that will be instrumented with transducers are identified on Figure 1. As necessary, an electronic water level probe will be used to supplement and verify transducer data. Strata has a combination of both vented and non-vented pressure transducers. The majority of the transducers are vented which eliminates the barometric effects on the sensor. The remaining transducers are non-vented; however, barometric pressure will be recorded at the site during the aquifer test to adjust the non-vented transducer data as necessary.

After the pressure transducers are installed in each well, water level data will be collected prior to the aquifer test to establish antecedent conditions. Water level data will be collected for a minimum of 24 hours prior to the test to demonstrate that aquifer conditions are stable. To evaluate aquifer stability, the pre-test hydrograph will be

evaluated to determine if the observed water level changes are beyond what can be attributed to barometric effects. If water level changes are greater than barometric effects, the pre-test monitoring period will continue as necessary until background water level trends can be determined to properly evaluate test data. During the stabilization monitoring period, pumping period, and recovery period, data will be collected at intervals no longer than ten minutes.

Test Discharge Rate and Duration

Constant discharge rates will range from 9 to 30 gpm and possibly higher if conditions warrant. The duration of the test may range from 24 to 96 hours or longer, if necessary. Ultimate test duration will be determined in the field with the test duration adjusted as necessary to ensure a drawdown response is observed in all the perimeter monitor wells. Typically, the minimum acceptable response in a perimeter monitor well will be one foot (12 inches). However, more or less response may be deemed acceptable depending on the proximity of the perimeter monitor well to the pumping well and trends/patterns monitored during the test. Field data will be collected and analyzed in real time to determine if boundary or equilibrium conditions are encountered. Example field forms are included in Attachment B.

Discharge Management

The handling of discharge water from the test will be permitted through the WDEQ-WQD temporary WYPDES program. The permit will require weekly effluent monitoring for TDS, TSS, radium 226, total uranium and daily monitoring of pH and flowrate. Any water discharged will be appropriately managed to minimize surface erosion and will not enter a live surface water feature.

TEST PROCEDURES AND METHODS OF ANALYSIS

Test Types

The aquifer test will evaluate hydraulic continuity between the perimeter monitor wells and the pumping well(s) as well as the confining capacity of the shale between the OZ aquifer and the SM and DM intervals. The aquifer test data will also be evaluated to demonstrate hydraulic continuity, or the lack thereof, as well as allow for the development of hydraulic parameters such as transmissivity and storativity.

Strata may perform a step-rate test in order to confirm optimal pumping rates of the pumping wells. If separate step-rate tests are performed, they will be completed prior to the constant rate aquifer test and stability monitoring will be performed to ensure that the aquifer is stable before the constant rate test is performed.

Water Level Measurement

Water levels will be measured with recording pressure transducers and electronic water level probe. The pressure transducers will be installed in the observation wells prior to the aquifer test and aquifer stabilization will be evaluated before the test commences. Table 2 provides proposed pressure transducer specifications. Prior to the test, water levels will be measured to the nearest hundredth foot with an electronic water level probe and pressure transducers will be set to record head changes a minimum of once per minute for the pumping well and every five minutes for the observation wells through drawdown and recovery. After pumping has ceased, water level measurement will continue through recovery of the pumped well. Typically, recovery will be defined as the point at which the water level in the pumping well reaches 90 percent of the pre-pumping test level. Depending on the specific aquifer conditions and the location of the well, recovery levels may be adjusted as necessary. All well response and discharge data will be recorded on the field form, an example of which is provided in Attachment B.

Table 2. Monitor Well Pressure Transducer Specifications

Well Type	Transducer	Parameters Measured	Accuracy
Pumping Wells	100 psi	Pressure level	Press. ± 0.1%
Production Observation Wells	15 - 100 psi	Pressure level	Press. ± 0.1%
Over/Underlying Observation Wells	15 - 100 psi	Pressure level	Press. ± 0.1%
Perimeter Monitor Wells	15 - 100 psi	Pressure level	Press. ± 0.1%

Discharge Measurement

An inline flow meter will be used to measure flow rates during the aquifer test. For the first eight hours of the test the flow will be manually recorded from the flow meter by field personnel on intervals not exceeding two hours. Based on the performance of the pumping well during the initial pumping period, Strata anticipates

that the frequency of the manual flow verification can be reduced for the remainder of the aquifer test.

Field Measurement and Samples

As necessary for the WYPDES discharge permit, field parameters (pH) will also be measured in conjunction with flow measurements. In addition, water samples will be collected and analyzed for constituents as required by the temporary WYPDES permit.

Field Operations and Schedule

The aquifer test will be conducted using a portable generator to provide power to pumps installed within the pumping wells. Strata anticipates a typical aquifer test could take between seven and eleven days. With the pumping portion requiring 24-96 hours and the pre/post-test setup and monitoring requiring up to 7 days. The exact test schedule may vary depending on actual aquifer conditions encountered. Table 3 summarizes a typical aquifer test schedule.

Table 3. Typical Aquifer Test Schedule

	Transducer Installation	Stability Monitoring	Pump Test	Recovery
MU1 Area	Up to 3 Days	1 Day	2 -4 Days	Up to 3 Days

Flow Management

Flow will be regulated with a gate valve, doll valve, or similar. Pressure upstream of the valve will also be measured throughout each aquifer test. A flow meter and manual flow measurements using a bucket and stopwatch will also be used to verify flow rates.

METHODS OF ANALYSIS

Aquifer test results will be analyzed using the Cooper and Jacob (1946) method for the drawdown portion of the test and the Theis method (1935) for the recovery portion of the test.

Data will also be evaluated using the method(s) appropriate to the observed well responses. Depending upon the response recorded in the observation and pumping wells (i.e. confined, leaky confined, and partial penetration). One or more of the following techniques will be used:

- Non-leaky confined, Theis (1935); Cooper and Jacob (1946)
- Leaky confined, Hantush and Jacob (1955)
- Leaky confined with storage in confining layer, Hantush (1960)
- Partial penetration, Hantush (1964)

Directional transmissivity, if necessary, will be determined using methods presented by Maslia and Randolph (1987).

ATTACHMENT A

Pump Test Wells

Monitor Wells Instrumented With Transducers During the Aquifer Test.

Well ID	Well Type	Pumping/Observation/ Ring
MU1-PM01	Perimeter	Ring
MU1-PM02	Perimeter	Ring
MU1-PM03	Perimeter	Ring
MU1-PM04	Perimeter	Ring
MU1-PM05	Perimeter	Ring
MU1-PM06	Perimeter	Ring
MU1-PM07	Perimeter	Ring
MU1-PM08	Perimeter	Ring
MU1-PM09	Perimeter	Ring
MU1-PM10	Perimeter	Ring
MU1-PM11	Perimeter	Ring
MU1-PM13	Perimeter	Ring
MU1-PM14A	Perimeter	Ring
MU1-PM12	Perimeter	Ring
MU1-PM15	Perimeter	Ring
MU1-PM16	Perimeter	Ring
MU1-PM17	Perimeter	Ring
MU1-PM18	Perimeter	Ring
MU1-PM19	Perimeter	Ring
MU1-SM14	Shallow	Observation
MU1-DM14	Deep	Observation
MU1-SM05	Shallow	Observation
MU1-DM05	Deep	Observation
MU1-SM08	Shallow	Observation
MU1-DM08	Deep	Observation
MU1-OZ02	Ore Zone	Pumping
MU1-SM06	Shallow	Observation
MU1-DM06	Deep	Observation
MU1-SM07	Shallow	Observation
MU1-DM07	Deep	Observation
MU1-SM09	Shallow	Observation
MU1-DM09	Deep	Observation
MU1-SM04	Shallow	Observation
MU1-DM04	Deep	Observation
MU1-SM01	Shallow	Observation
MU1-DM01	Deep	Observation
MU1-SM11	Shallow	Observation
MU1-DM11	Deep	Observation
MU1-SM02	Shallow	Observation
MU1-DM02	Deep	Observation
MU1-DM13	Deep	Observation

ATTACHMENT B

Example Field Form

WWC ENGINEERING

AQUIFER TEST FIELD DATA

Project/Client ____

Pumped Well No. ________________ Observation Well No. ________________

Type of Pump Test: ☐ Constant Discharge ☐ Step-Drawdown

Pumped Well Casing ID ________________ inches

Distance Between Pumped and Observation Wells ____________ feet

Water Level Measurements by: ☐ electric tape ☐ pressure transducer

Discharge Measurements by: ☐ bucket/stopwatch ☐ flow meter ☐ flume/weir

Screen/Perforation Interval(s) (below land surface) ____________________

Depth of Pump Intake (below land surface) ____________feet

Depth of Static Water Level (from measurement point) __________feet

Height of Measurement Point (above land surface) ____________feet

Elevation of Measurement Point ___________feet a.m.s.l.

Pump On Date ______/_______/_______ Time ____________ AM/PM

Pump Off Date ______/_______/_______ Time ____________ AM/PM

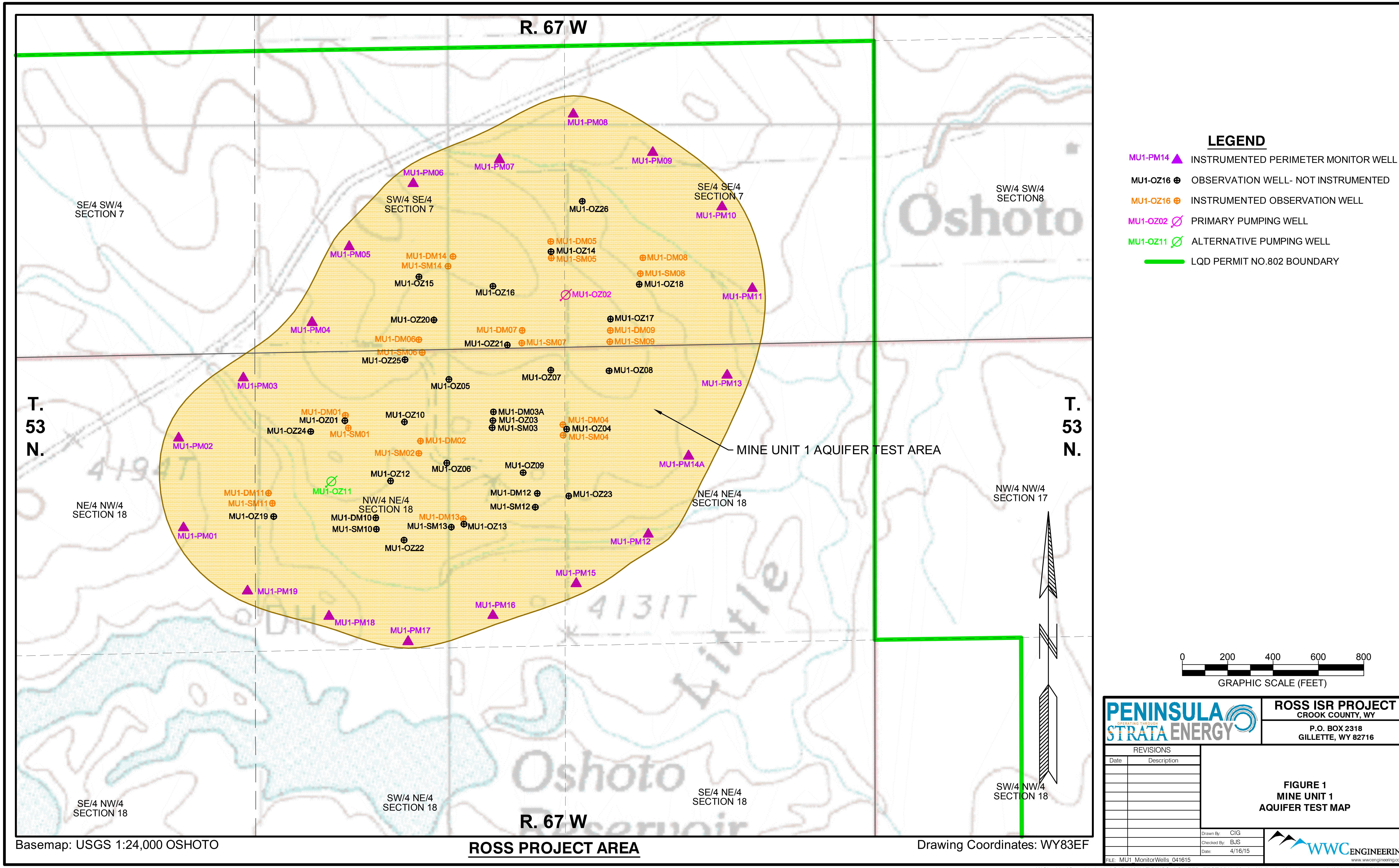
Weather Conditions ____

Test Performed by ____

AQUIFER TEST FIELD DATA

Project/Client ______________________________________ Well No. ________________

TIME			WATER LEVEL DATA					
Date	Clock Time	(**t**) Elapsed Time Since Pump ON or OFF (min)	Depth to Water Below M.P. (ft)	(**s**) Drawdown/ Recovery (ft)	(**Q**) Discharge (gpm)	Discharge Pipe Pressure (PSI)	COMMENTS


R. 67 W
T. 53 N.
SE/4 SW/4 SECTION 7
SW/4 SE/4 SECTION 7
SE/4 SE/4 SECTION 7
SW/4 SW/4 SECTION8
NE/4 NW/4 SECTION 18
NW/4 NE/4 SECTION 18
NE/4 NE/4 SECTION 18
NW/4 NW/4 SECTION 17
SE/4 NW/4 SECTION 18
SW/4 NE/4 SECTION 18
SE/4 NE/4 SECTION 18
SW/4 NW/4 SECTION 18
Oshoto
MINE UNIT 1 AQUIFER TEST AREA
MU1-PM01
MU1-PM02
MU1-PM03
MU1-PM04
MU1-PM05
MU1-PM06
MU1-PM07
MU1-PM08
MU1-PM09
MU1-PM10
MU1-PM11
MU1-PM12
MU1-PM13
MU1-PM14A
MU1-PM15
MU1-PM16
MU1-PM17
MU1-PM18
MU1-PM19
MU1-OZ02
MU1-OZ11
LEGEND
MU1-PM14 INSTRUMENTED PERIMETER MONITOR WELL
MU1-OZ16 OBSERVATION WELL- NOT INSTRUMENTED
MU1-OZ16 INSTRUMENTED OBSERVATION WELL
MU1-OZ02 PRIMARY PUMPING WELL
MU1-OZ11 ALTERNATIVE PUMPING WELL
LQD PERMIT NO.802 BOUNDARY
0 200 400 600 800
GRAPHIC SCALE (FEET)
PENINSULA STRATA ENERGY
ROSS ISR PROJECT
CROOK COUNTY, WY
P.O. BOX 2318
GILLETTE, WY 82716
REVISIONS
Date Description
FIGURE 1
MINE UNIT 1
AQUIFER TEST MAP
WWC ENGINEERING
Basemap: USGS 1:24,000 OSHOTO
ROSS PROJECT AREA
Drawing Coordinates: WY83EF

ATTACHMENT C

Additional Pumping Test at MU1-OZ23

INTRODUCTION

As proposed in the aquifer testing plan, an aquifer test was recently conducted within Mine Unit 1 utilizing MU1-OZ02 as the pumping well. Based on the results of the initial pumping test, an additional aquifer test is proposed at MU1-OZ23 to further characterize the hydraulic properties of the southeast portion of the wellfield. MU1-OZ2 was pumped from May 5, 2015 until May 8, 2015. Following the active pumping period, recovery in the wellfield was monitored until May 12, 2015. The results of the aquifer test demonstrated that throughout most of Mine Unit 1 the OZ aquifer is in hydraulic communication. The preliminary results also indicate there is no hydrologic communication between the OZ aquifer and the overlying and underlying intervals monitored during the test. However, no clear responses to the aquifer test were observed in six perimeter monitor wells and one OZ observation well along the southeast side of the mine unit (PM 13, PM14A, PM12, PM15, PM16, PM17, and MU-OZ23). The geologic cross sections indicate that the OZ sand in the southeast side of the mine unit contains more shale, as well as lower permeability sands; these are believed to be the reason for limited response. A second pumping test conducted at MU1-OZ23 will allow the hydrological characteristics of this area to be evaluated in further detail. This attachment discusses the details of the proposed aquifer test at MU1-OZ23.

MU1-OZ23 ALTERNATIVE AQUIFER TEST OBJECTIVES

The aquifer test at MU1-OZ02 was sufficient to characterize aquifer characteristics throughout most of Mine Unit 1 with the exception of the area immediately surrounding the perimeter monitor wells that had limited response. Therefore, the focus of the MU1-OZ23 alternative aquifer test will be to help further understand the hydrologic characteristics in the small portion of the wellfield that had limited response during the primary aquifer test. MU1-OZ23 was chosen as a pumping well for this additional aquifer testing because no response was observed in MU1-OZ23 or in PM12 approximately 350 feet to the east while drawdown was observed in MU1-OZ09 approximately 200 feet to the west. MU1-OZ23 is a logical choice as the

pumping well given its proximity to both wells that did and did not respond in the primary aquifer test. The key objectives of the alternative aquifer test using MU1-OZ23 include:

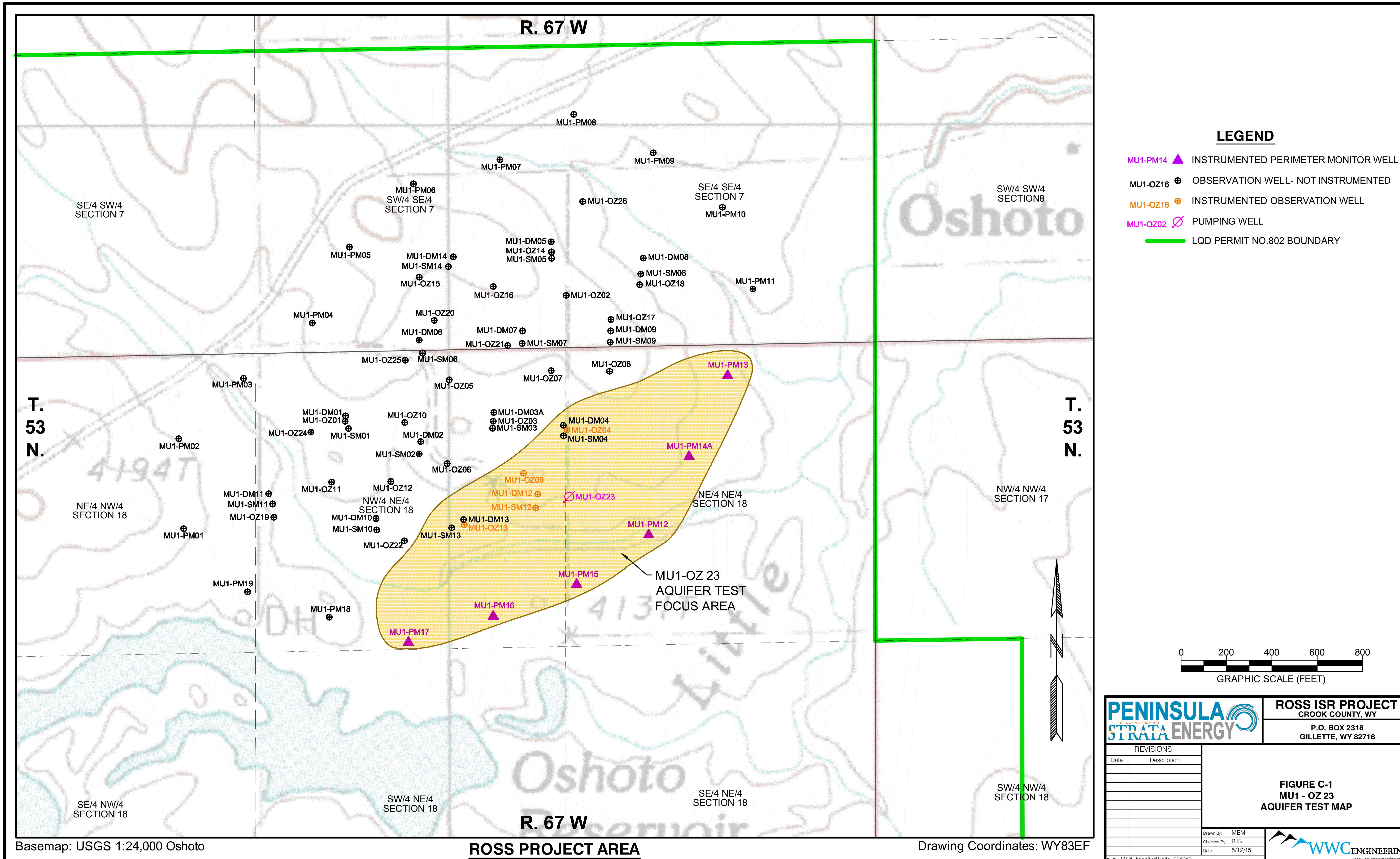
1) To further characterize the hydraulic characteristics of the aquifer within the area of lower permeability observed in the southeast side of Mine Unit 1.
2) To demonstrate hydrologic connection between MU1-OZ23 and the adjacent perimeter wells.
3) To further confirm the results of the primary aquifer test that the OZ aquifer is not in hydrologic communication with the overlying SM aquifer or underlying DM interval.

AQUIFER TEST PROGRAM.

The equipment and the data quality objectives of the aquifer test proposed for MU1-OZ23 are described in detail within the original work plan. The same equipment and data quality objectives described in the plan will be utilized for the aquifer test conducted at MU1-OZ23. The only variation from the plan will be that a smaller subset of wells will be instrumented during the test with 12 wells monitored. Table C-1 includes a summary of the wells that will be instrumented during the aquifer test. In summary, all of the PM wells in which a limited response was observed in the MU1-OZ02 aquifer test will be instrumented. The three OZ wells in closest proximity to MU1-OZ23 will also be instrumented. One well in the overlying aquifer and one well in the underlying aquifer will also be instrumented. The overlying and underlying wells chosen for monitoring were selected because they are in close proximity to MU1-OZ23 (less than 200 feet away). Figure C-1 graphically portrays the wells that will be instrumented during the pumping test.

Table C-1 Monitor wells instrumented with transducers during MU1-OZ23 aquifer test.

Well ID	Well Completion	Pumping/Observation/Perimeter
MU1-PM13	Ore Zone	Perimeter
MU1-PM14A	Ore Zone	Perimeter
MU1-PM12	Ore Zone	Perimeter
MU1-PM15	Ore Zone	Perimeter
MU1-PM16	Ore Zone	Perimeter
MU1-PM17	Ore Zone	Perimeter
MU1-OZ23	Ore Zone	Pumping
MU1-OZ04	Ore Zone	Observation
MU1-OZ09	Ore Zone	Observation
MU1-OZ13	Ore Zone	Observation
MU1-SM12	Shallow	Observation
MU1-DM12	Deep	Observation


R. 67 W
T. 53 N.
LEGEND
MU1-PM14 INSTRUMENTED PERIMETER MONITOR WELL
MU1-OZ16 OBSERVATION WELL- NOT INSTRUMENTED
MU1-OZ16 INSTRUMENTED OBSERVATION WELL
MU1-OZ02 PUMPING WELL
LQD PERMIT NO.802 BOUNDARY
SE/4 SW/4 SECTION 7
SW/4 SE/4 SECTION 7
SE/4 SE/4 SECTION 7
SW/4 SW/4 SECTION8
NE/4 NW/4 SECTION 18
NW/4 NE/4 SECTION 18
NE/4 NE/4 SECTION 18
NW/4 NW/4 SECTION 17
SE/4 NW/4 SECTION 18
SW/4 NE/4 SECTION 18
SE/4 NE/4 SECTION 18
SW/4 NW/4 SECTION 18
Oshoto
Oshoto Reservoir
MU1-OZ 23 AQUIFER TEST FOCUS AREA
MU1-PM01
MU1-PM02
MU1-PM03
MU1-PM04
MU1-PM05
MU1-PM06
MU1-PM07
MU1-PM08
MU1-PM09
MU1-PM10
MU1-PM11
MU1-PM12
MU1-PM13
MU1-PM14A
MU1-PM15
MU1-PM16
MU1-PM17
MU1-PM18
MU1-PM19
MU1-OZ23
MU1-OZ09
MU1-DM12
MU1-SM12
MU1-DM13
MU1-OZ13
MU1-SM13
MU1-DM04
MU1-OZ04
MU1-SM04
MU1-DM03A
MU1-OZ03
MU1-SM03
0 200 400 600 800
GRAPHIC SCALE (FEET)
PENINSULA
STRATA ENERGY
ROSS ISR PROJECT
CROOK COUNTY, WY
P.O. BOX 2318
GILLETTE, WY 82716
REVISIONS
Date Description
FIGURE C-1
MU1 - OZ 23
AQUIFER TEST MAP
WWC ENGINEERING
Basemap: USGS 1:24,000 Oshoto
ROSS PROJECT AREA
Drawing Coordinates: WY83EF

Attachment 5

Appendix B

First Aquifer Test (MU1-OZ02) Field Data Sheets

WWC ENGINEERING

AQUIFER TEST FIELD DATA

Project/Client Ross MU1/Strata

Pumped Well No. MU1-022 Observation Well No. ______

Type of Pump Test: ☑ Constant Discharge ☐ Step-Drawdown

Pumped Well Casing ID 4.33 inches

Distance Between Pumped and Observation Wells ______ feet

Water Level Measurements by: ☑ electric tape ☑ pressure transducer

Discharge Measurements by: ☑ bucket/stopwatch ☑ flow meter ☐ flume/weir

Screen/Perforation Interval(s) (below land surface) 413 – 425

Depth of Pump Intake (below land surface) 340' feet

Depth of Static Water Level (from measurement point) 110.96' feet

Height of Measurement Point (above land surface) 1.56 feet

Elevation of Measurement Point 4169.14 feet a.m.s.l.
Transducer set @ 318.37

Pump On Date 5 / 5 / 15 Time 9:10 AM/PM (AM circled)

Pump Off Date 5 / 8 / 15 Time 13:02 AM/PM (PM circled)

Weather Conditions ______

Test Performed by [signature]

WWC ENGINEERING

AQUIFER TEST FIELD DATA

Project/Client Ross MU1 / Strata Well No. MU1-OZ2

TIME			WATER LEVEL DATA					
Date	Clock Time	(t) Elapsed Time Since Pump ON or OFF (min)	Depth to Water Below M.P. (ft)	(s) Drawdown/ Recovery (ft)	(Q) Discharge (gpm)	Discharge Pipe Pressure (before control valve) (PSI)	Discharge Pipe Pressure (after control valve) (PSI)	COMMENTS
5/5/15	9:15am	5			32.8	11	0	
	9:22	12		100	32.9	11	0	
	9:38	28		102	33.0	11	0	
	10:05	55			32.5	10.5	0	
	10:30	80			32.0	12.0		Reduced Flow
	10:42	72		107	31.8	16.0		Reduced Flow
	11:26	136		107.8	31.75	16.0		
	12:24pm	194		109.2	31.7	16.0		
	1:25pm	255		109.9	31.7	16.0		
	2:28pm	318		105	31.75	16.0		
	4:10pm	420			31.7	16	0	
	5:49pm	519			31.65	16	0	
5/6/15	12:04am	894			31.7	15	0	Had to slightly increase flow
	6:05am	1255			31.74	14	0	Had to slightly increase flow
	8:31am			117.67'	31.7	14	0	
	11:42am				31.64	14	0	
	15:38			117.67	31.74	14	0	
5/7/15	6:00am				31.57	14	0	

WWC ENGINEERING

AQUIFER TEST FIELD DATA

Project/Client Ross/MU1 Strata   Well No. MU1-022

TIME			WATER LEVEL DATA					
Date	Clock Time	(t) Elapsed Time Since Pump ON or OFF (min)	Depth to Water Below M.P. (ft)	(s) Drawdown/ Recovery (ft)	(Q) Discharge (gpm)	Discharge Pipe Pressure (before control valve) (PSI)	Discharge Pipe Pressure (after control valve) (PSI)	COMMENTS
5/7/15	6:10am				31.73	13.5	0	Slightly Increased Flow.
5/7/15	8:55am				31.67	13.0	0	Slightly Increased Flow
5/7/15	12:20				31.67	~~13.0~~ 12.5	0	
5/7/15	16:07				31.73	12.0	0	Slightly Increased Flow
5/8/15	5:55am				31.67	12.0	0	Slightly Increased Flow
5/8/15	8:24am				31.7	12.0	0	~~Slightly Increased~~
5/8/15	13:00				31.64	11.5	0	

C:\Users\jholmgren\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\DY56LR7L\AQUIFER TEST FIELD DATA FORM Step Test.doc

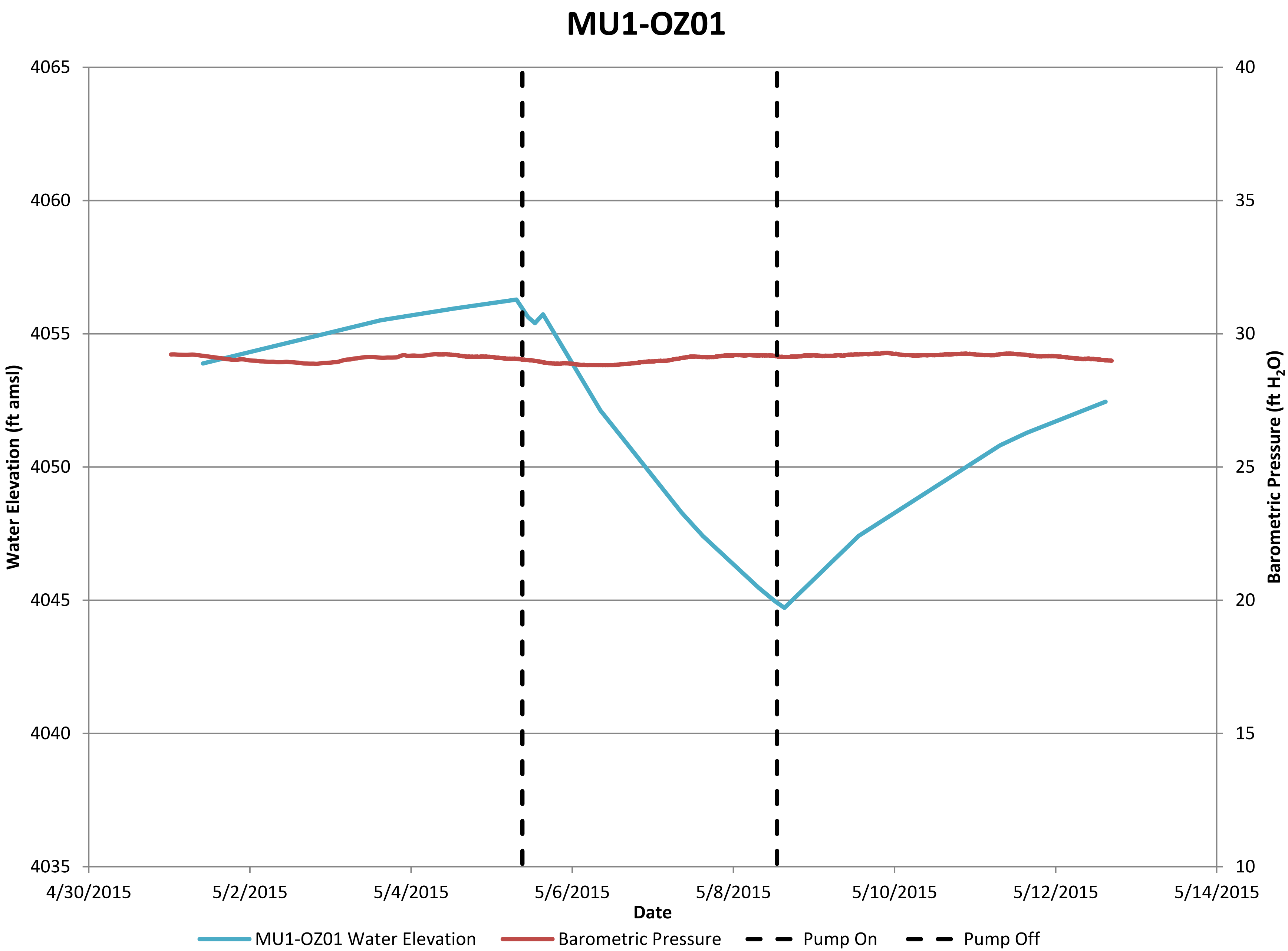
Attachment 5

Appendix C

First Aquifer Test (MU1-OZ02) Hydrographs

TABLE OF CONTENTS

OZ HYDROGRAPHS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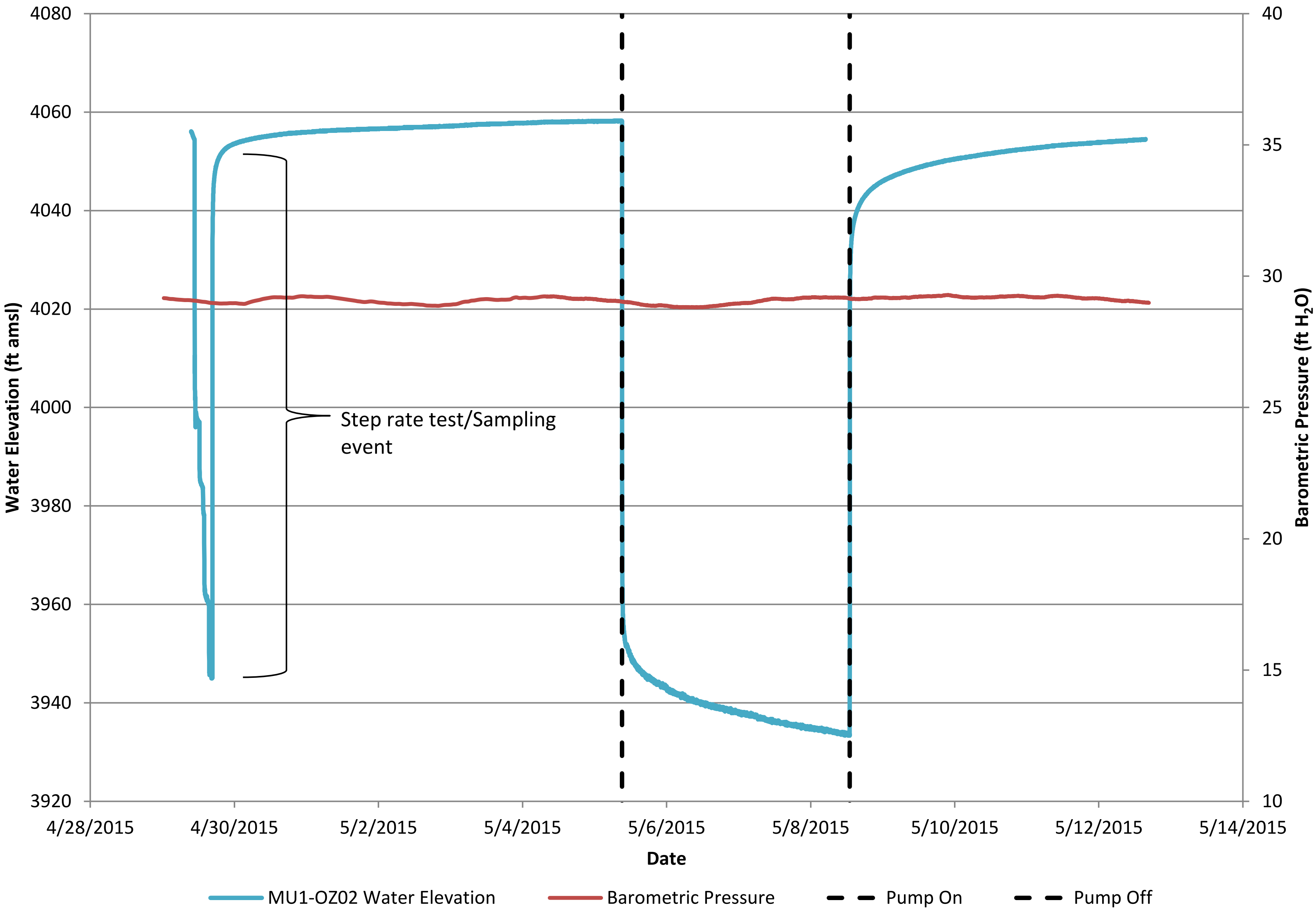
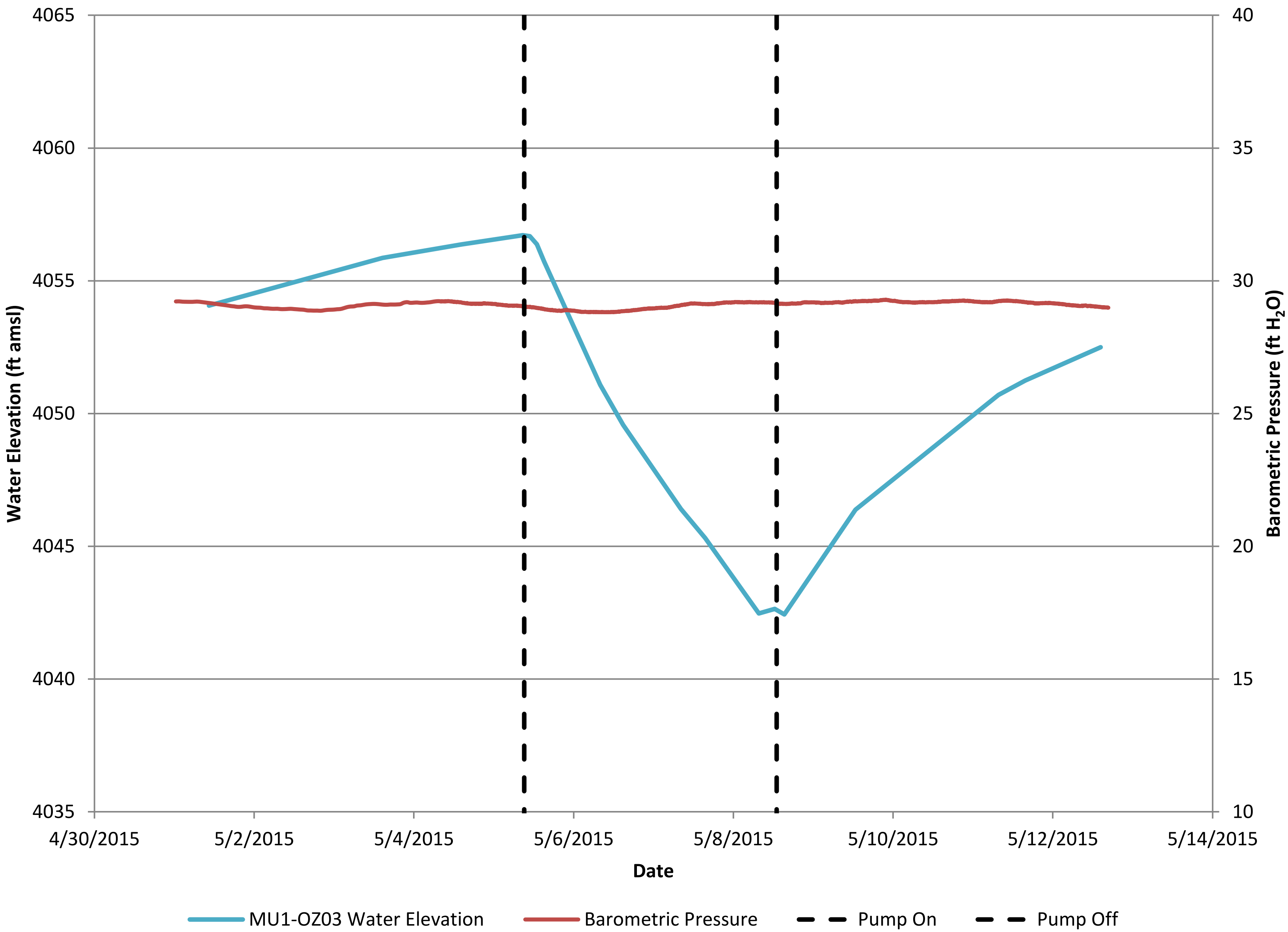
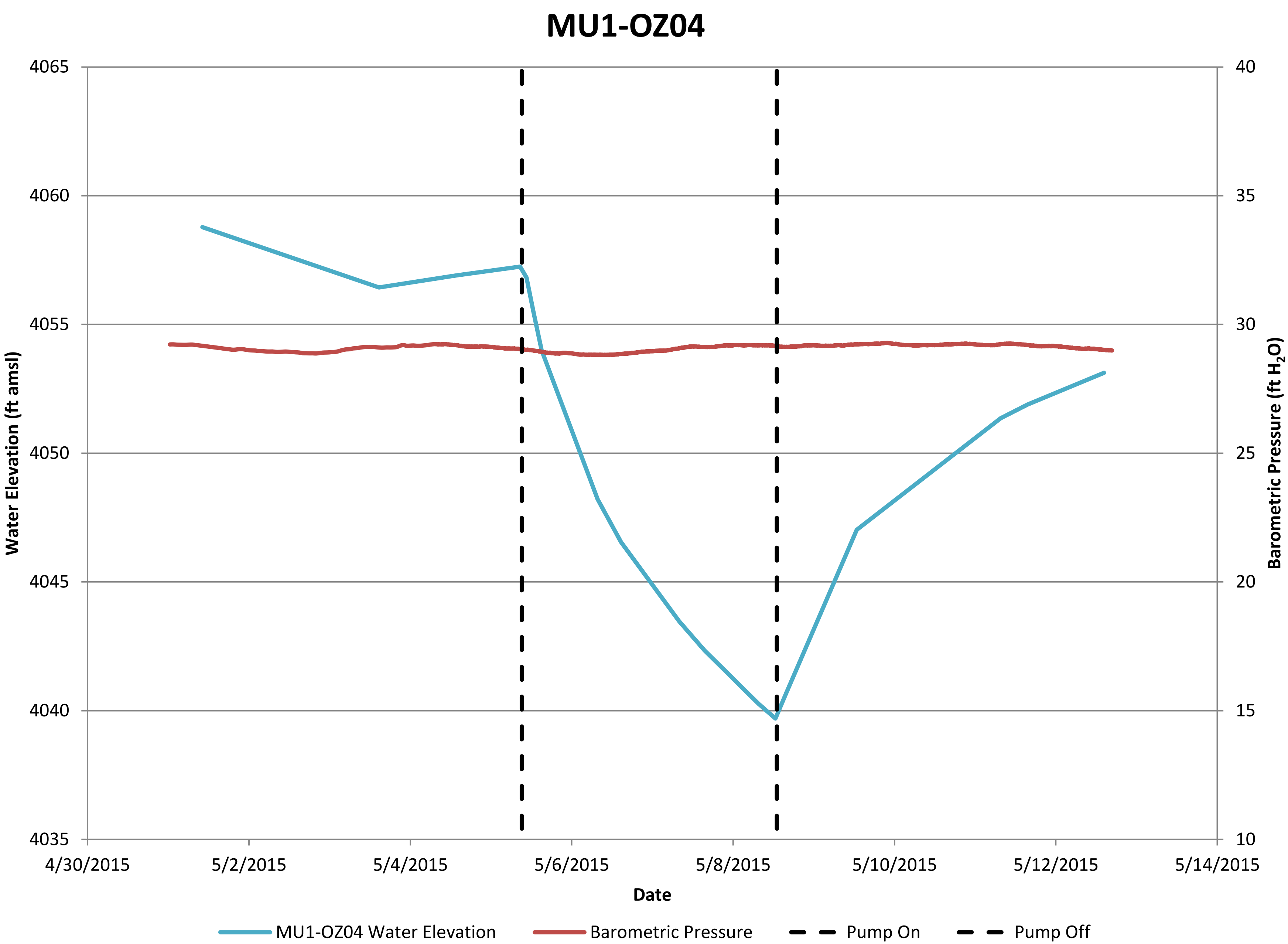
Water Elevation (ft amsl)
Barometric Pressure (ft H2O)
Date
4065
4060
4055
4050
4045
4040
4035
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
MU1-OZ01 Water Elevation
Barometric Pressure
Pump On
Pump Off

MU1-OZ02 Primary Pumping Well

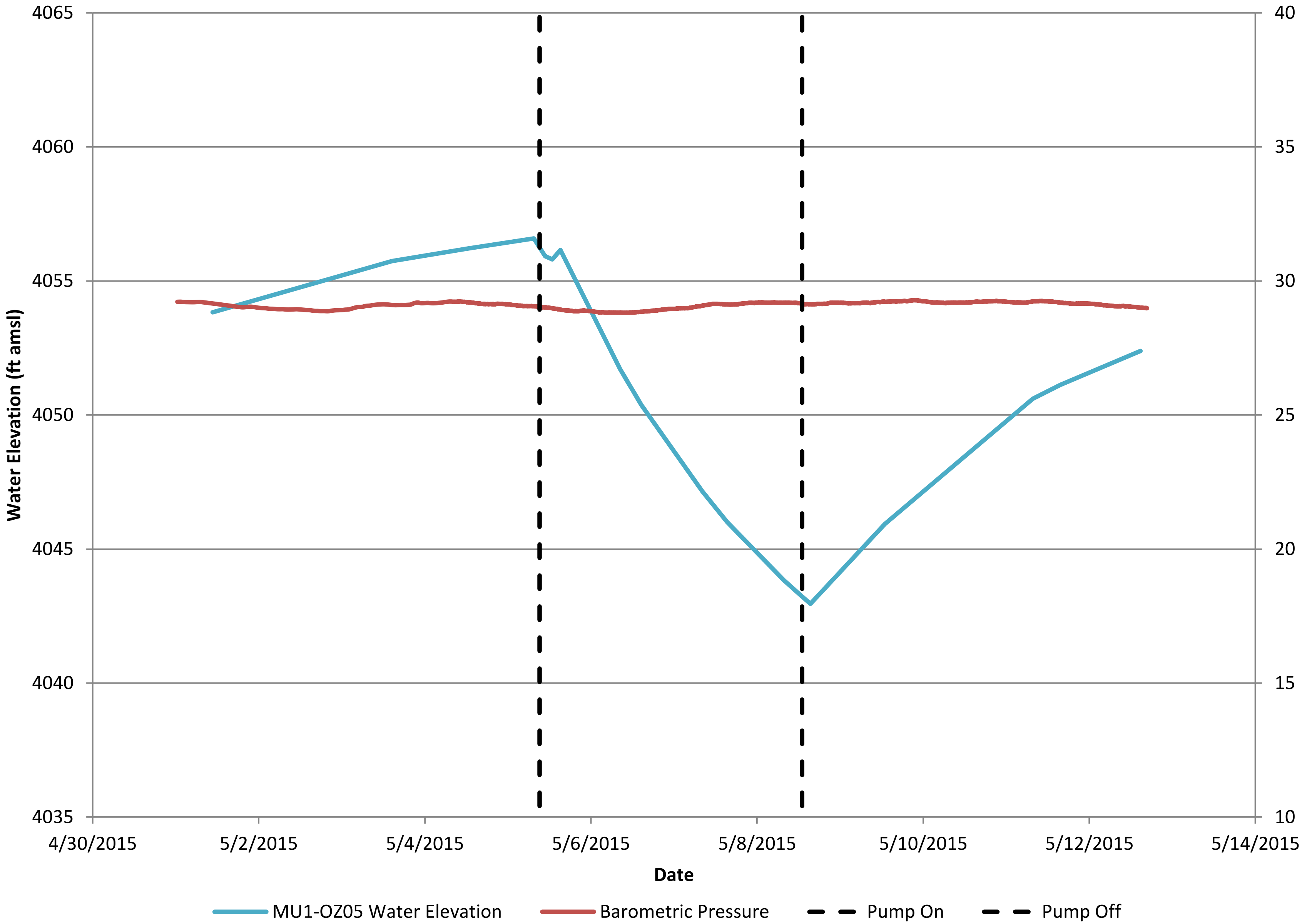


MU1-OZ03

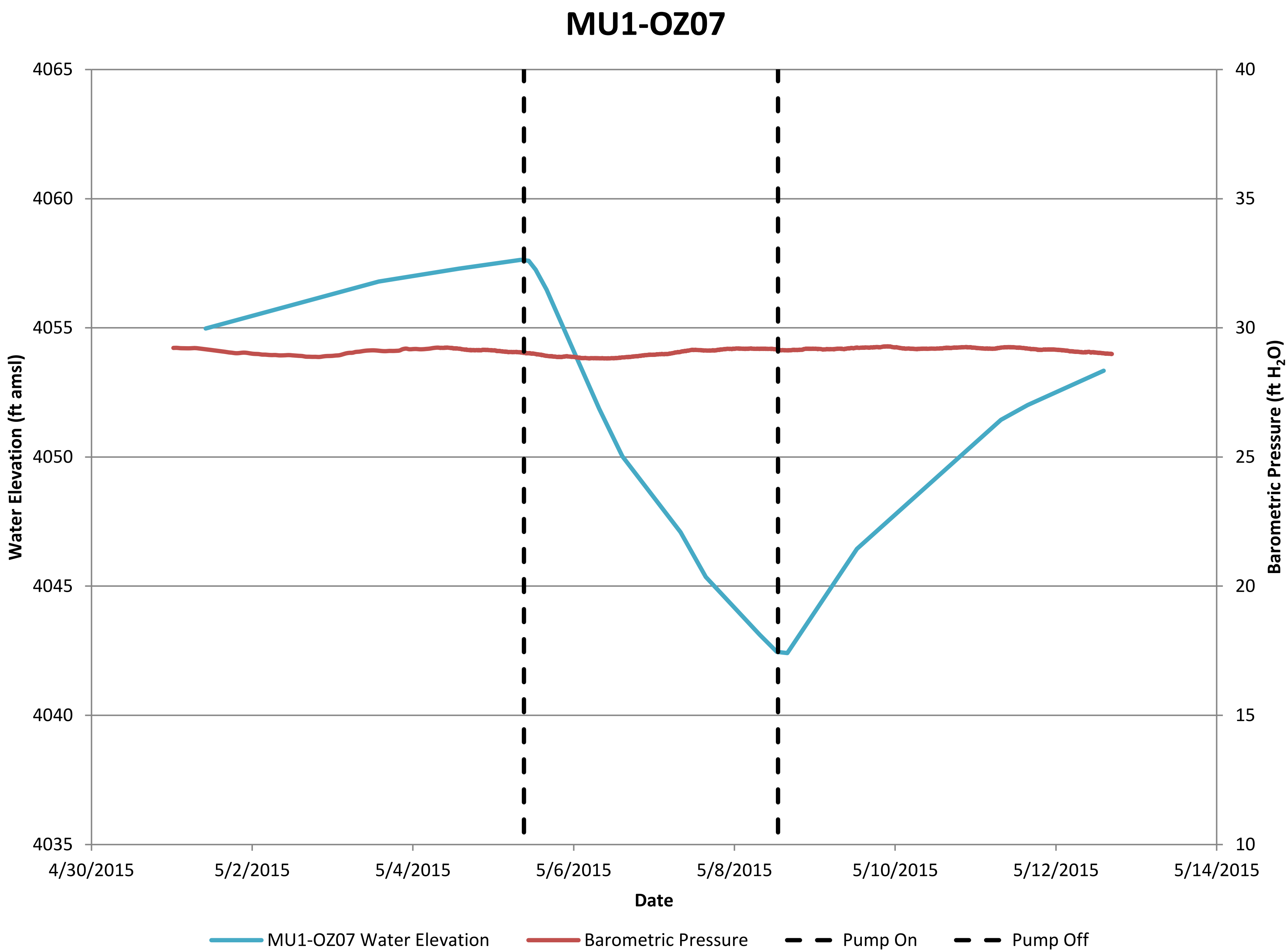

4065
4060
4055
4050
4045
4040
4035
Water Elevation (ft amsl)
40
35
30
25
20
15
10
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ03 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-OZ04
Water Elevation (ft amsl)
4065
4060
4055
4050
4045
4040
4035
Barometric Pressure (ft H_2O)
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ04 Water Elevation
Barometric Pressure
Pump On
Pump Off

MU1-OZ05


4065
4060
4055
4050
4045
4040
4035
Water Elevation (ft amsl)
40
35
30
25
20
15
10
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ05 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-OZ06
Water Elevation (ft amsl)
4065
4060
4055
4050
4045
4040
4035
Barometric Pressure (ft H_2O)
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ06 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-OZ07
Water Elevation (ft amsl)
Barometric Pressure (ft H2O)
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4060
4055
4050
4045
4040
4035
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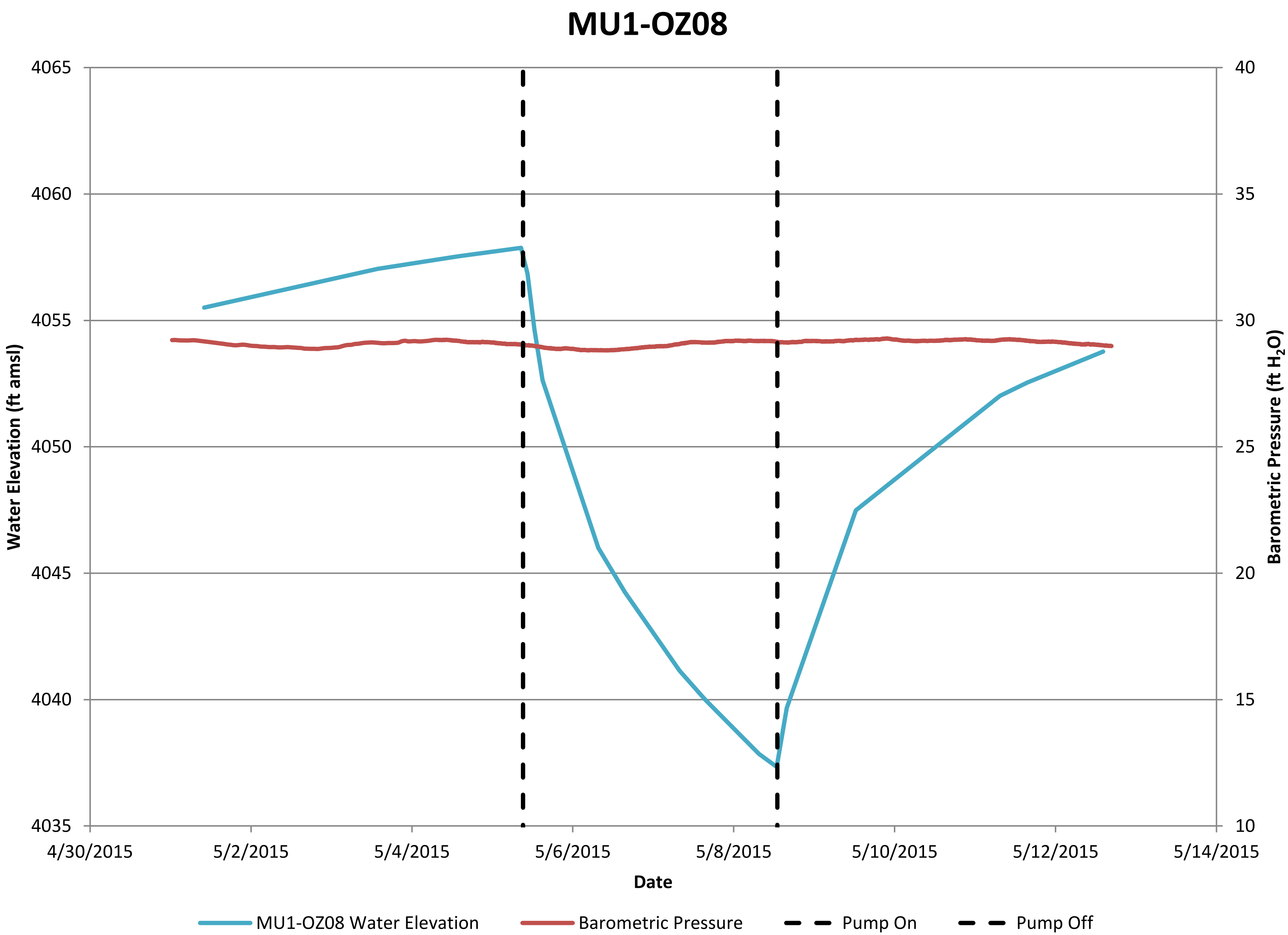
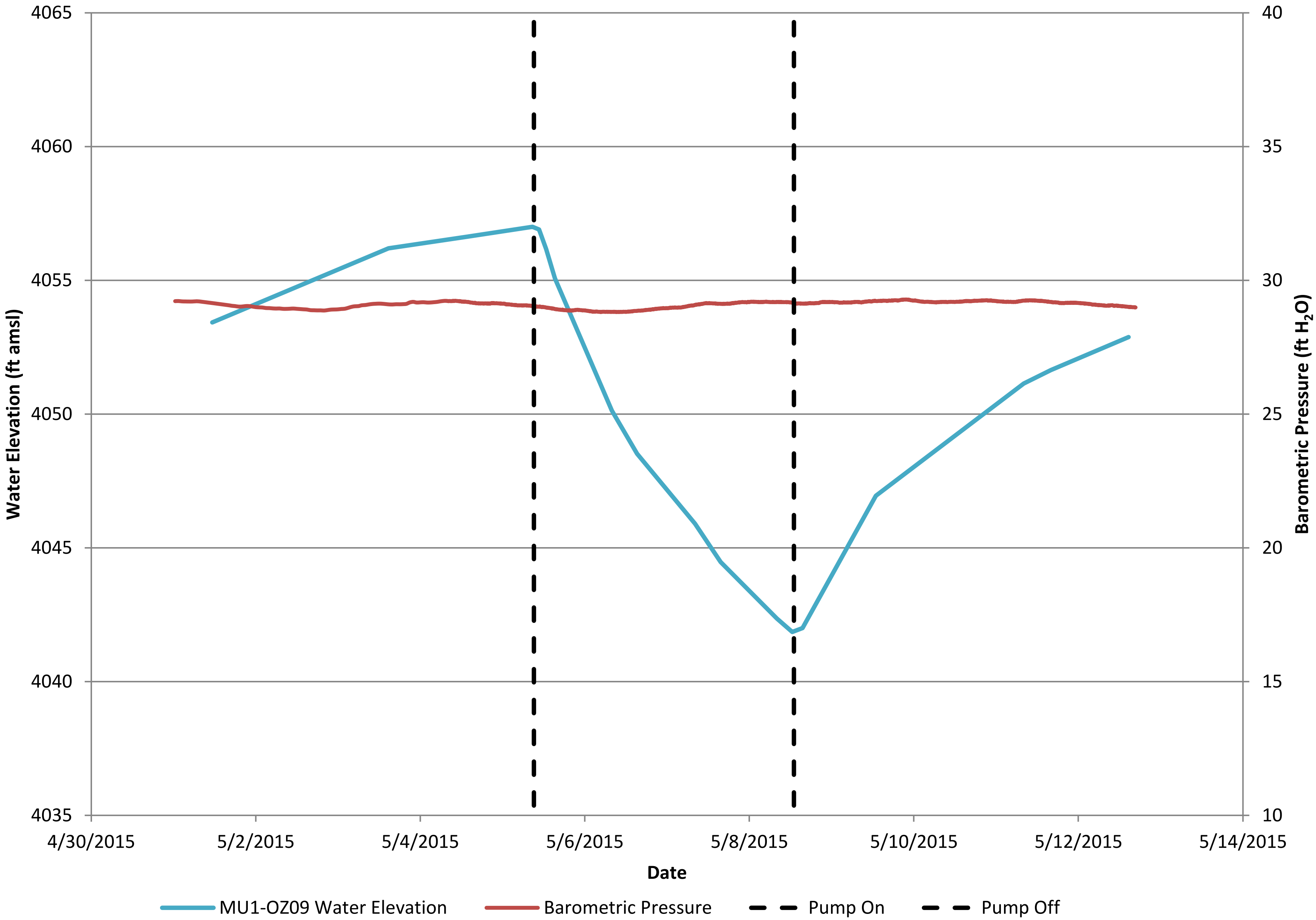
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ07 Water Elevation
Barometric Pressure
Pump On
Pump Off

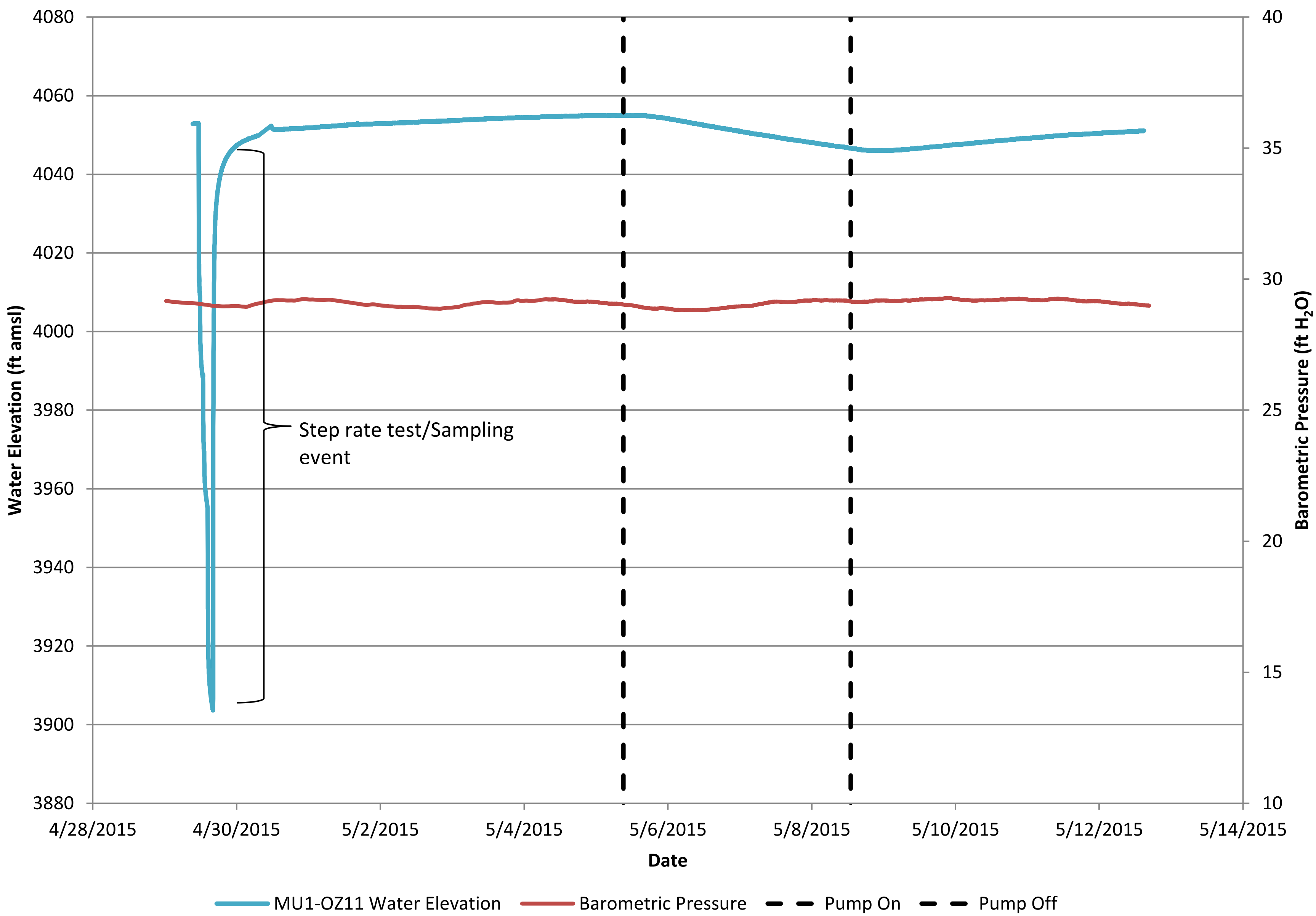

MU1-OZ08
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4065
4060
4055
4050
4045
4040
4035
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ08 Water Elevation
Barometric Pressure
Pump On
Pump Off

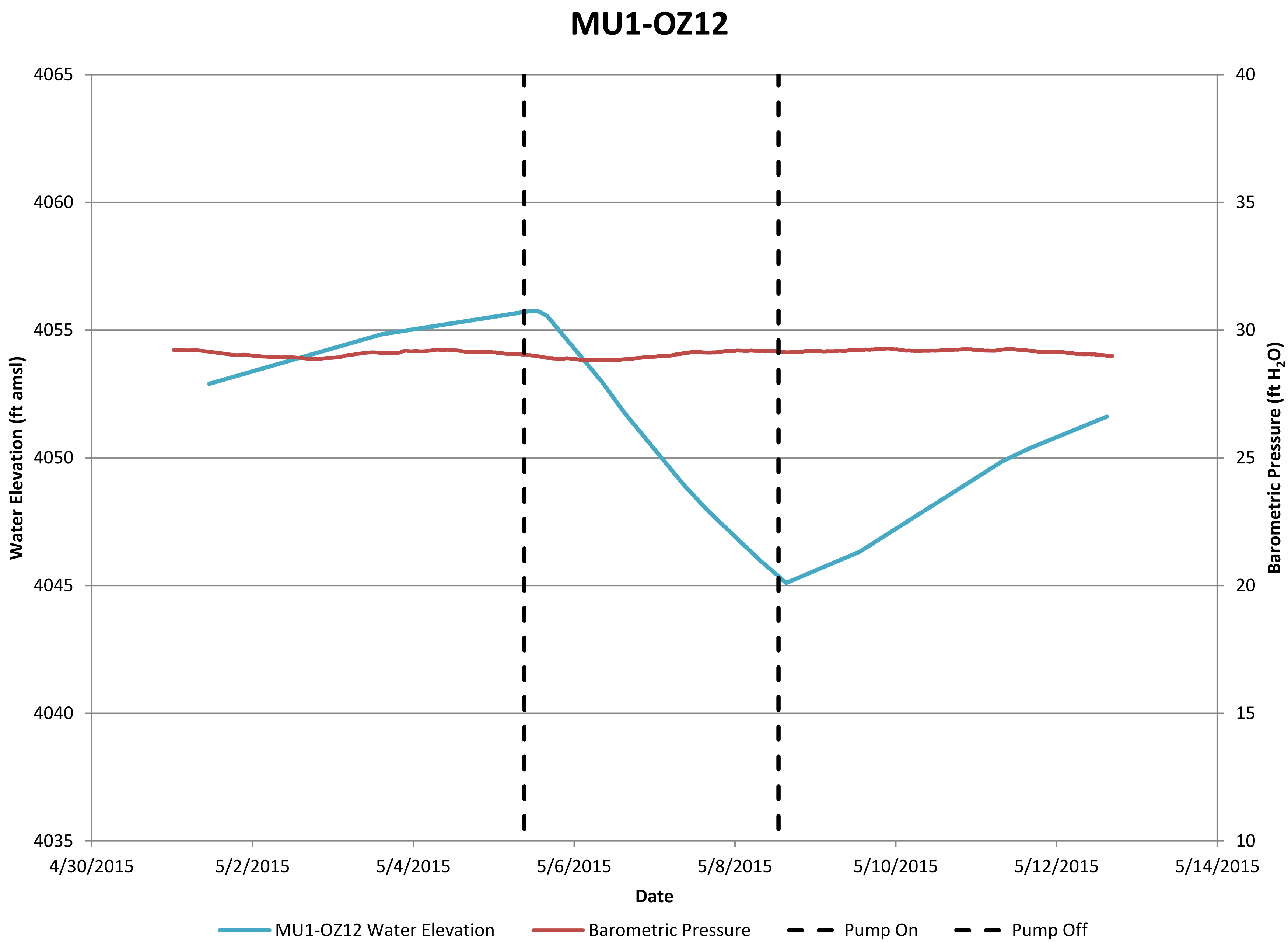
MU1-OZ09

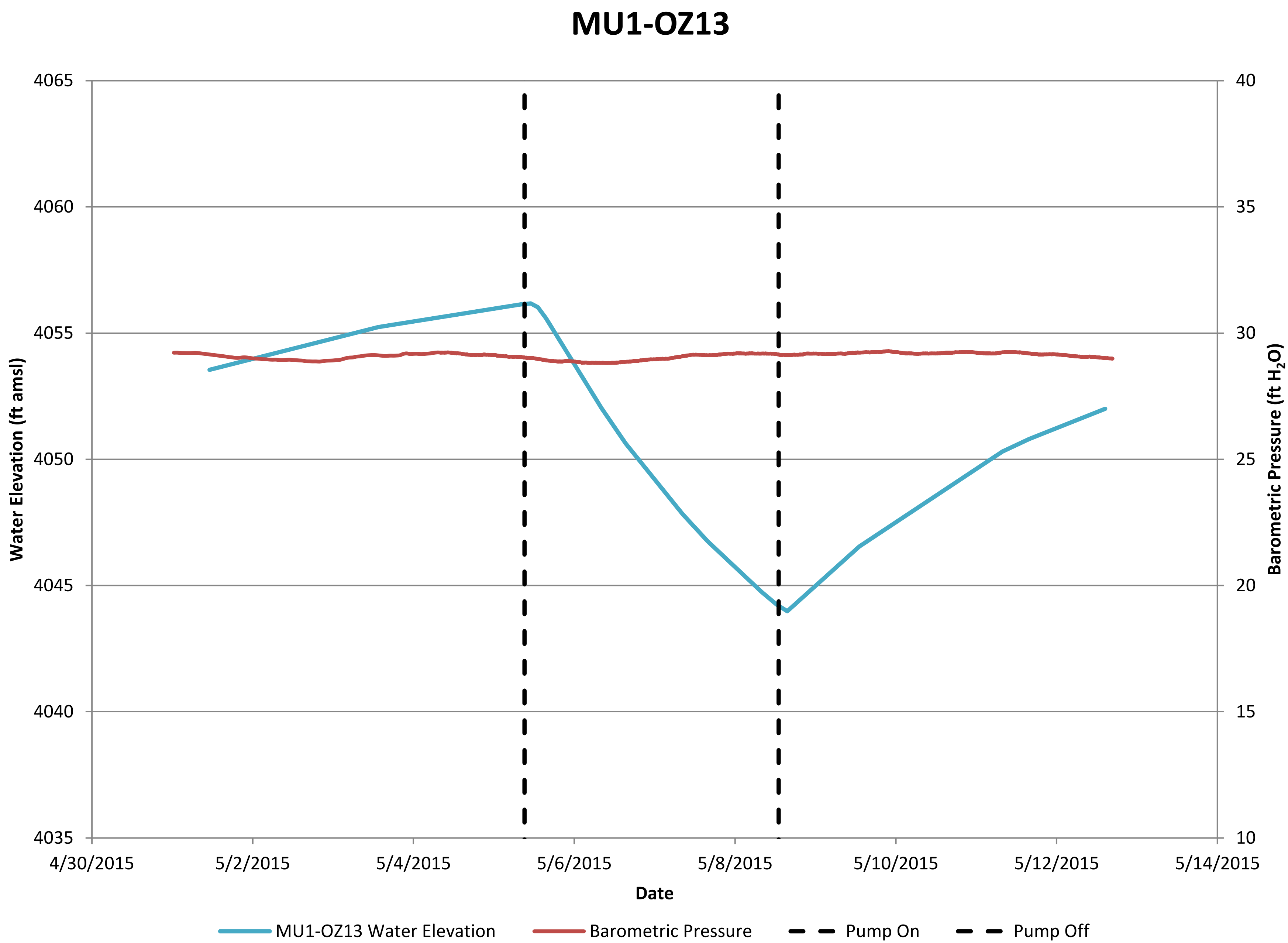

4065
4060
4055
4050
4045
4040
4035
Water Elevation (ft amsl)
40
35
30
25
20
15
10
Barometric Pressure (ft H2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ09 Water Elevation
Barometric Pressure
Pump On
Pump Off

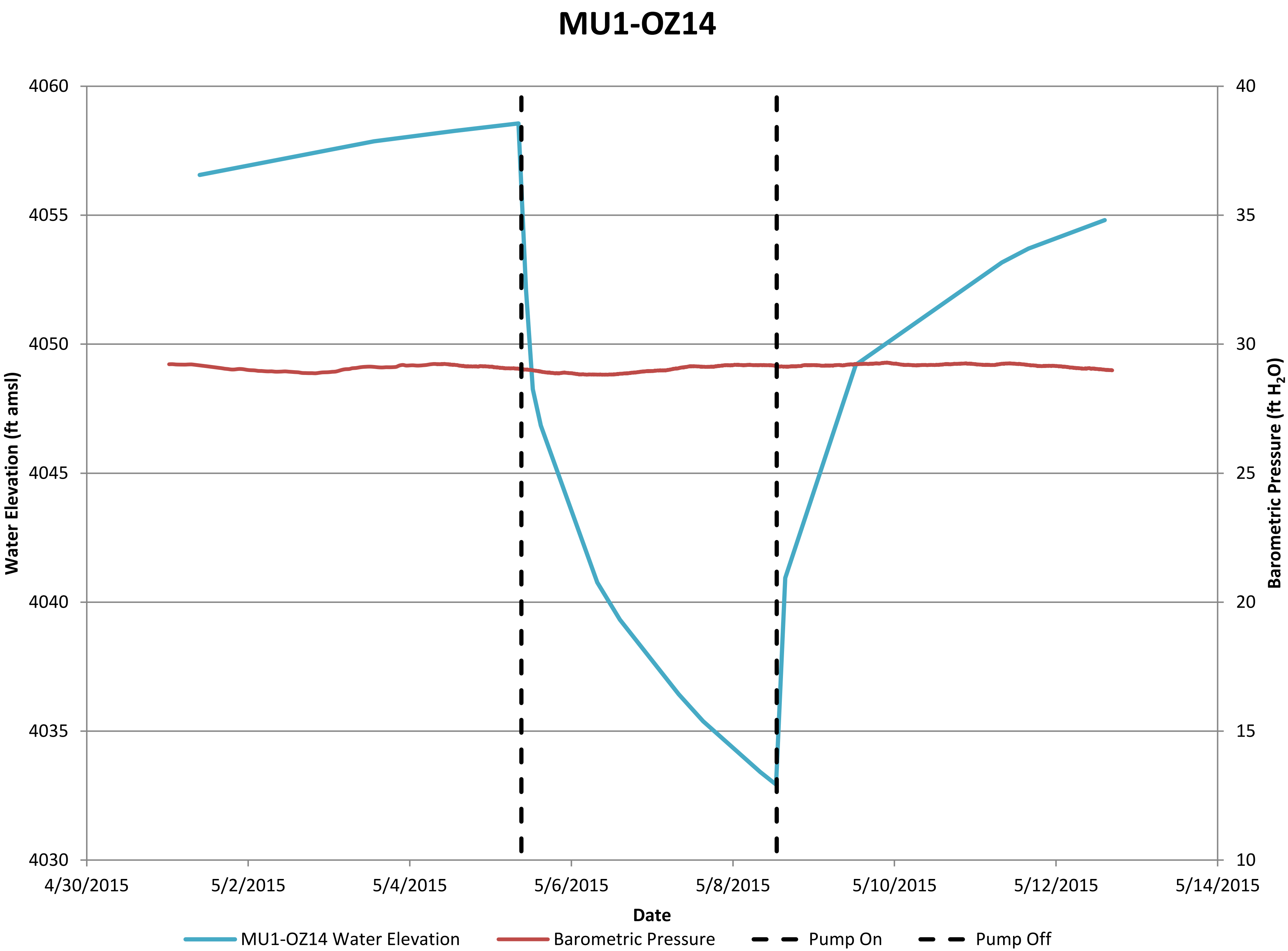

MU1-OZ10
Water Elevation (ft amsl)
4065
4060
4055
4050
4045
4040
4035
Barometric Pressure (ft H_2O)
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ10 Water Elevation
Barometric Pressure
Pump On
Pump Off

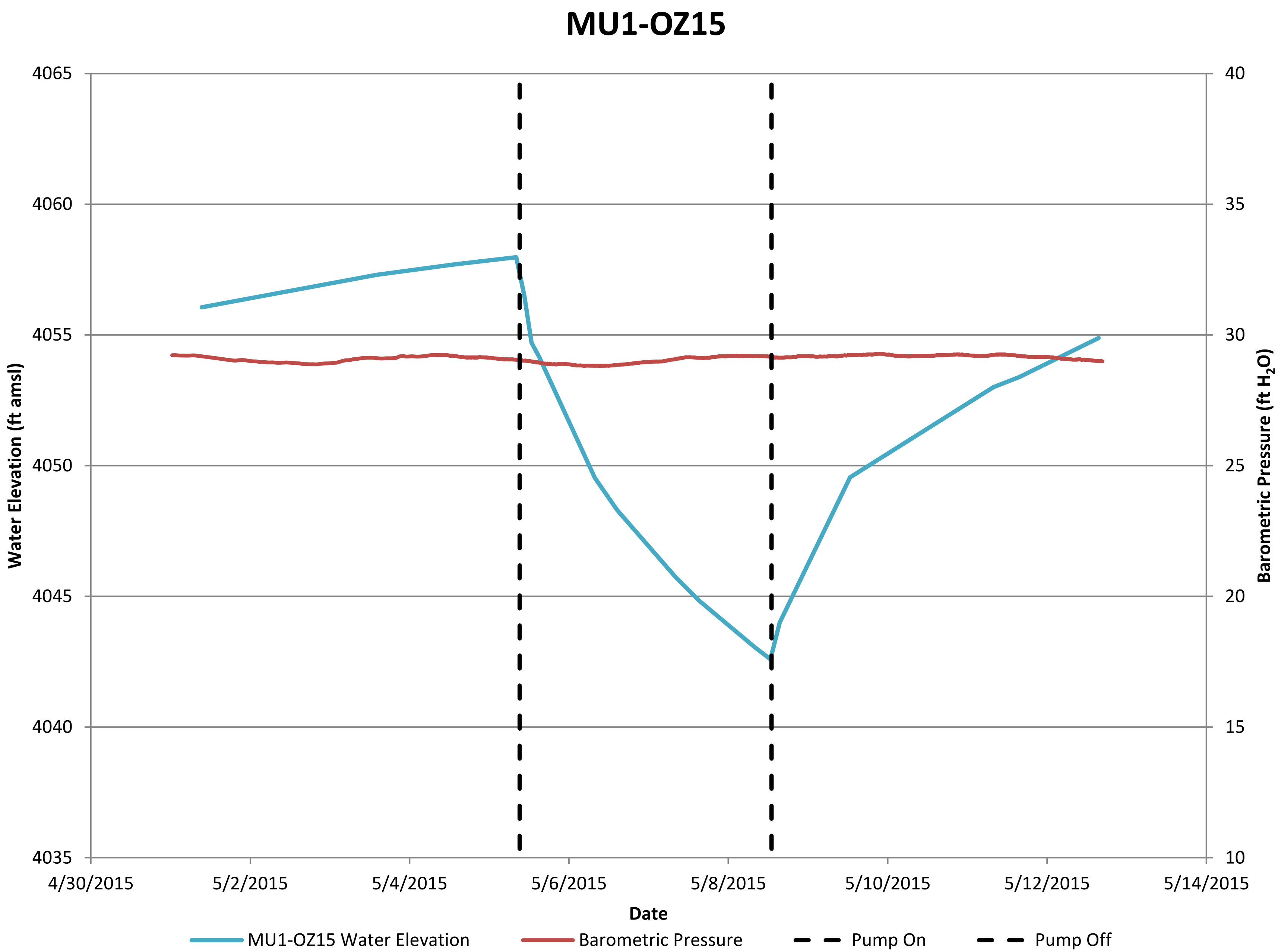
MU1-OZ11

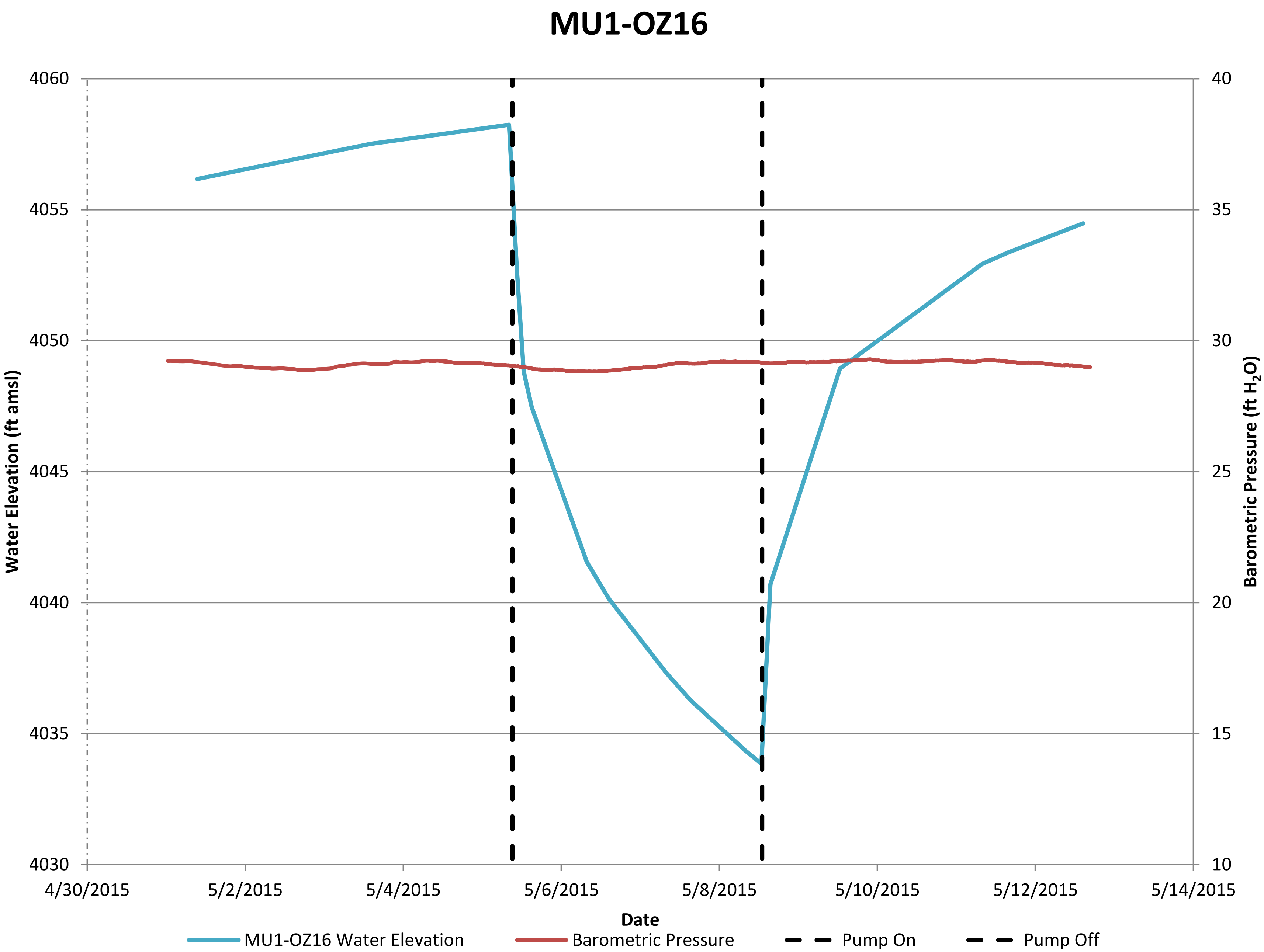

4080
4060
4040
4020
4000
3980
3960
3940
3920
3900
3880
Water Elevation (ft amsl)
40
35
30
25
20
15
10
Barometric Pressure (ft H_2O)
Step rate test/Sampling event
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ11 Water Elevation
Barometric Pressure
Pump On
Pump Off

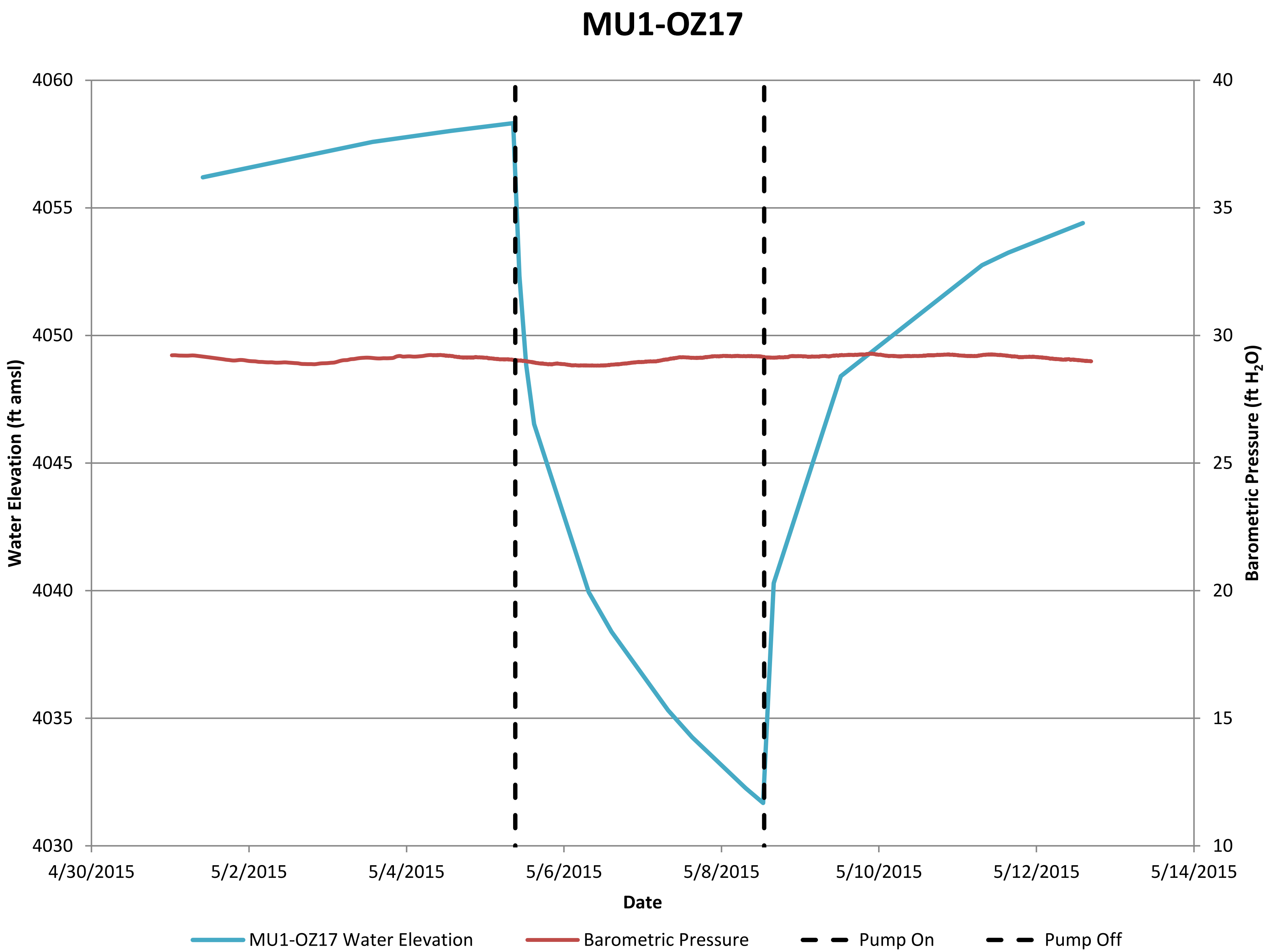

MU1-OZ12
Water Elevation (ft amsl)
4065
4060
4055
4050
4045
4040
4035
Barometric Pressure (ft H_2O)
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ12 Water Elevation
Barometric Pressure
Pump On
Pump Off

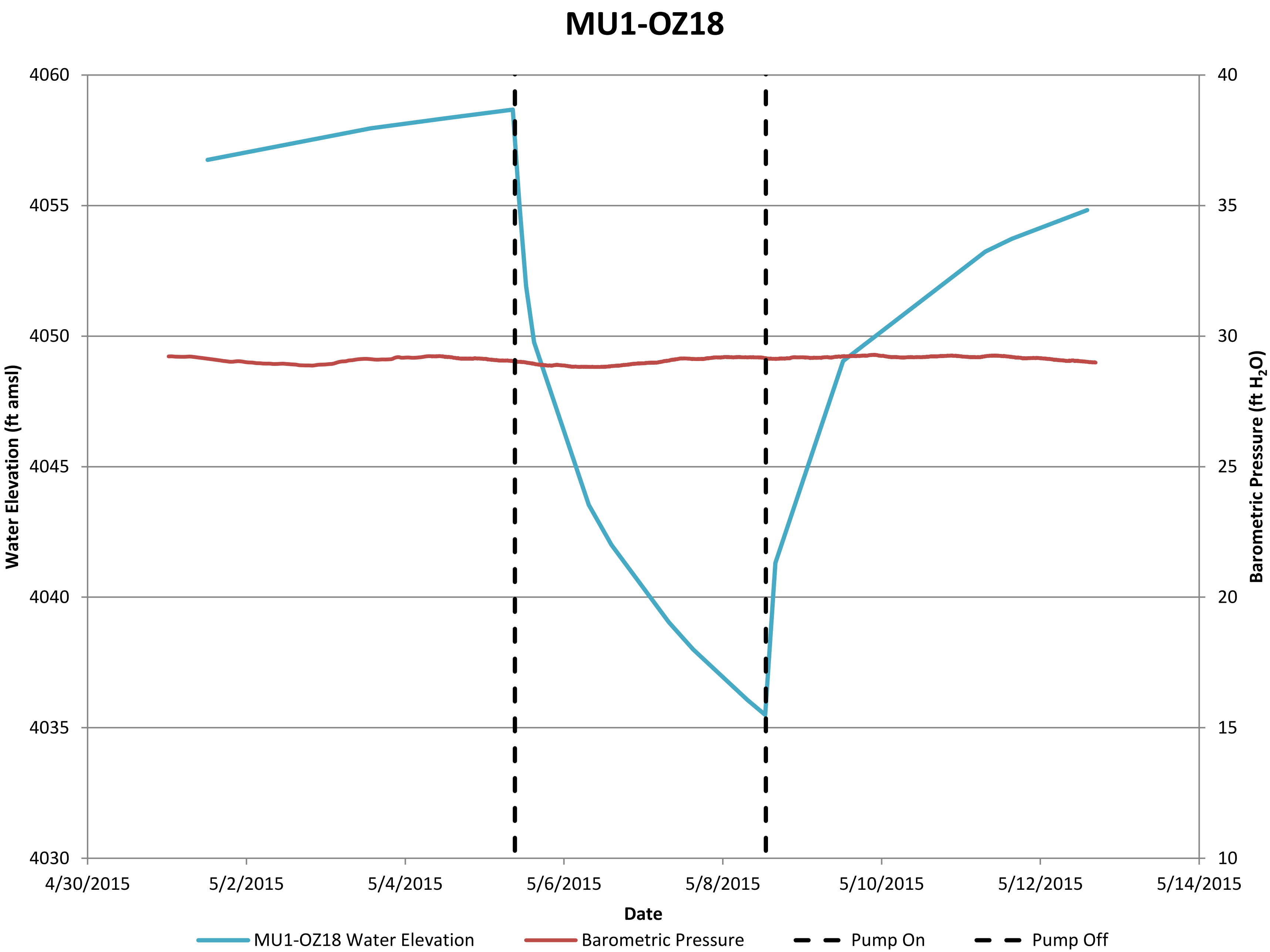

MU1-OZ13
Water Elevation (ft amsl)
4065
4060
4055
4050
4045
4040
4035
Barometric Pressure (ft H_2O)
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ13 Water Elevation
Barometric Pressure
Pump On
Pump Off

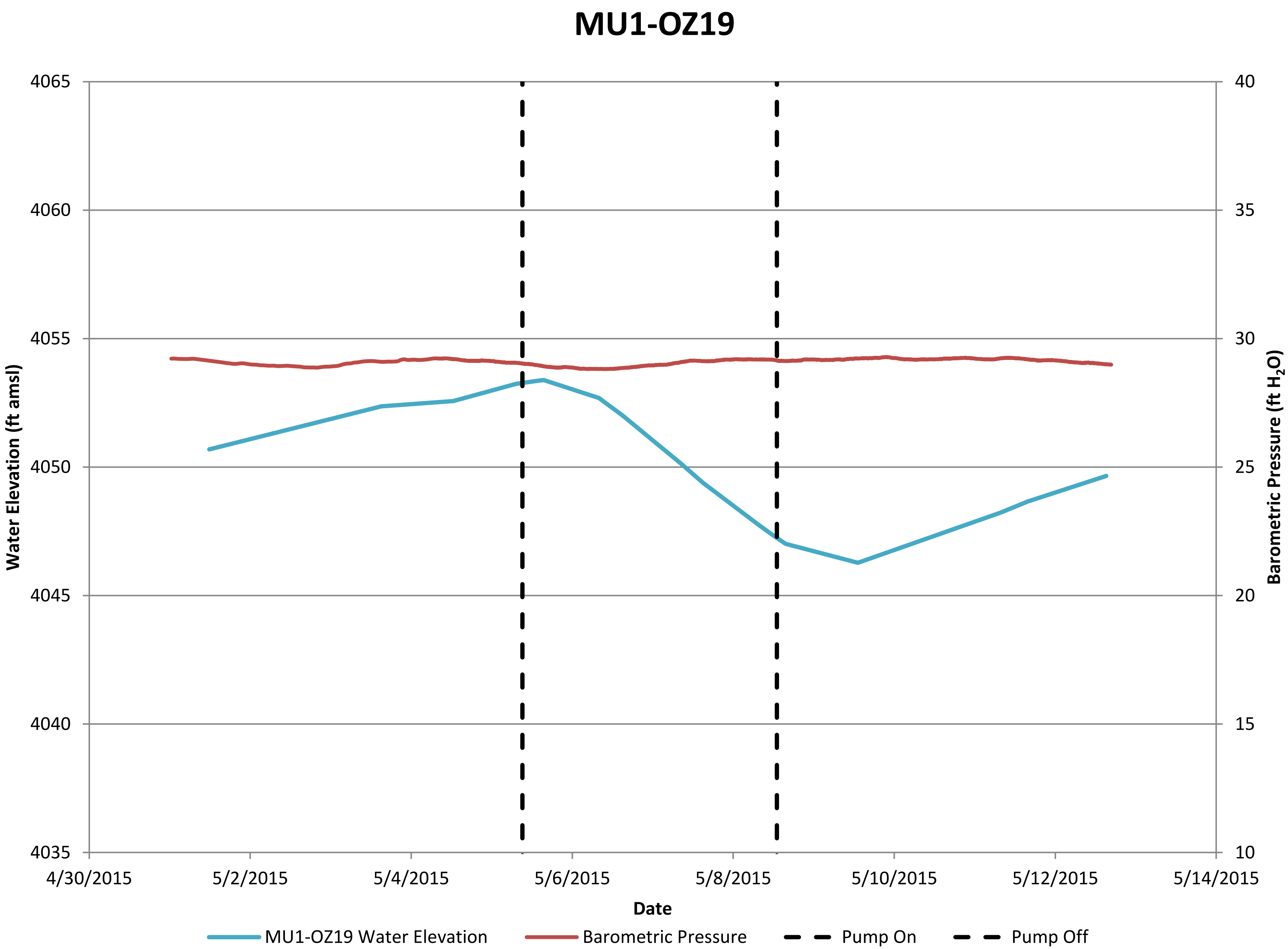

MU1-OZ14
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4060
4055
4050
4045
4040
4035
4030
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ14 Water Elevation
Barometric Pressure
Pump On
Pump Off

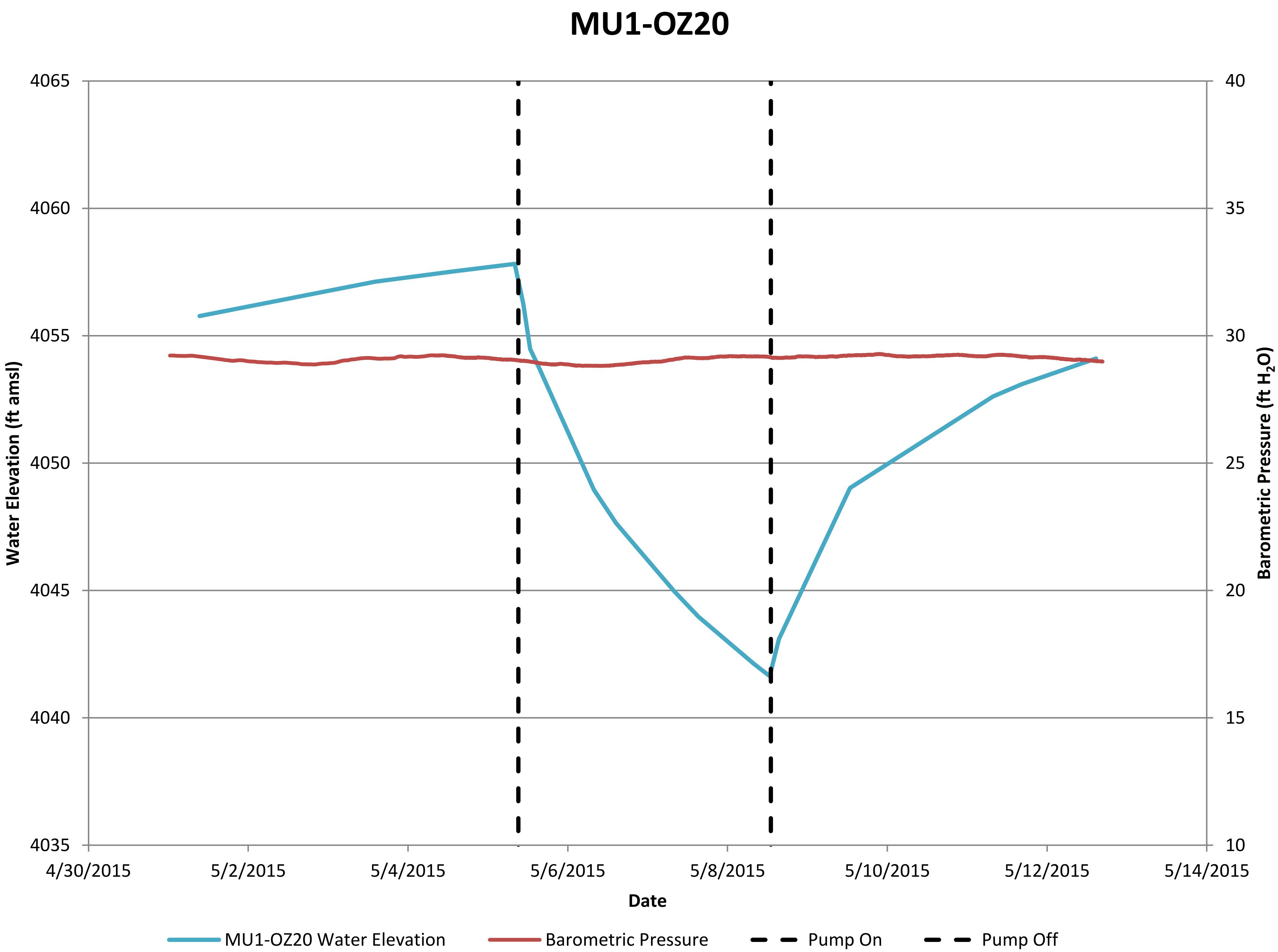

MU1-OZ15
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4065
4060
4055
4050
4045
4040
4035
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ15 Water Elevation
Barometric Pressure
Pump On
Pump Off

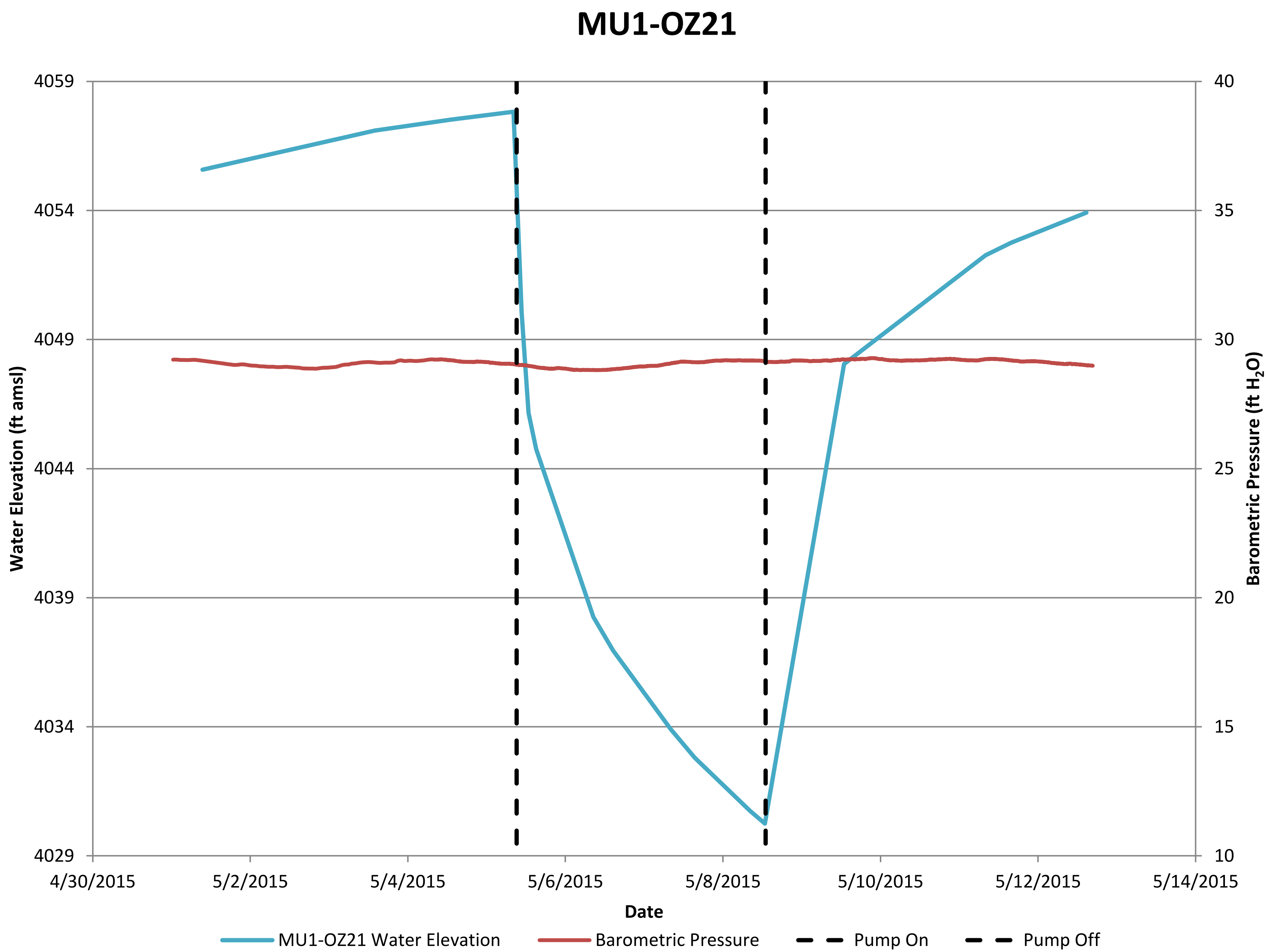

MU1-OZ16
Water Elevation (ft amsl)
4060
4055
4050
4045
4040
4035
4030
Barometric Pressure (ft H_2O)
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ16 Water Elevation
Barometric Pressure
Pump On
Pump Off

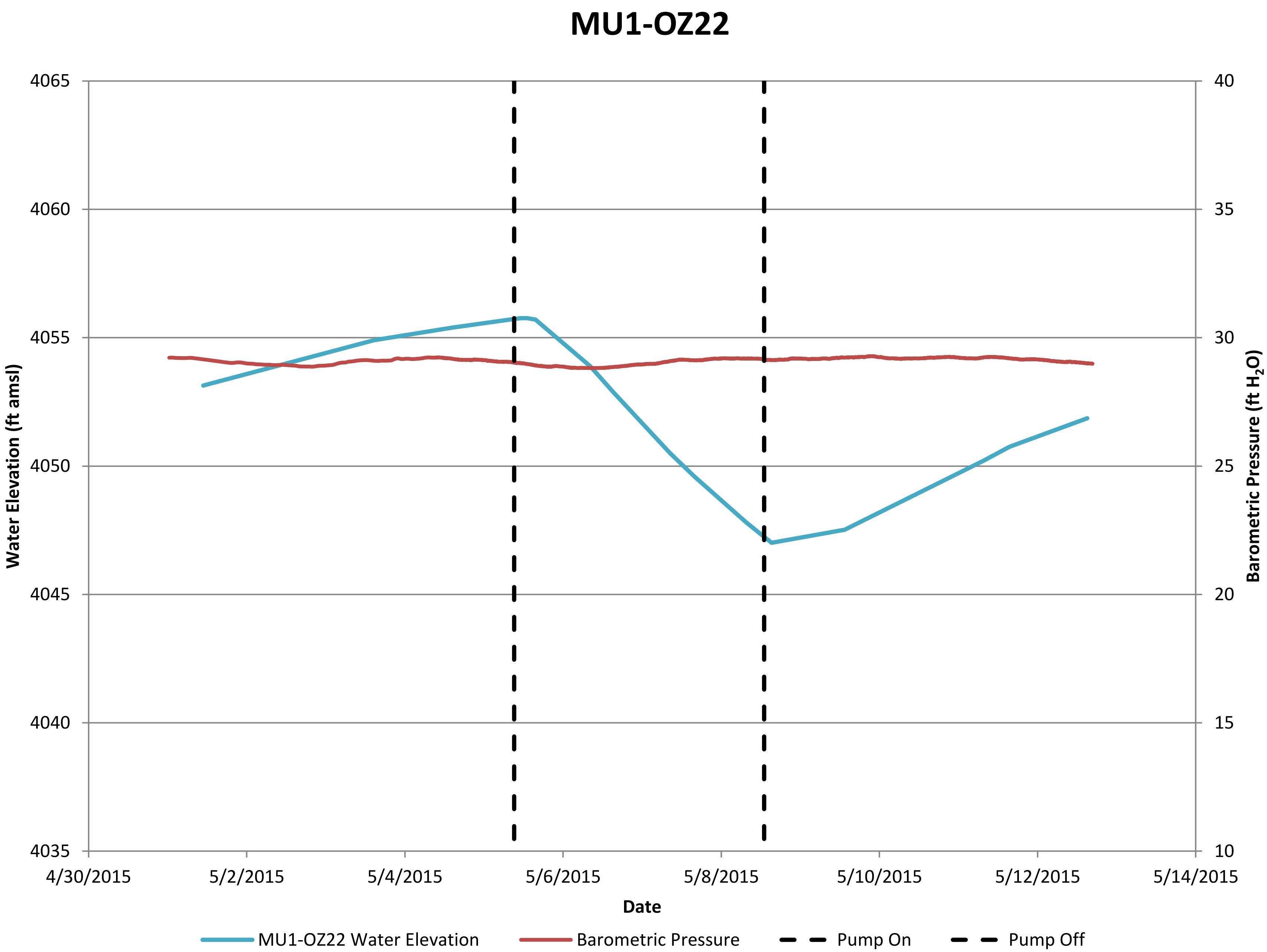

MU1-OZ17
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
Date
4060
4055
4050
4045
4040
4035
4030
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
MU1-OZ17 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-OZ18
Water Elevation (ft amsl)
4060
4055
4050
4045
4040
4035
4030
Barometric Pressure (ft H_2O)
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ18 Water Elevation
Barometric Pressure
Pump On
Pump Off

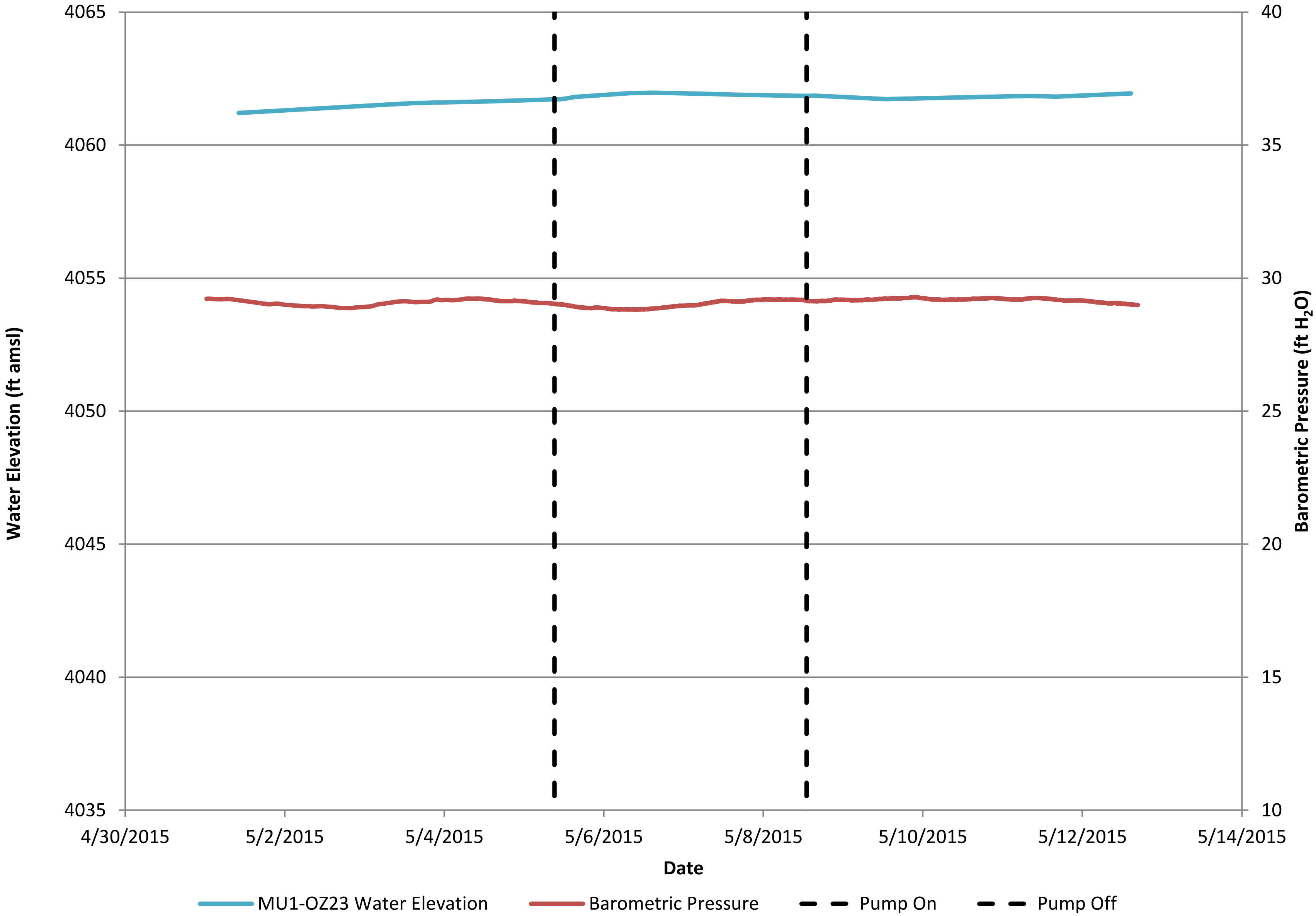

MU1-OZ19
4065
4060
4055
4050
4045
4040
4035
Water Elevation (ft amsl)
40
35
30
25
20
15
10
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ19 Water Elevation
Barometric Pressure
Pump On
Pump Off

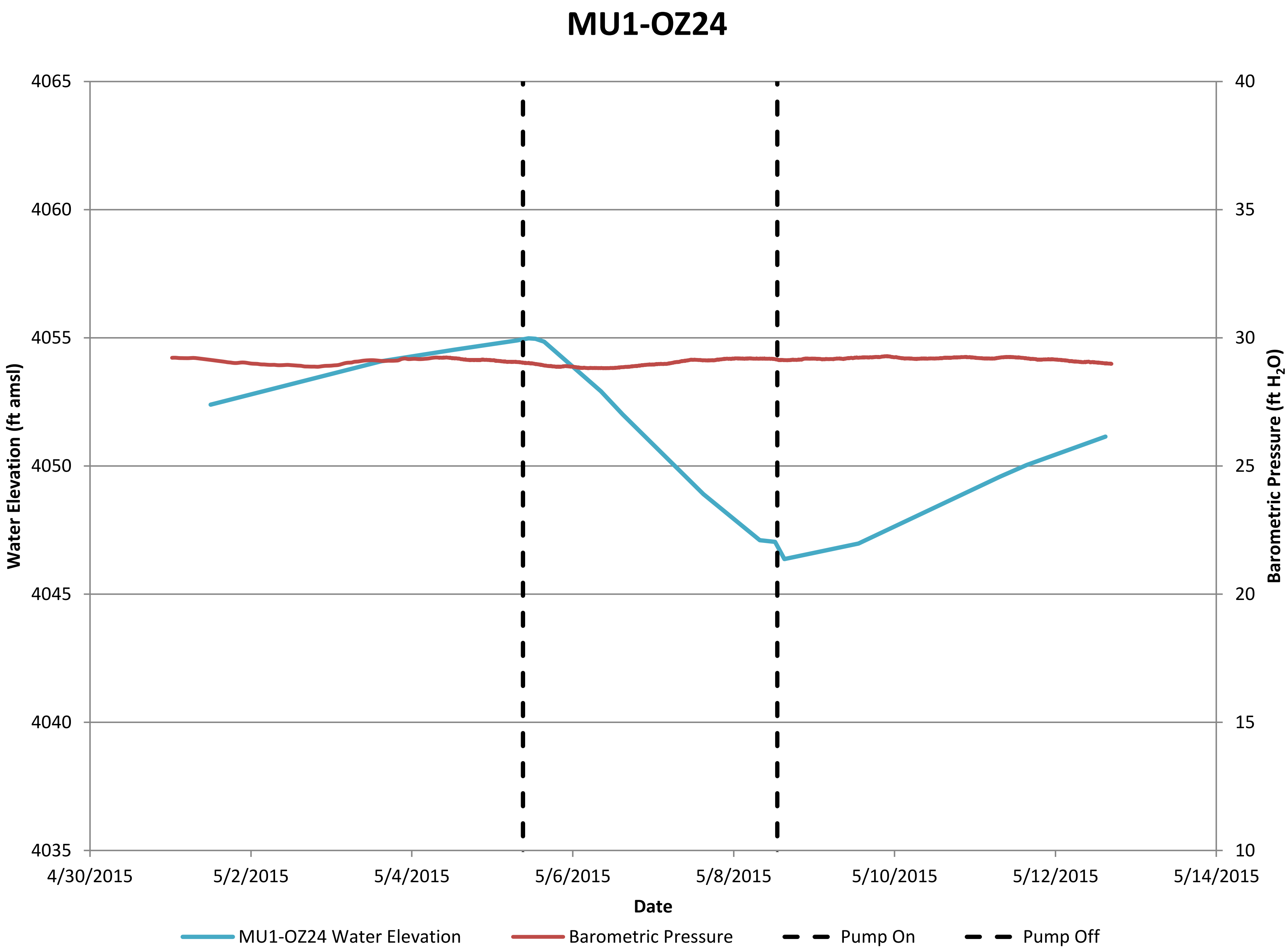

MU1-OZ20
4065
4060
4055
4050
4045
4040
4035
Water Elevation (ft amsl)
40
35
30
25
20
15
10
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ20 Water Elevation
Barometric Pressure
Pump On
Pump Off

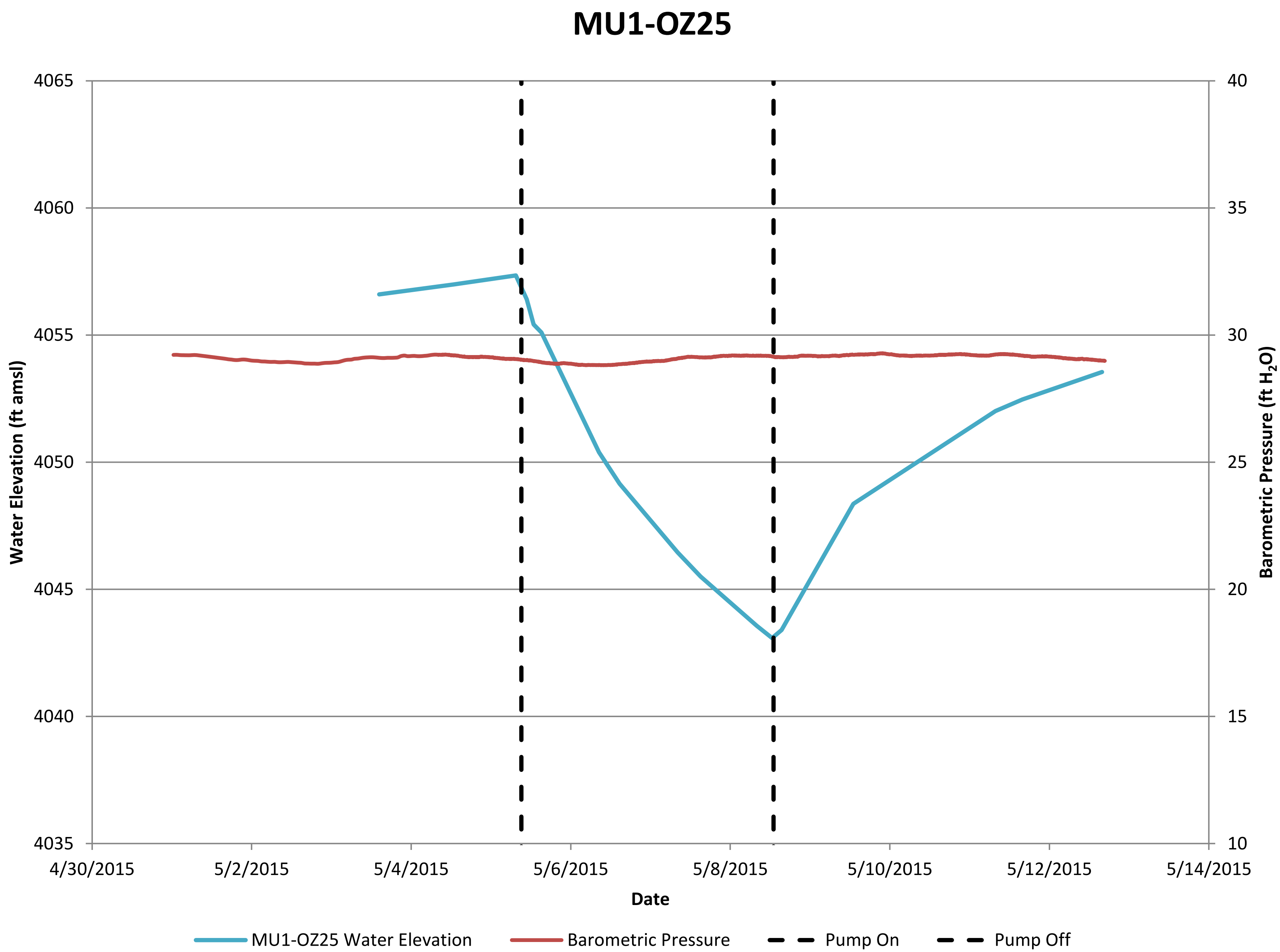

MU1-OZ21
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4059
4054
4049
4044
4039
4034
4029
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ21 Water Elevation
Barometric Pressure
Pump On
Pump Off

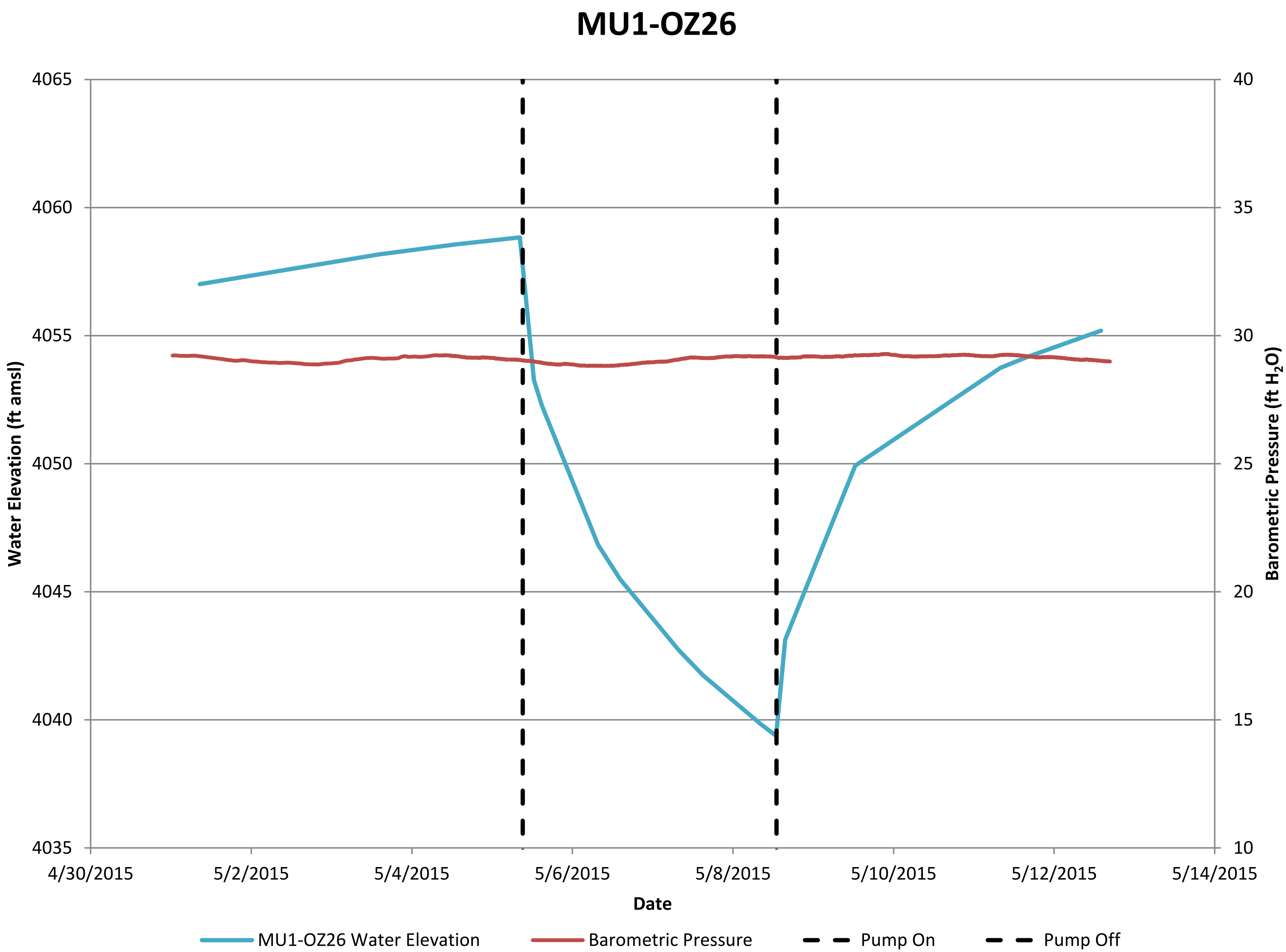

MU1-OZ22
Water Elevation (ft amsl)
4065
4060
4055
4050
4045
4040
4035
Barometric Pressure (ft H_2O)
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ22 Water Elevation
Barometric Pressure
Pump On
Pump Off

MU1-OZ23


4065
4060
4055
4050
4045
4040
4035
Water Elevation (ft amsl)
40
35
30
25
20
15
10
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ23 Water Elevation
Barometric Pressure
Pump On
Pump Off

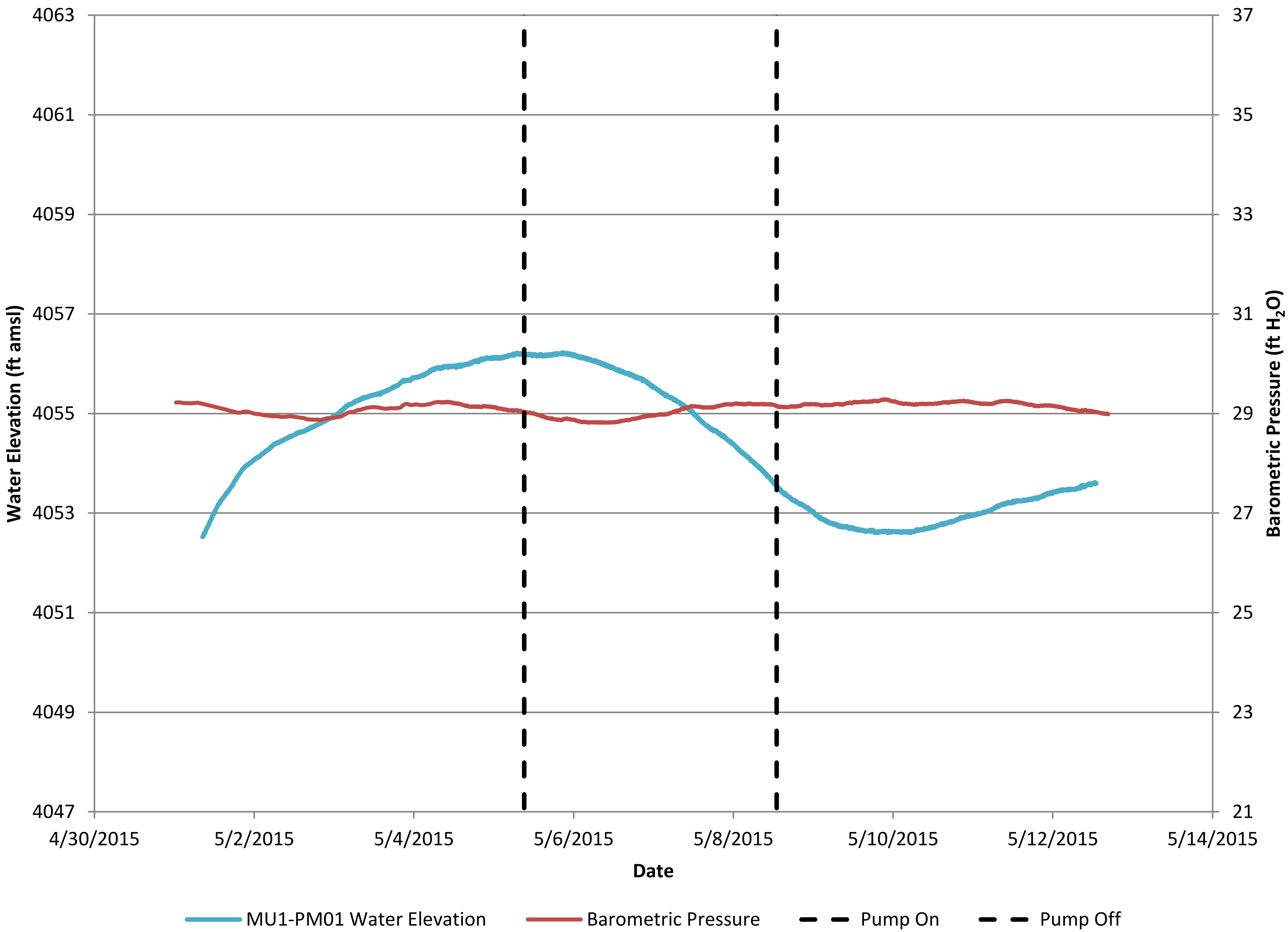

MU1-OZ24
4065
4060
4055
4050
4045
4040
4035
Water Elevation (ft amsl)
40
35
30
25
20
15
10
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ24 Water Elevation
Barometric Pressure
Pump On
Pump Off

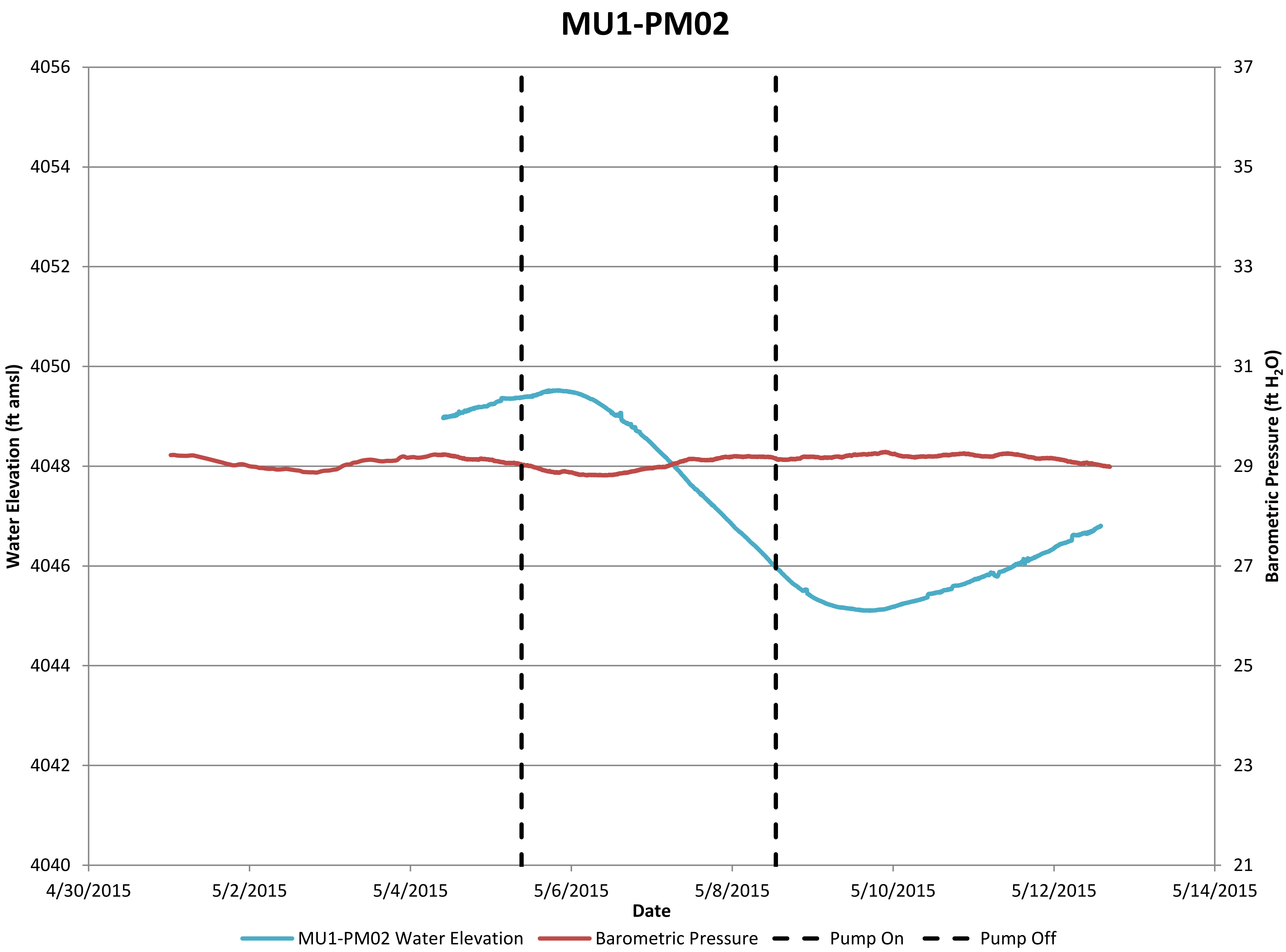

MU1-OZ25
4065
4060
4055
4050
4045
4040
4035
Water Elevation (ft amsl)
40
35
30
25
20
15
10
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ25 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-OZ26
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4065
4060
4055
4050
4045
4040
4035
40
35
30
25
20
15
10
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-OZ26 Water Elevation
Barometric Pressure
Pump On
Pump Off

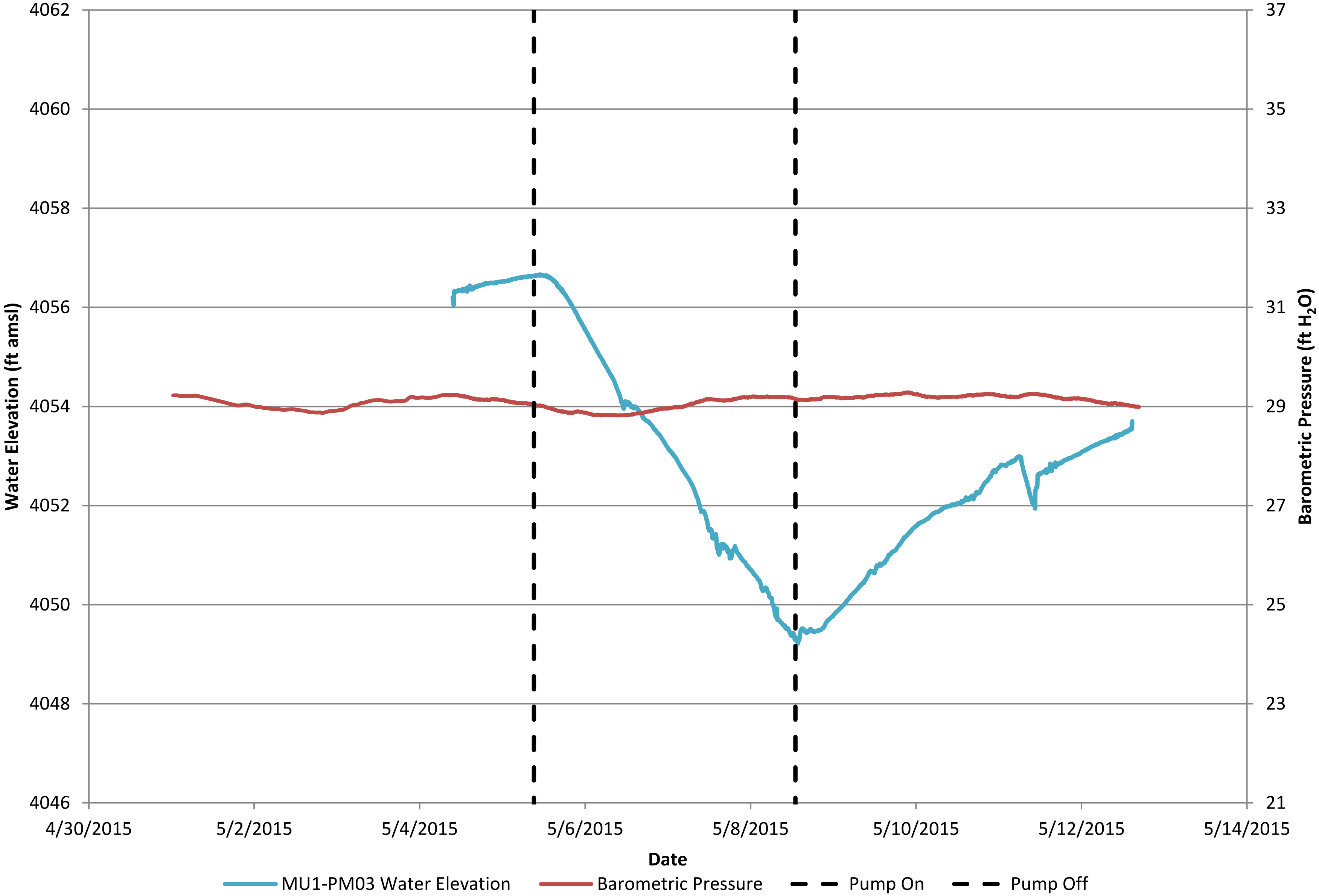
PM HYDROGRAPHS

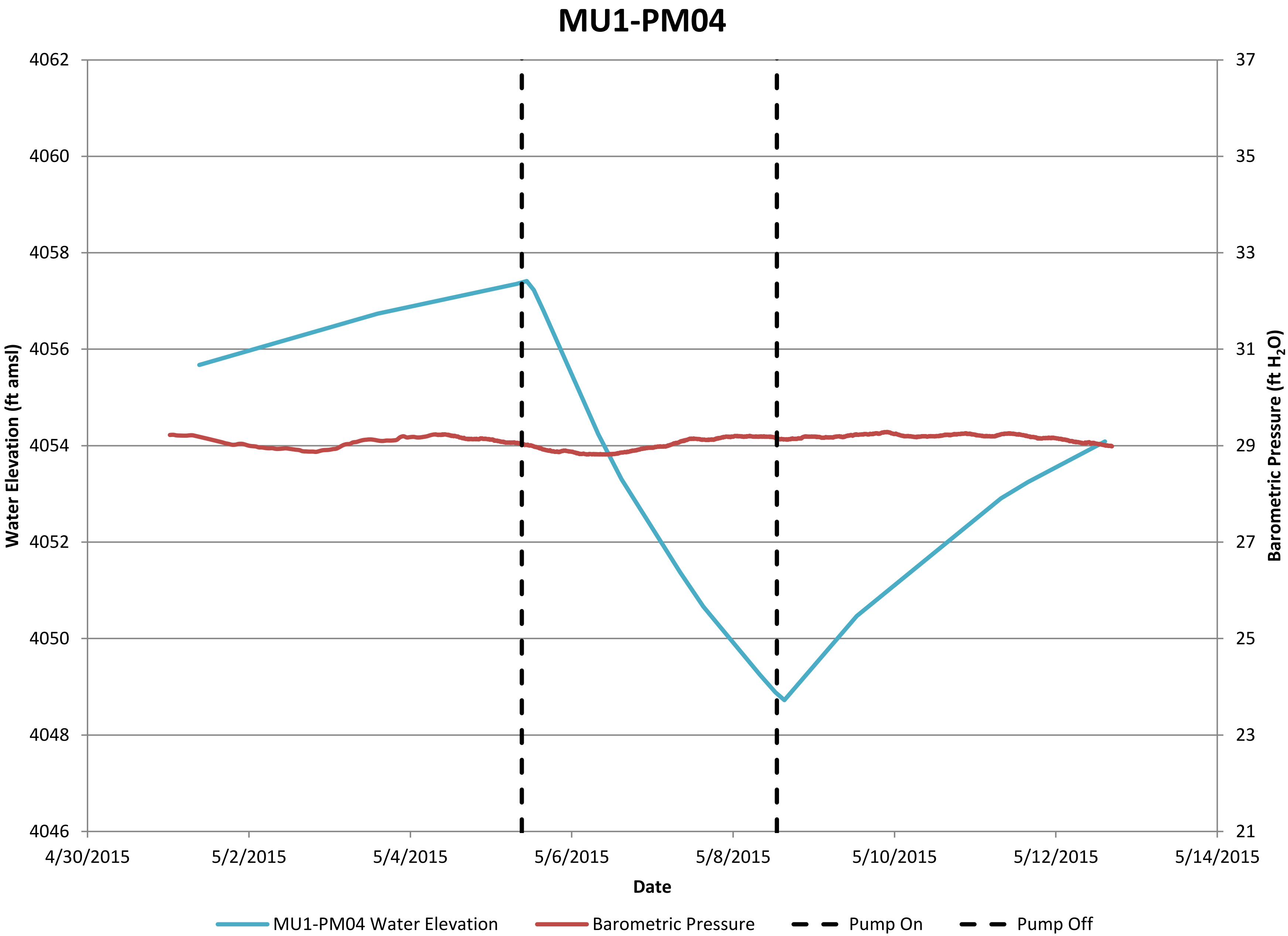
MU1-PM01

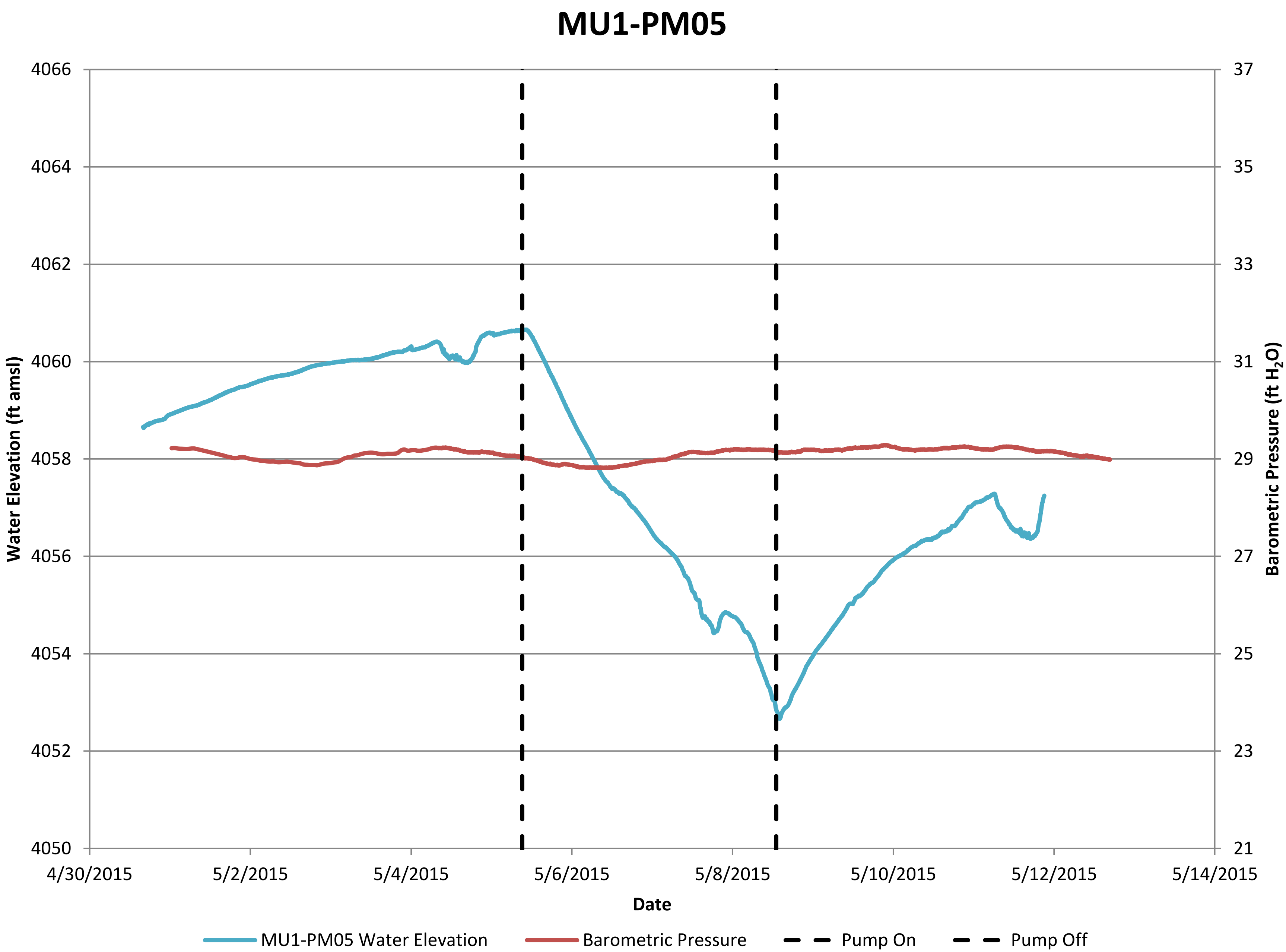

4063
4061
4059
4057
4055
4053
4051
4049
4047
Water Elevation (ft amsl)
37
35
33
31
29
27
25
23
21
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM01 Water Elevation
Barometric Pressure
Pump On
Pump Off

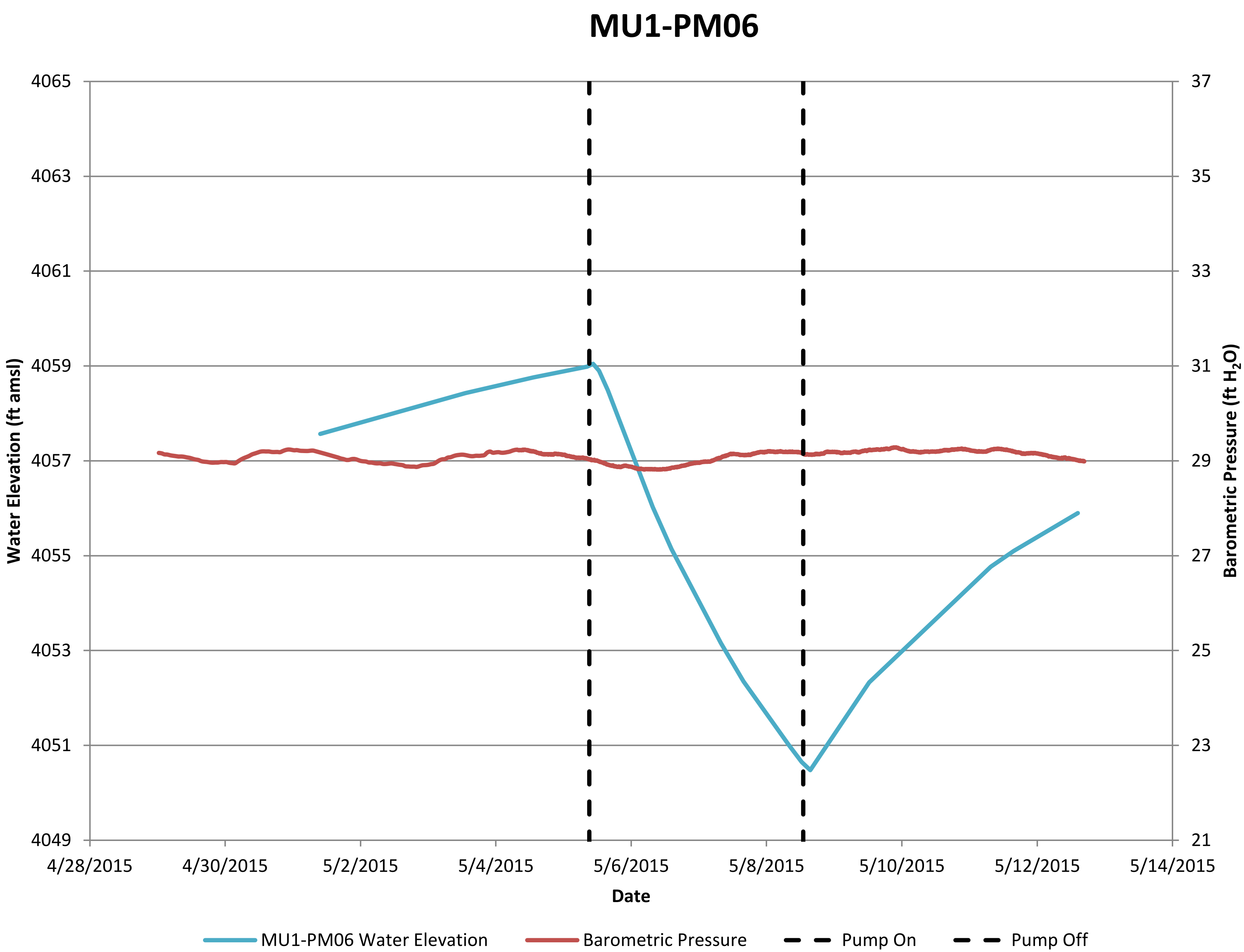

MU1-PM02
Water Elevation (ft amsl)
4056
4054
4052
4050
4048
4046
4044
4042
4040
Barometric Pressure (ft H_2O)
37
35
33
31
29
27
25
23
21
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM02 Water Elevation
Barometric Pressure
Pump On
Pump Off

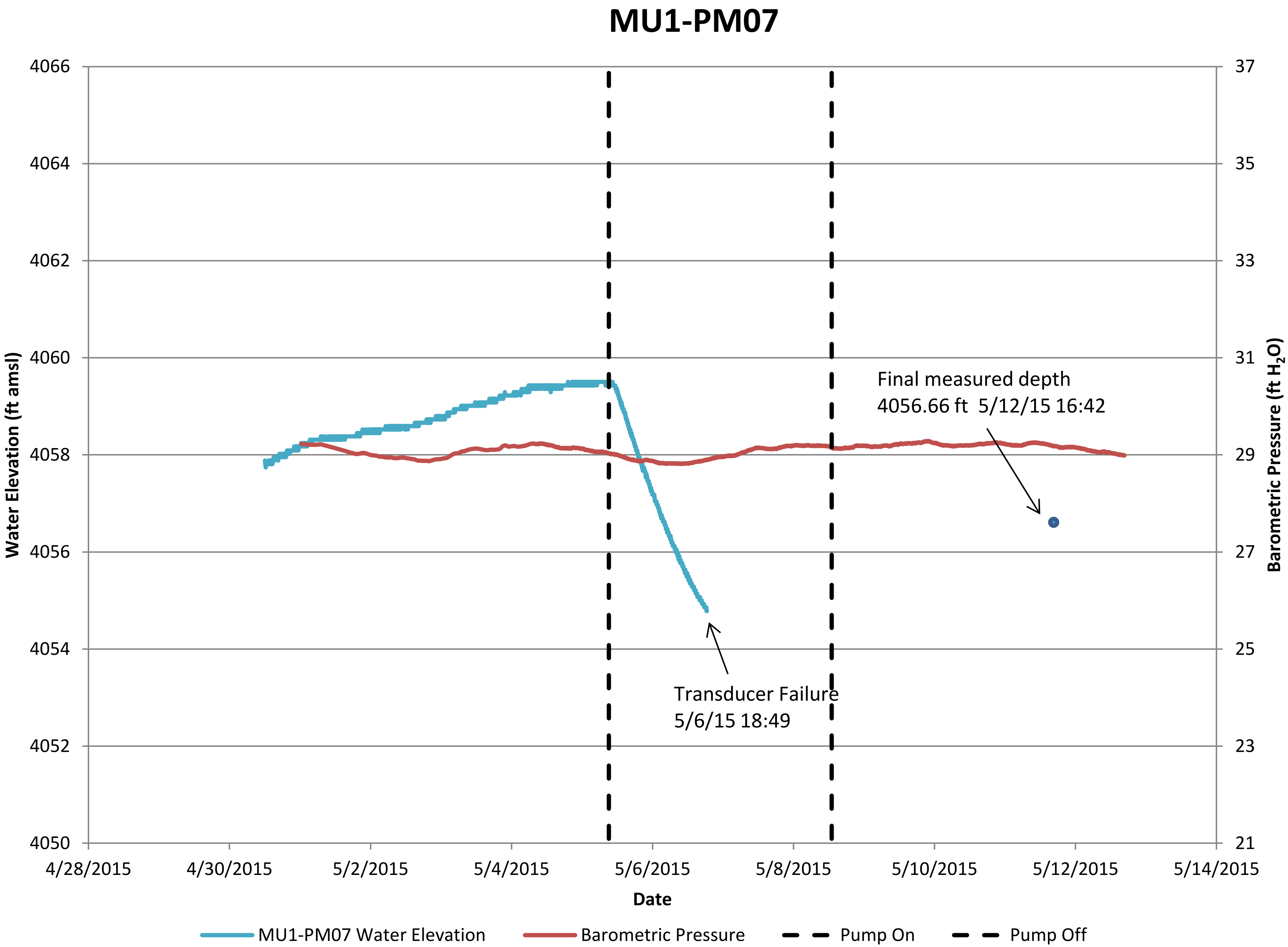
MU1-PM03

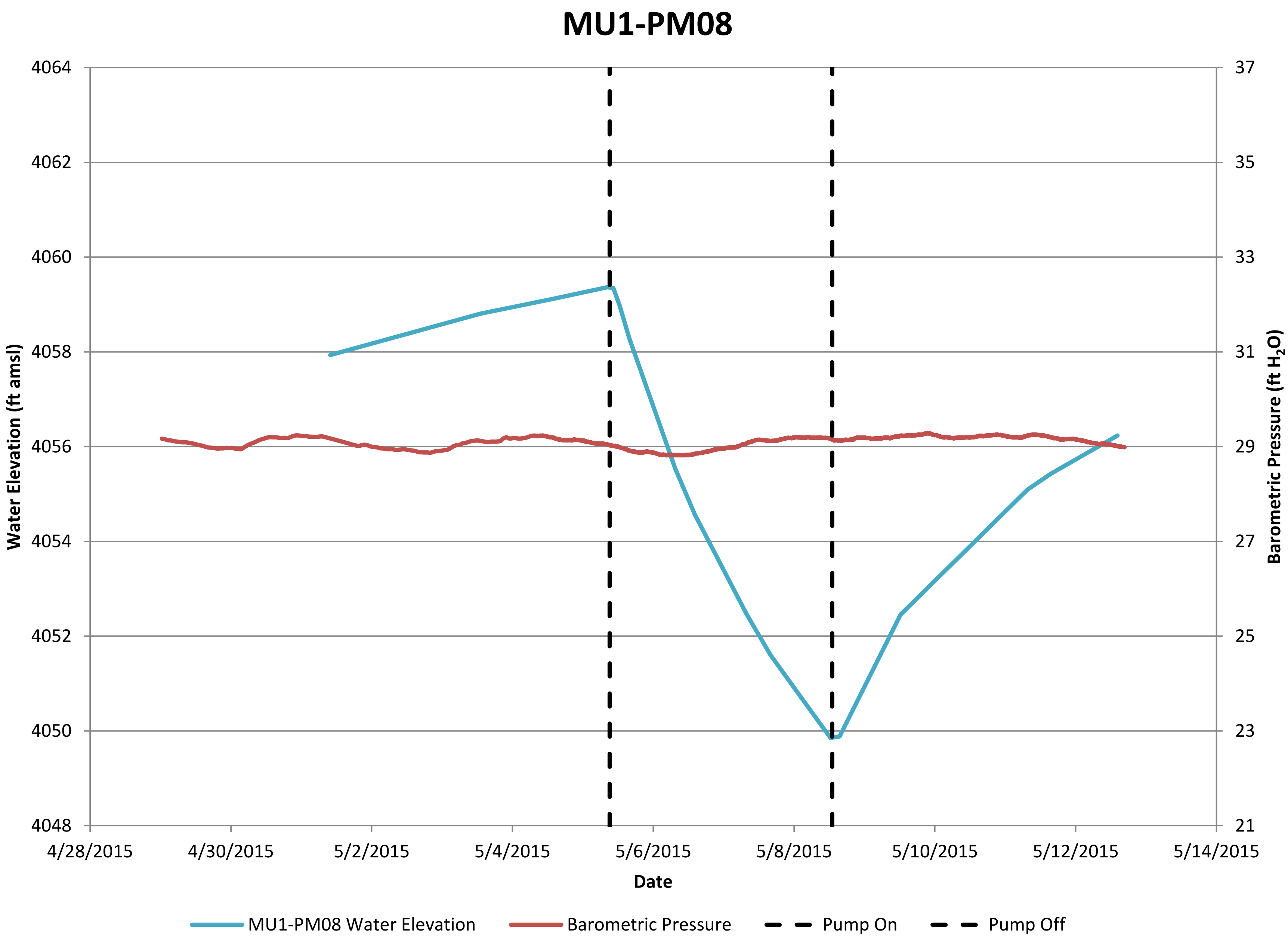

MU1-PM03
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4062
4060
4058
4056
4054
4052
4050
4048
4046
37
35
33
31
29
27
25
23
21
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM03 Water Elevation
Barometric Pressure
Pump On
Pump Off

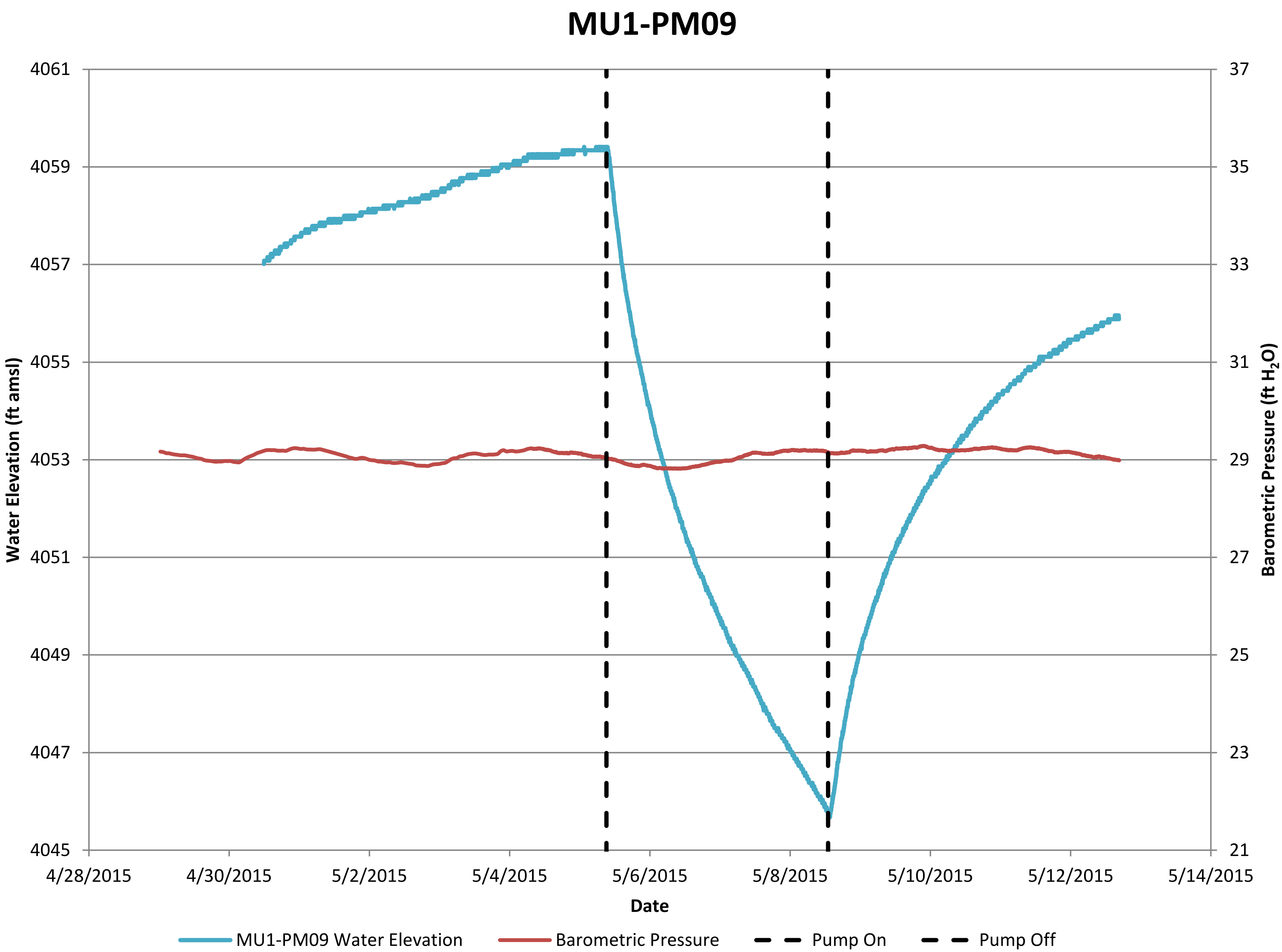

MU1-PM04
Water Elevation (ft amsl)
4062
4060
4058
4056
4054
4052
4050
4048
4046
Barometric Pressure (ft H_2O)
37
35
33
31
29
27
25
23
21
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM04 Water Elevation
Barometric Pressure
Pump On
Pump Off

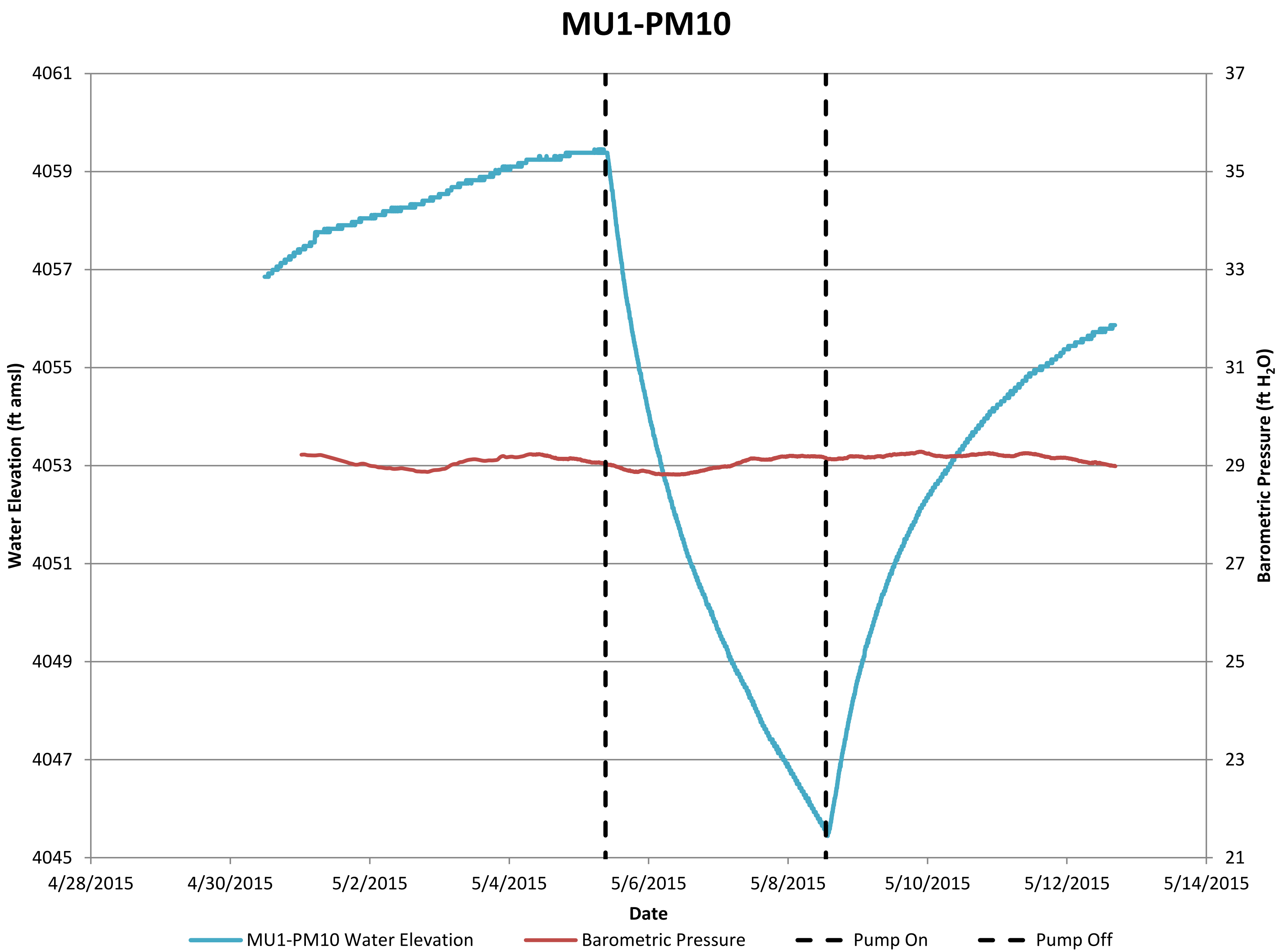

MU1-PM05
4066
4064
4062
4060
4058
4056
4054
4052
4050
Water Elevation (ft amsl)
37
35
33
31
29
27
25
23
21
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM05 Water Elevation
Barometric Pressure
Pump On
Pump Off

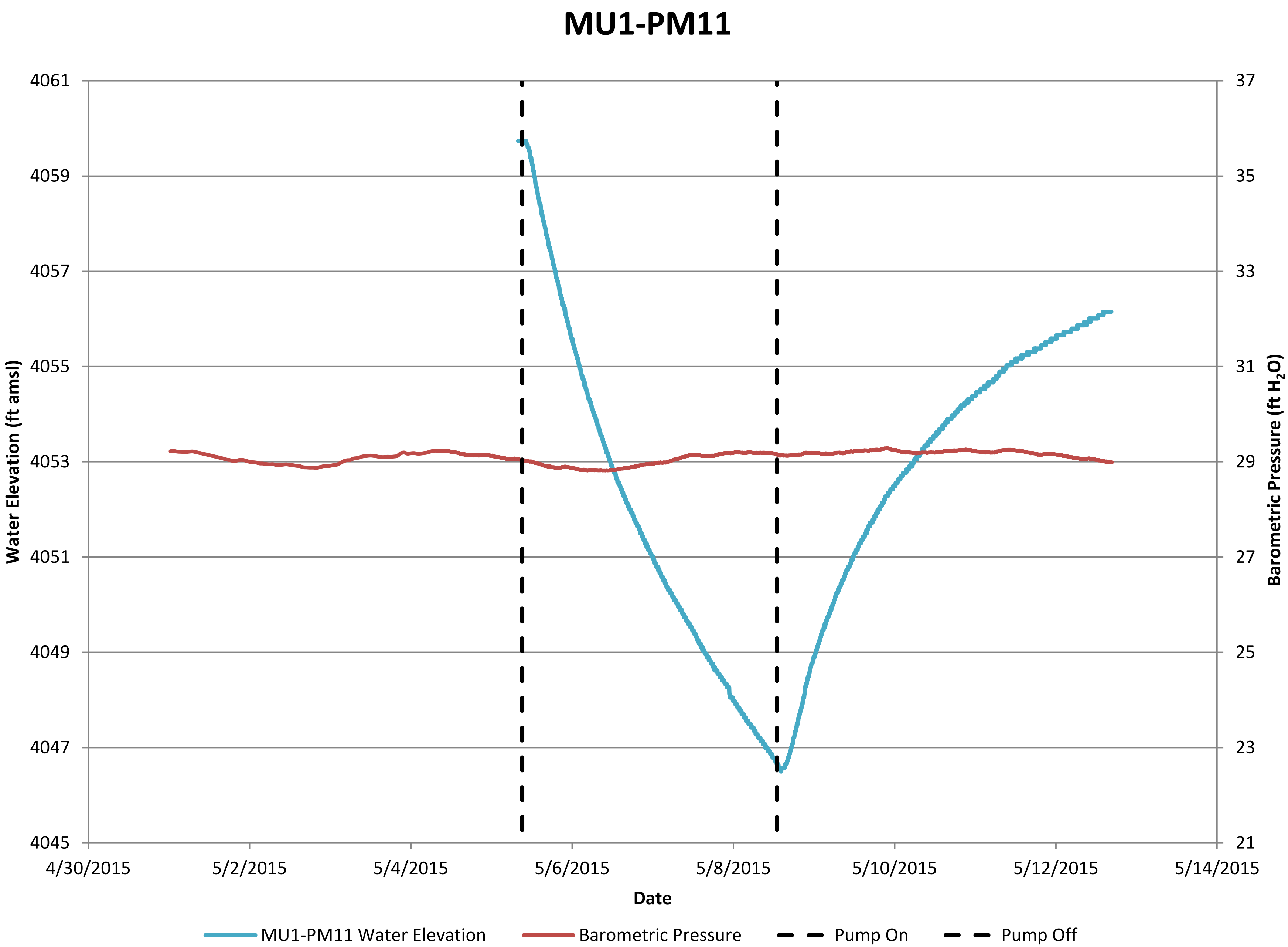

MU1-PM06
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4065
4063
4061
4059
4057
4055
4053
4051
4049
37
35
33
31
29
27
25
23
21
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM06 Water Elevation
Barometric Pressure
Pump On
Pump Off

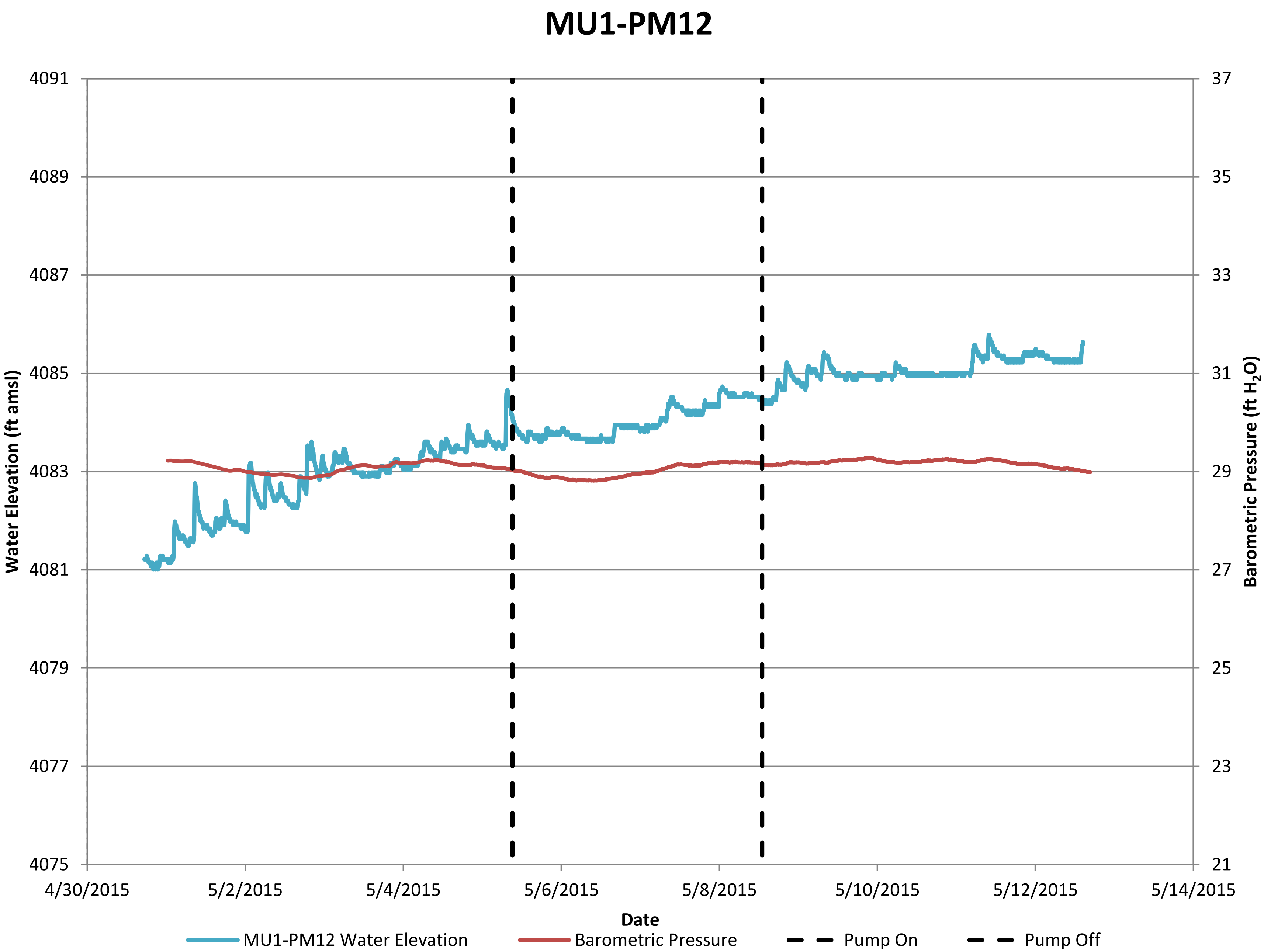

MU1-PM07
Water Elevation (ft amsl)
4066
4064
4062
4060
4058
4056
4054
4052
4050
Barometric Pressure (ft H_2O)
37
35
33
31
29
27
25
23
21
Date
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Final measured depth
4056.66 ft 5/12/15 16:42
Transducer Failure
5/6/15 18:49
MU1-PM07 Water Elevation
Barometric Pressure
Pump On
Pump Off

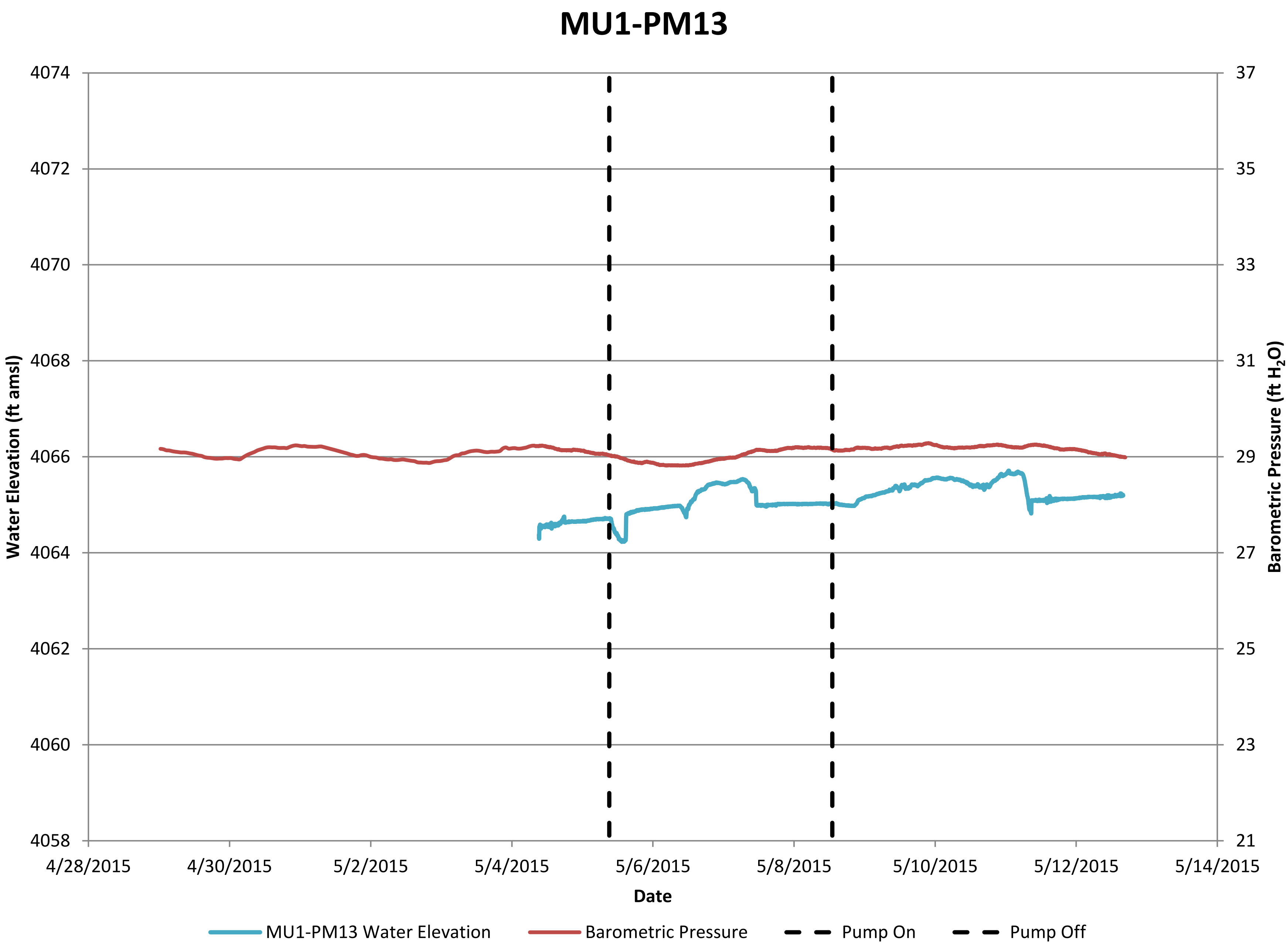

MU1-PM08
Water Elevation (ft amsl)
4064
4062
4060
4058
4056
4054
4052
4050
4048
Barometric Pressure (ft H_2O)
37
35
33
31
29
27
25
23
21
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM08 Water Elevation
Barometric Pressure
Pump On
Pump Off

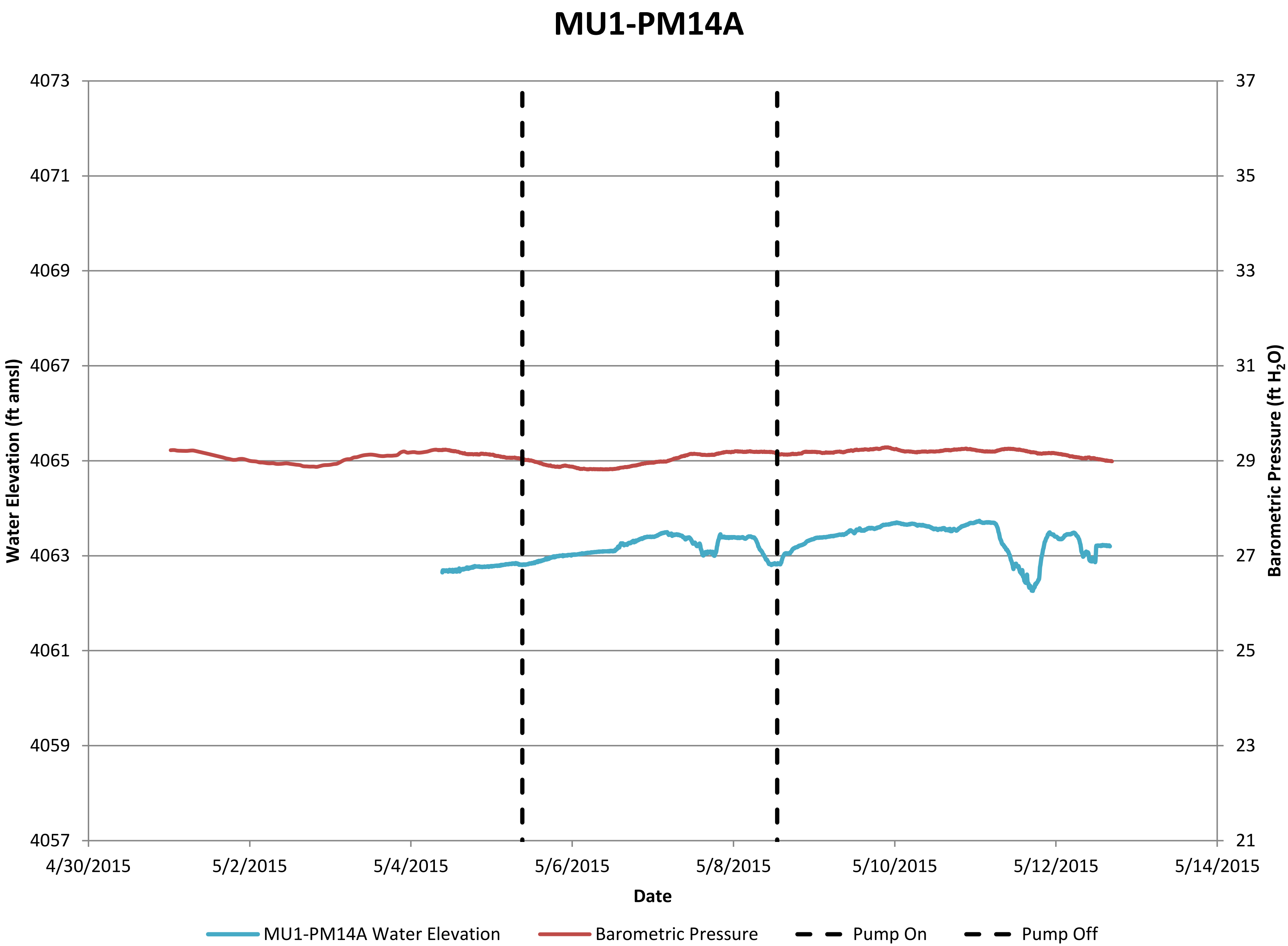

MU1-PM09
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4061
4059
4057
4055
4053
4051
4049
4047
4045
37
35
33
31
29
27
25
23
21
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM09 Water Elevation
Barometric Pressure
Pump On
Pump Off

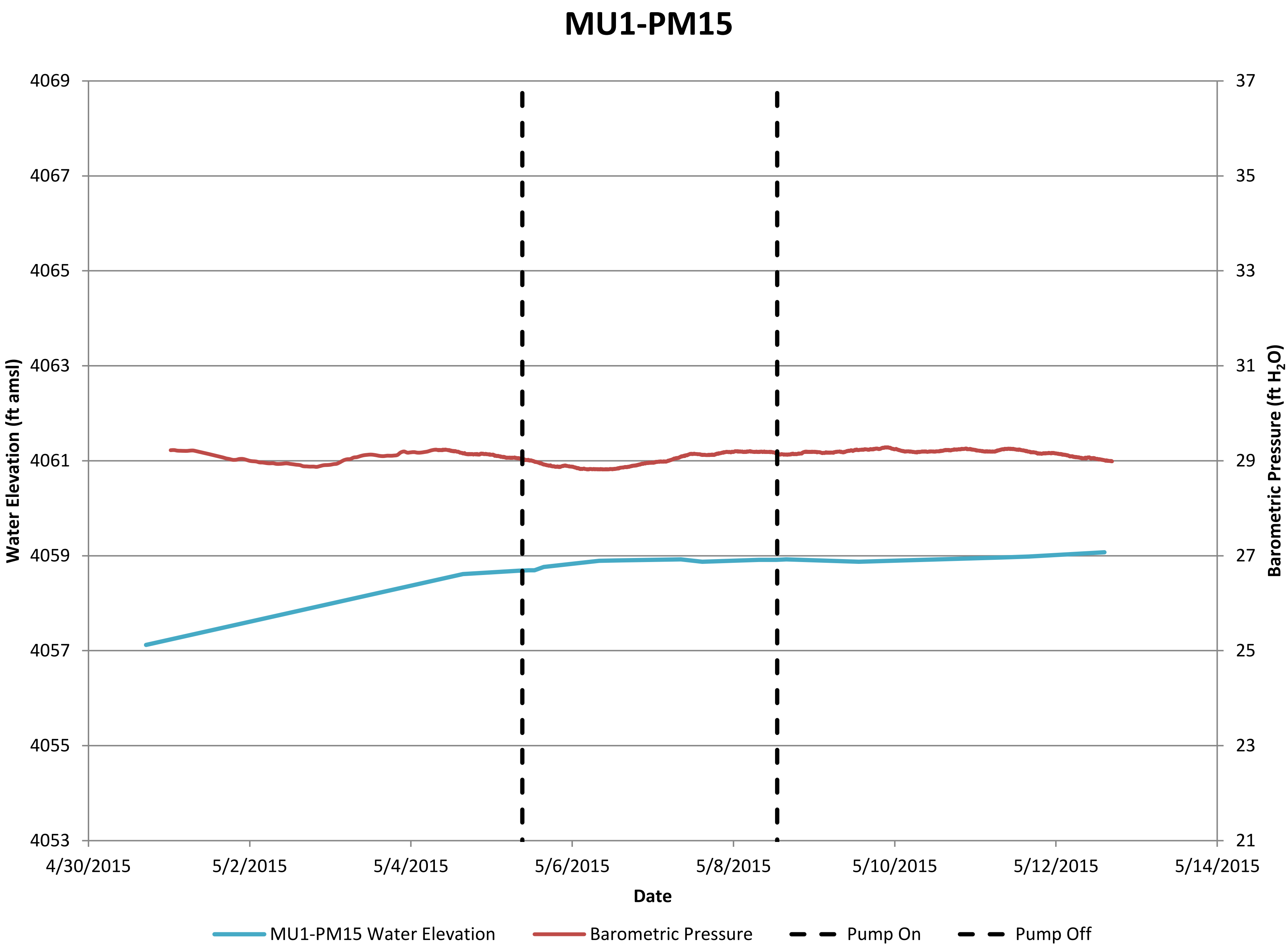

MU1-PM10
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
Date
4061
4059
4057
4055
4053
4051
4049
4047
4045
37
35
33
31
29
27
25
23
21
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
MU1-PM10 Water Elevation
Barometric Pressure
Pump On
Pump Off

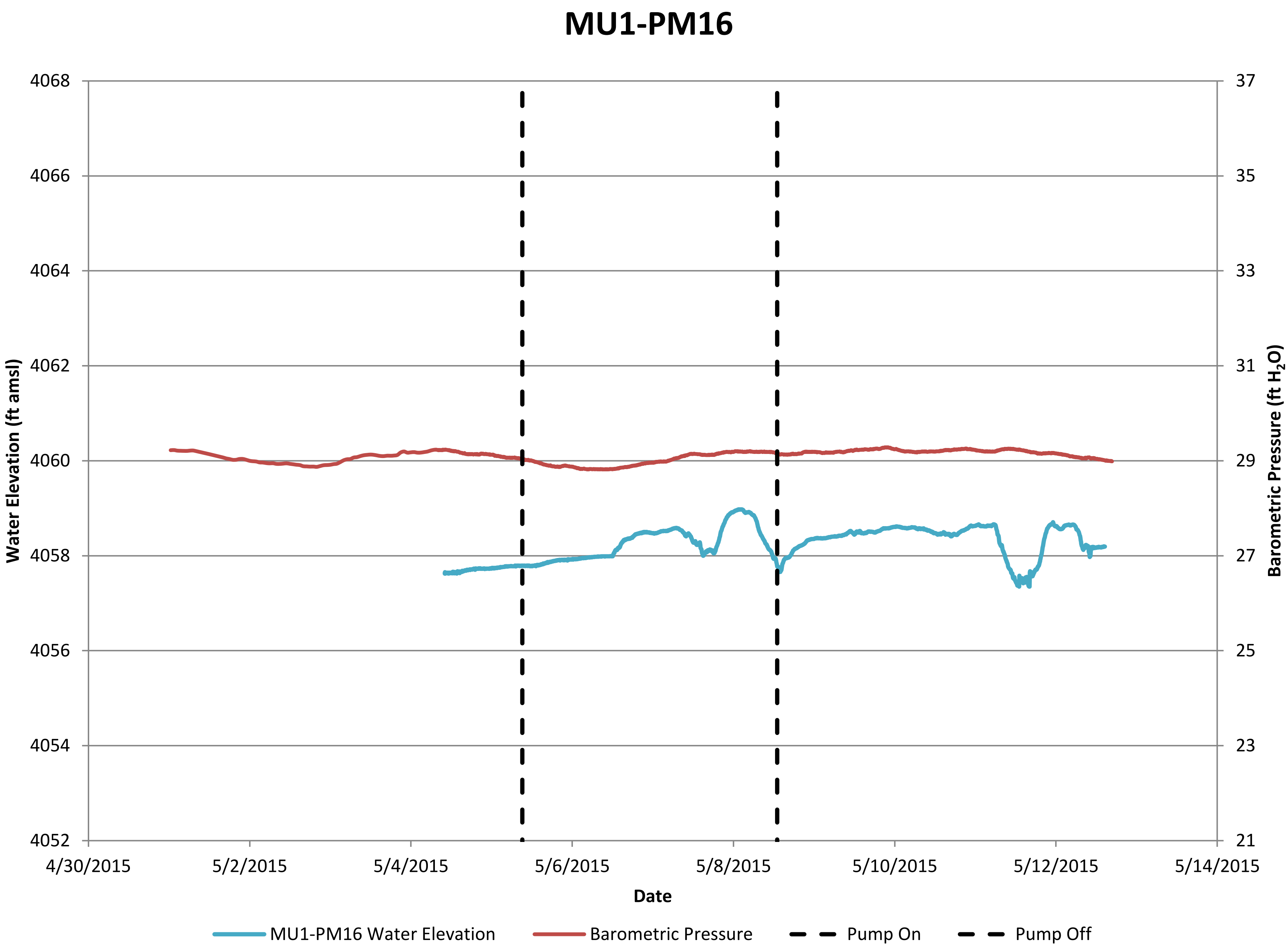

MU1-PM11
Water Elevation (ft amsl)
4061
4059
4057
4055
4053
4051
4049
4047
4045
Barometric Pressure (ft H_2O)
37
35
33
31
29
27
25
23
21
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM11 Water Elevation
Barometric Pressure
Pump On
Pump Off

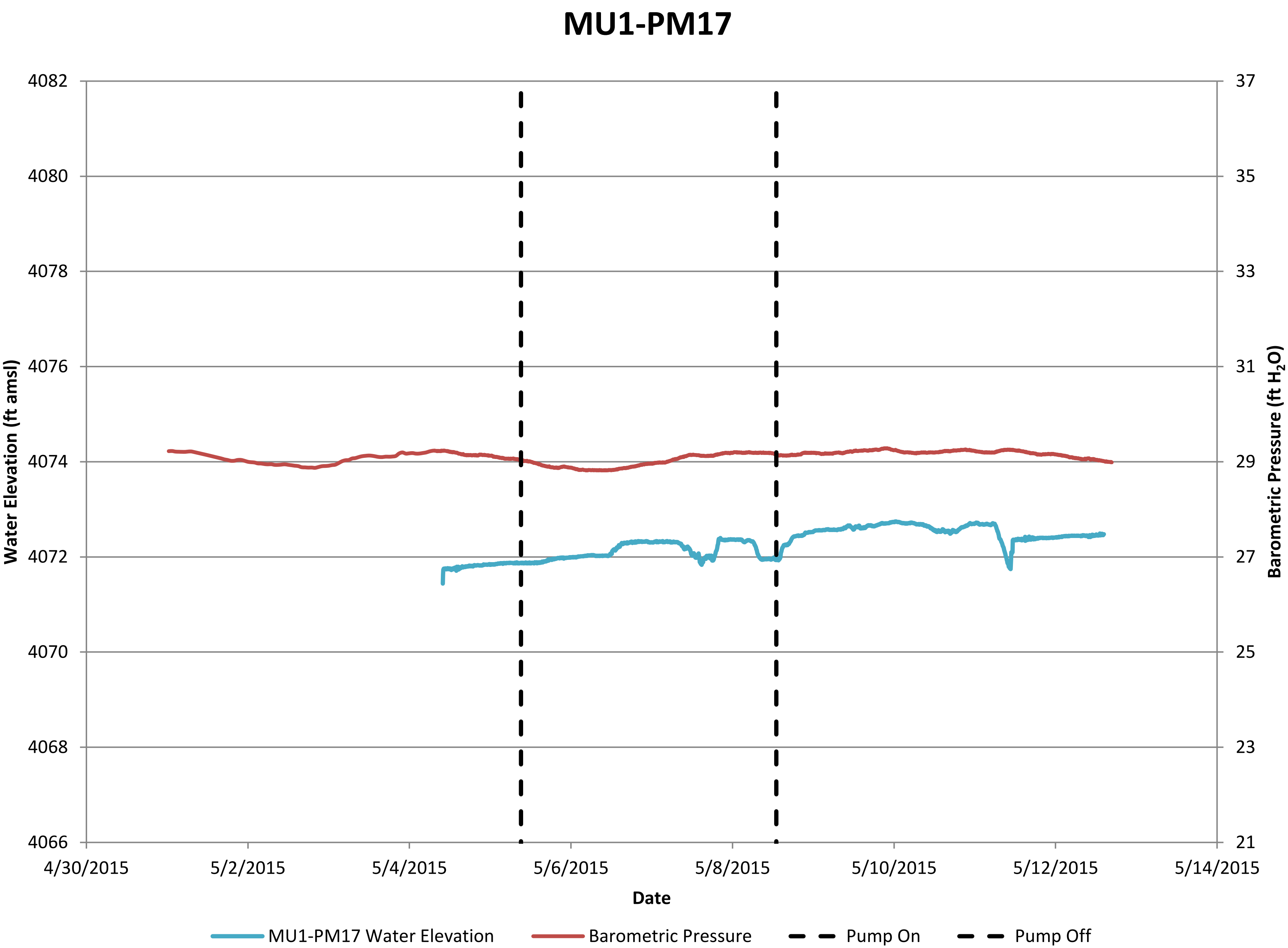

MU1-PM12
4091
4089
4087
4085
4083
4081
4079
4077
4075
Water Elevation (ft amsl)
37
35
33
31
29
27
25
23
21
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM12 Water Elevation
Barometric Pressure
Pump On
Pump Off

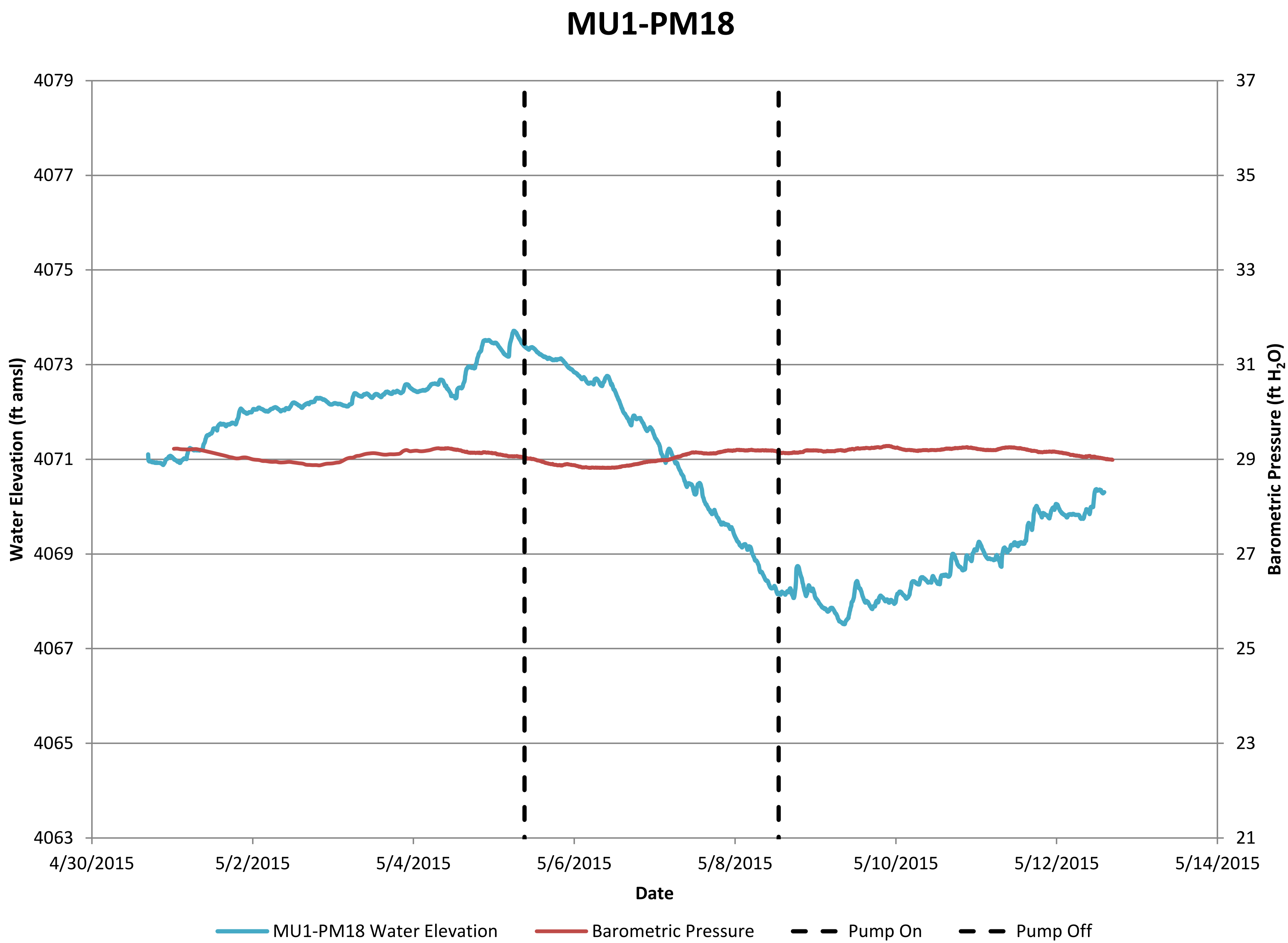

MU1-PM13
Water Elevation (ft amsl)
4074
4072
4070
4068
4066
4064
4062
4060
4058
Barometric Pressure (ft H_2O)
37
35
33
31
29
27
25
23
21
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM13 Water Elevation
Barometric Pressure
Pump On
Pump Off

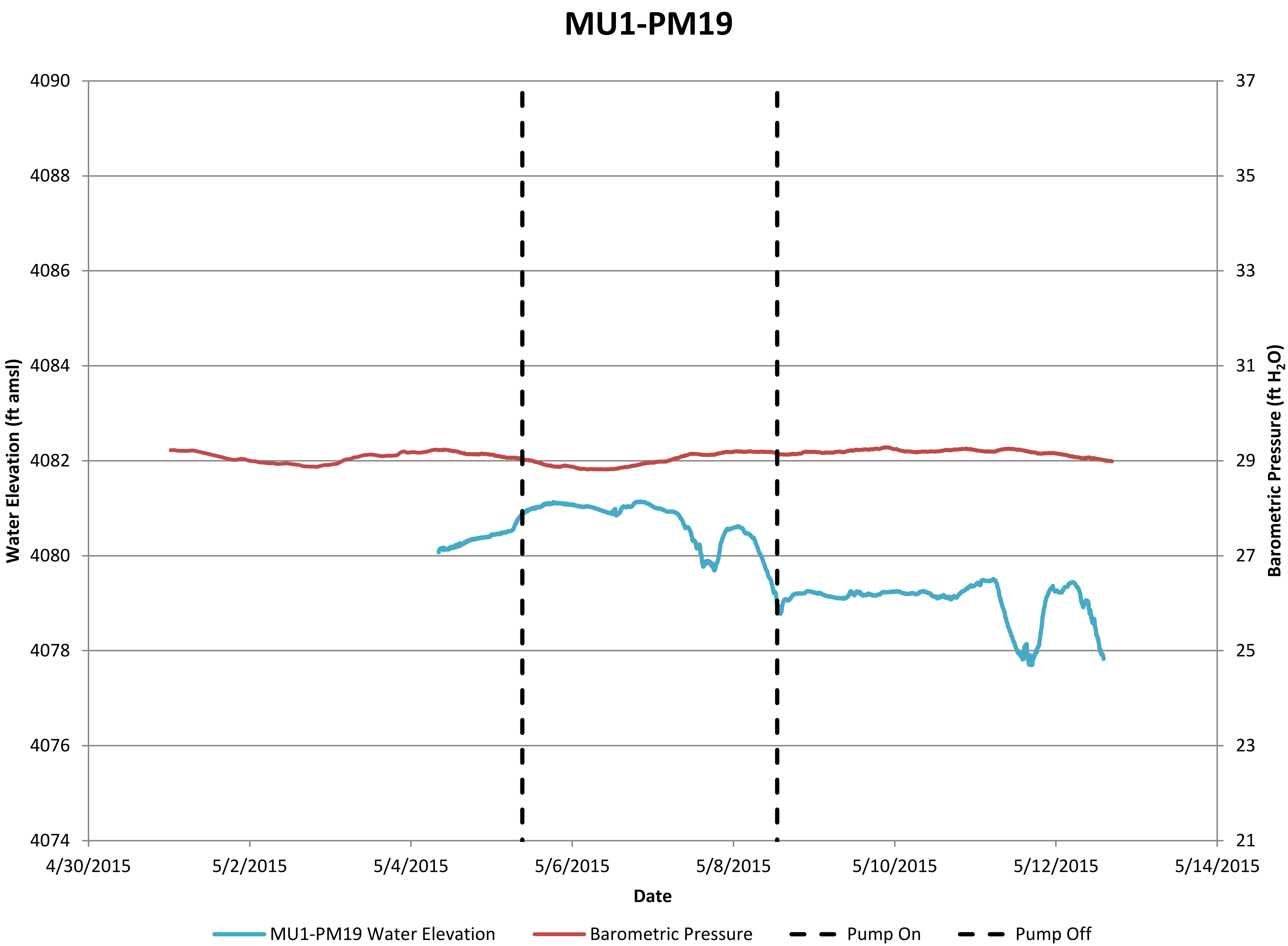

MU1-PM14A
Water Elevation (ft amsl)
4073
4071
4069
4067
4065
4063
4061
4059
4057
Barometric Pressure (ft H_2O)
37
35
33
31
29
27
25
23
21
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM14A Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-PM15
4069
4067
4065
4063
4061
4059
4057
4055
4053
Water Elevation (ft amsl)
37
35
33
31
29
27
25
23
21
Barometric Pressure (ft H2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM15 Water Elevation
Barometric Pressure
Pump On
Pump Off

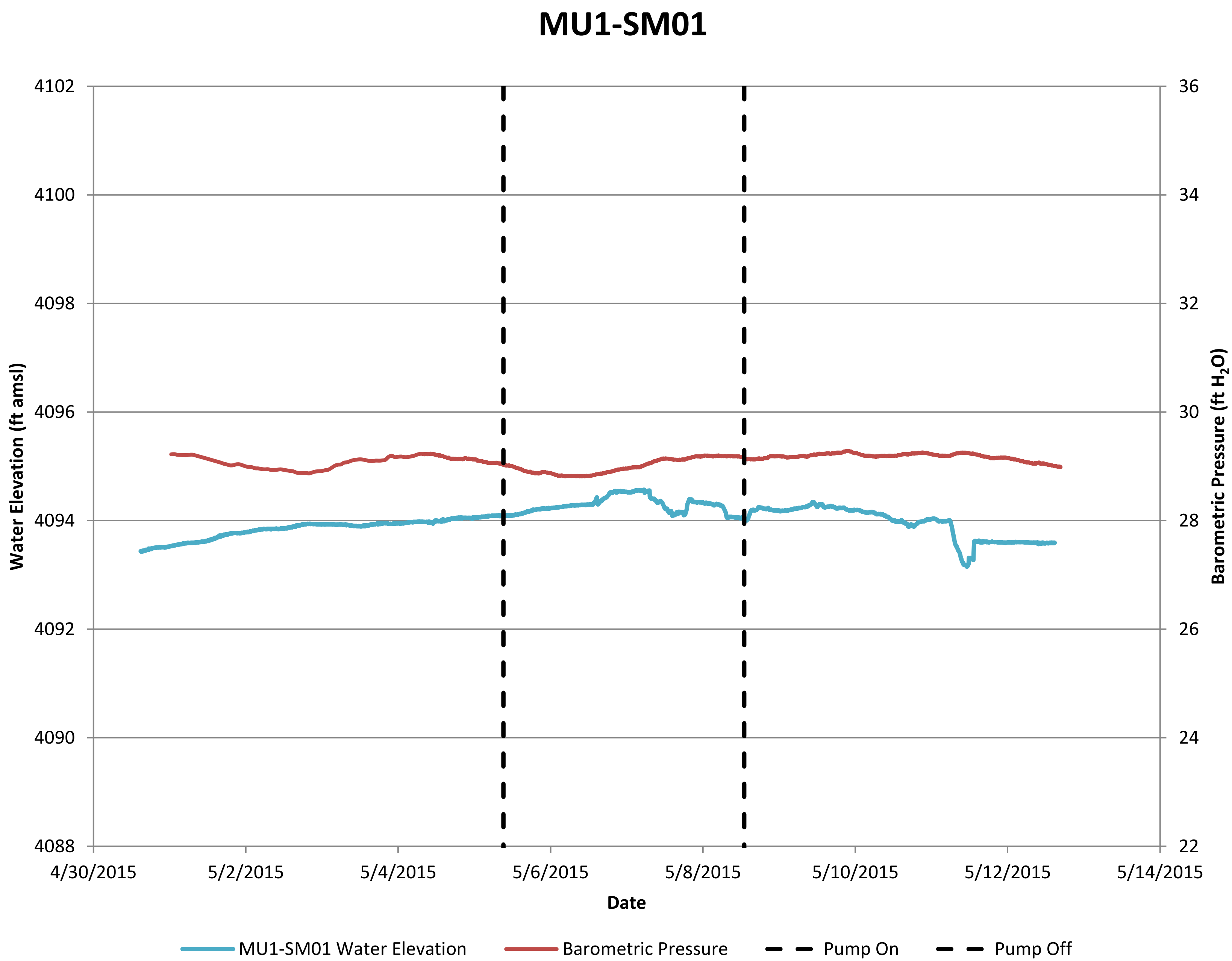

MU1-PM16
Water Elevation (ft amsl)
4068
4066
4064
4062
4060
4058
4056
4054
4052
Barometric Pressure (ft H_2O)
37
35
33
31
29
27
25
23
21
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM16 Water Elevation
Barometric Pressure
Pump On
Pump Off

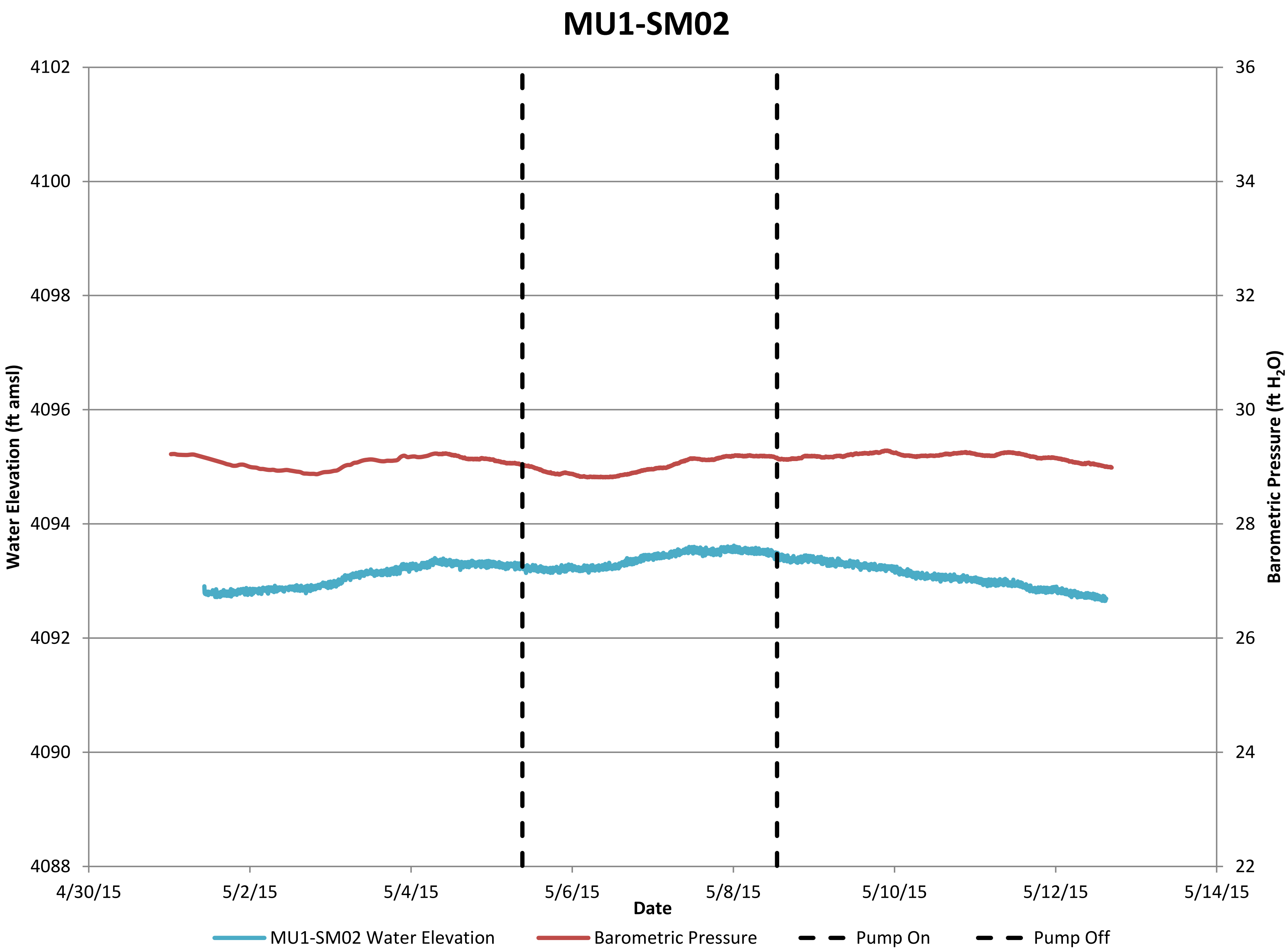

MU1-PM17
4082
4080
4078
4076
4074
4072
4070
4068
4066
Water Elevation (ft amsl)
37
35
33
31
29
27
25
23
21
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM17 Water Elevation
Barometric Pressure
Pump On
Pump Off

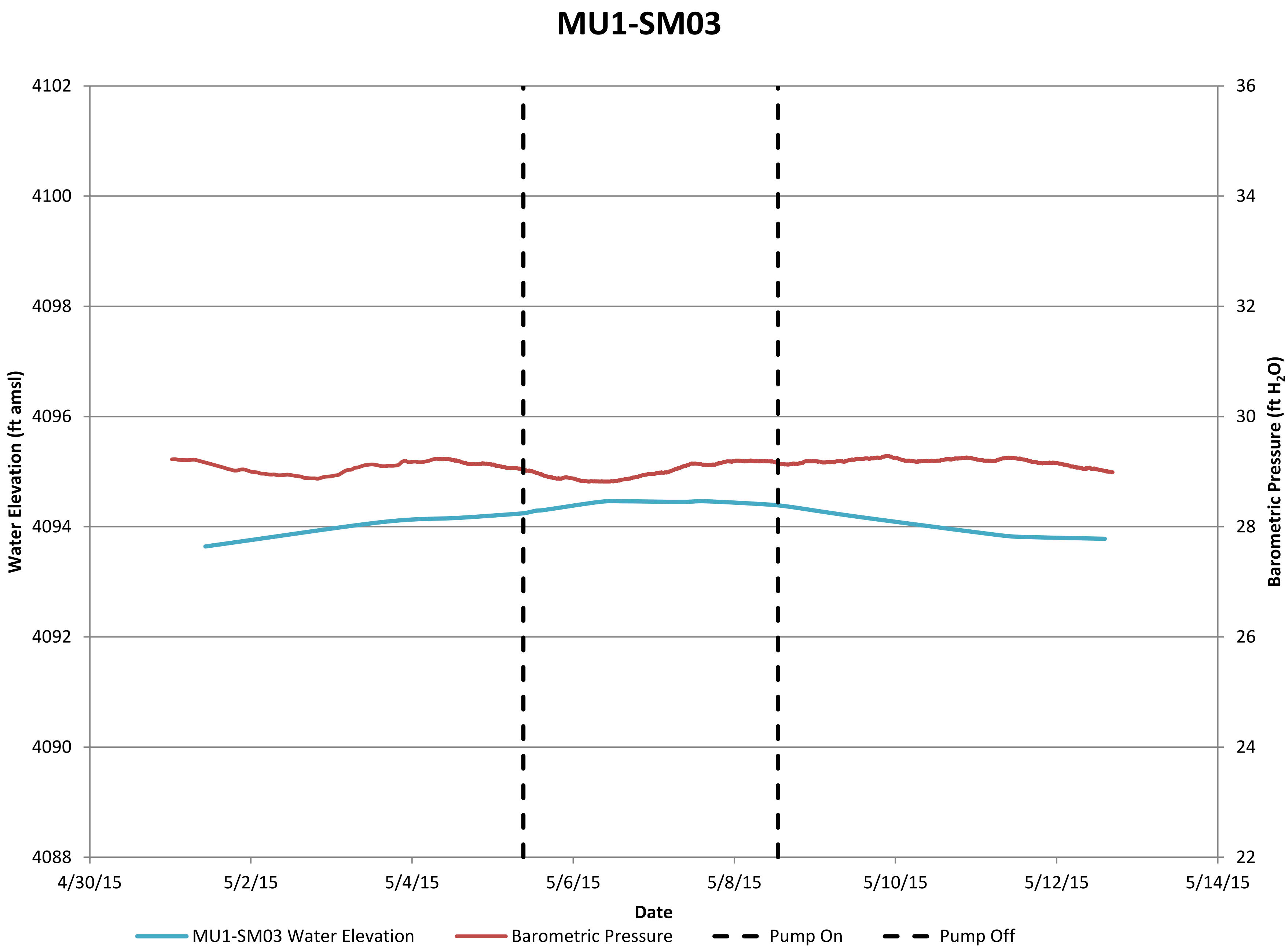

MU1-PM18
4079
4077
4075
4073
4071
4069
4067
4065
4063
Water Elevation (ft amsl)
37
35
33
31
29
27
25
23
21
Barometric Pressure (ft H2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM18 Water Elevation
Barometric Pressure
Pump On
Pump Off

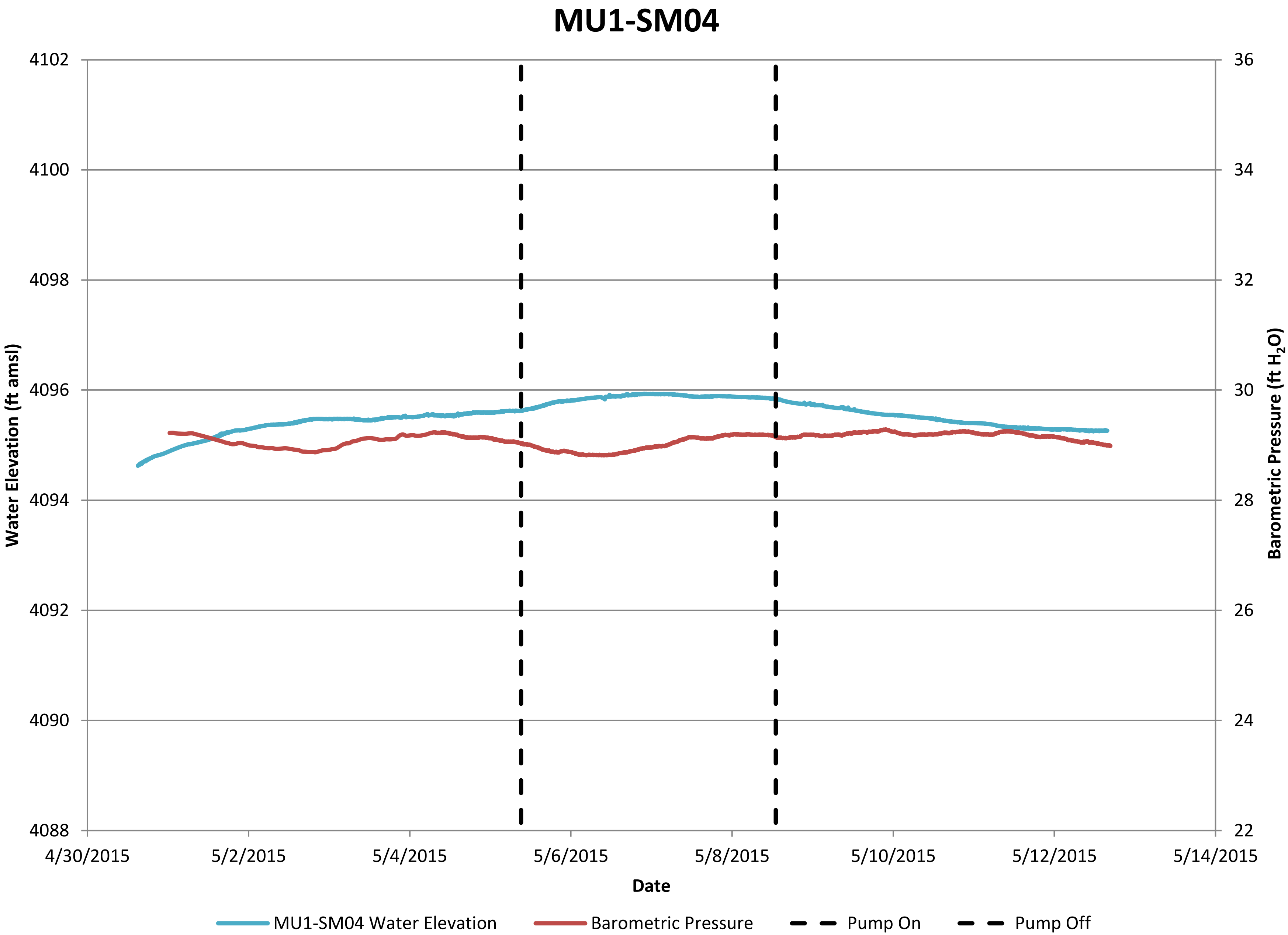

MU1-PM19
Water Elevation (ft amsl)
4090
4088
4086
4084
4082
4080
4078
4076
4074
Barometric Pressure (ft H_2O)
37
35
33
31
29
27
25
23
21
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-PM19 Water Elevation
Barometric Pressure
Pump On
Pump Off

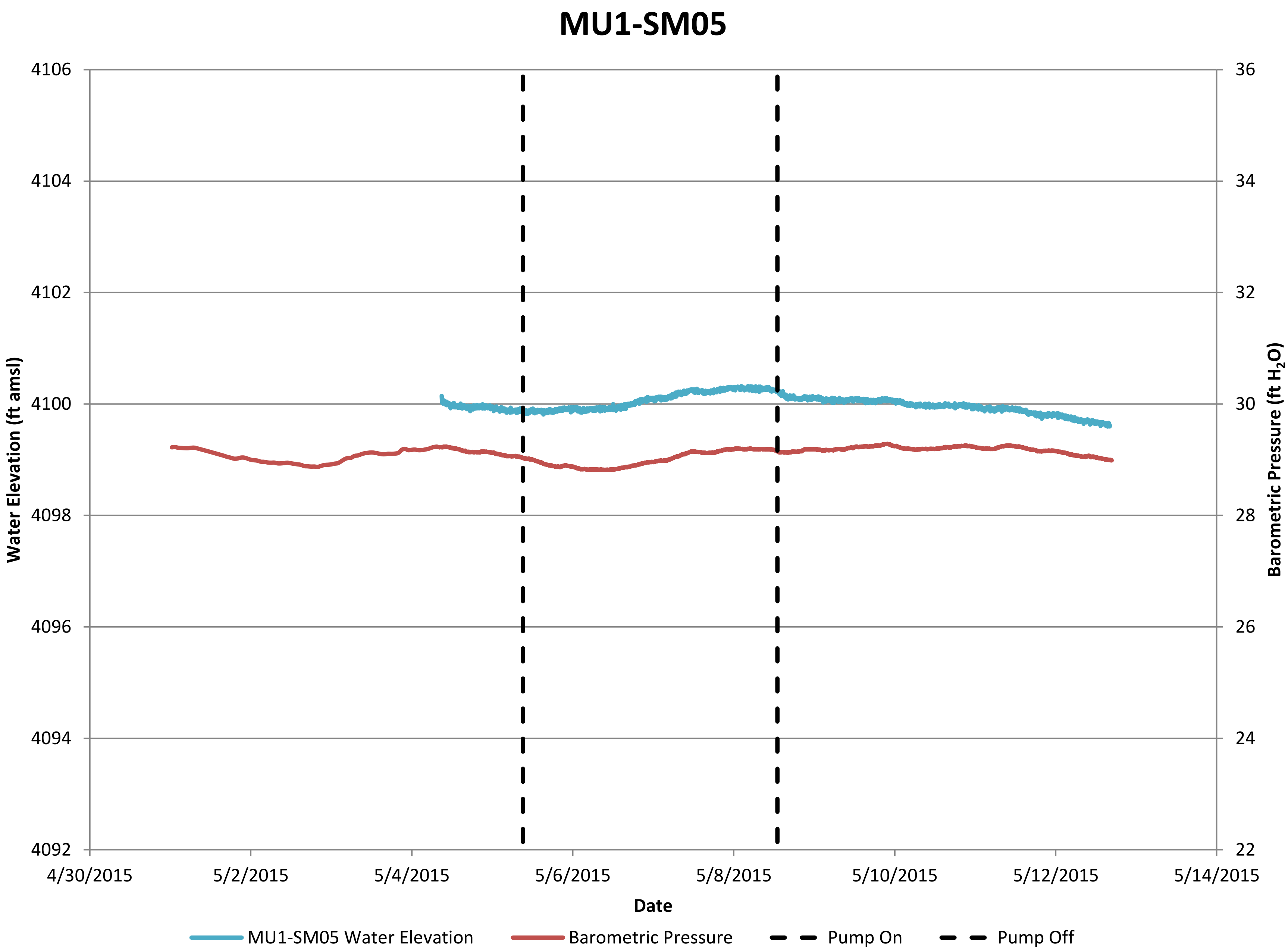
SM HYDROGRAPHS

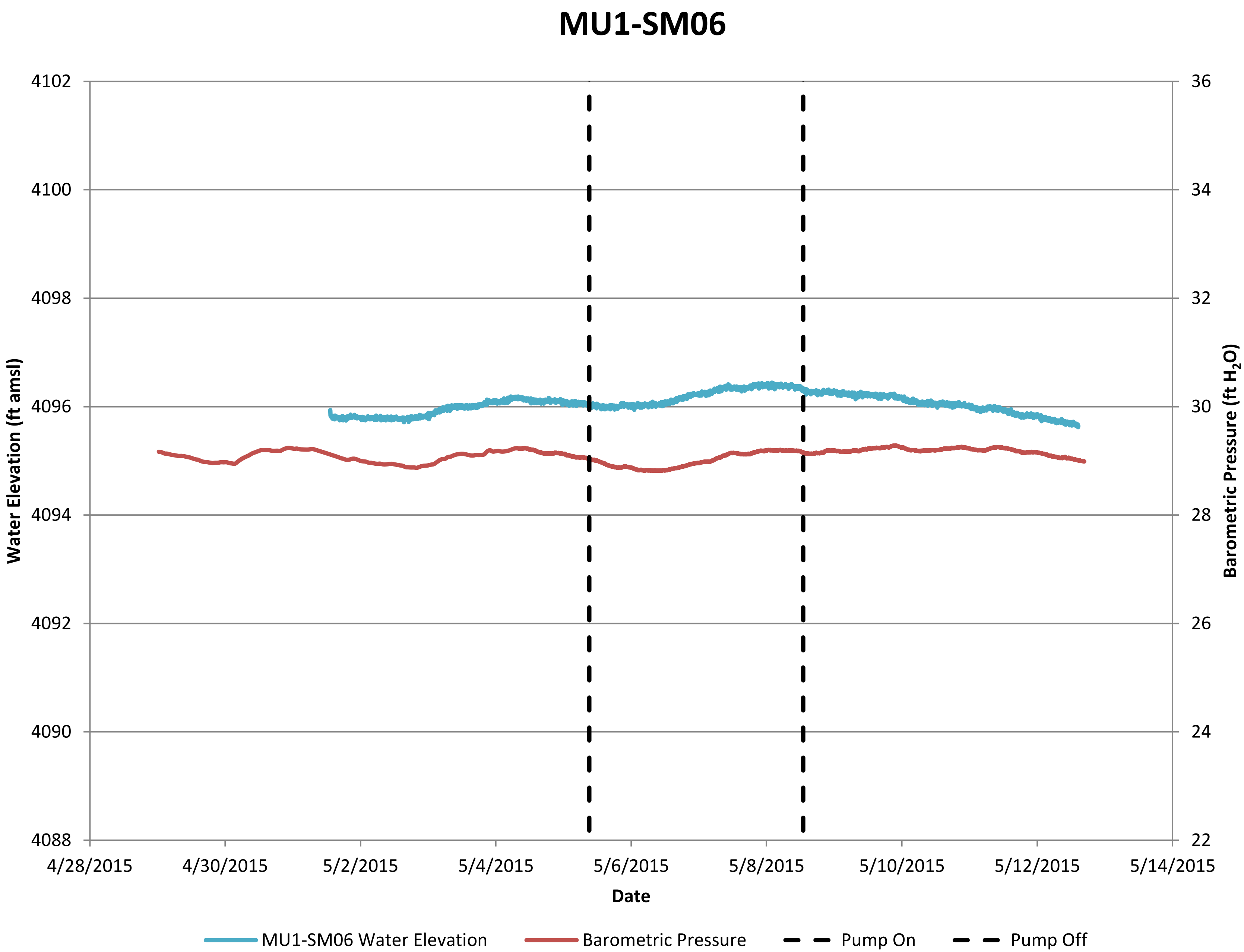

MU1-SM01
Water Elevation (ft amsl)
4102
4100
4098
4096
4094
4092
4090
4088
Barometric Pressure (ft H_2O)
36
34
32
30
28
26
24
22
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-SM01 Water Elevation
Barometric Pressure
Pump On
Pump Off

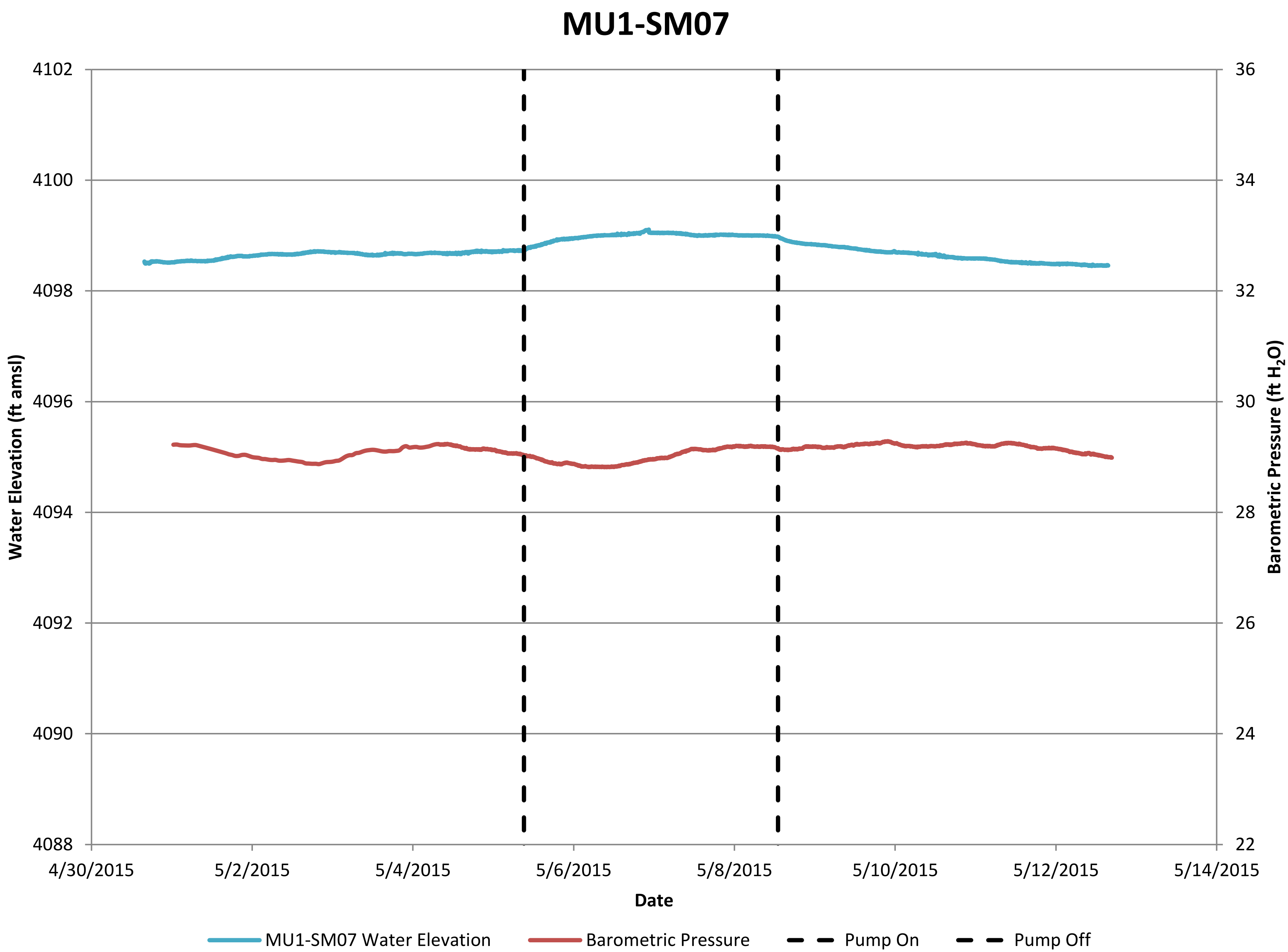

MU1-SM02
Water Elevation (ft amsl)
4102
4100
4098
4096
4094
4092
4090
4088
Barometric Pressure (ft H_2O)
36
34
32
30
28
26
24
22
4/30/15
5/2/15
5/4/15
5/6/15
5/8/15
5/10/15
5/12/15
5/14/15
Date
MU1-SM02 Water Elevation
Barometric Pressure
Pump On
Pump Off

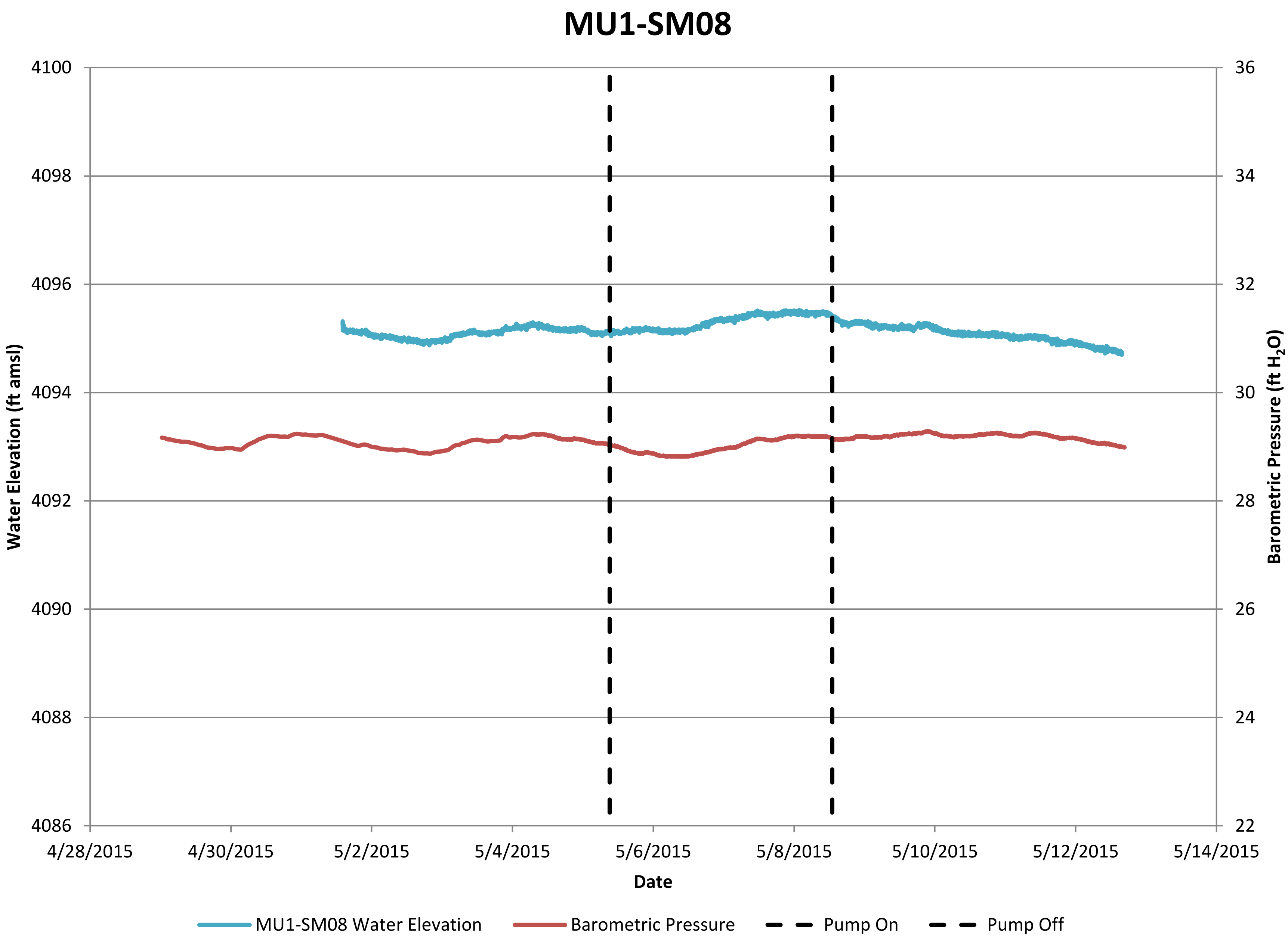

MU1-SM03
Water Elevation (ft amsl)
4102
4100
4098
4096
4094
4092
4090
4088
Barometric Pressure (ft H_2O)
36
34
32
30
28
26
24
22
4/30/15
5/2/15
5/4/15
5/6/15
5/8/15
5/10/15
5/12/15
5/14/15
Date
MU1-SM03 Water Elevation
Barometric Pressure
Pump On
Pump Off

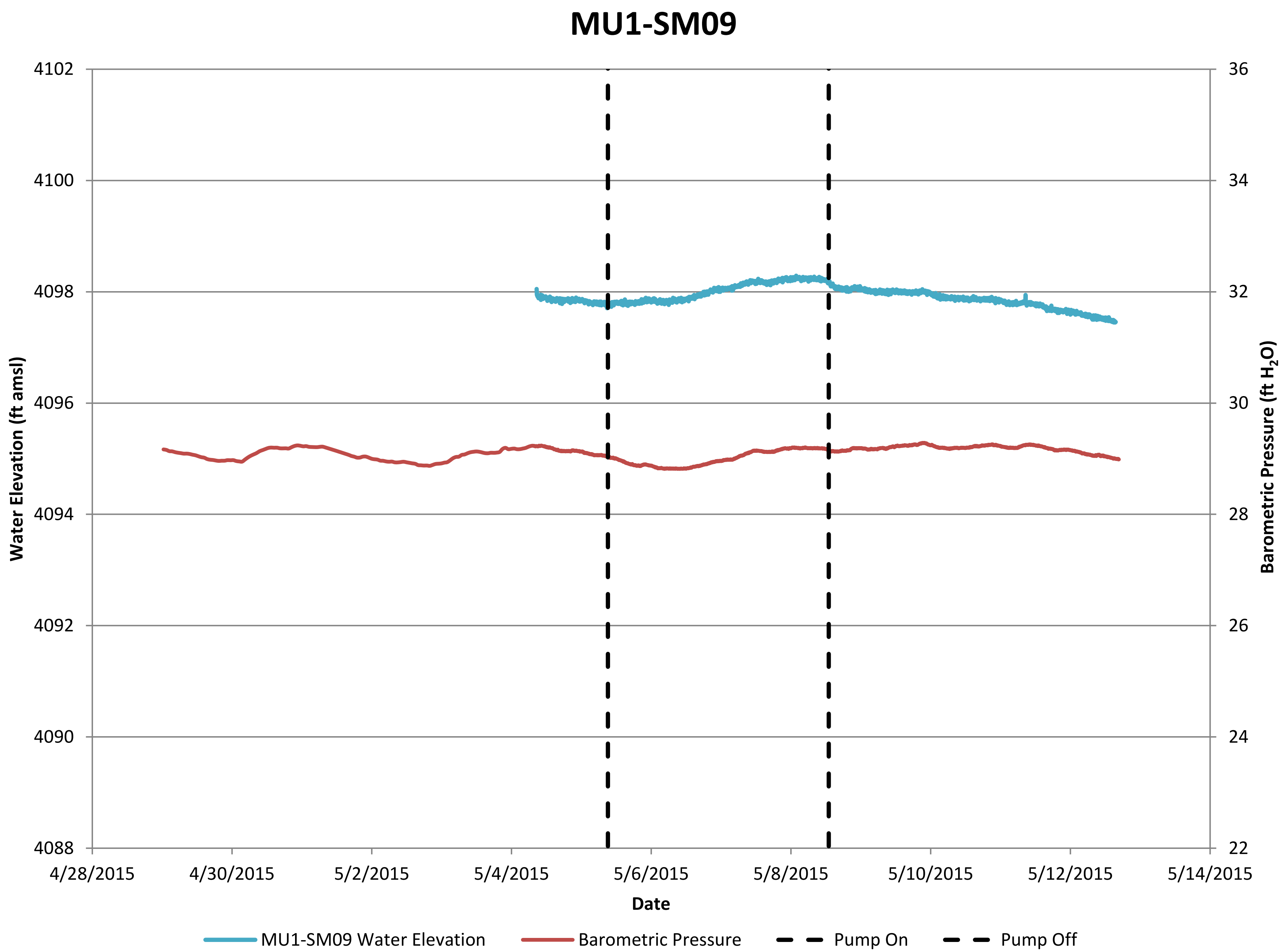

MU1-SM04
4102
4100
4098
4096
4094
4092
4090
4088
Water Elevation (ft amsl)
36
34
32
30
28
26
24
22
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-SM04 Water Elevation
Barometric Pressure
Pump On
Pump Off

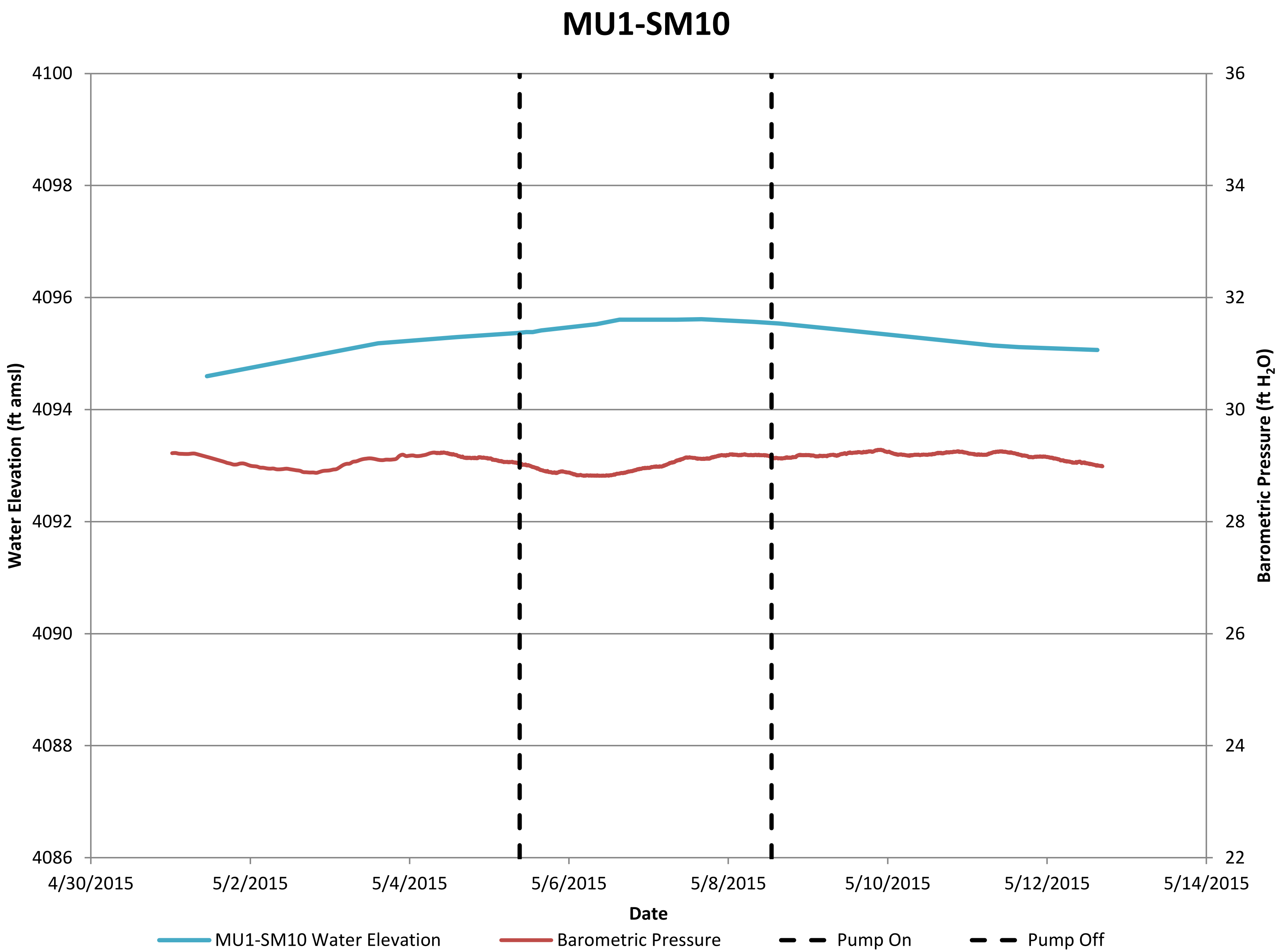

MU1-SM05
Water Elevation (ft amsl)
4106
4104
4102
4100
4098
4096
4094
4092
Barometric Pressure (ft H_2O)
36
34
32
30
28
26
24
22
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-SM05 Water Elevation
Barometric Pressure
Pump On
Pump Off

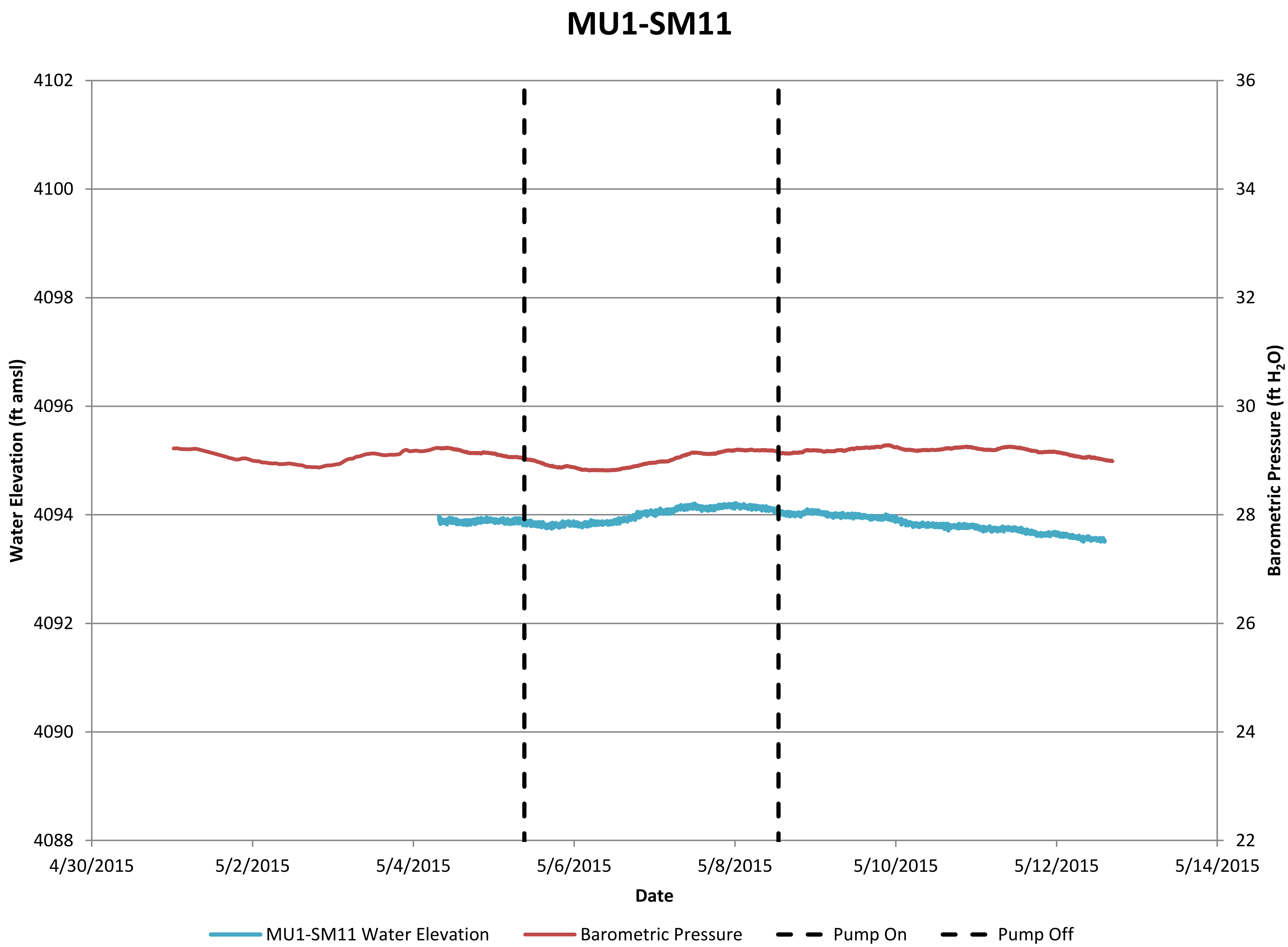

MU1-SM06
Water Elevation (ft amsl)
4102
4100
4098
4096
4094
4092
4090
4088
Barometric Pressure (ft H_2O)
36
34
32
30
28
26
24
22
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-SM06 Water Elevation
Barometric Pressure
Pump On
Pump Off

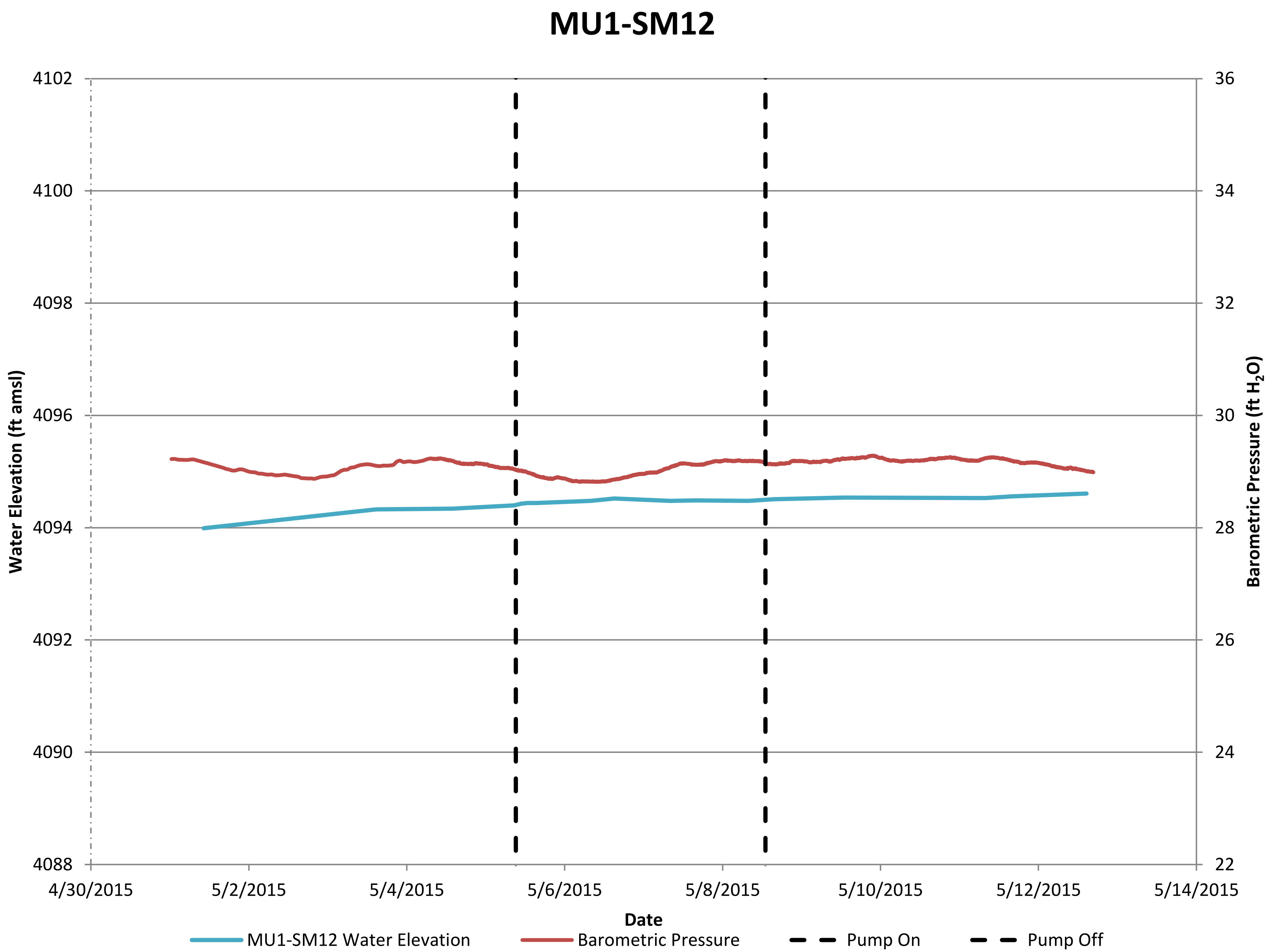

MU1-SM07
Water Elevation (ft amsl)
4102
4100
4098
4096
4094
4092
4090
4088
Barometric Pressure (ft H_2O)
36
34
32
30
28
26
24
22
Date
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
MU1-SM07 Water Elevation
Barometric Pressure
Pump On
Pump Off

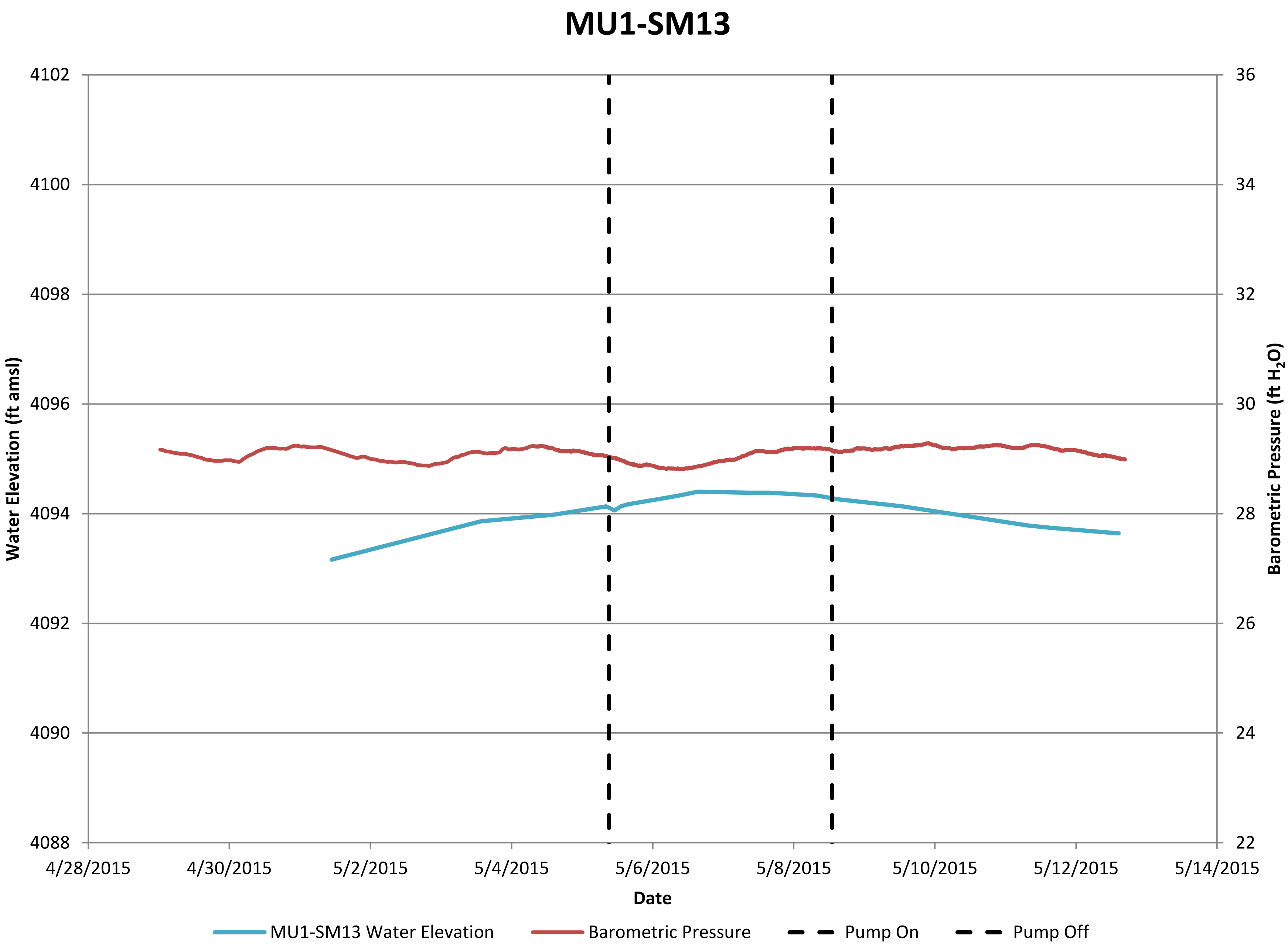

MU1-SM08
Water Elevation (ft amsl)
4100
4098
4096
4094
4092
4090
4088
4086
Barometric Pressure (ft H2O)
36
34
32
30
28
26
24
22
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-SM08 Water Elevation
Barometric Pressure
Pump On
Pump Off

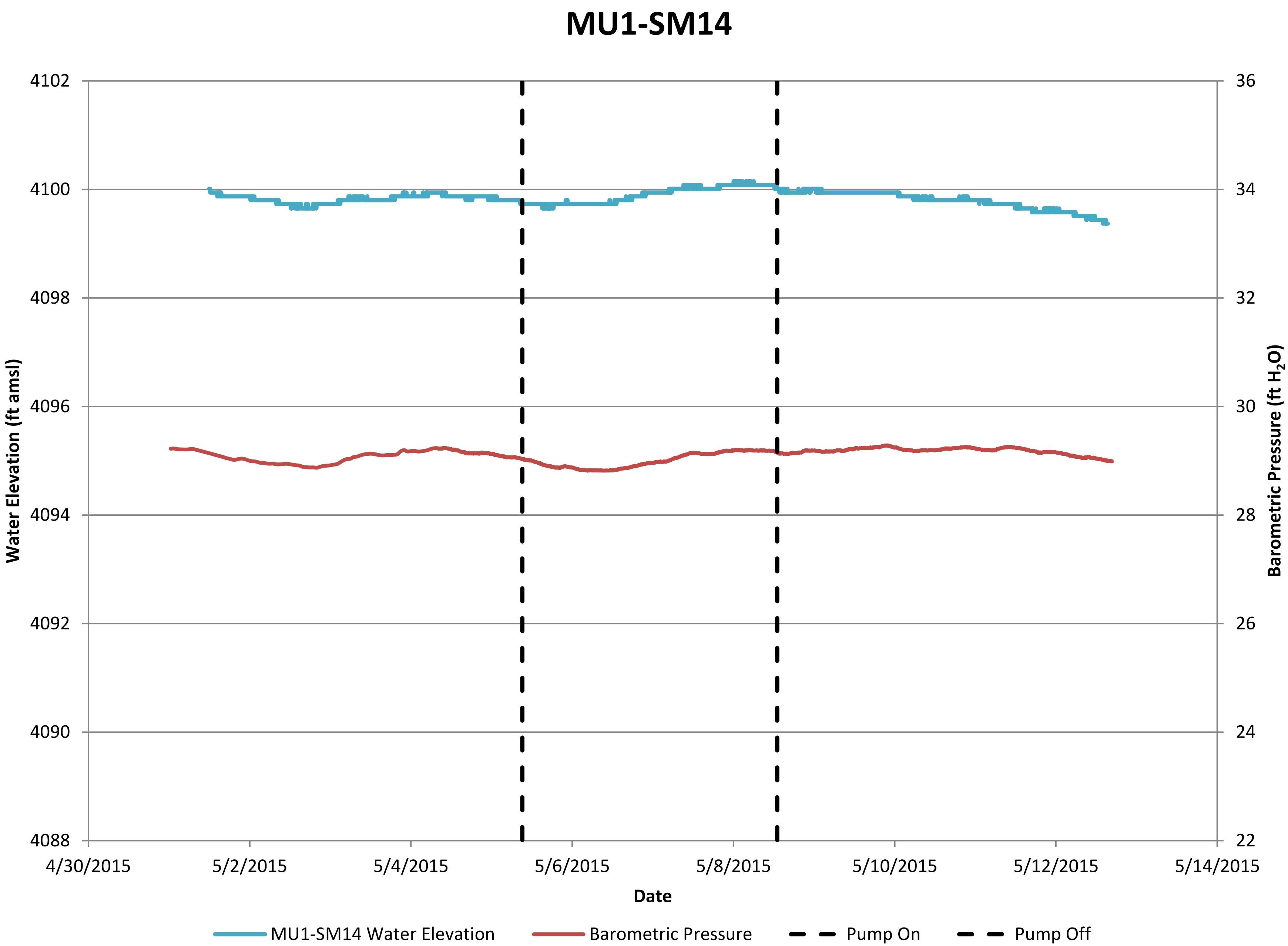

MU1-SM09
Water Elevation (ft amsl)
4102
4100
4098
4096
4094
4092
4090
4088
Barometric Pressure (ft H_2O)
36
34
32
30
28
26
24
22
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-SM09 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-SM10
4100
4098
4096
4094
4092
4090
4088
4086
36
34
32
30
28
26
24
22
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-SM10 Water Elevation
Barometric Pressure
Pump On
Pump Off

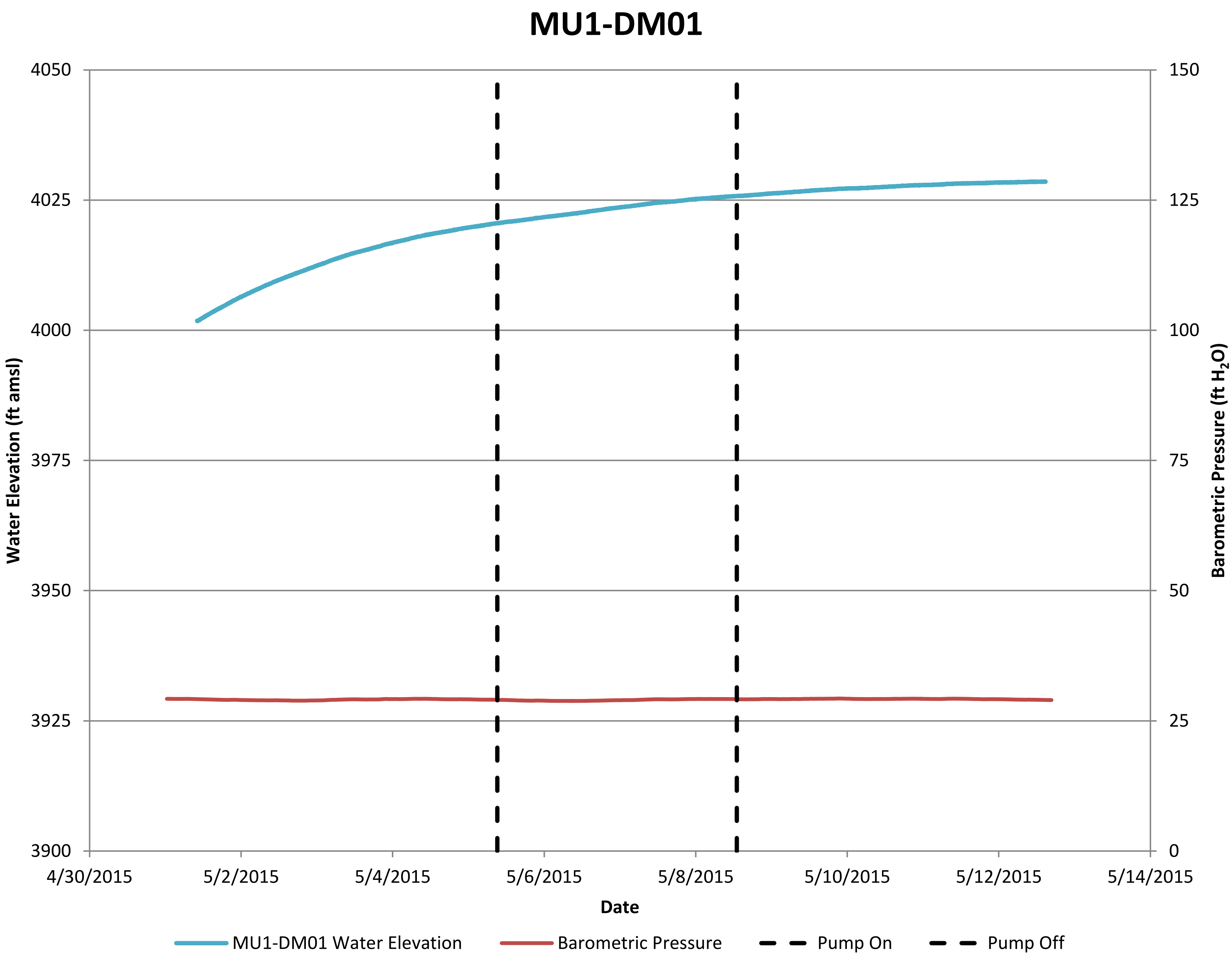

MU1-SM11
Water Elevation (ft amsl)
4102
4100
4098
4096
4094
4092
4090
4088
Barometric Pressure (ft H_2O)
36
34
32
30
28
26
24
22
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-SM11 Water Elevation
Barometric Pressure
Pump On
Pump Off

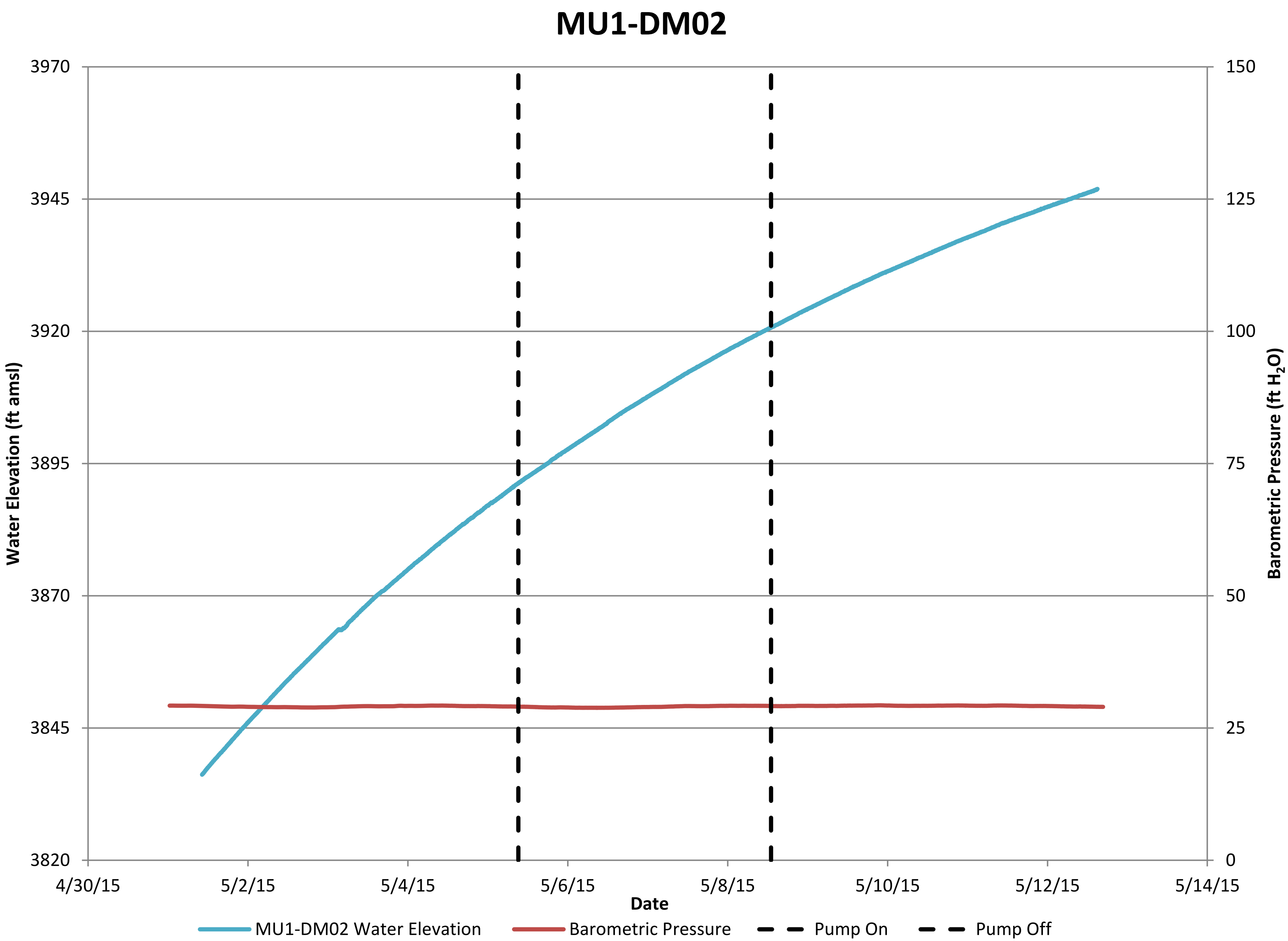

MU1-SM12
Water Elevation (ft amsl)
4102
4100
4098
4096
4094
4092
4090
4088
Barometric Pressure (ft H_2O)
36
34
32
30
28
26
24
22
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-SM12 Water Elevation
Barometric Pressure
Pump On
Pump Off

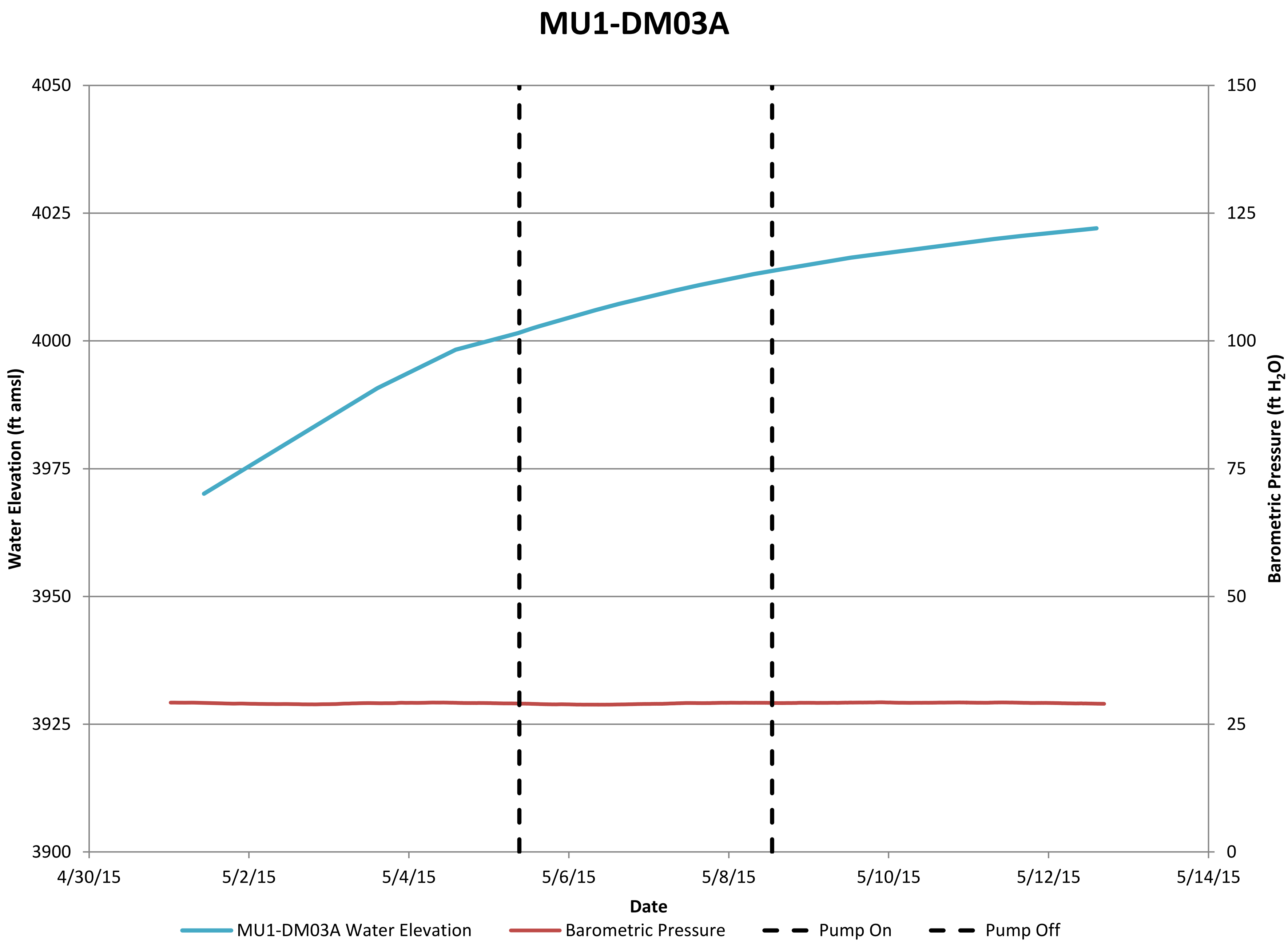

MU1-SM13
4102
4100
4098
4096
4094
4092
4090
4088
Water Elevation (ft amsl)
36
34
32
30
28
26
24
22
Barometric Pressure (ft H2O)
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-SM13 Water Elevation
Barometric Pressure
Pump On
Pump Off

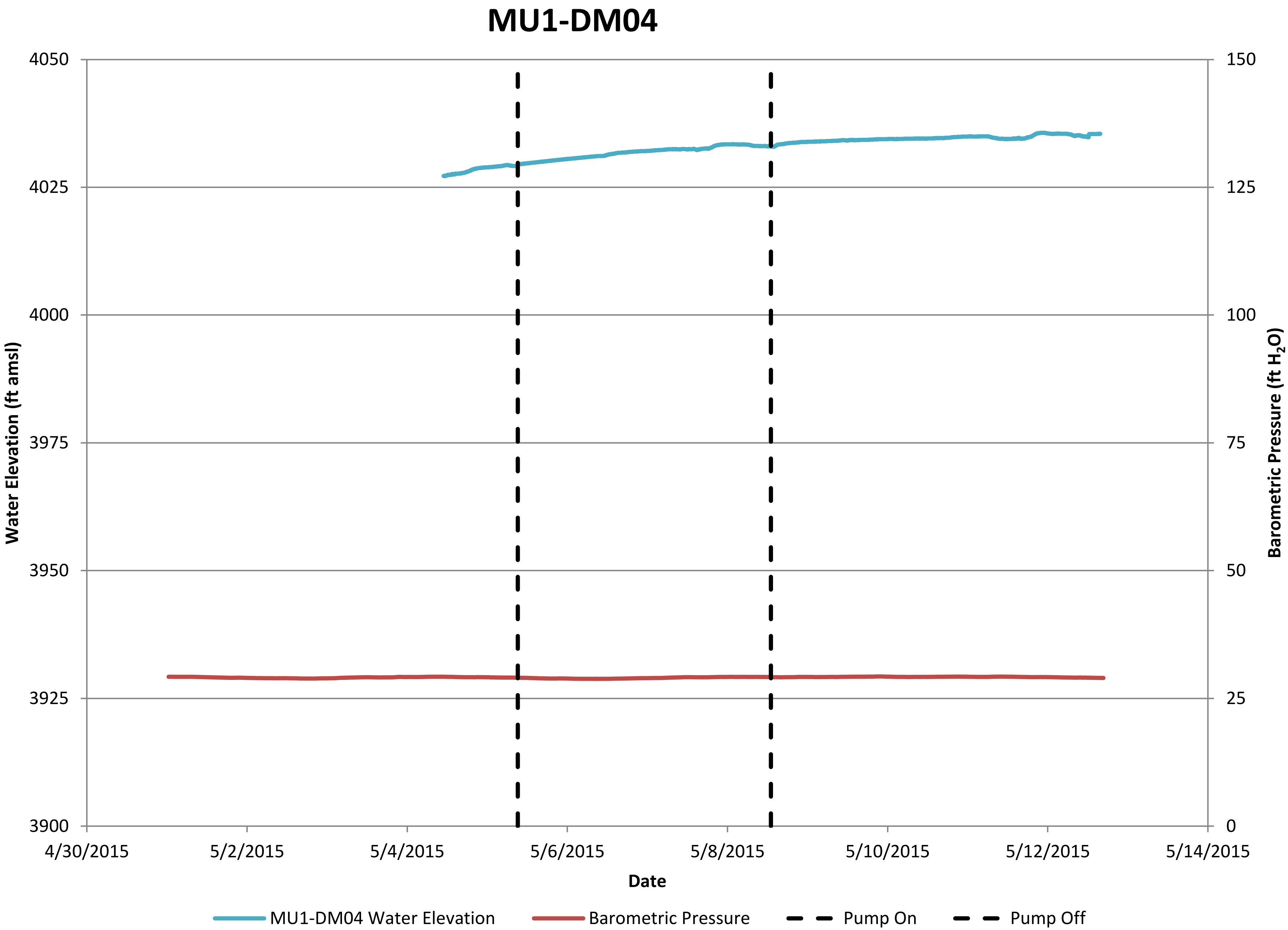

MU1-SM14
Water Elevation (ft amsl)
4102
4100
4098
4096
4094
4092
4090
4088
Barometric Pressure (ft H_2O)
36
34
32
30
28
26
24
22
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-SM14 Water Elevation
Barometric Pressure
Pump On
Pump Off

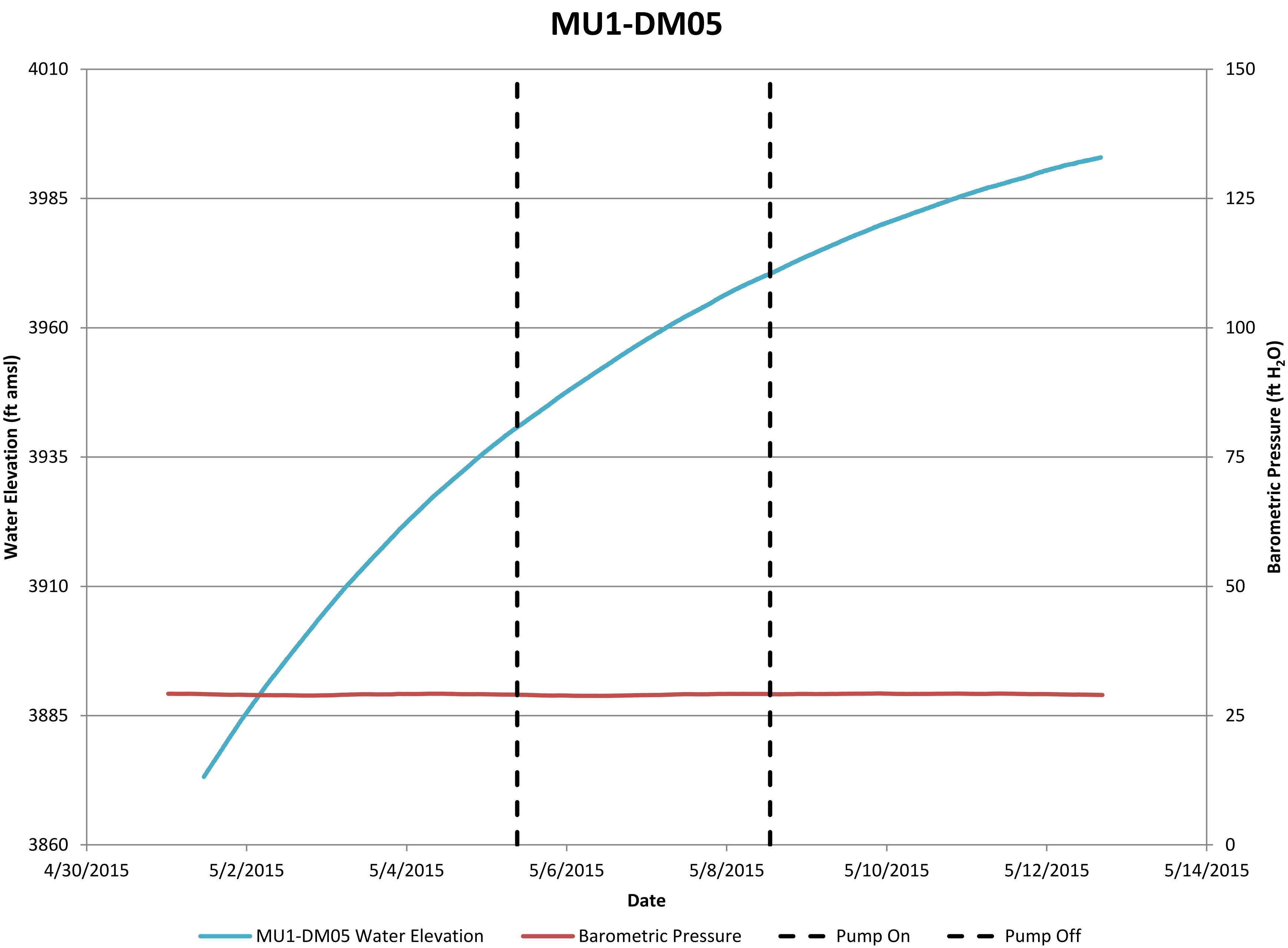
DM HYDROGRAPHS

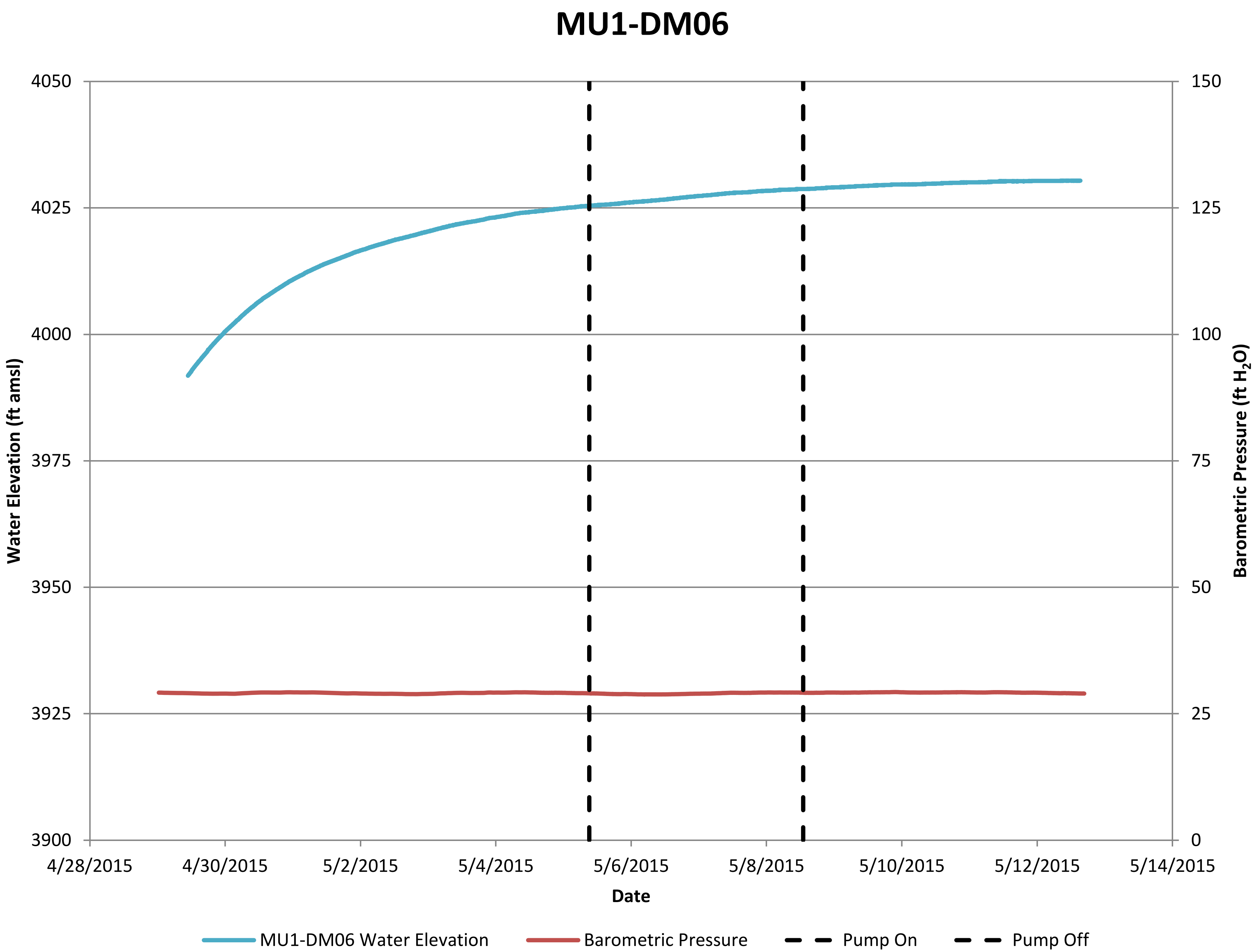

MU1-DM01
4050
4025
4000
3975
3950
3925
3900
Water Elevation (ft amsl)
150
125
100
75
50
25
0
Barometric Pressure (ft H2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM01 Water Elevation
Barometric Pressure
Pump On
Pump Off

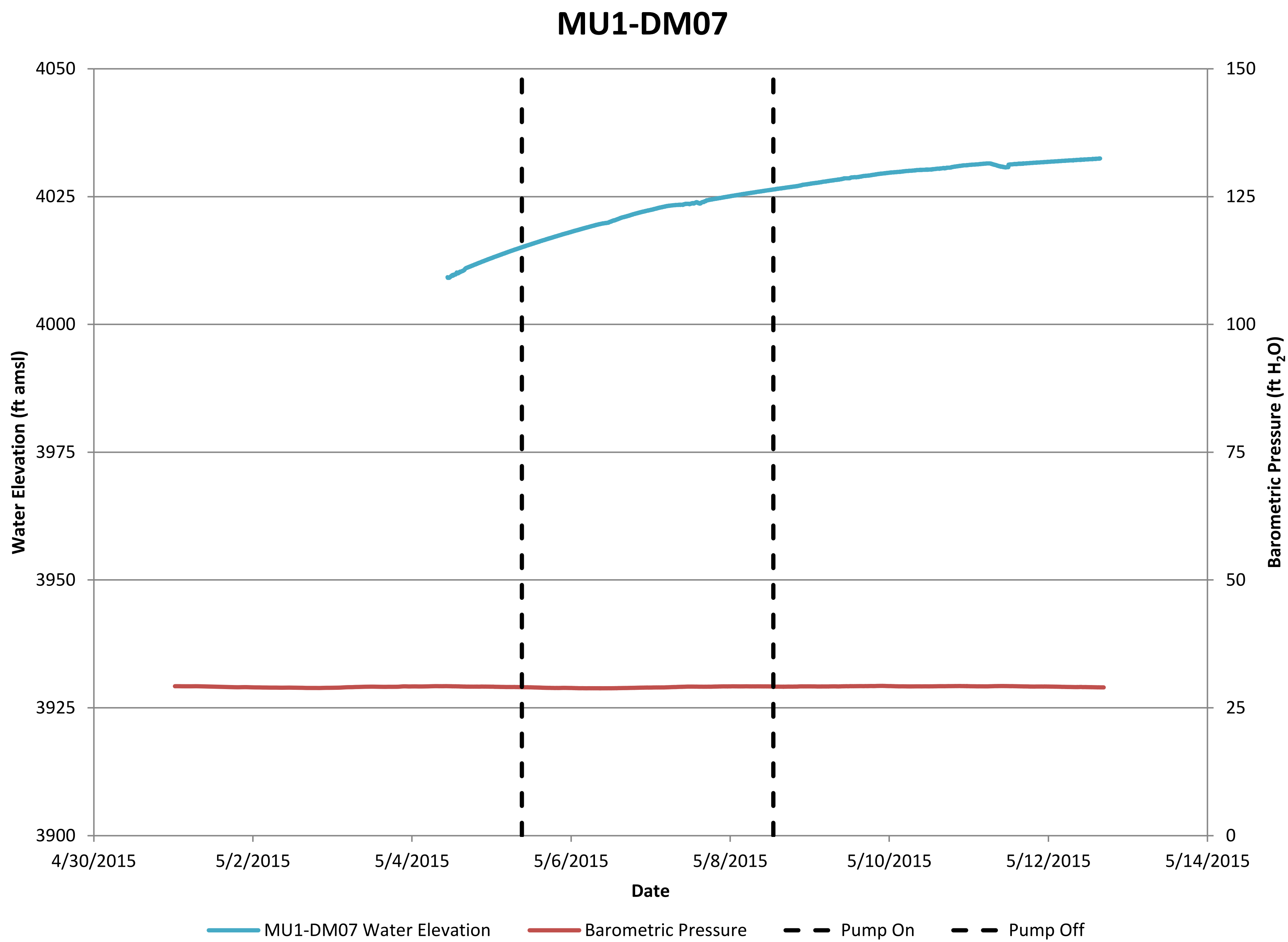

MU1-DM02
Water Elevation (ft amsl)
3970
3945
3920
3895
3870
3845
3820
Barometric Pressure (ft H_2O)
150
125
100
75
50
25
0
4/30/15
5/2/15
5/4/15
5/6/15
5/8/15
5/10/15
5/12/15
5/14/15
Date
MU1-DM02 Water Elevation
Barometric Pressure
Pump On
Pump Off

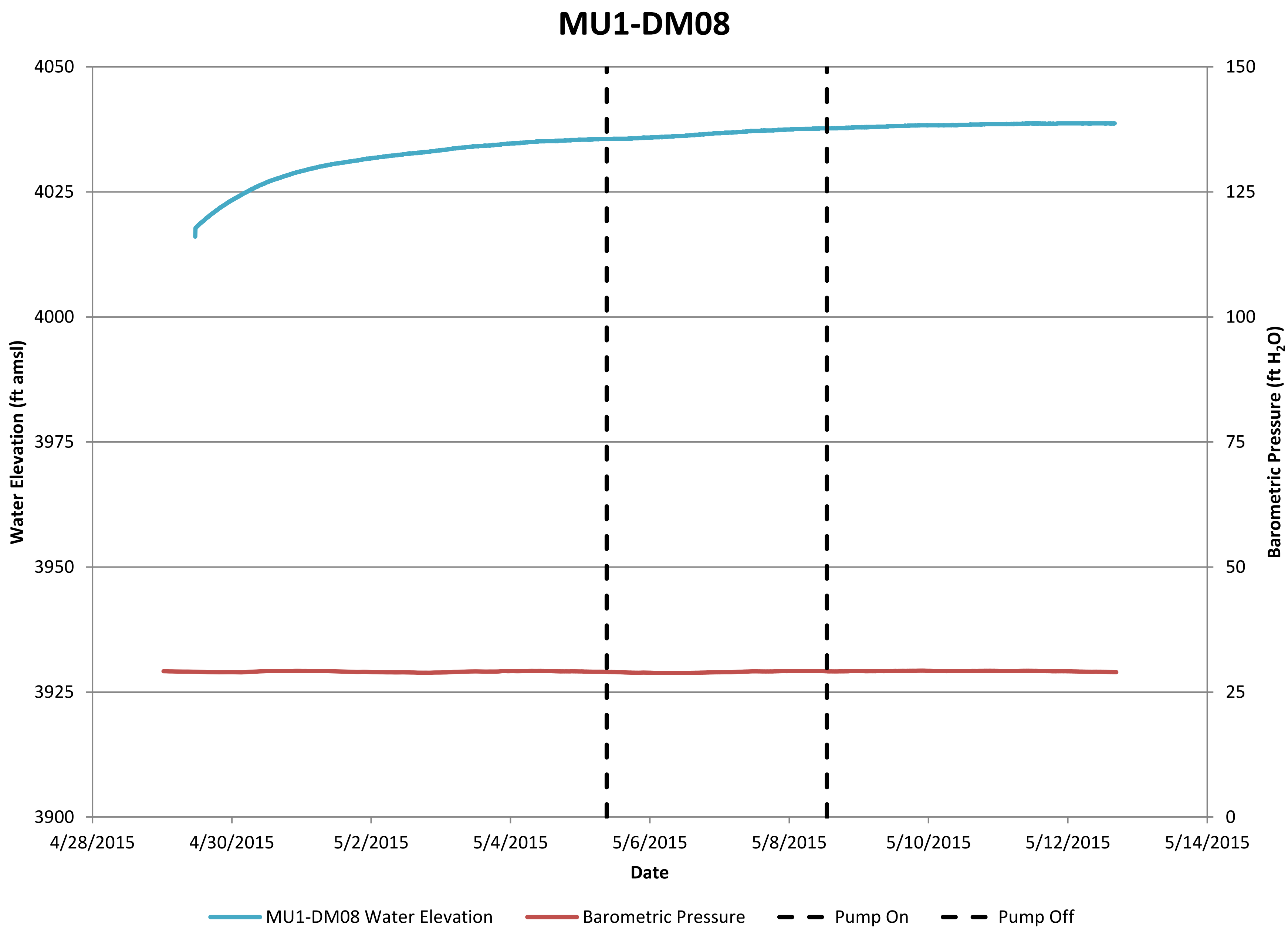

MU1-DM03A
Water Elevation (ft amsl)
4050
4025
4000
3975
3950
3925
3900
Barometric Pressure (ft H_2O)
150
125
100
75
50
25
0
4/30/15
5/2/15
5/4/15
5/6/15
5/8/15
5/10/15
5/12/15
5/14/15
Date
MU1-DM03A Water Elevation
Barometric Pressure
Pump On
Pump Off

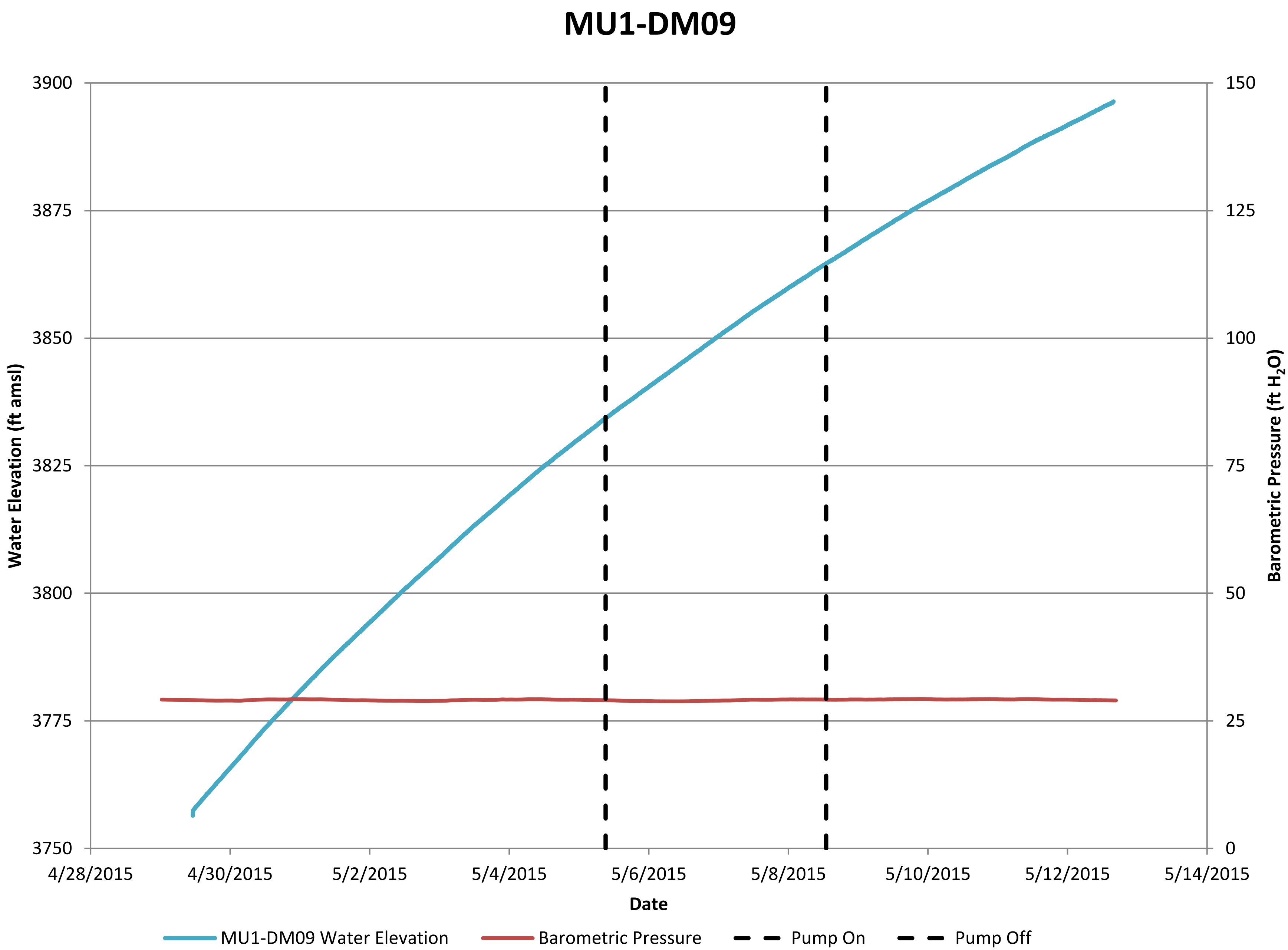

MU1-DM04
Water Elevation (ft amsl)
4050
4025
4000
3975
3950
3925
3900
Barometric Pressure (ft H_2O)
150
125
100
75
50
25
0
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM04 Water Elevation
Barometric Pressure
Pump On
Pump Off

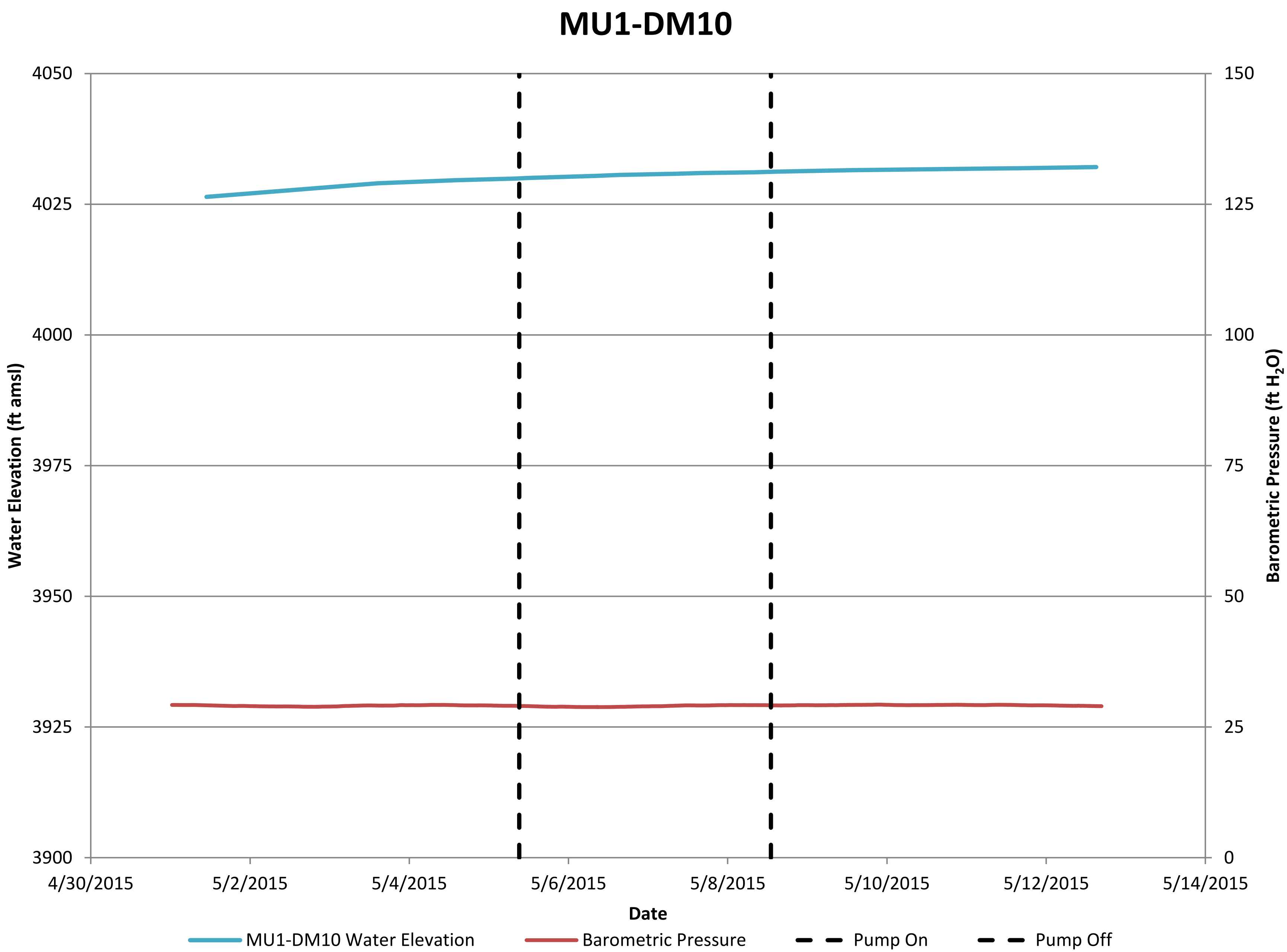

MU1-DM05
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4010
3985
3960
3935
3910
3885
3860
150
125
100
75
50
25
0
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM05 Water Elevation
Barometric Pressure
Pump On
Pump Off

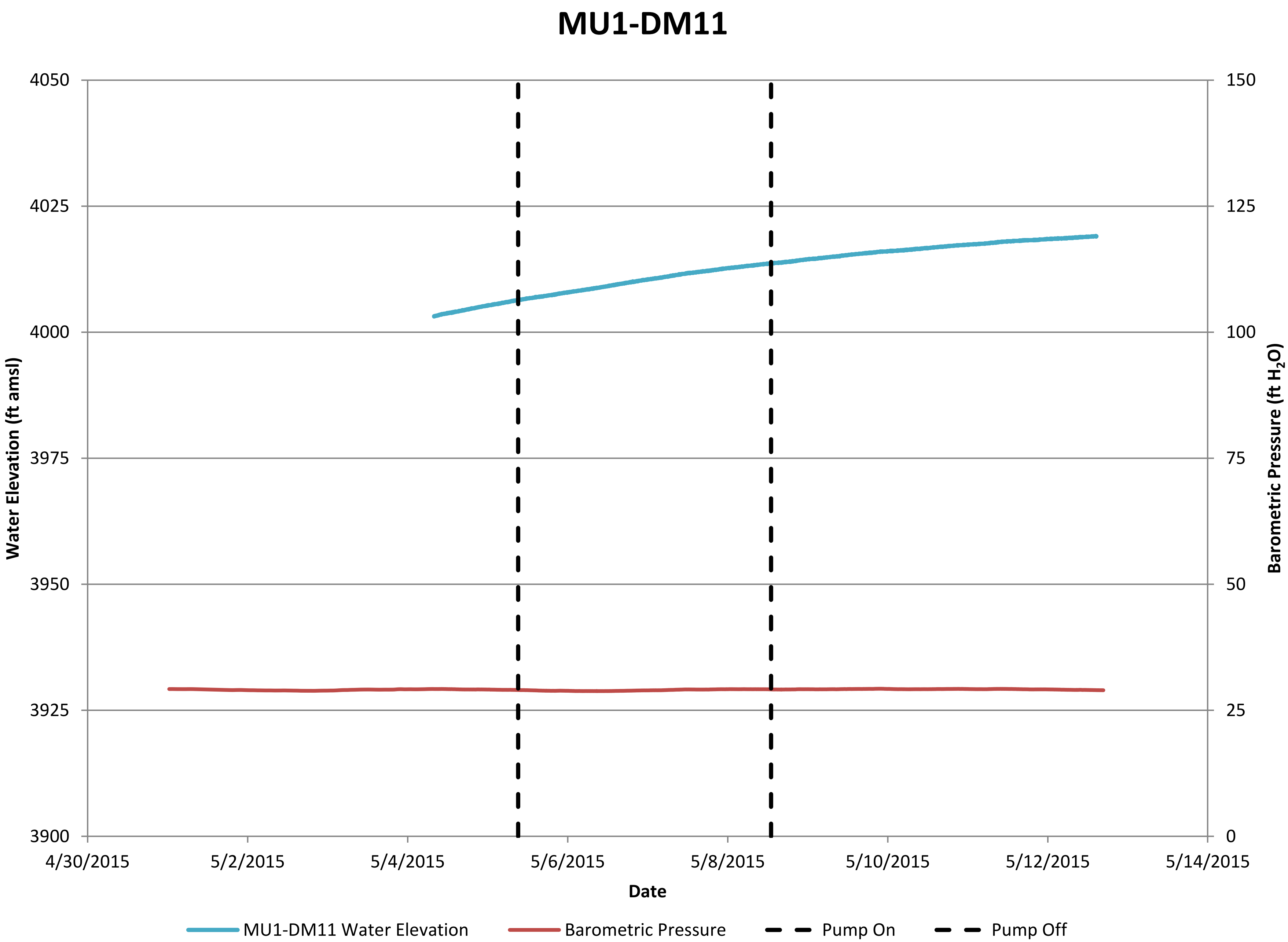

MU1-DM06
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4050
4025
4000
3975
3950
3925
3900
150
125
100
75
50
25
0
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM06 Water Elevation
Barometric Pressure
Pump On
Pump Off

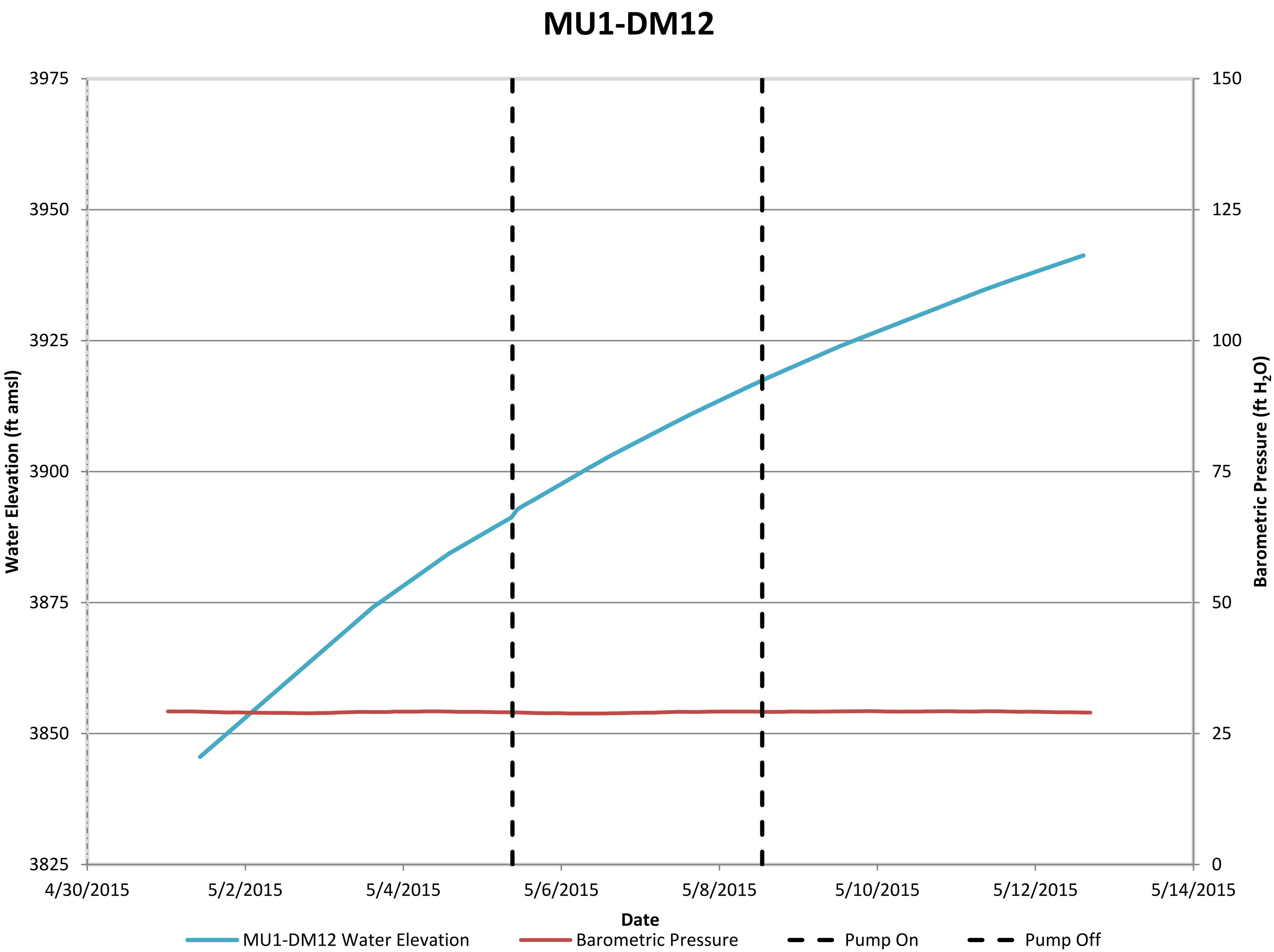

MU1-DM07
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
Date
4050
4025
4000
3975
3950
3925
3900
150
125
100
75
50
25
0
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
MU1-DM07 Water Elevation
Barometric Pressure
Pump On
Pump Off

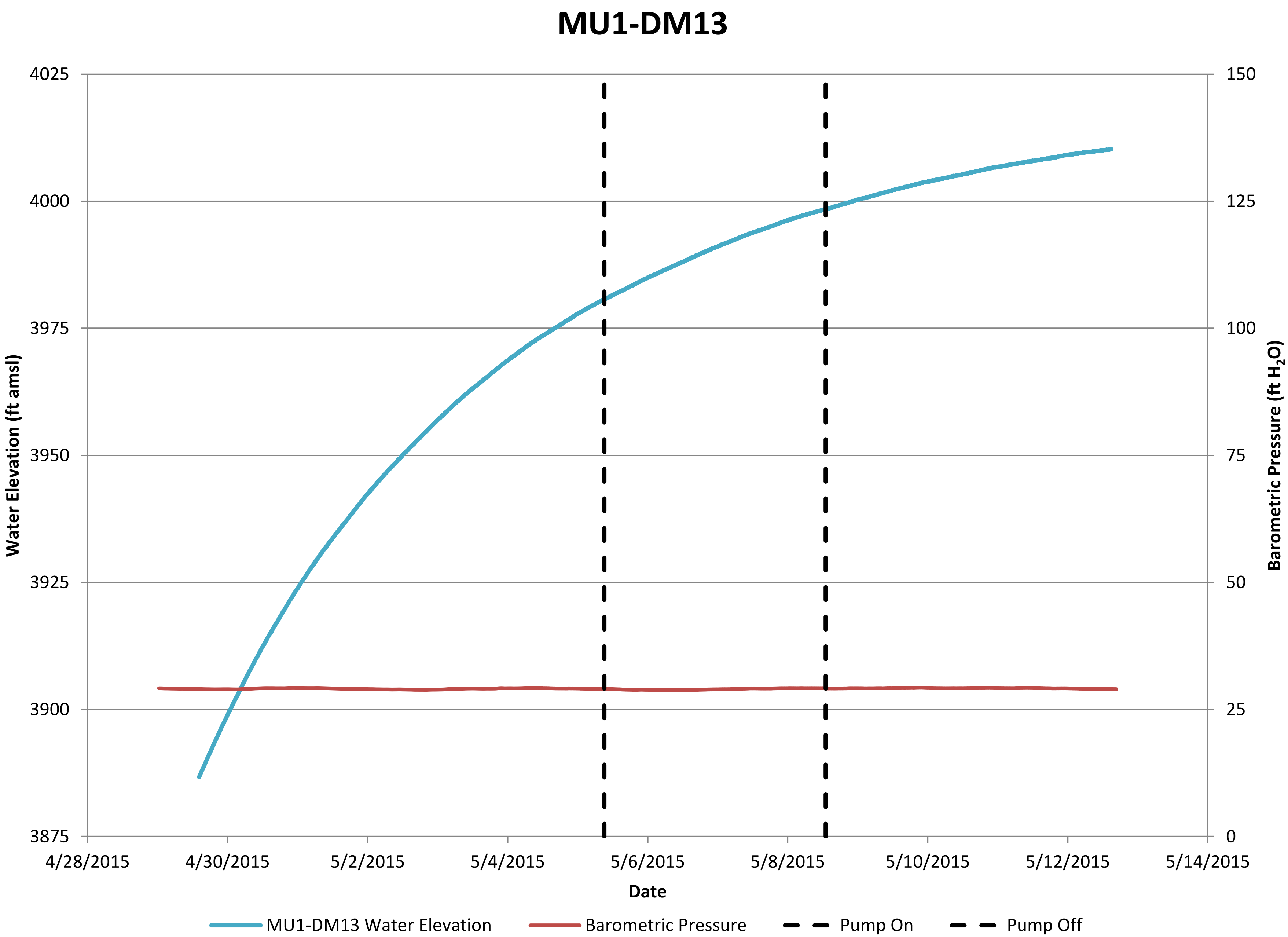

MU1-DM08
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4050
4025
4000
3975
3950
3925
3900
150
125
100
75
50
25
0
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM08 Water Elevation
Barometric Pressure
Pump On
Pump Off

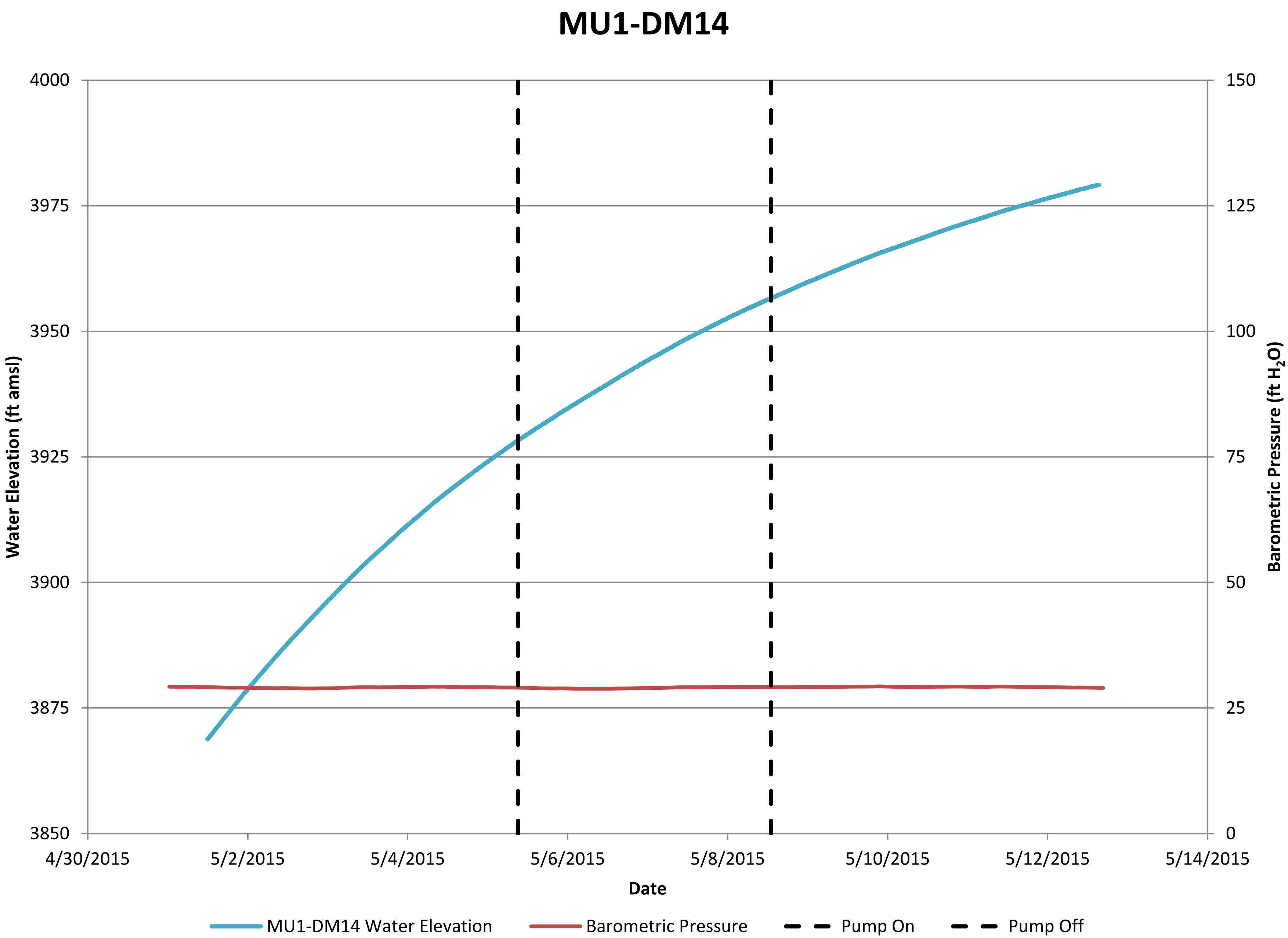

MU1-DM09
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
3900
3875
3850
3825
3800
3775
3750
150
125
100
75
50
25
0
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM09 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-DM10
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4050
4025
4000
3975
3950
3925
3900
150
125
100
75
50
25
0
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM10 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-DM11
4050
4025
4000
3975
3950
3925
3900
Water Elevation (ft amsl)
150
125
100
75
50
25
0
Barometric Pressure (ft H_2O)
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM11 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-DM12
Water Elevation (ft amsl)
3975
3950
3925
3900
3875
3850
3825
Barometric Pressure (ft H_2O)
150
125
100
75
50
25
0
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM12 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-DM13
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4025
4000
3975
3950
3925
3900
3875
150
125
100
75
50
25
0
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM13 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-DM14
Water Elevation (ft amsl)
4000
3975
3950
3925
3900
3875
3850
Barometric Pressure (ft H_2O)
150
125
100
75
50
25
0
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM14 Water Elevation
Barometric Pressure
Pump On
Pump Off

Attachment 5

Appendix D

Second Aquifer Test (MU1-OZ23) Field Data Sheets

WWC ENGINEERING

AQUIFER TEST FIELD DATA

Project/Client Ross MU1 / Strata Energy Inc

Pumped Well No. MU1-0Z23 Observation Well No. NA

Type of Pump Test: ☑ Constant Discharge ☐ Step-Drawdown

Pumped Well Casing ID 4.33 inches

Distance Between Pumped and Observation Wells 0 feet

Water Level Measurements by: ☑ electric tape ☑ pressure transducer

Discharge Measurements by: ☑ bucket/stopwatch ☑ flow meter ☐ flume/weir

Screen/Perforation Interval(s) (below land surface) 373'-382'

Depth of Pump Intake (below land surface) ~345 feet

Depth of Static Water Level (from measurement point) 76.52 feet

Height of Measurement Point (above land surface) 1.49 feet

Elevation of Measurement Point 4140.10 feet a.m.s.l.

Pump On Date 5 / 19 / 2015 Time 8:21 AM/PM (AM circled)

Pump Off Date 5 / 24 / 2015 Time 9:04 AM/PM (AM circled)

Weather Conditions

Test Performed by [signature]

WWC ENGINEERING

AQUIFER TEST FIELD DATA

Project/Client: Ross MU1/Strata Energy Inc   Well No. MU1-0223

TIME			WATER LEVEL DATA					
Date	Clock Time	(t) Elapsed Time Since Pump ON or OFF (min)	Depth to Water Below M.P. (ft)	(s) Drawdown/ Recovery (ft)	(Q) Discharge (gpm)	Discharge Pipe Pressure (before control valve) (PSI)	Discharge Pipe Pressure (after control valve) (PSI)	COMMENTS
5/19/15	8:26	5	123.86		4.16	100+	0	
	8:40	19	157.94		4.28	100+	0	
	8:56	35	180.64		4.05	98	0	
	9:16	55	188.07		4.08	94	0	
	9:50	89	199.53		4.10	89-90	0	
	10:21	120	202.87		4.10	88	0	
	10:48	147	206.83		4.08	88	0	
	11:43	202	209.82		4.04	84	0	
	13:00	279	210.65		4.02	84	0	
	14:31	370	210.99		3.97	83	0	
	16:30	489			4.03	83	0	
5/20/15	7:15am	1369	217.2		4.10	82	0	
	8:30am	1449	222.27		4.50	78	0	Increased Flow to 4.5gpm
	8:50am	1469			4.46	75	0	
	9:40am	1519	228.79		4.55	75	0	
	11:16am	1615	230.92		5.02	72	0	Increased Flow to 5.0 gpm
	11:41am	1640	242.46		5.05	68	0	
	13:01	1720	244.92		4.94	66	0	

WWC ENGINEERING

AQUIFER TEST FIELD DATA

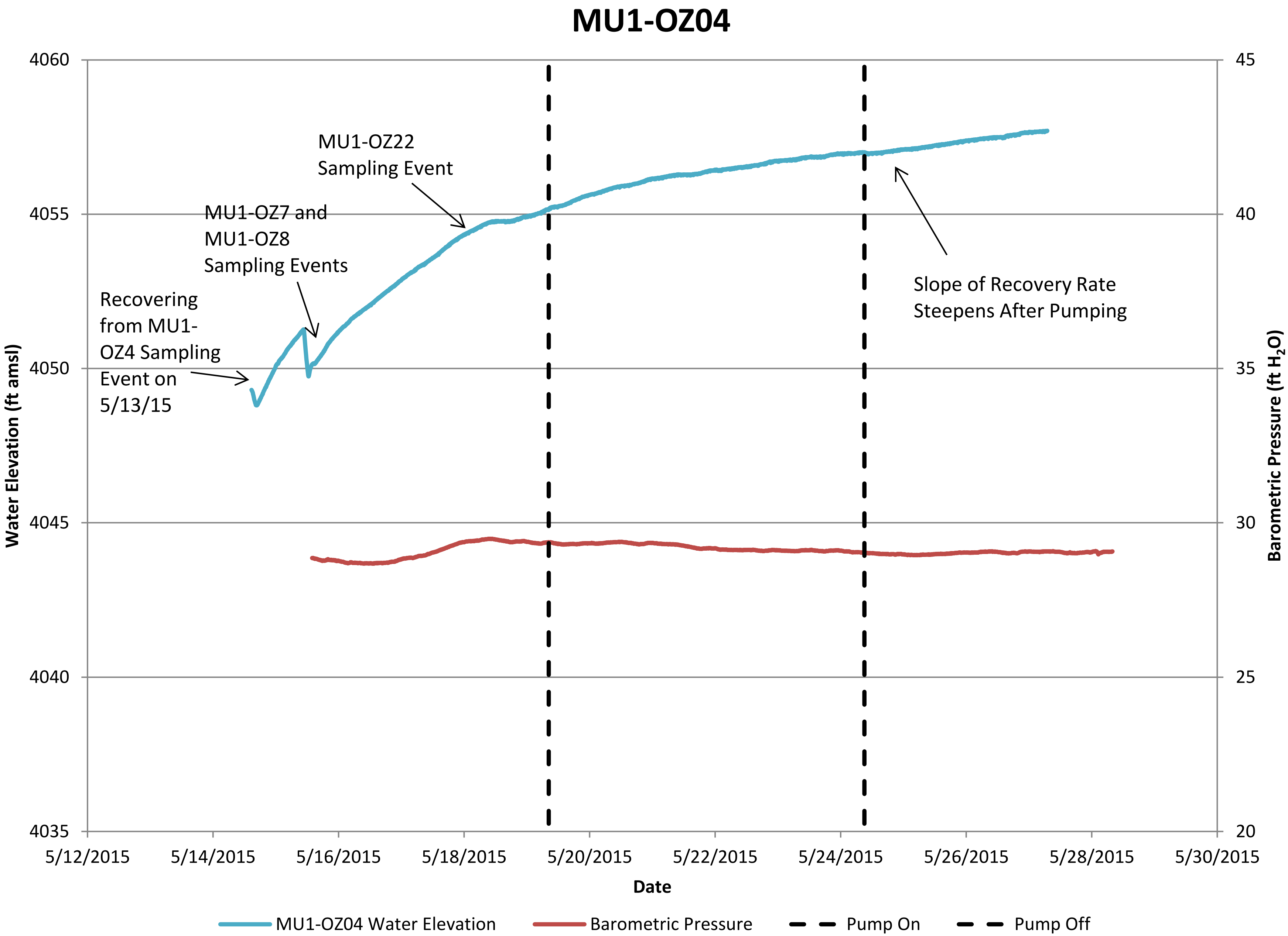
Project/Client Ross MU1 / Strata Energy Inc. Well No. MU1-0223

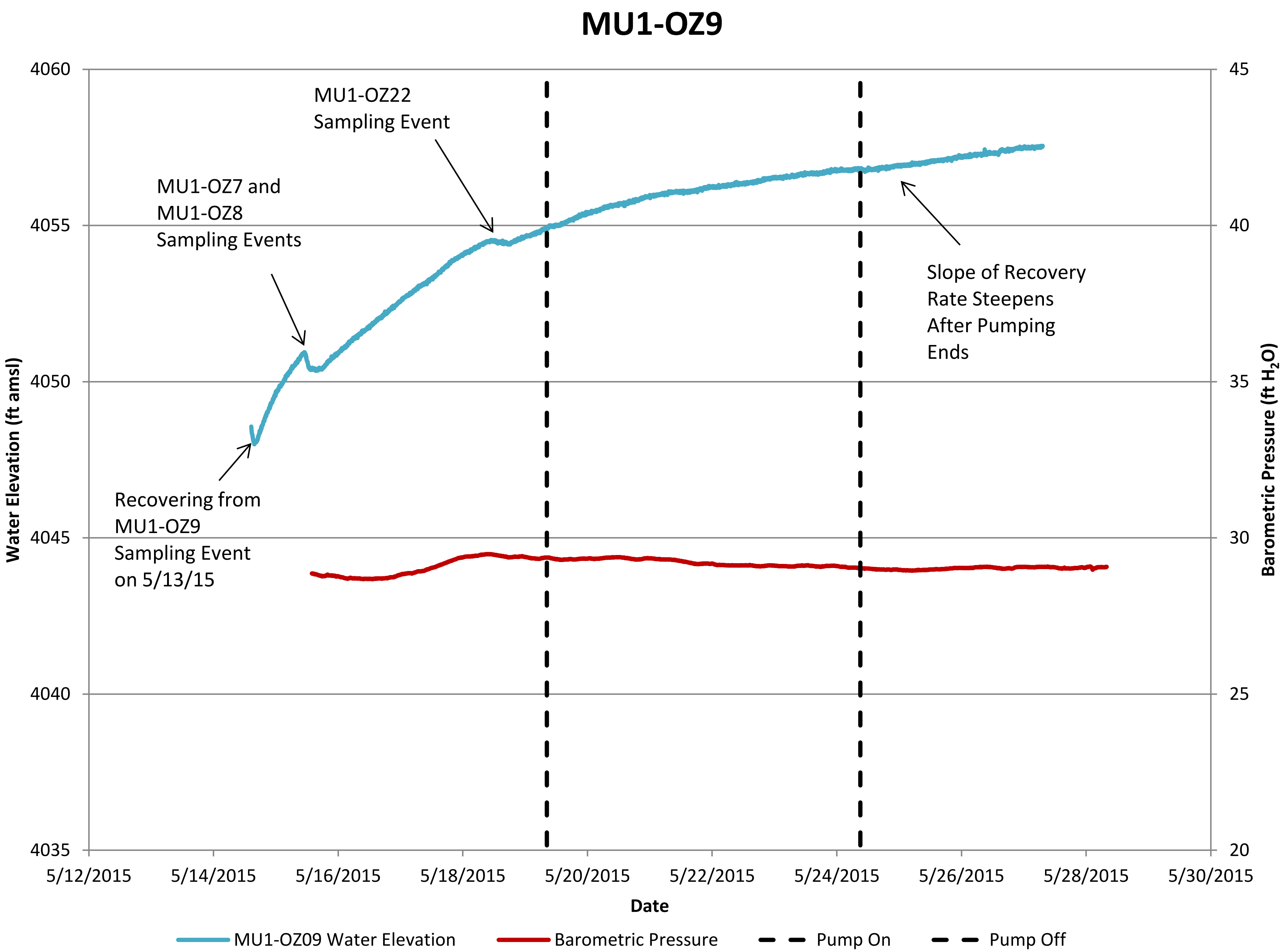
TIME			WATER LEVEL DATA					
Date	Clock Time	(t) Elapsed Time Since Pump ON or OFF (min)	Depth to Water Below M.P. (ft)	(s) Drawdown/ Recovery (ft)	(Q) Discharge (gpm)	Discharge Pipe Pressure (before control valve) (PSI)	Discharge Pipe Pressure (after control valve) (PSI)	COMMENTS
5/20/15	14:48		243.56		5.08	66	0	
	16:30		247.5		5.15	64	0	
5/21/15	7:18am				4.80	64	0	
	7:23am		250.21		4.98	64	0	
	8:17am		251.19		4.96	64	6	
	12:36		250.89		5.0	63	0	
	13:41		250.90		4.96	63	0	
	16:15		252.04		5.01	61	0	
5/22/15	7:33am		253.01		5.02	61	0	
	13:49		254.75		5.06	61	0	
5/23/15	15:30		255.48		5.06	60	0	
5/24/15	9:00		256.0		5.00	60.5	0	Shut Pump off @ 9:04am

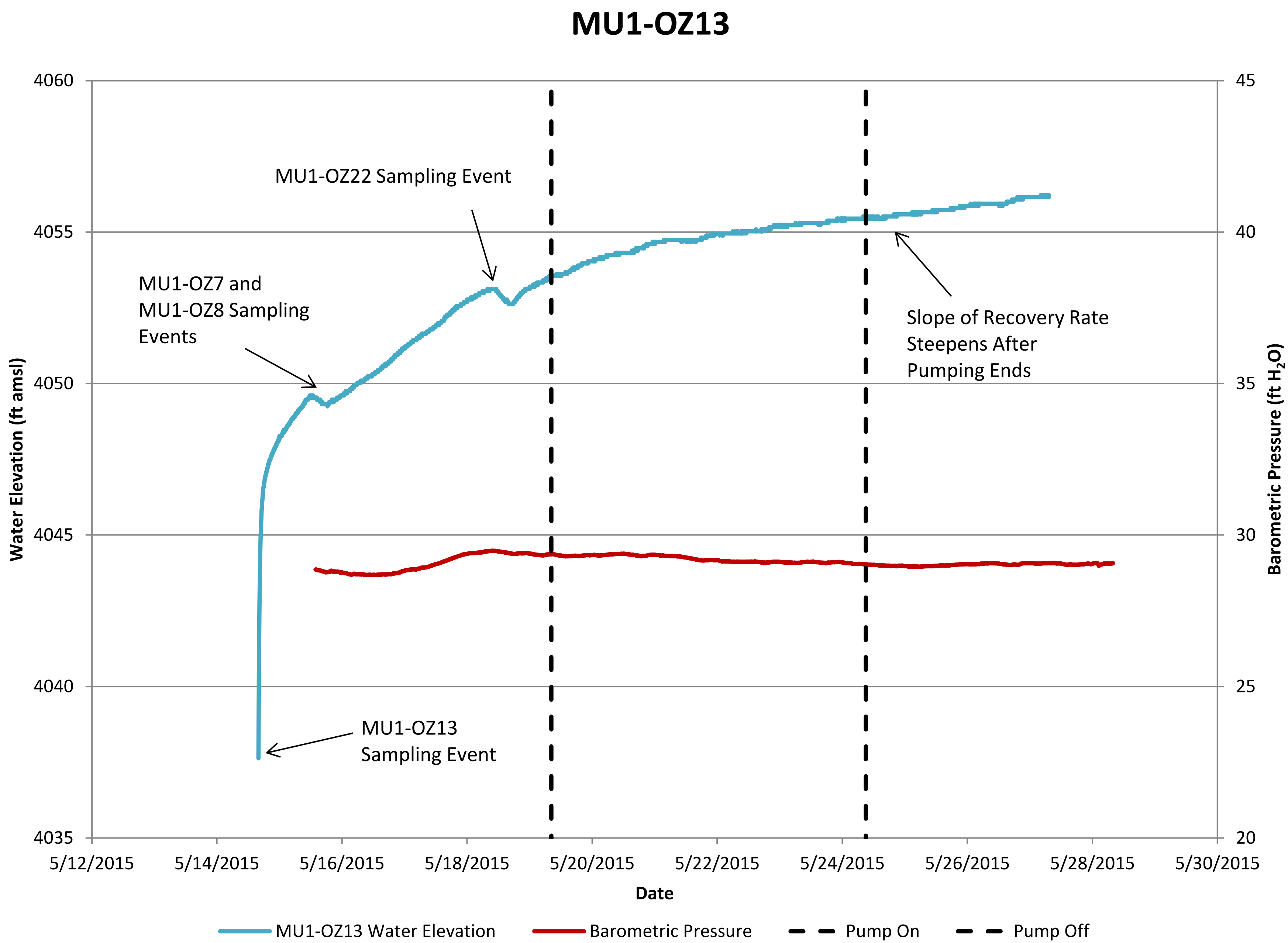
Attachment 5

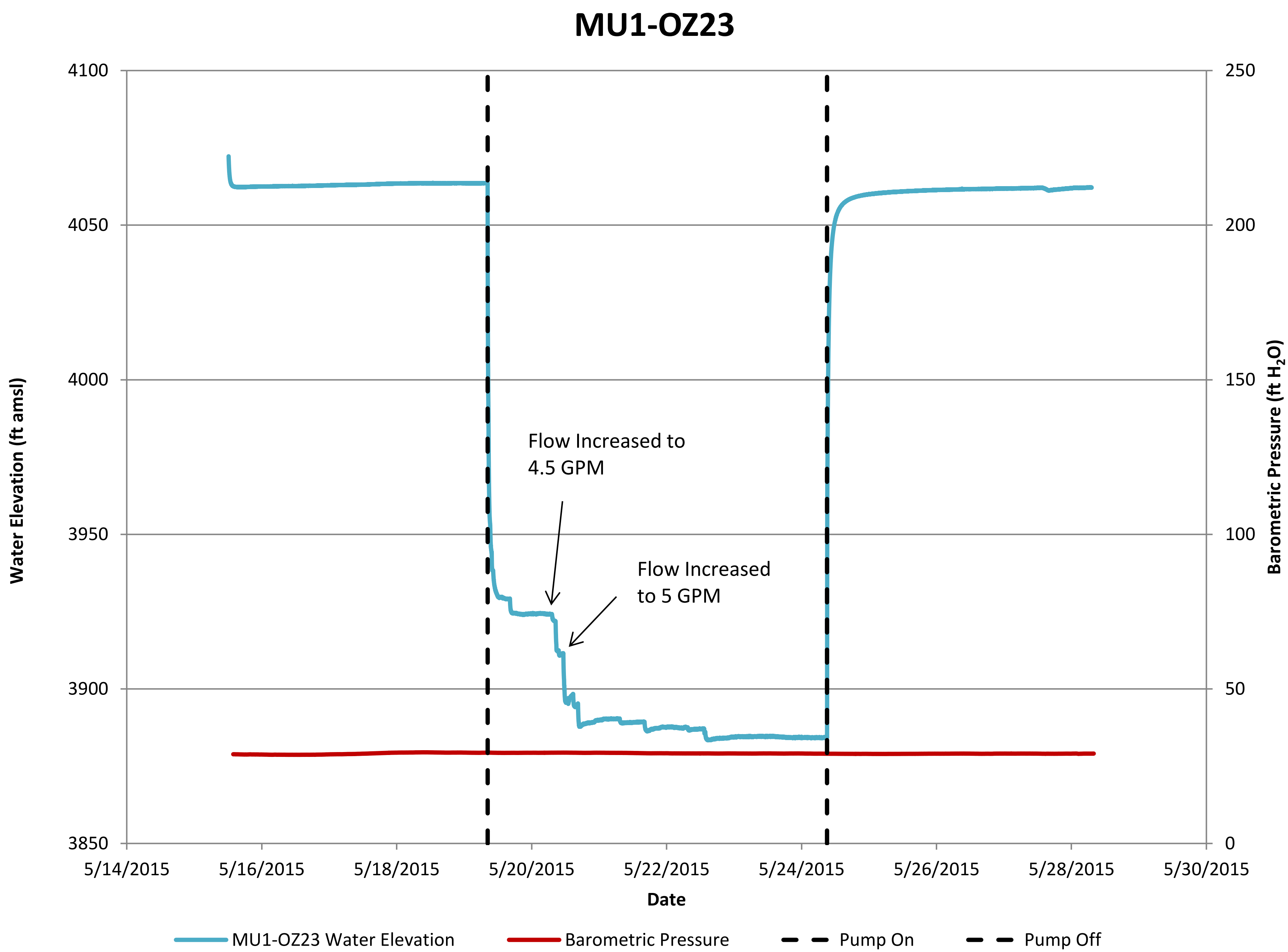
Appendix E

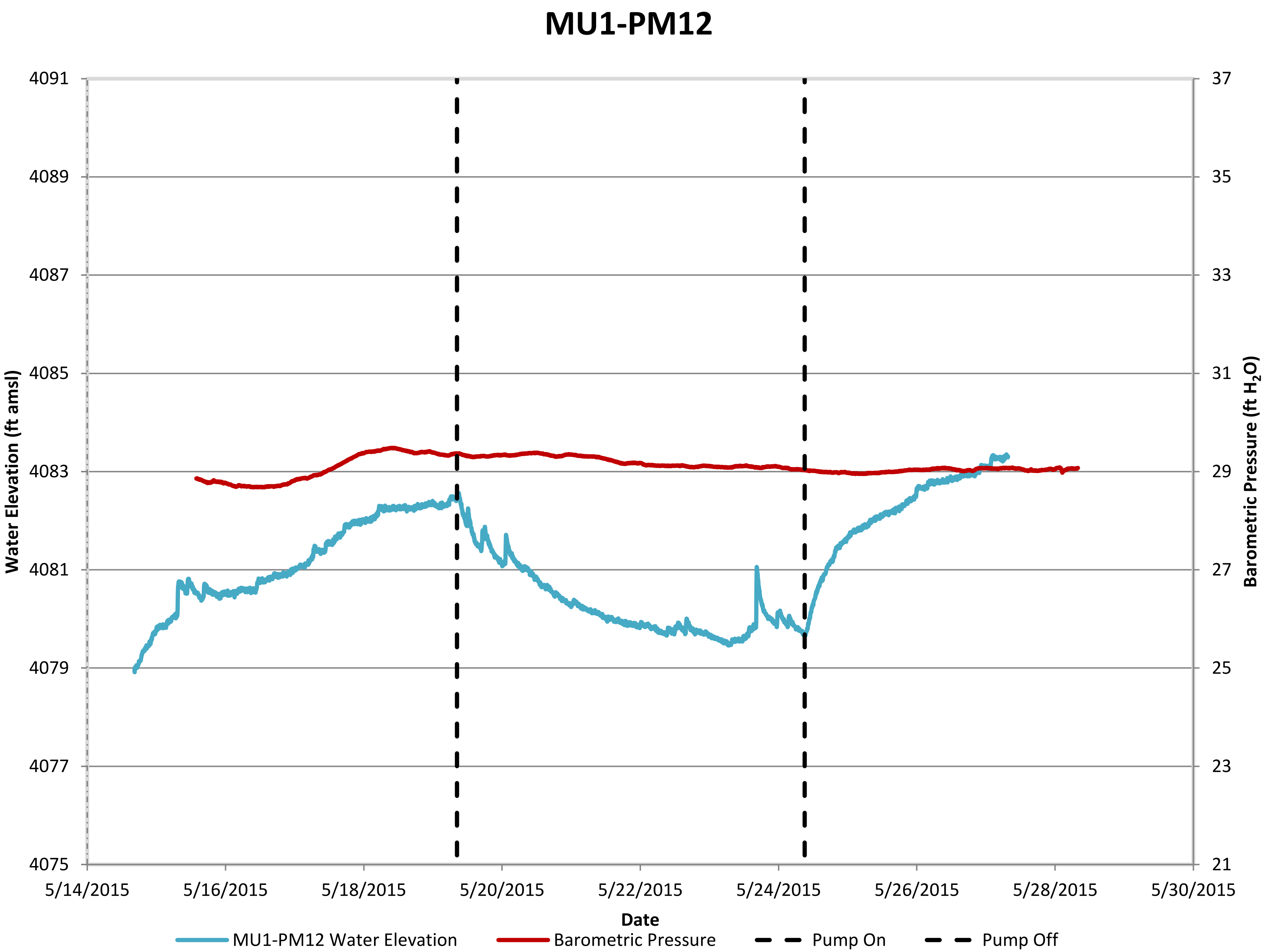
Second Aquifer Test (MU1-OZ23) Hydrographs

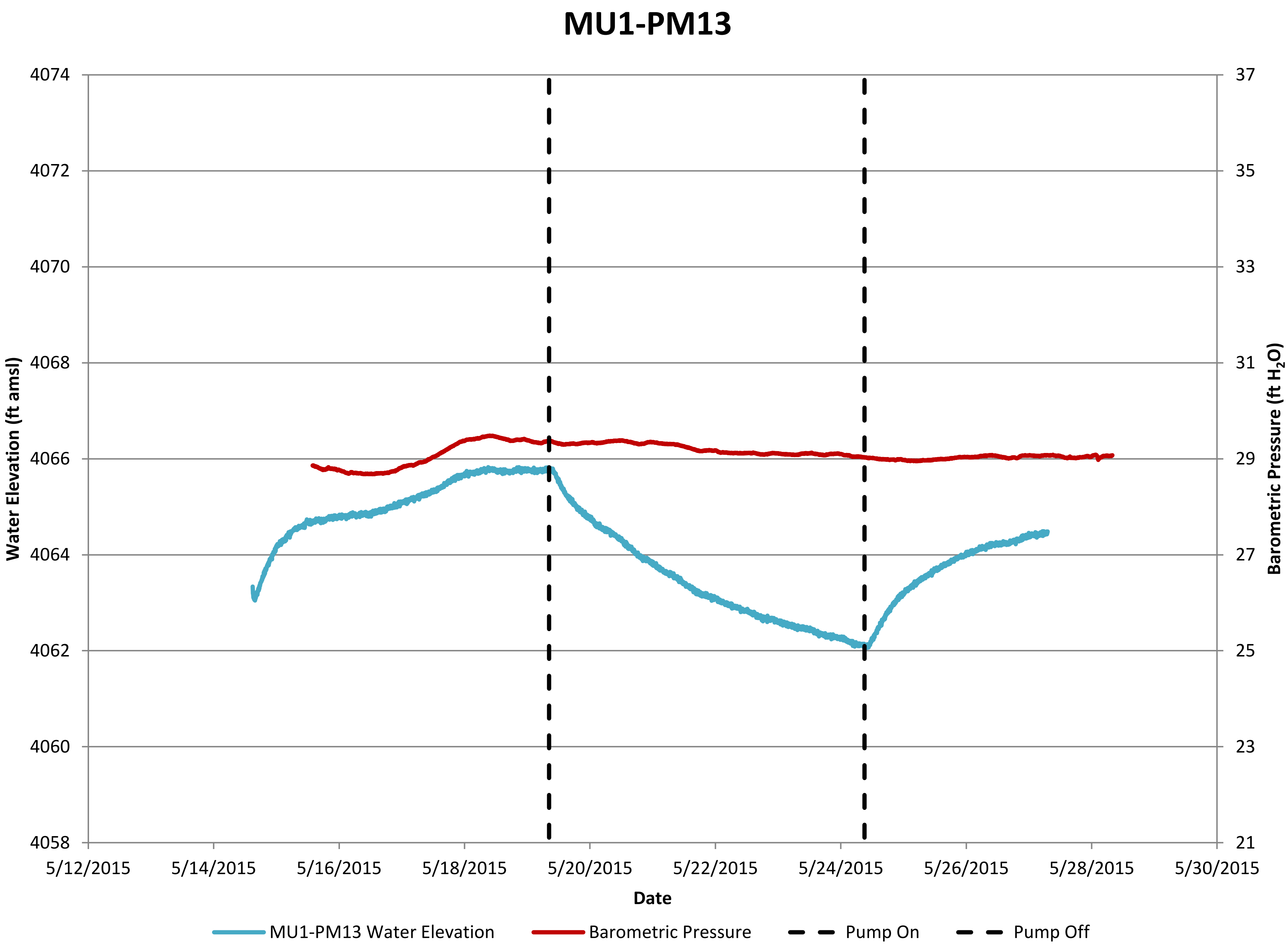

MU1-OZ04
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4060
4055
4050
4045
4040
4035
45
40
35
30
25
20
5/12/2015
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-OZ22 Sampling Event
MU1-OZ7 and MU1-OZ8 Sampling Events
Recovering from MU1-OZ4 Sampling Event on 5/13/15
Slope of Recovery Rate Steepens After Pumping
MU1-OZ04 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-OZ9
4060
4055
4050
4045
4040
4035
45
40
35
30
25
20
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
MU1-OZ22
Sampling Event
MU1-OZ7 and
MU1-OZ8
Sampling Events
Recovering from
MU1-OZ9
Sampling Event
on 5/13/15
Slope of Recovery
Rate Steepens
After Pumping
Ends
5/12/2015
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-OZ09 Water Elevation
Barometric Pressure
Pump On
Pump Off

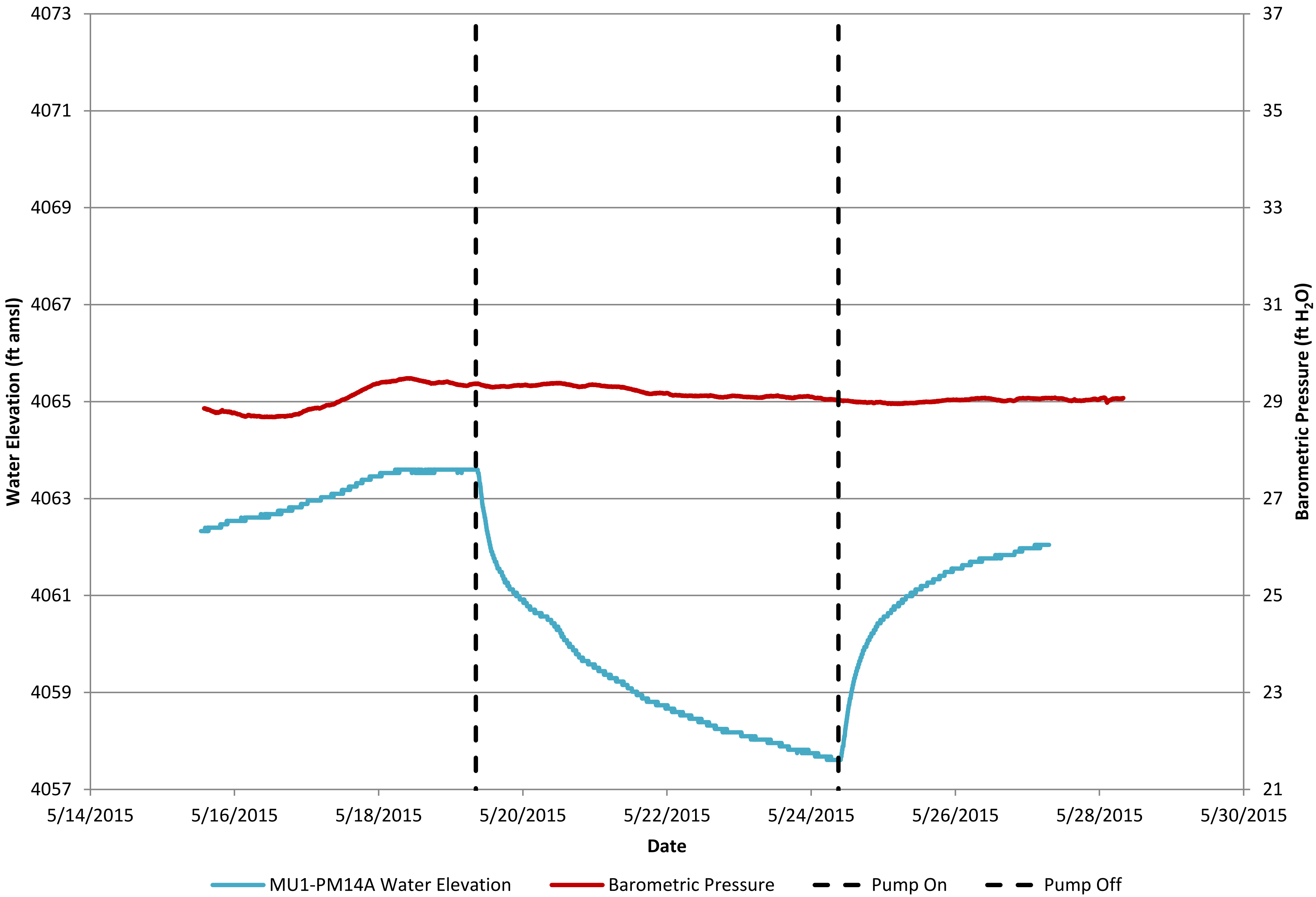

MU1-OZ13
4060
4055
4050
4045
4040
4035
Water Elevation (ft amsl)
45
40
35
30
25
20
Barometric Pressure (ft H_2O)
5/12/2015
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-OZ22 Sampling Event
MU1-OZ7 and MU1-OZ8 Sampling Events
Slope of Recovery Rate Steepens After Pumping Ends
MU1-OZ13 Sampling Event
MU1-OZ13 Water Elevation
Barometric Pressure
Pump On
Pump Off

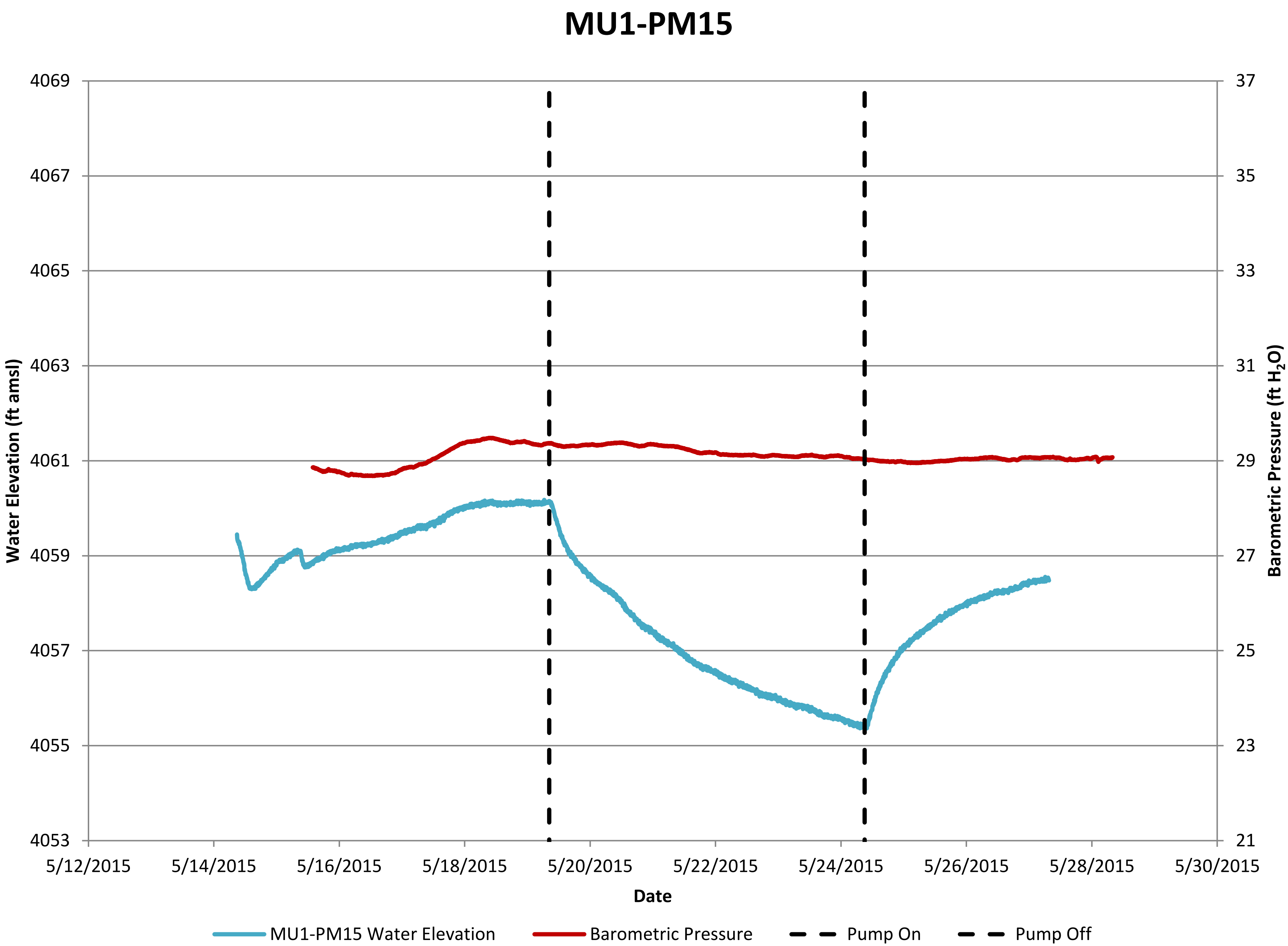

MU1-OZ23
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4100
4050
4000
3950
3900
3850
250
200
150
100
50
0
Flow Increased to
4.5 GPM
Flow Increased
to 5 GPM
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-OZ23 Water Elevation
Barometric Pressure
Pump On
Pump Off

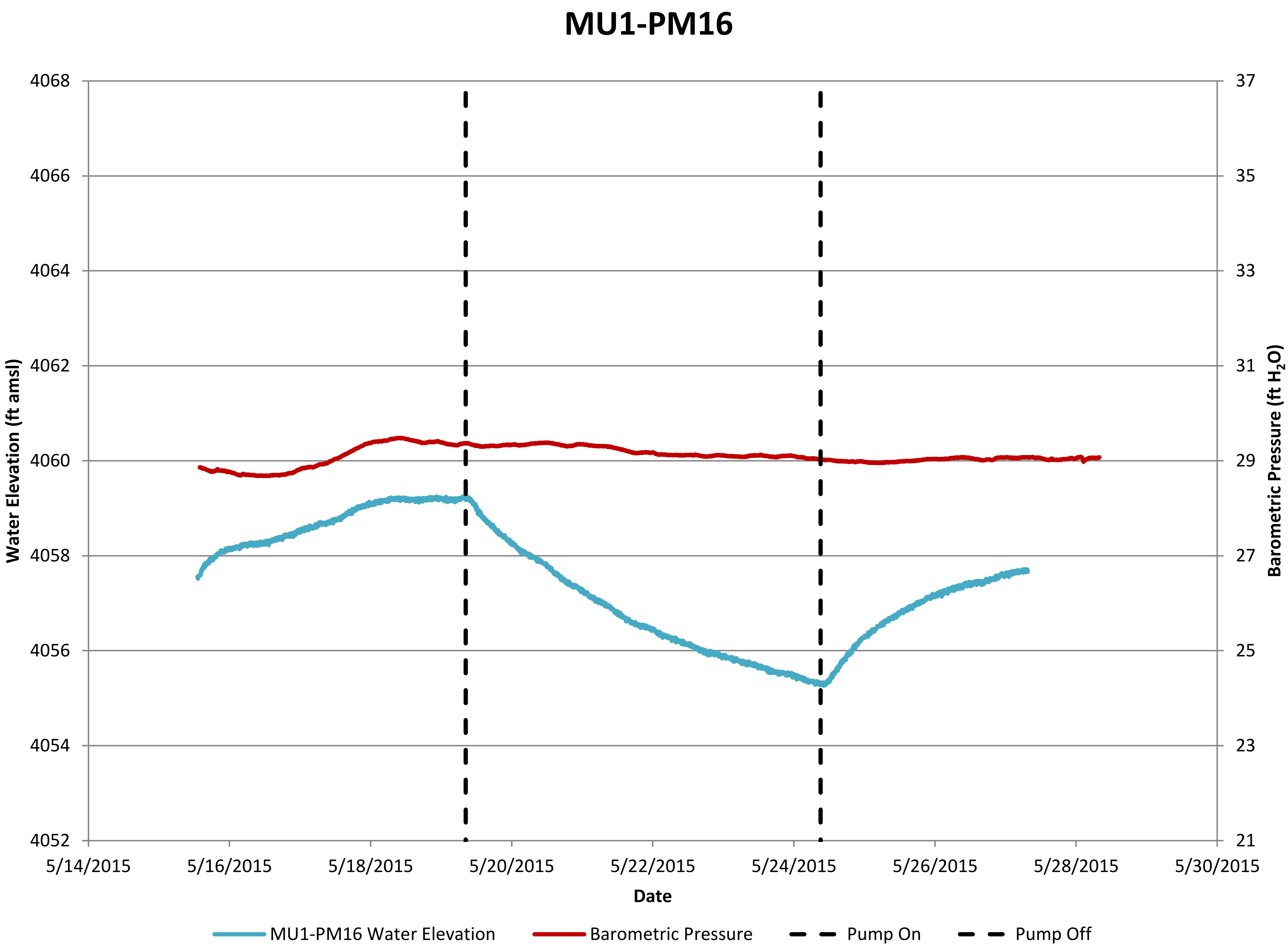

MU1-PM12
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4091
4089
4087
4085
4083
4081
4079
4077
4075
37
35
33
31
29
27
25
23
21
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-PM12 Water Elevation
Barometric Pressure
Pump On
Pump Off

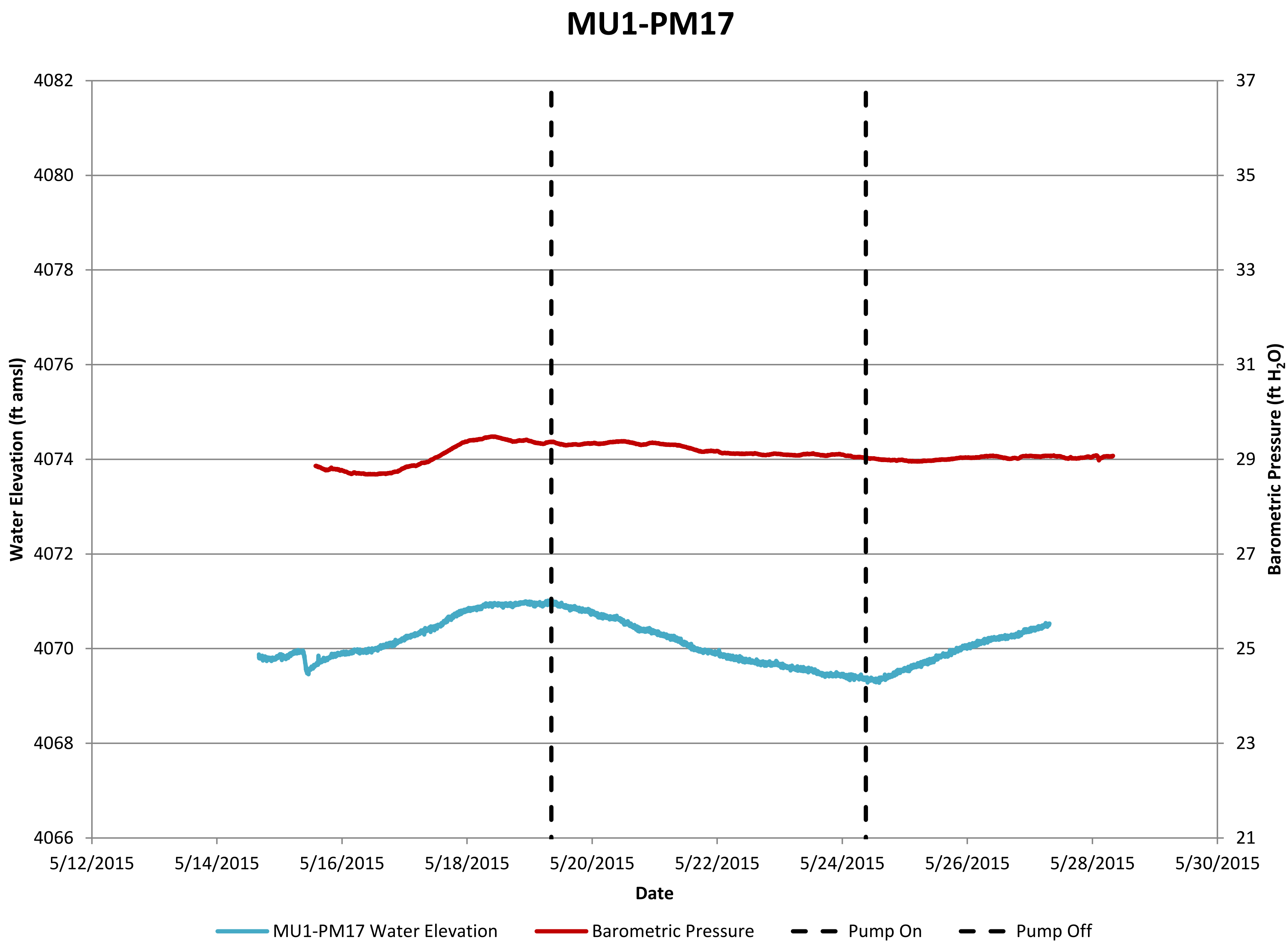

MU1-PM13
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4074
4072
4070
4068
4066
4064
4062
4060
4058
37
35
33
31
29
27
25
23
21
5/12/2015
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-PM13 Water Elevation
Barometric Pressure
Pump On
Pump Off

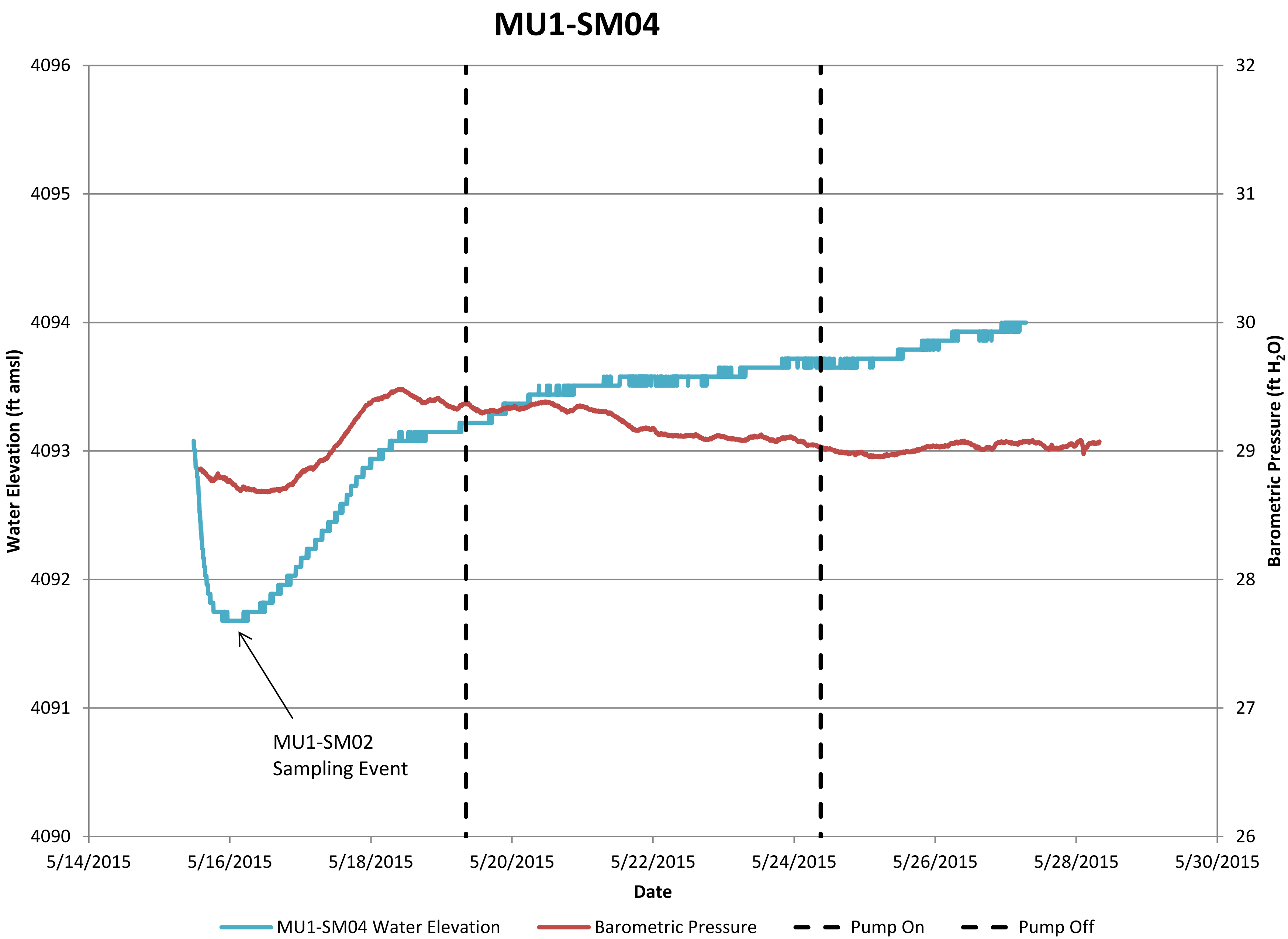
MU1-PM14A

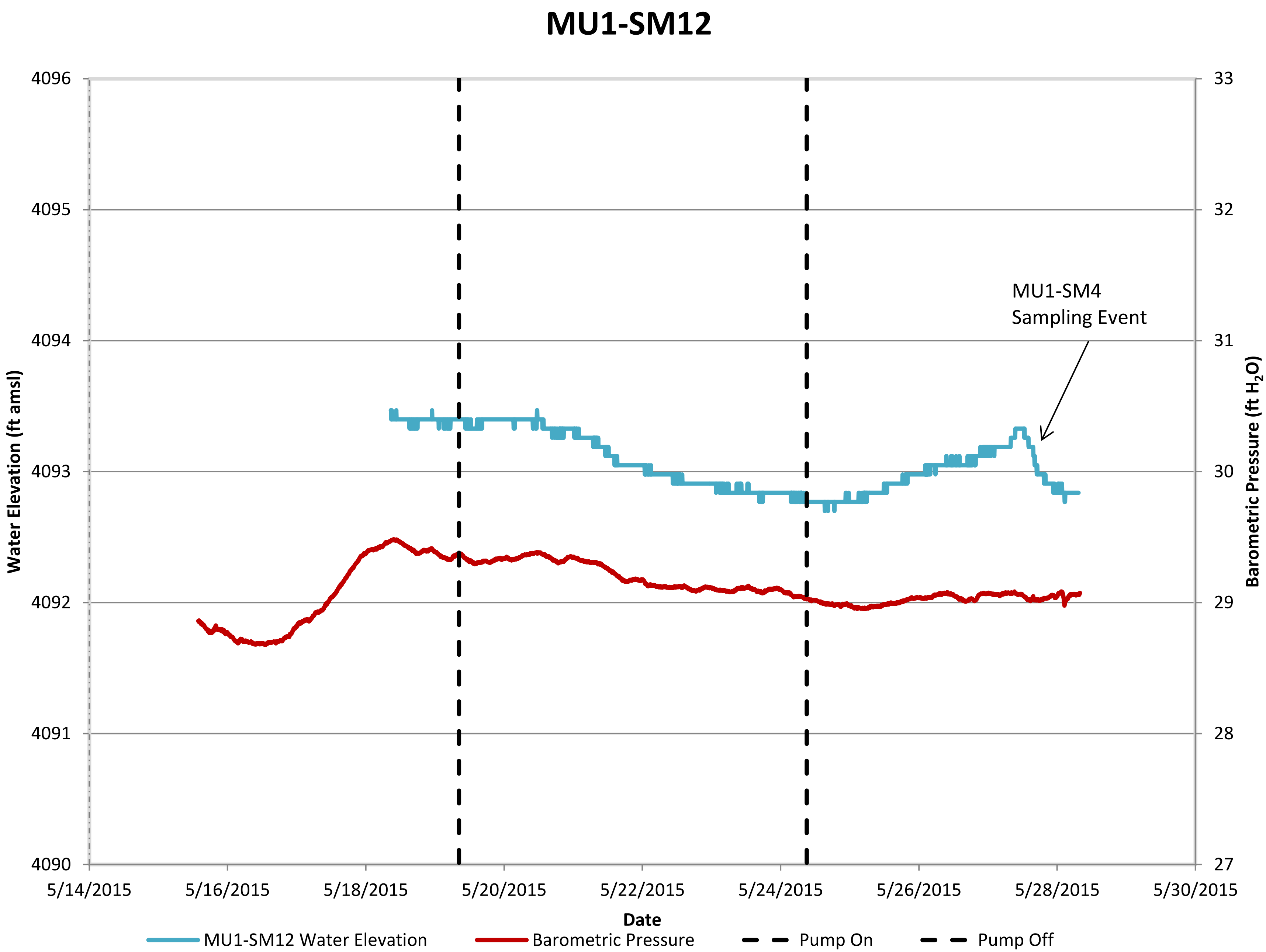

4073
4071
4069
4067
4065
4063
4061
4059
4057
Water Elevation (ft amsl)
37
35
33
31
29
27
25
23
21
Barometric Pressure (ft H_2O)
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-PM14A Water Elevation
Barometric Pressure
Pump On
Pump Off

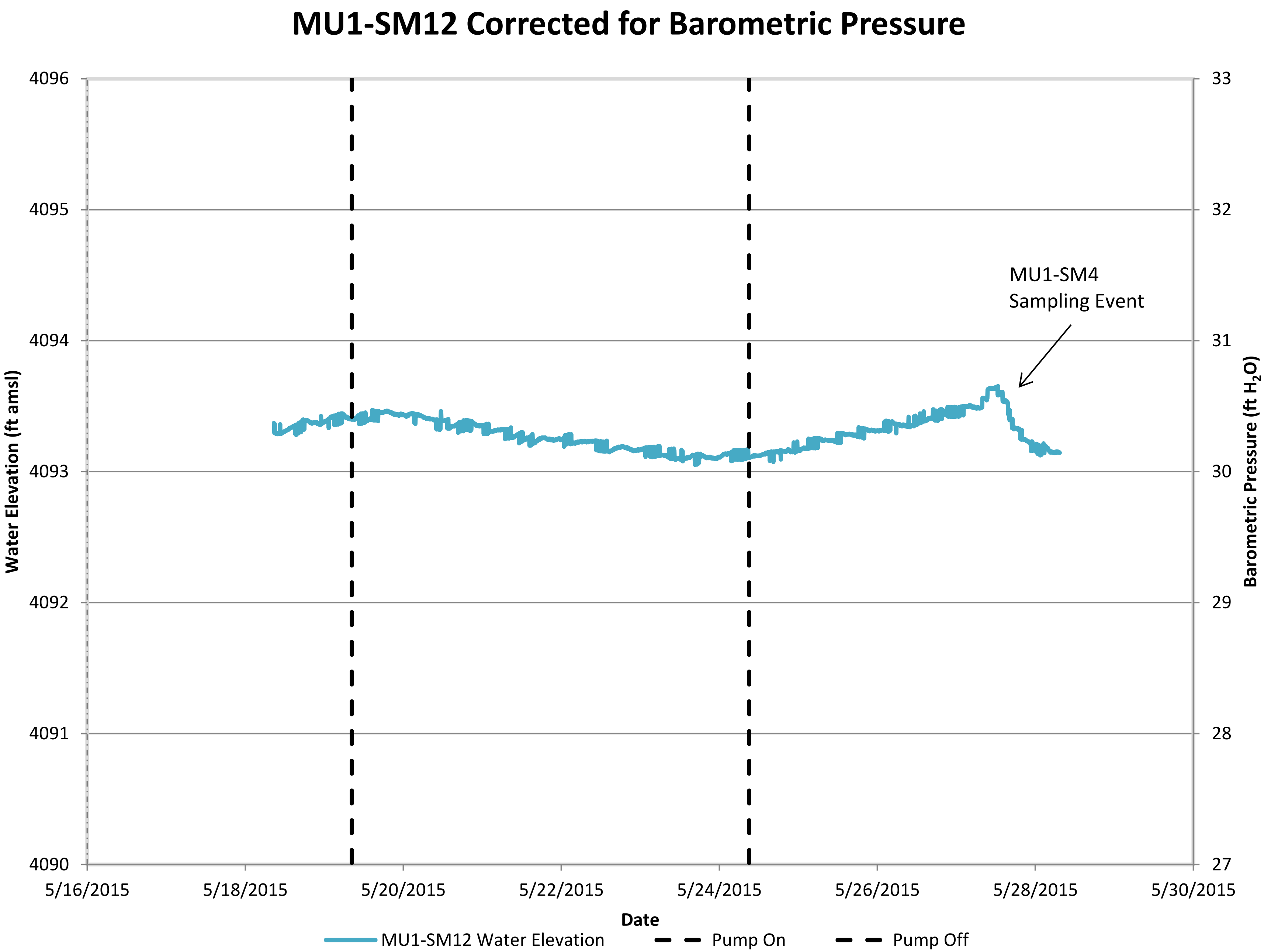

MU1-PM15
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4069
4067
4065
4063
4061
4059
4057
4055
4053
37
35
33
31
29
27
25
23
21
5/12/2015
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-PM15 Water Elevation
Barometric Pressure
Pump On
Pump Off

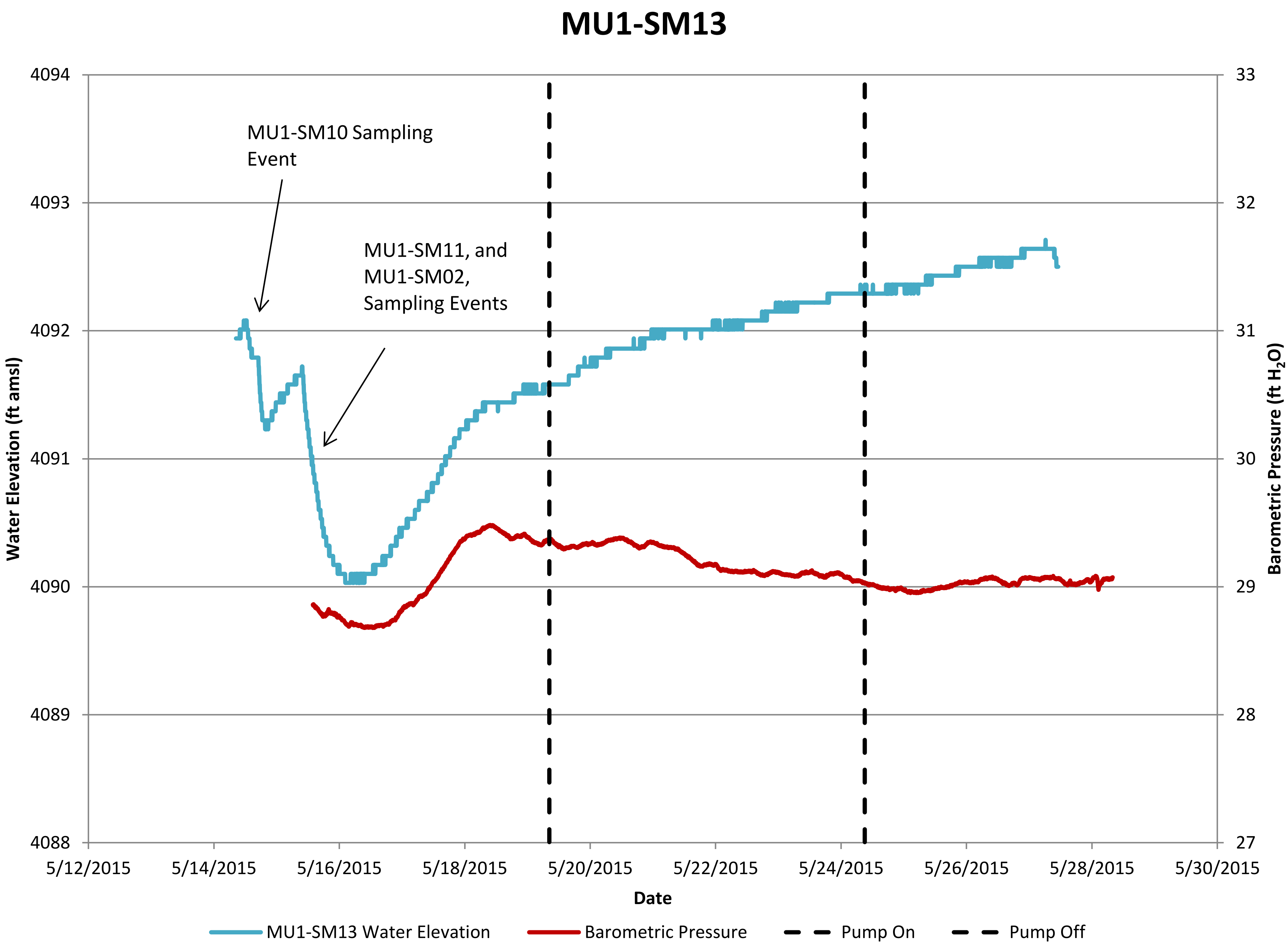

MU1-PM16
4068
4066
4064
4062
4060
4058
4056
4054
4052
Water Elevation (ft amsl)
37
35
33
31
29
27
25
23
21
Barometric Pressure (ft H_2O)
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-PM16 Water Elevation
Barometric Pressure
Pump On
Pump Off

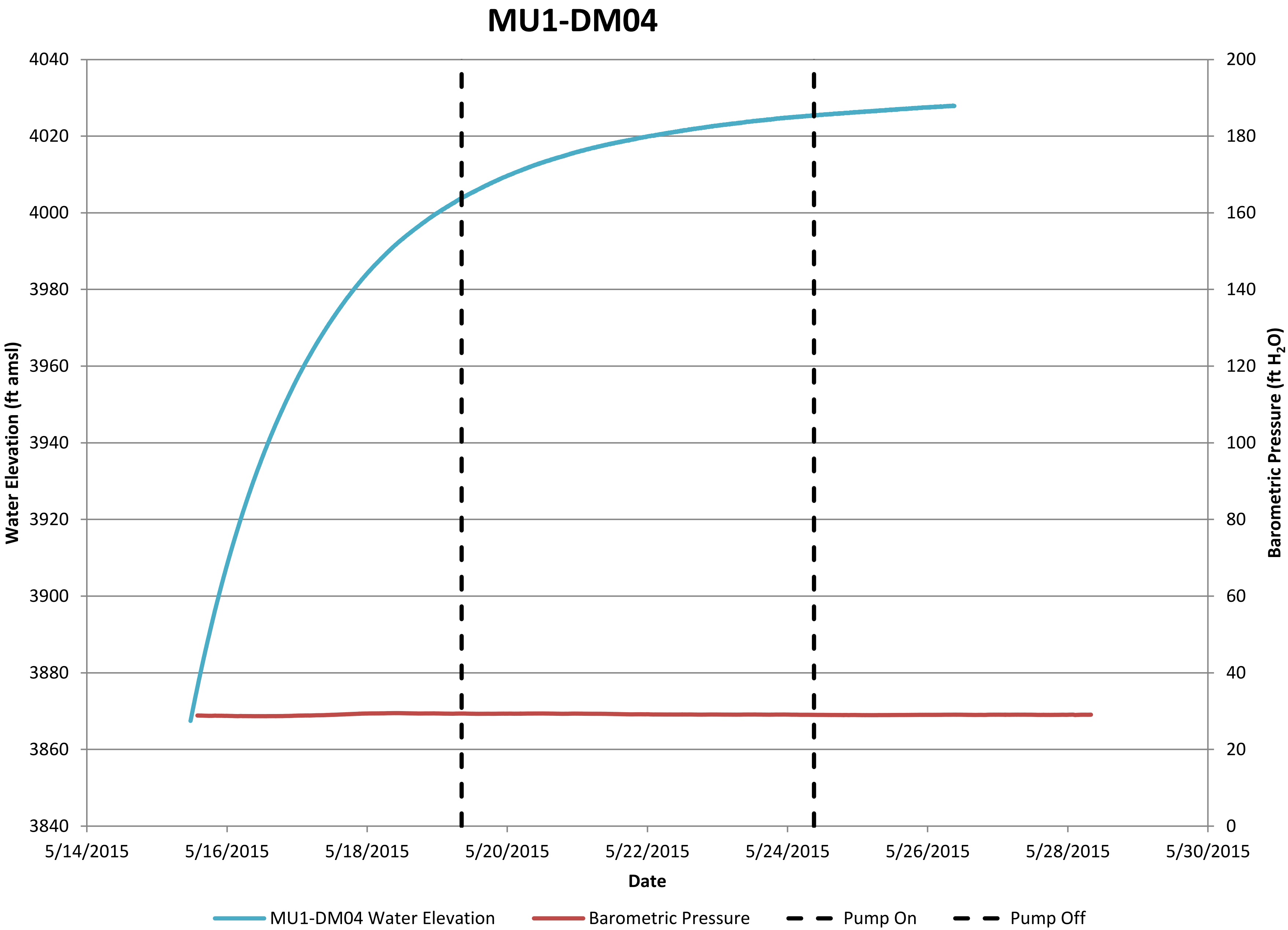

MU1-PM17
Water Elevation (ft amsl)
4082
4080
4078
4076
4074
4072
4070
4068
4066
Barometric Pressure (ft H_2O)
37
35
33
31
29
27
25
23
21
5/12/2015
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-PM17 Water Elevation
Barometric Pressure
Pump On
Pump Off

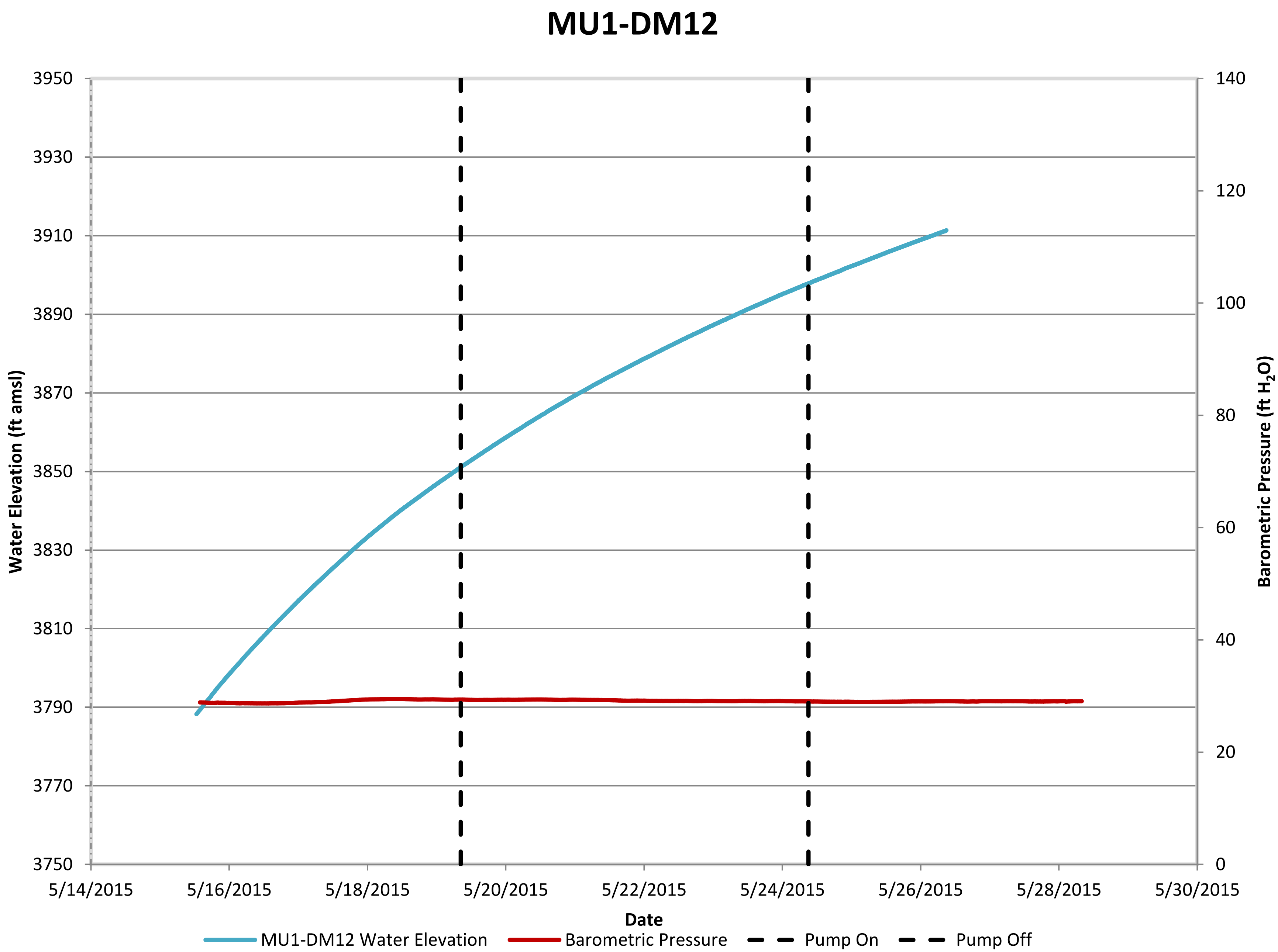

MU1-SM04
Water Elevation (ft amsl)
4096
4095
4094
4093
4092
4091
4090
Barometric Pressure (ft H_2O)
32
31
30
29
28
27
26
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-SM02
Sampling Event
MU1-SM04 Water Elevation
Barometric Pressure
Pump On
Pump Off

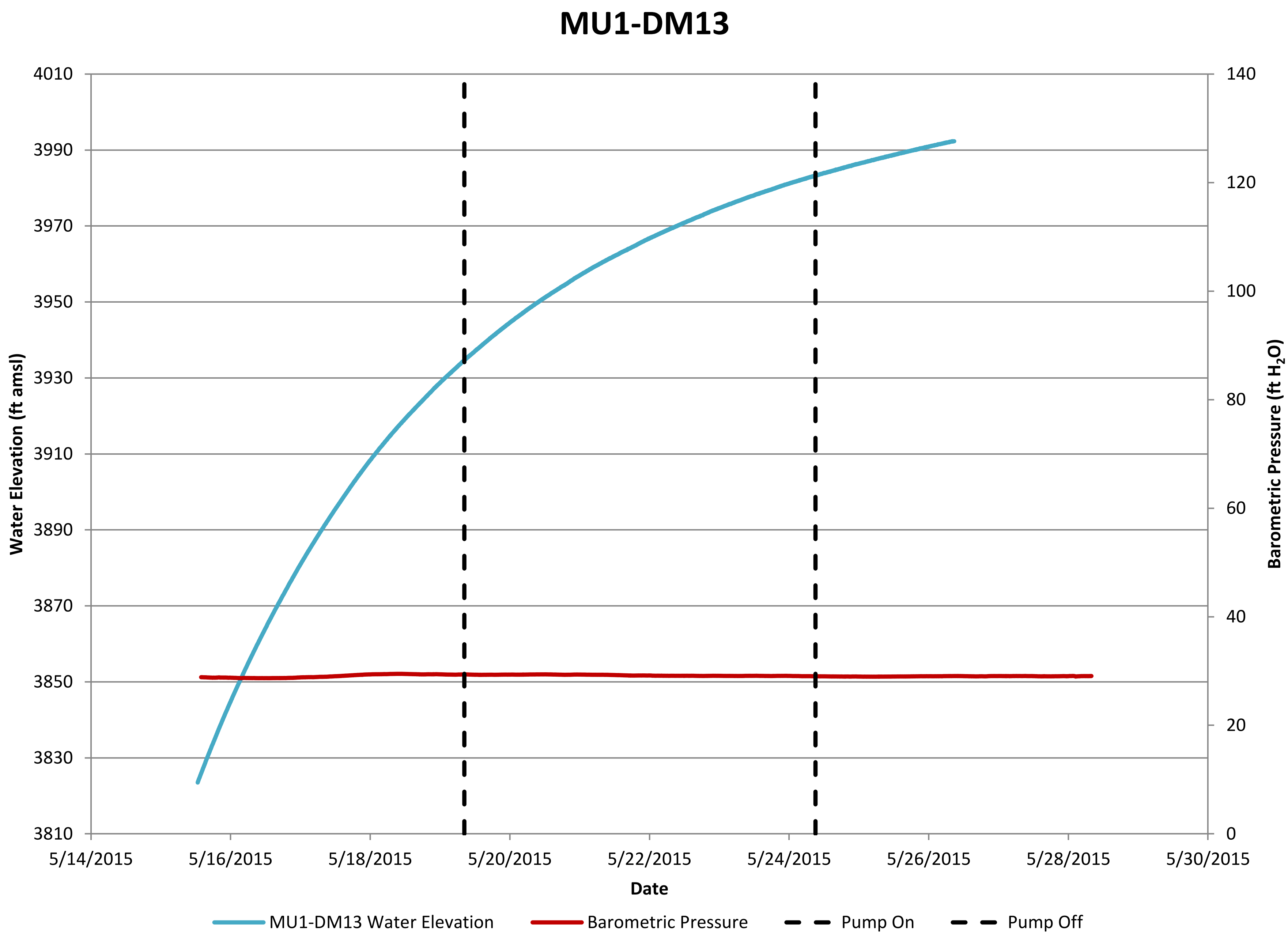

MU1-SM12
4096
4095
4094
4093
4092
4091
4090
Water Elevation (ft amsl)
33
32
31
30
29
28
27
Barometric Pressure (ft H2O)
MU1-SM4
Sampling Event
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-SM12 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-SM12 Corrected for Barometric Pressure
Water Elevation (ft amsl)
4096
4095
4094
4093
4092
4091
4090
Barometric Pressure (ft H_2O)
33
32
31
30
29
28
27
MU1-SM4
Sampling Event
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-SM12 Water Elevation
Pump On
Pump Off


MU1-SM13
MU1-SM10 Sampling Event
MU1-SM11, and MU1-SM02, Sampling Events
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
4094
4093
4092
4091
4090
4089
4088
33
32
31
30
29
28
27
5/12/2015
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-SM13 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-DM04
4040
4020
4000
3980
3960
3940
3920
3900
3880
3860
3840
Water Elevation (ft amsl)
200
180
160
140
120
100
80
60
40
20
0
Barometric Pressure (ft H2O)
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-DM04 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-DM12
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
3950
3930
3910
3890
3870
3850
3830
3810
3790
3770
3750
140
120
100
80
60
40
20
0
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-DM12 Water Elevation
Barometric Pressure
Pump On
Pump Off

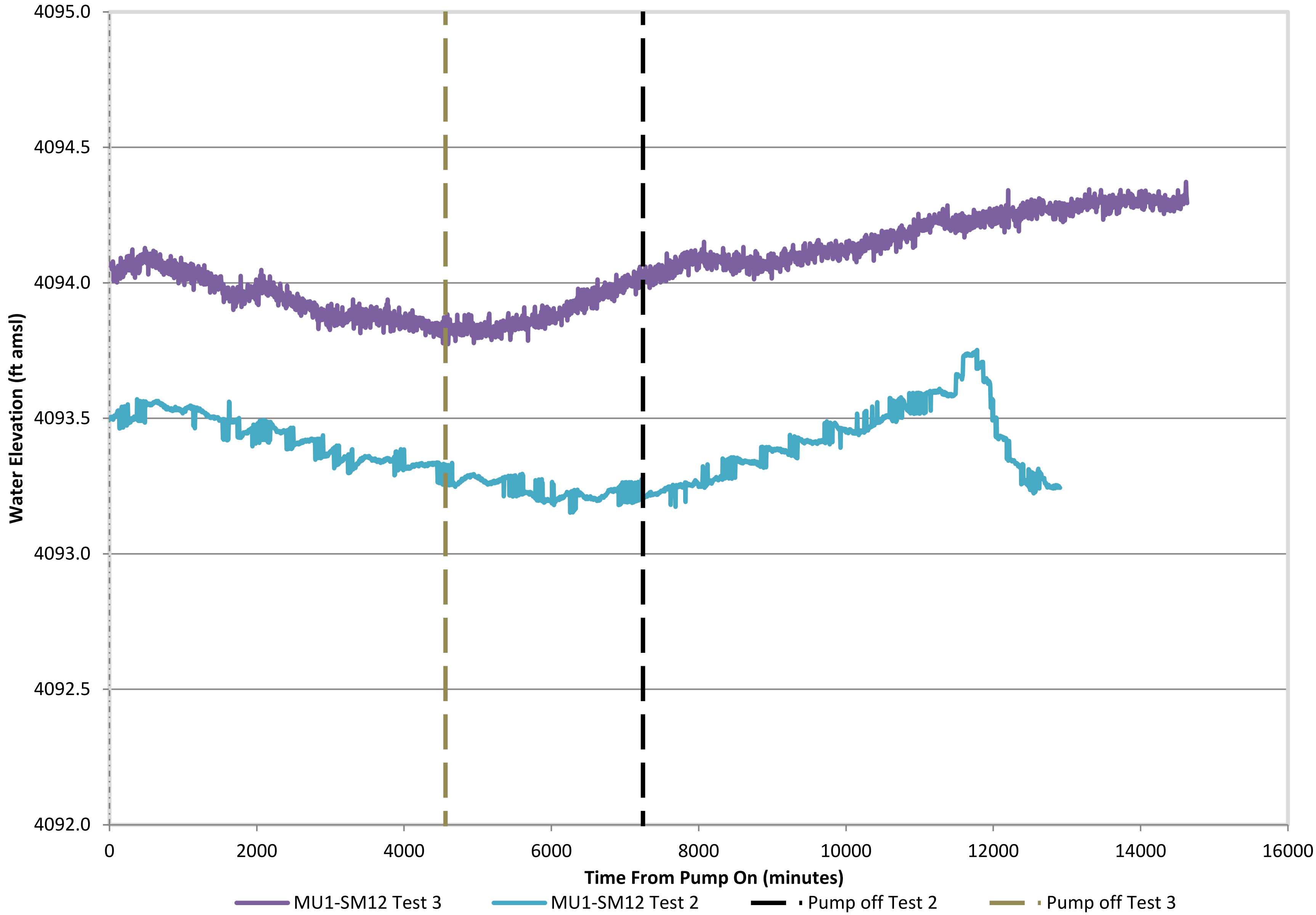

MU1-DM13
Water Elevation (ft amsl)
4010
3990
3970
3950
3930
3910
3890
3870
3850
3830
3810
Barometric Pressure (ft H_2O)
140
120
100
80
60
40
20
0
5/14/2015
5/16/2015
5/18/2015
5/20/2015
5/22/2015
5/24/2015
5/26/2015
5/28/2015
5/30/2015
Date
MU1-DM13 Water Elevation
Barometric Pressure
Pump On
Pump Off

Attachment 5

Appendix F

MU1-SM12 Comparison Hydrograph Between the Second and Third Aquifer Tests

MU1-SM12 Test 2 & 3 Hydrographs Adjusted for Barometric Pressure

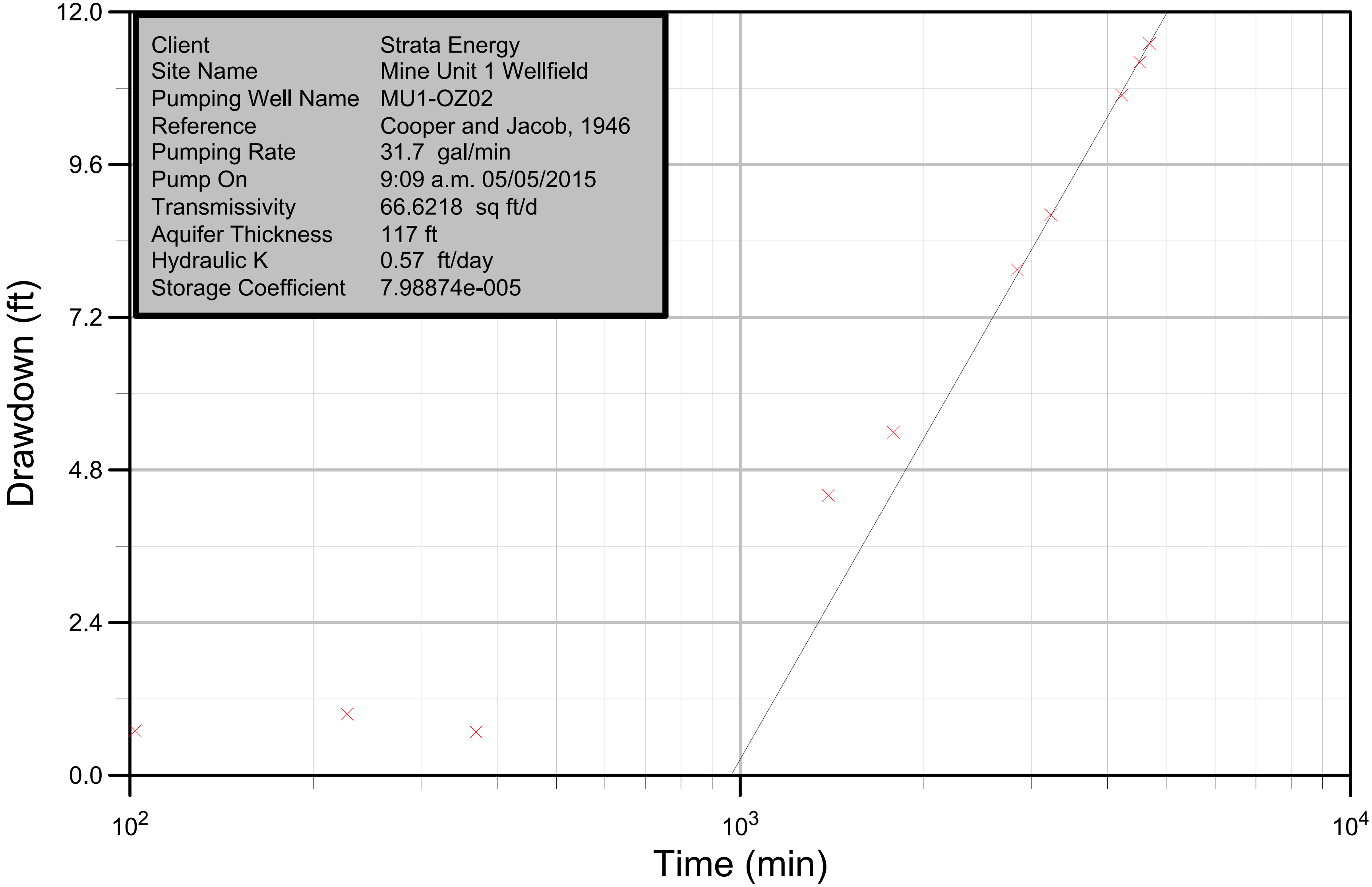


Attachment 5

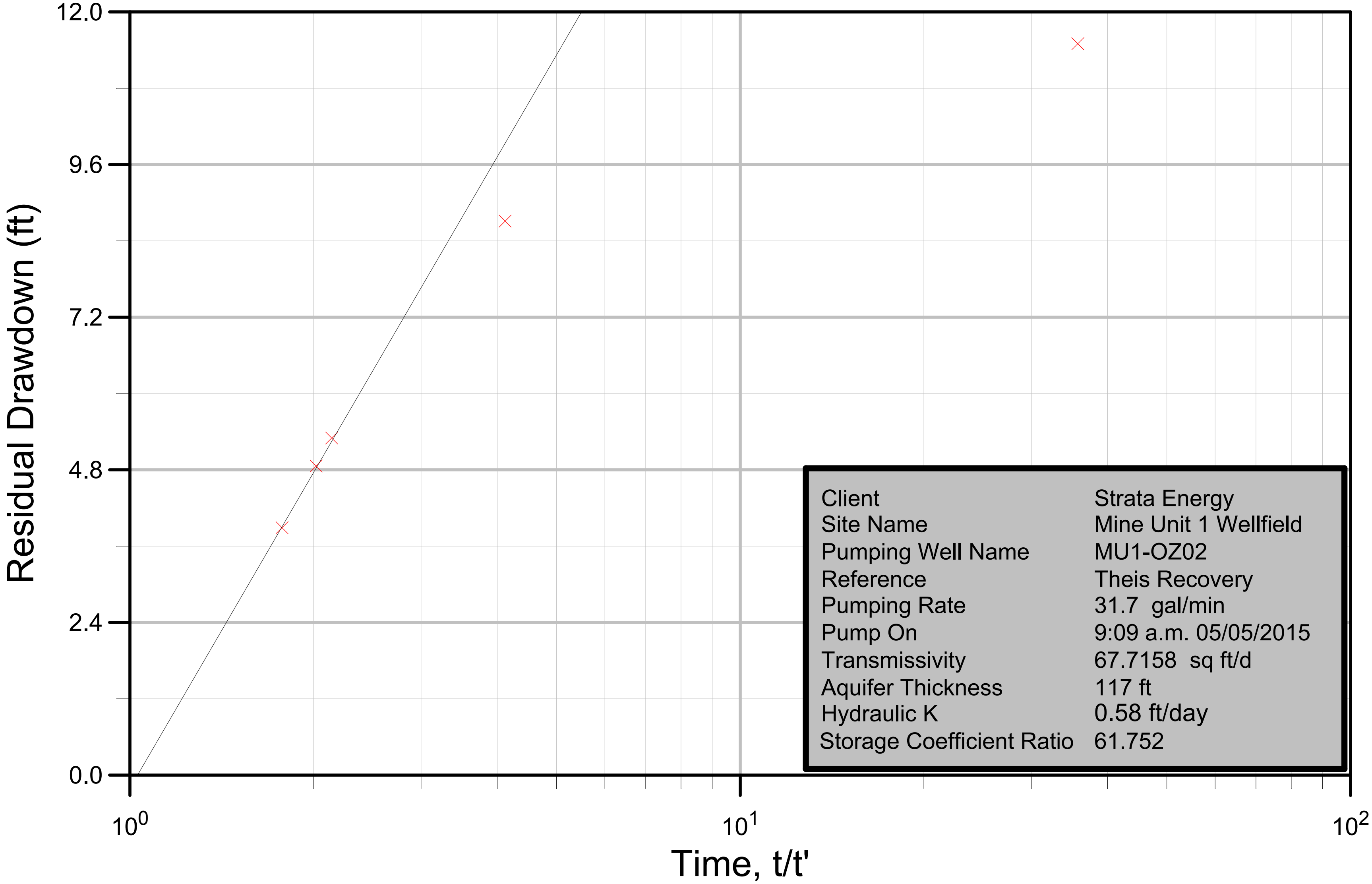
Appendix G

First Aquifer Test (MU1-OZ02) Time-Drawdown Analyses

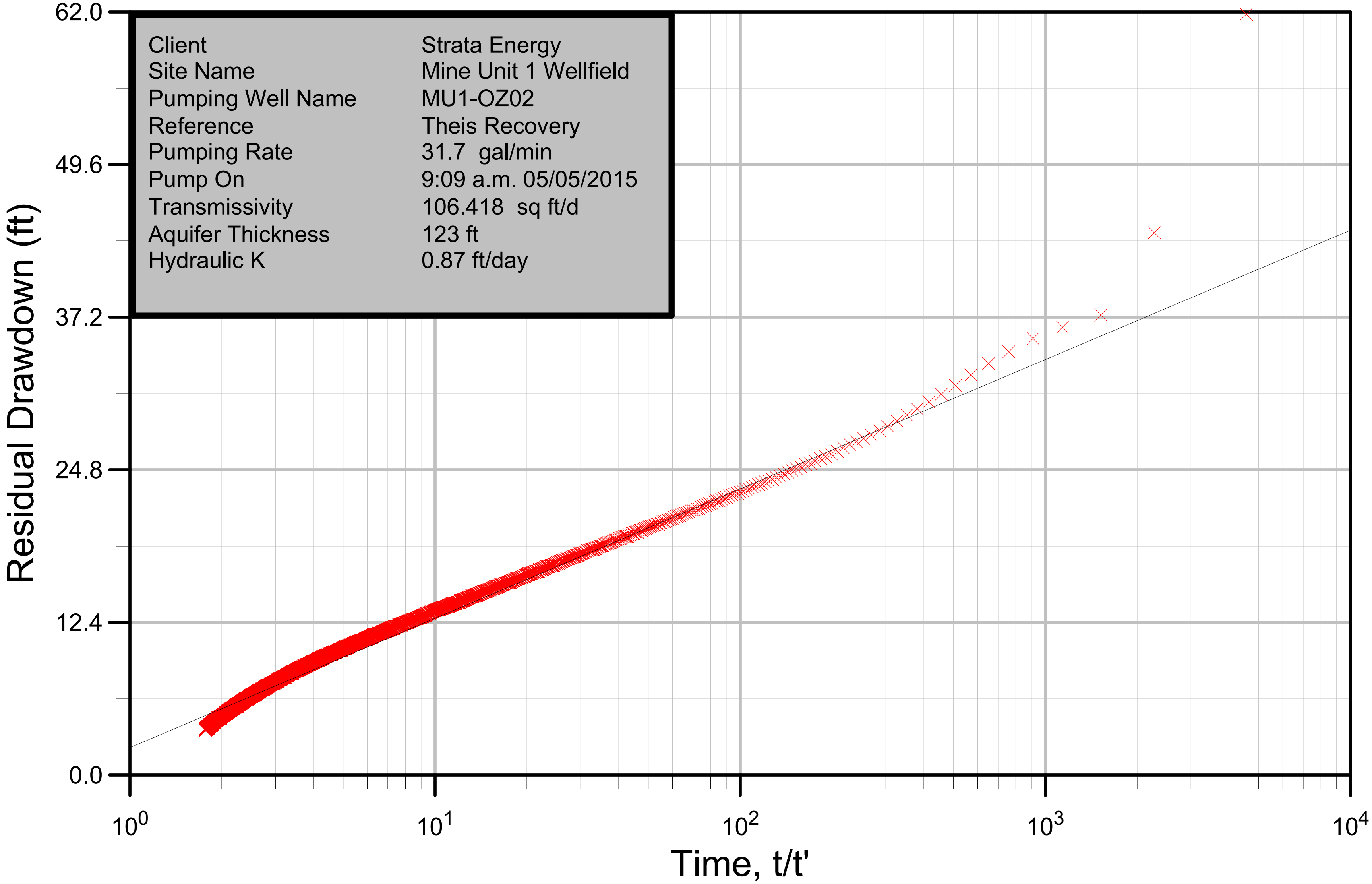
MU1-OZ01


Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 66.6218 sq ft/d
Aquifer Thickness 117 ft
Hydraulic K 0.57 ft/day
Storage Coefficient 7.98874e-005
Drawdown (ft)
12.0
9.6
7.2
4.8
2.4
0.0
10^2
10^3
10^4
Time (min)

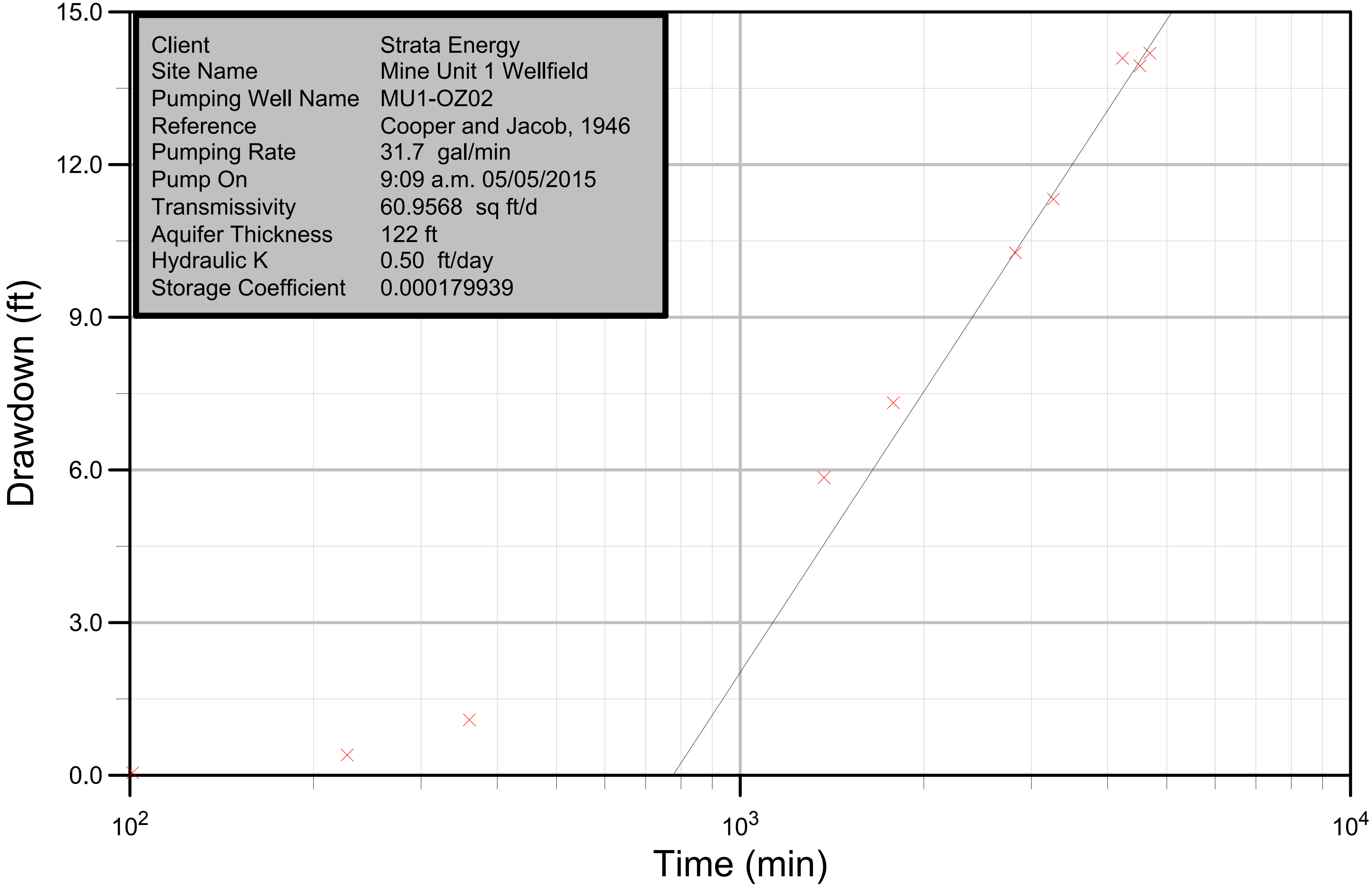
MU1-OZ01


Residual Drawdown (ft)
12.0
9.6
7.2
4.8
2.4
0.0
10^0
10^1
10^2
Time, t/t'
Client | Strata Energy
Site Name | Mine Unit 1 Wellfield
Pumping Well Name | MU1-OZ02
Reference | Theis Recovery
Pumping Rate | 31.7 gal/min
Pump On | 9:09 a.m. 05/05/2015
Transmissivity | 67.7158 sq ft/d
Aquifer Thickness | 117 ft
Hydraulic K | 0.58 ft/day
Storage Coefficient Ratio | 61.752

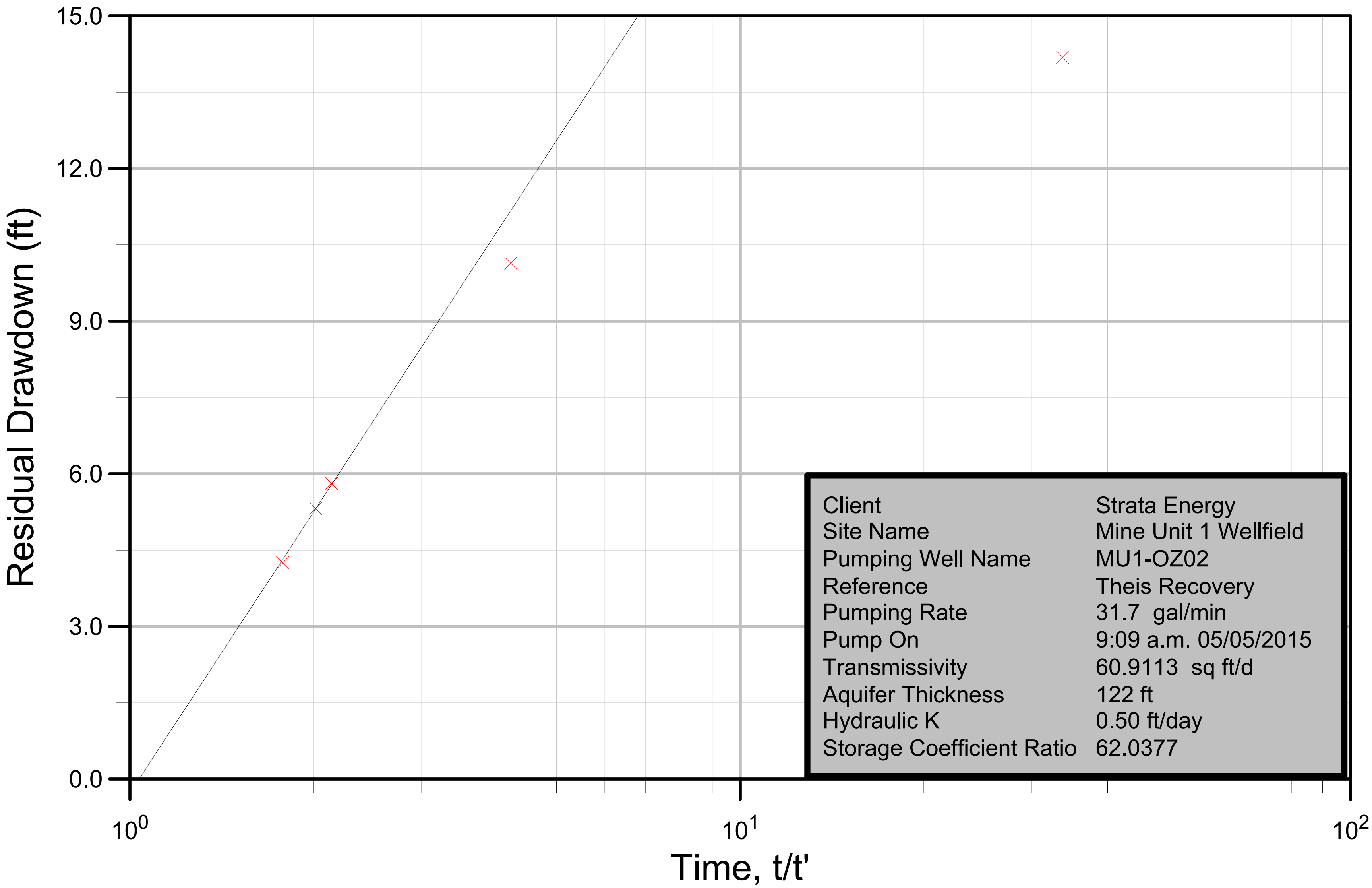
MU1-OZ02


Client | Strata Energy
Site Name | Mine Unit 1 Wellfield
Pumping Well Name | MU1-OZ02
Reference | Theis Recovery
Pumping Rate | 31.7 gal/min
Pump On | 9:09 a.m. 05/05/2015
Transmissivity | 106.418 sq ft/d
Aquifer Thickness | 123 ft
Hydraulic K | 0.87 ft/day
Residual Drawdown (ft)
62.0
49.6
37.2
24.8
12.4
0.0
Time, t/t'
10^0
10^1
10^2
10^3
10^4

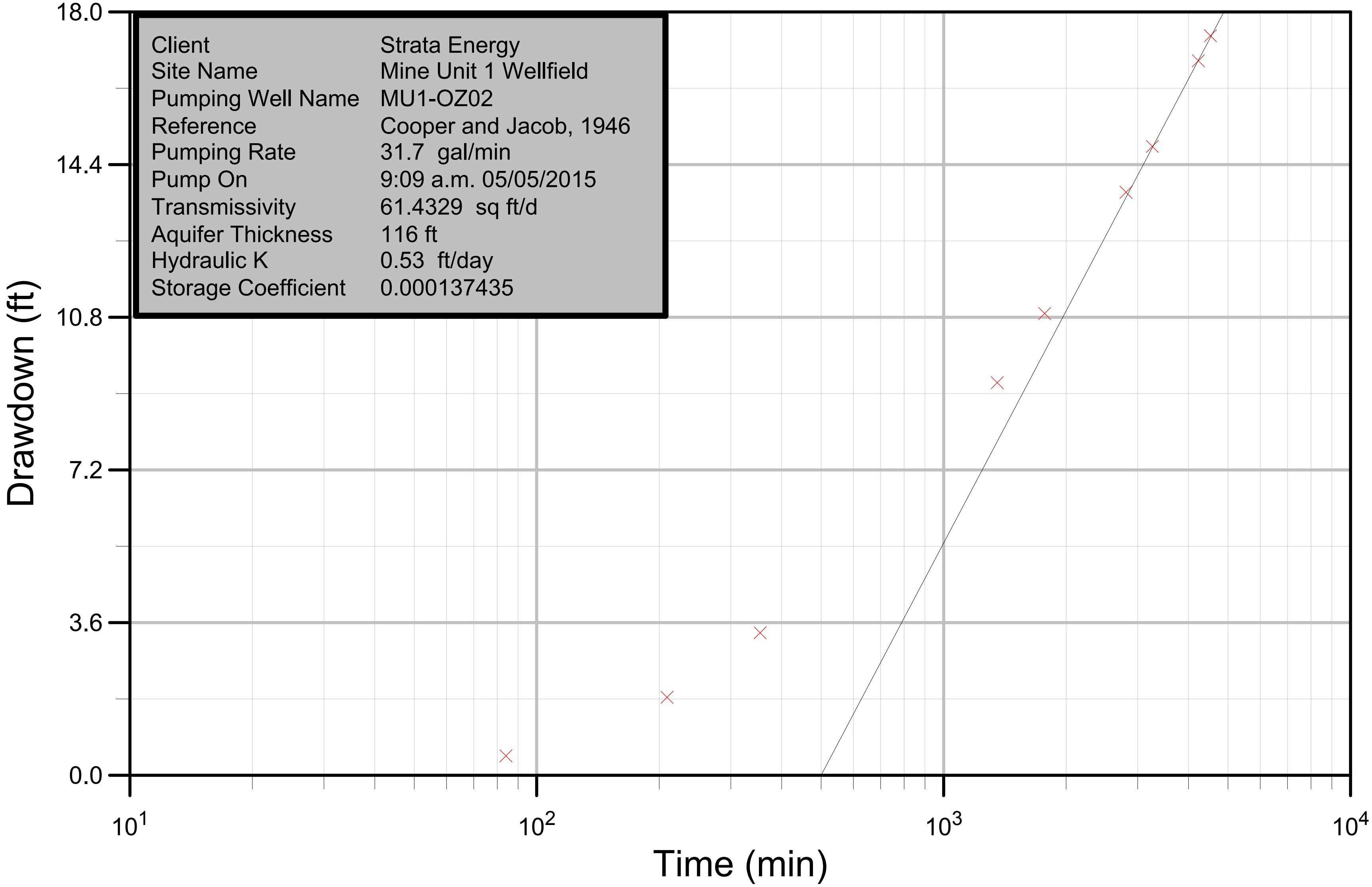
MU1-OZ03

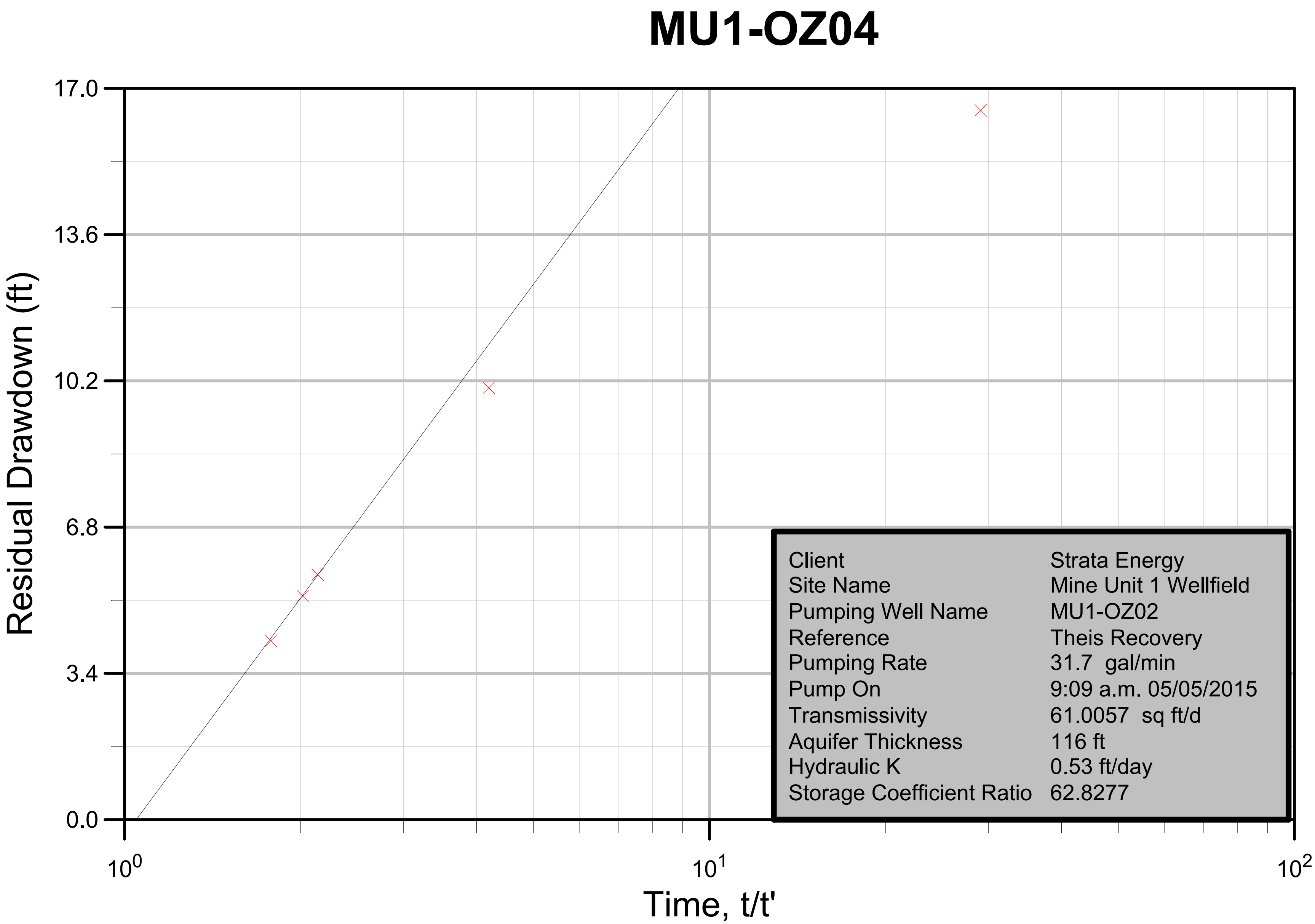

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 60.9568 sq ft/d
Aquifer Thickness 122 ft
Hydraulic K 0.50 ft/day
Storage Coefficient 0.000179939
Drawdown (ft)
15.0
12.0
9.0
6.0
3.0
0.0
10^2
10^3
10^4
Time (min)

MU1-OZ03

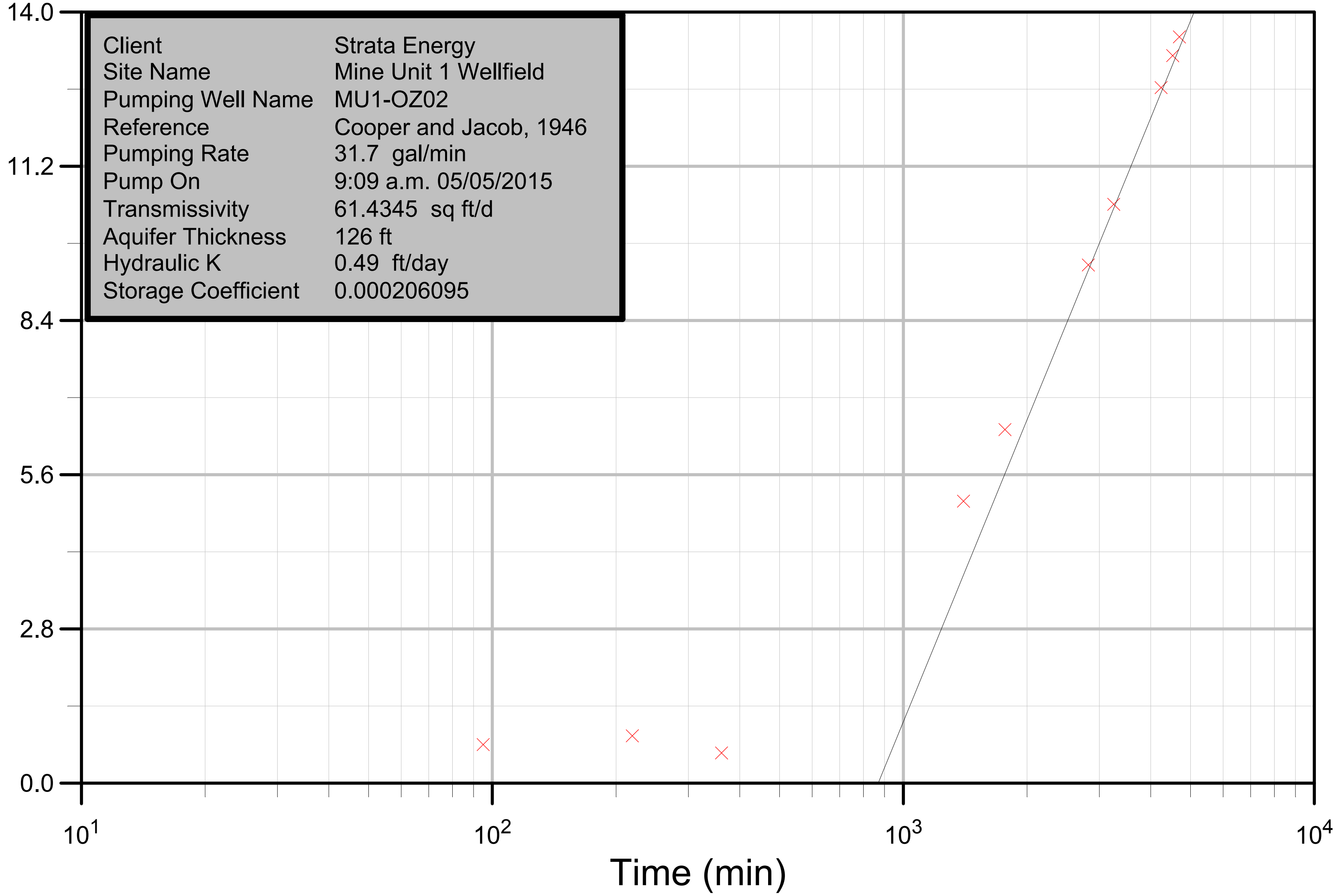

15.0
12.0
9.0
6.0
3.0
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 60.9113 sq ft/d
Aquifer Thickness 122 ft
Hydraulic K 0.50 ft/day
Storage Coefficient Ratio 62.0377

MU1-OZ04

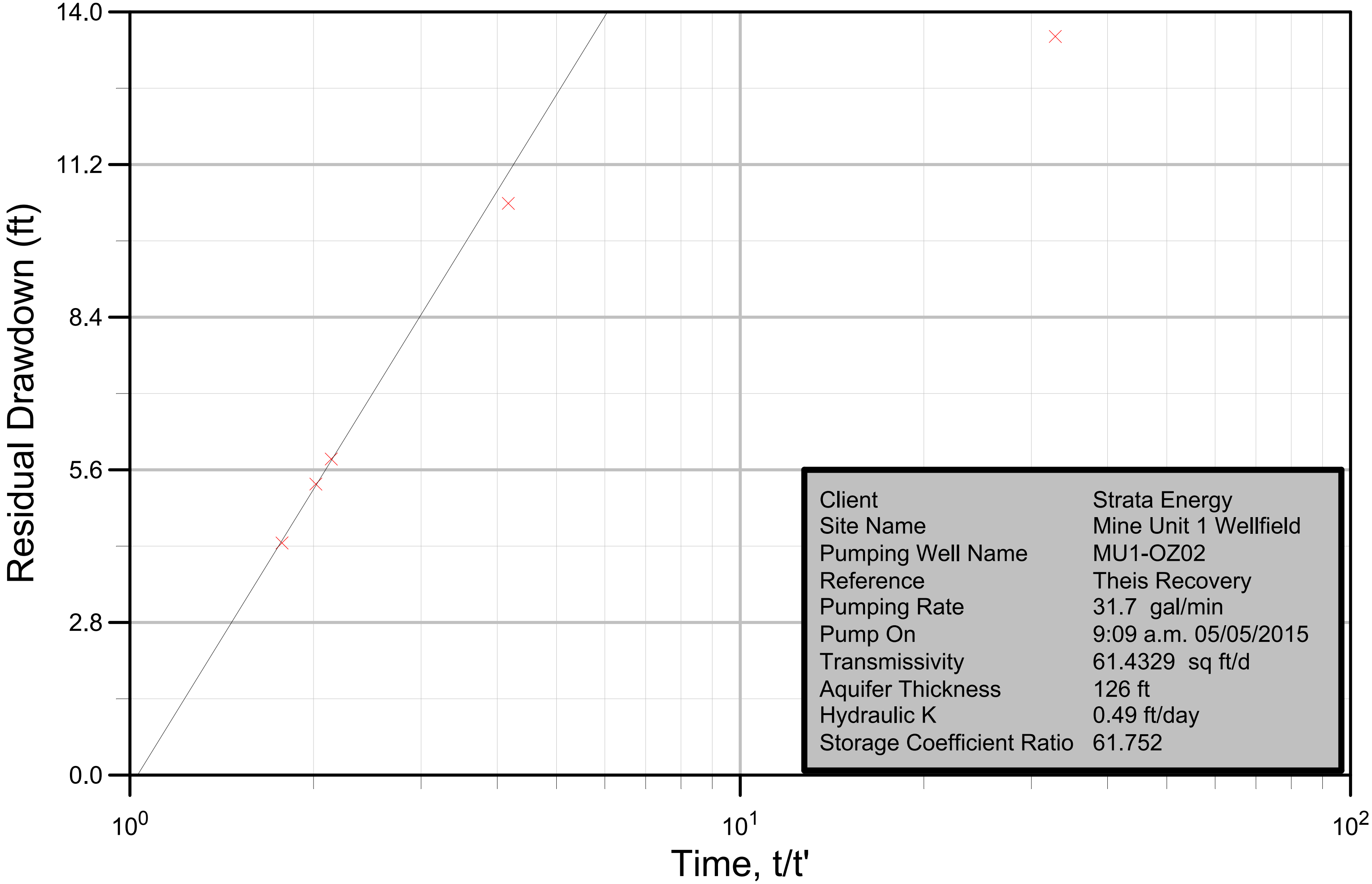

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 61.4329 sq ft/d
Aquifer Thickness 116 ft
Hydraulic K 0.53 ft/day
Storage Coefficient 0.000137435
Drawdown (ft)
18.0
14.4
10.8
7.2
3.6
0.0
10^1
10^2
10^3
10^4
Time (min)


MU1-OZ04
Residual Drawdown (ft)
17.0
13.6
10.2
6.8
3.4
0.0
10^0
10^1
10^2
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 61.0057 sq ft/d
Aquifer Thickness 116 ft
Hydraulic K 0.53 ft/day
Storage Coefficient Ratio 62.8277

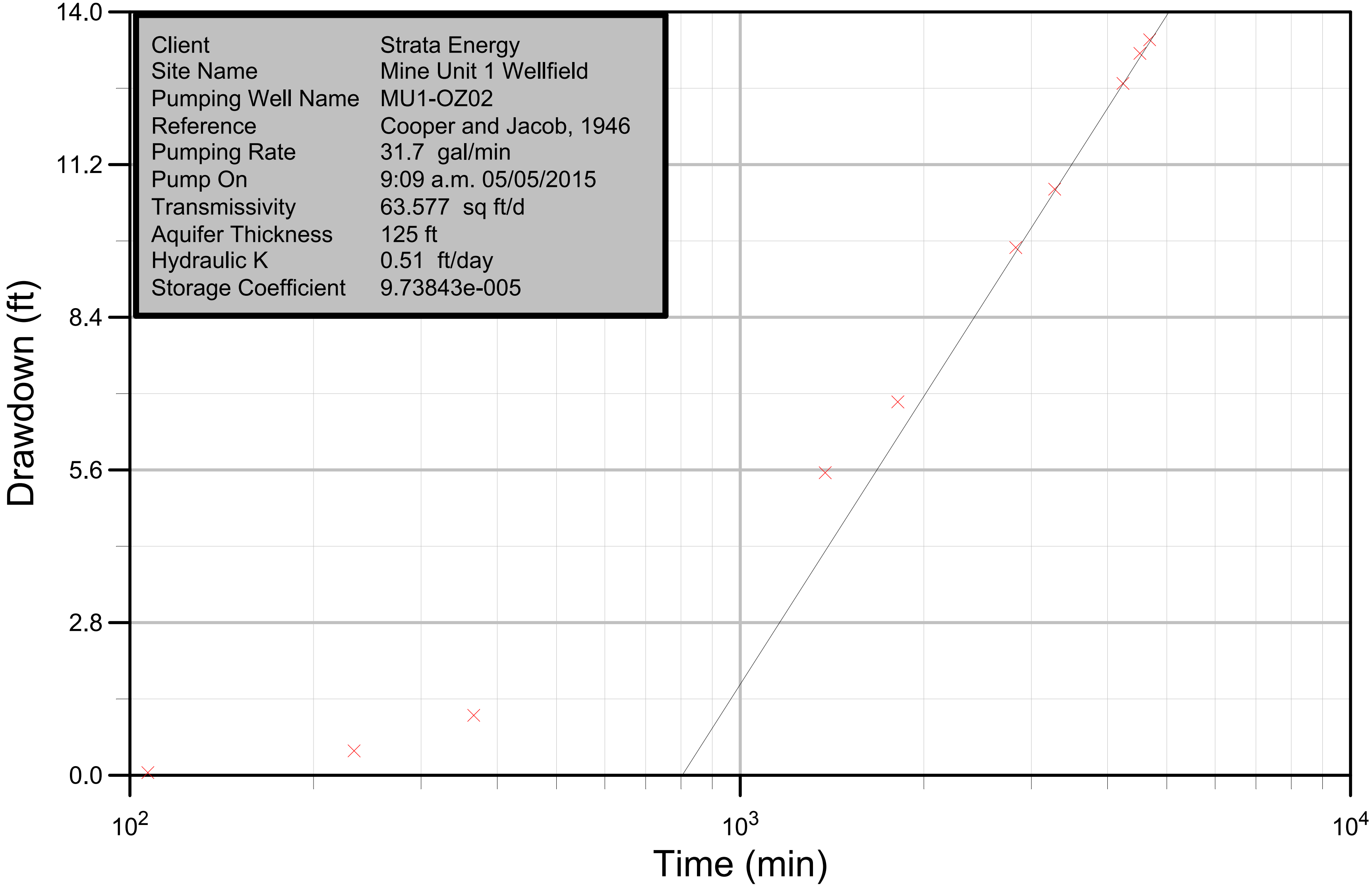
MU1-OZ05


Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 61.4345 sq ft/d
Aquifer Thickness 126 ft
Hydraulic K 0.49 ft/day
Storage Coefficient 0.000206095
Drawdown (ft)
14.0
11.2
8.4
5.6
2.8
0.0
10^1
10^2
10^3
10^4
Time (min)

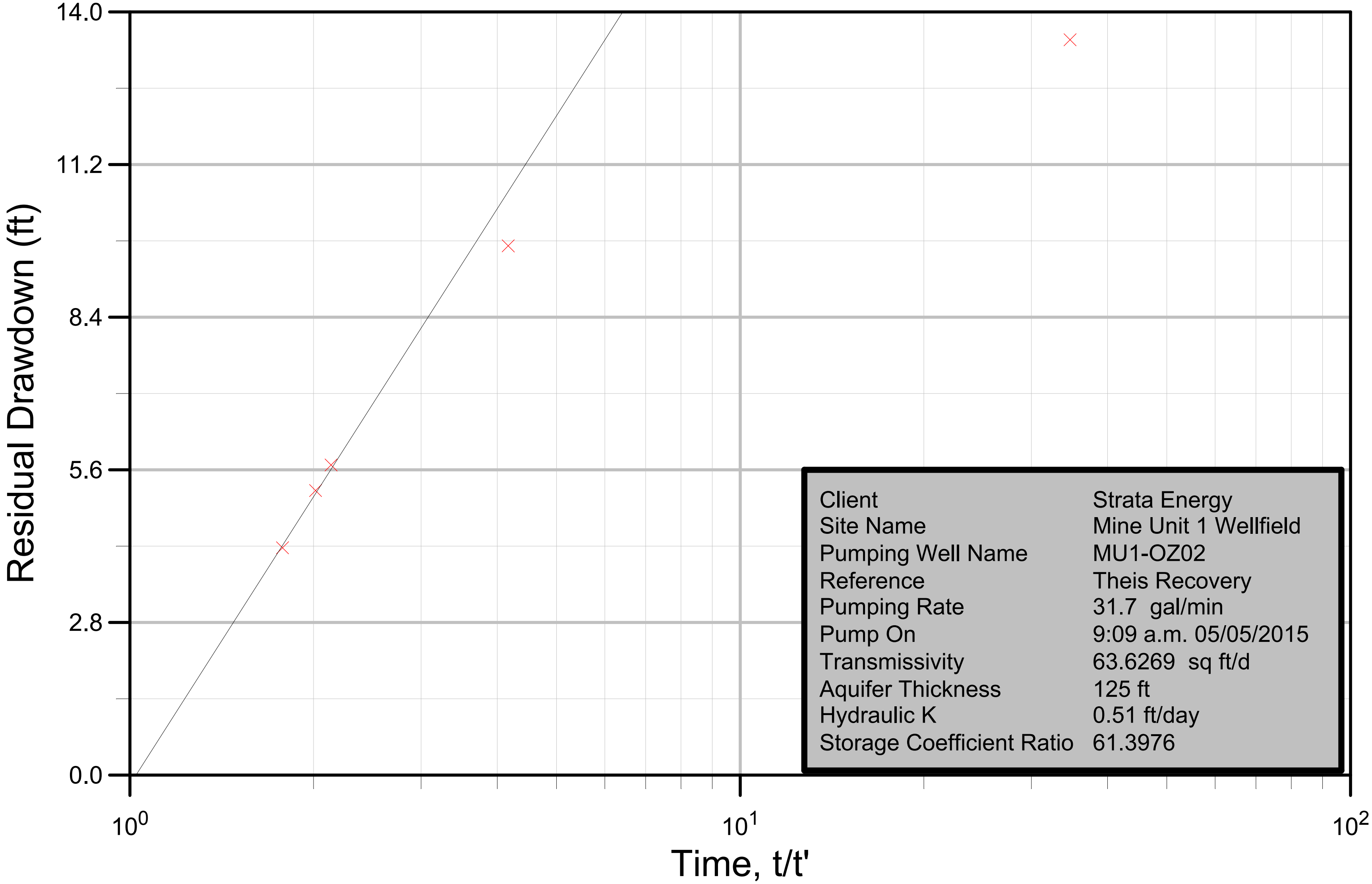
MU1-OZ05

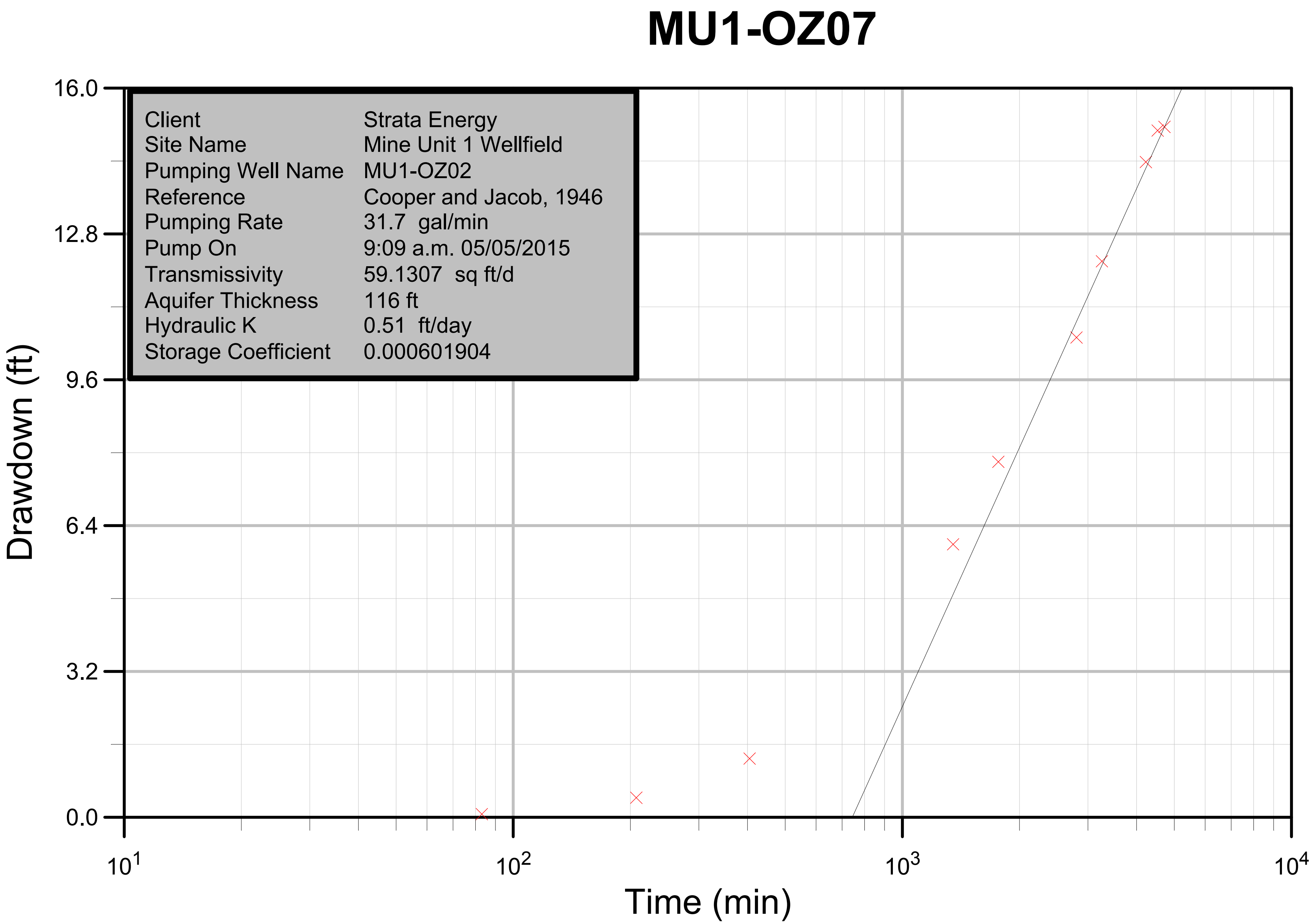

14.0
11.2
8.4
5.6
2.8
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 61.4329 sq ft/d
Aquifer Thickness 126 ft
Hydraulic K 0.49 ft/day
Storage Coefficient Ratio 61.752

MU1-OZ06

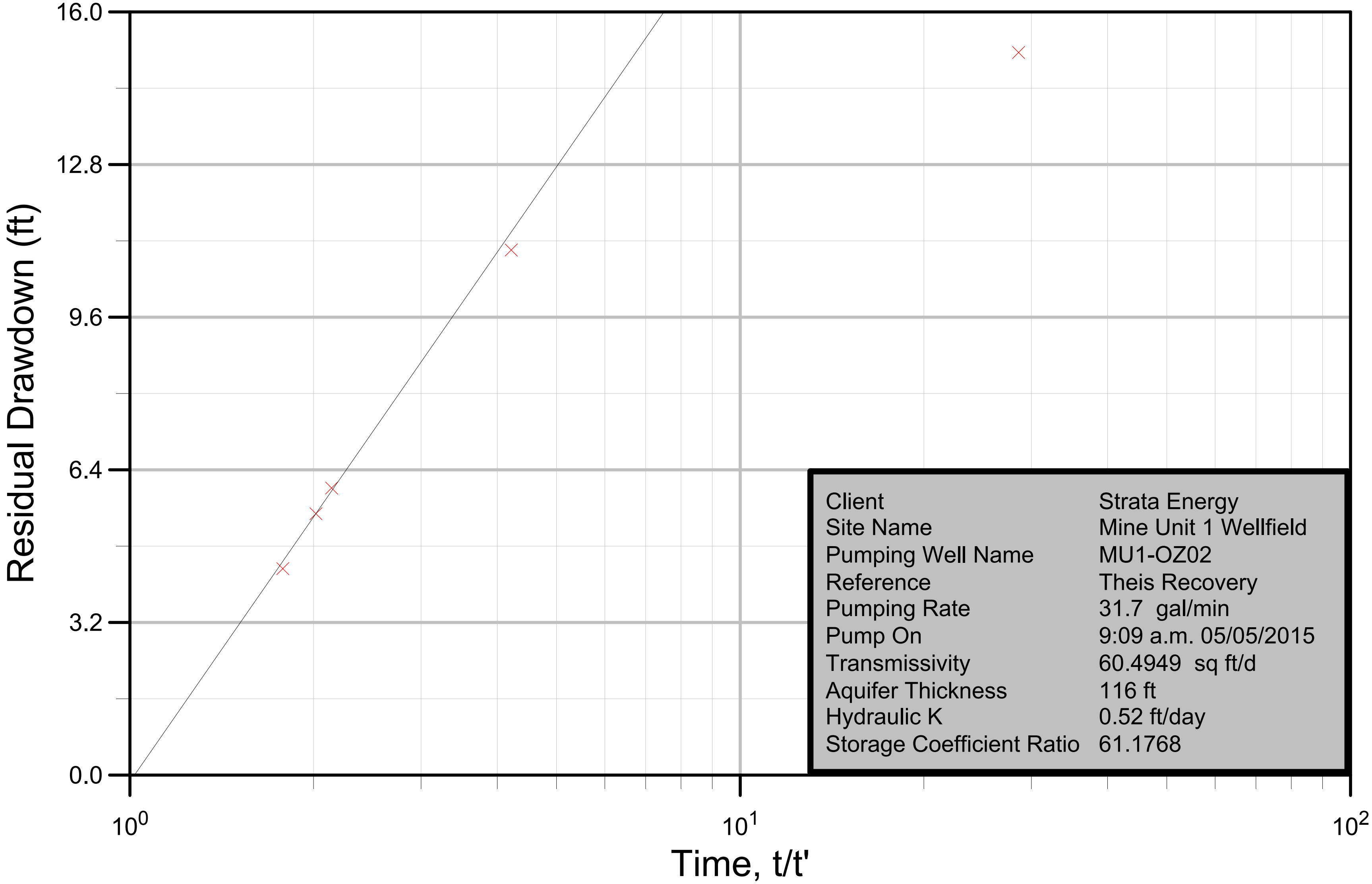

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 63.577 sq ft/d
Aquifer Thickness 125 ft
Hydraulic K 0.51 ft/day
Storage Coefficient 9.73843e-005
Drawdown (ft)
14.0
11.2
8.4
5.6
2.8
0.0
10^2
10^3
10^4
Time (min)

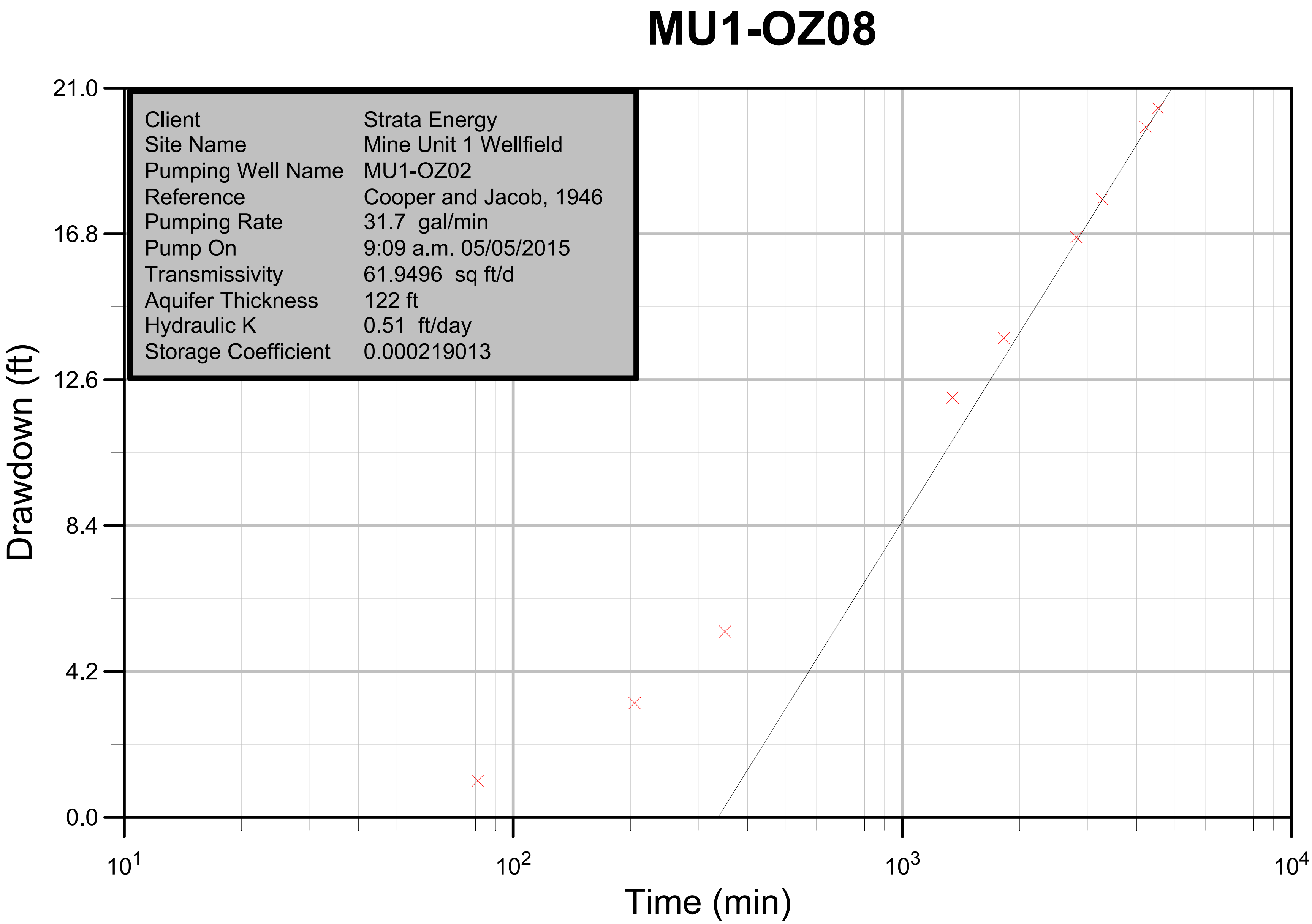
MU1-OZ06


14.0
11.2
8.4
5.6
2.8
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ02
Reference
Theis Recovery
Pumping Rate
31.7 gal/min
Pump On
9:09 a.m. 05/05/2015
Transmissivity
63.6269 sq ft/d
Aquifer Thickness
125 ft
Hydraulic K
0.51 ft/day
Storage Coefficient Ratio
61.3976

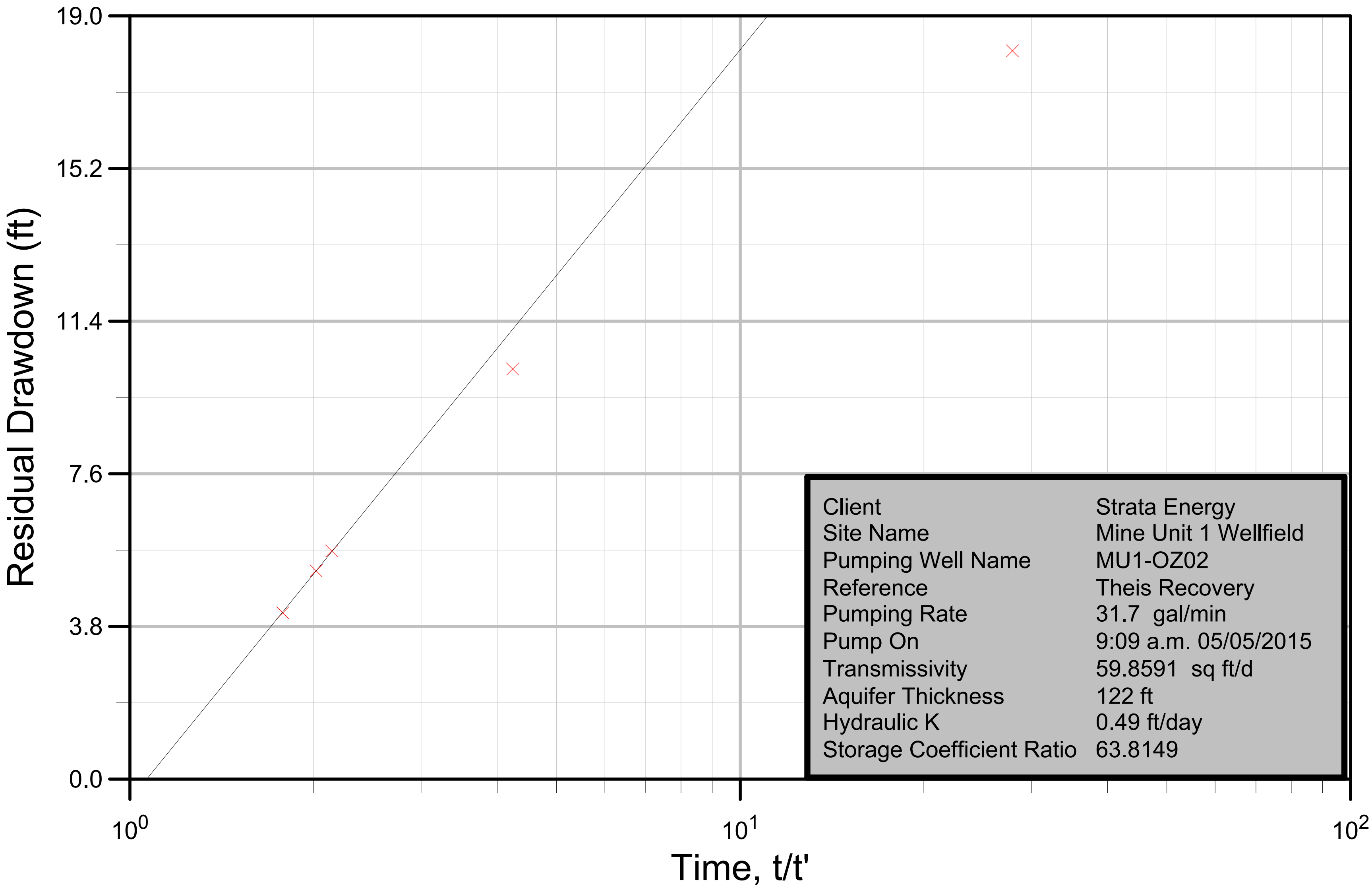

MU1-OZ07
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 59.1307 sq ft/d
Aquifer Thickness 116 ft
Hydraulic K 0.51 ft/day
Storage Coefficient 0.000601904
Drawdown (ft)
16.0
12.8
9.6
6.4
3.2
0.0
10^1
10^2
10^3
10^4
Time (min)

MU1-OZ07


Residual Drawdown (ft)
16.0
12.8
9.6
6.4
3.2
0.0
10^0
10^1
10^2
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 60.4949 sq ft/d
Aquifer Thickness 116 ft
Hydraulic K 0.52 ft/day
Storage Coefficient Ratio 61.1768

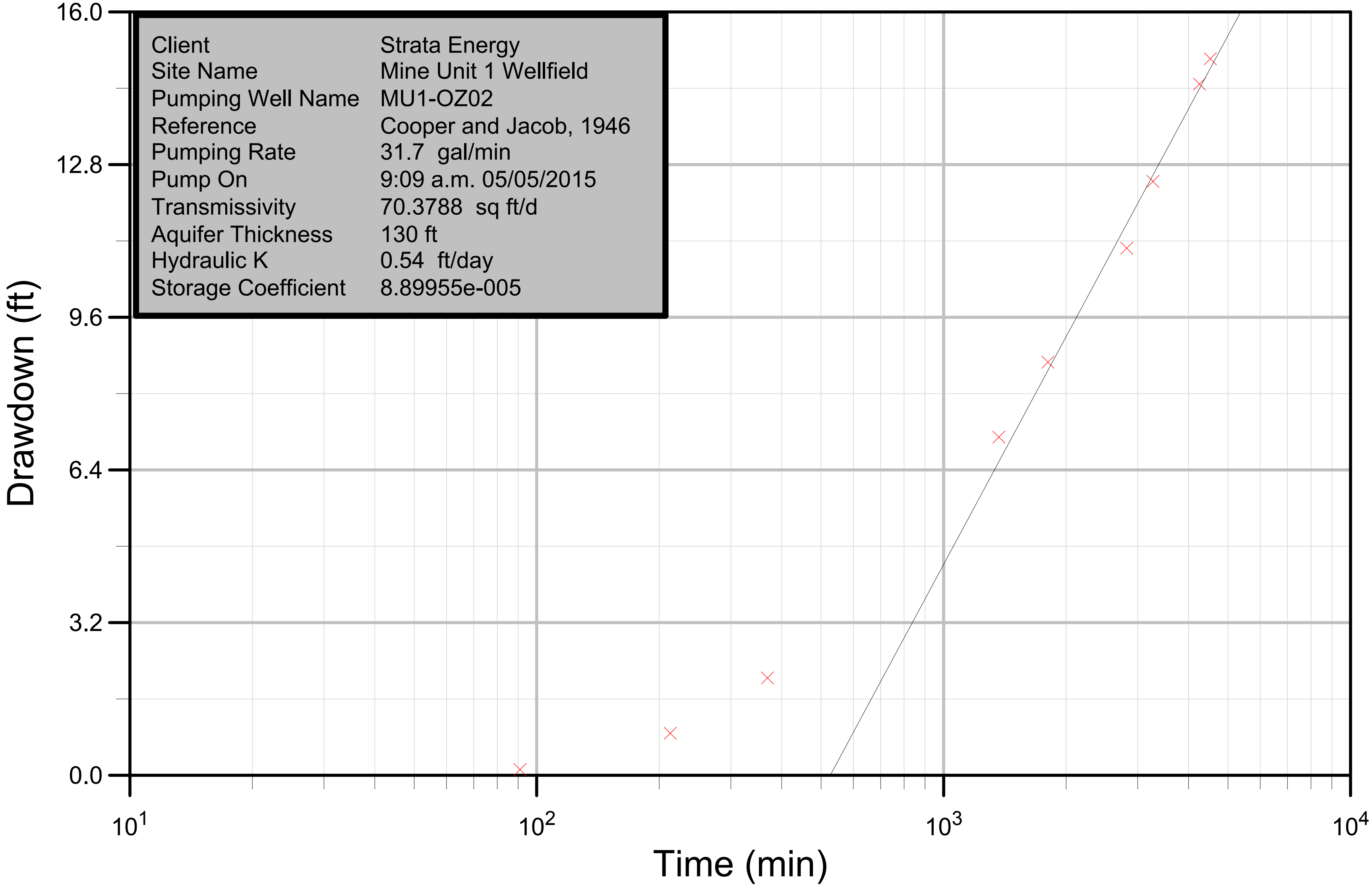

MU1-OZ08
Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ02
Reference
Cooper and Jacob, 1946
Pumping Rate
31.7 gal/min
Pump On
9:09 a.m. 05/05/2015
Transmissivity
61.9496 sq ft/d
Aquifer Thickness
122 ft
Hydraulic K
0.51 ft/day
Storage Coefficient
0.000219013
Drawdown (ft)
21.0
16.8
12.6
8.4
4.2
0.0
Time (min)
10^1
10^2
10^3
10^4

MU1-OZ08

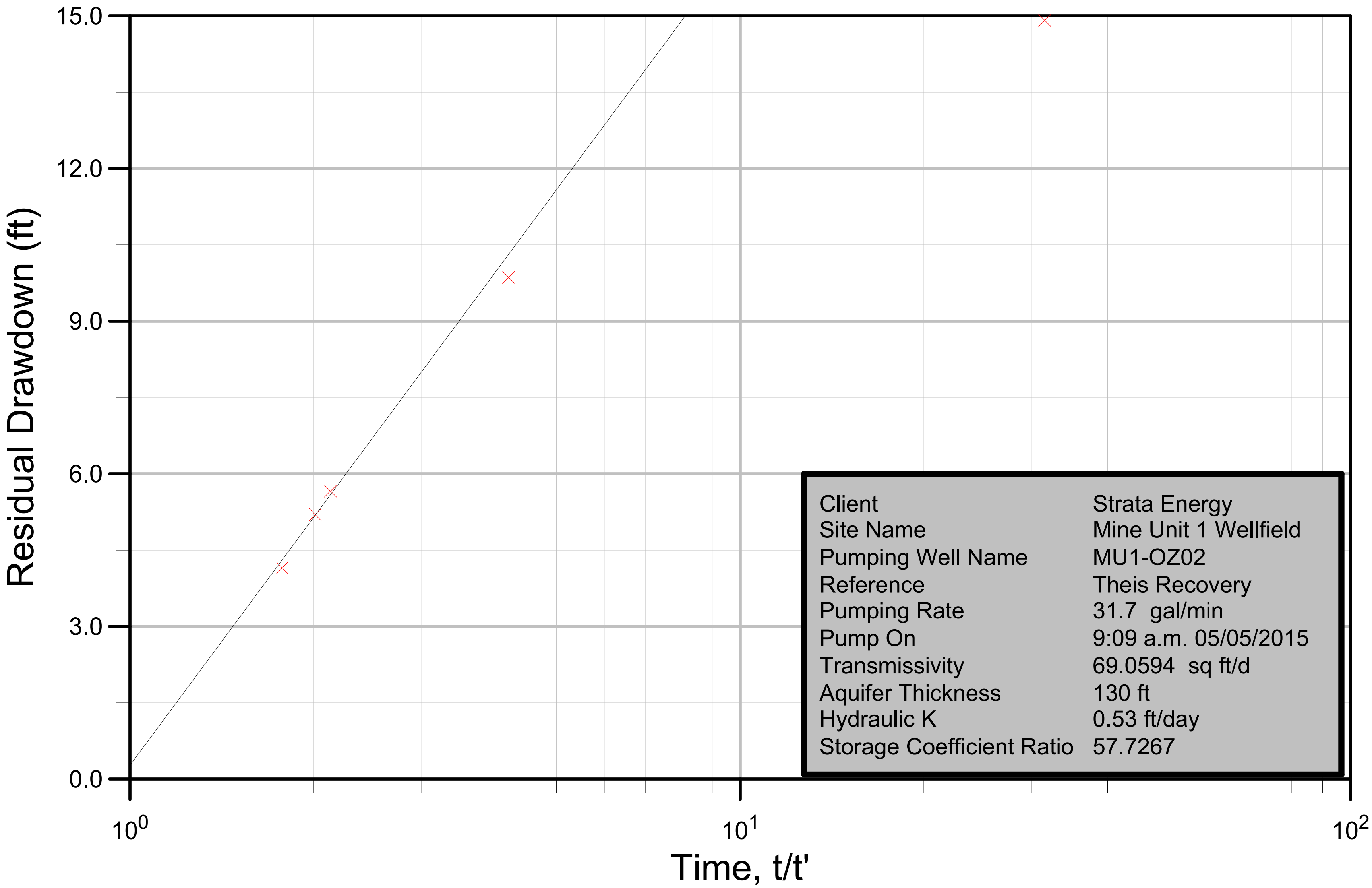


Client	Strata Energy
Site Name	Mine Unit 1 Wellfield
Pumping Well Name	MU1-OZ02
Reference	Theis Recovery
Pumping Rate	31.7 gal/min
Pump On	9:09 a.m. 05/05/2015
Transmissivity	59.8591 sq ft/d
Aquifer Thickness	122 ft
Hydraulic K	0.49 ft/day
Storage Coefficient Ratio	63.8149

MU1-OZ09

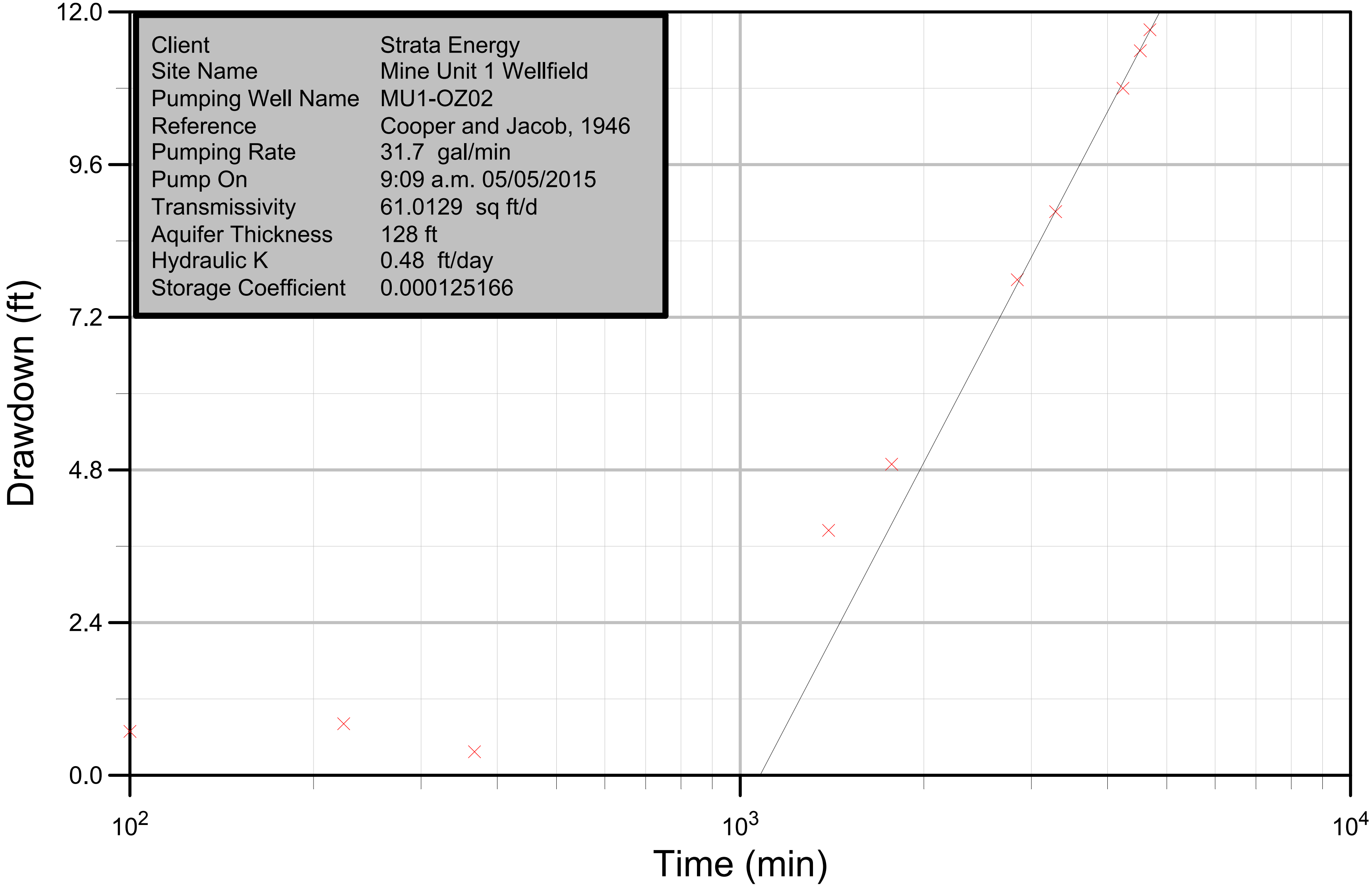

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 70.3788 sq ft/d
Aquifer Thickness 130 ft
Hydraulic K 0.54 ft/day
Storage Coefficient 8.89955e-005
Drawdown (ft)
16.0
12.8
9.6
6.4
3.2
0.0
10^1
10^2
10^3
10^4
Time (min)

MU1-OZ09

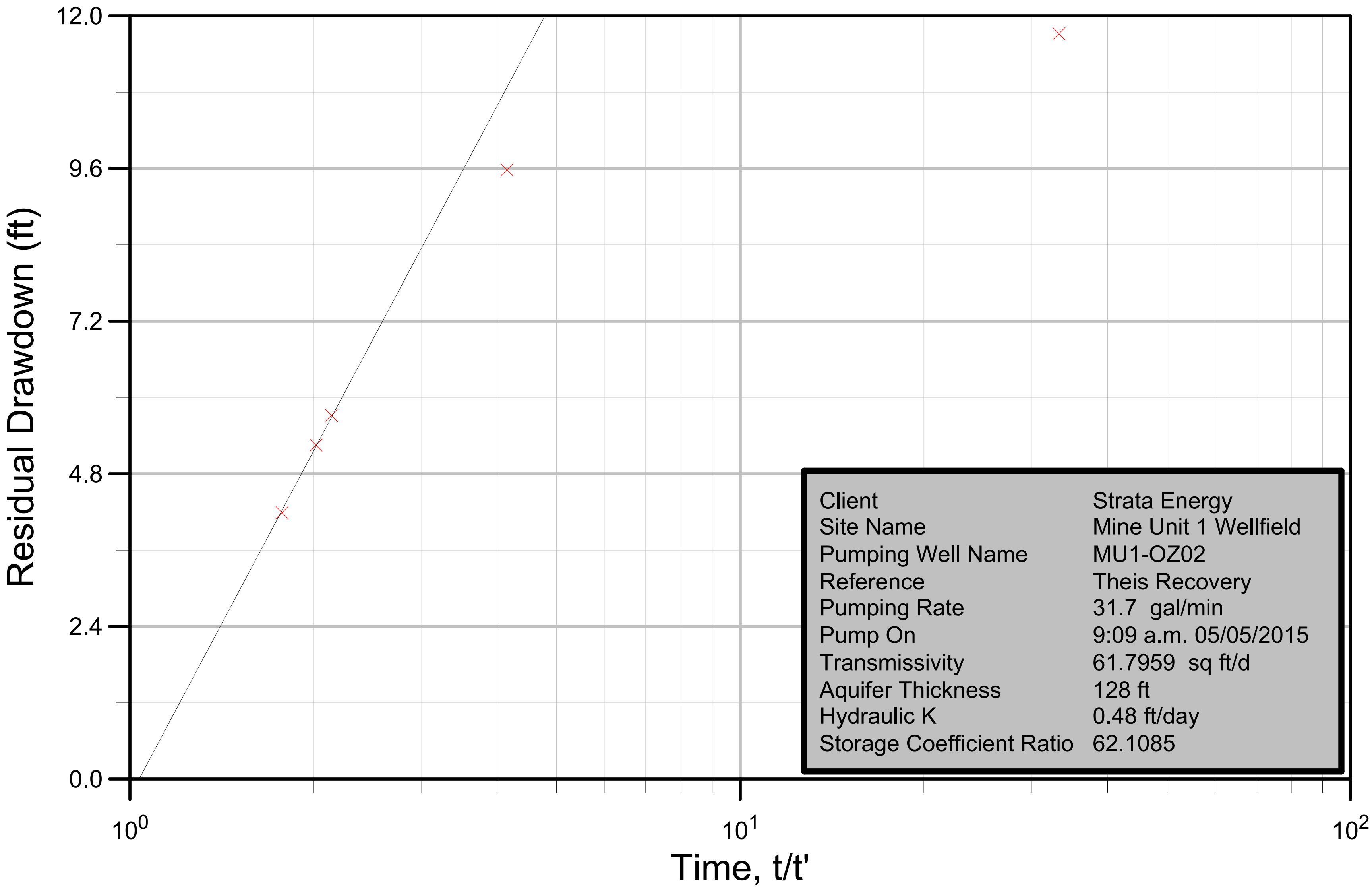


Client	Strata Energy
Site Name	Mine Unit 1 Wellfield
Pumping Well Name	MU1-OZ02
Reference	Theis Recovery
Pumping Rate	31.7 gal/min
Pump On	9:09 a.m. 05/05/2015
Transmissivity	69.0594 sq ft/d
Aquifer Thickness	130 ft
Hydraulic K	0.53 ft/day
Storage Coefficient Ratio	57.7267

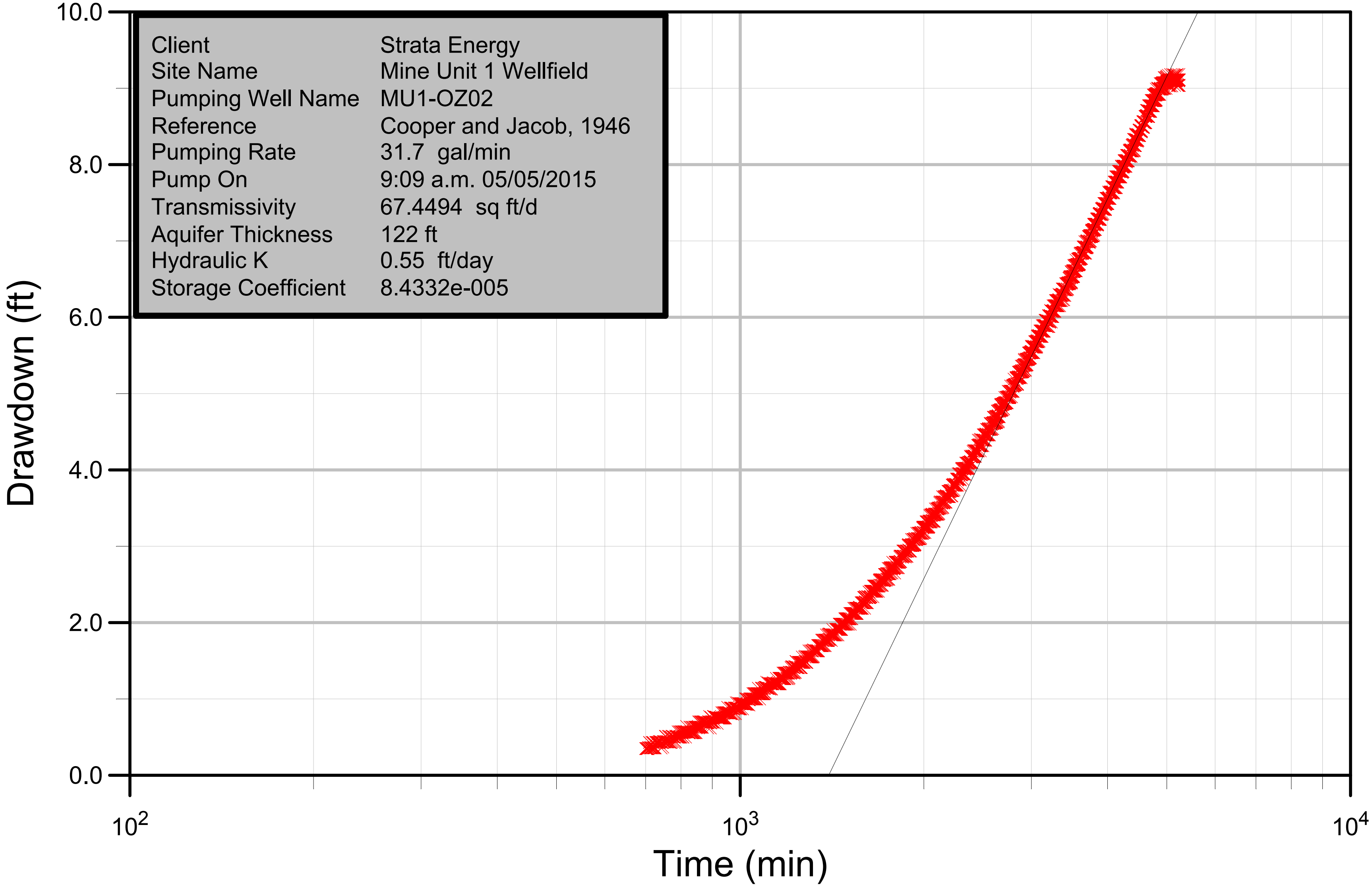
MU1-OZ10

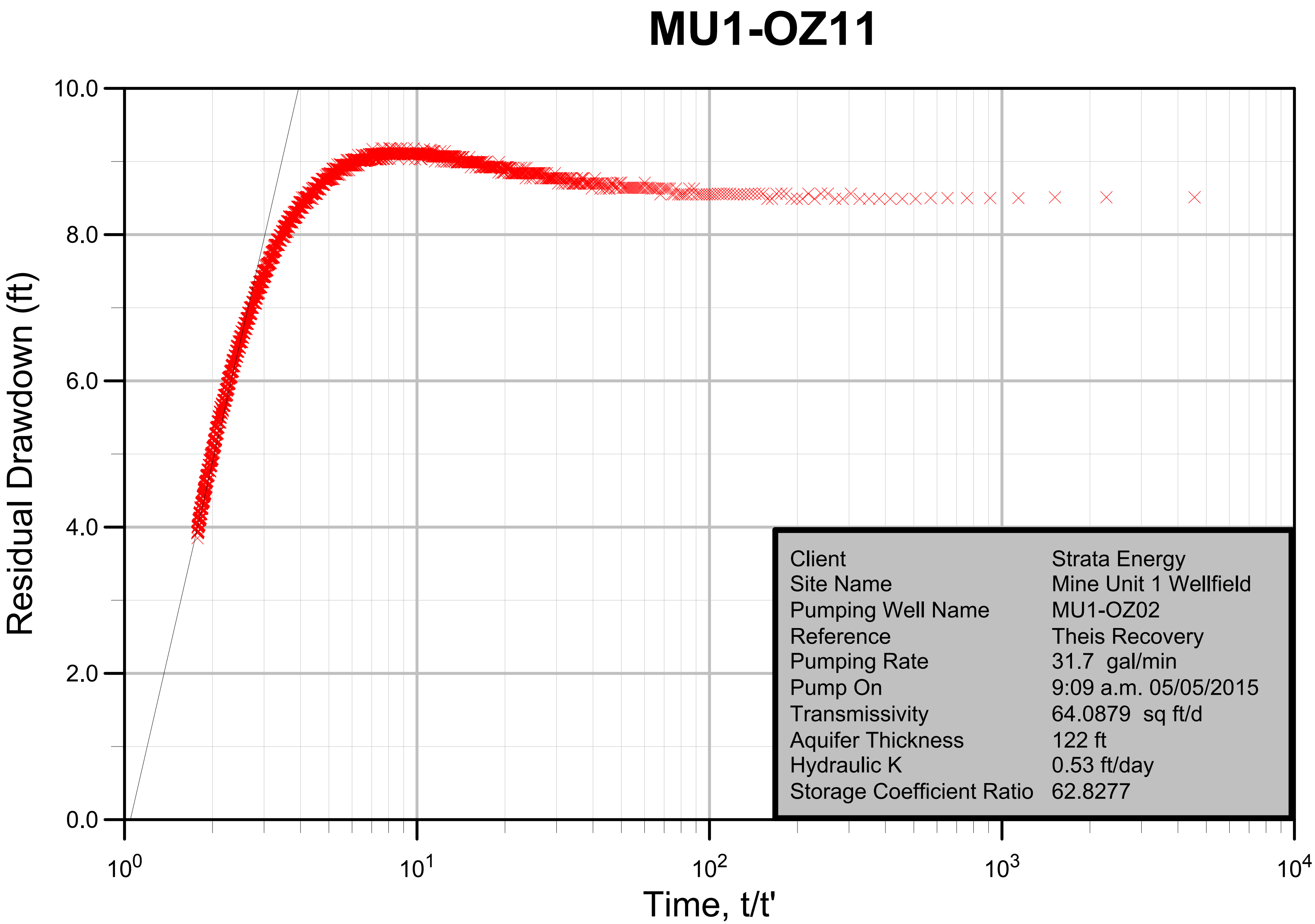

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 61.0129 sq ft/d
Aquifer Thickness 128 ft
Hydraulic K 0.48 ft/day
Storage Coefficient 0.000125166
Drawdown (ft)
12.0
9.6
7.2
4.8
2.4
0.0
10^2
10^3
10^4
Time (min)

MU1-OZ10


Residual Drawdown (ft)
12.0
9.6
7.2
4.8
2.4
0.0
10^0
10^1
10^2
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 61.7959 sq ft/d
Aquifer Thickness 128 ft
Hydraulic K 0.48 ft/day
Storage Coefficient Ratio 62.1085

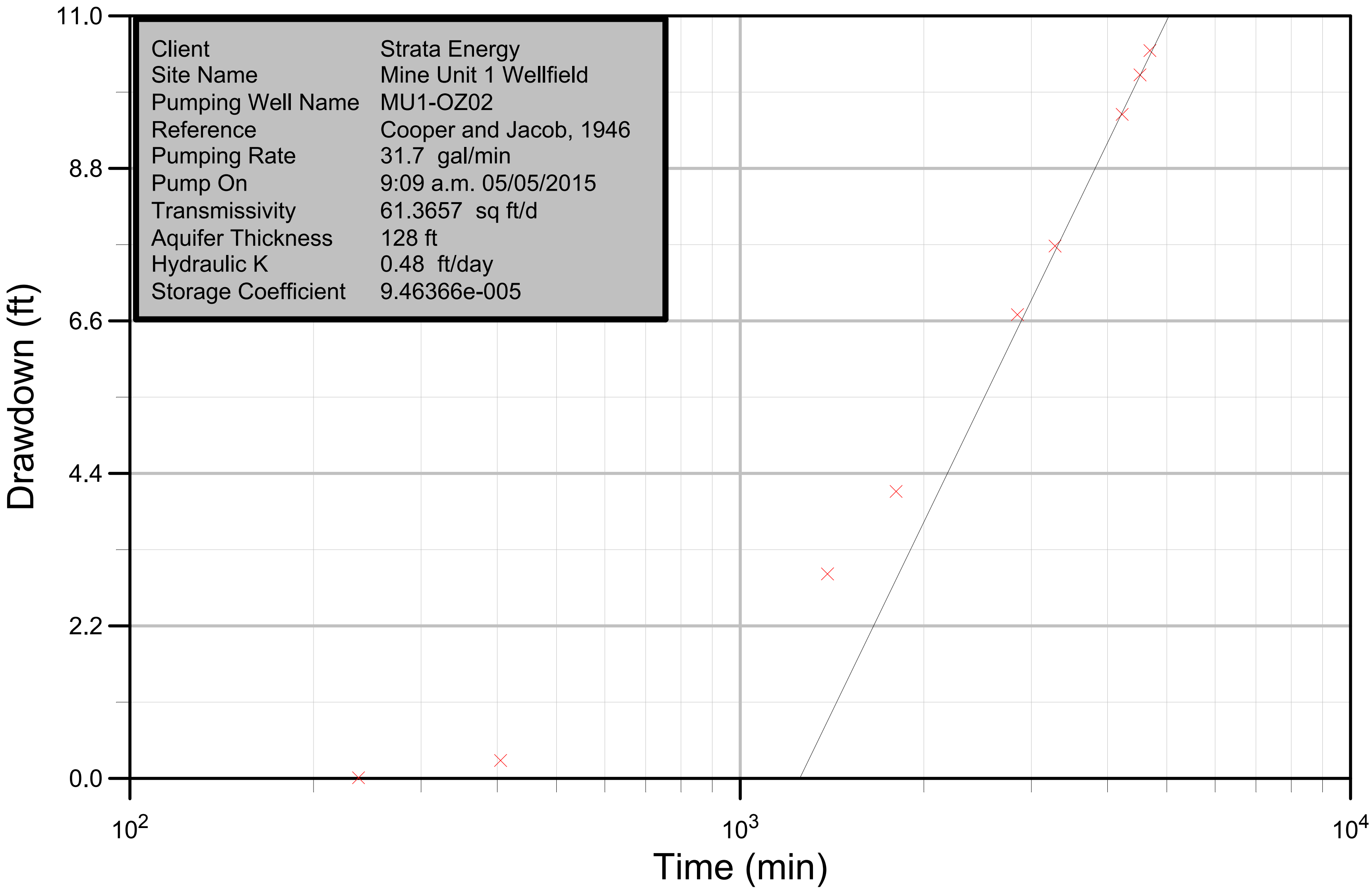
MU1-OZ11


Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 67.4494 sq ft/d
Aquifer Thickness 122 ft
Hydraulic K 0.55 ft/day
Storage Coefficient 8.4332e-005
10.0
8.0
6.0
4.0
2.0
0.0
Drawdown (ft)
10^2
10^3
10^4
Time (min)

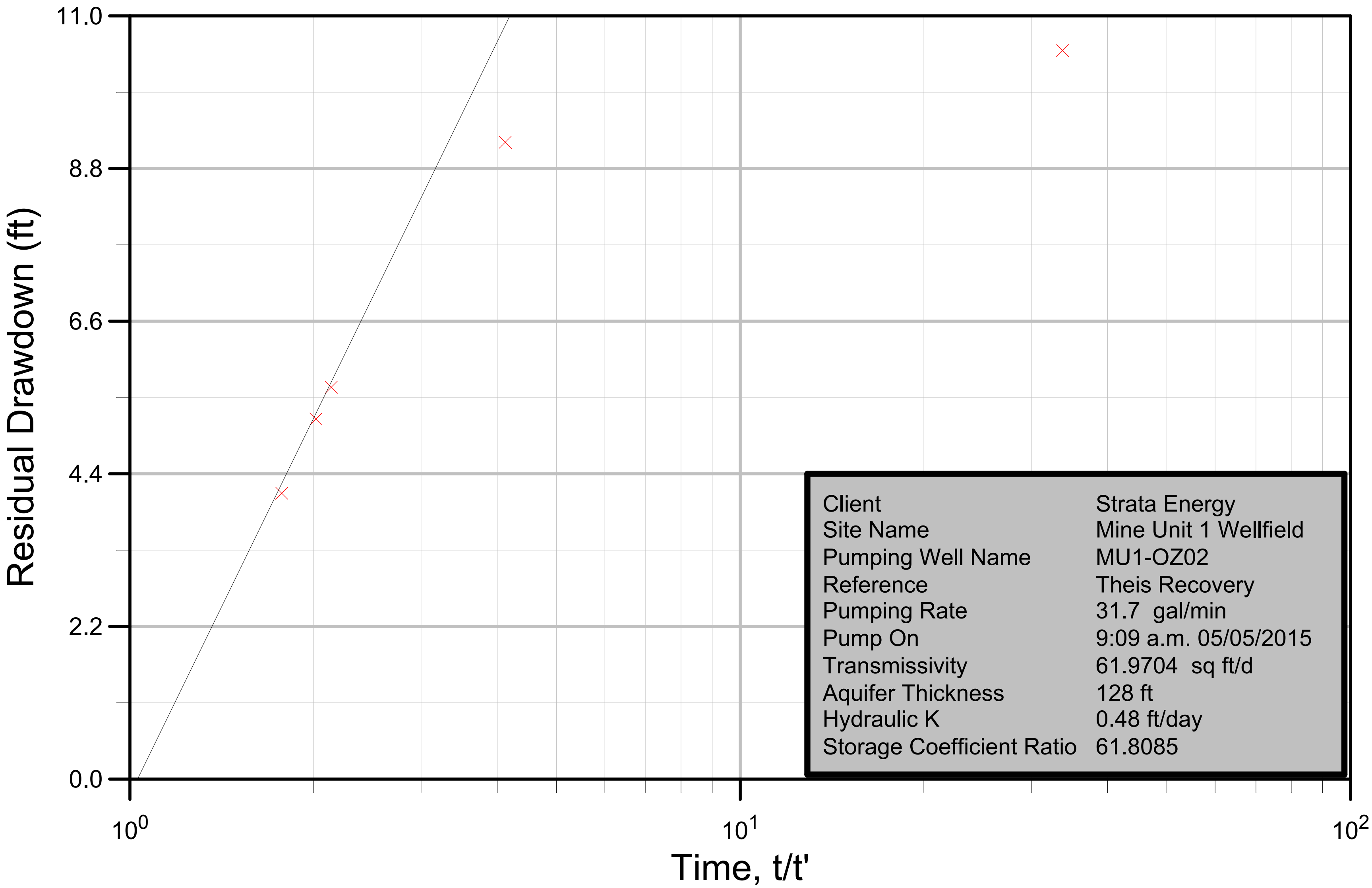

MU1-OZ11
Residual Drawdown (ft)
10.0
8.0
6.0
4.0
2.0
0.0
10^0
10^1
10^2
10^3
10^4
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 64.0879 sq ft/d
Aquifer Thickness 122 ft
Hydraulic K 0.53 ft/day
Storage Coefficient Ratio 62.8277

MU1-OZ12

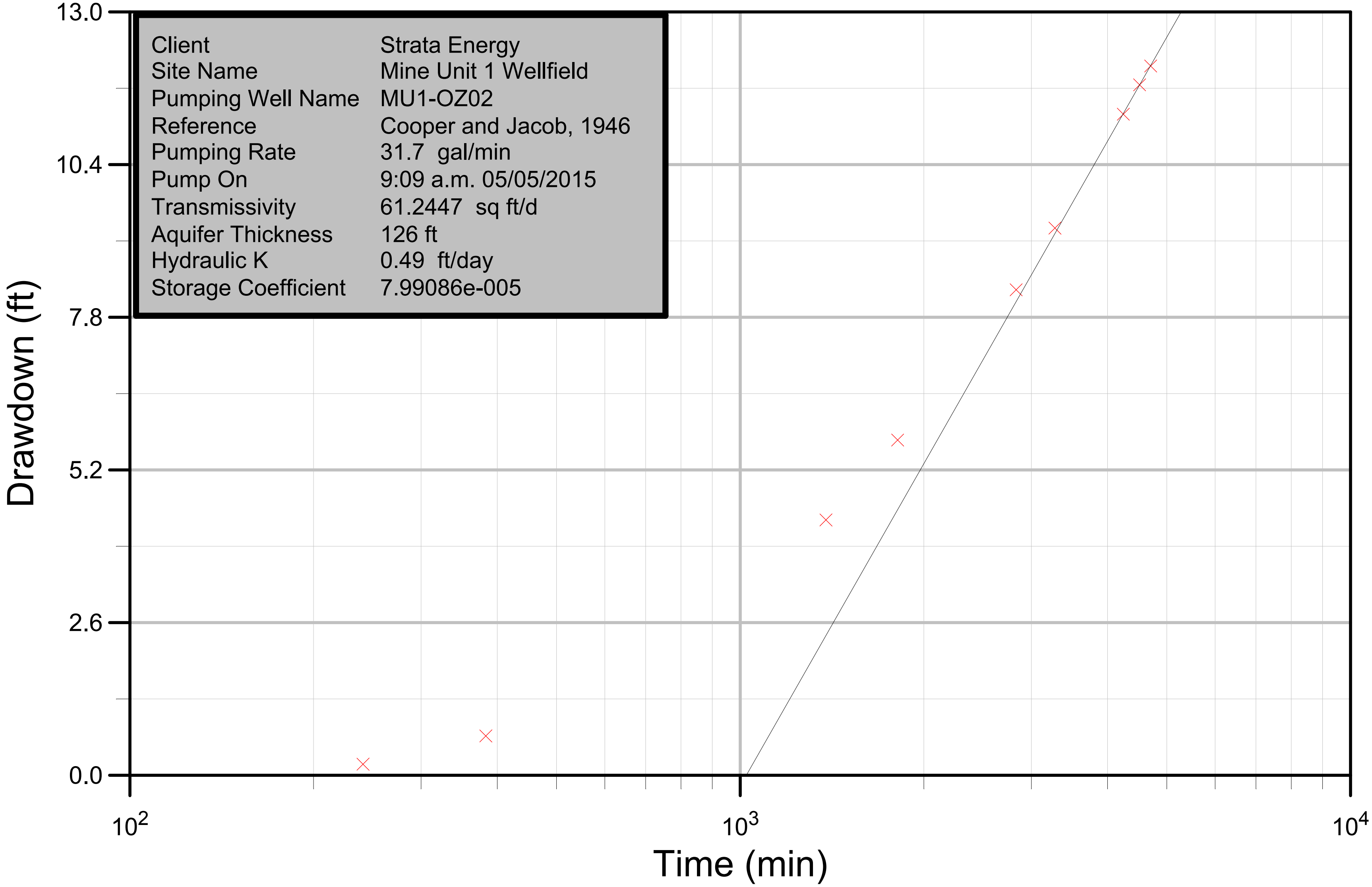
Client	Strata Energy
Site Name	Mine Unit 1 Wellfield
Pumping Well Name	MU1-OZ02
Reference	Cooper and Jacob, 1946
Pumping Rate	31.7 gal/min
Pump On	9:09 a.m. 05/05/2015
Transmissivity	61.3657 sq ft/d
Aquifer Thickness	128 ft
Hydraulic K	0.48 ft/day
Storage Coefficient	9.46366e-005



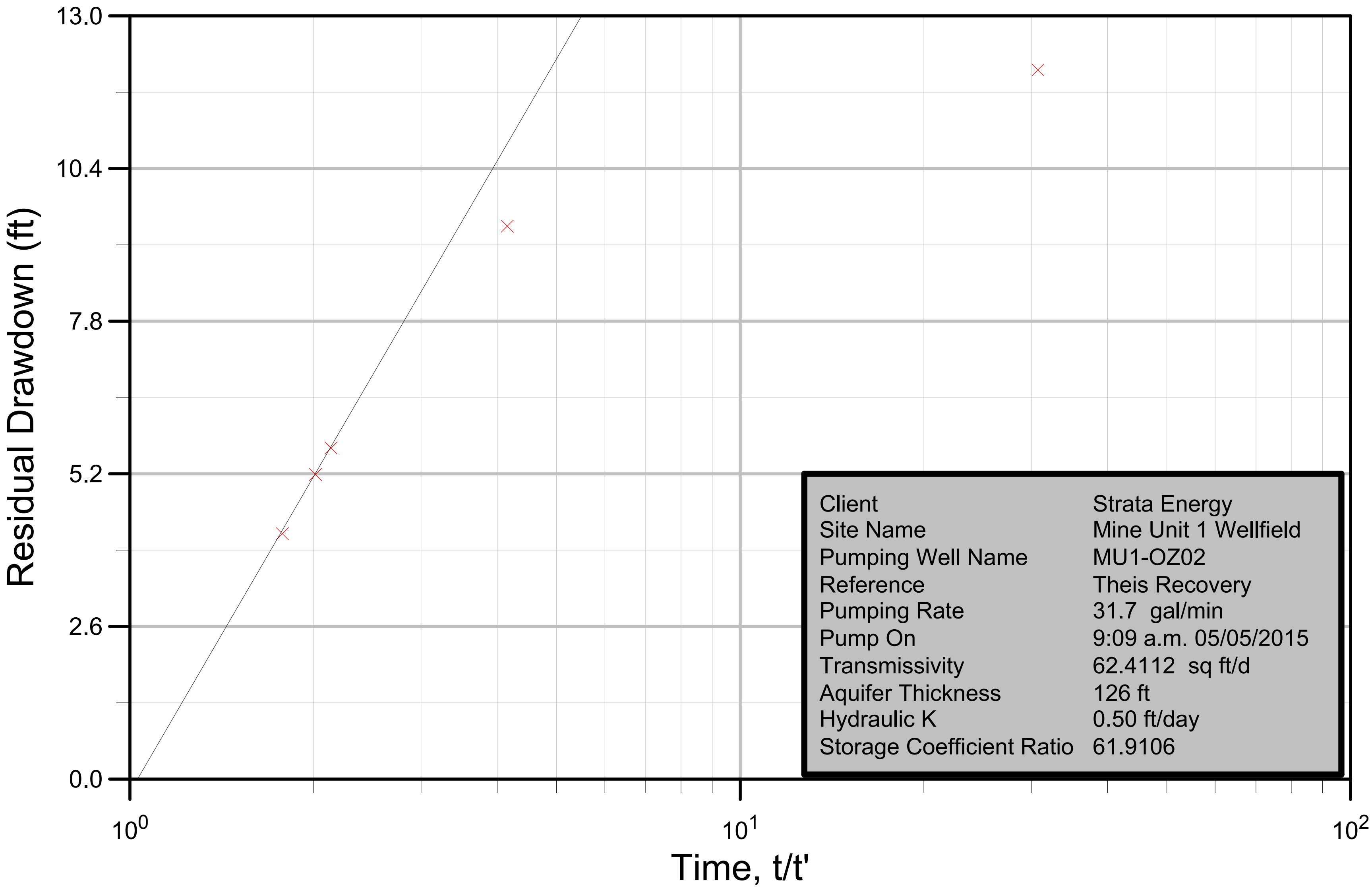
MU1-OZ12


11.0
8.8
6.6
4.4
2.2
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 61.9704 sq ft/d
Aquifer Thickness 128 ft
Hydraulic K 0.48 ft/day
Storage Coefficient Ratio 61.8085

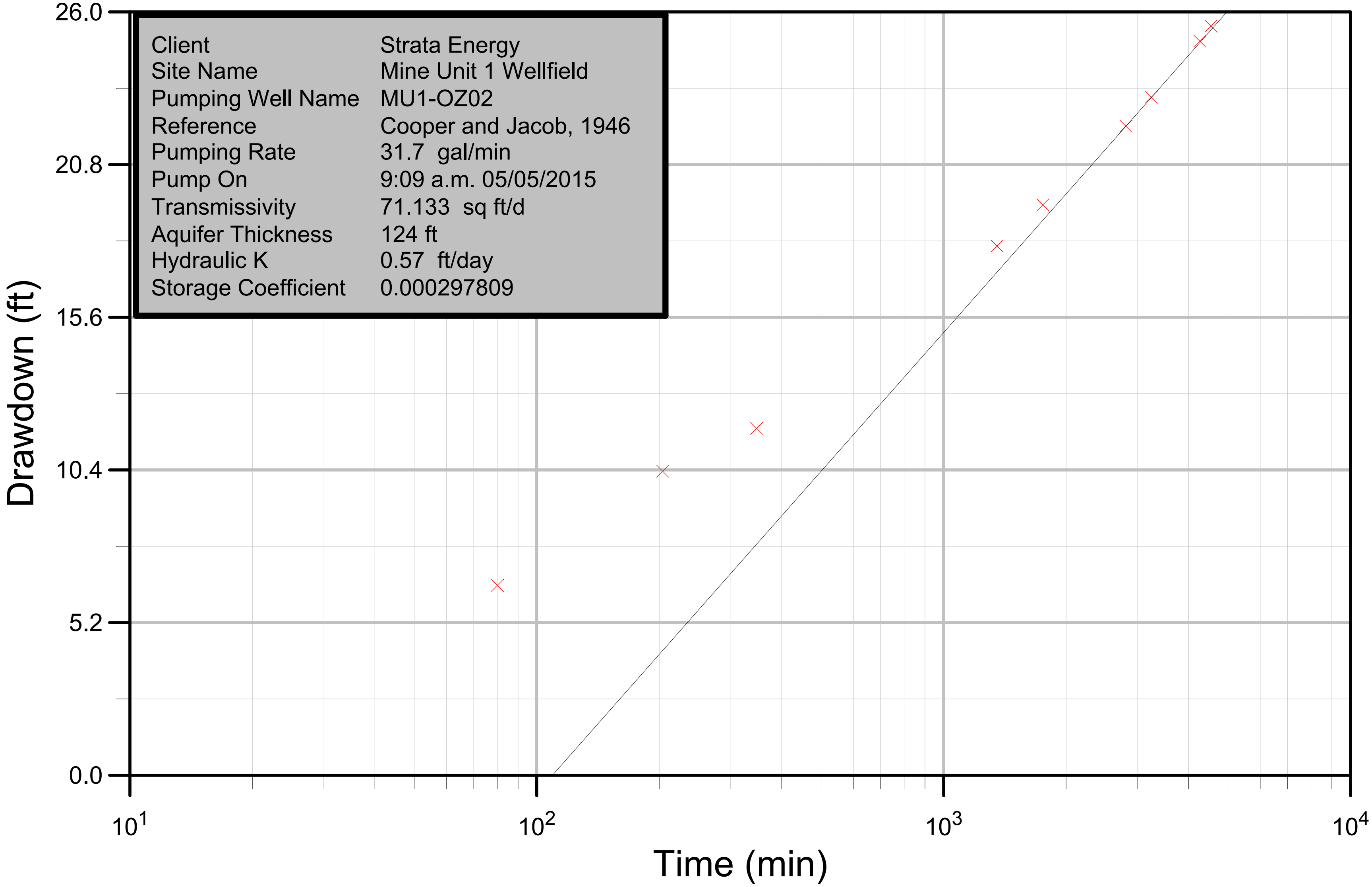
MU1-OZ13

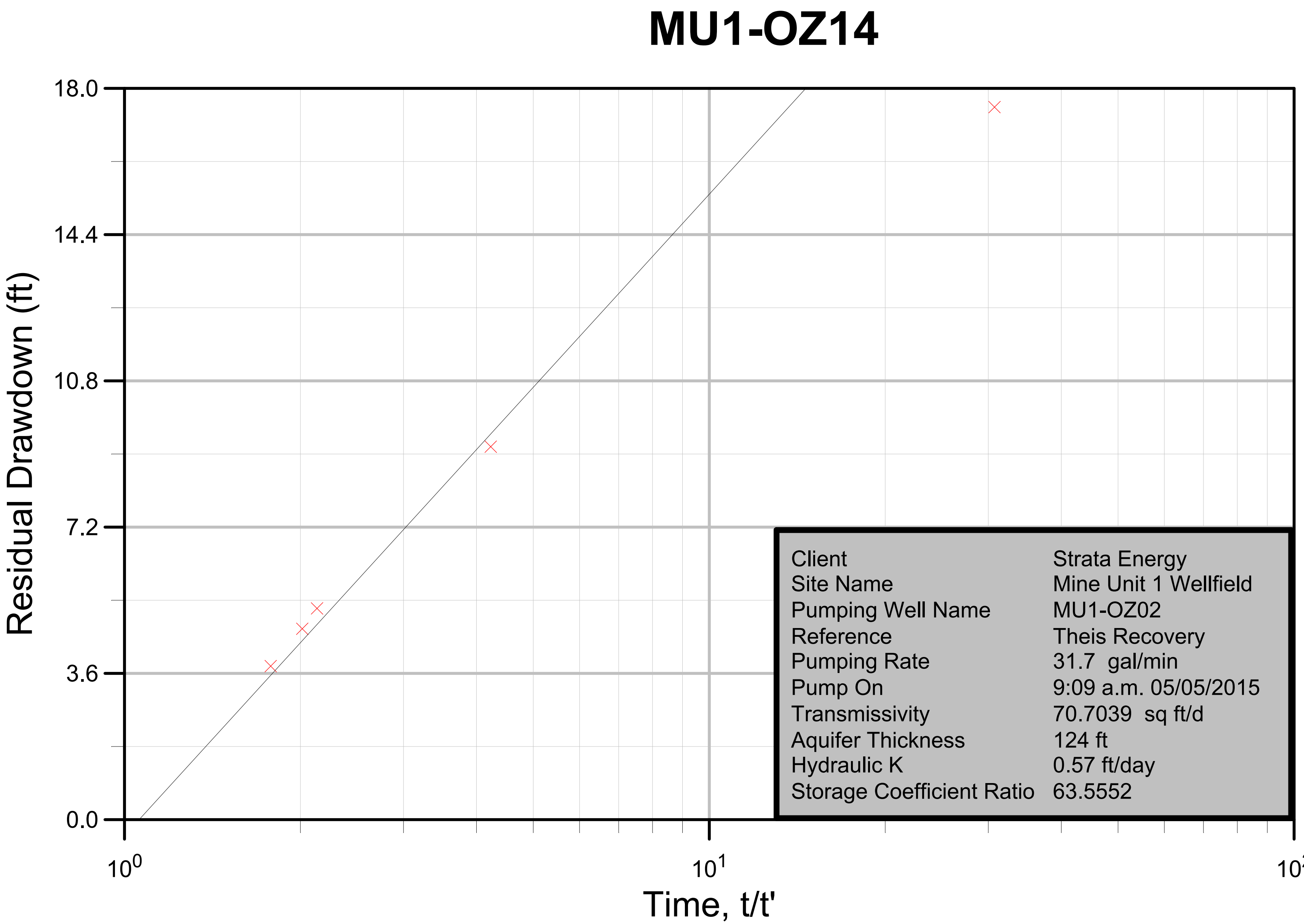

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 61.2447 sq ft/d
Aquifer Thickness 126 ft
Hydraulic K 0.49 ft/day
Storage Coefficient 7.99086e-005
Drawdown (ft)
13.0
10.4
7.8
5.2
2.6
0.0
Time (min)
10^2
10^3
10^4

MU1-OZ13

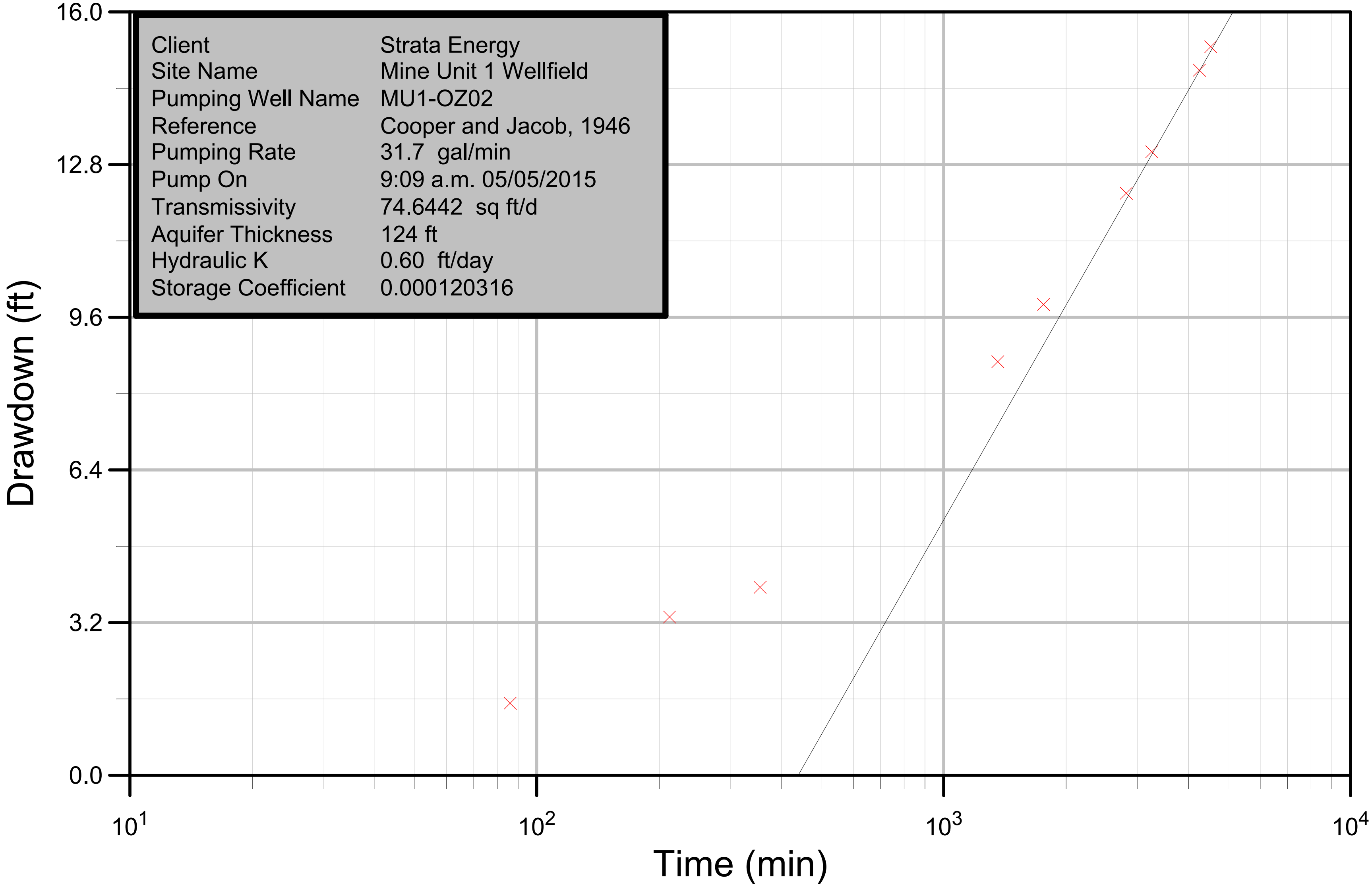

13.0
10.4
7.8
5.2
2.6
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ02
Reference
Theis Recovery
Pumping Rate
31.7 gal/min
Pump On
9:09 a.m. 05/05/2015
Transmissivity
62.4112 sq ft/d
Aquifer Thickness
126 ft
Hydraulic K
0.50 ft/day
Storage Coefficient Ratio
61.9106

MU1-OZ14

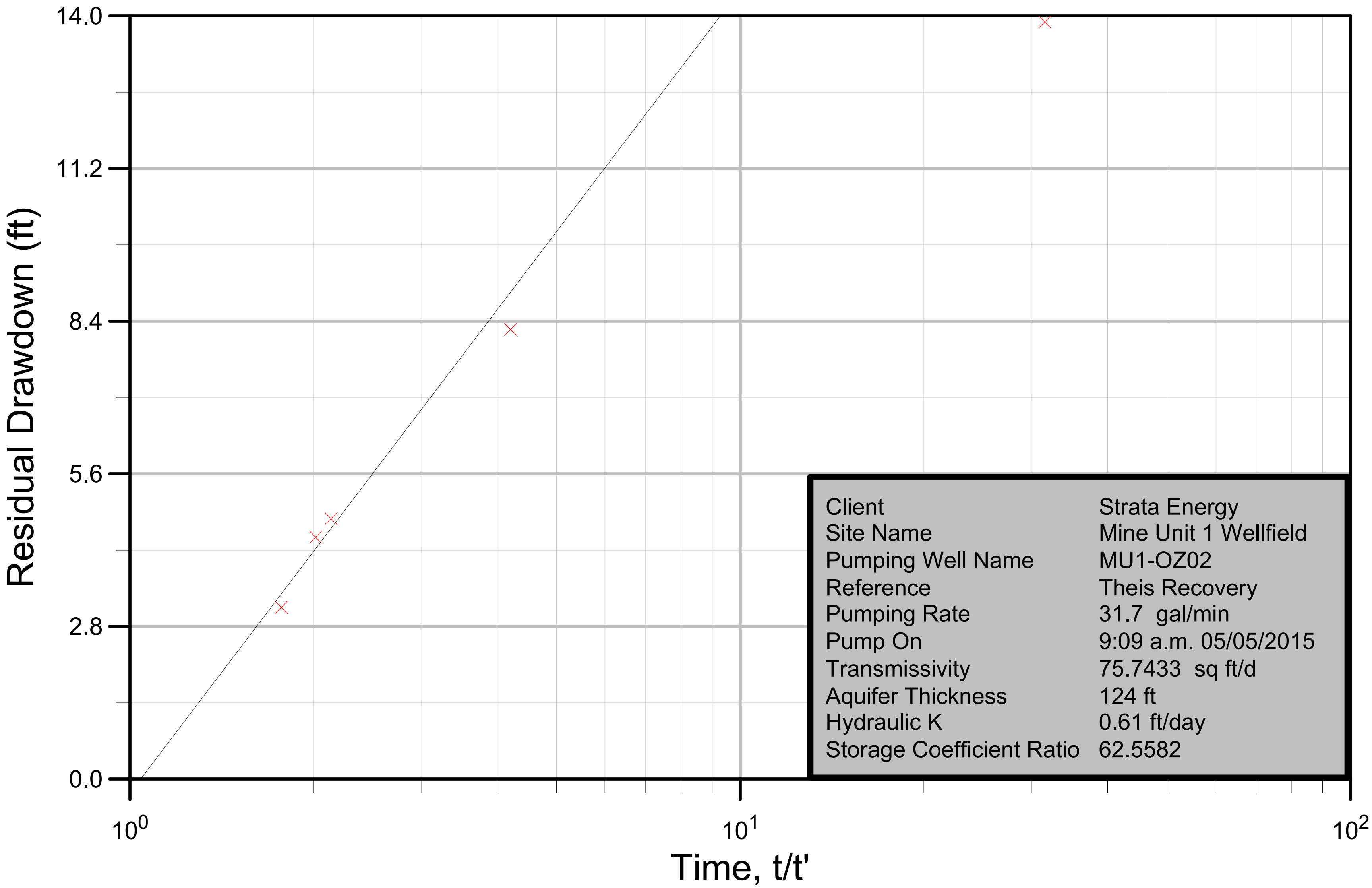

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 71.133 sq ft/d
Aquifer Thickness 124 ft
Hydraulic K 0.57 ft/day
Storage Coefficient 0.000297809
Drawdown (ft)
26.0
20.8
15.6
10.4
5.2
0.0
Time (min)
10^1
10^2
10^3
10^4


MU1-OZ14
Residual Drawdown (ft)
18.0
14.4
10.8
7.2
3.6
0.0
10^0
10^1
10^2
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 70.7039 sq ft/d
Aquifer Thickness 124 ft
Hydraulic K 0.57 ft/day
Storage Coefficient Ratio 63.5552

MU1-OZ15

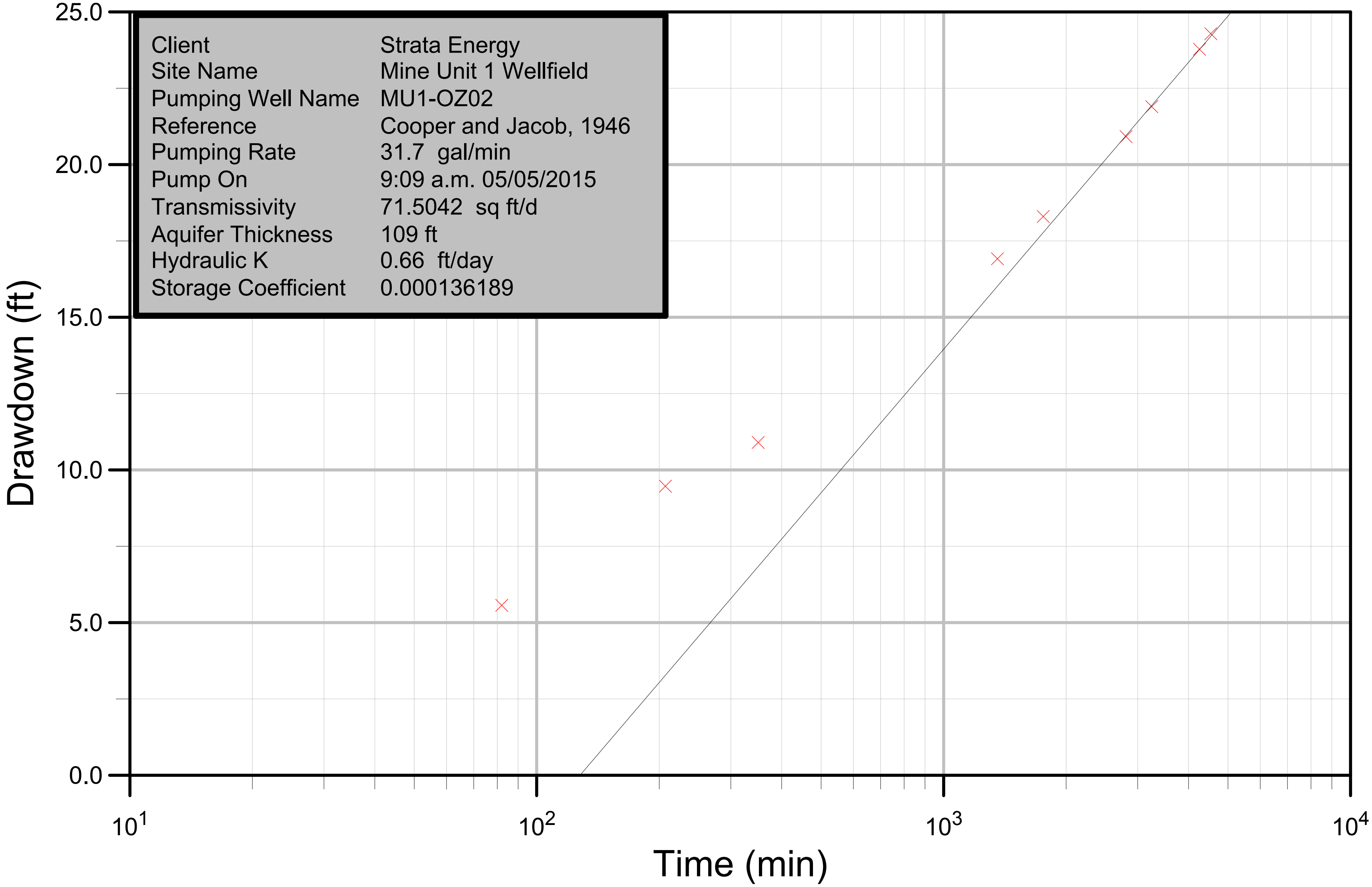

Client: Strata Energy
Site Name: Mine Unit 1 Wellfield
Pumping Well Name: MU1-OZ02
Reference: Cooper and Jacob, 1946
Pumping Rate: 31.7 gal/min
Pump On: 9:09 a.m. 05/05/2015
Transmissivity: 74.6442 sq ft/d
Aquifer Thickness: 124 ft
Hydraulic K: 0.60 ft/day
Storage Coefficient: 0.000120316
Drawdown (ft)
16.0
12.8
9.6
6.4
3.2
0.0
Time (min)
10^1
10^2
10^3
10^4

MU1-OZ15

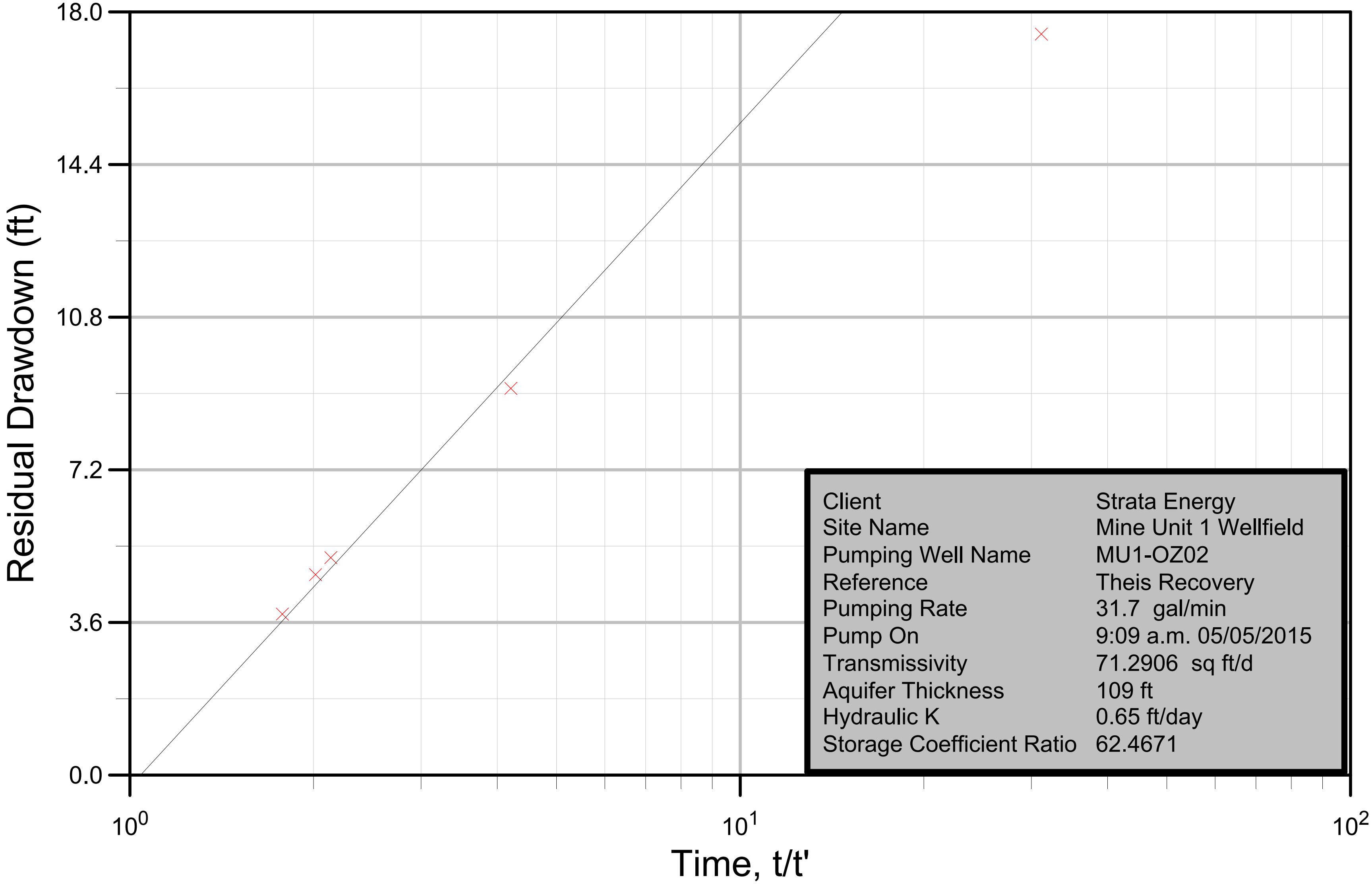


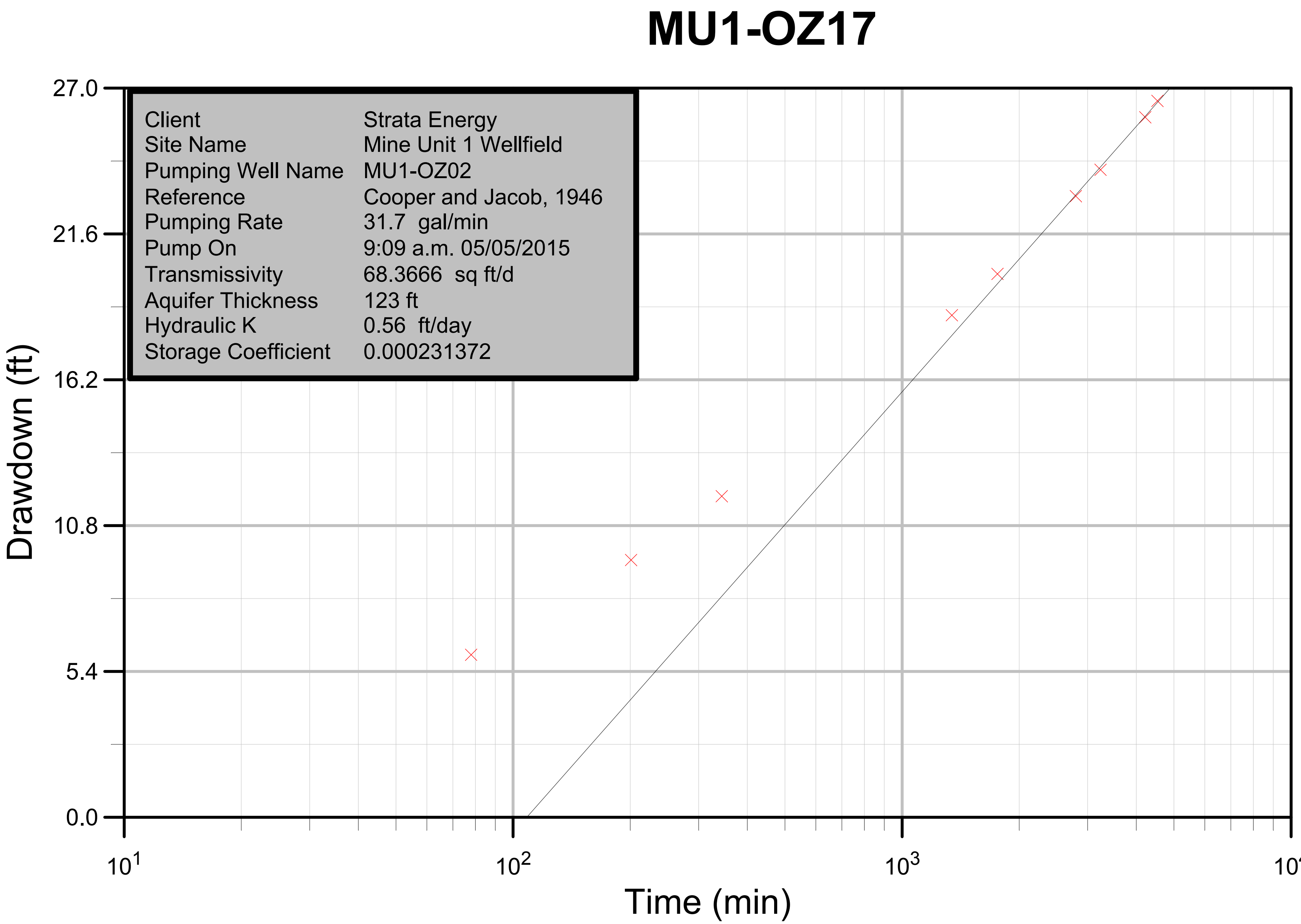
Client	Strata Energy
Site Name	Mine Unit 1 Wellfield
Pumping Well Name	MU1-OZ02
Reference	Theis Recovery
Pumping Rate	31.7 gal/min
Pump On	9:09 a.m. 05/05/2015
Transmissivity	75.7433 sq ft/d
Aquifer Thickness	124 ft
Hydraulic K	0.61 ft/day
Storage Coefficient Ratio	62.5582

MU1-OZ16

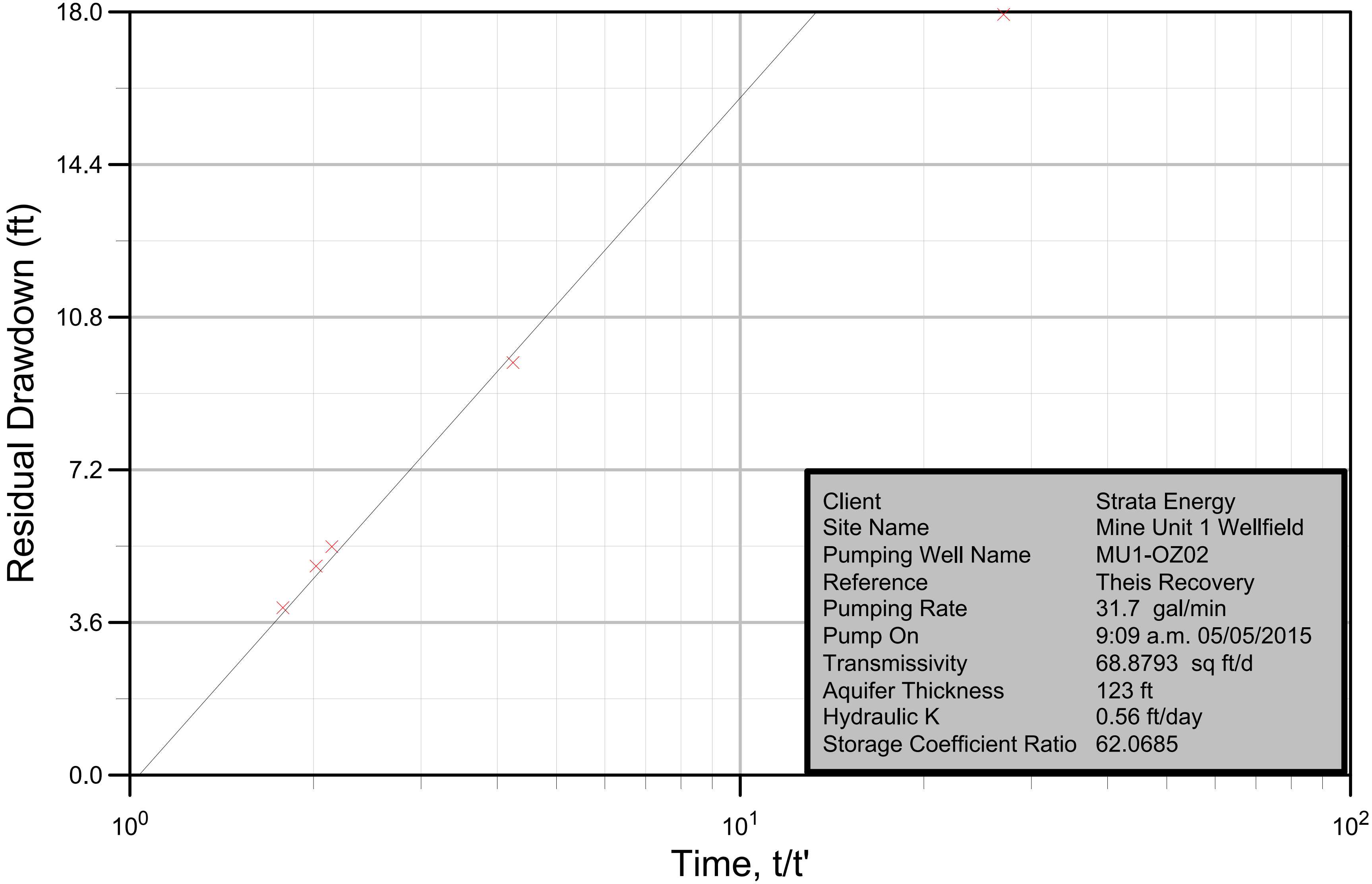

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 71.5042 sq ft/d
Aquifer Thickness 109 ft
Hydraulic K 0.66 ft/day
Storage Coefficient 0.000136189
Drawdown (ft)
25.0
20.0
15.0
10.0
5.0
0.0
10^1
10^2
10^3
10^4
Time (min)

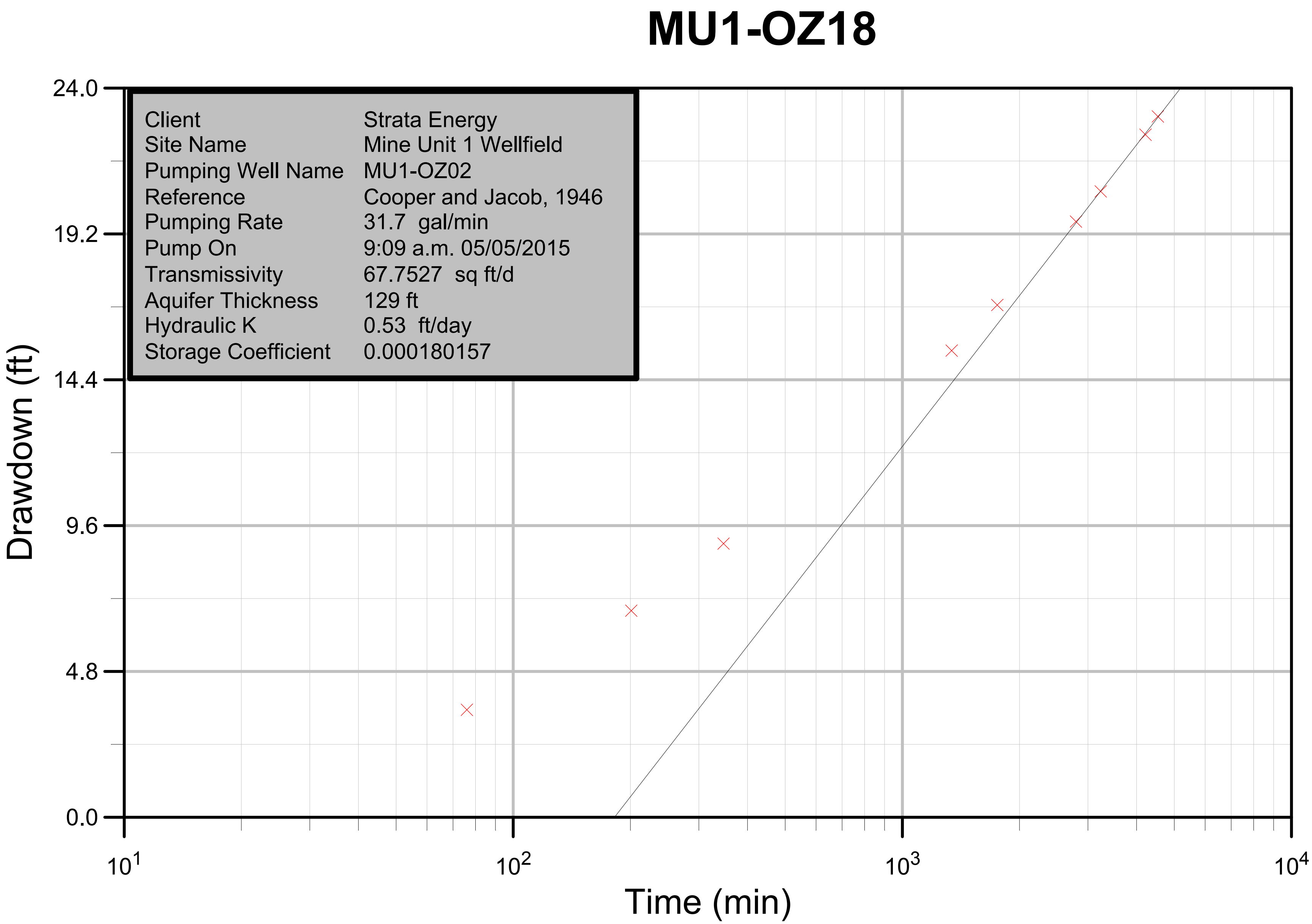
MU1-OZ16


18.0
14.4
10.8
7.2
3.6
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ02
Reference
Theis Recovery
Pumping Rate
31.7 gal/min
Pump On
9:09 a.m. 05/05/2015
Transmissivity
71.2906 sq ft/d
Aquifer Thickness
109 ft
Hydraulic K
0.65 ft/day
Storage Coefficient Ratio
62.4671

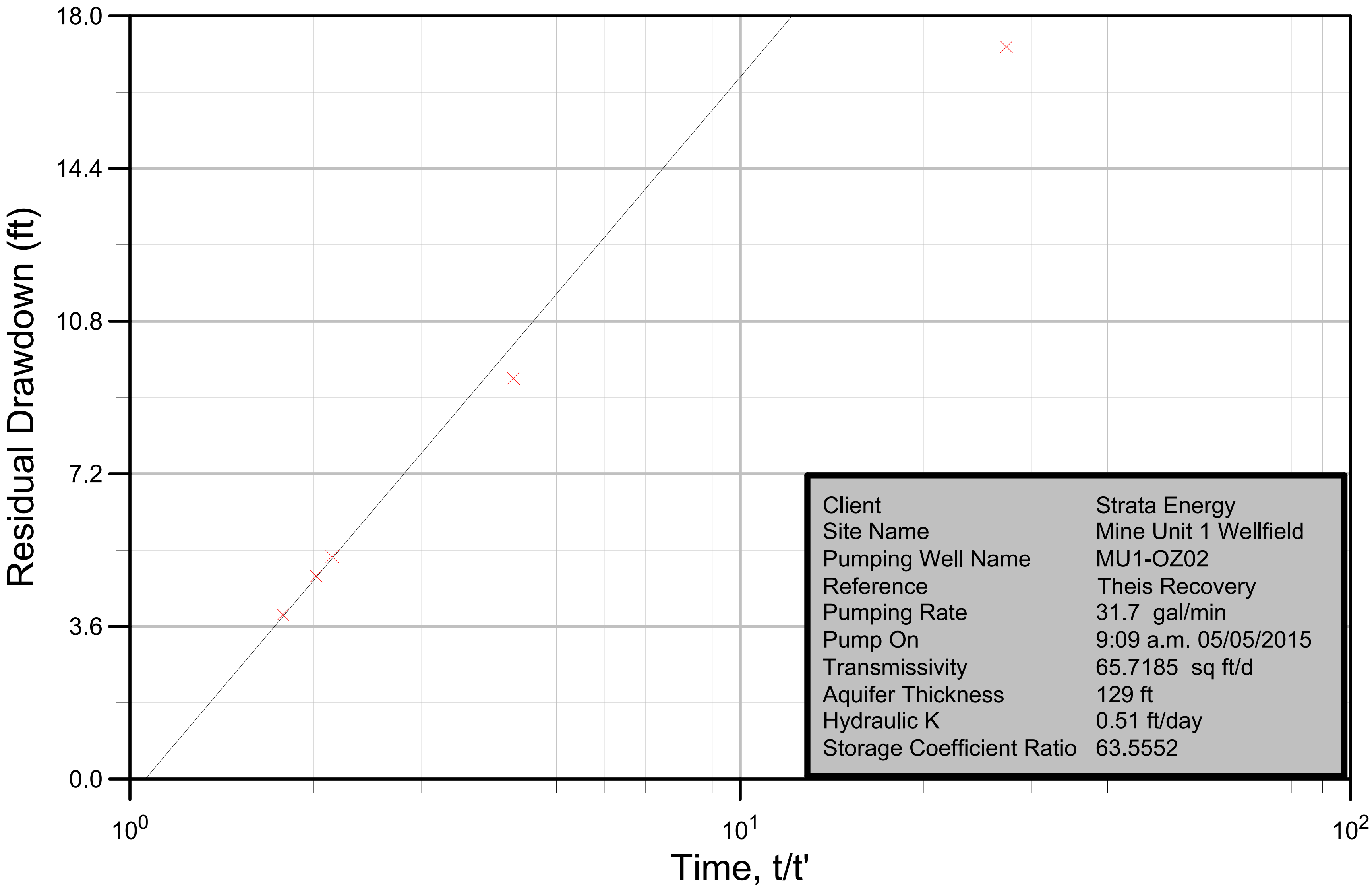

MU1-OZ17
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 68.3666 sq ft/d
Aquifer Thickness 123 ft
Hydraulic K 0.56 ft/day
Storage Coefficient 0.000231372
Drawdown (ft)
27.0
21.6
16.2
10.8
5.4
0.0
Time (min)
10^1
10^2
10^3
10^4

MU1-OZ17


18.0
14.4
10.8
7.2
3.6
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client | Strata Energy
Site Name | Mine Unit 1 Wellfield
Pumping Well Name | MU1-OZ02
Reference | Theis Recovery
Pumping Rate | 31.7 gal/min
Pump On | 9:09 a.m. 05/05/2015
Transmissivity | 68.8793 sq ft/d
Aquifer Thickness | 123 ft
Hydraulic K | 0.56 ft/day
Storage Coefficient Ratio | 62.0685

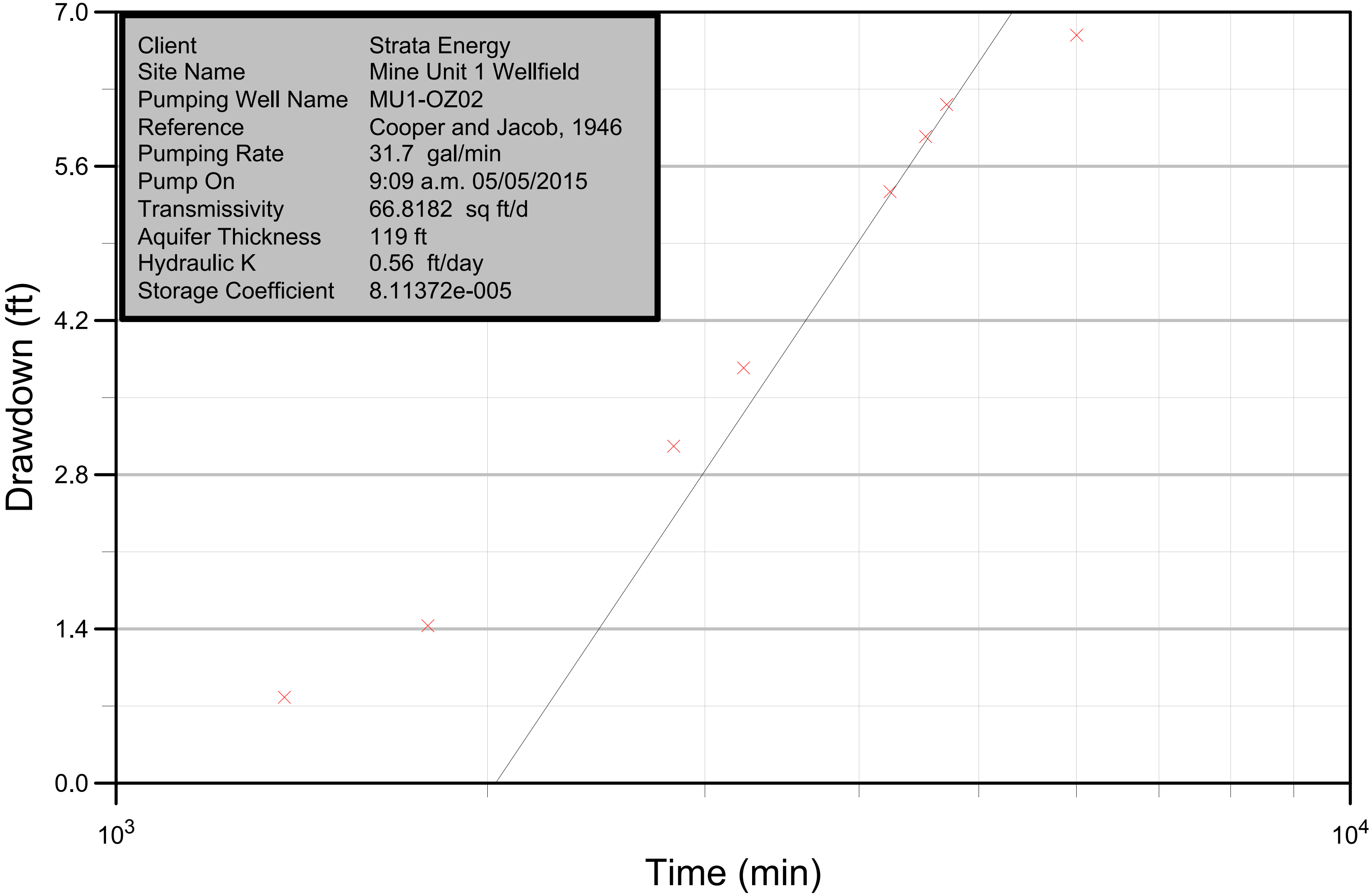

MU1-OZ18
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 67.7527 sq ft/d
Aquifer Thickness 129 ft
Hydraulic K 0.53 ft/day
Storage Coefficient 0.000180157
Drawdown (ft)
Time (min)

MU1-OZ18

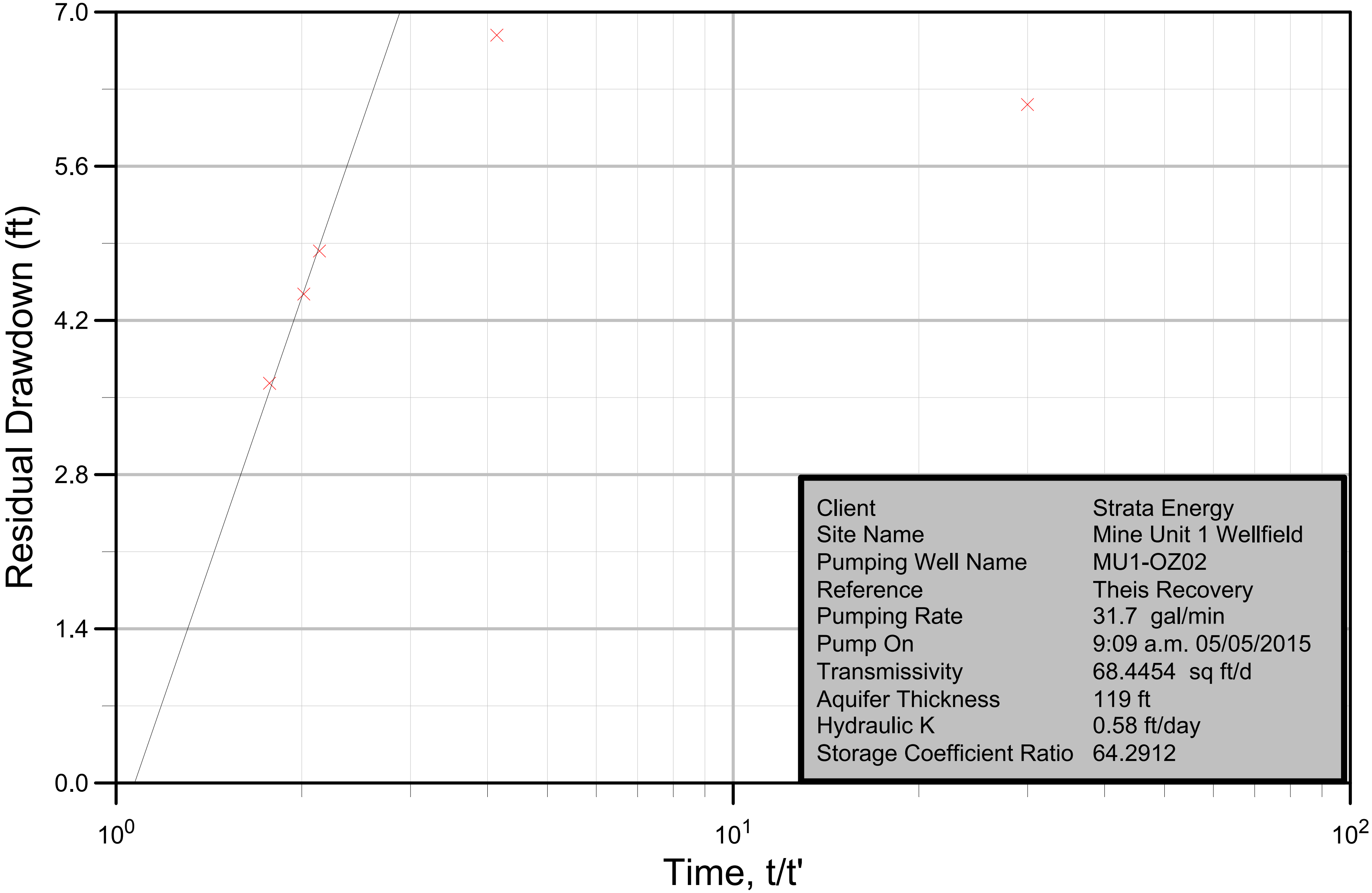


Client	Strata Energy
Site Name	Mine Unit 1 Wellfield
Pumping Well Name	MU1-OZ02
Reference	Theis Recovery
Pumping Rate	31.7 gal/min
Pump On	9:09 a.m. 05/05/2015
Transmissivity	65.7185 sq ft/d
Aquifer Thickness	129 ft
Hydraulic K	0.51 ft/day
Storage Coefficient Ratio	63.5552

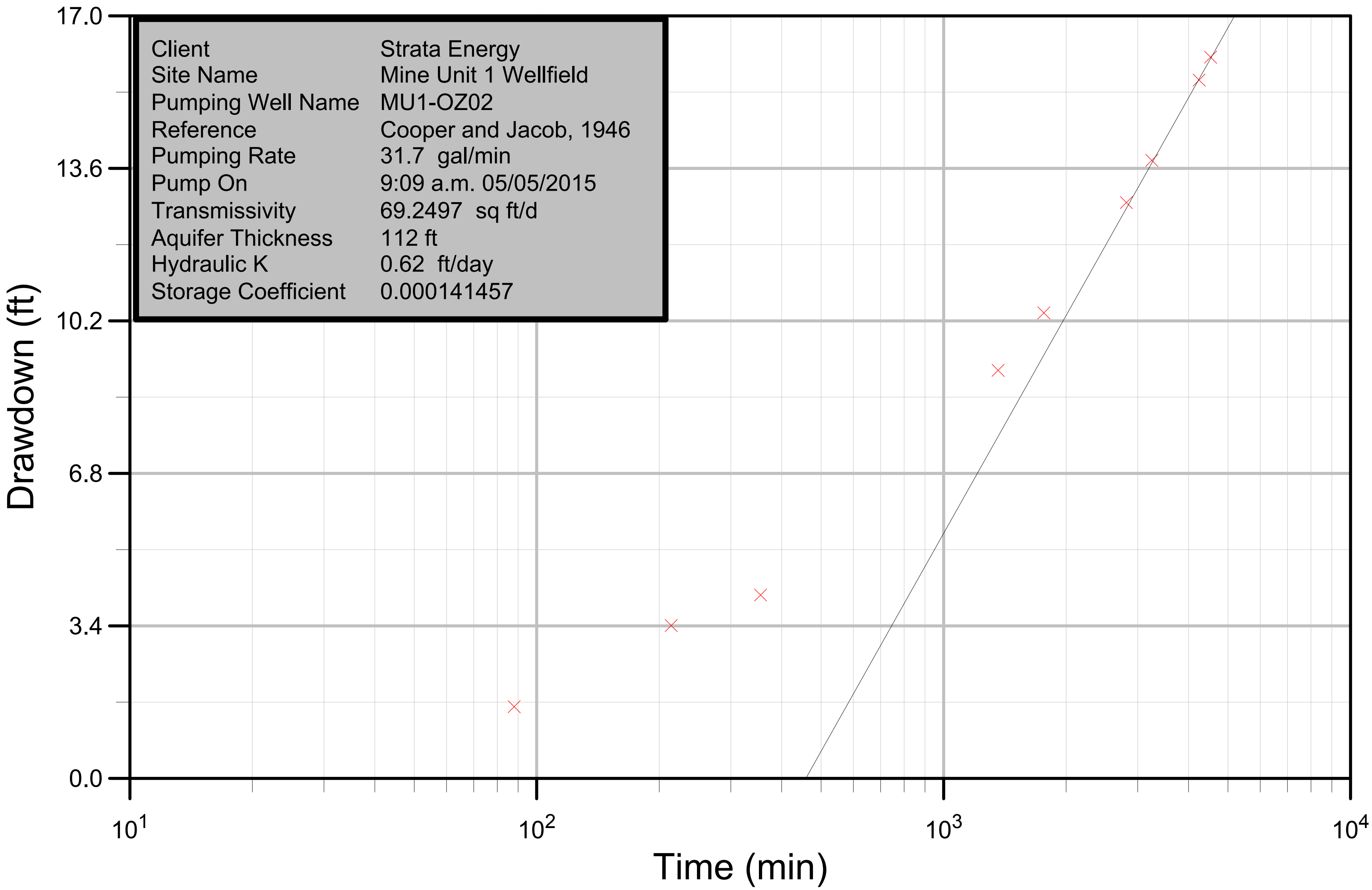
MU1-OZ19


Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 66.8182 sq ft/d
Aquifer Thickness 119 ft
Hydraulic K 0.56 ft/day
Storage Coefficient 8.11372e-005
Drawdown (ft)
7.0
5.6
4.2
2.8
1.4
0.0
10^3
10^4
Time (min)

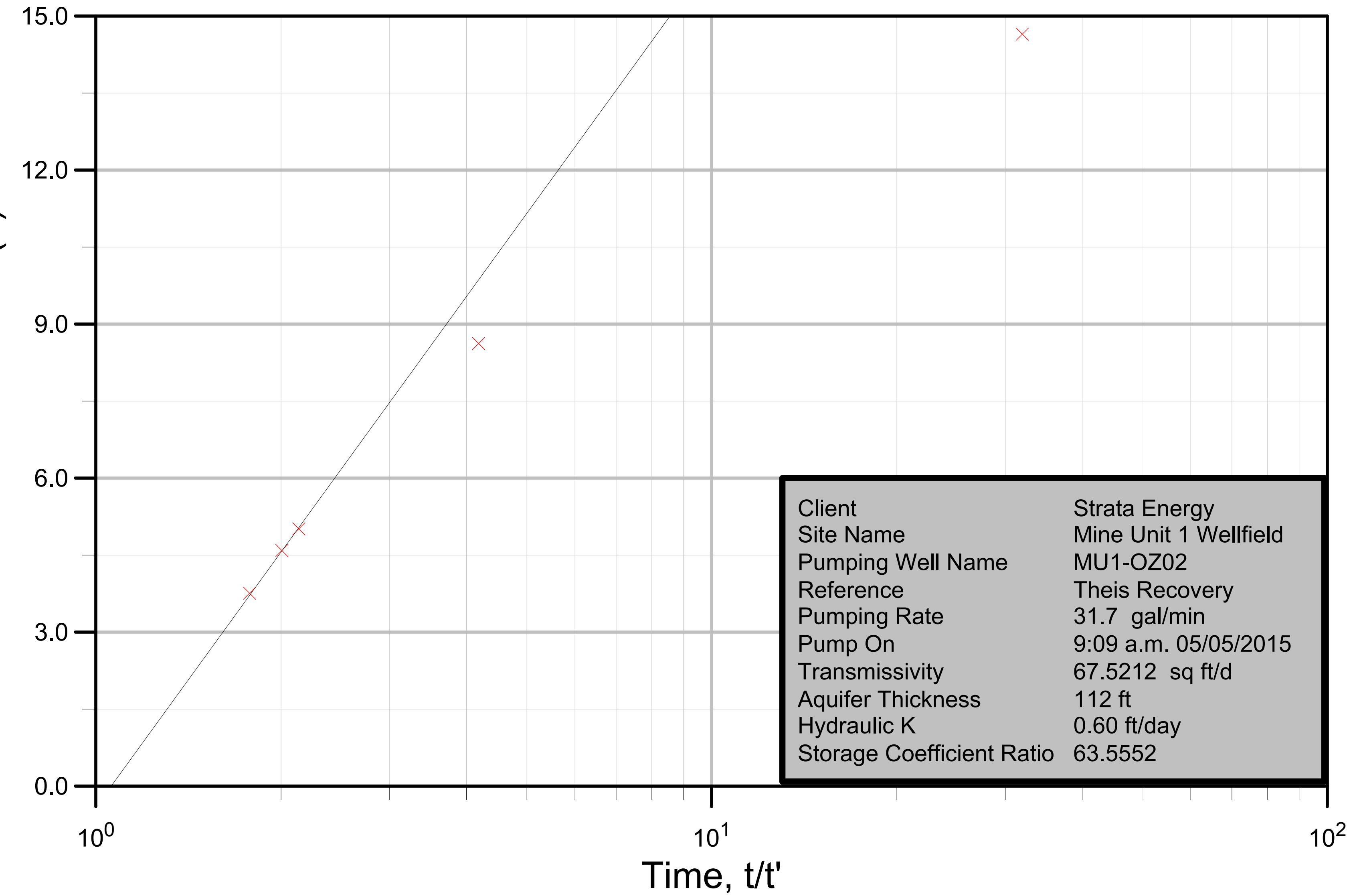
MU1-OZ19


Residual Drawdown (ft)
7.0
5.6
4.2
2.8
1.4
0.0
10^0
10^1
10^2
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 68.4454 sq ft/d
Aquifer Thickness 119 ft
Hydraulic K 0.58 ft/day
Storage Coefficient Ratio 64.2912

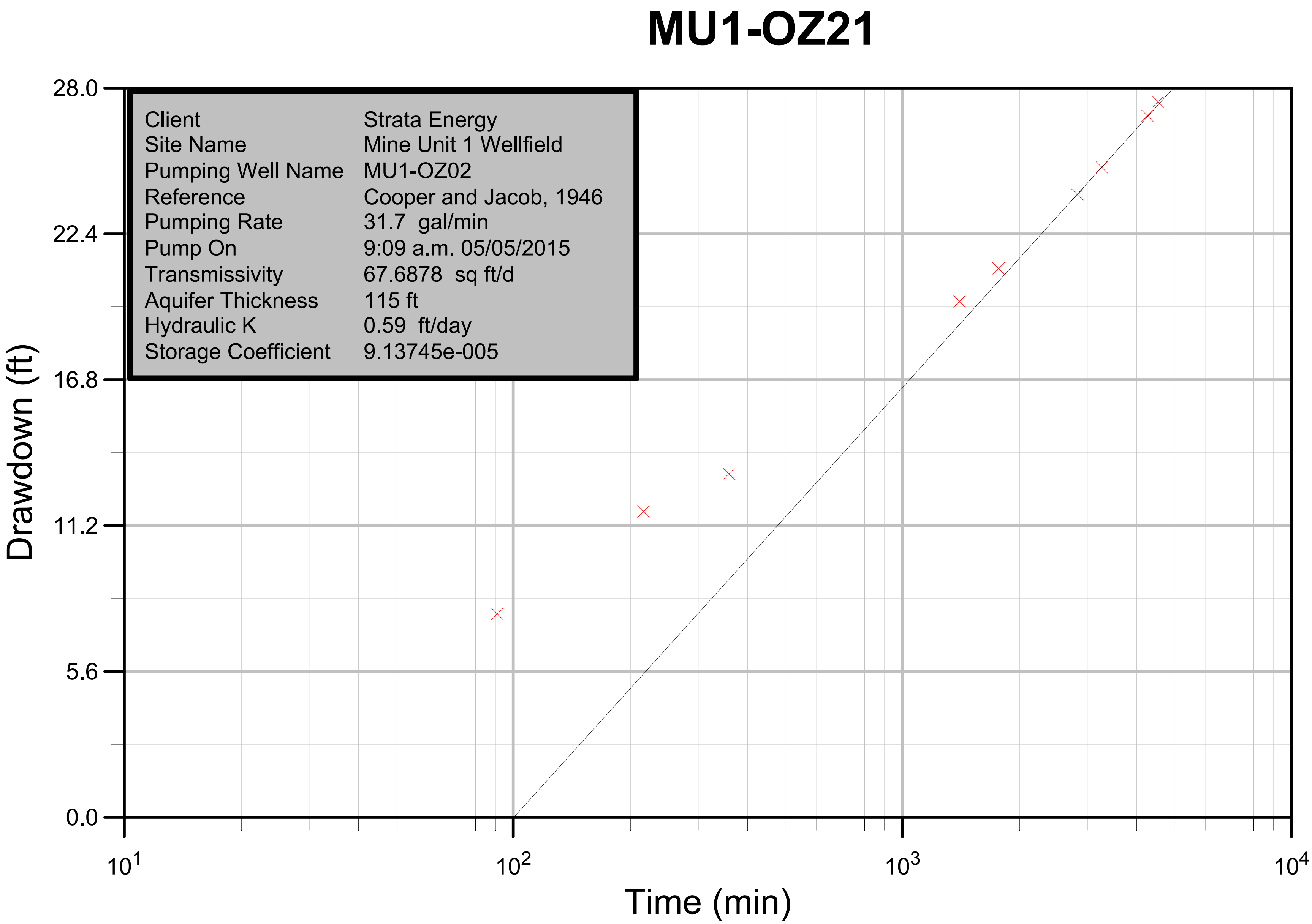
MU1-OZ20


Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ02
Reference
Cooper and Jacob, 1946
Pumping Rate
31.7 gal/min
Pump On
9:09 a.m. 05/05/2015
Transmissivity
69.2497 sq ft/d
Aquifer Thickness
112 ft
Hydraulic K
0.62 ft/day
Storage Coefficient
0.000141457
Drawdown (ft)
17.0
13.6
10.2
6.8
3.4
0.0
Time (min)
10^1
10^2
10^3
10^4

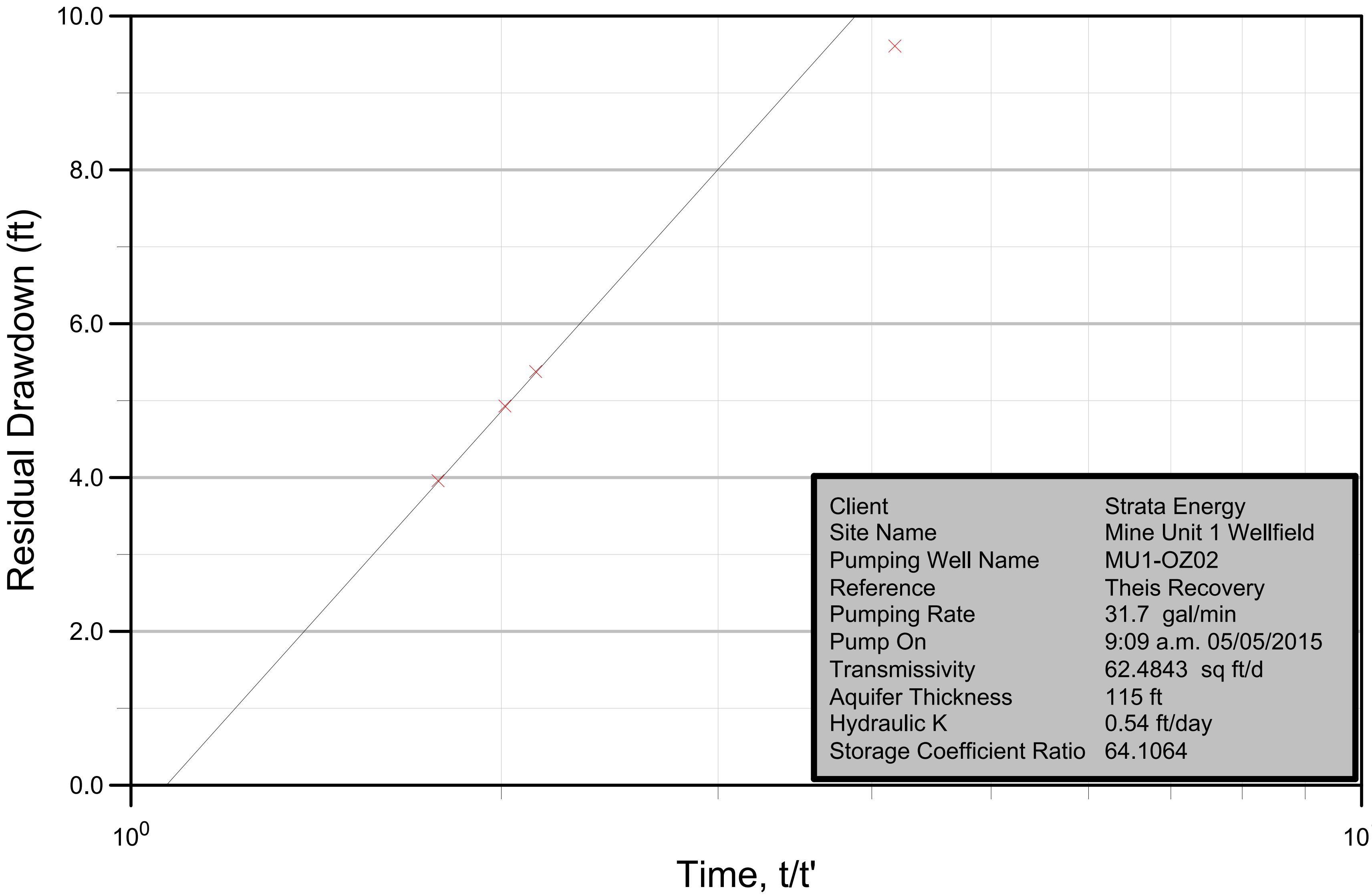
MU1-OZ20



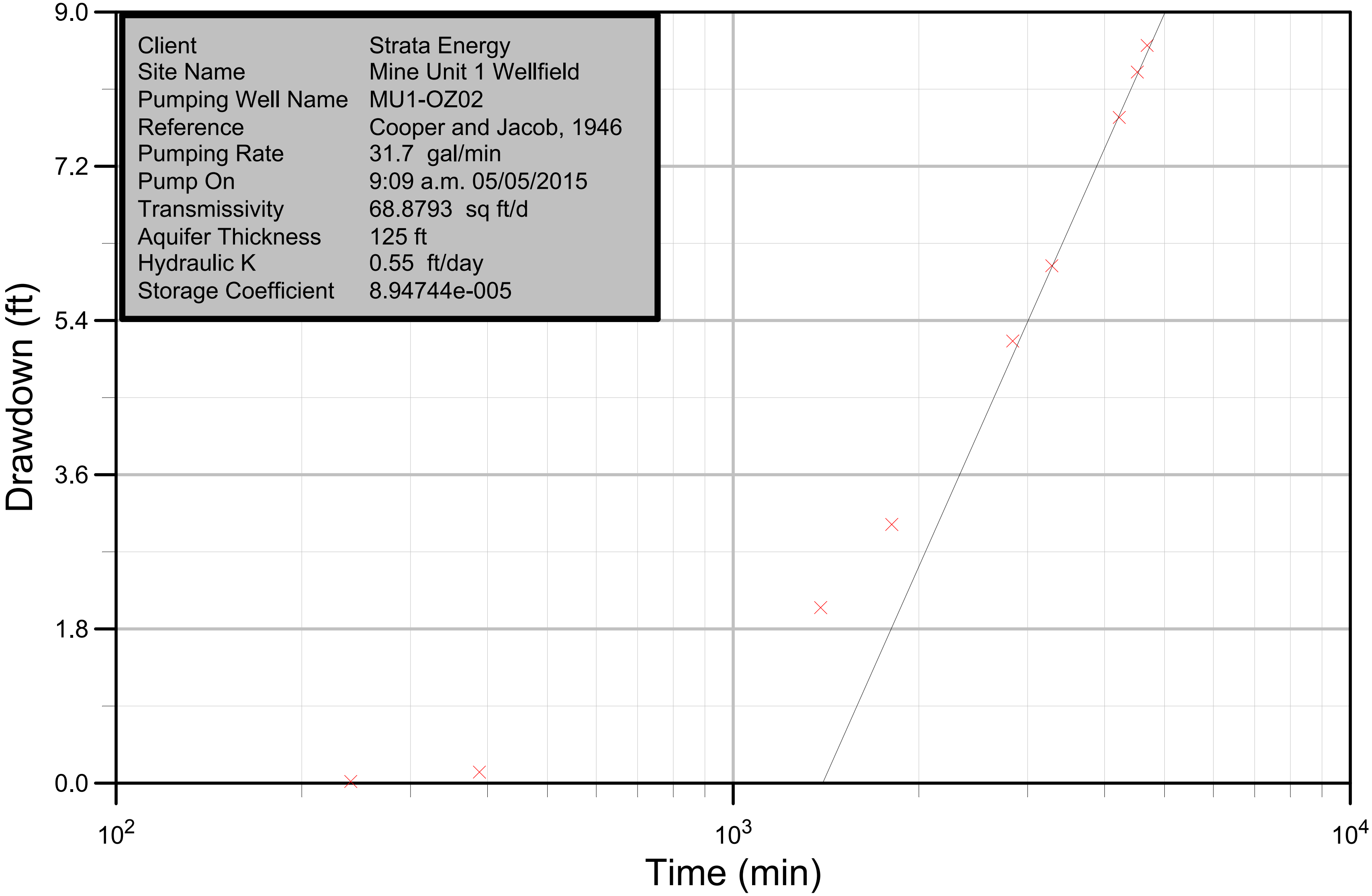
Client	Strata Energy
Site Name	Mine Unit 1 Wellfield
Pumping Well Name	MU1-OZ02
Reference	Theis Recovery
Pumping Rate	31.7 gal/min
Pump On	9:09 a.m. 05/05/2015
Transmissivity	67.5212 sq ft/d
Aquifer Thickness	112 ft
Hydraulic K	0.60 ft/day
Storage Coefficient Ratio	63.5552


MU1-OZ21
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 67.6878 sq ft/d
Aquifer Thickness 115 ft
Hydraulic K 0.59 ft/day
Storage Coefficient 9.13745e-005
Drawdown (ft)
28.0
22.4
16.8
11.2
5.6
0.0
Time (min)
10^1
10^2
10^3
10^4

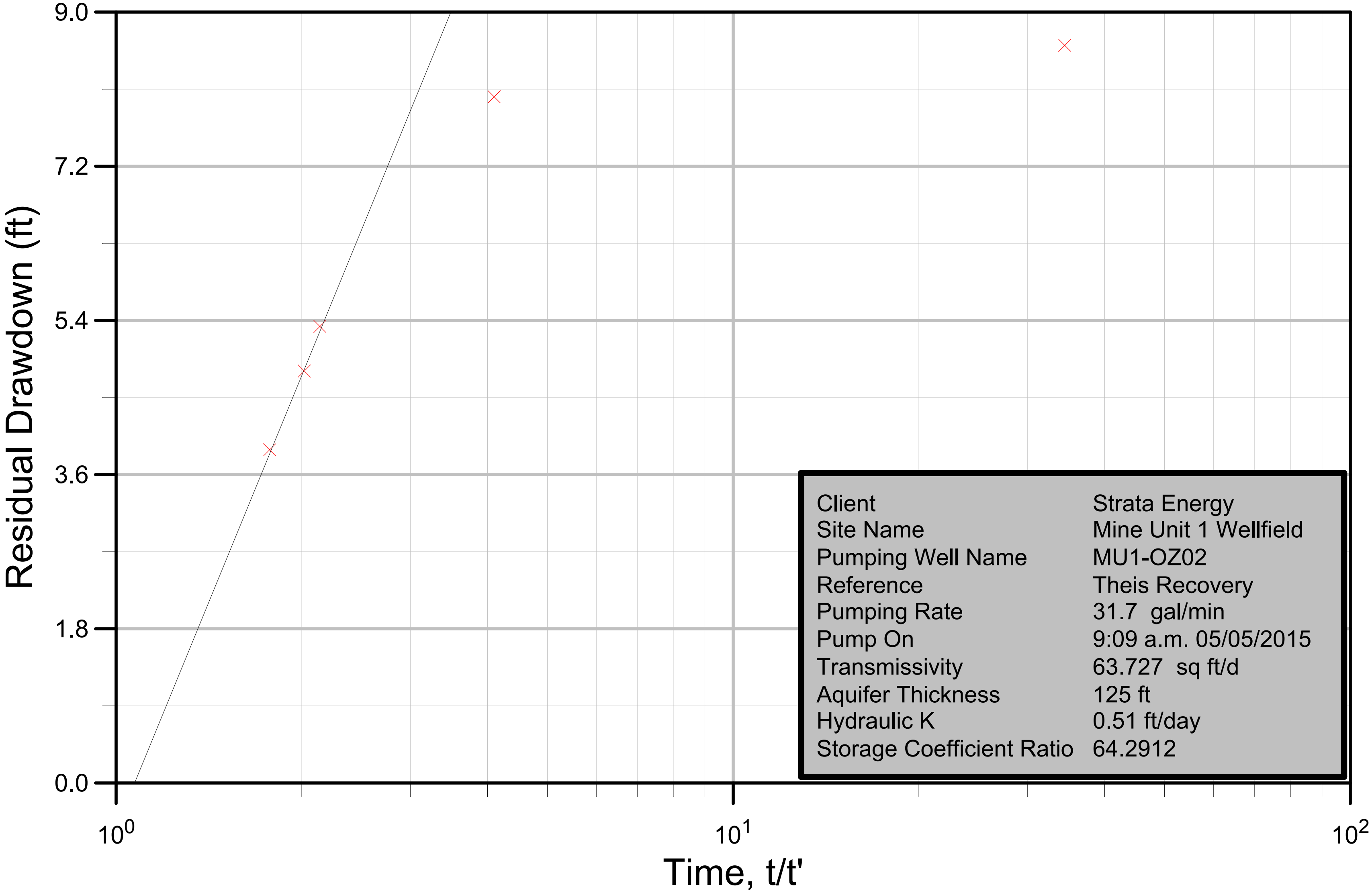
MU1-OZ21


Residual Drawdown (ft)
10.0
8.0
6.0
4.0
2.0
0.0
10^0
10^1
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 62.4843 sq ft/d
Aquifer Thickness 115 ft
Hydraulic K 0.54 ft/day
Storage Coefficient Ratio 64.1064

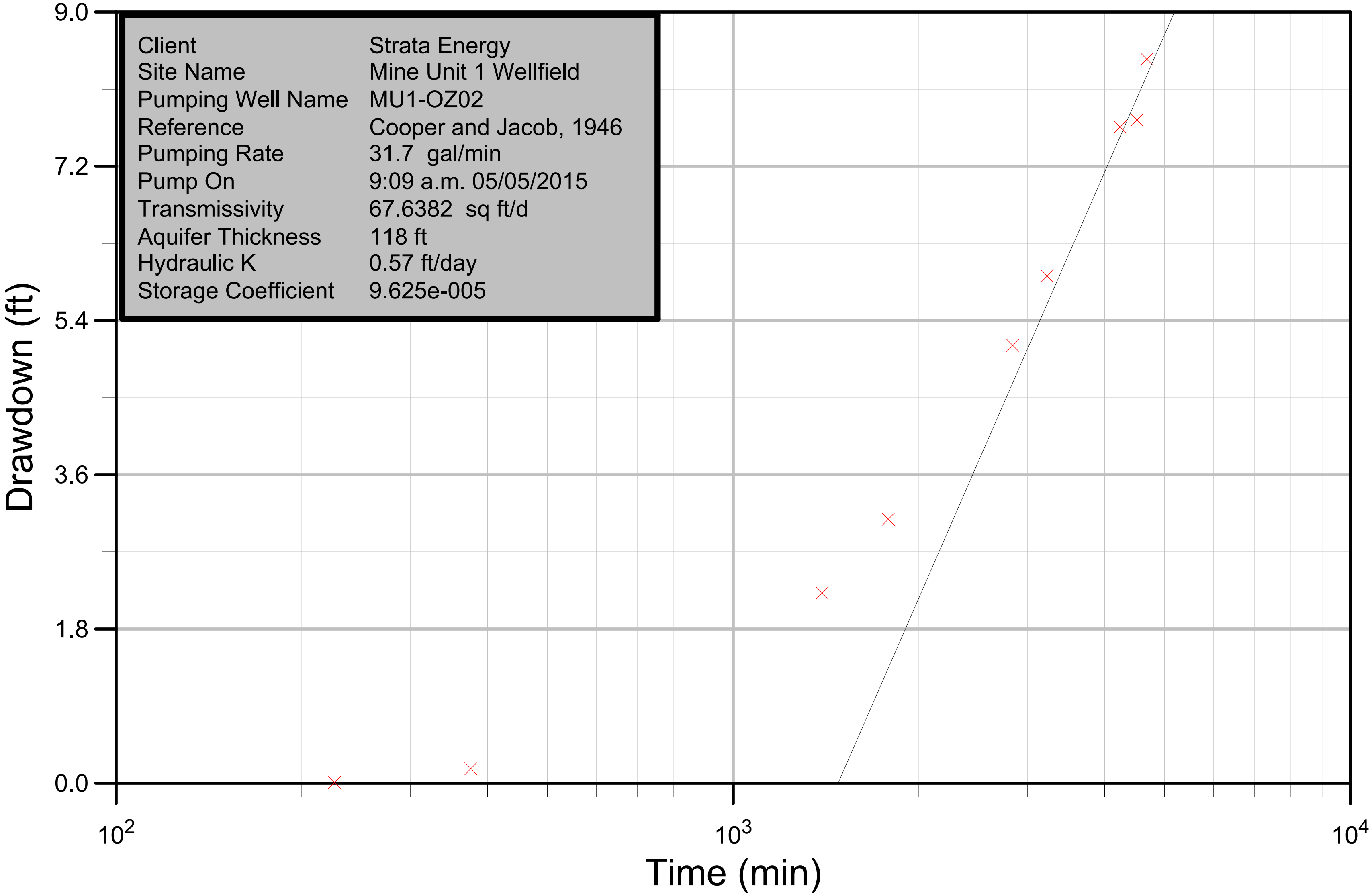
MU1-OZ22


Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 68.8793 sq ft/d
Aquifer Thickness 125 ft
Hydraulic K 0.55 ft/day
Storage Coefficient 8.94744e-005
Drawdown (ft)
9.0
7.2
5.4
3.6
1.8
0.0
10^2
10^3
10^4
Time (min)

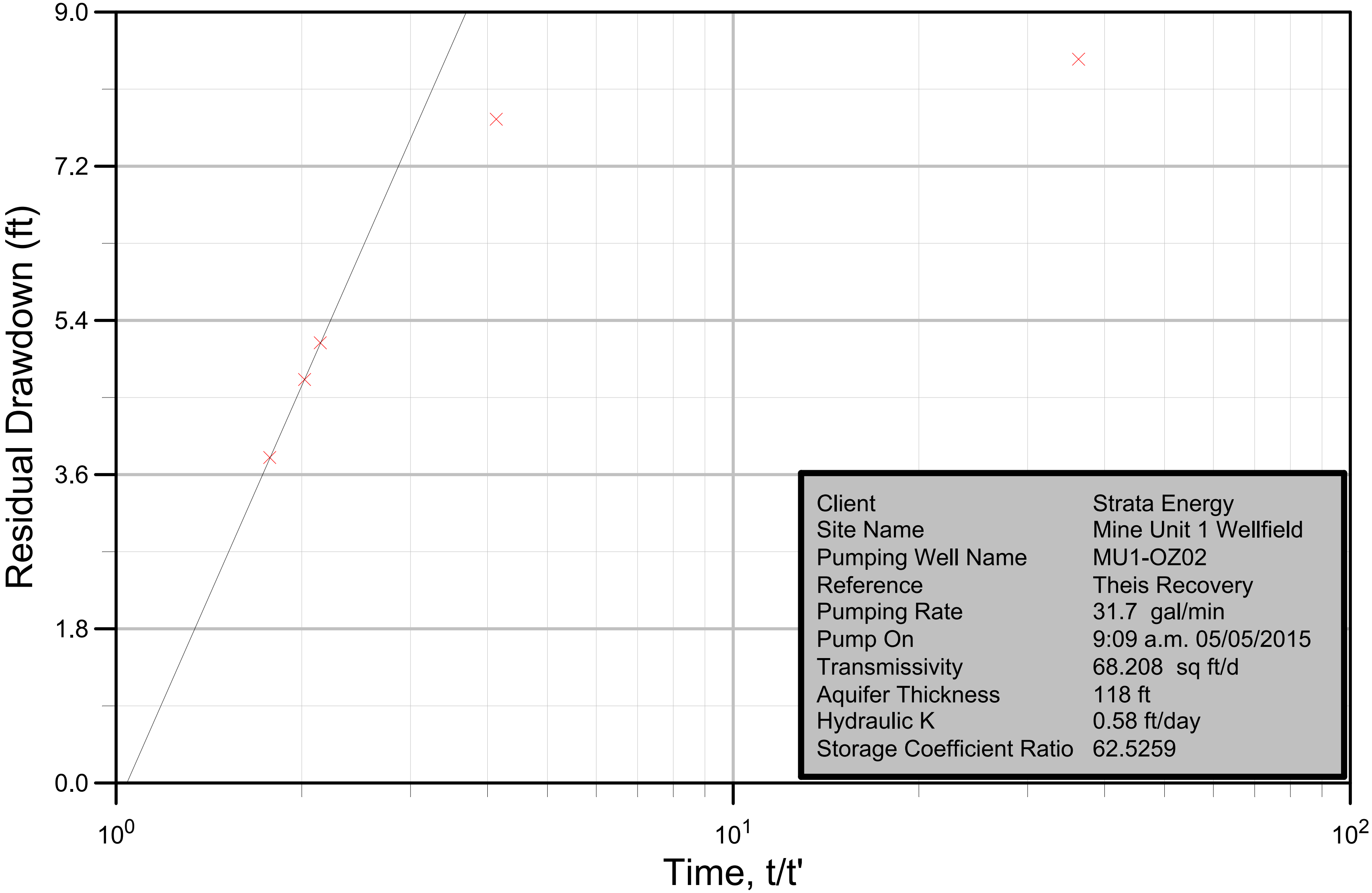
MU1-OZ22


9.0
7.2
5.4
3.6
1.8
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 63.727 sq ft/d
Aquifer Thickness 125 ft
Hydraulic K 0.51 ft/day
Storage Coefficient Ratio 64.2912

MU1-OZ24

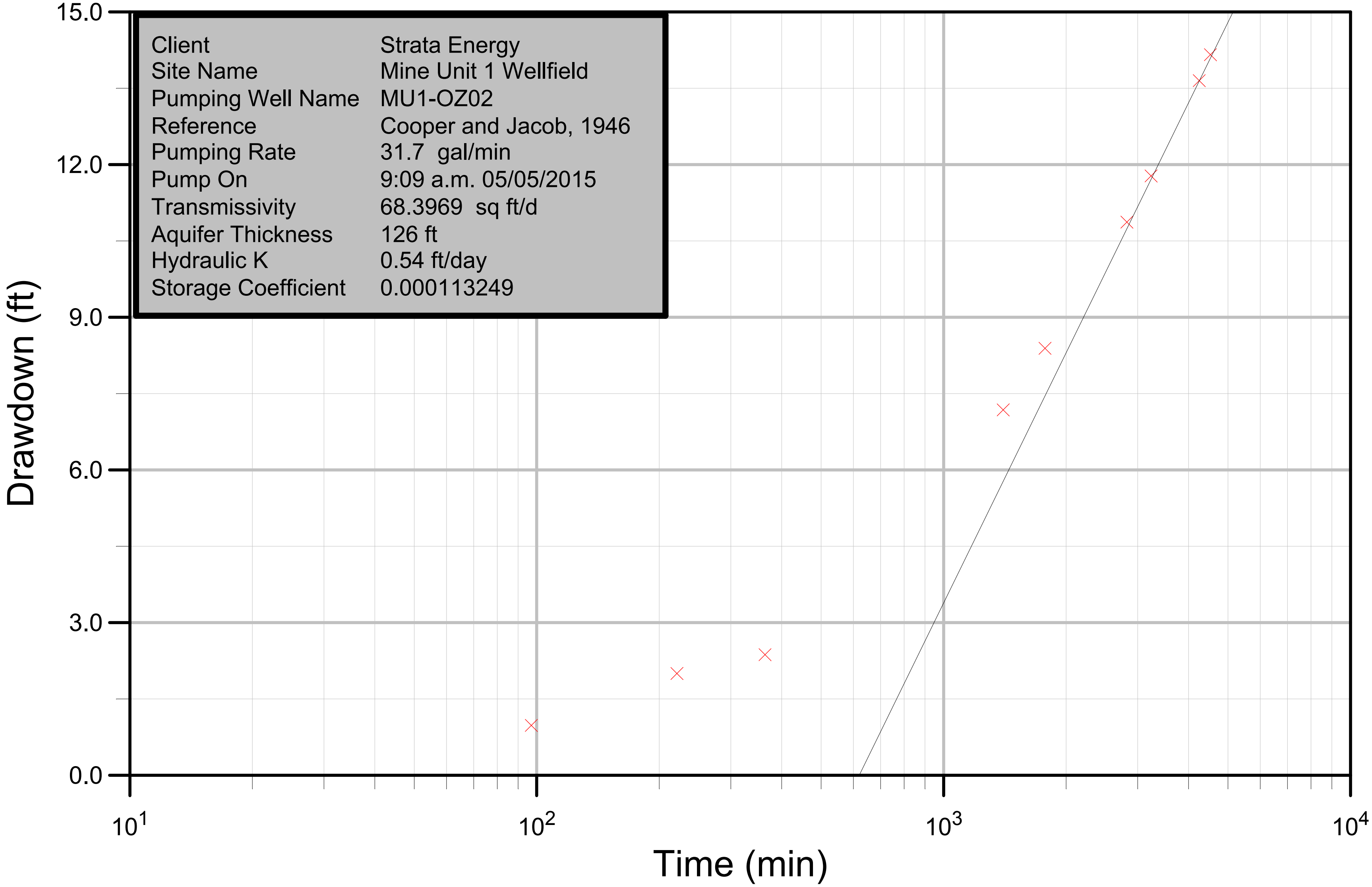

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 67.6382 sq ft/d
Aquifer Thickness 118 ft
Hydraulic K 0.57 ft/day
Storage Coefficient 9.625e-005
Drawdown (ft)
9.0
7.2
5.4
3.6
1.8
0.0
10^2
10^3
10^4
Time (min)

MU1-OZ24

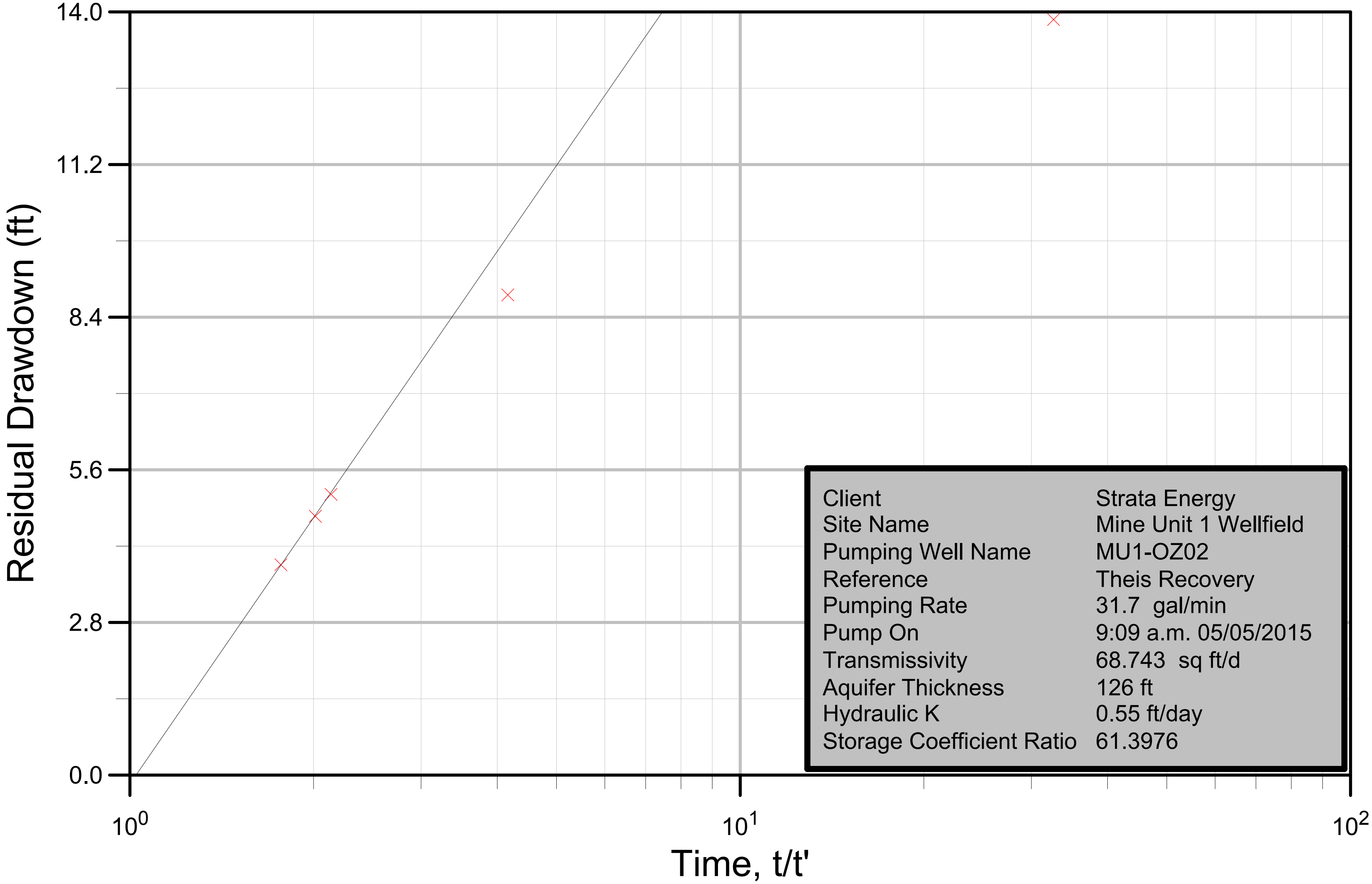


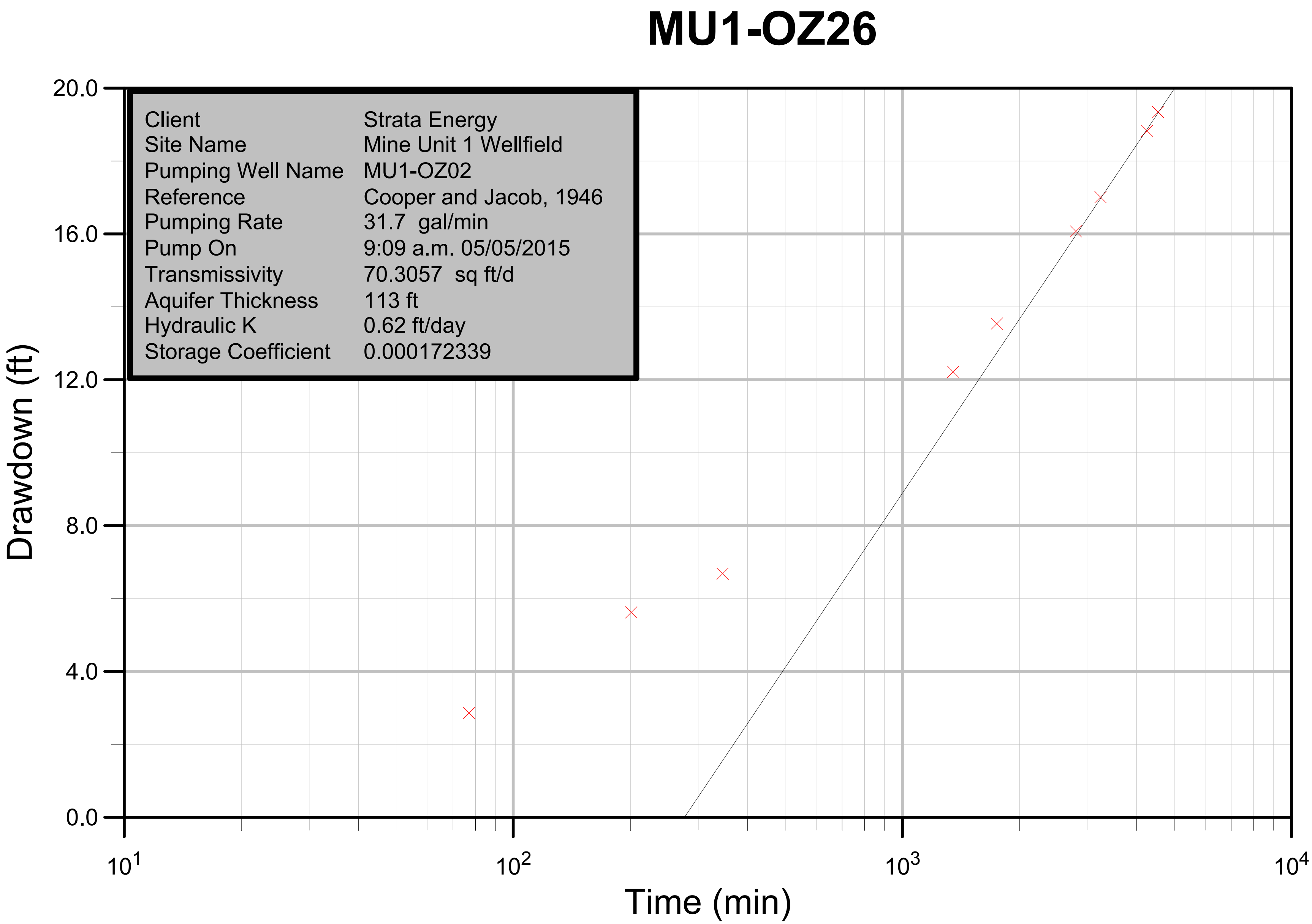
Client	Strata Energy
Site Name	Mine Unit 1 Wellfield
Pumping Well Name	MU1-OZ02
Reference	Theis Recovery
Pumping Rate	31.7 gal/min
Pump On	9:09 a.m. 05/05/2015
Transmissivity	68.208 sq ft/d
Aquifer Thickness	118 ft
Hydraulic K	0.58 ft/day
Storage Coefficient Ratio	62.5259

MU1-OZ25

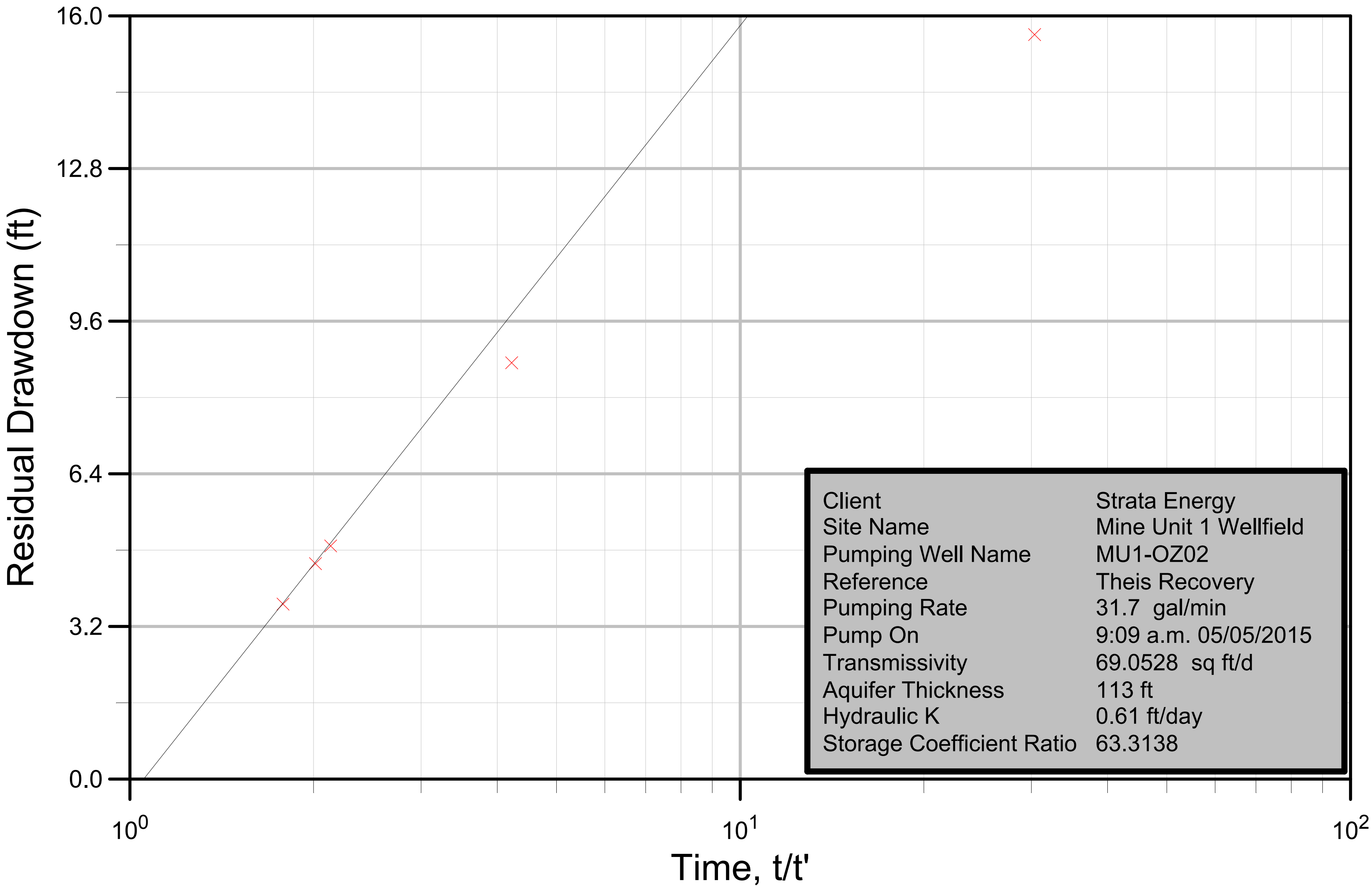

Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ02
Reference
Cooper and Jacob, 1946
Pumping Rate
31.7 gal/min
Pump On
9:09 a.m. 05/05/2015
Transmissivity
68.3969 sq ft/d
Aquifer Thickness
126 ft
Hydraulic K
0.54 ft/day
Storage Coefficient
0.000113249
Drawdown (ft)
15.0
12.0
9.0
6.0
3.0
0.0
10^1
10^2
10^3
10^4
Time (min)

MU1-OZ25

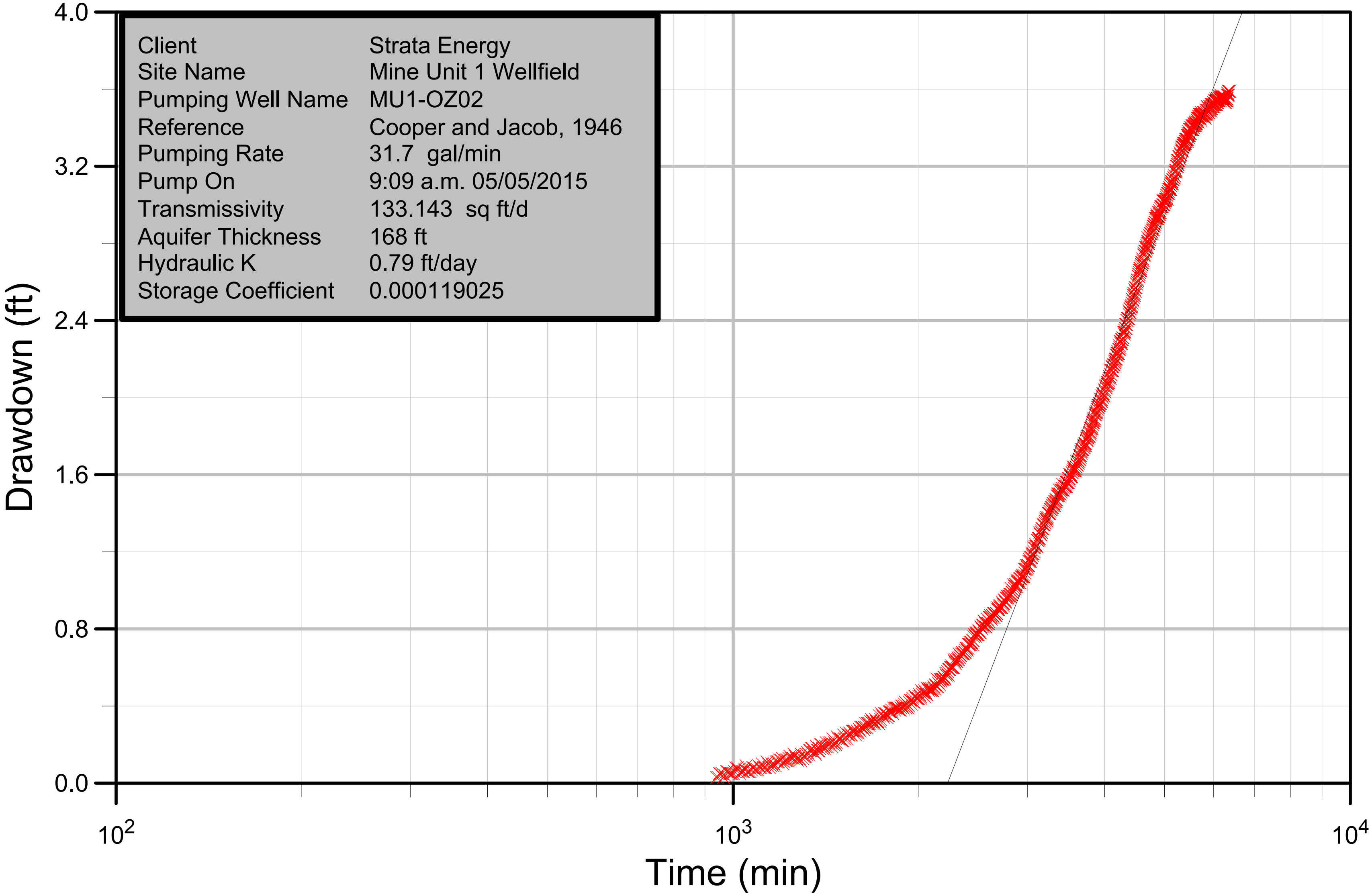

14.0
11.2
8.4
5.6
2.8
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 68.743 sq ft/d
Aquifer Thickness 126 ft
Hydraulic K 0.55 ft/day
Storage Coefficient Ratio 61.3976


MU1-OZ26
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 70.3057 sq ft/d
Aquifer Thickness 113 ft
Hydraulic K 0.62 ft/day
Storage Coefficient 0.000172339
Drawdown (ft)
20.0
16.0
12.0
8.0
4.0
0.0
Time (min)
10^1
10^2
10^3
10^4

MU1-OZ26

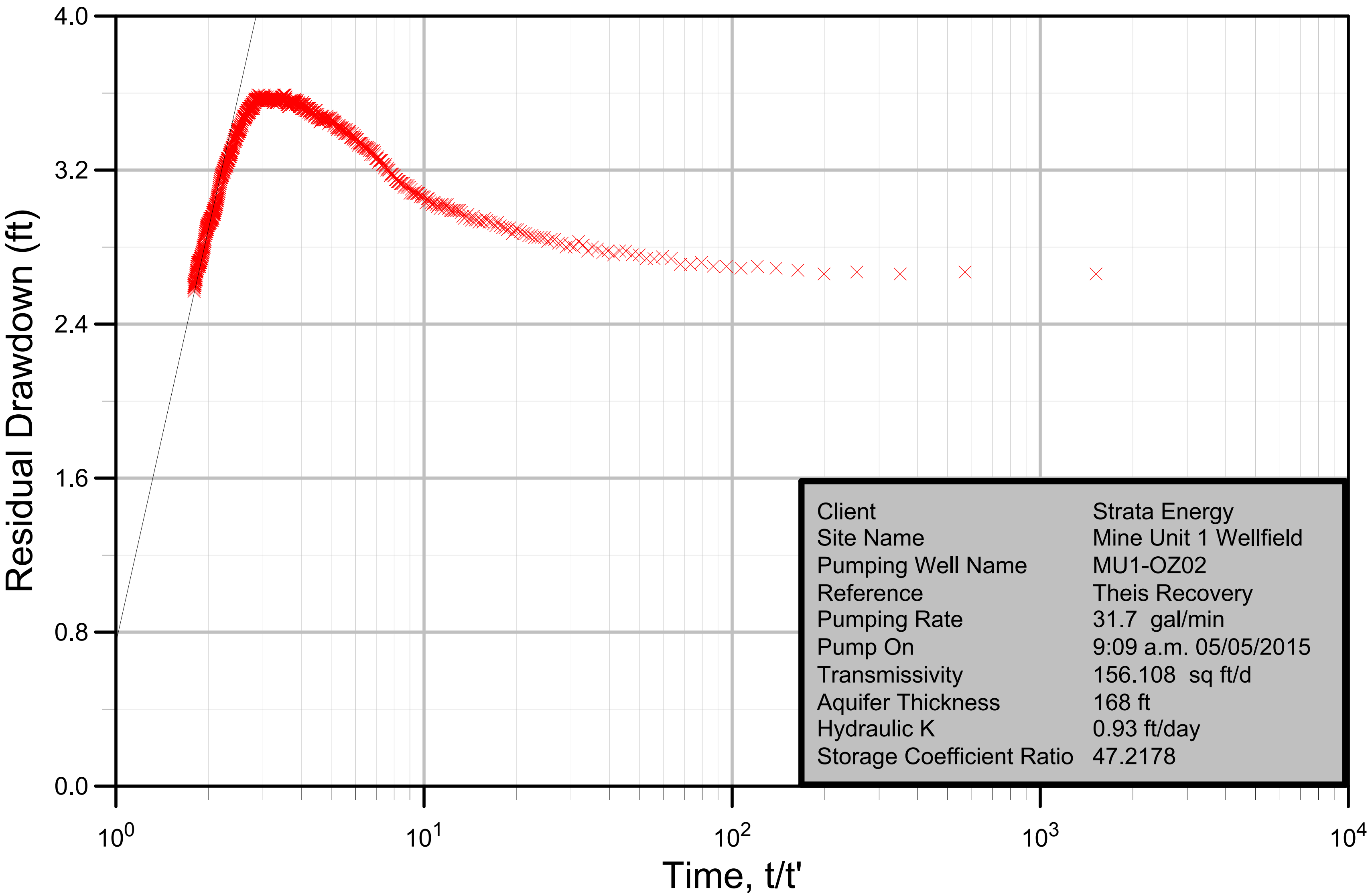

16.0
12.8
9.6
6.4
3.2
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ02
Reference
Theis Recovery
Pumping Rate
31.7 gal/min
Pump On
9:09 a.m. 05/05/2015
Transmissivity
69.0528 sq ft/d
Aquifer Thickness
113 ft
Hydraulic K
0.61 ft/day
Storage Coefficient Ratio
63.3138

MU1-PM01

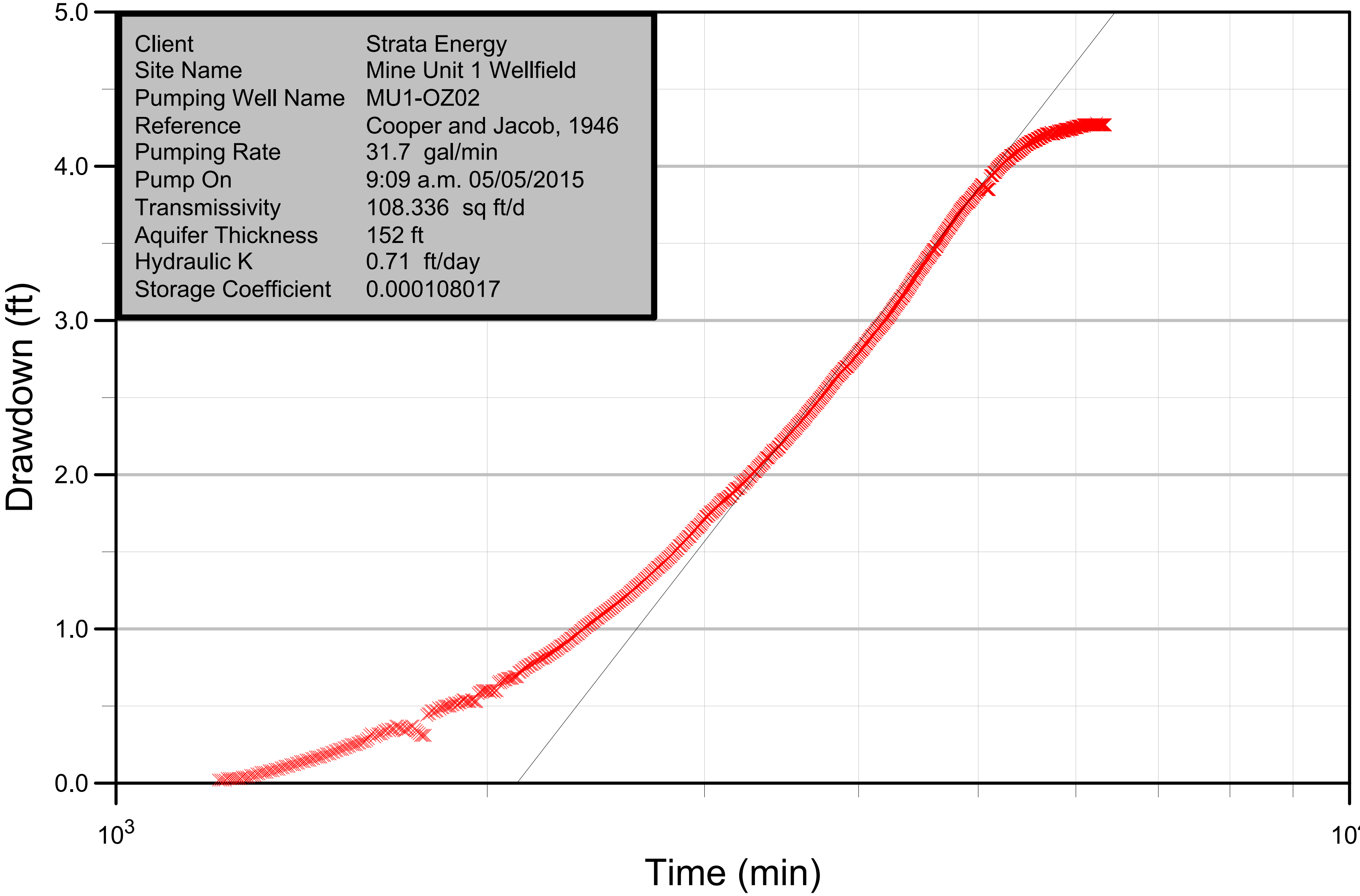


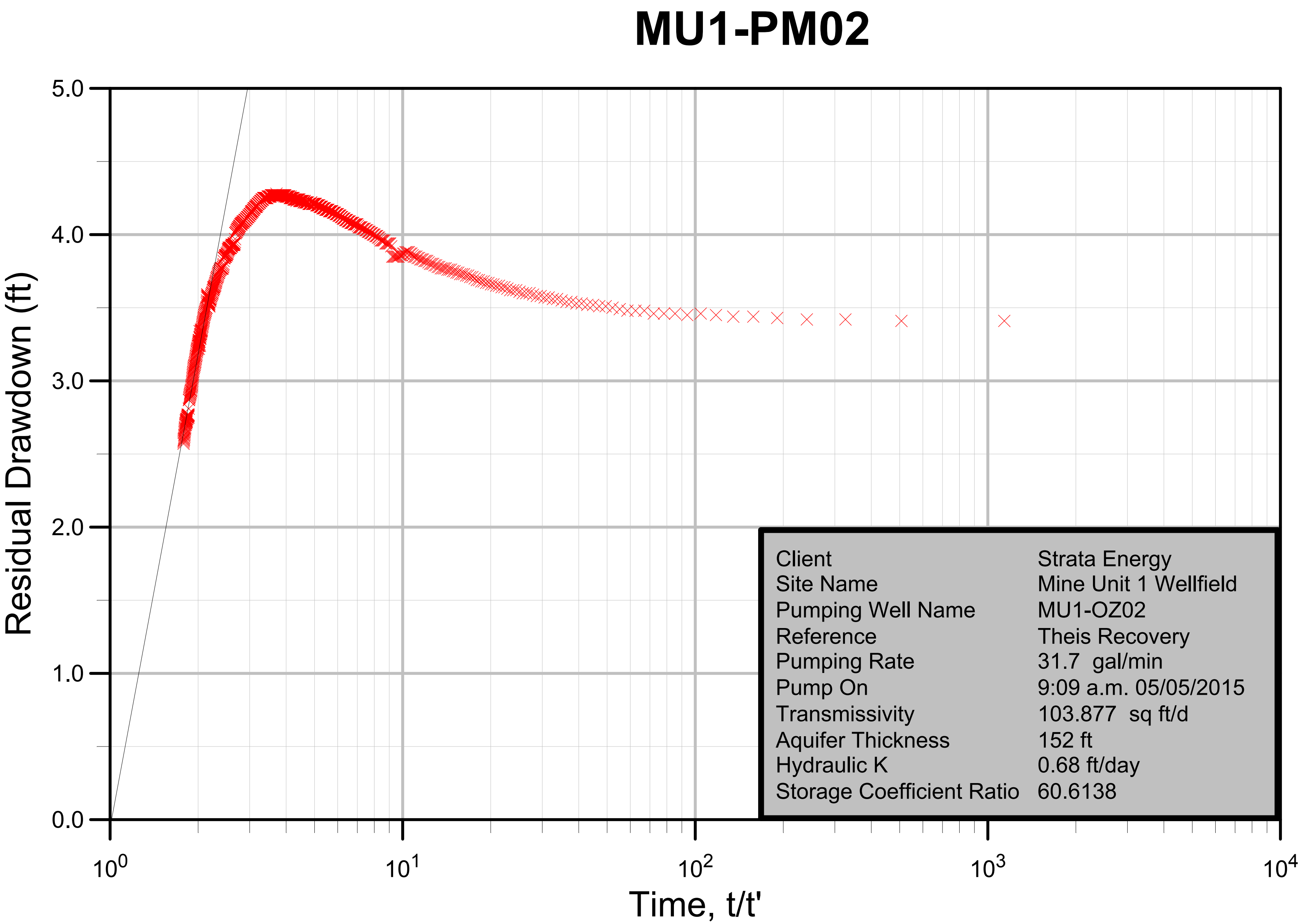
Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ02
Reference
Cooper and Jacob, 1946
Pumping Rate
31.7 gal/min
Pump On
9:09 a.m. 05/05/2015
Transmissivity
133.143 sq ft/d
Aquifer Thickness
168 ft
Hydraulic K
0.79 ft/day
Storage Coefficient
0.000119025
Drawdown (ft)
4.0
3.2
2.4
1.6
0.8
0.0
10^2
10^3
10^4
Time (min)

MU1-PM01

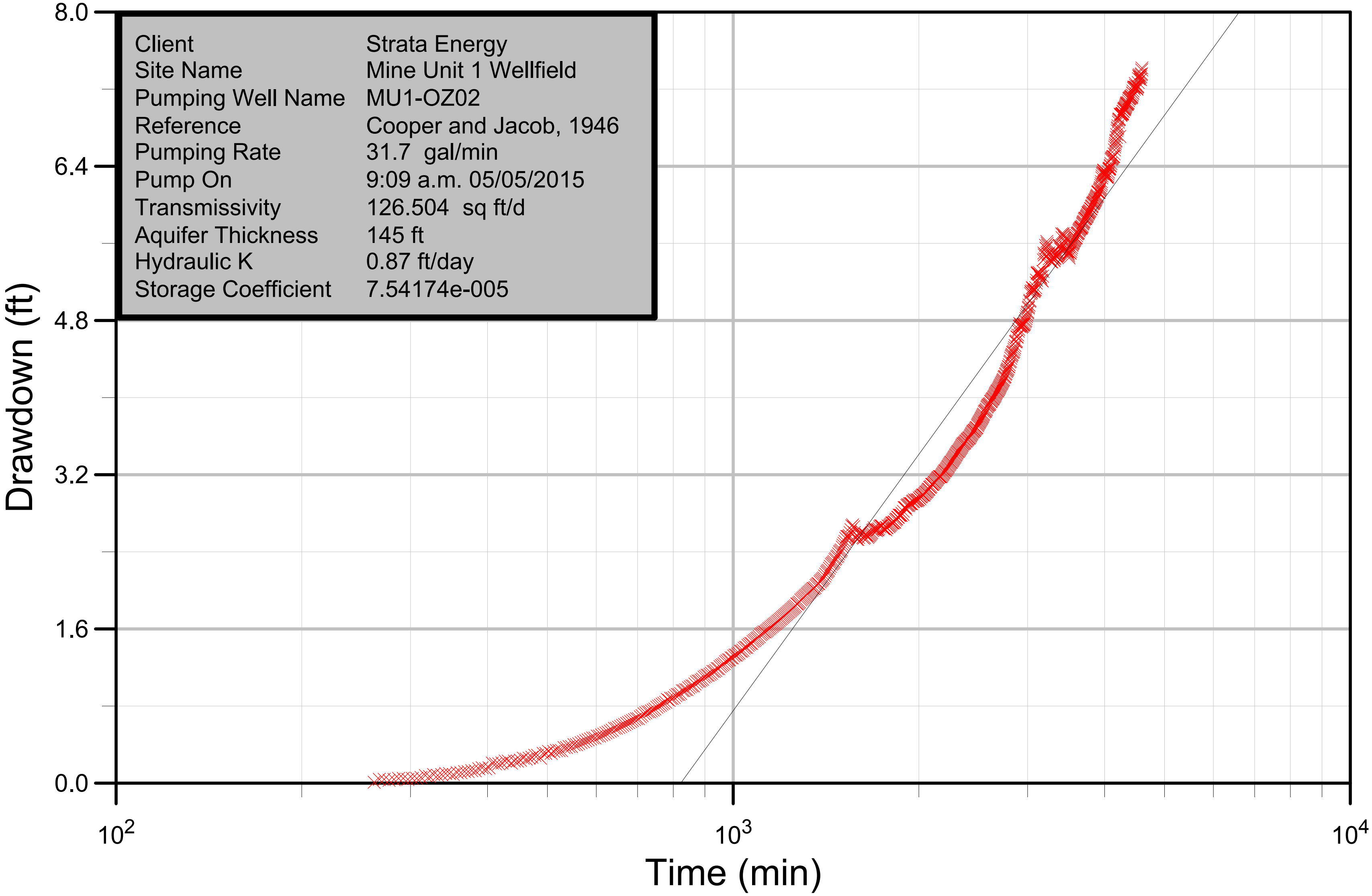

Residual Drawdown (ft)
4.0
3.2
2.4
1.6
0.8
0.0
10^0
10^1
10^2
10^3
10^4
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 156.108 sq ft/d
Aquifer Thickness 168 ft
Hydraulic K 0.93 ft/day
Storage Coefficient Ratio 47.2178

MU1-PM02

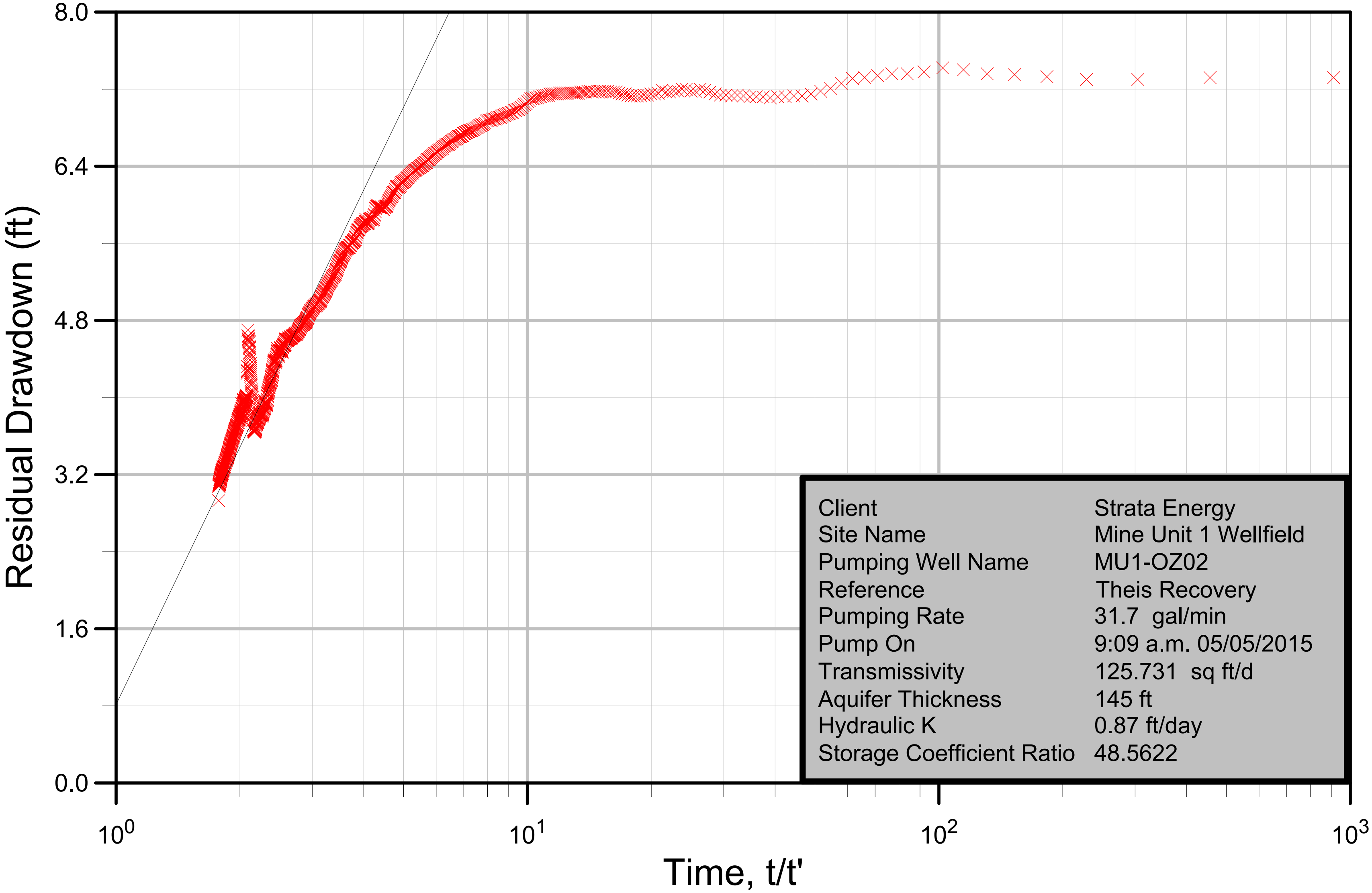

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 108.336 sq ft/d
Aquifer Thickness 152 ft
Hydraulic K 0.71 ft/day
Storage Coefficient 0.000108017
Drawdown (ft)
5.0
4.0
3.0
2.0
1.0
0.0
10^3
10^4
Time (min)


MU1-PM02
Residual Drawdown (ft)
5.0
4.0
3.0
2.0
1.0
0.0
10^0
10^1
10^2
10^3
10^4
Time, t/t'
Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ02
Reference
Theis Recovery
Pumping Rate
31.7 gal/min
Pump On
9:09 a.m. 05/05/2015
Transmissivity
103.877 sq ft/d
Aquifer Thickness
152 ft
Hydraulic K
0.68 ft/day
Storage Coefficient Ratio
60.6138

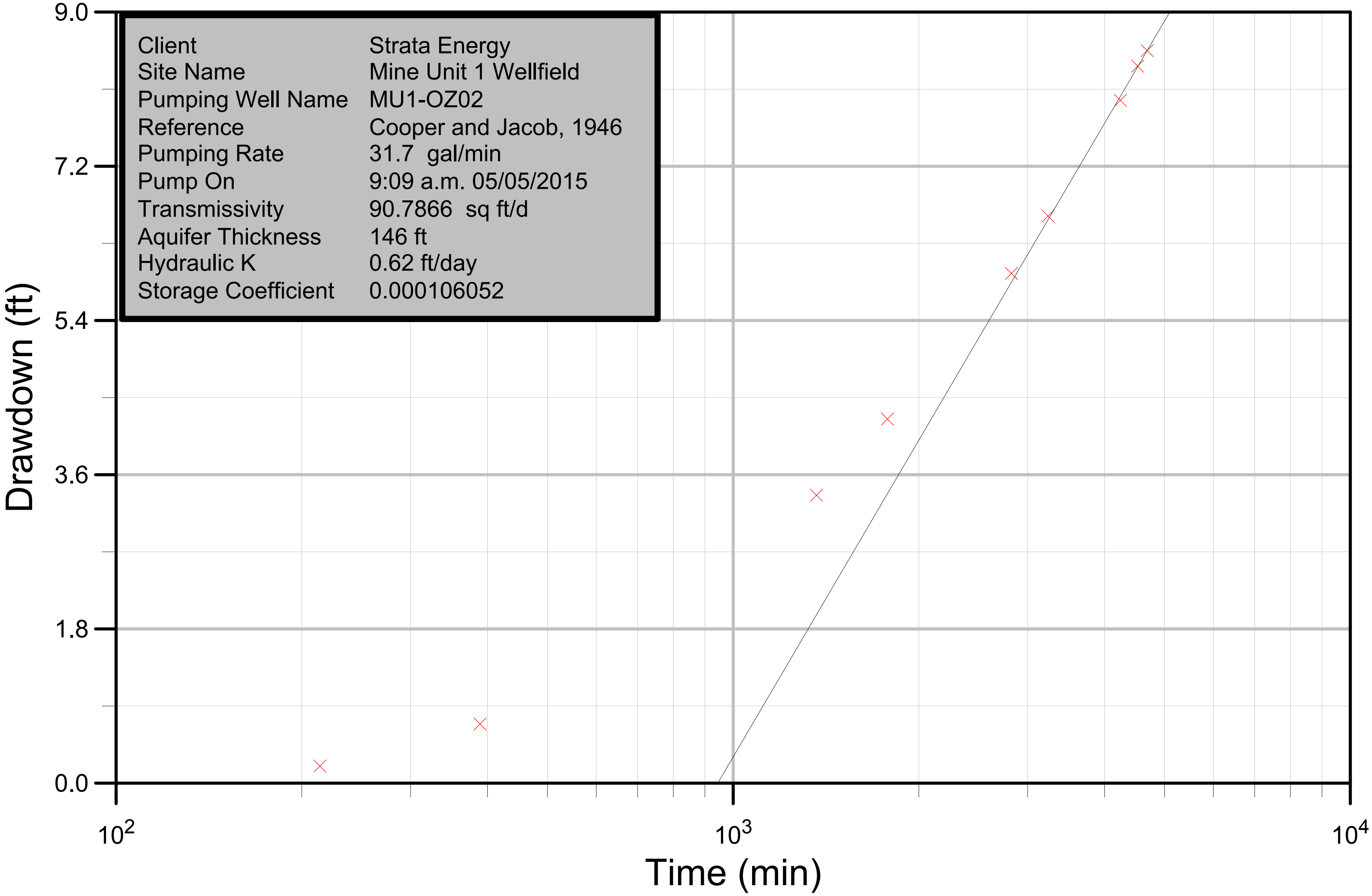
MU1-PM03


Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 126.504 sq ft/d
Aquifer Thickness 145 ft
Hydraulic K 0.87 ft/day
Storage Coefficient 7.54174e-005
Drawdown (ft)
8.0
6.4
4.8
3.2
1.6
0.0
10^2
10^3
10^4
Time (min)

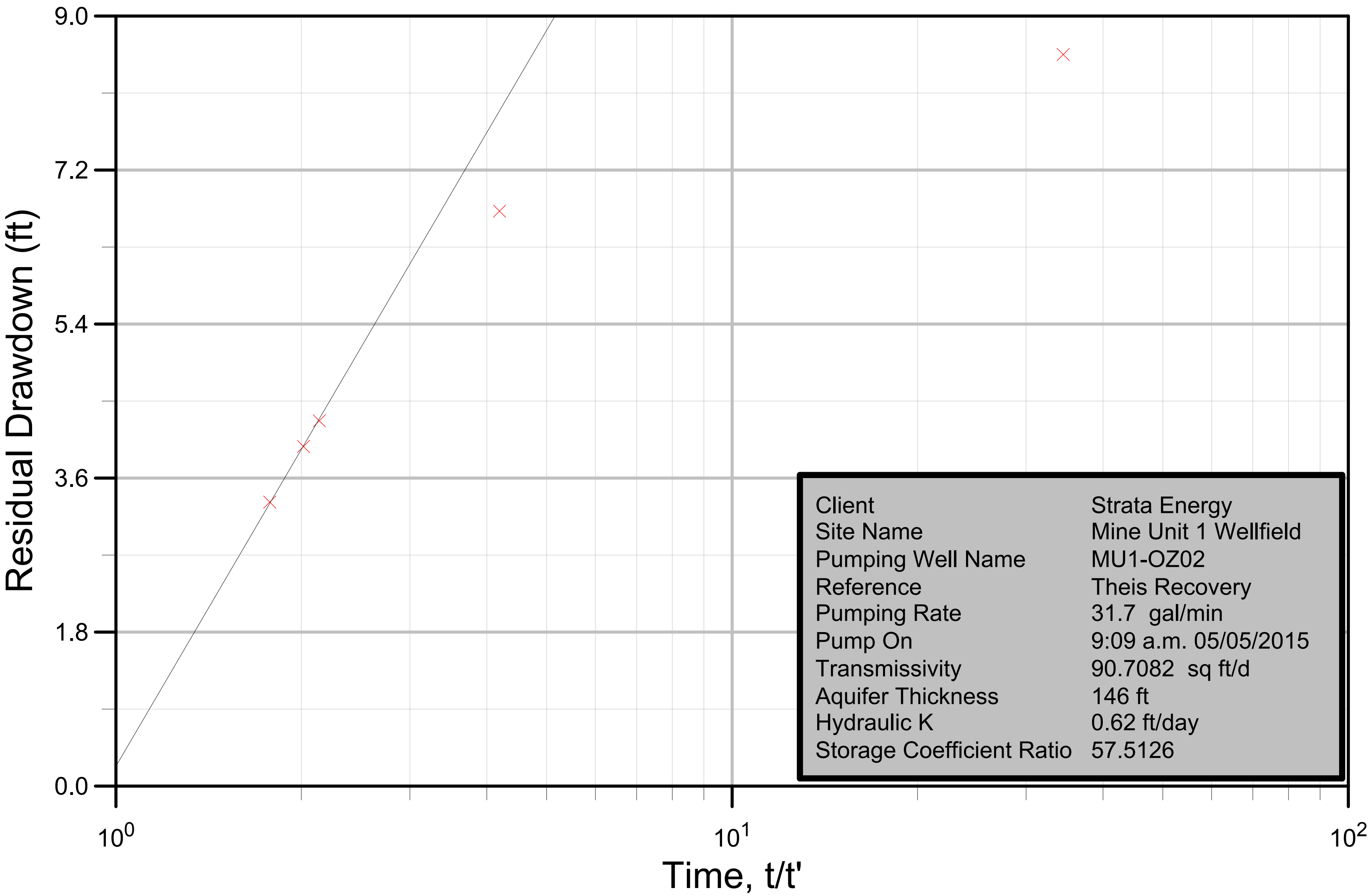
MU1-PM03


8.0
6.4
4.8
3.2
1.6
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
10^3
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 125.731 sq ft/d
Aquifer Thickness 145 ft
Hydraulic K 0.87 ft/day
Storage Coefficient Ratio 48.5622

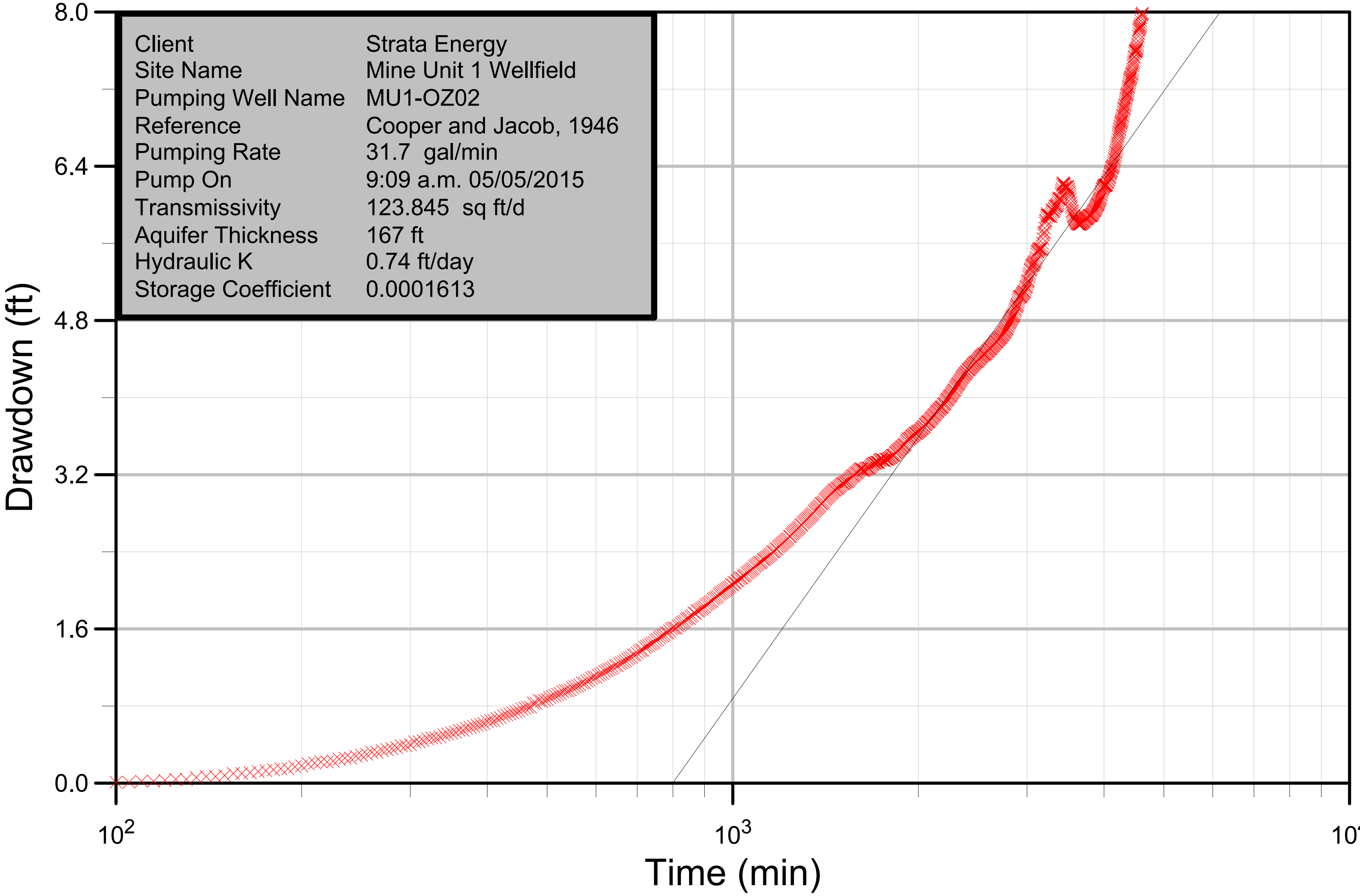
MU1-PM04

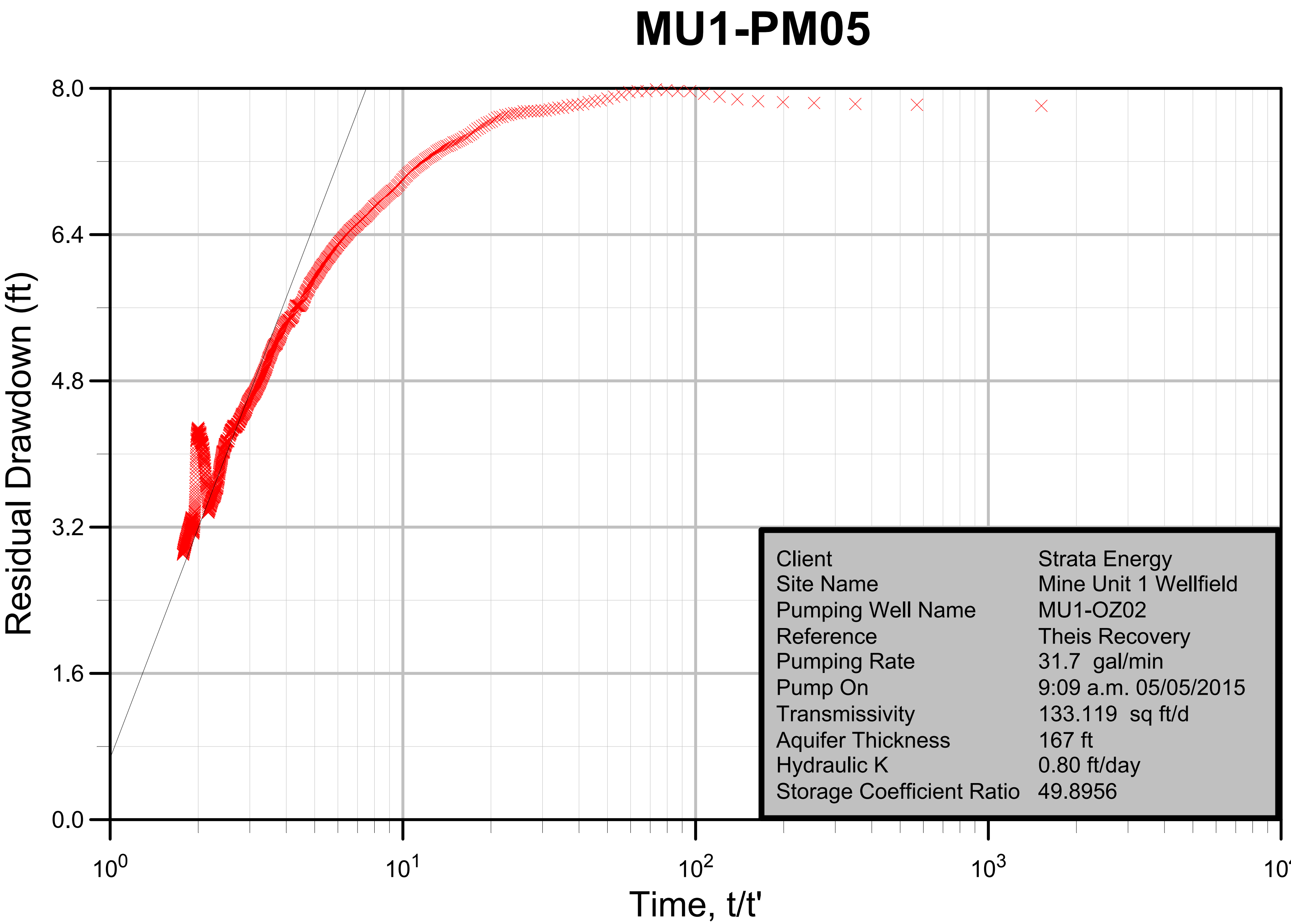

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 90.7866 sq ft/d
Aquifer Thickness 146 ft
Hydraulic K 0.62 ft/day
Storage Coefficient 0.000106052
Drawdown (ft)
9.0
7.2
5.4
3.6
1.8
0.0
Time (min)
10^2
10^3
10^4

MU1-PM04


9.0
7.2
5.4
3.6
1.8
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ02
Reference
Theis Recovery
Pumping Rate
31.7 gal/min
Pump On
9:09 a.m. 05/05/2015
Transmissivity
90.7082 sq ft/d
Aquifer Thickness
146 ft
Hydraulic K
0.62 ft/day
Storage Coefficient Ratio
57.5126

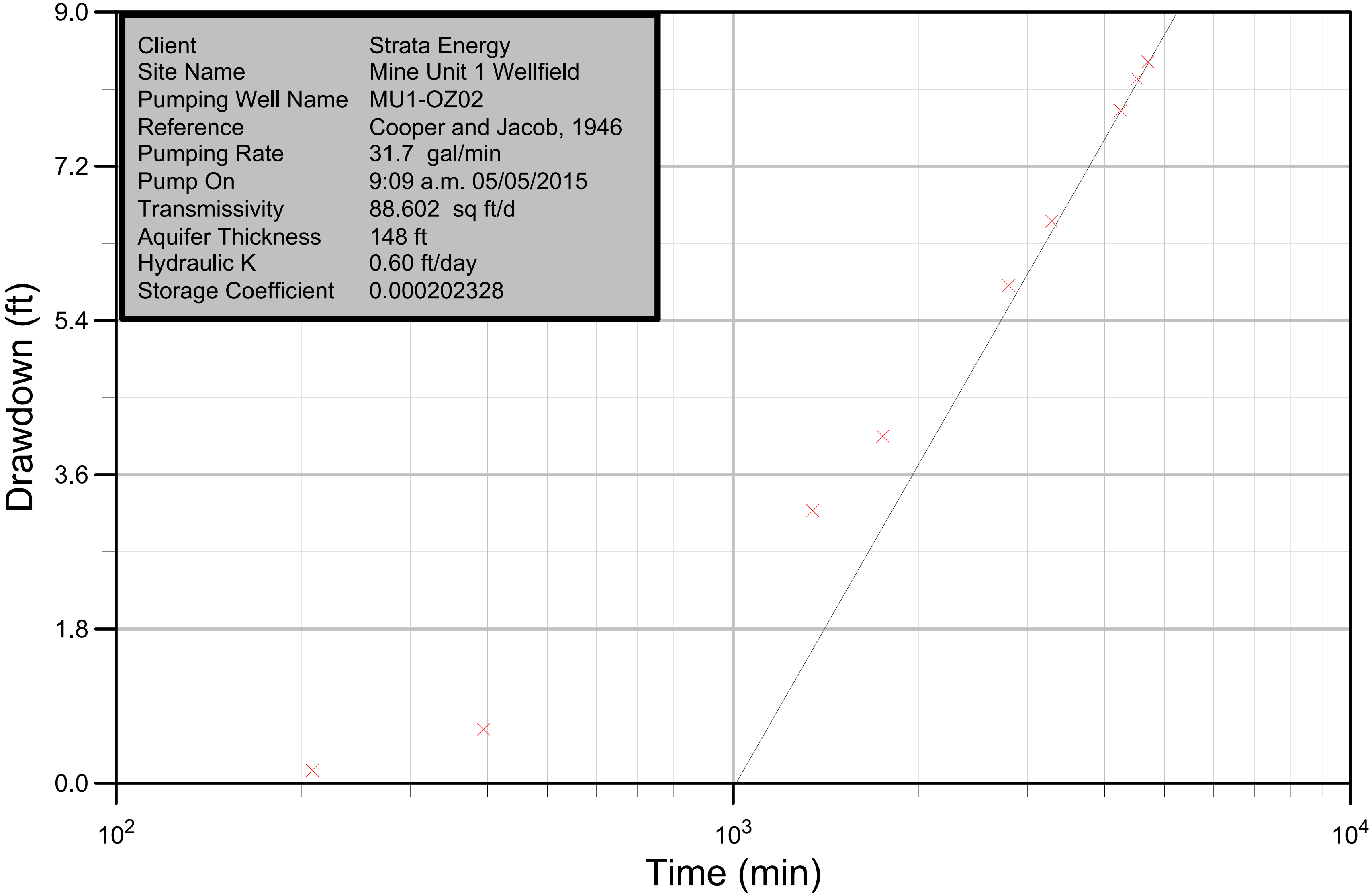
MU1-PM05


Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ02
Reference
Cooper and Jacob, 1946
Pumping Rate
31.7 gal/min
Pump On
9:09 a.m. 05/05/2015
Transmissivity
123.845 sq ft/d
Aquifer Thickness
167 ft
Hydraulic K
0.74 ft/day
Storage Coefficient
0.0001613
Drawdown (ft)
8.0
6.4
4.8
3.2
1.6
0.0
10^2
10^3
10^4
Time (min)

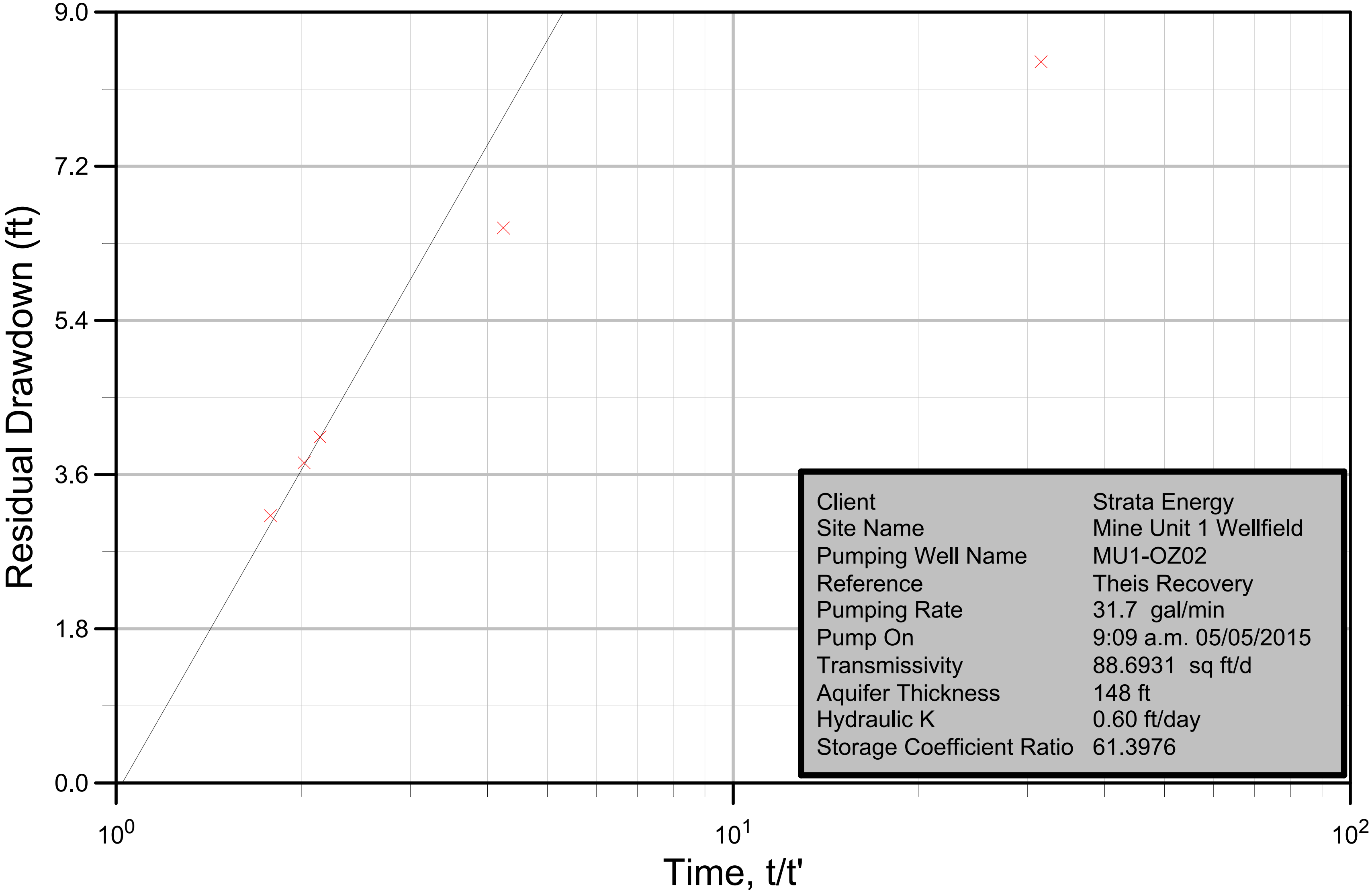


Client	Strata Energy
Site Name	Mine Unit 1 Wellfield
Pumping Well Name	MU1-OZ02
Reference	Theis Recovery
Pumping Rate	31.7 gal/min
Pump On	9:09 a.m. 05/05/2015
Transmissivity	133.119 sq ft/d
Aquifer Thickness	167 ft
Hydraulic K	0.80 ft/day
Storage Coefficient Ratio	49.8956

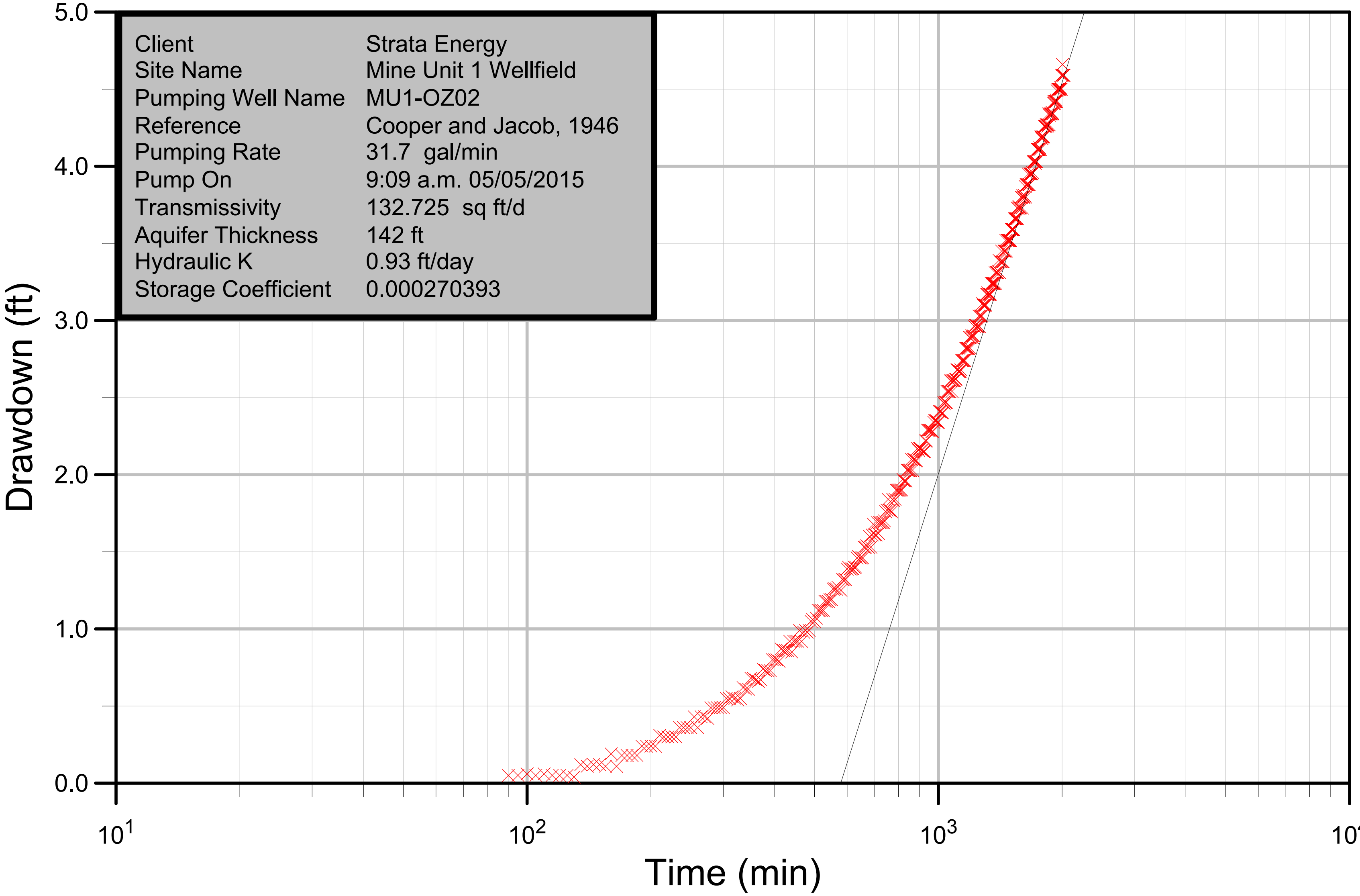
MU1-PM06


Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 88.602 sq ft/d
Aquifer Thickness 148 ft
Hydraulic K 0.60 ft/day
Storage Coefficient 0.000202328
Drawdown (ft)
9.0
7.2
5.4
3.6
1.8
0.0
10^2
10^3
10^4
Time (min)

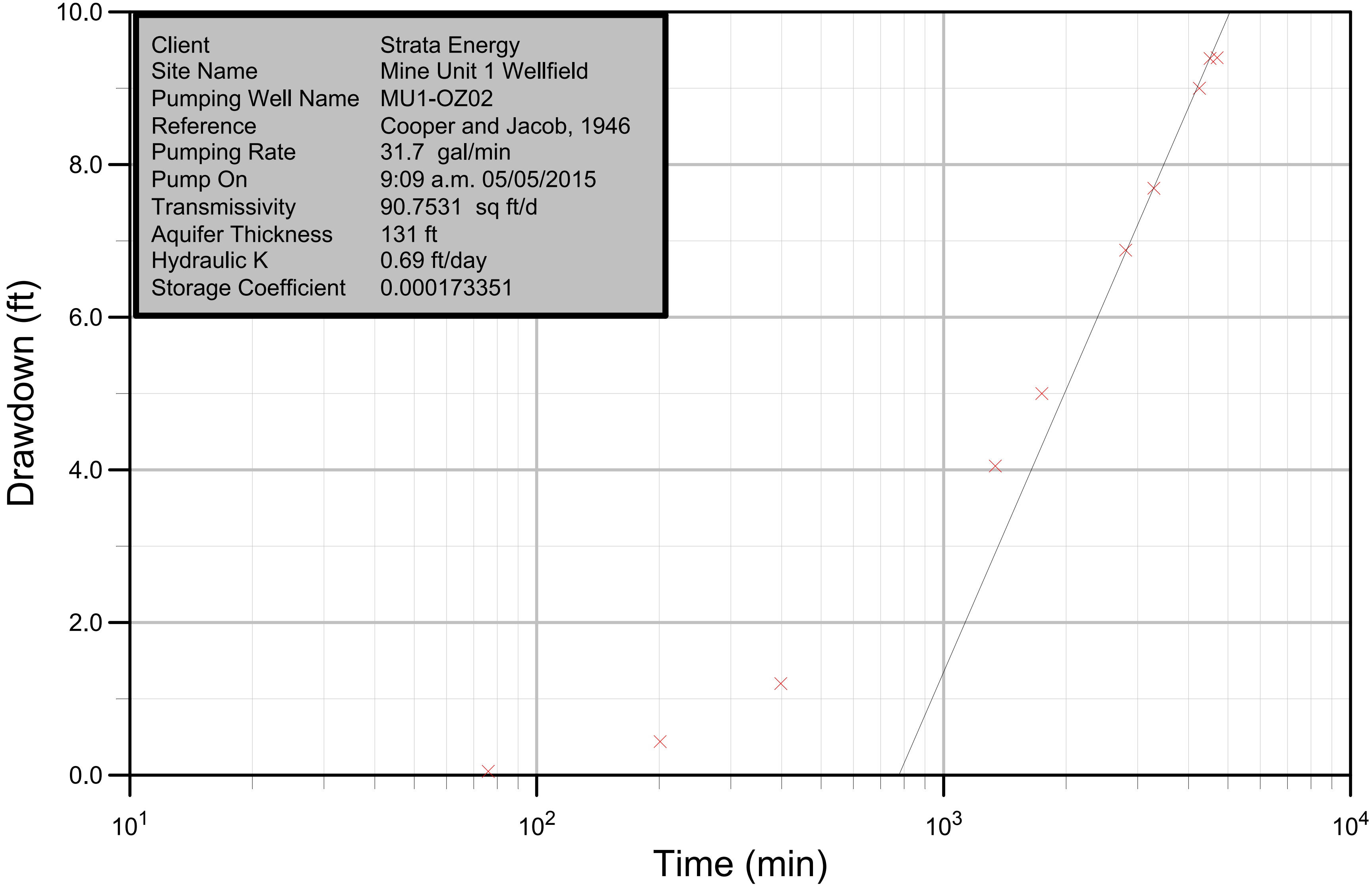
MU1-PM06


9.0
7.2
5.4
3.6
1.8
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 88.6931 sq ft/d
Aquifer Thickness 148 ft
Hydraulic K 0.60 ft/day
Storage Coefficient Ratio 61.3976

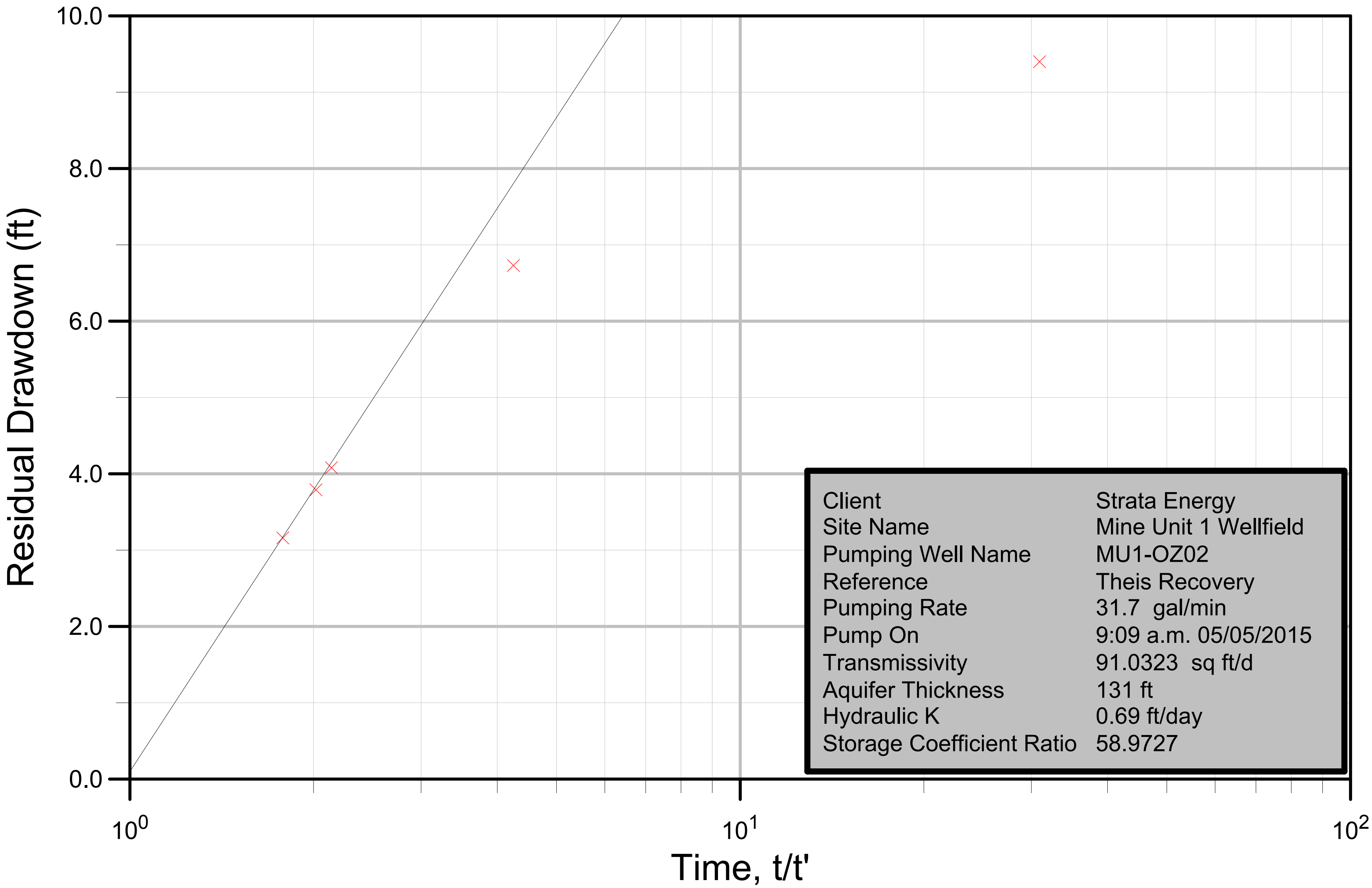
MU1-PM07


Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 132.725 sq ft/d
Aquifer Thickness 142 ft
Hydraulic K 0.93 ft/day
Storage Coefficient 0.000270393
Drawdown (ft)
5.0
4.0
3.0
2.0
1.0
0.0
10^1
10^2
10^3
10^4
Time (min)

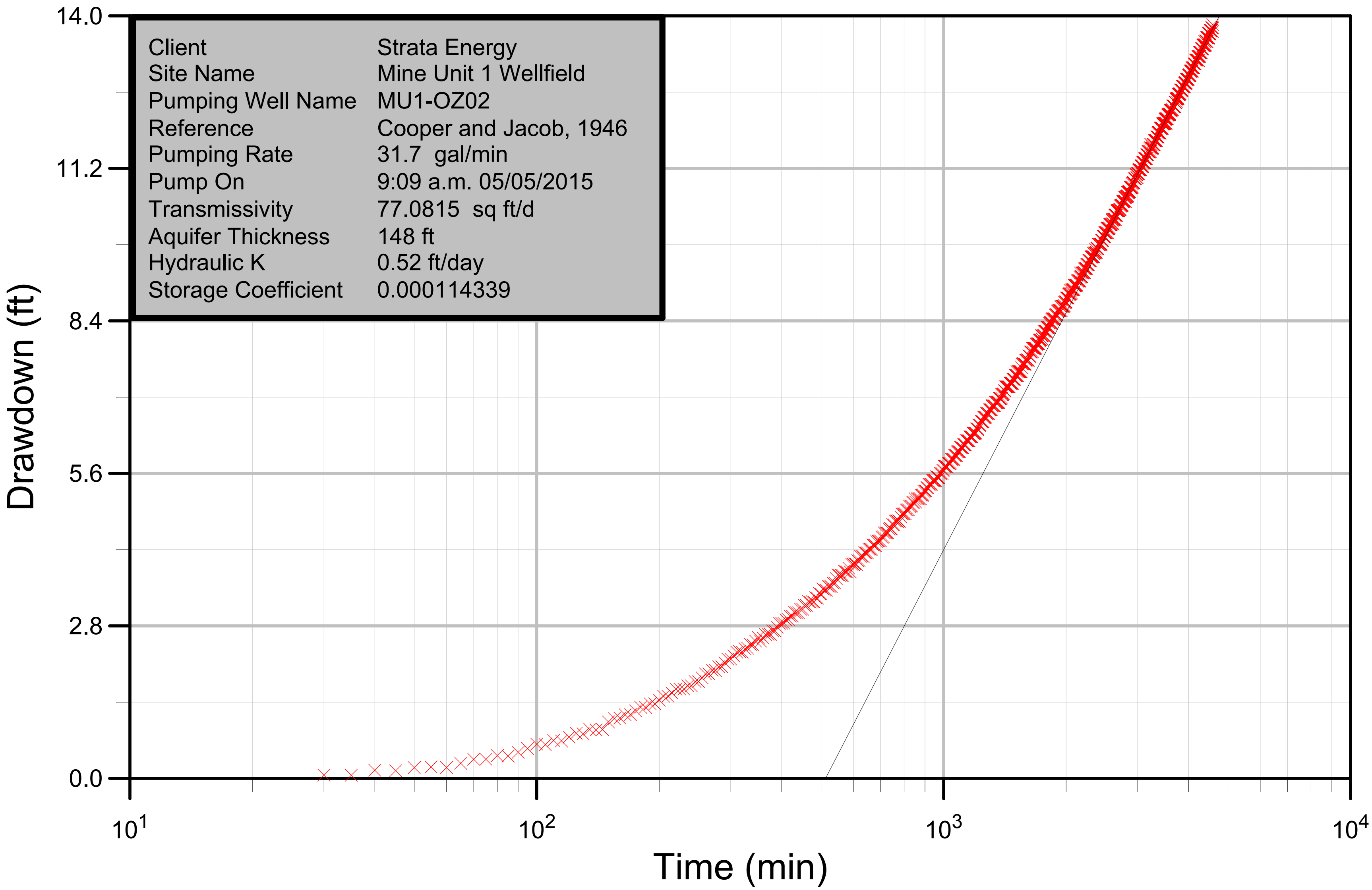
MU1-PM08


Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 90.7531 sq ft/d
Aquifer Thickness 131 ft
Hydraulic K 0.69 ft/day
Storage Coefficient 0.000173351
Drawdown (ft)
10.0
8.0
6.0
4.0
2.0
0.0
10^1
10^2
10^3
10^4
Time (min)

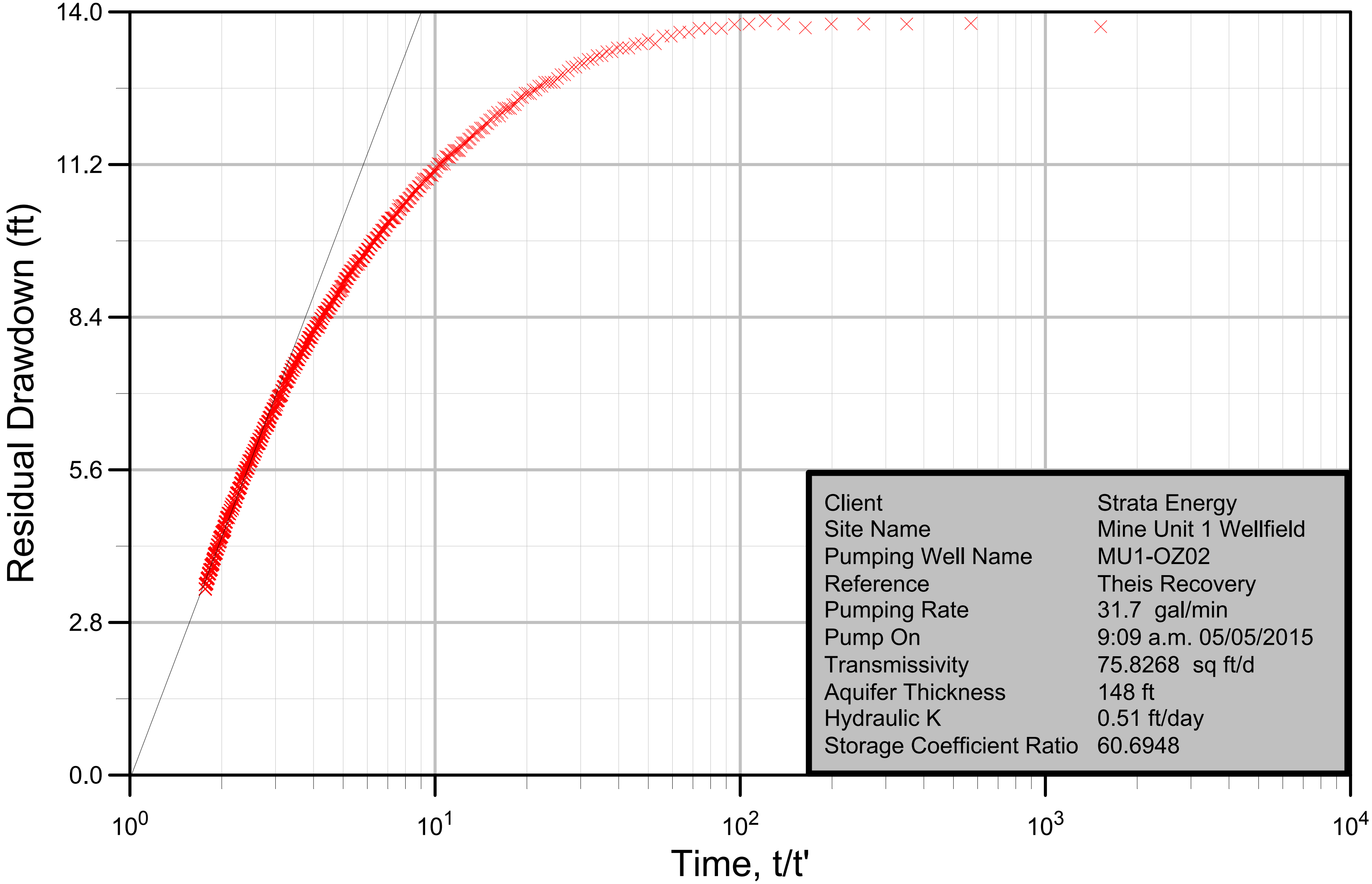
MU1-PM08


10.0
8.0
6.0
4.0
2.0
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 91.0323 sq ft/d
Aquifer Thickness 131 ft
Hydraulic K 0.69 ft/day
Storage Coefficient Ratio 58.9727

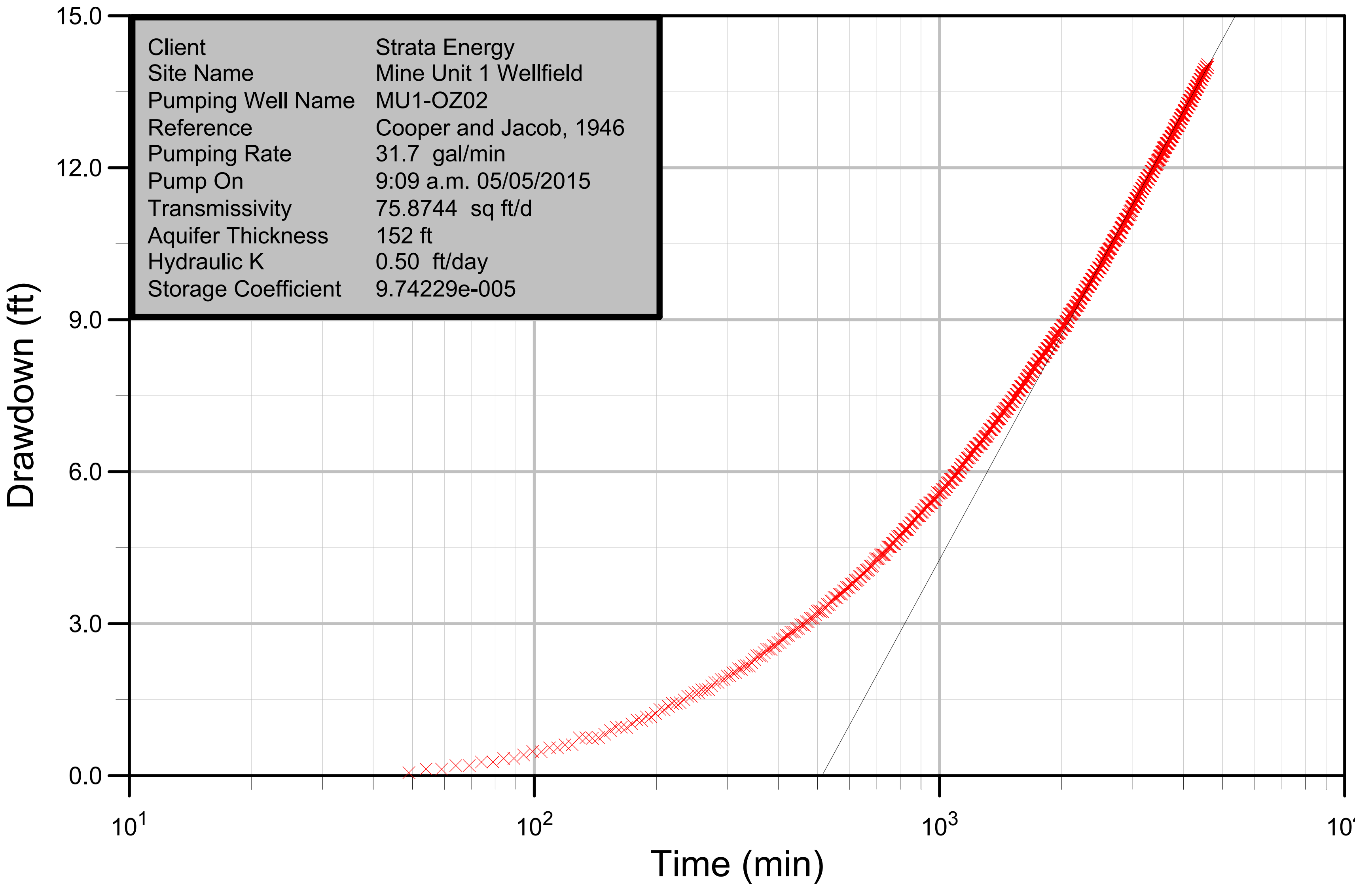
MU1-PM09

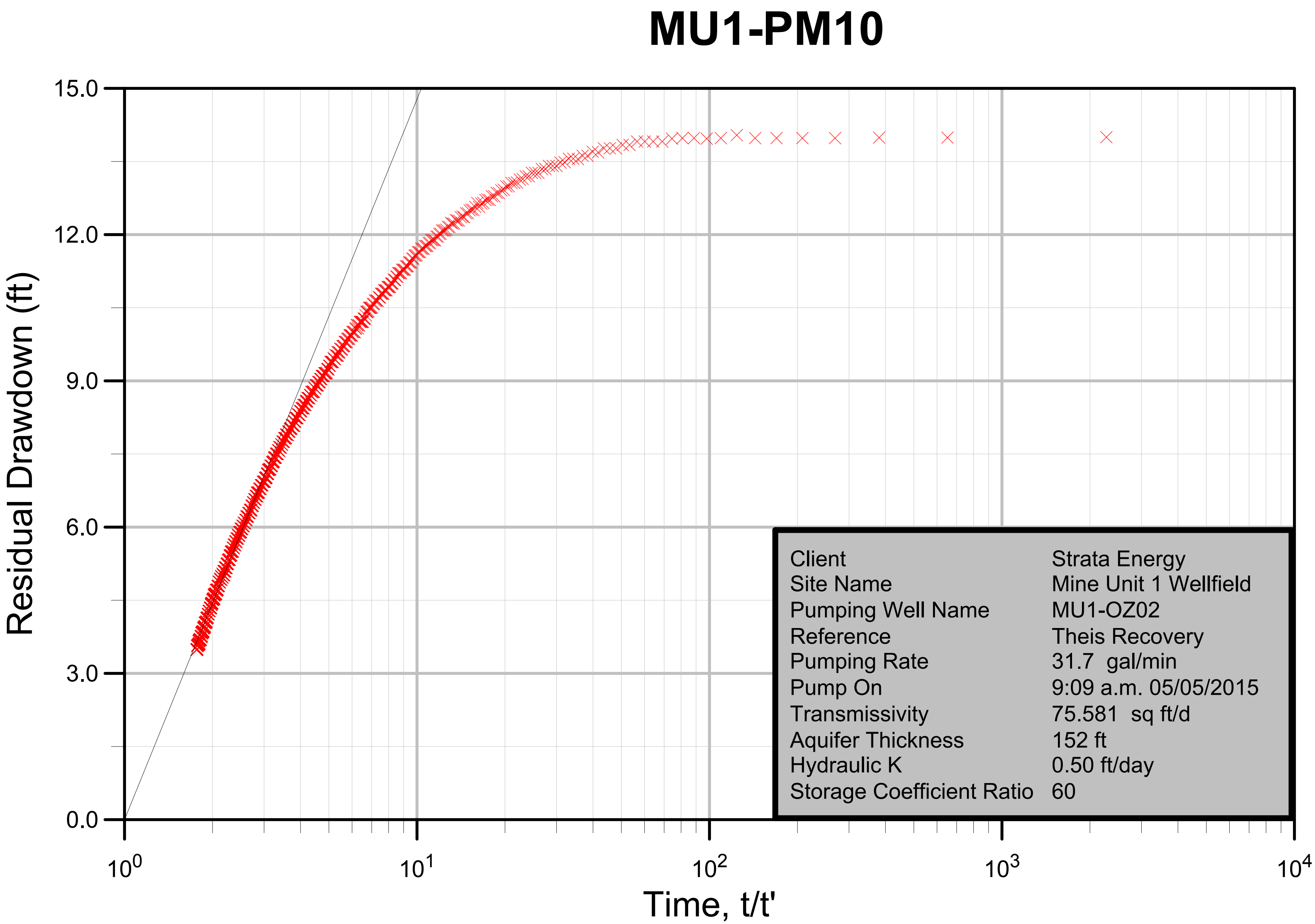

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 77.0815 sq ft/d
Aquifer Thickness 148 ft
Hydraulic K 0.52 ft/day
Storage Coefficient 0.000114339
Drawdown (ft)
14.0
11.2
8.4
5.6
2.8
0.0
10^1
10^2
10^3
10^4
Time (min)

MU1-PM09

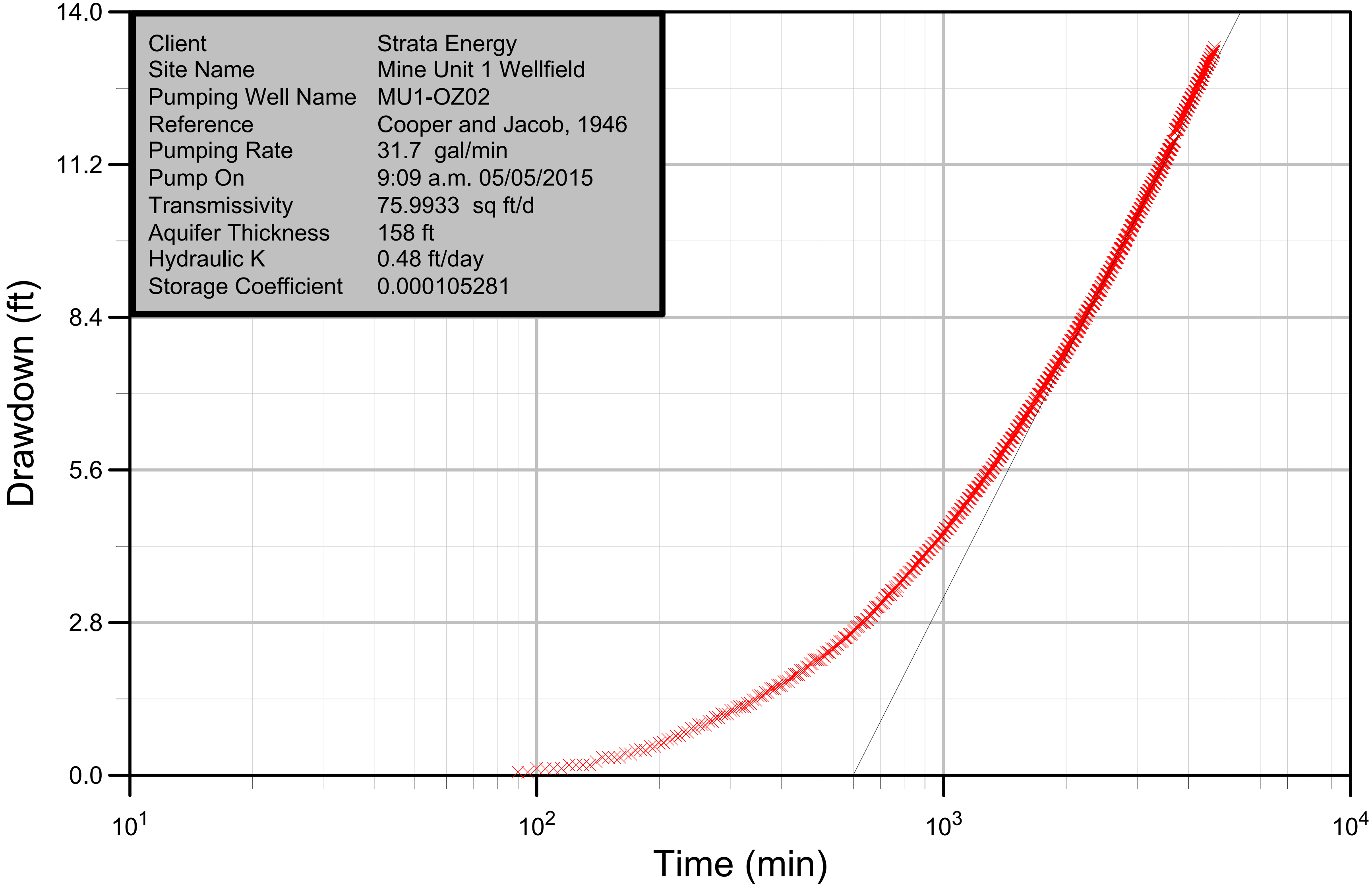

Residual Drawdown (ft)
14.0
11.2
8.4
5.6
2.8
0.0
10^0
10^1
10^2
10^3
10^4
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 75.8268 sq ft/d
Aquifer Thickness 148 ft
Hydraulic K 0.51 ft/day
Storage Coefficient Ratio 60.6948

MU1-PM10

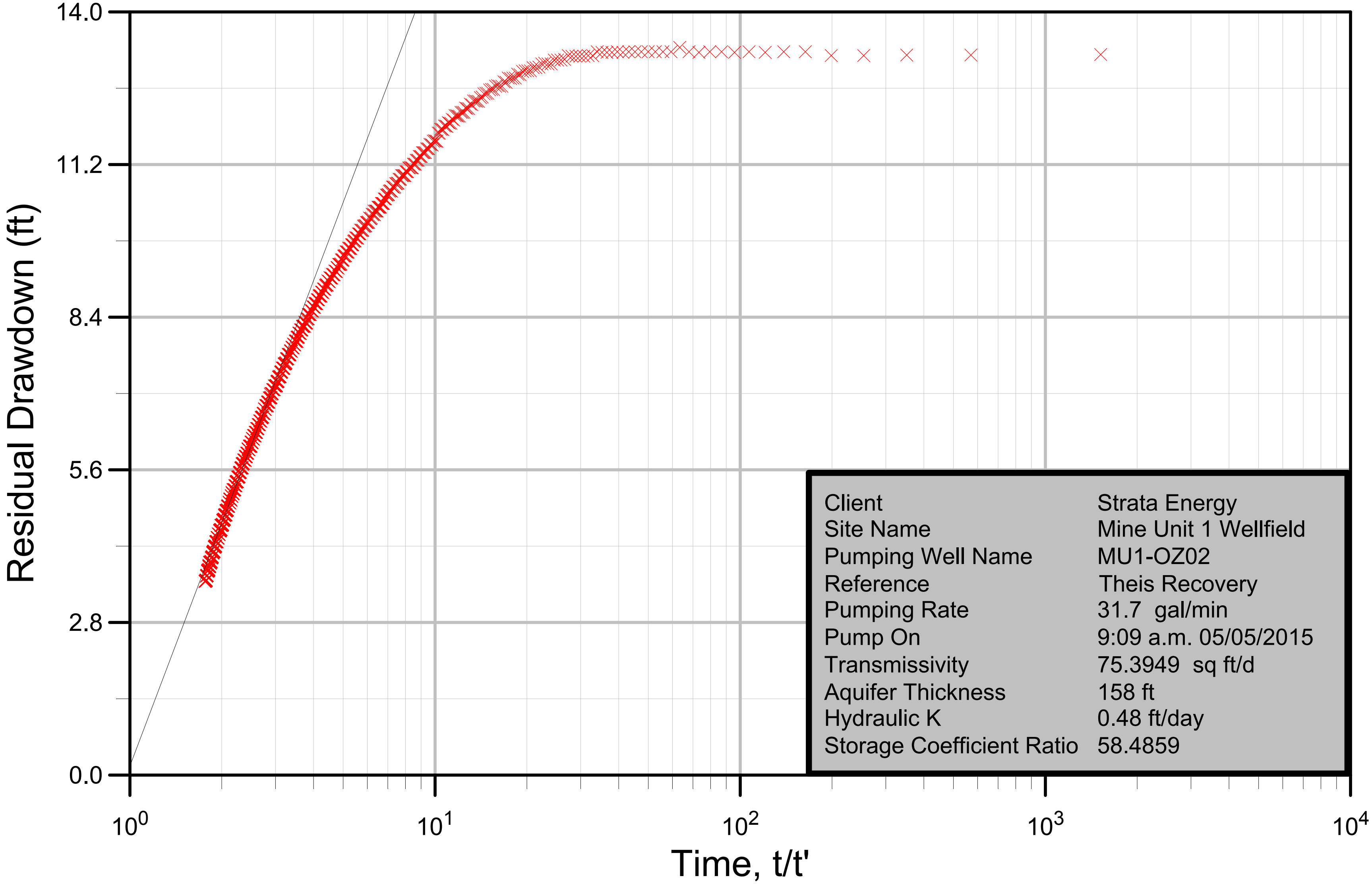

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 75.8744 sq ft/d
Aquifer Thickness 152 ft
Hydraulic K 0.50 ft/day
Storage Coefficient 9.74229e-005
Drawdown (ft)
15.0
12.0
9.0
6.0
3.0
0.0
10^1
10^2
10^3
10^4
Time (min)

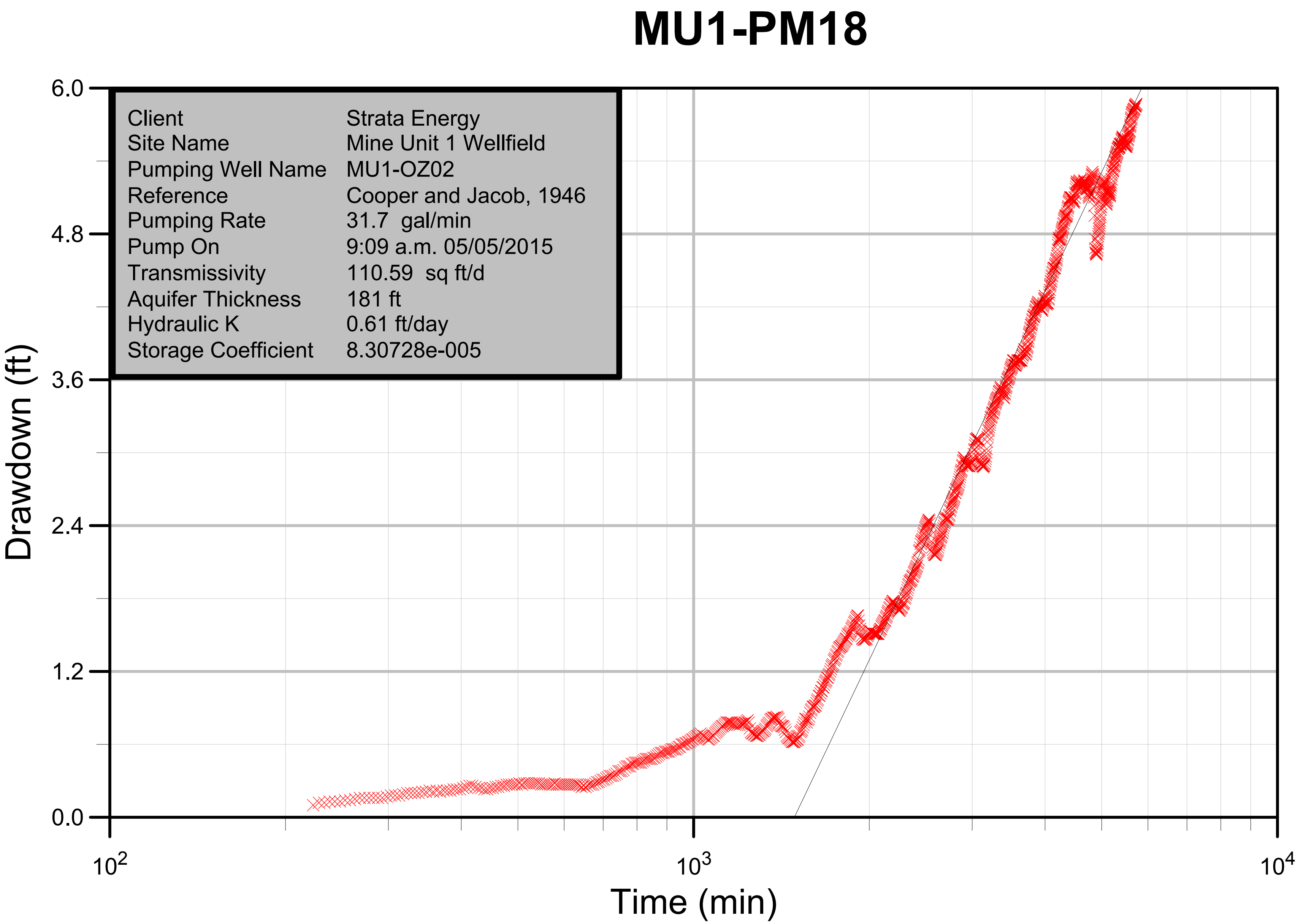

MU1-PM10
Residual Drawdown (ft)
15.0
12.0
9.0
6.0
3.0
0.0
10^0
10^1
10^2
10^3
10^4
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 75.581 sq ft/d
Aquifer Thickness 152 ft
Hydraulic K 0.50 ft/day
Storage Coefficient Ratio 60

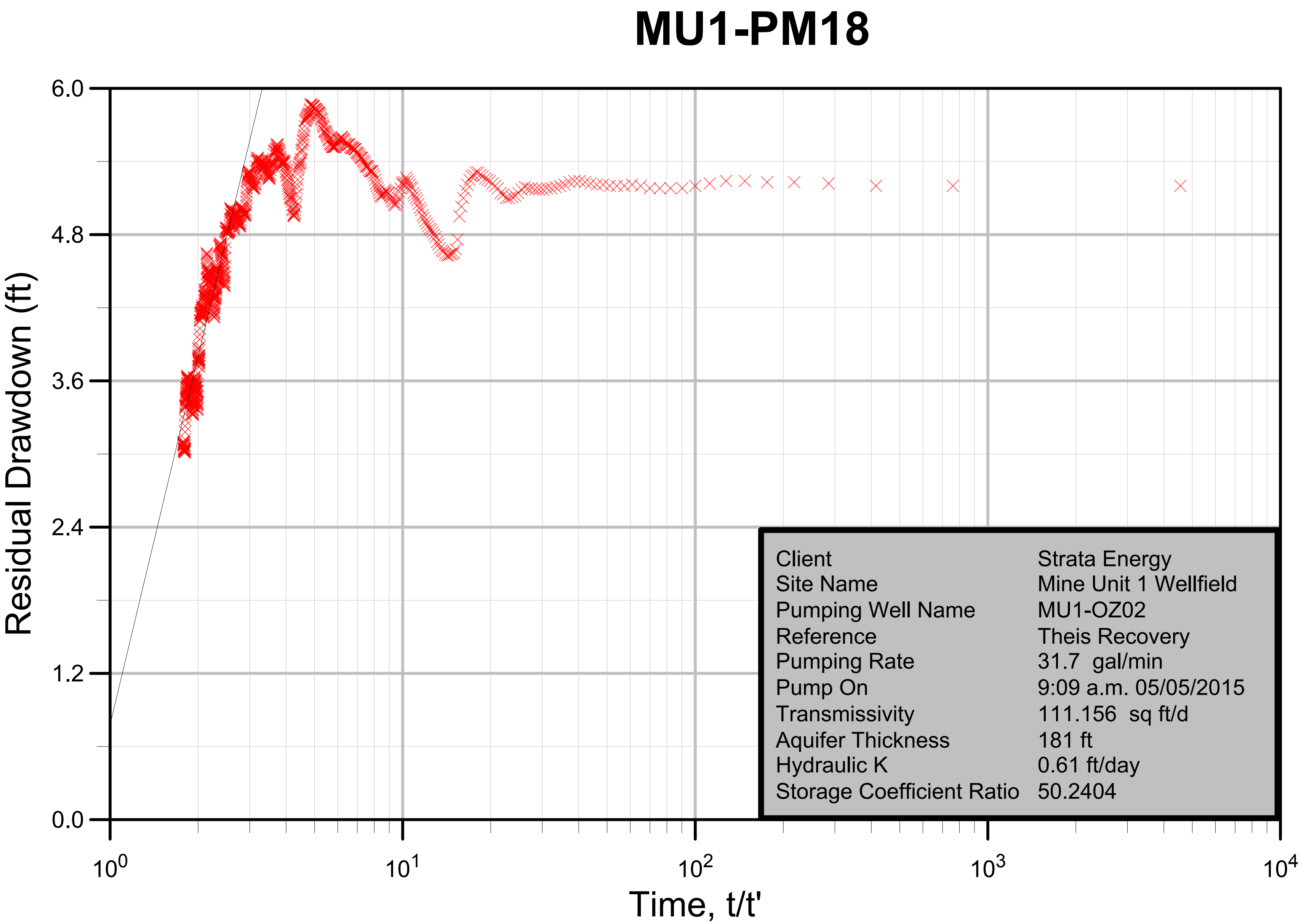
MU1-PM11


Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Cooper and Jacob, 1946
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 75.9933 sq ft/d
Aquifer Thickness 158 ft
Hydraulic K 0.48 ft/day
Storage Coefficient 0.000105281
Drawdown (ft)
14.0
11.2
8.4
5.6
2.8
0.0
Time (min)
10^1
10^2
10^3
10^4

MU1-PM11


14.0
11.2
8.4
5.6
2.8
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
10^3
10^4
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 75.3949 sq ft/d
Aquifer Thickness 158 ft
Hydraulic K 0.48 ft/day
Storage Coefficient Ratio 58.4859

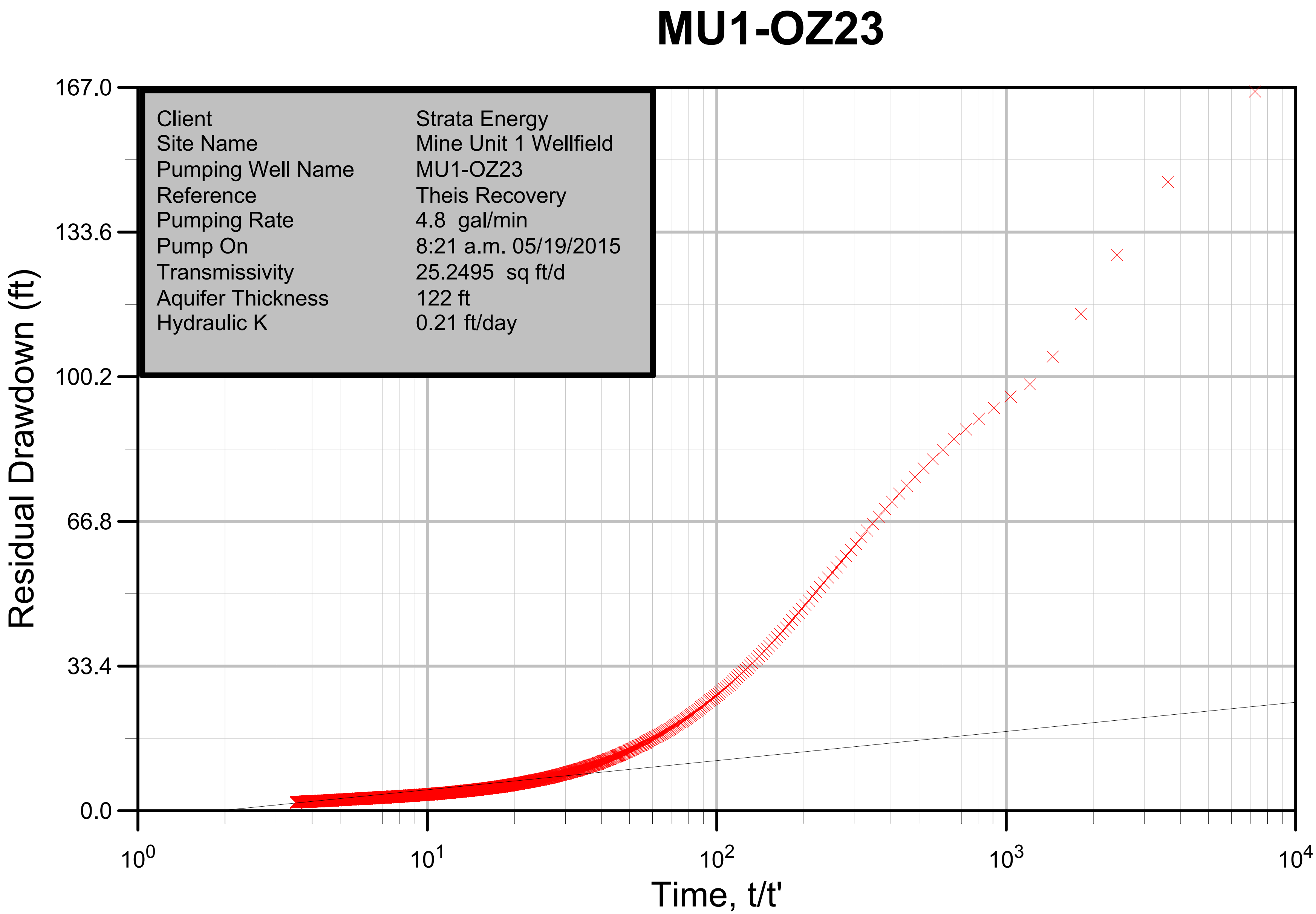

MU1-PM18
Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ02
Reference
Cooper and Jacob, 1946
Pumping Rate
31.7 gal/min
Pump On
9:09 a.m. 05/05/2015
Transmissivity
110.59 sq ft/d
Aquifer Thickness
181 ft
Hydraulic K
0.61 ft/day
Storage Coefficient
8.30728e-005
Drawdown (ft)
6.0
4.8
3.6
2.4
1.2
0.0
Time (min)
10^2
10^3
10^4

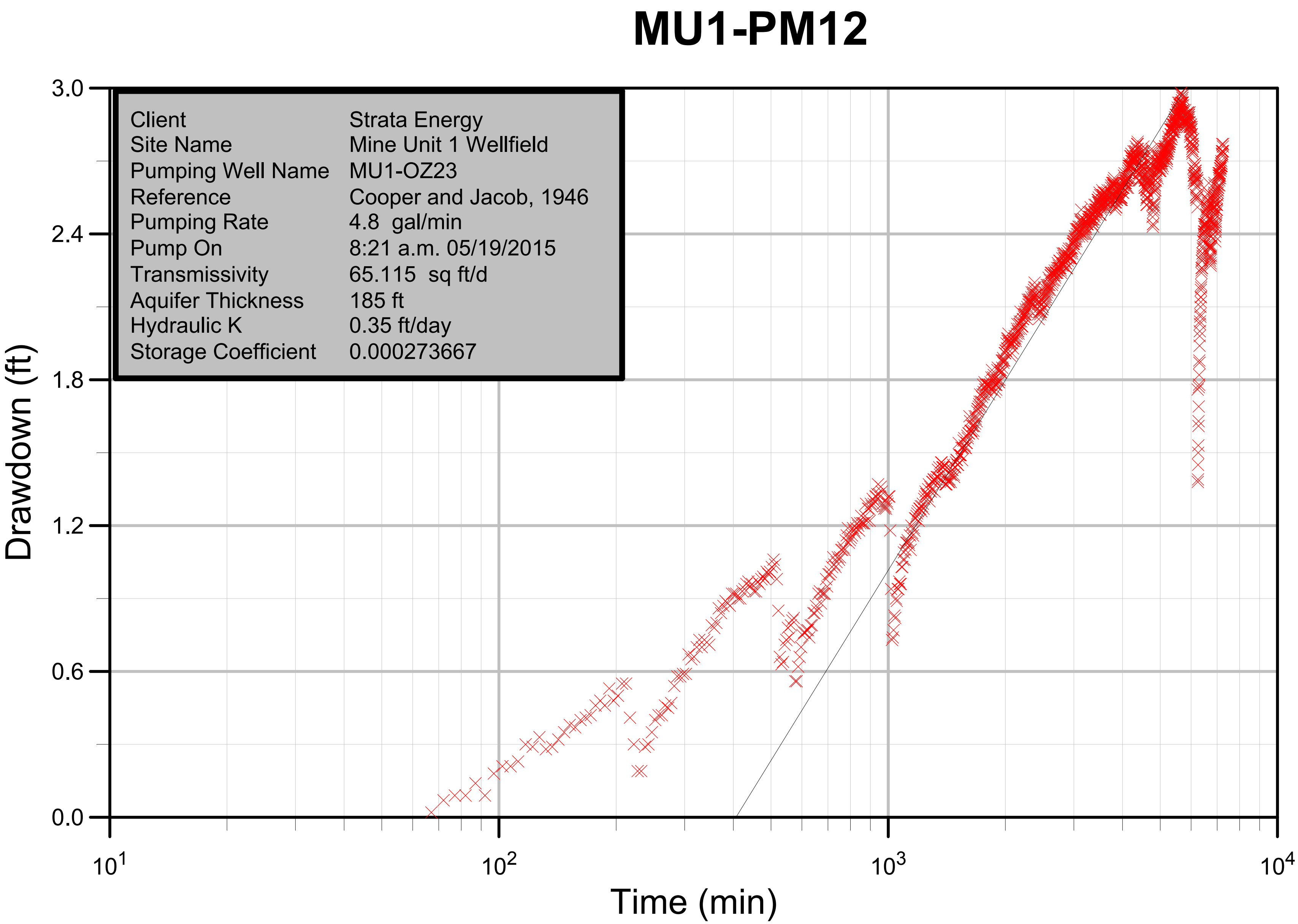

MU1-PM18
Residual Drawdown (ft)
Time, t/t'
6.0
4.8
3.6
2.4
1.2
0.0
10^0
10^1
10^2
10^3
10^4
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ02
Reference Theis Recovery
Pumping Rate 31.7 gal/min
Pump On 9:09 a.m. 05/05/2015
Transmissivity 111.156 sq ft/d
Aquifer Thickness 181 ft
Hydraulic K 0.61 ft/day
Storage Coefficient Ratio 50.2404

Attachment 5

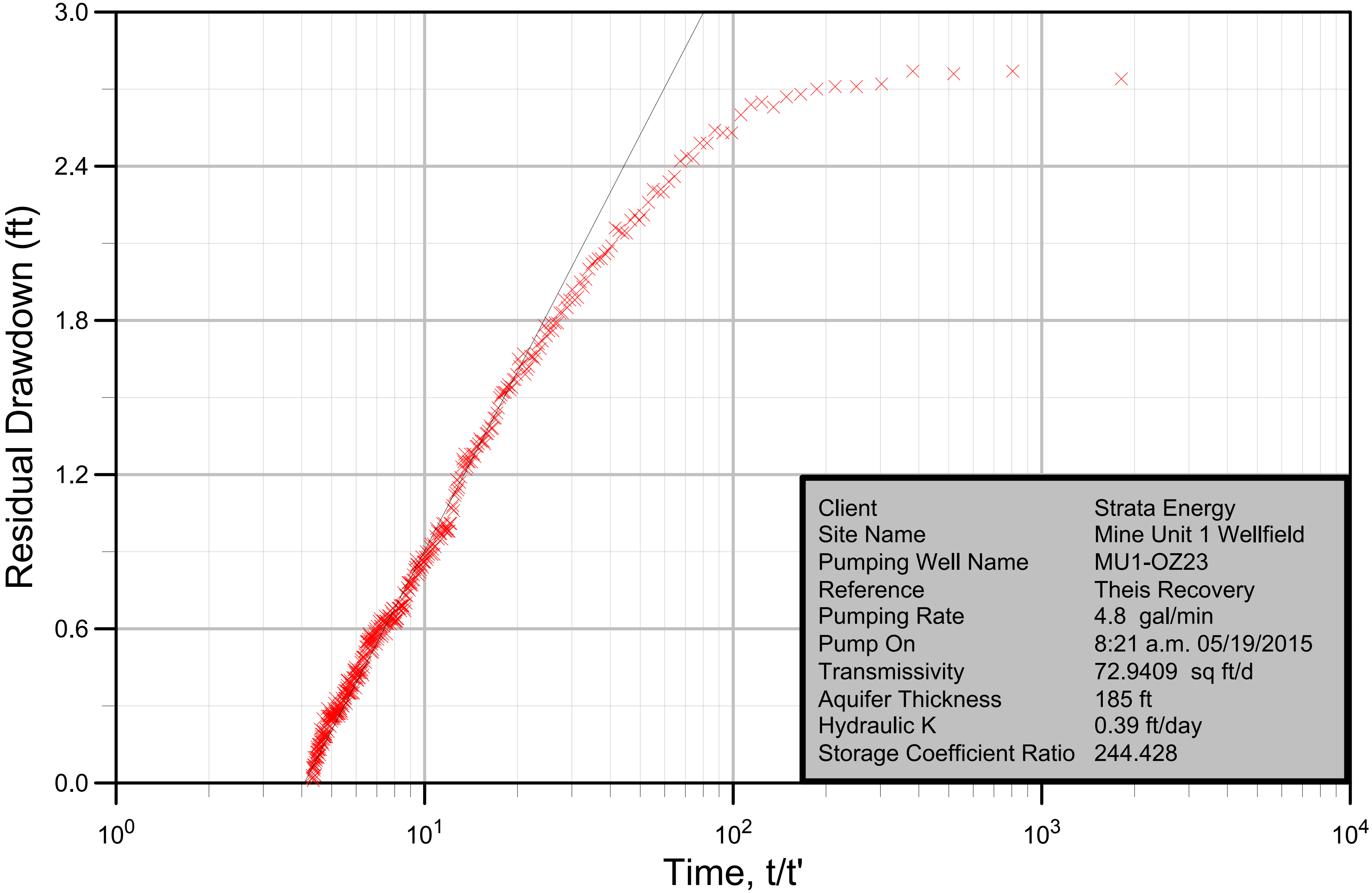
Appendix H

Second Aquifer Test (MU1-OZ23) Time-Drawdown Analyses


MU1-OZ23
Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ23
Reference
Theis Recovery
Pumping Rate
4.8 gal/min
Pump On
8:21 a.m. 05/19/2015
Transmissivity
25.2495 sq ft/d
Aquifer Thickness
122 ft
Hydraulic K
0.21 ft/day
Residual Drawdown (ft)
167.0
133.6
100.2
66.8
33.4
0.0
10^0
10^1
10^2
10^3
10^4
Time, t/t'

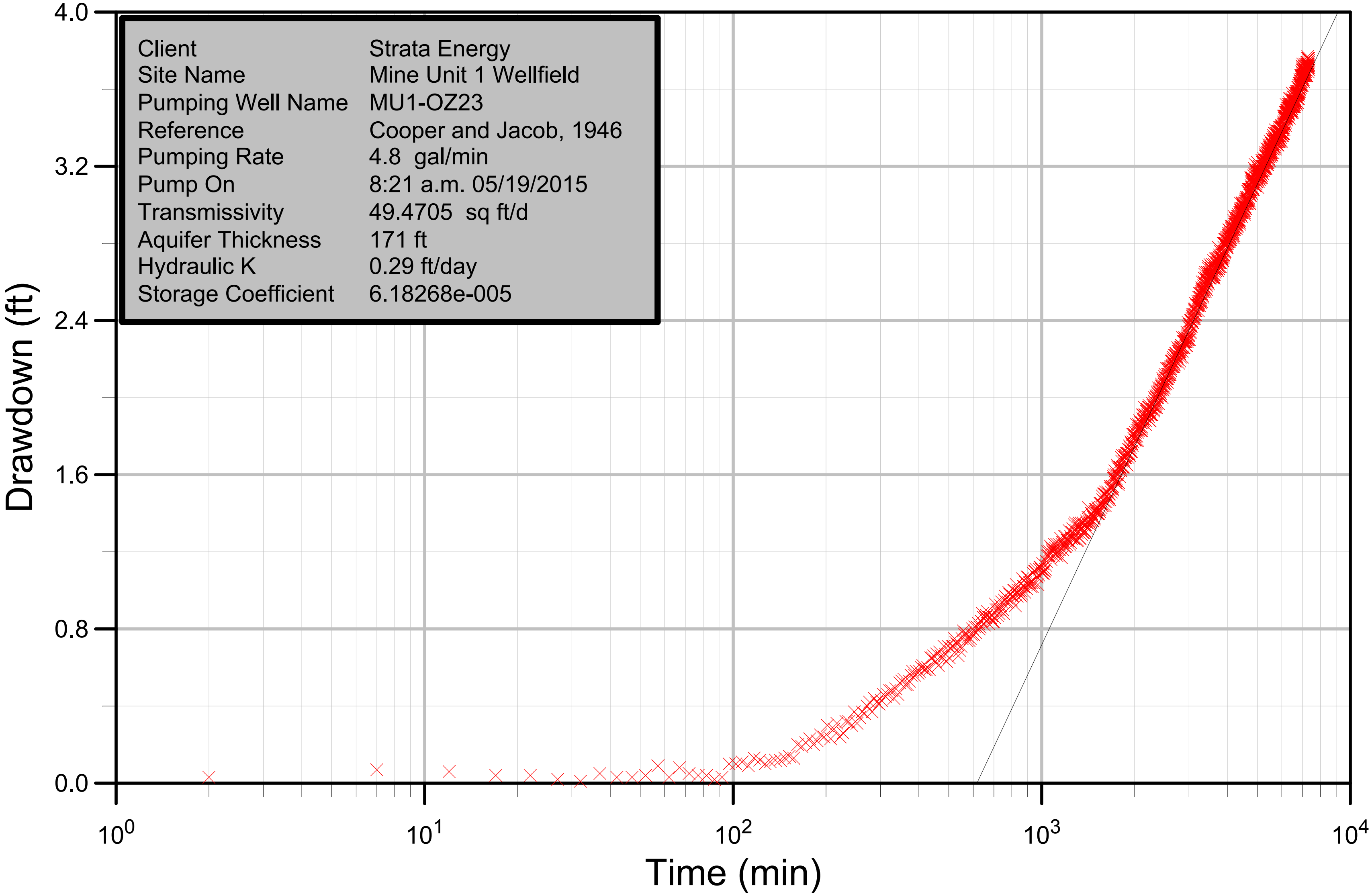

MU1-PM12
Client | Strata Energy
Site Name | Mine Unit 1 Wellfield
Pumping Well Name | MU1-OZ23
Reference | Cooper and Jacob, 1946
Pumping Rate | 4.8 gal/min
Pump On | 8:21 a.m. 05/19/2015
Transmissivity | 65.115 sq ft/d
Aquifer Thickness | 185 ft
Hydraulic K | 0.35 ft/day
Storage Coefficient | 0.000273667
Drawdown (ft)
3.0
2.4
1.8
1.2
0.6
0.0
Time (min)
10^1
10^2
10^3
10^4

MU1-PM12

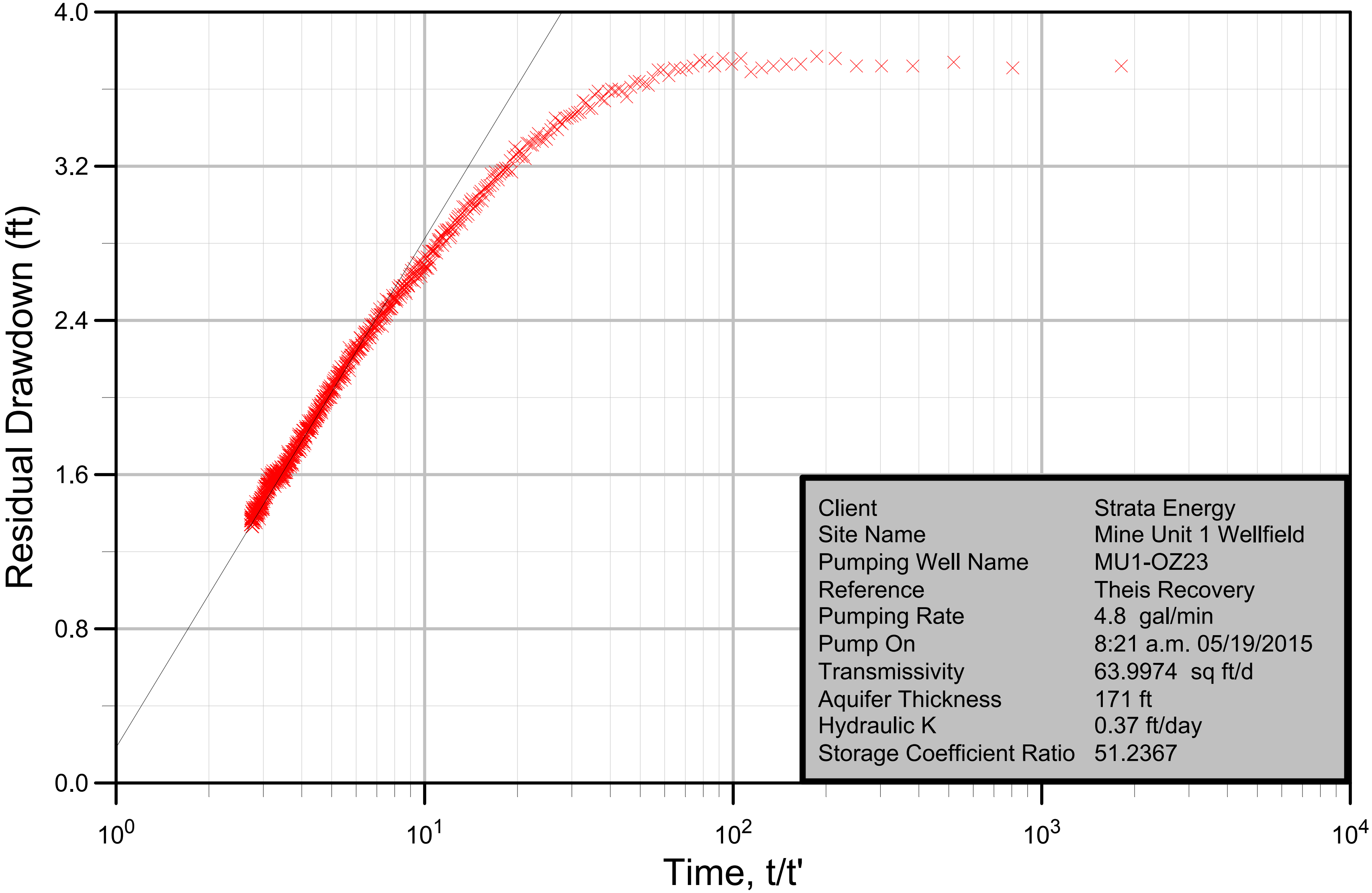


Client	Strata Energy
Site Name	Mine Unit 1 Wellfield
Pumping Well Name	MU1-OZ23
Reference	Theis Recovery
Pumping Rate	4.8 gal/min
Pump On	8:21 a.m. 05/19/2015
Transmissivity	72.9409 sq ft/d
Aquifer Thickness	185 ft
Hydraulic K	0.39 ft/day
Storage Coefficient Ratio	244.428

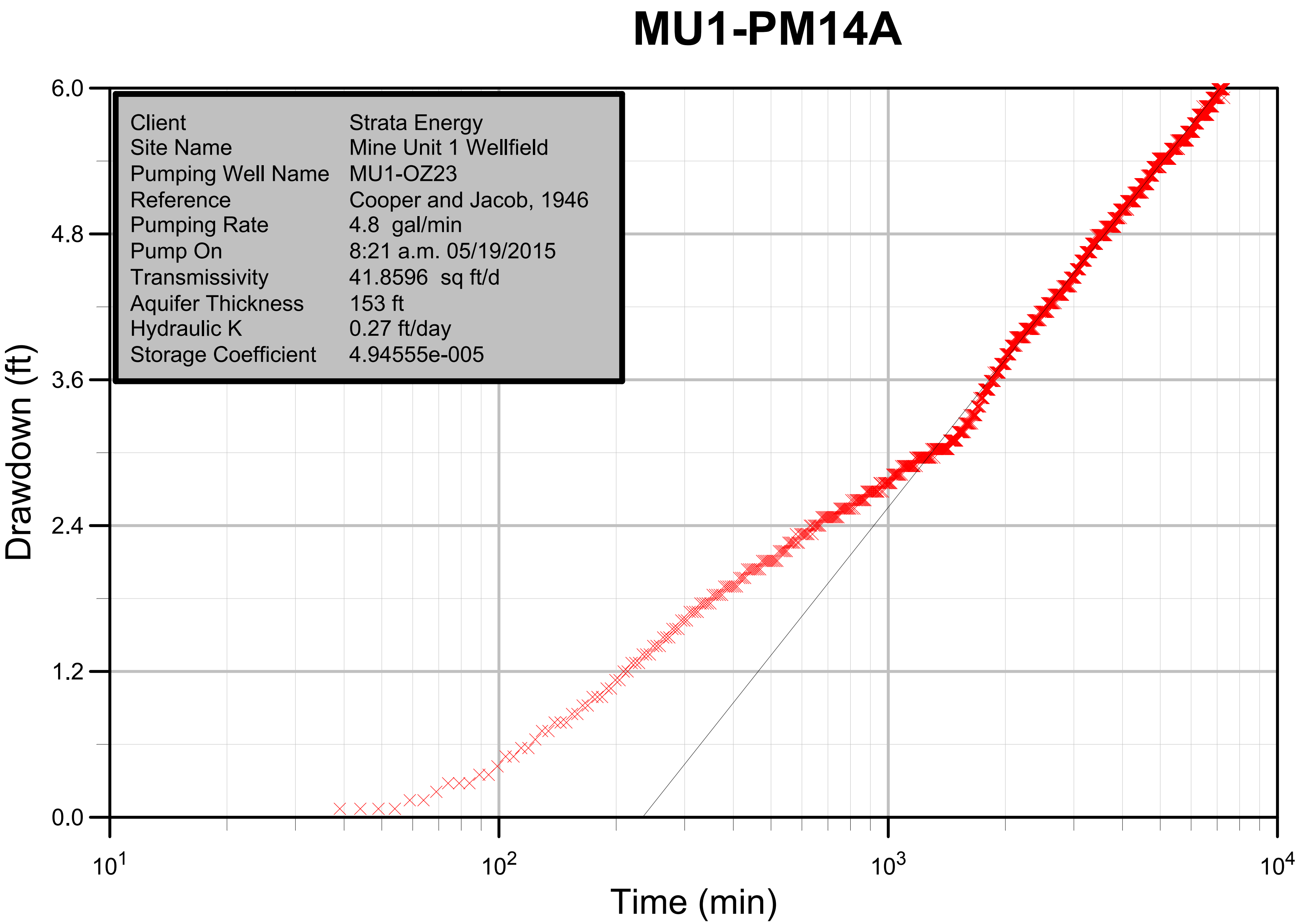
MU1-PM13

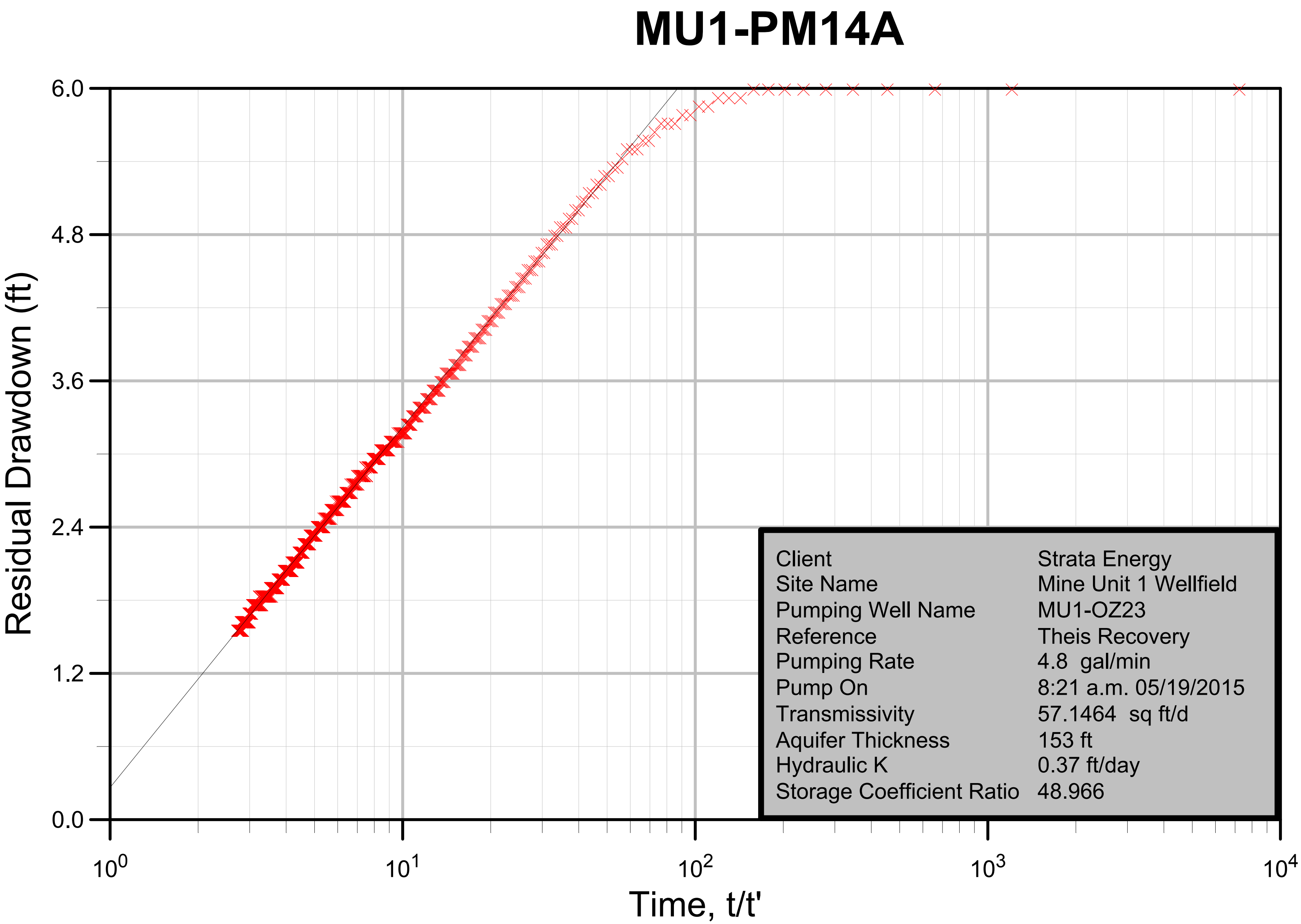

Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ23
Reference Cooper and Jacob, 1946
Pumping Rate 4.8 gal/min
Pump On 8:21 a.m. 05/19/2015
Transmissivity 49.4705 sq ft/d
Aquifer Thickness 171 ft
Hydraulic K 0.29 ft/day
Storage Coefficient 6.18268e-005
Drawdown (ft)
4.0
3.2
2.4
1.6
0.8
0.0
10^0
10^1
10^2
10^3
10^4
Time (min)

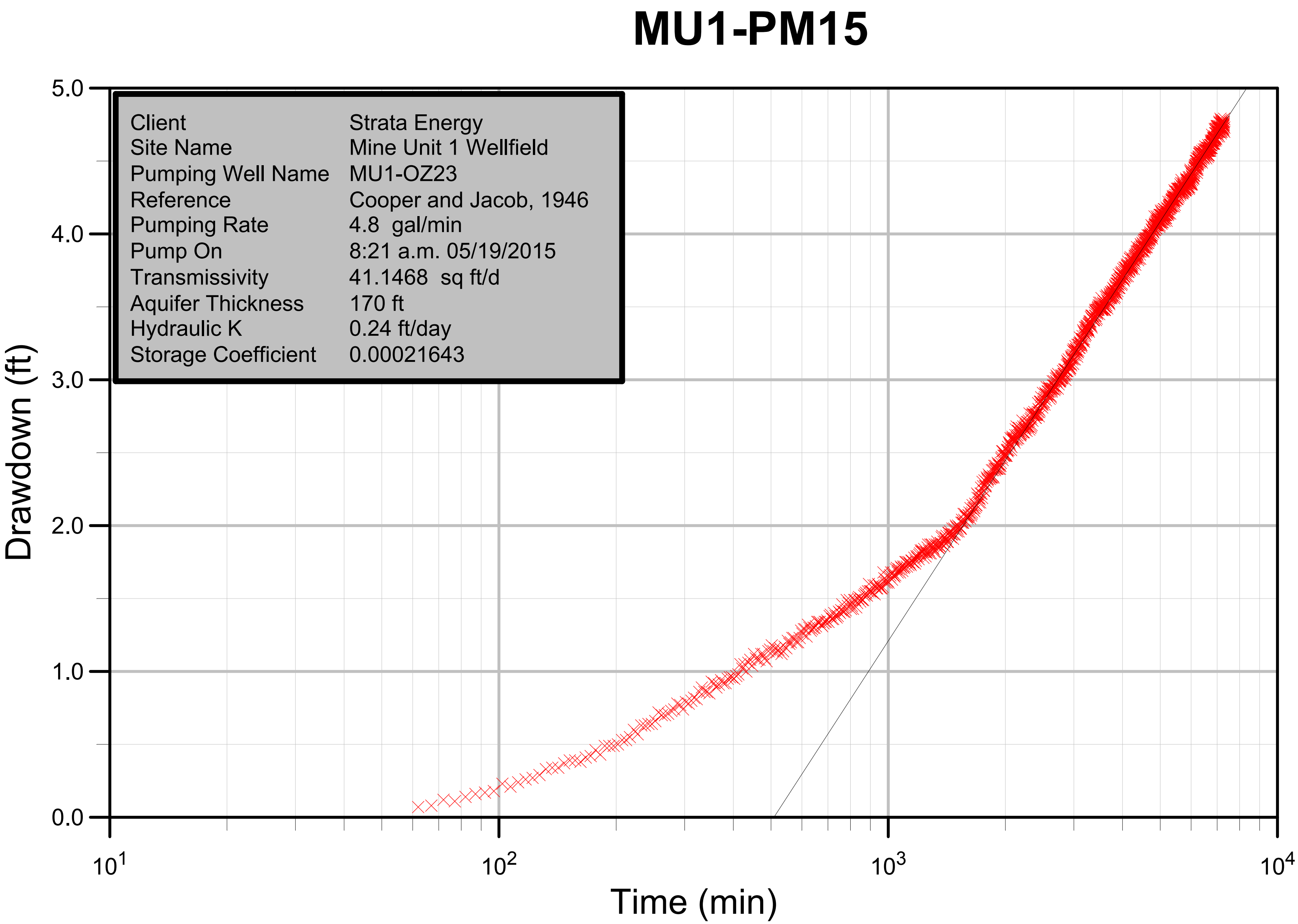
MU1-PM13

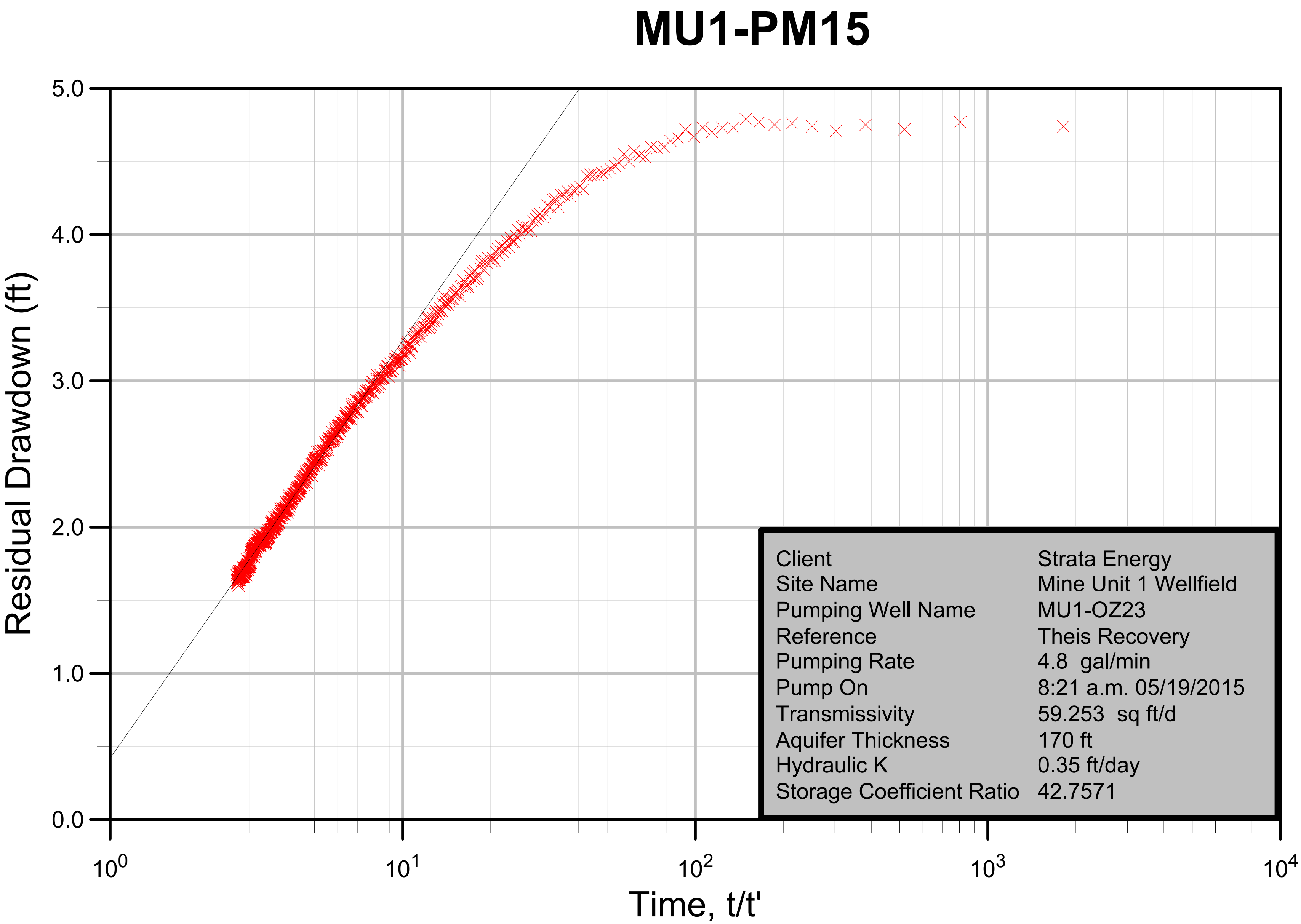


Client	Strata Energy
Site Name	Mine Unit 1 Wellfield
Pumping Well Name	MU1-OZ23
Reference	Theis Recovery
Pumping Rate	4.8 gal/min
Pump On	8:21 a.m. 05/19/2015
Transmissivity	63.9974 sq ft/d
Aquifer Thickness	171 ft
Hydraulic K	0.37 ft/day
Storage Coefficient Ratio	51.2367

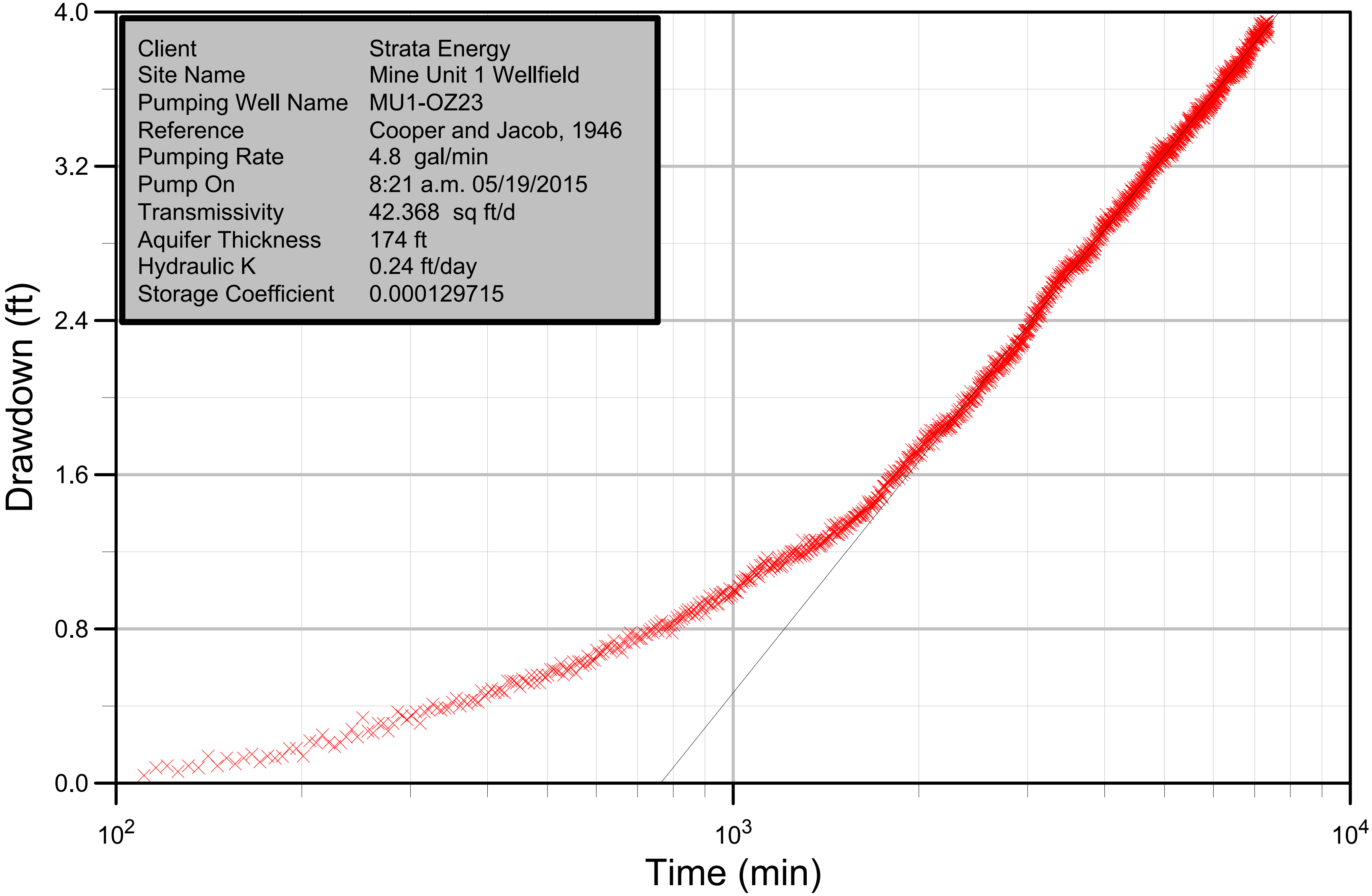

MU1-PM14A
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ23
Reference Cooper and Jacob, 1946
Pumping Rate 4.8 gal/min
Pump On 8:21 a.m. 05/19/2015
Transmissivity 41.8596 sq ft/d
Aquifer Thickness 153 ft
Hydraulic K 0.27 ft/day
Storage Coefficient 4.94555e-005
Drawdown (ft)
6.0
4.8
3.6
2.4
1.2
0.0
10^1
10^2
10^3
10^4
Time (min)


MU1-PM14A
Residual Drawdown (ft)
6.0
4.8
3.6
2.4
1.2
0.0
10^0
10^1
10^2
10^3
10^4
Time, t/t'
Client
Strata Energy
Site Name
Mine Unit 1 Wellfield
Pumping Well Name
MU1-OZ23
Reference
Theis Recovery
Pumping Rate
4.8 gal/min
Pump On
8:21 a.m. 05/19/2015
Transmissivity
57.1464 sq ft/d
Aquifer Thickness
153 ft
Hydraulic K
0.37 ft/day
Storage Coefficient Ratio
48.966

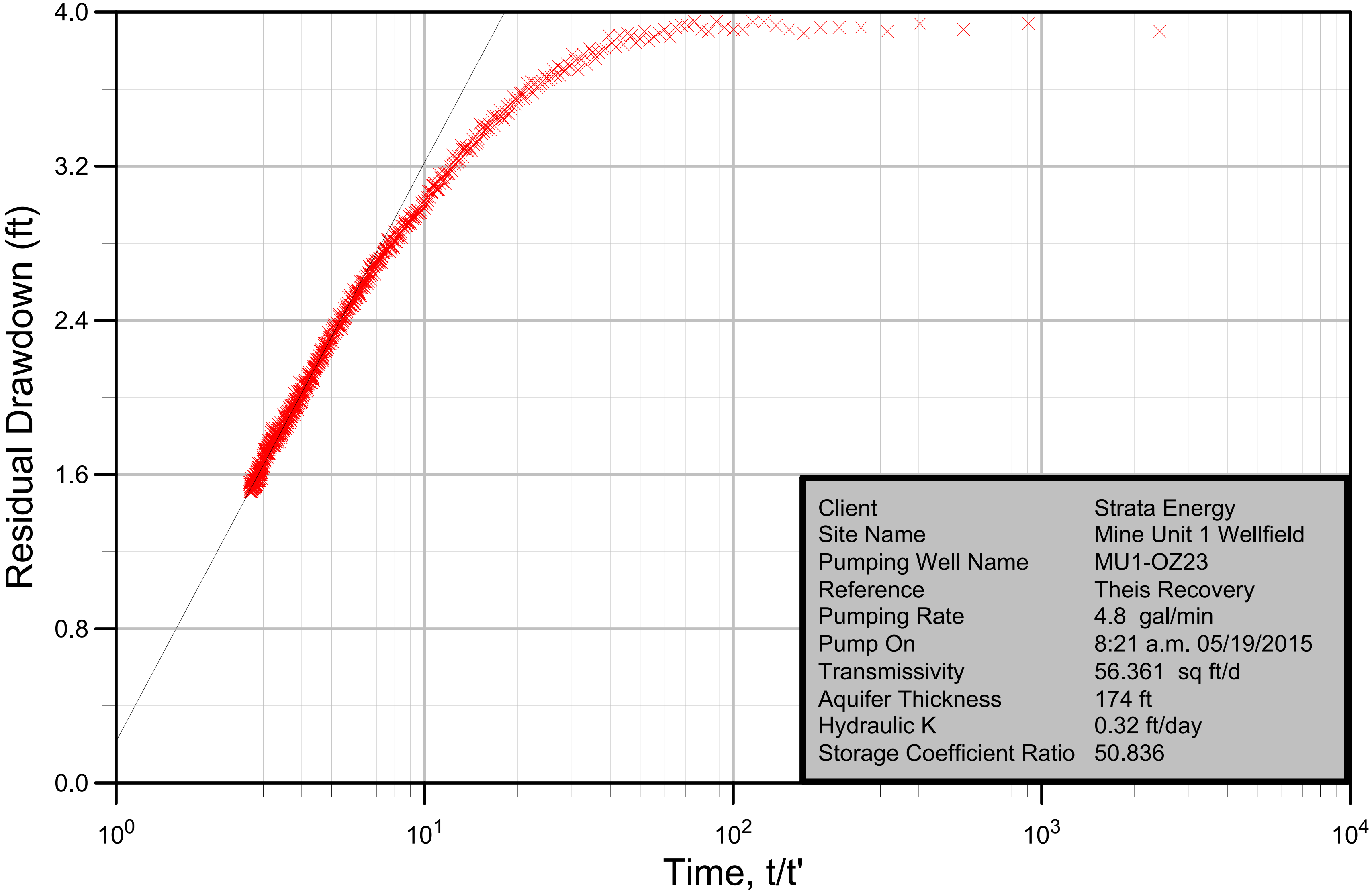

MU1-PM15
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ23
Reference Cooper and Jacob, 1946
Pumping Rate 4.8 gal/min
Pump On 8:21 a.m. 05/19/2015
Transmissivity 41.1468 sq ft/d
Aquifer Thickness 170 ft
Hydraulic K 0.24 ft/day
Storage Coefficient 0.00021643
Drawdown (ft)
5.0
4.0
3.0
2.0
1.0
0.0
10^1
10^2
10^3
10^4
Time (min)


MU1-PM15
Residual Drawdown (ft)
5.0
4.0
3.0
2.0
1.0
0.0
10^0
10^1
10^2
10^3
10^4
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ23
Reference Theis Recovery
Pumping Rate 4.8 gal/min
Pump On 8:21 a.m. 05/19/2015
Transmissivity 59.253 sq ft/d
Aquifer Thickness 170 ft
Hydraulic K 0.35 ft/day
Storage Coefficient Ratio 42.7571

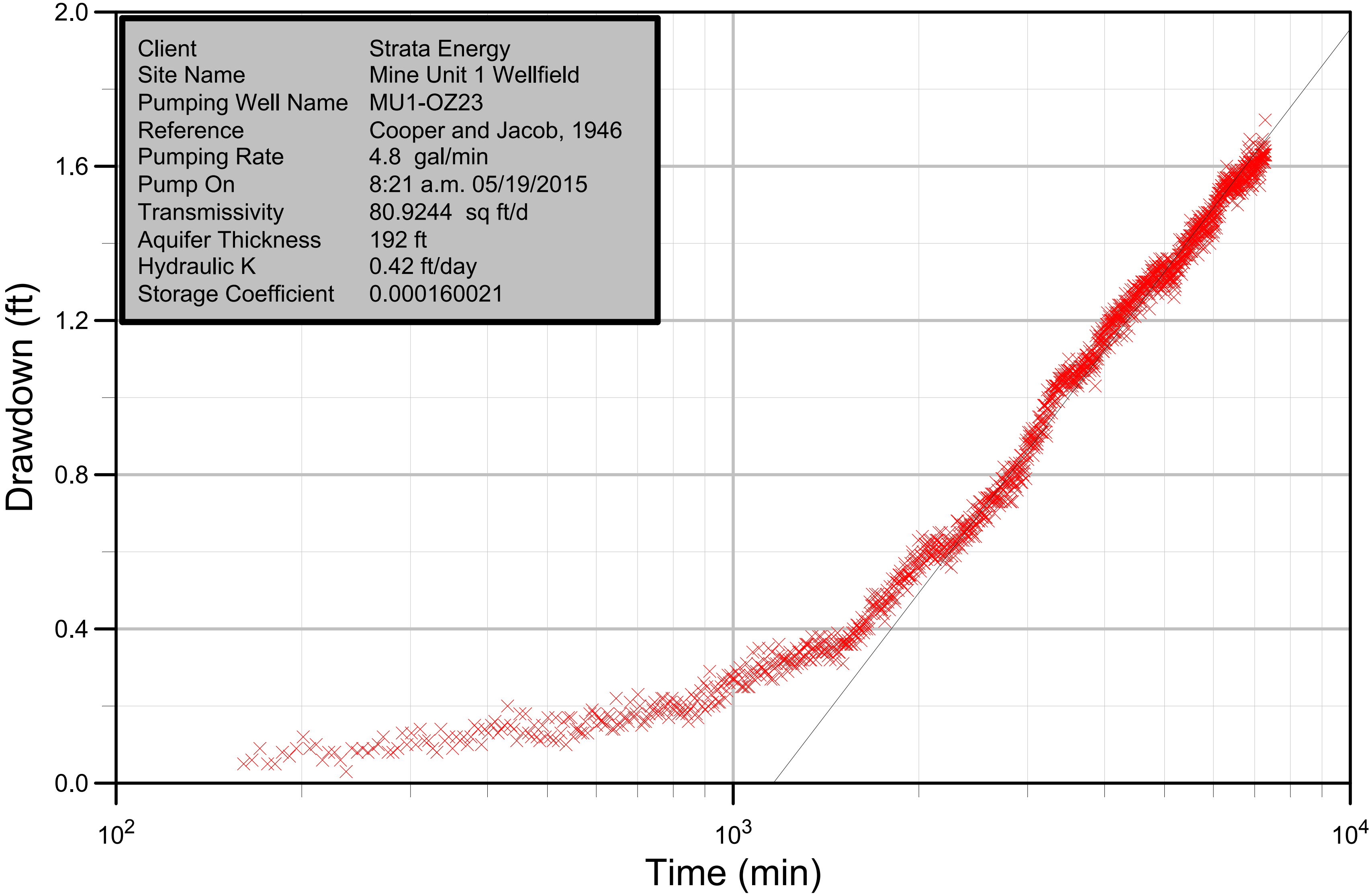
MU1-PM16


Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ23
Reference Cooper and Jacob, 1946
Pumping Rate 4.8 gal/min
Pump On 8:21 a.m. 05/19/2015
Transmissivity 42.368 sq ft/d
Aquifer Thickness 174 ft
Hydraulic K 0.24 ft/day
Storage Coefficient 0.000129715
Drawdown (ft)
4.0
3.2
2.4
1.6
0.8
0.0
10^2
10^3
10^4
Time (min)

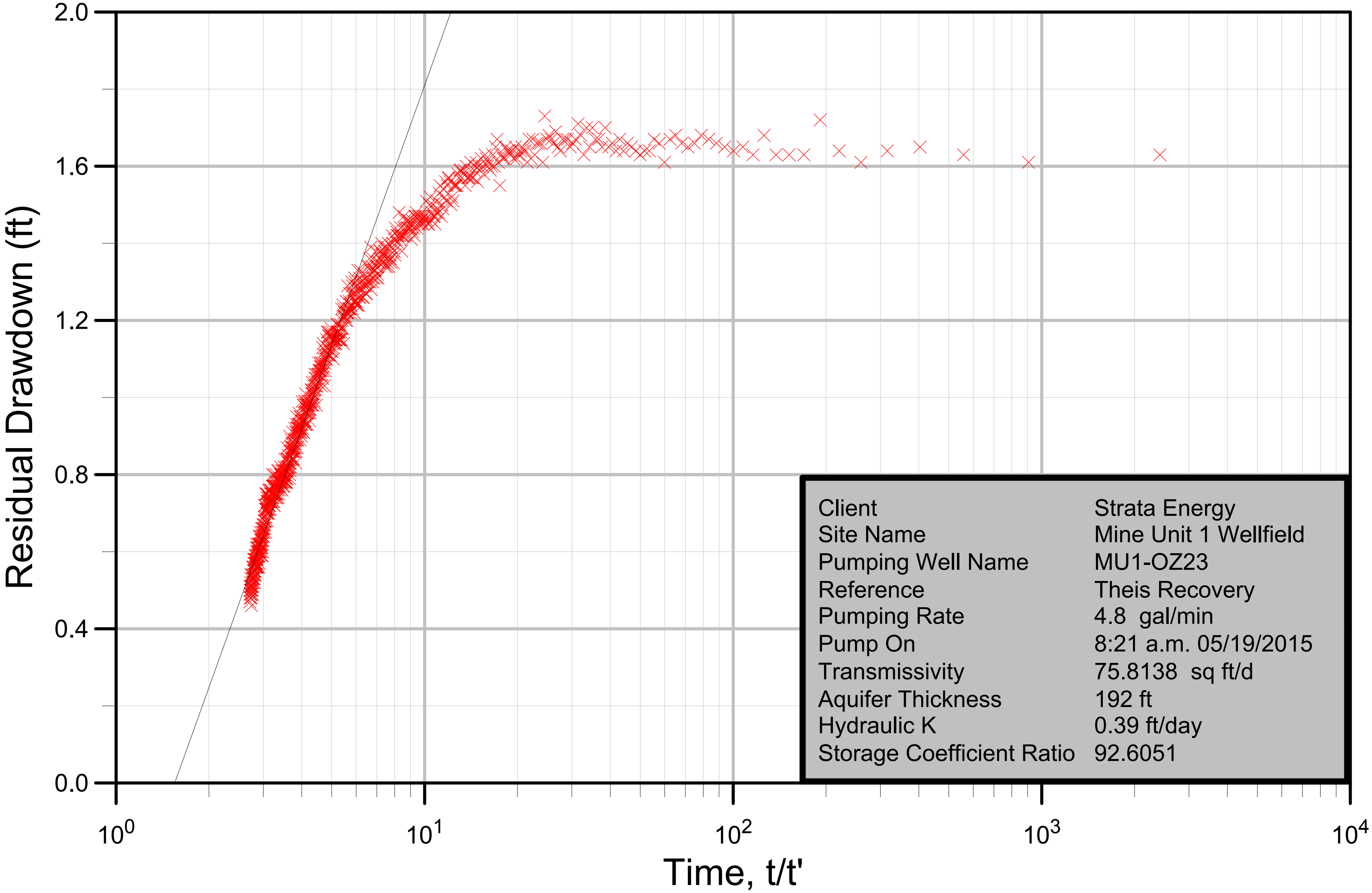
MU1-PM16


Residual Drawdown (ft)
4.0
3.2
2.4
1.6
0.8
0.0
Time, t/t'
10^0
10^1
10^2
10^3
10^4
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ23
Reference Theis Recovery
Pumping Rate 4.8 gal/min
Pump On 8:21 a.m. 05/19/2015
Transmissivity 56.361 sq ft/d
Aquifer Thickness 174 ft
Hydraulic K 0.32 ft/day
Storage Coefficient Ratio 50.836

MU1-PM17


Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ23
Reference Cooper and Jacob, 1946
Pumping Rate 4.8 gal/min
Pump On 8:21 a.m. 05/19/2015
Transmissivity 80.9244 sq ft/d
Aquifer Thickness 192 ft
Hydraulic K 0.42 ft/day
Storage Coefficient 0.000160021
Drawdown (ft)
2.0
1.6
1.2
0.8
0.4
0.0
10^2
10^3
10^4
Time (min)

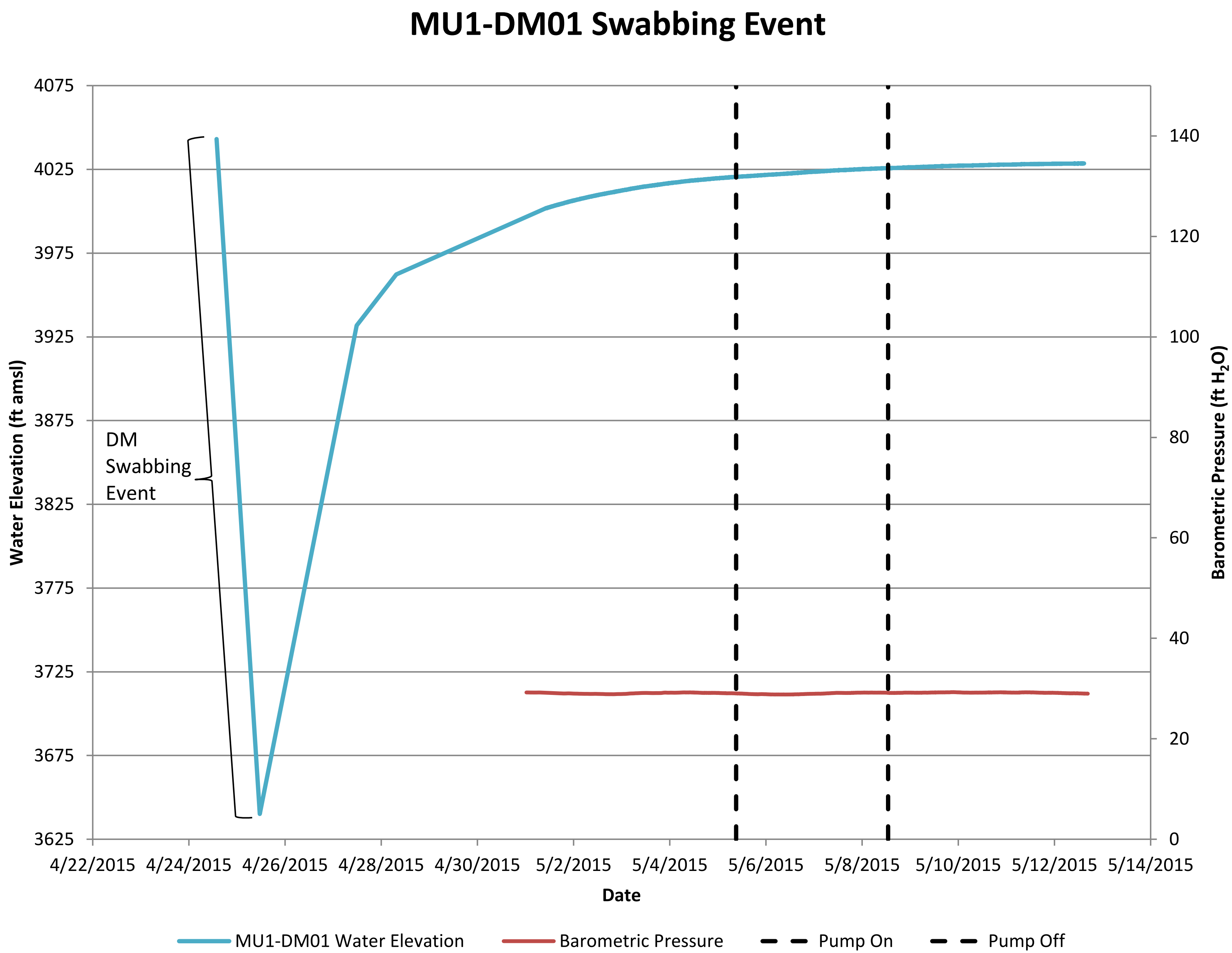
MU1-PM17

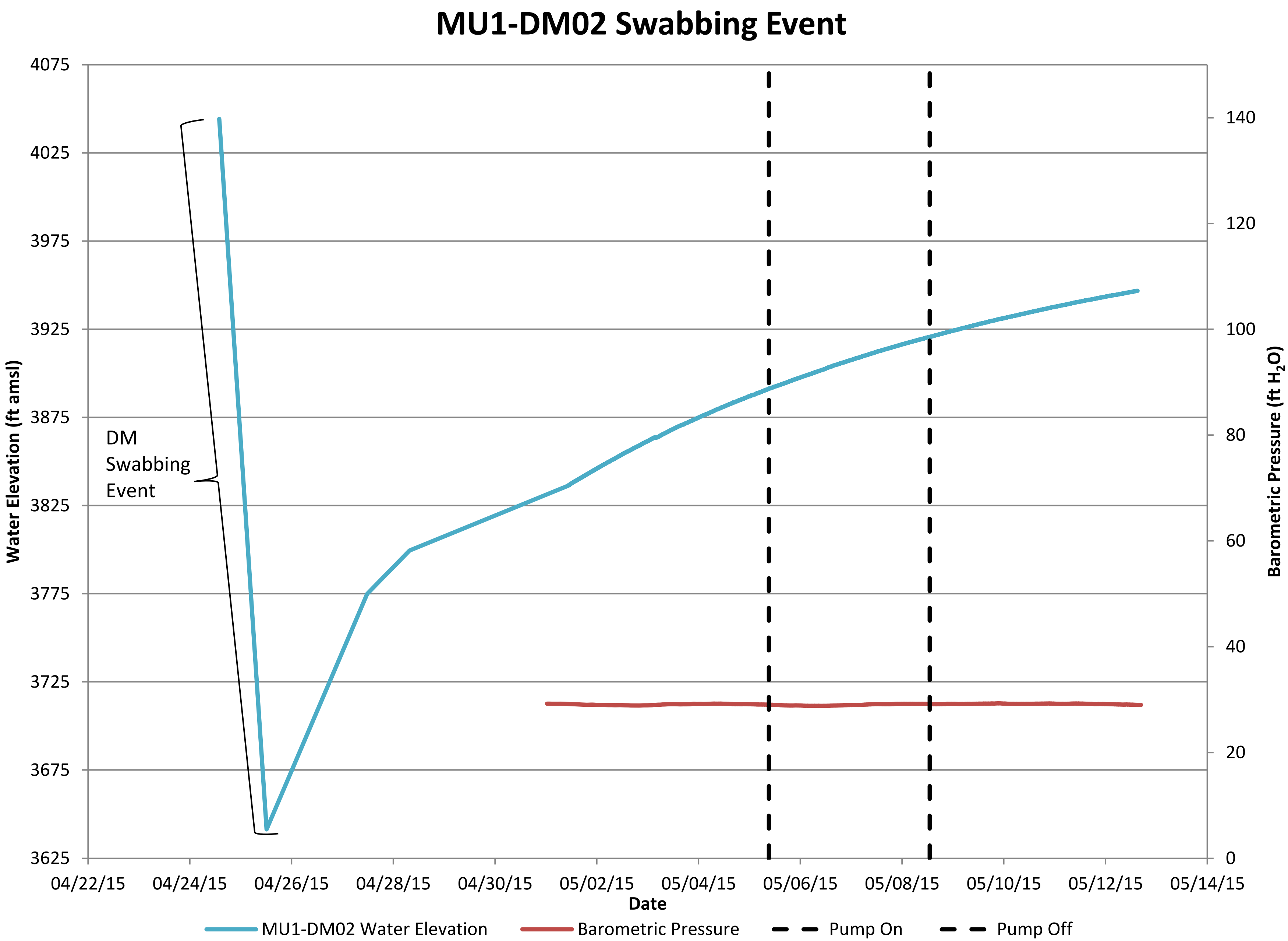

2.0
1.6
1.2
0.8
0.4
0.0
Residual Drawdown (ft)
10^0
10^1
10^2
10^3
10^4
Time, t/t'
Client Strata Energy
Site Name Mine Unit 1 Wellfield
Pumping Well Name MU1-OZ23
Reference Theis Recovery
Pumping Rate 4.8 gal/min
Pump On 8:21 a.m. 05/19/2015
Transmissivity 75.8138 sq ft/d
Aquifer Thickness 192 ft
Hydraulic K 0.39 ft/day
Storage Coefficient Ratio 92.6051

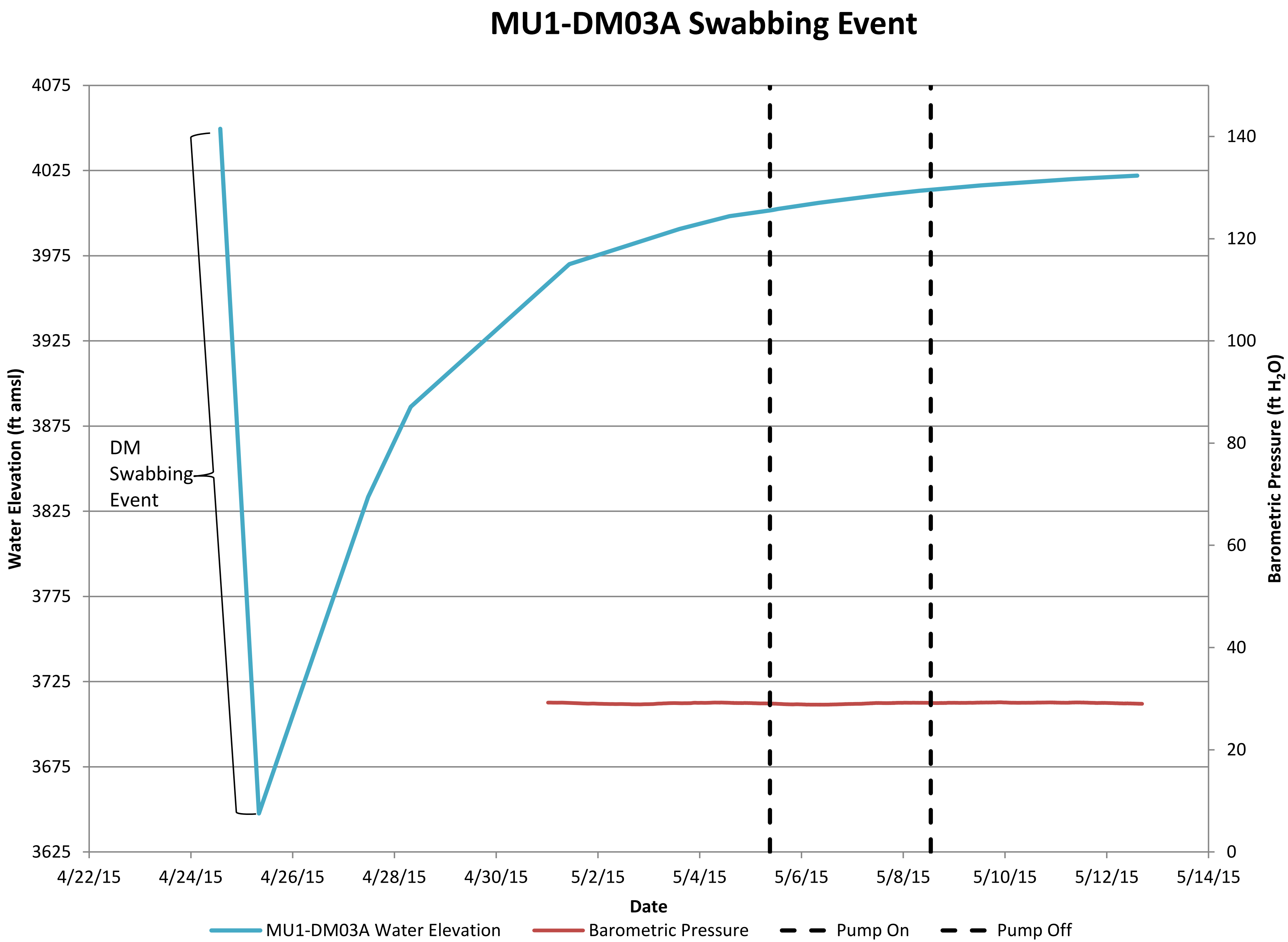
Attachment 5

Appendix I

DM Swabbing Event Hydrographs


MU1-DM01 Swabbing Event
Water Elevation (ft amsl)
4075
4025
3975
3925
3875
3825
3775
3725
3675
3625
Barometric Pressure (ft H_2O)
140
120
100
80
60
40
20
0
DM
Swabbing
Event
4/22/2015
4/24/2015
4/26/2015
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM01 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-DM02 Swabbing Event
Water Elevation (ft amsl)
4075
4025
3975
3925
3875
3825
3775
3725
3675
3625
Barometric Pressure (ft H_2O)
140
120
100
80
60
40
20
0
DM Swabbing Event
04/22/15
04/24/15
04/26/15
04/28/15
04/30/15
05/02/15
05/04/15
05/06/15
05/08/15
05/10/15
05/12/15
05/14/15
Date
MU1-DM02 Water Elevation
Barometric Pressure
Pump On
Pump Off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4025
3975
3925
3875
3825
3775
3725
3675
3625
Barometric Pressure (ft H_2O)
140
120
100
80
60
40
20
0
DM
Swabbing
Event
Date
4/22/15
4/24/15
4/26/15
4/28/15
4/30/15
5/2/15
5/4/15
5/6/15
5/8/15
5/10/15
5/12/15
5/14/15
MU1-DM03A Water Elevation
Barometric Pressure
Pump On
Pump Off

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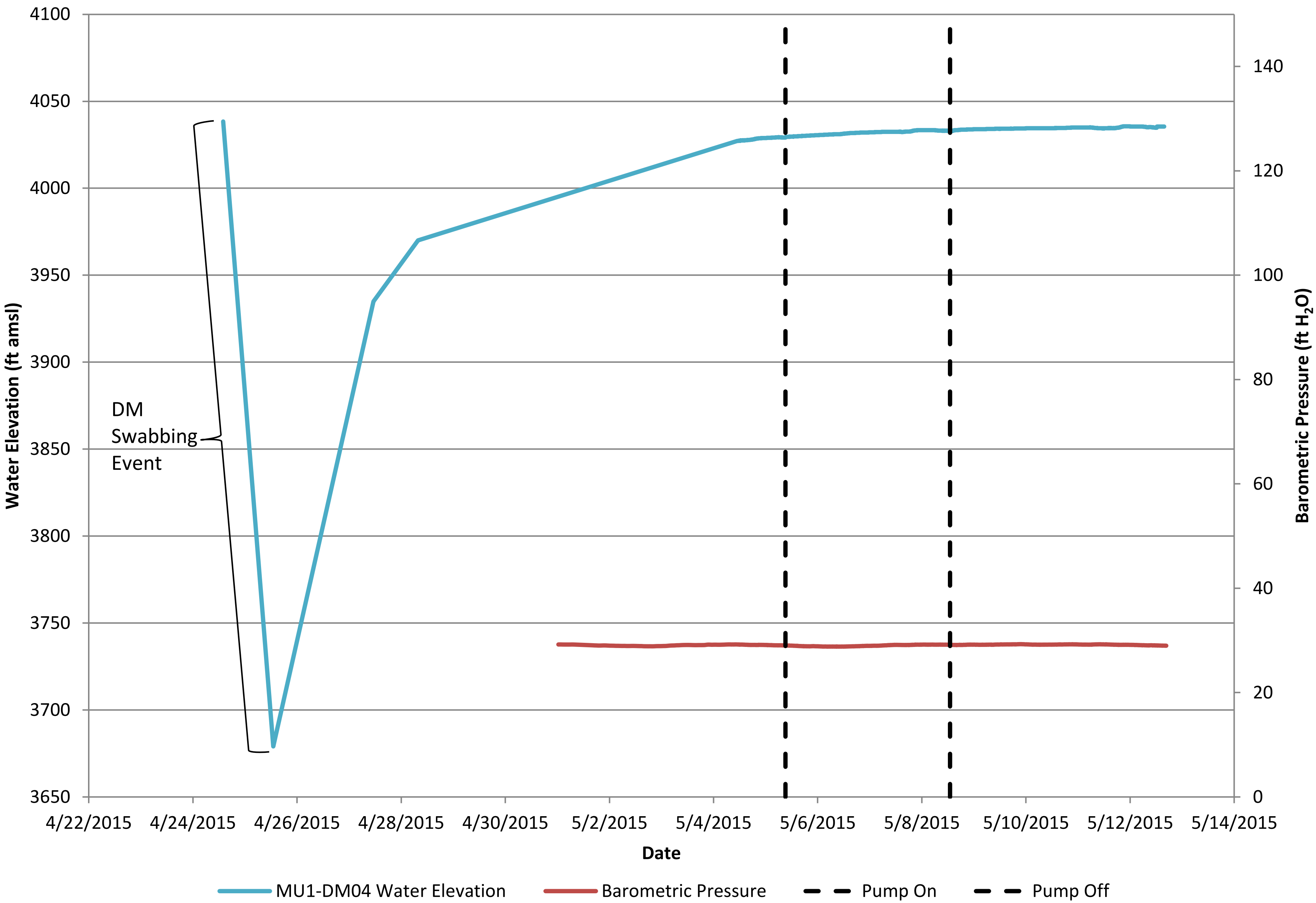

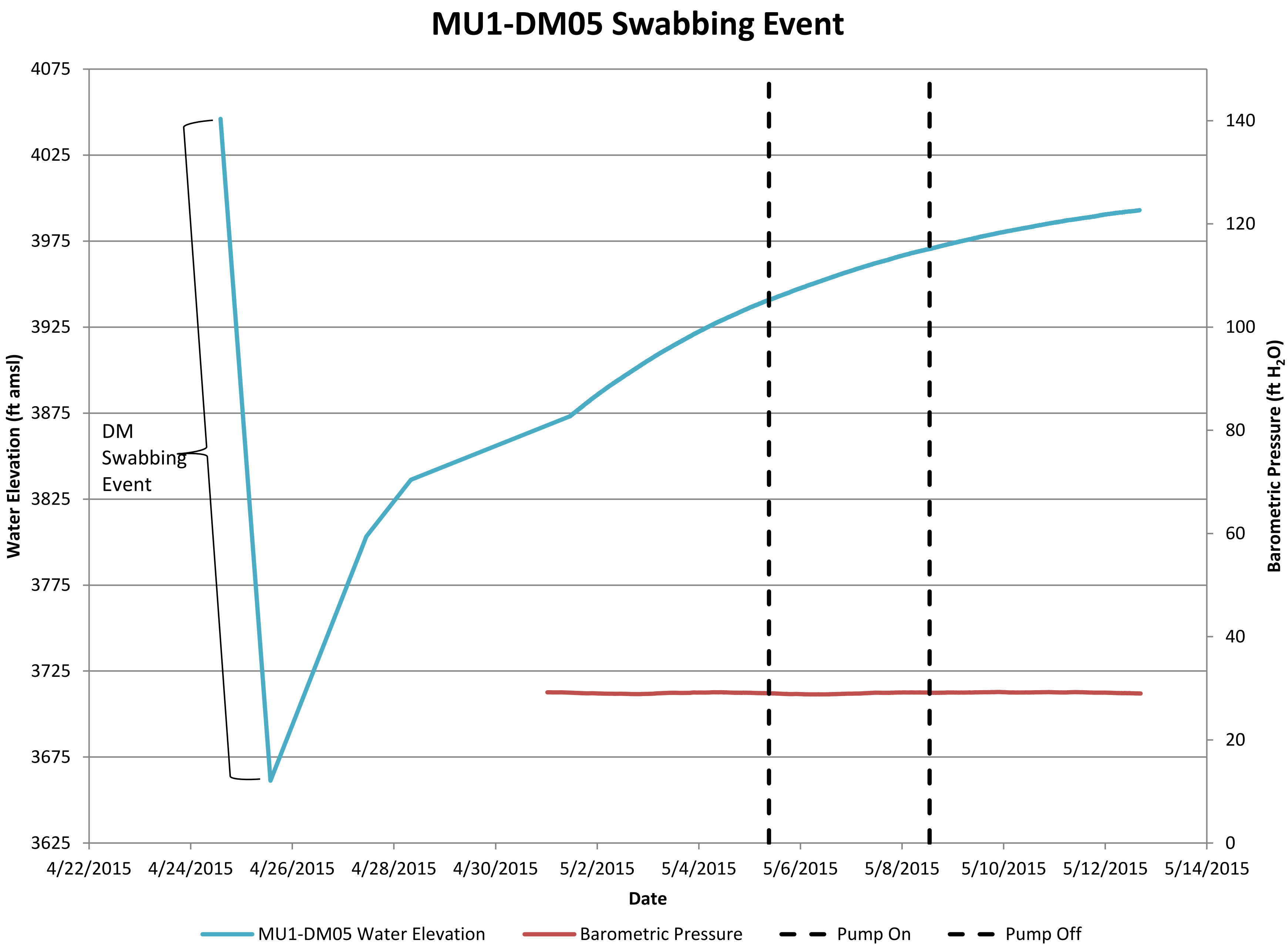
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4025
3975
3925
3875
3825
3775
3725
3675
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Barometric Pressure (ft H_2O)
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120
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60
40
20
0
DM
Swabbing
Event
Date
4/22/2015
4/24/2015
4/26/2015
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
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Barometric Pressure
Pump On
Pump Off

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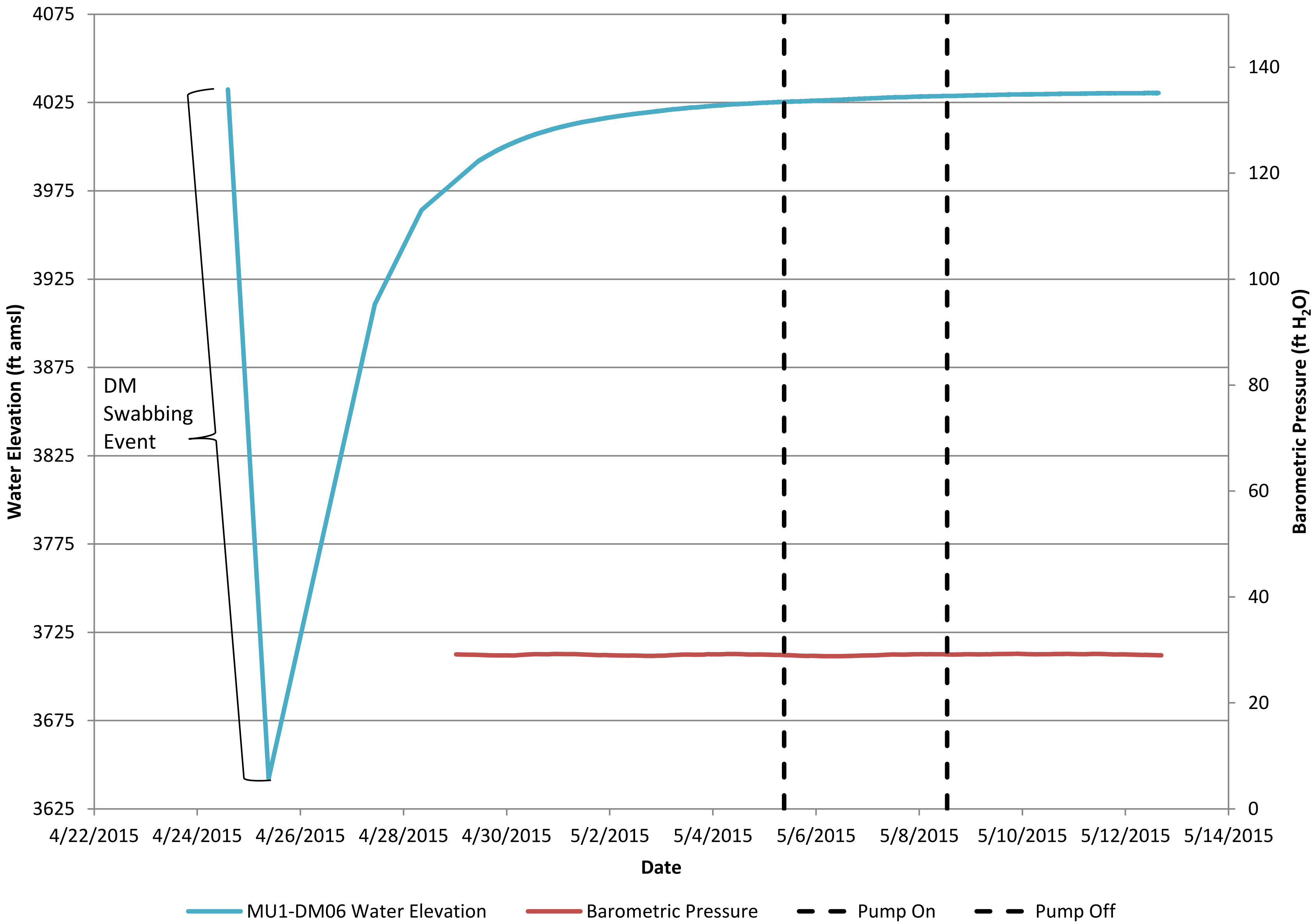

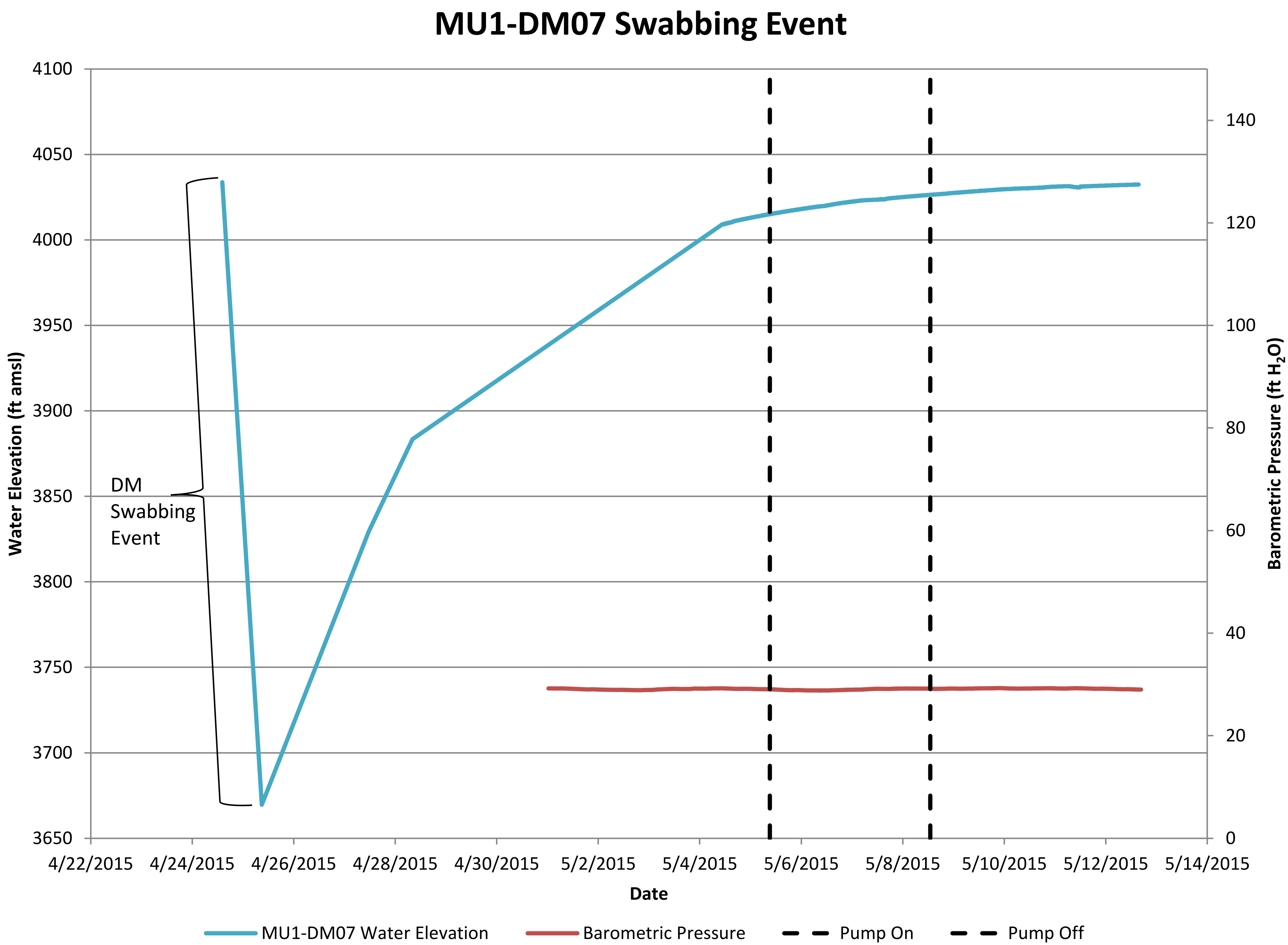
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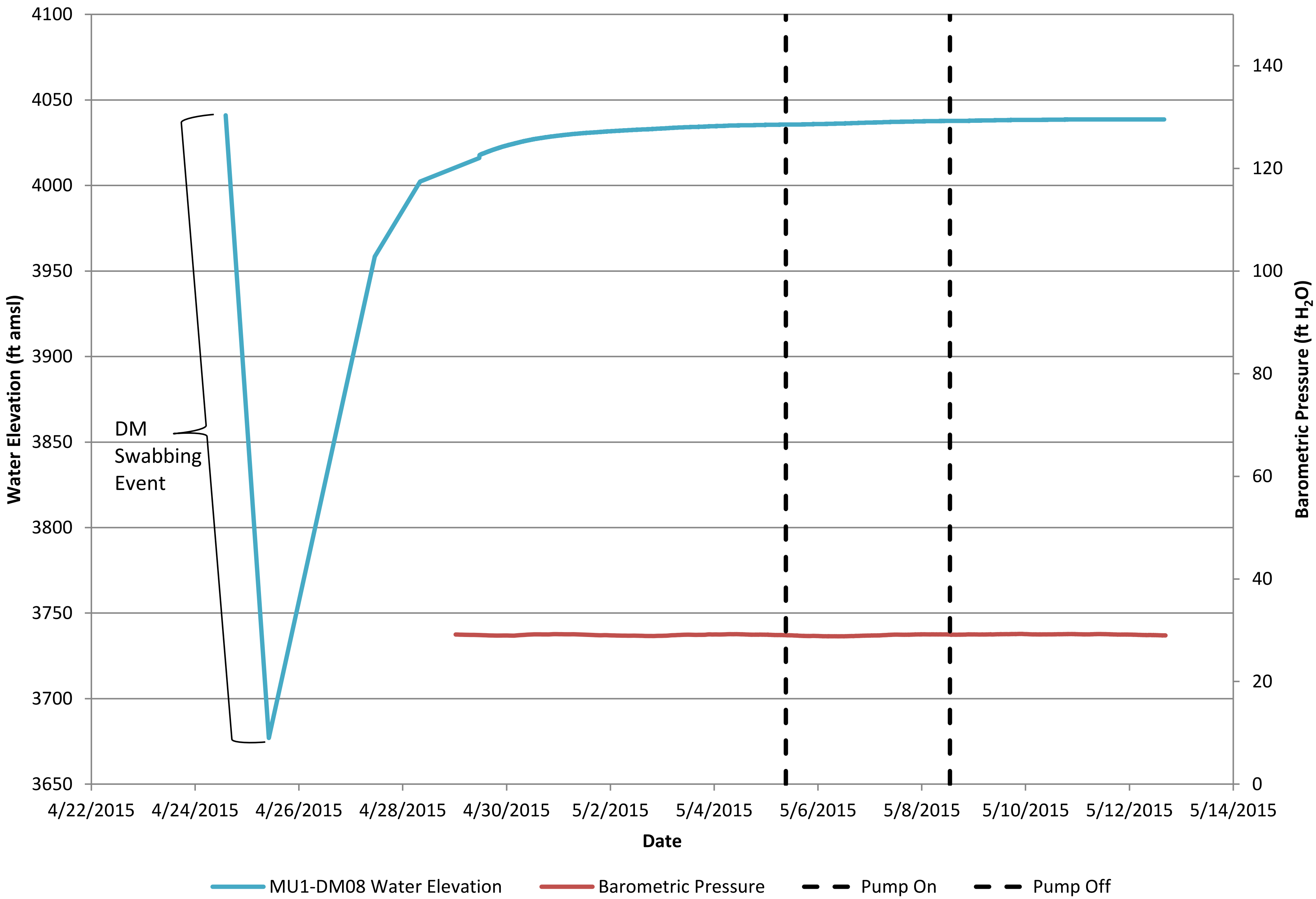
4050
4000
3950
3900
3850
3800
3750
3700
3650
Barometric Pressure (ft H_2O)
140
120
100
80
60
40
20
0
DM Swabbing Event
4/22/2015
4/24/2015
4/26/2015
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM07 Water Elevation
Barometric Pressure
Pump On
Pump Off

MU1-DM08 Swabbing Event



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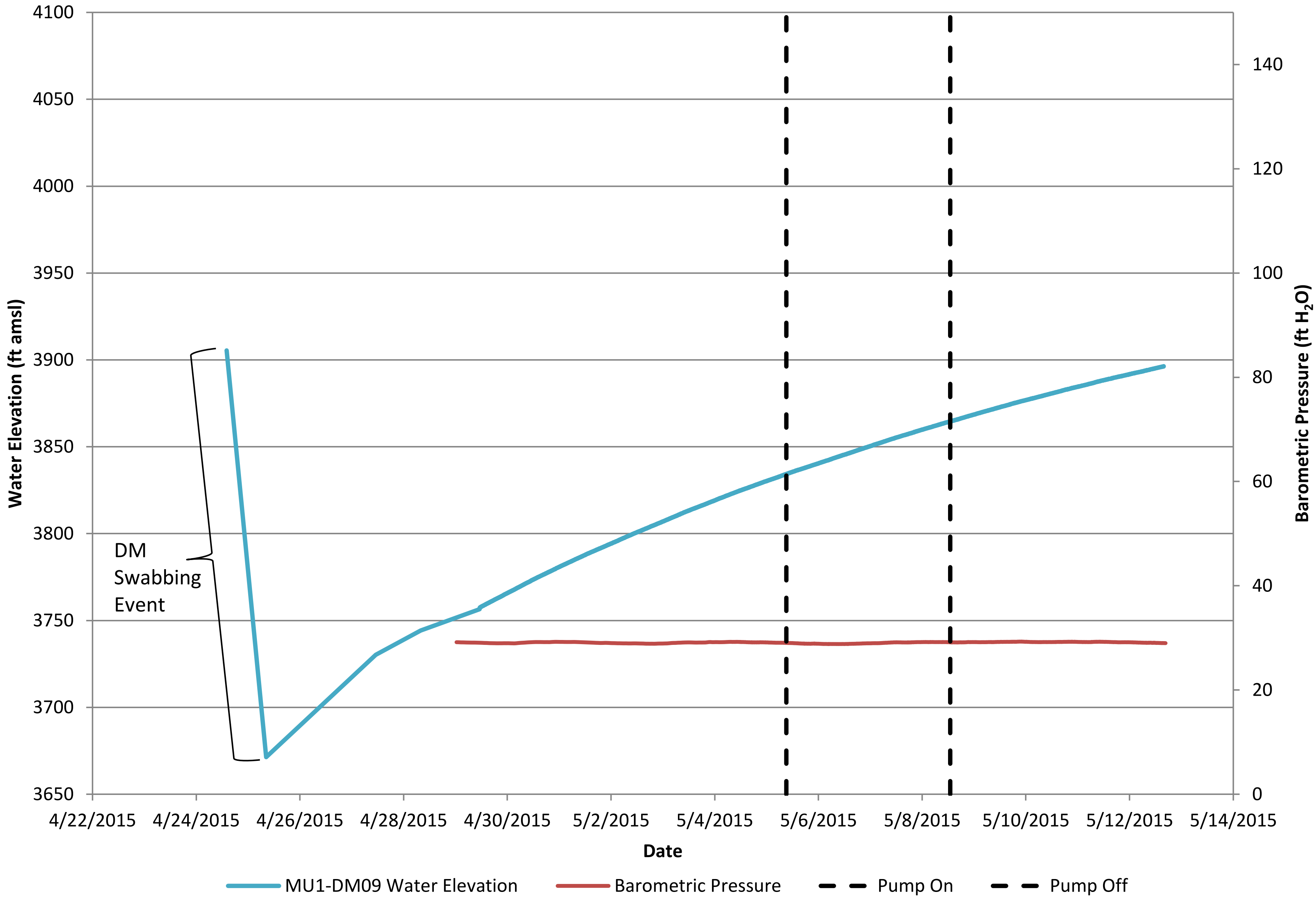
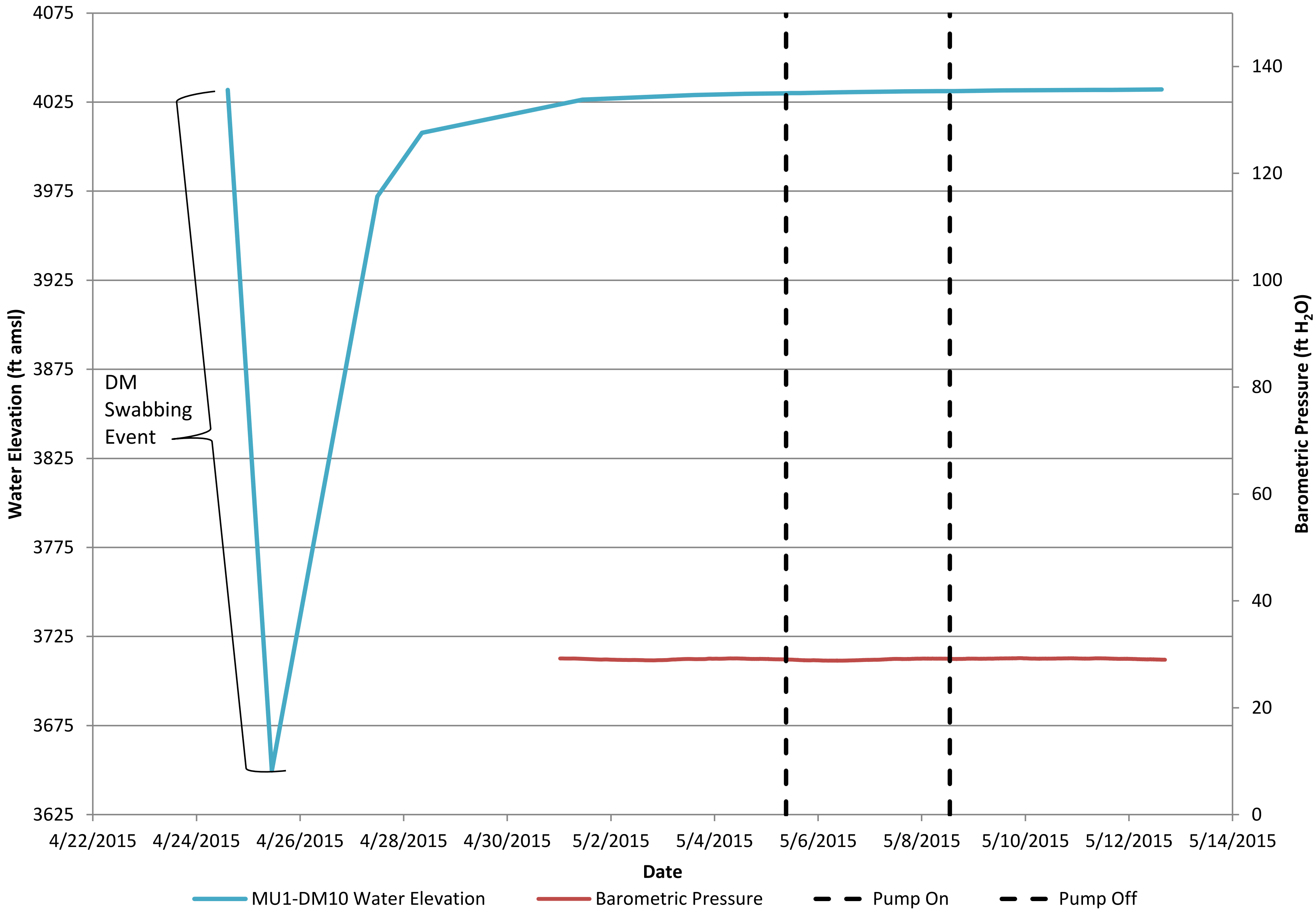
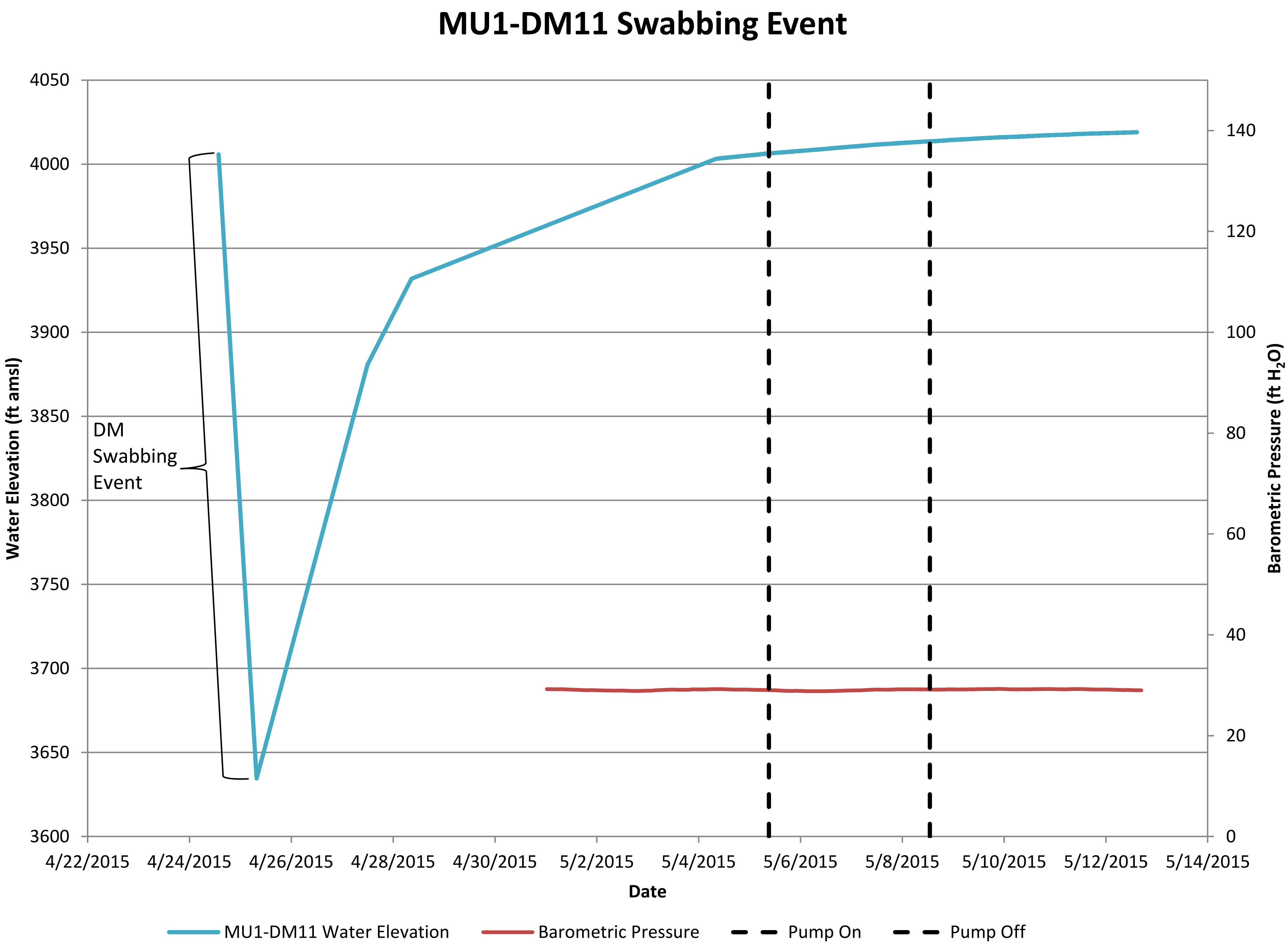


MU1-DM10 Swabbing Event




MU1-DM11 Swabbing Event
Water Elevation (ft amsl)
Barometric Pressure (ft H_2O)
Date
DM Swabbing Event
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4000
3950
3900
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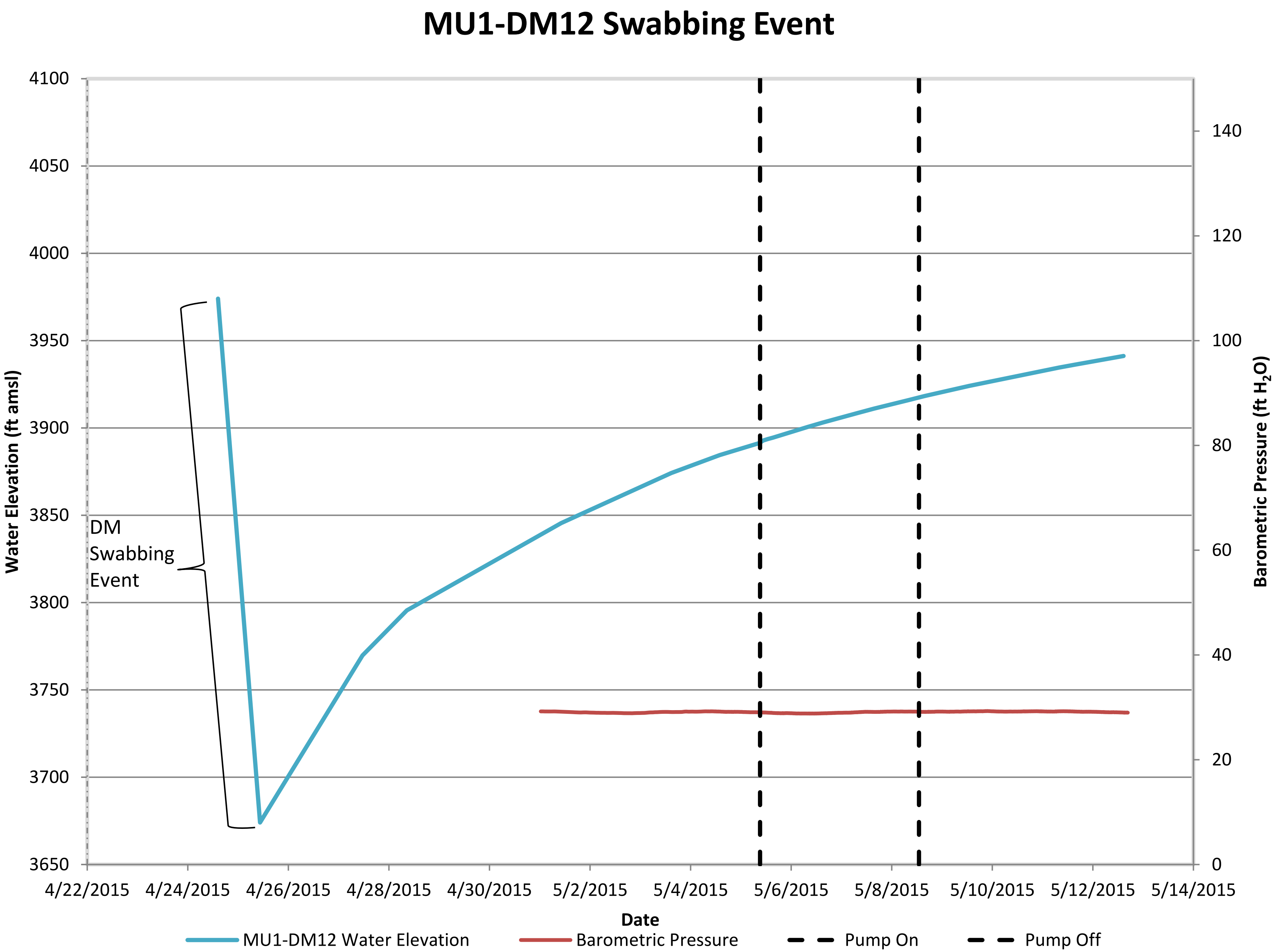
3800
3750
3700
3650
3600
140
120
100
80
60
40
20
0
4/22/2015
4/24/2015
4/26/2015
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
MU1-DM11 Water Elevation
Barometric Pressure
Pump On
Pump Off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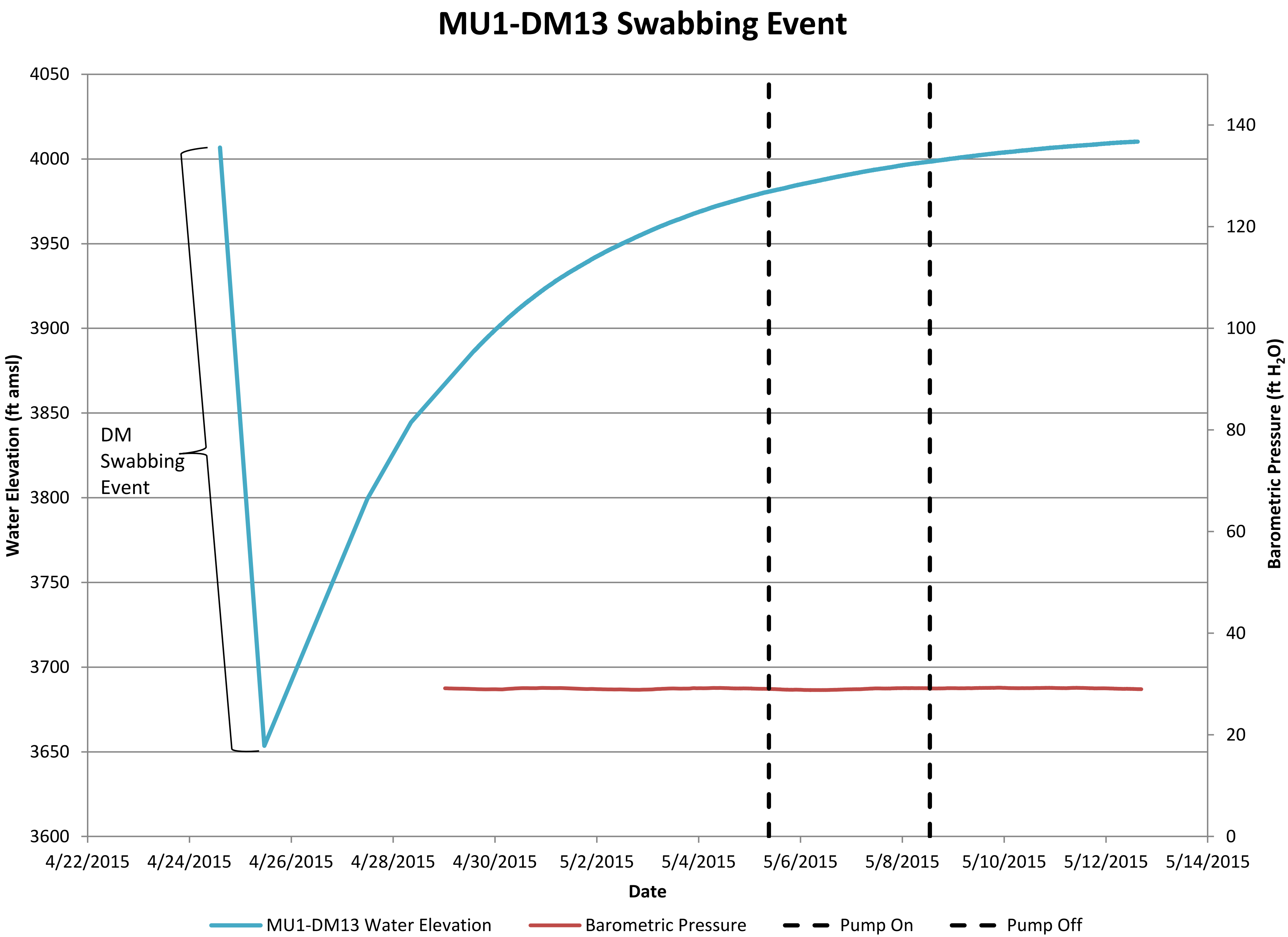
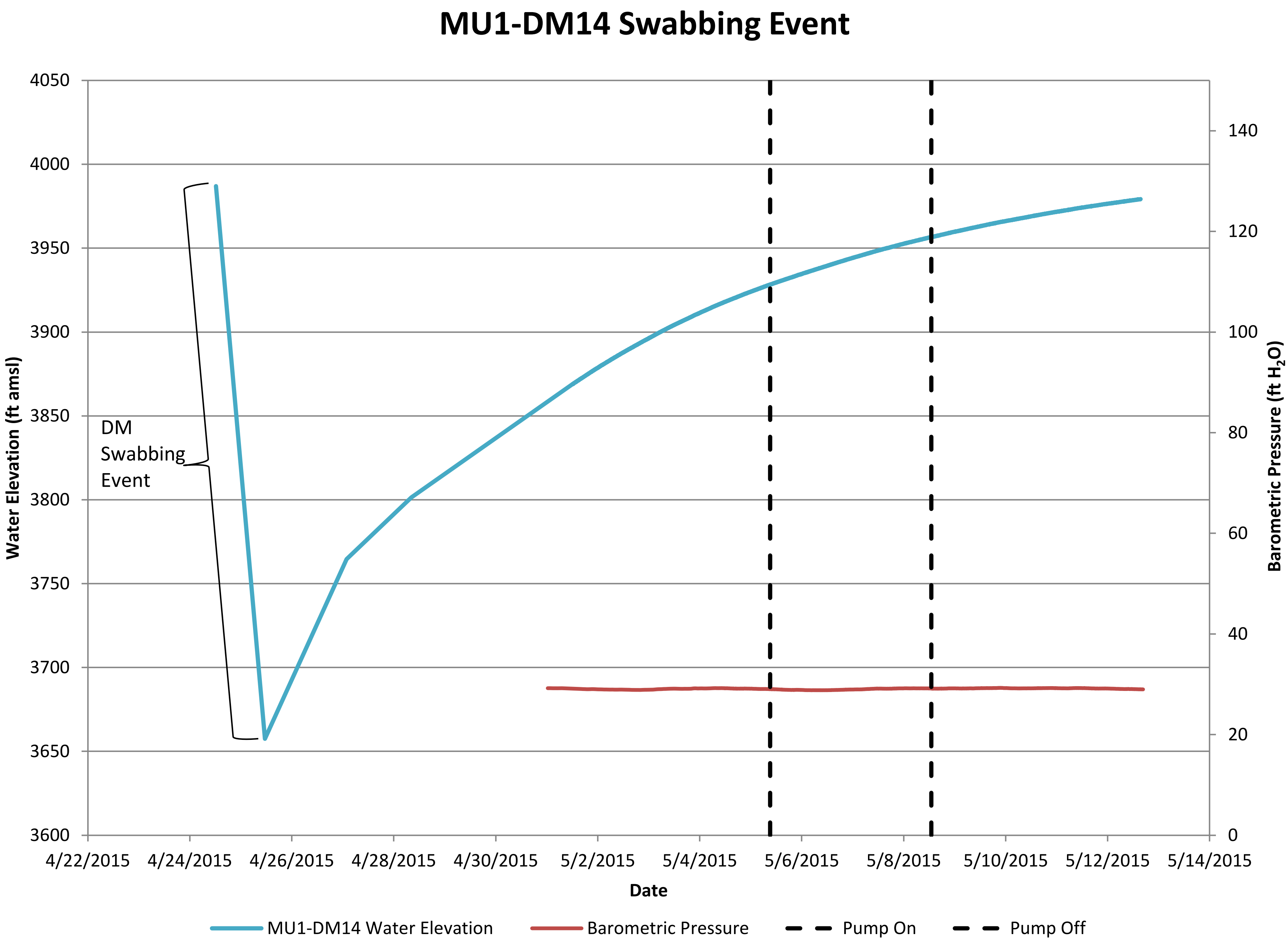
4050
4000
3950
3900
3850
3800
3750
3700
3650
Barometric Pressure (ft H_2O)
140
120
100
80
60
40
20
0
DM Swabbing Event
Date
4/22/2015
4/24/2015
4/26/2015
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
MU1-DM12 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-DM13 Swabbing Event
Water Elevation (ft amsl)
4050
4000
3950
3900
3850
3800
3750
3700
3650
3600
Barometric Pressure (ft H_2O)
140
120
100
80
60
40
20
0
DM
Swabbing
Event
Date
4/22/2015
4/24/2015
4/26/2015
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
MU1-DM13 Water Elevation
Barometric Pressure
Pump On
Pump Off


MU1-DM14 Swabbing Event
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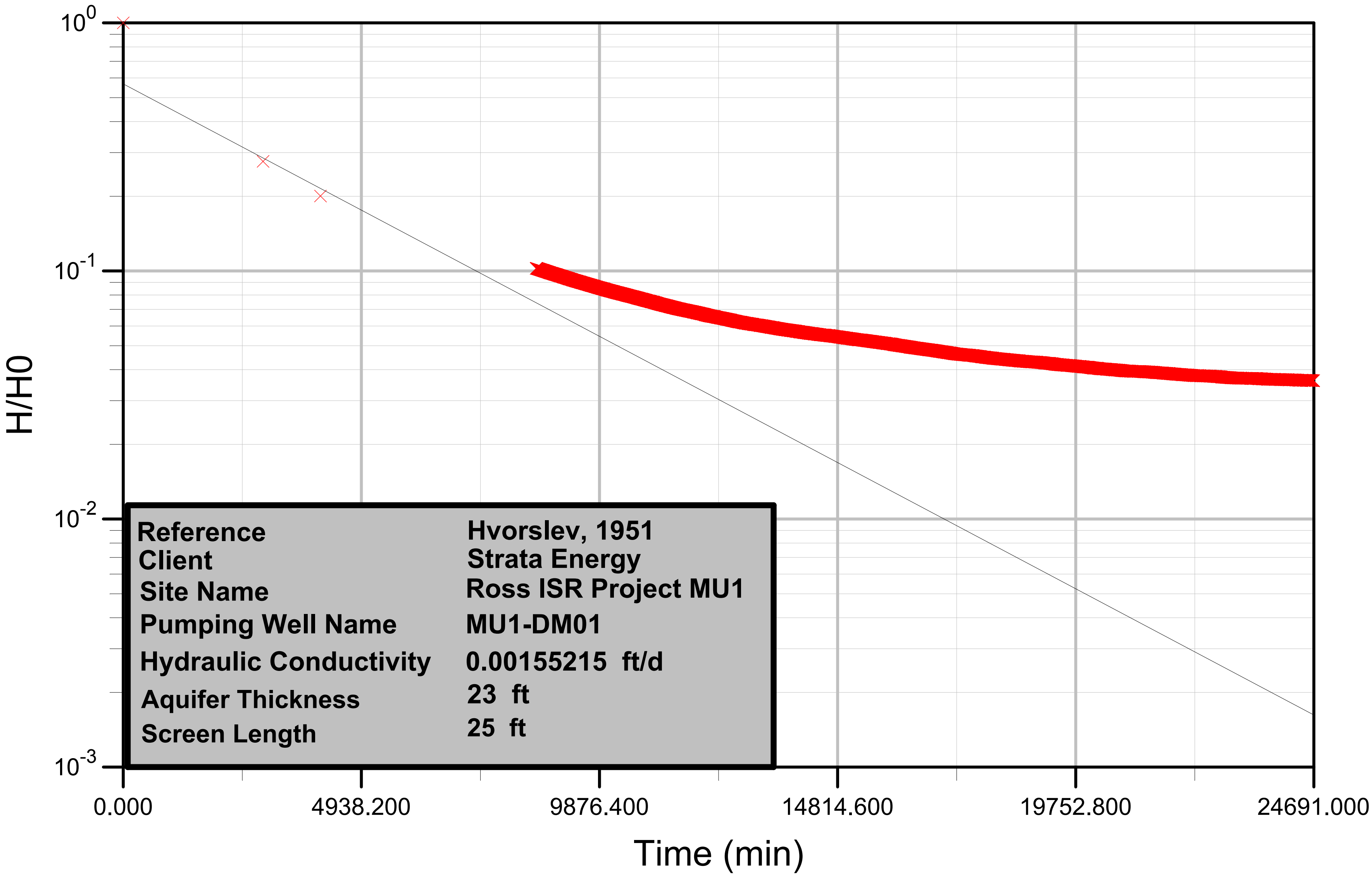
3950
3900
3850
3800
3750
3700
3650
3600
Water Elevation (ft amsl)
140
120
100
80
60
40
20
0
Barometric Pressure (ft H2O)
DM Swabbing Event
4/22/2015
4/24/2015
4/26/2015
4/28/2015
4/30/2015
5/2/2015
5/4/2015
5/6/2015
5/8/2015
5/10/2015
5/12/2015
5/14/2015
Date
MU1-DM14 Water Elevation
Barometric Pressure
Pump On
Pump Off

Attachment 5

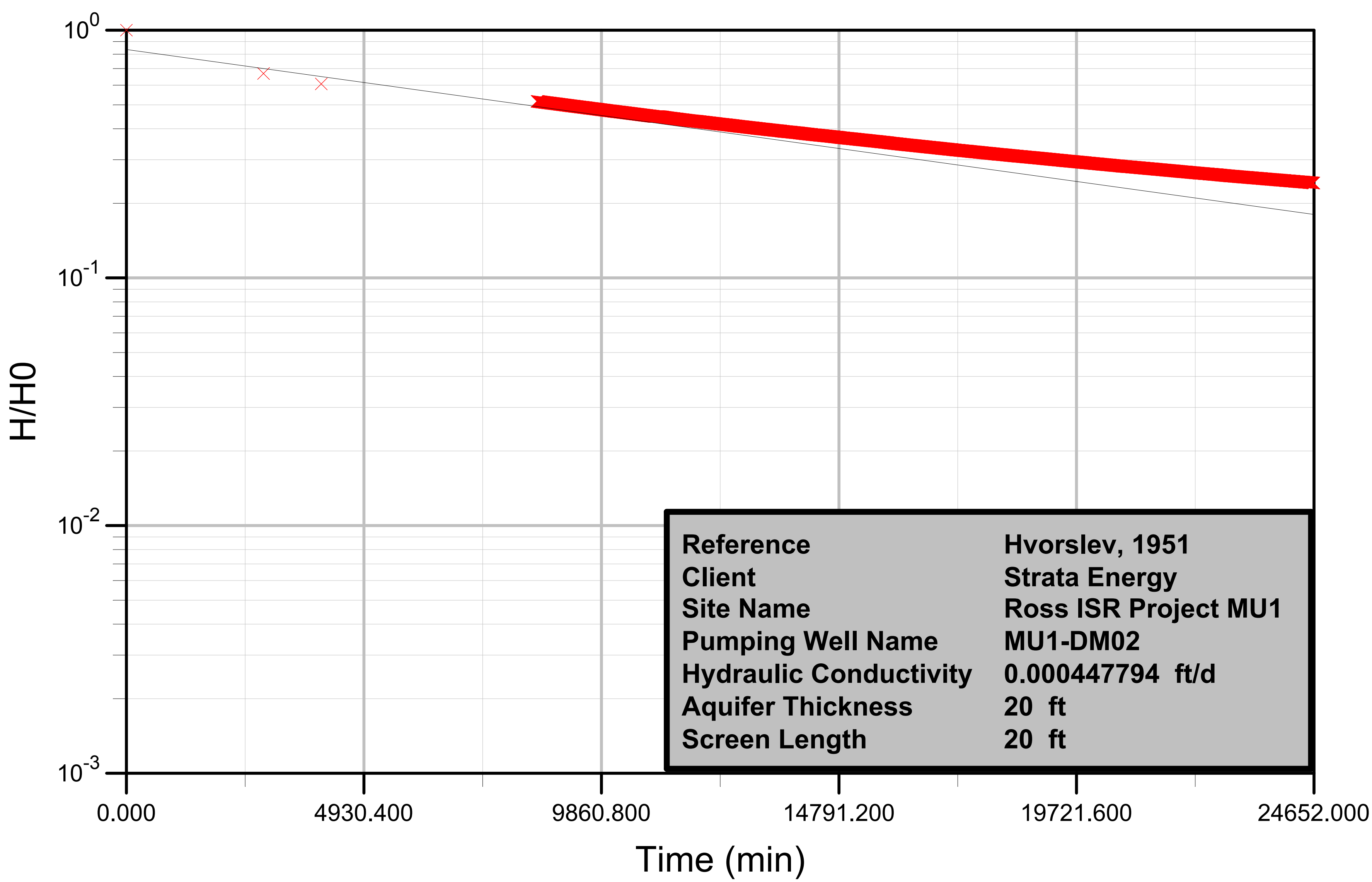
Appendix J

DM Slug Test Analyses

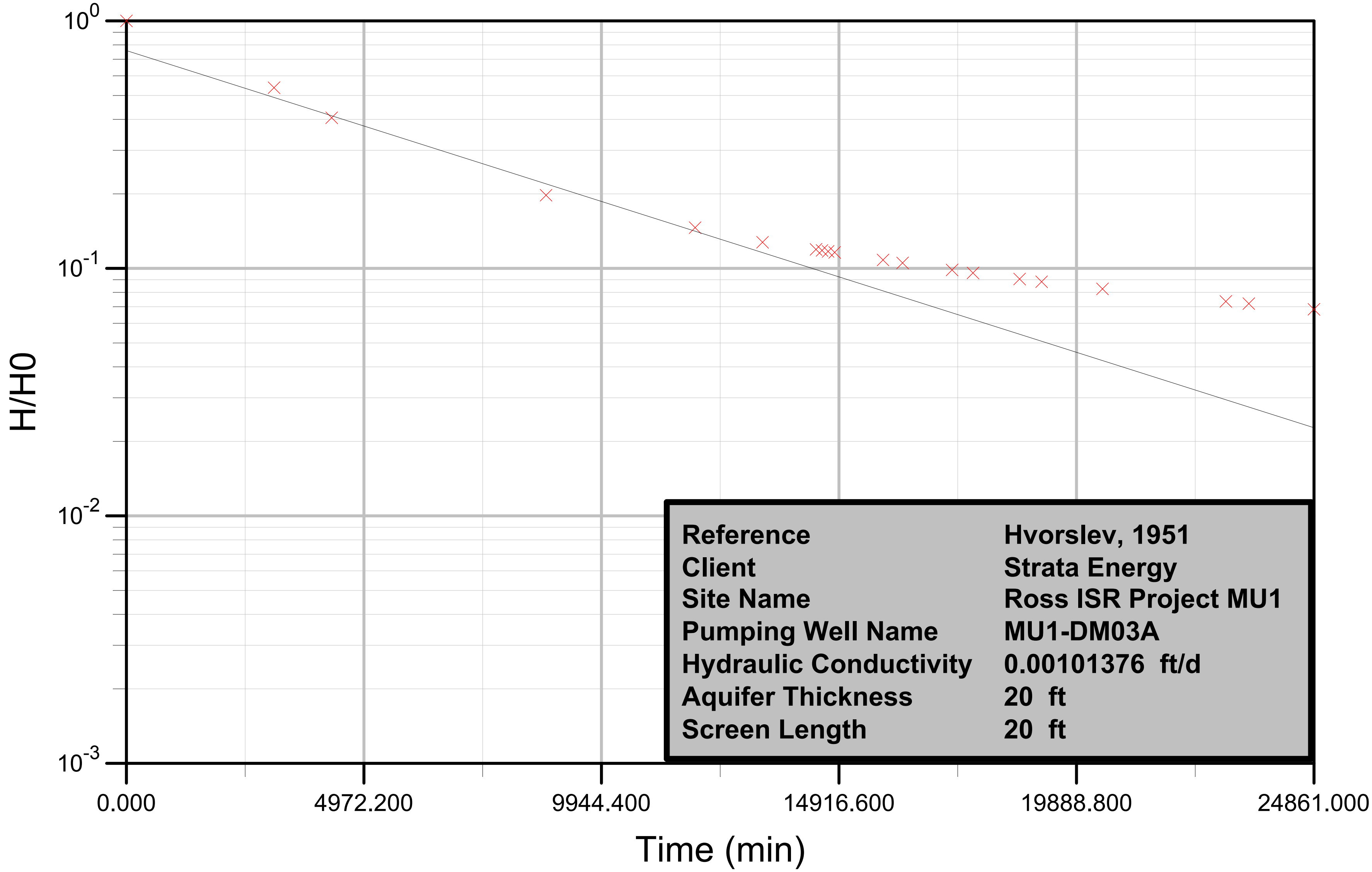
MU1-DM01 Slug Analysis



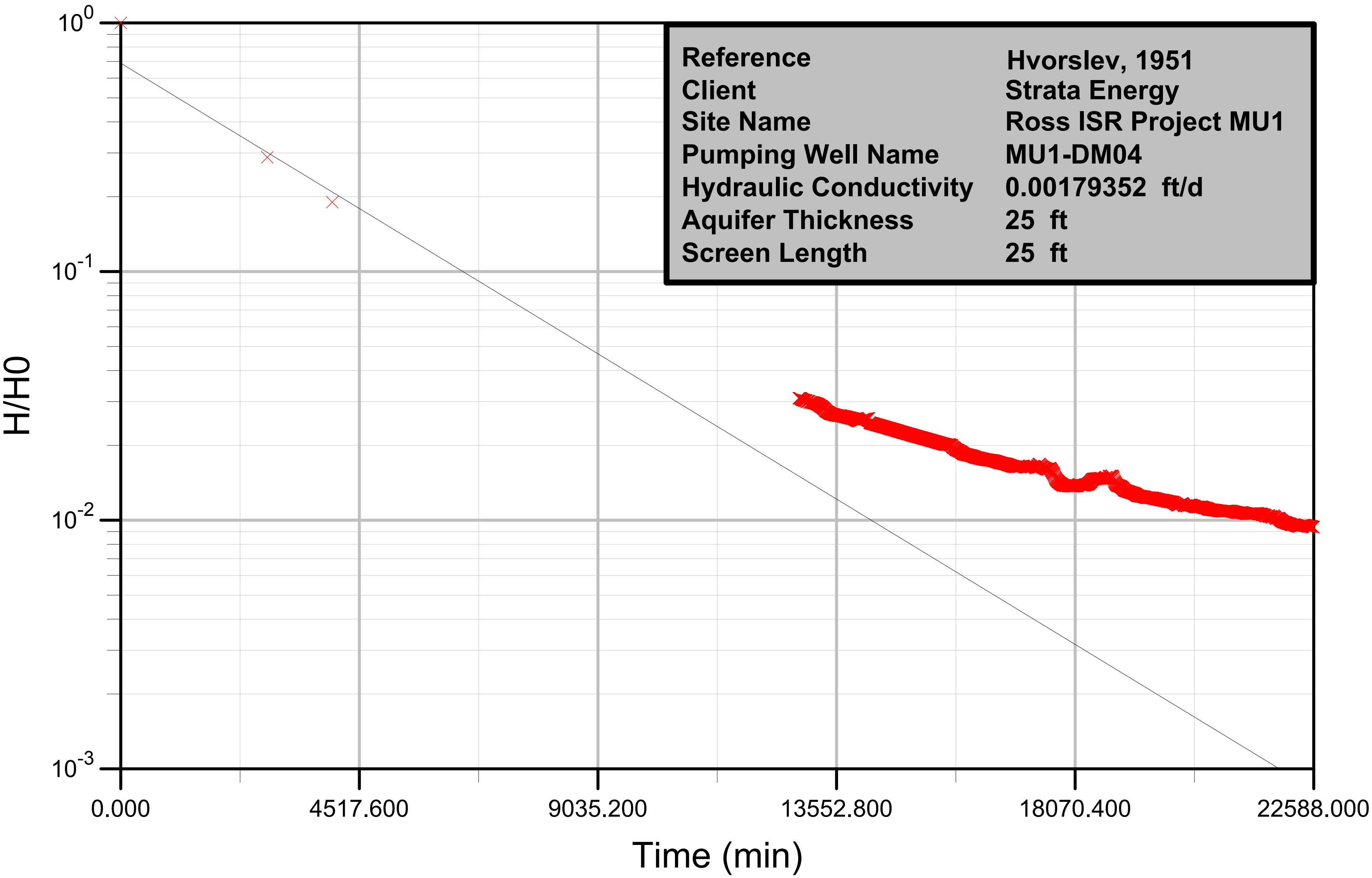
MU1-DM02 Slug Analysis

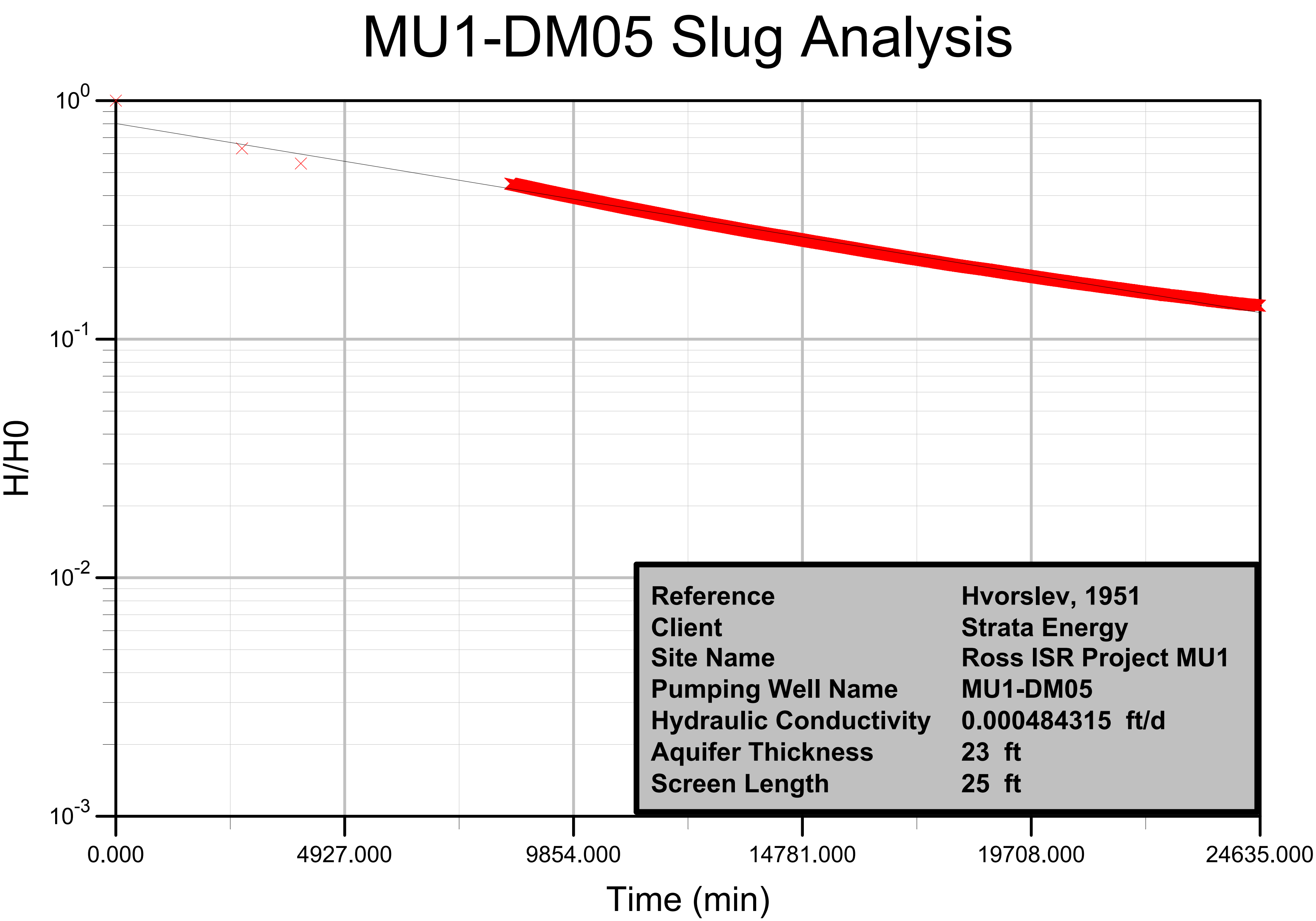


MU1-DM03A Slug Analysis

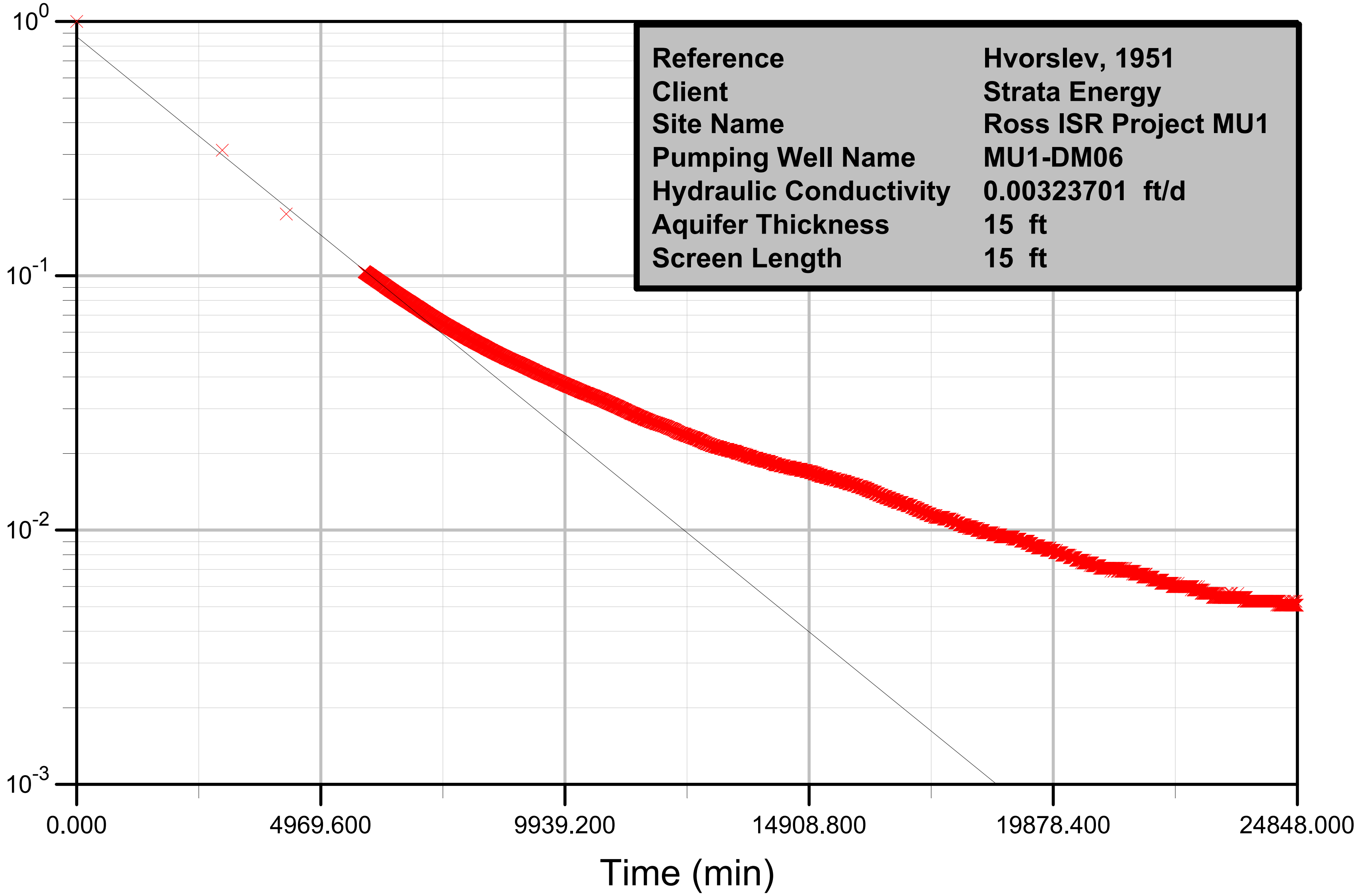


MU1-DM04 Slug Analysis

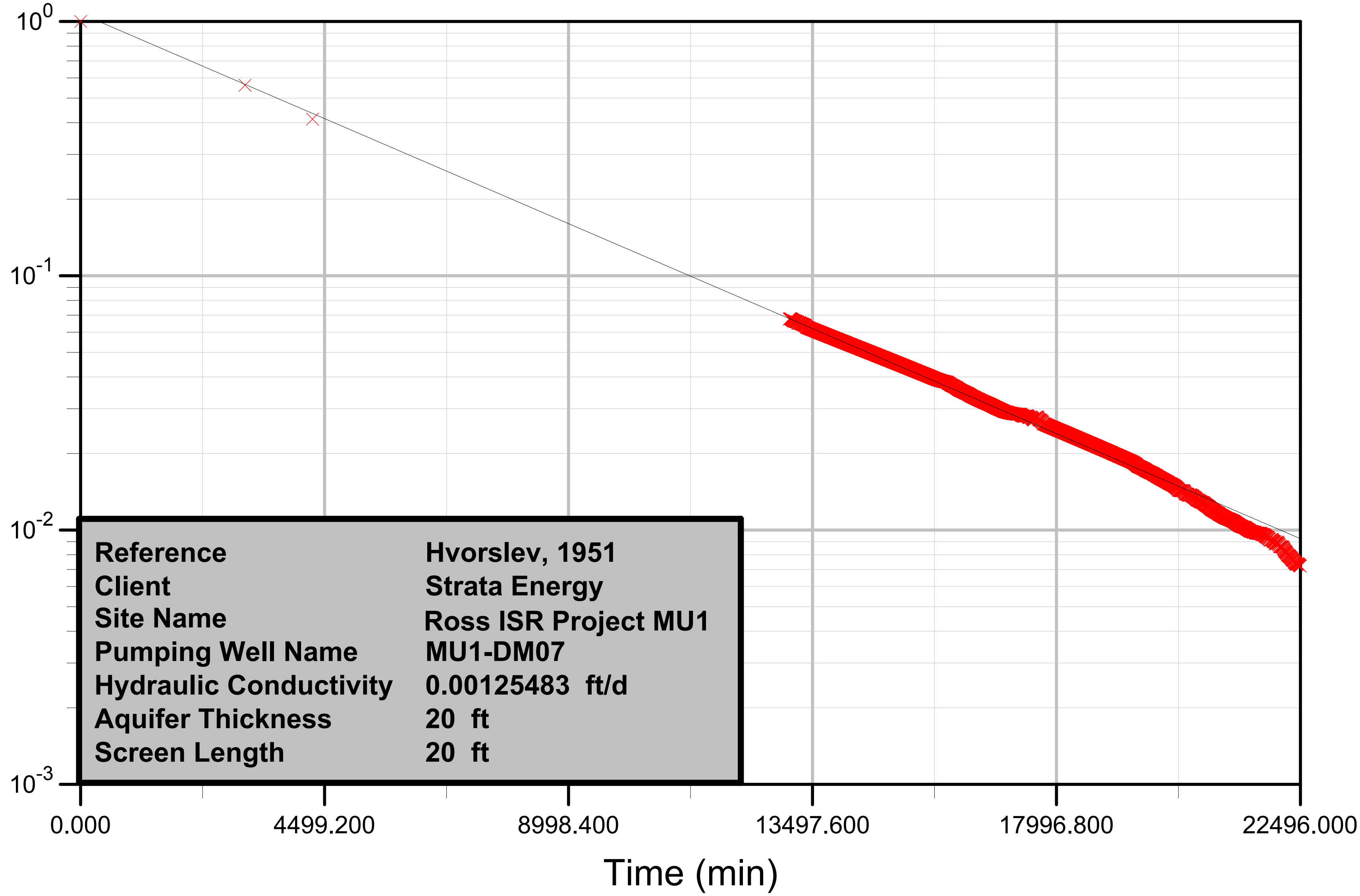



MU1-DM05 Slug Analysis
H/H0
10^0
10^-1
10^-2
10^-3
0.000
4927.000
9854.000
14781.000
19708.000
24635.000
Time (min)
Reference
Hvorslev, 1951
Client
Strata Energy
Site Name
Ross ISR Project MU1
Pumping Well Name
MU1-DM05
Hydraulic Conductivity
0.000484315 ft/d
Aquifer Thickness
23 ft
Screen Length
25 ft

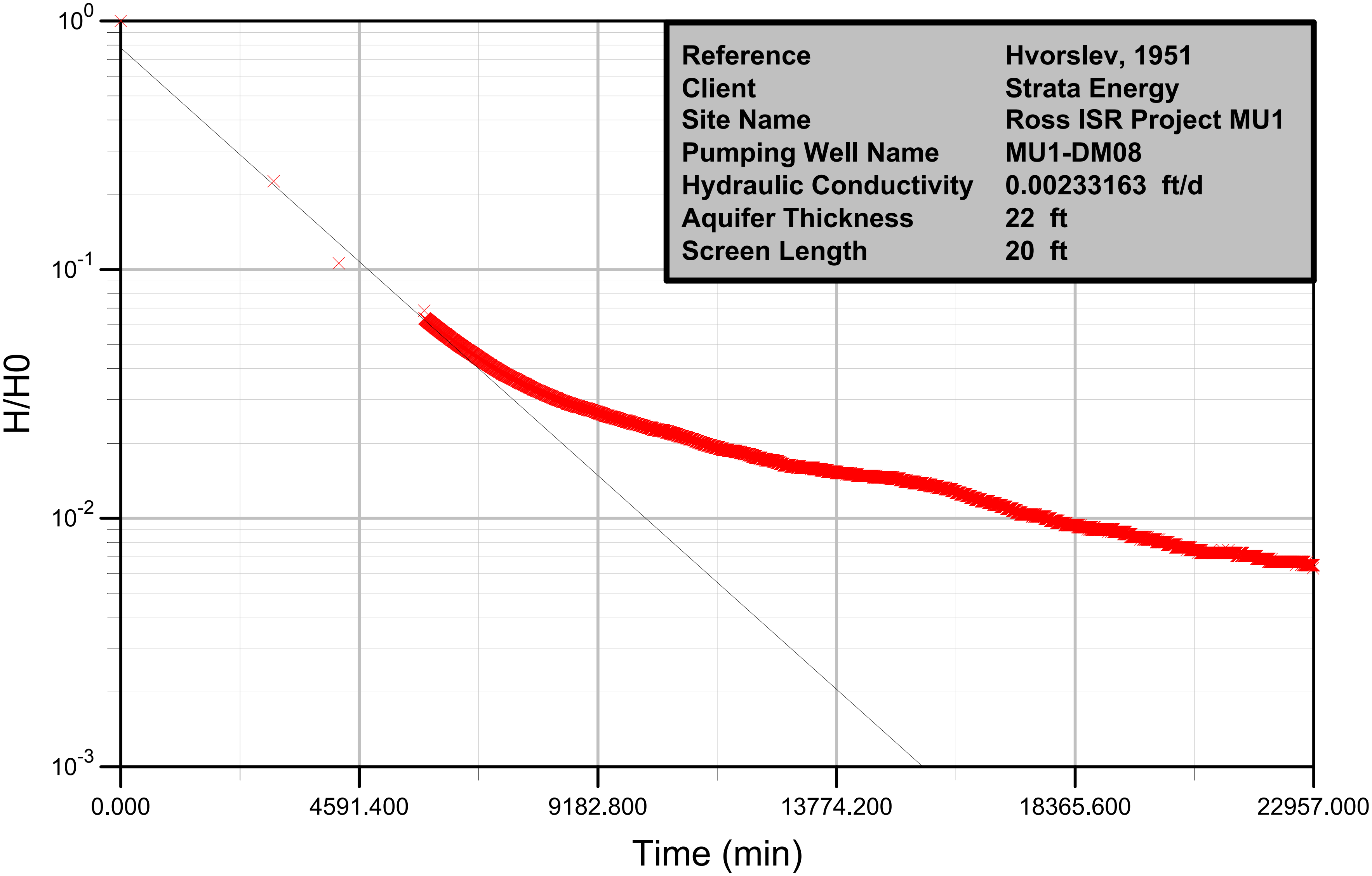
MU1-DM06 Slug Analysis



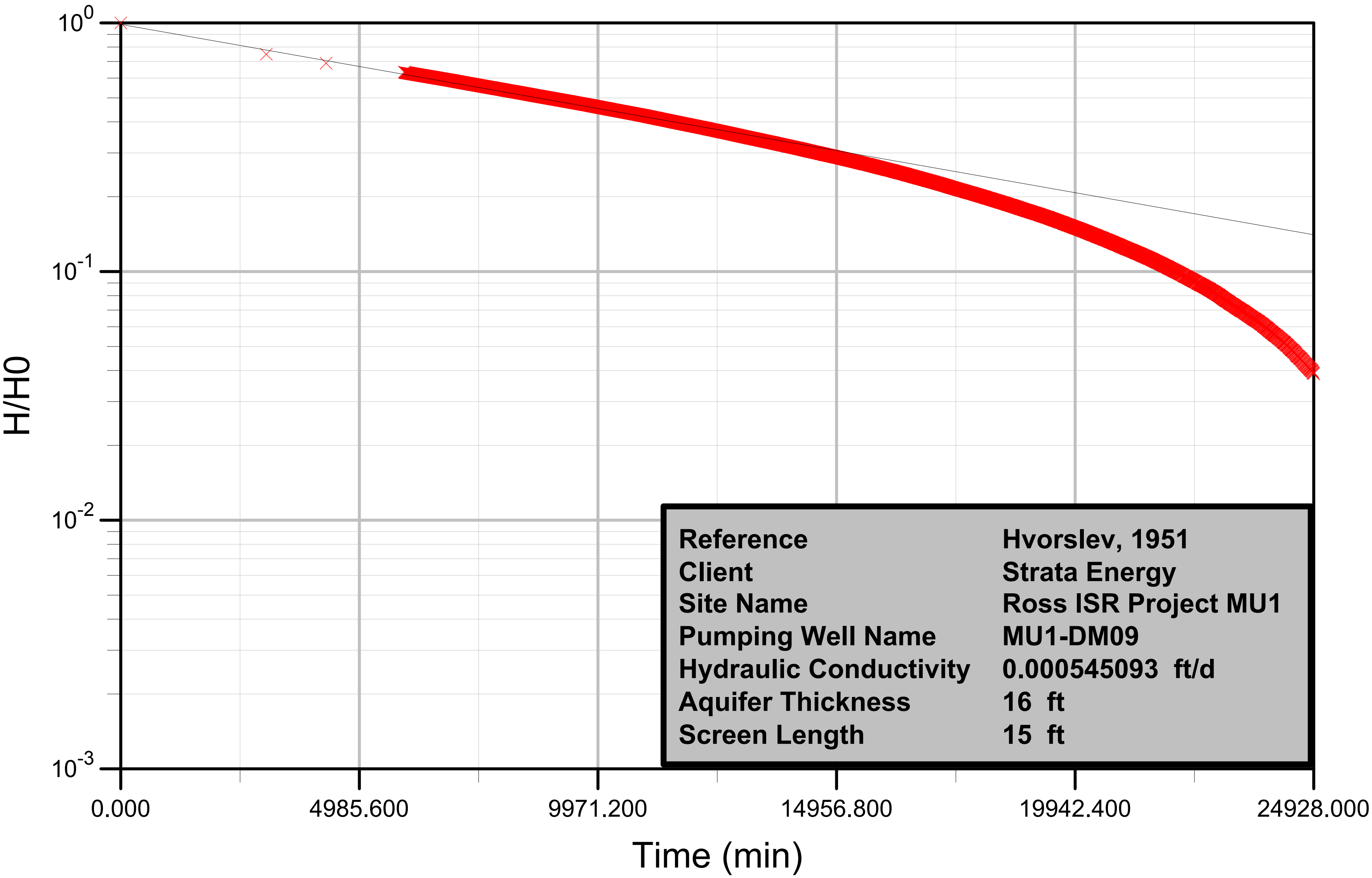
MU1-DM07 Slug Analysis



MU1-DM08 Slug Analysis

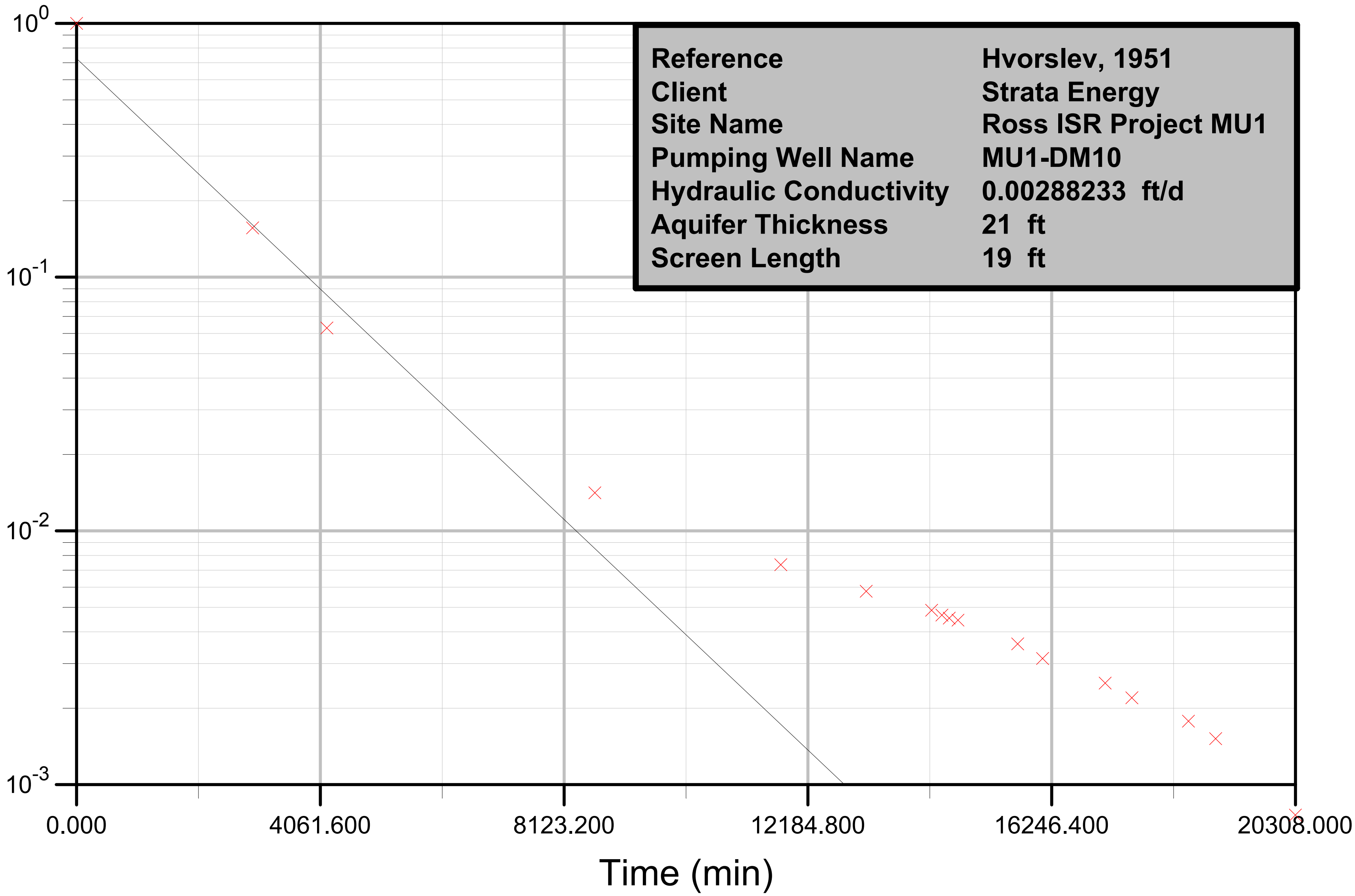


MU1-DM09 Slug Analysis

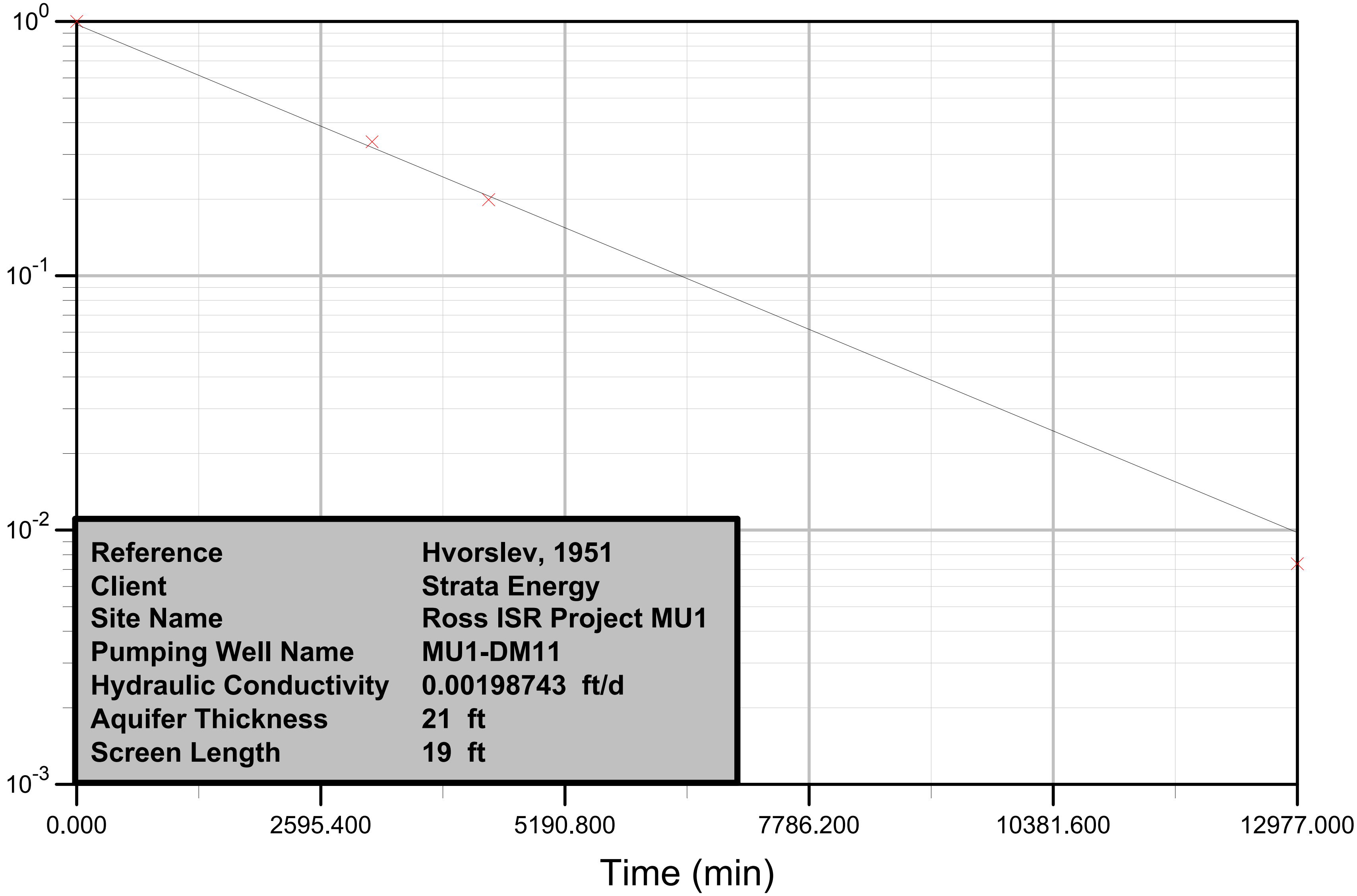


Reference	**Hvorslev, 1951**
Client	**Strata Energy**
Site Name	**Ross ISR Project MU1**
Pumping Well Name	**MU1-DM09**
Hydraulic Conductivity	**0.000545093 ft/d**
Aquifer Thickness	**16 ft**
Screen Length	**15 ft**

MU1-DM10 Slug Analysis

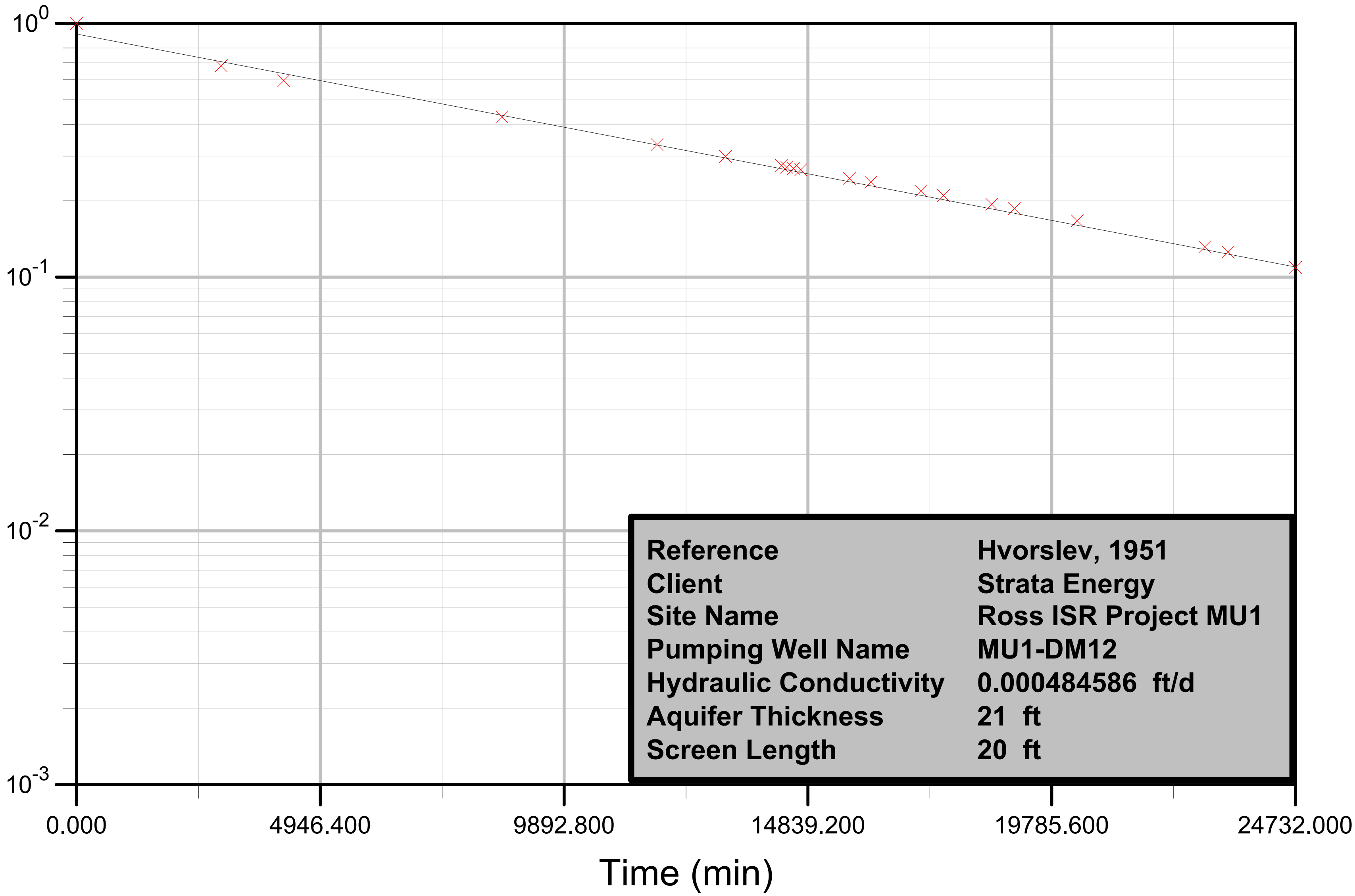


MU1-DM11 Slug Analysis

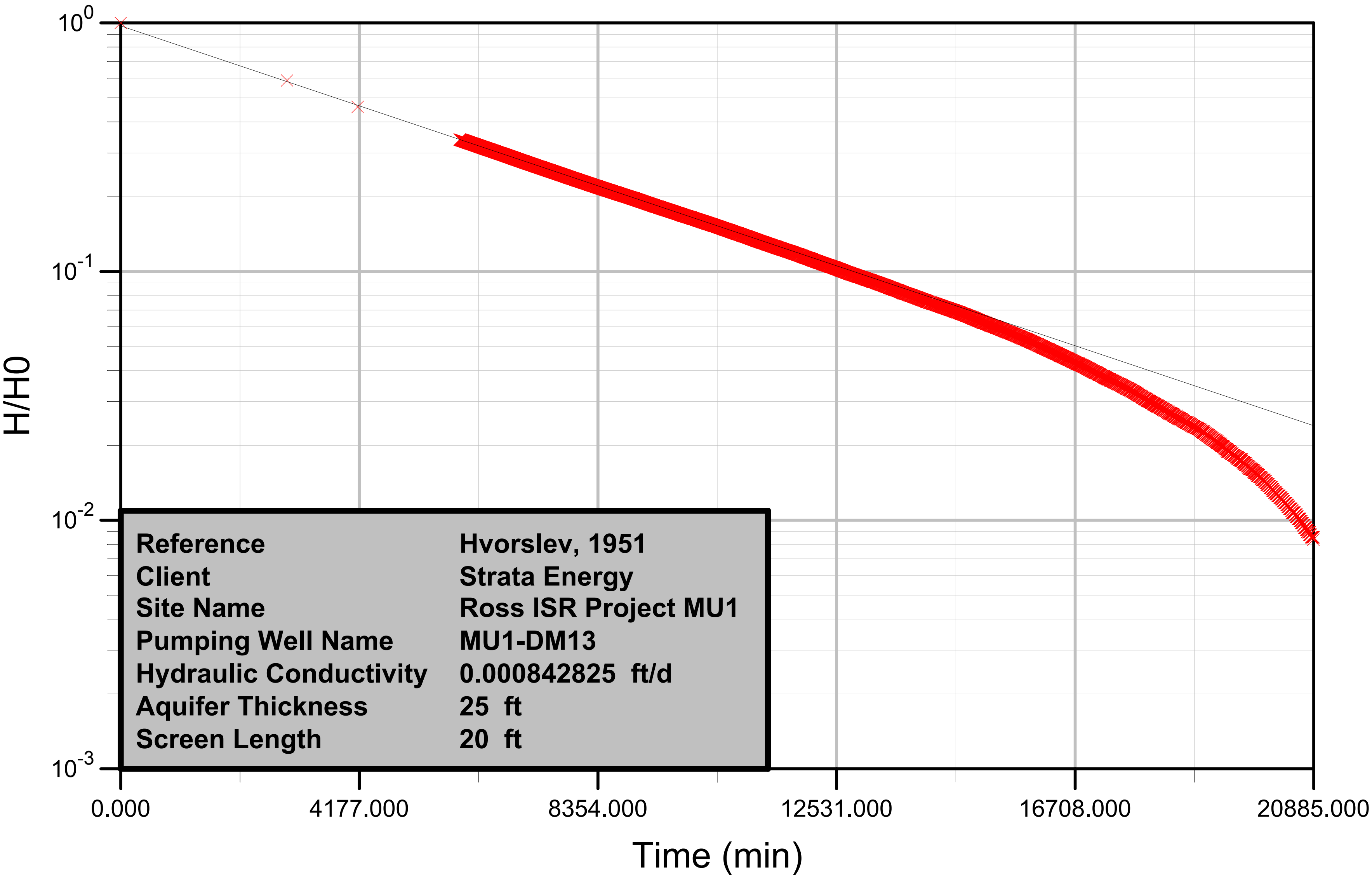


Reference	Hvorslev, 1951
Client	Strata Energy
Site Name	Ross ISR Project MU1
Pumping Well Name	MU1-DM11
Hydraulic Conductivity	0.00198743 ft/d
Aquifer Thickness	21 ft
Screen Length	19 ft

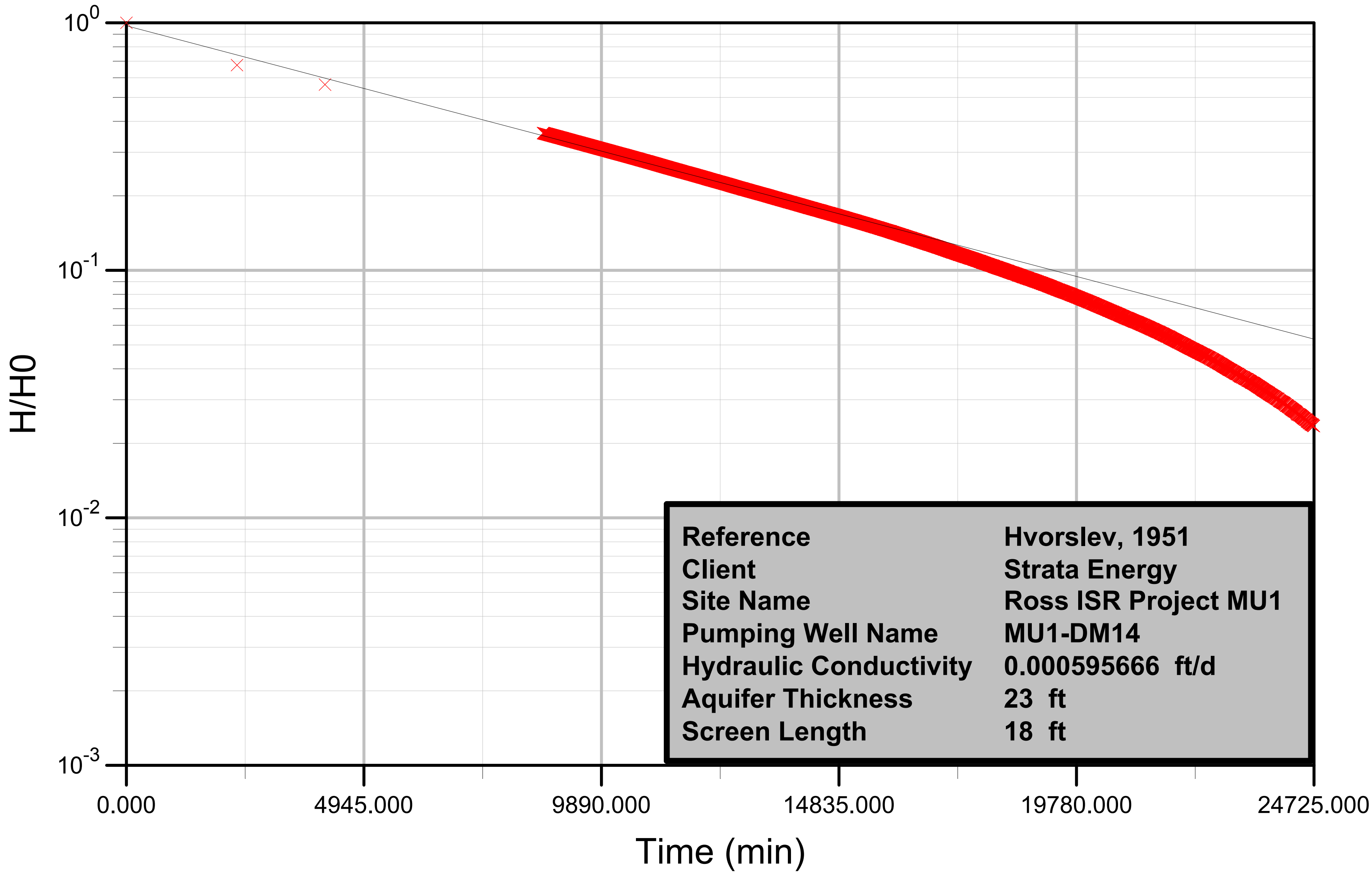
MU1-DM12 Slug Analysis



MU1-DM13 Slug Analysis



MU1-DM14 Slug Analysis



Attachment 5

Appendix K

Mine Unit 1 Pressure Transducer Data in Excel Format (on CD)

ATTACHMENT 6

MU1 Groundwater Model Report

Groundwater Model Files Provided on Compact Disc

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MINE UNIT 1 GROUNDWATER MODEL

1.0 INTRODUCTION

This attachment provides numerical groundwater modeling results for Strata Energy Inc.'s (Strata) wellfield data package for Mine Unit 1 (MU1) at the Ross *in-situ* recovery (ISR) uranium project located near Oshoto, Wyoming in western Crook County. Figure 1 provides a general location view of MU1 in relation to the greater Wyoming area and the Ross permit area. This report discusses the groundwater model developed using the groundwater flow program Groundwater Vistas by Environmental Simulations Incorporated (ESI) to simulate operational conditions in MU1 (referred to herein as MU1 Groundwater Model). The MU1 Groundwater Model is based on a previous regional groundwater model developed for the Ross ISR Project (the Ross Groundwater Model). Details regarding the regional groundwater model are included in a report entitled "Groundwater Modeling of Potential Impacts Associated with the Ross ISR Project" submitted with the original permit/license applications for the Ross ISR Project (WWC 2010 and 2011). The MU1 Groundwater Model was developed to satisfy the following goals:

1. Refinement of the Ross Groundwater Model to simulate operational conditions specific to MU1.
2. Verification that the previous analyses in the Ross Groundwater Model are still valid given the collection of additional site-specific data.
3. Verification that an inward hydraulic gradient can be maintained under balanced wellfield conditions.
4. Verification that bleed rates between 0.5 percent and 2.0 percent are sufficient to maintain hydraulic control.

The MU1 Groundwater Model used the Ross Groundwater Model as a basis. To accomplish this, Groundwater Vista's Telescopic Mesh Refinement (TMR) function was used to increase the grid resolution within the MU1 modeled area. The TMR tool allows the creation of a more refined model within a sub-region of a larger model. A model domain 5,500 feet in the east-west

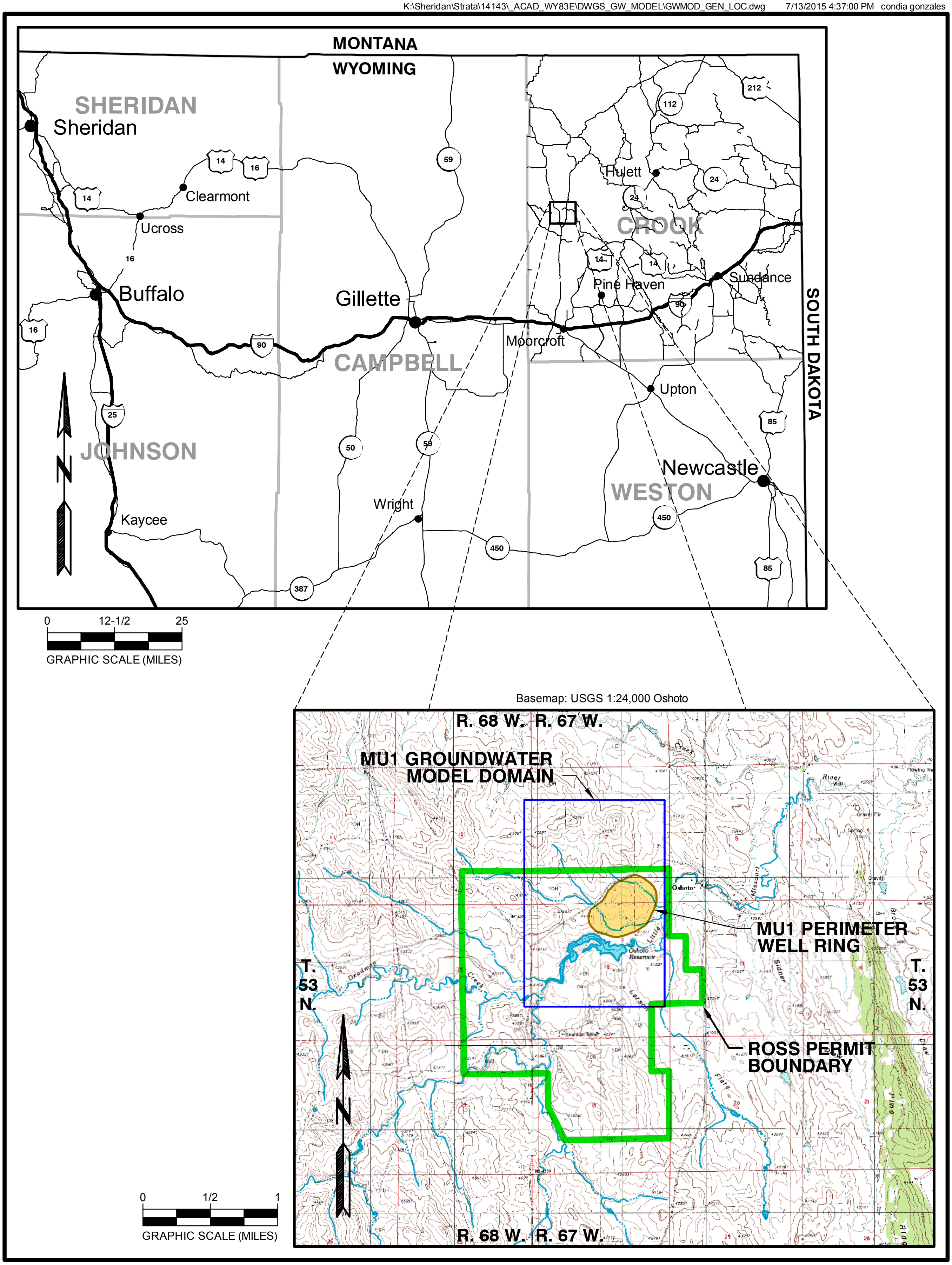

Figure 1. MU1 General Location Map

direction by 8,100 feet in the north-south direction was delineated for the MU1 Groundwater Model. The TMR tool exported all the aquifer properties such as hydraulic conductivity, specific storage, and potentiometric surfaces for all the layers within the selected portion of the Ross Groundwater Model. Information from the Ross Groundwater Model was imported into the MU1 Groundwater Model with a more refined grid spacing (25 feet within MU1 and up to 112.5 feet outside of MU1). Using the exported heads from the regional model, the TMR tool was used to automatically set general head boundary conditions at the edge of the MU1 model domain. For the MU1 Groundwater Model, the potentiometric surface used to estimate initial general head boundary conditions was the post-2010 potentiometric surface in the Ross Groundwater Model assuming the enhanced oil recovery (EOR) wells in the vicinity of MU1 were operating. Although no EOR wells exist within the MU1 model domain, nearby EOR wells have caused a southerly groundwater flow gradient in the ore zone (OZ) aquifer in the refined model domain. The initial general head boundaries and potentiometric surface were further refined using water level measurements taken from MU1 observation wells prior to the May 2015 aquifer tests discussed in Attachment 5 of the wellfield data package (WWC 2015). Figure 1 depicts the extents of the MU1 Groundwater Model domain.

2.0 CONCEPTUAL MODEL

The conceptual model and geology is described in detail within the Ross Groundwater Model Report. For the purpose of this modeling study, the primary units of interest are the Fox Hills Formation and the overlying Lance Formation sandstones targeted for uranium ISR. The targeted ISR unit is referred to as the OZ aquifer. As shown by previous investigations, and described in the Ross Groundwater Model Report, the OZ aquifer is isolated from the units above (the shallow monitoring (SM) zone) and below (the deep monitoring (DM) zone). Therefore, only the OZ aquifer was considered for the MU1 Groundwater Model. The MU1 Groundwater Model assumes no communication between the OZ aquifer and the SM zone and the DM zone.

However, as described in Section 5.4, potential impacts of communication between the SM and OZ aquifers are considered in this report. The hydrogeologic setting, hydrostratigraphy, and the groundwater flow system are all described in detail in the Ross Groundwater Model Report.

The MU1 Groundwater Model includes an increased geologic resolution and updated hydrologic parameters specific to the MU1 area. Within the MU1 area, based on the increased geologic resolution, Strata has identified a local shale unit (W shale) that is present across MU1 within the OZ aquifer. The W shale is not regionally continuous; it pinches out west of MU1. However, it serves as a local confining layer within MU1. Although measured hydraulic properties were not available for the W shale, it was assumed that the hydraulic properties are similar to those of the upper OZ confining shale based on similarities in the depositional environment and geophysical logs. Therefore, the hydraulic characteristics used in the Ross Groundwater Model for the OZ confining shale between the SM zone and the OZ aquifer were used to characterize the W shale. Within MU1, the majority of ore-bearing sands of the OZ aquifer are located below the W shale. Although most of the wells targeting the ore-bearing sands will be completed below the W shale, the W shale and the interval above the W shale were considered in the MU1 Groundwater Model because the perimeter monitor (PM) wells are completed as fully penetrating wells in the OZ aquifer, which includes the W shale. Furthermore, aquifer testing in MU1 has not verified the confining capability of the W shale even though it has been identified consistently in the geophysical logs. Including the W shale as a separate layer allowed for a sensitivity analysis to be conducted to determine how the aquifer might react if the W shale is not a confining interval across the entire wellfield.

As previously noted, the MU1 pre-operational potentiometric surface was established by using the Ross Groundwater Model elevations and making slight adjustments in the boundary conditions to more closely match May 2015 water level measurements in MU1. Appendix A summarizes the wells in MU1 and the water level measurements taken at these wells, which were used as targets to

establish the pre-operational potentiometric surface. Other than general head boundaries, no external hydrologic boundaries were included in the MU1 Groundwater Model.

The hydraulic properties in the MU1 Groundwater Model were based upon values previously established in the Ross Groundwater Model, which were then further refined for the MU1 area using measurements from the aquifer tests reported in Attachment 5 of this wellfield data package. The aquifer tests demonstrate that there is an area of low permeability near the southeastern edge of MU1. The geophysical logs and geologic cross sections provided in the wellfield package demonstrate that the low permeability zone is most likely the result two separate channel systems within the OZ sandstone locally isolated by floodplain mudstones and thinner, lower permeability sands. The geophysical logs demonstrate that within the low permeability area, the OZ sands are finer grained and contain more shale than outside of the low permeability zones. This area of low permeability restricts hydraulic communication between the southeastern portion of the wellfield and the remainder of MU1. However, outside of the low permeability area, the aquifer parameters are relatively homogeneous.

As described in Attachment 5, within all but the southeastern portion of MU1, the aquifer parameters of transmissivity, hydraulic conductivity, and storativity were calculated at 25 interior OZ and 12 PM observation wells. Within the southeastern portion of the wellfield, aquifer parameters were calculated at six PM wells and one interior OZ well. Table 1 summarizes the aquifer parameters measured in the southeastern portion of the mine unit and the remainder of MU1.

The hydraulic properties including hydraulic conductivity, storage, and leakance were initially estimated within the MU1 Groundwater Model domain using a combination of Ross Groundwater Model parameters (established by the TMR tool) and the parameters summarized in Table 1. The specific storage (Ss) was adjusted from that used in the Ross Groundwater Model based upon

the storativity (S) calculated from the aquifer tests and the aquifer thickness in the MU1 area.

Table 1. Summary of Calculated Aquifer Parameters from Aquifer Tests in the Ore Zone

Hydraulic Characteristics Calculated at Interior OZ Wells within all but the Southeastern Portion of MU1				
	Transmissivity (sq ft/day)	**Aquifer Thickness (ft)**	**Hydraulic Conductivity (ft/day)**	**Storage Coefficient (Unitless)**
Minimum	59.1	109	0.48	8.0E-05
Maximum	75.7	130	0.63	6.0E-04
Average	65.9	121	0.54	1.6E-04
Number of Data Points	25			
Hydraulic Characteristics Calculated at PM Wells within all but the Southeastern Portion of MU1				
	Transmissivity (sq ft/day)	**Aquifer Thickness (ft)**	**Hydraulic Conductivity (ft/day)**	**Storage Coefficient (Unitless)**
Minimum	75.4	131	0.48	7.5E-5
Maximum	156.1	181	0.93	2.0E-4
Average	102.7	153	0.67	1.3E-4
Number of Data Points	12			
Hydraulic Characteristics Calculated at Interior OZ Wells within the Southeastern Portion of MU1				
	Transmissivity (sq ft/day)	**Aquifer Thickness (ft)**	**Hydraulic Conductivity (ft/day)**	**Storage Coefficient (Unitless)**
MU1-OZ23*	25.2	122	0.21	N/A
Hydraulic Characteristics Calculated at PM Wells within the Southeastern Portion of MU1				
	Transmissivity (sq ft/day)	**Aquifer Thickness (ft)**	**Hydraulic Conductivity (ft/day)**	**Storage Coefficient (Unitless)**
Minimum	41.1	153	0.24	4.9E-05
Maximum	80.9	192	0.42	2.7E-04
Average	58.9	174	0.34	1.5E-04
Number of Data Points	6			

* The only interior OZ well in the southeastern aquifer test that responded sufficiently for analysis was the pumping well (MU1-OZ23).

3.0 COMPUTER CODES

3.1 Software

The MU1 Groundwater Model utilizes the USGS modular finite-difference groundwater model MODFLOW (MacDonald and Harbaugh 1988) and the pre/post processor Groundwater Vistas (Rumbaugh and Rumbaugh 2011). Groundwater Vistas utilizing MODFLOW2005 was chosen for the MU1 Groundwater Model because it is widely accepted within the groundwater

modeling community. Additionally, previous modeling efforts in the Ross area utilized Groundwater Vistas and earlier versions of MODFLOW. Groundwater Vistas and MODFLOW are widely used and accepted by both industry and regulatory agencies.

3.2 MODFLOW Input Files

Five MODFLOW packages were used in the MU1 Groundwater Model. The packages include:

- Basic – Contains starting heads and some basic options such as number of stress periods and units for the model.
- Output Control – Determines what model results to print and save to files during simulation.
- Solver – Solves the partial differential equations in MODFLOW.
- Well – Determines well boundary conditions.
- General Head – Specifies general head boundary conditions.

In addition to the MODFLOW packages described above, two packages specific to MODFLOW2005 were used. Those include:

- Upstream Weighting Package (UPW)
- Newton Solver (NWT) – Utilizes the Newton Raphson method for non-linear solutions. Default values were used for the MU1 analysis.

4.0 MODEL CONSTRUCTION

4.1 Model Domain

The model grid is oriented north-south and encompasses approximately 1,023 acres. The model is constructed with a variably-spaced grid having a minimum cell spacing of 25 x 25 feet within the MU1 area and a maximum spacing of 112.5 x 112.5 feet outside the MU1 area. The maximum increase in size between adjacent cells is limited to 1.5 times or less in order to eliminate numerical errors (Anderson and Woessner 1992). The finite difference grid consists of 161 rows along the north-south axis and 139 columns along the

east-west axis, covering distances of 8,100 feet and 5,500 feet, respectively. The model grid is depicted in Figure 2. The model domain was sized to minimize edge effects by extending it approximately one half mile from MU1 to the north, south, and west. Just to the east of the model domain is the Black Hills monocline which, as described in the Ross Groundwater Model Report, is where the strata begin dipping much more steeply. In the Ross Groundwater Model, the active model ended just east of the monocline, and recharge to the model was provided via the OZ aquifer outcrop near the monocline. To simplify the MU1 Groundwater Model, the eastern edge of the model domain was bounded by general head boundaries which mimic natural recharge without simulating complicated geology in the model. The model consists of three layers, which are defined as follows:

- Layer 1 – Represents the OZ aquifer above the W-shale,
- Layer 2 – Represents the W shale which separates the upper OZ aquifer from the lower OZ aquifer in the area of MU1, and
- Layer 3 – Represents the OZ aquifer below the W shale.

The shales overlying and underlying the OZ aquifer have been shown through aquifer testing to hydrologically separate the OZ aquifer from the overlying and underlying water-bearing zones. Therefore, these shales were not included in the MU1 model. Groundwater Vistas assumes that the top and bottom of the model is impermeable, which reasonably approximates the shales confining the OZ aquifer. The layer surfaces were developed based on geophysical logs collected at exploration/delineation drill holes and observation wells within MU1. The stratigraphic picks from each log were then converted into structure contour maps representing the tops and bottoms of each geologic layer, which were imported into the groundwater model. Cross sections from various rows in the groundwater model are depicted in Figure 3. The row locations are shown in Figure 2.

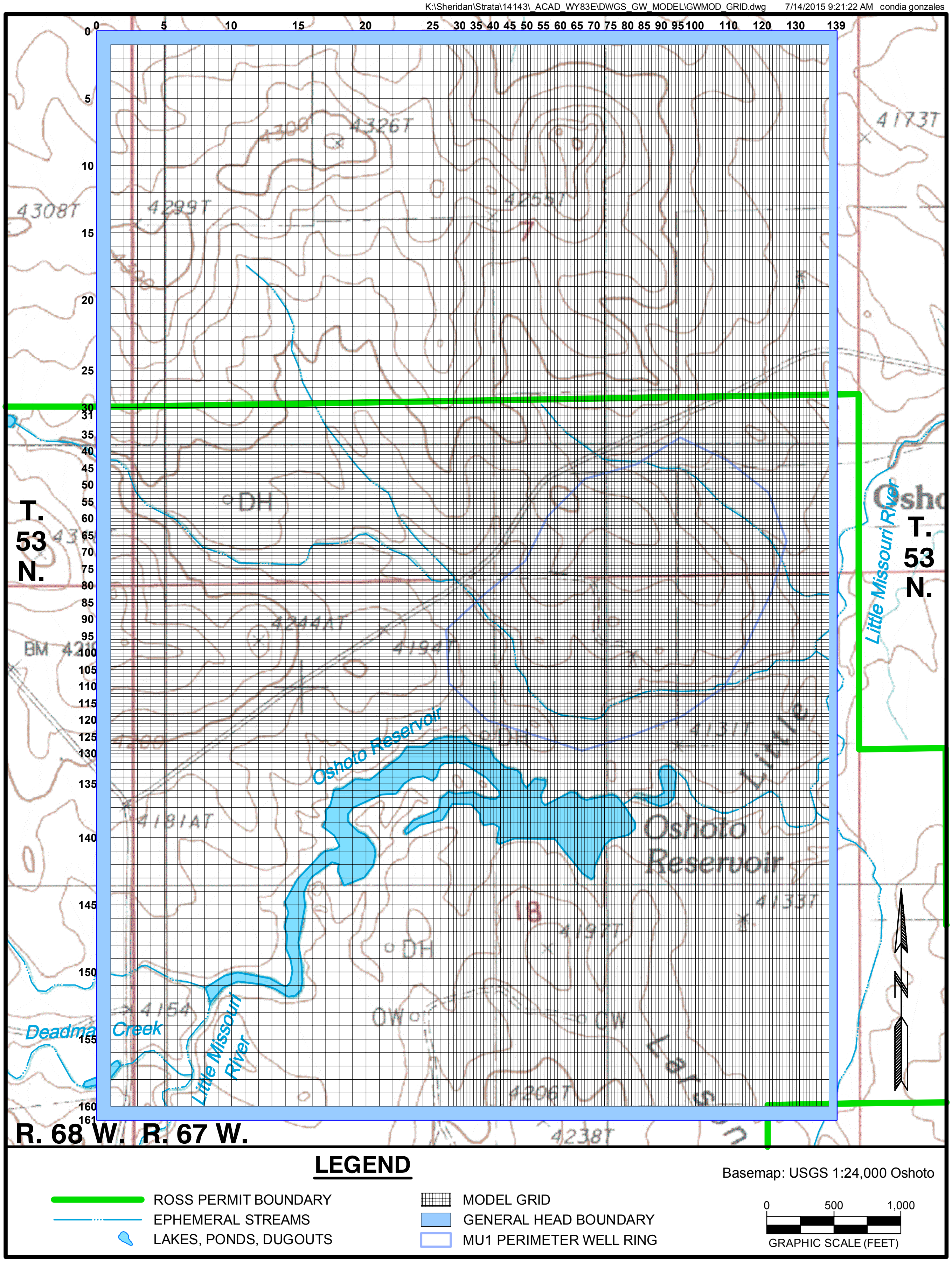

Figure 2. MU1 Groundwater Model Grid

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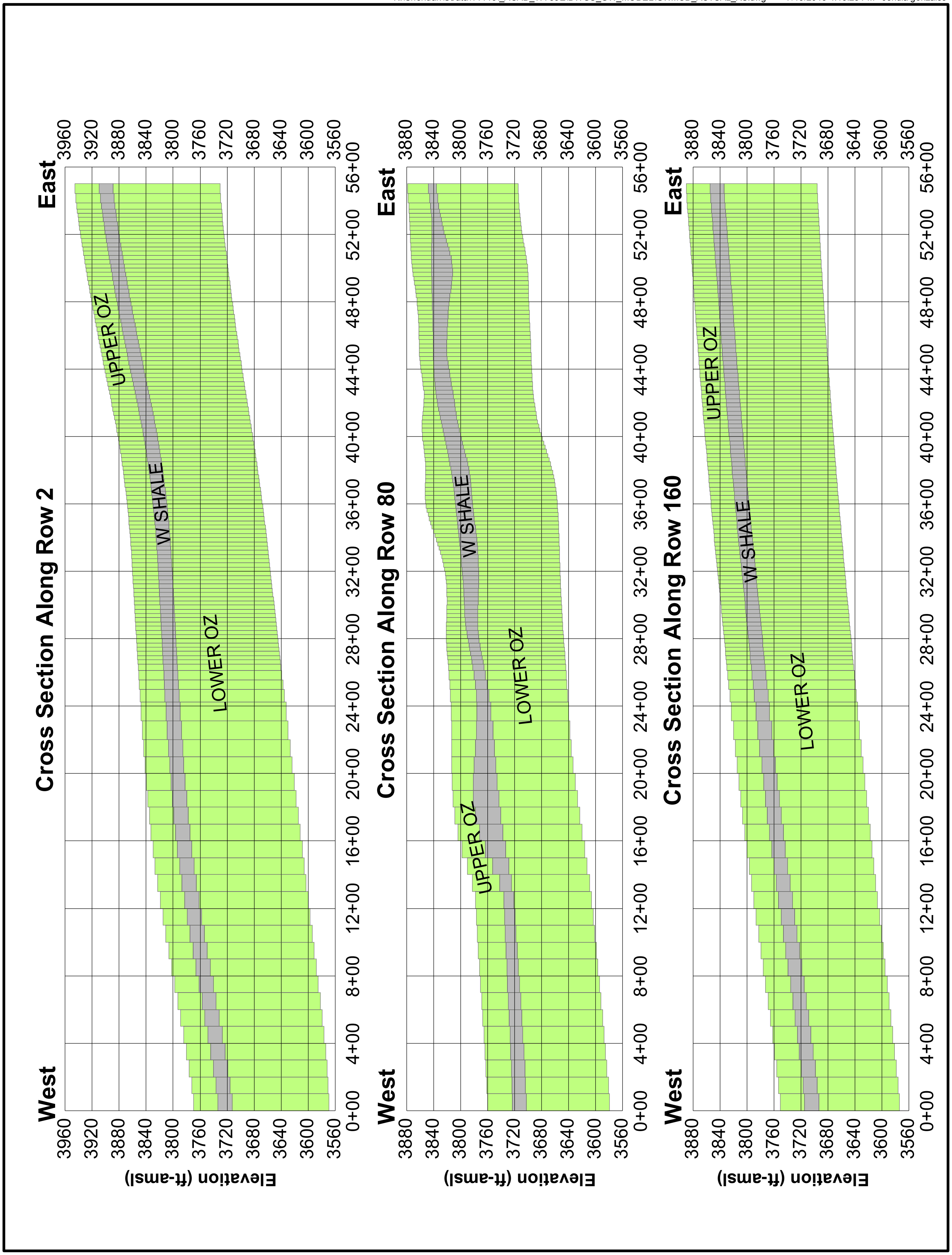

Figure 3. East-West Cross Sections from Various Rows within the Groundwater Model

4.2 Hydraulic Parameters

The hydraulic parameters used in the groundwater model include hydraulic conductivity and specific storage. Specific values for each parameter used in the model are described in this section. The modeling approach started by constructing an initial model with reasonable starting values (as described in Section 2.0). Then, during the calibration process, the values were refined as necessary to meet the various calibration targets (provided in Appendix A). The calibration process is described in more detail in Section 4.6.

4.2.1 Hydraulic Conductivity

Hydraulic conductivity estimates available for the model area are discussed in Section 2.0. The hydraulic conductivities assigned within the model were based on the data presented in that section and subsequent calibration runs. The most significant difference in the assigned hydraulic conductivities in the MU1 Groundwater Model compared to the Ross Groundwater Model was consideration of the low permeability area identified in the MU1 aquifer tests. To develop hydraulic properties for the low permeability area, the hydraulic conductivity was adjusted until the model responded consistent with drawdowns measured in the aquifer tests.

Tables 2 and 3 summarize the horizontal and vertical hydraulic conductivity values used for each layer, respectively. During the calibration process, the vertical hydraulic conductivity was calculated by multiplying the horizontal hydraulic conductivity by 0.7 in the OZ aquifer, which was the ratio used in the Ross Groundwater Model. Hydraulic conductivity for the W shale was assumed to be similar to the hydraulic conductivity of the confining shale above the OZ aquifer modeled in the Ross Groundwater Model. Therefore, the hydraulic properties of the overlying OZ confining shale in the Ross Groundwater Model were used to estimate the W shale properties. Figure 4 presents the spatial distribution of the horizontal hydraulic conductivities

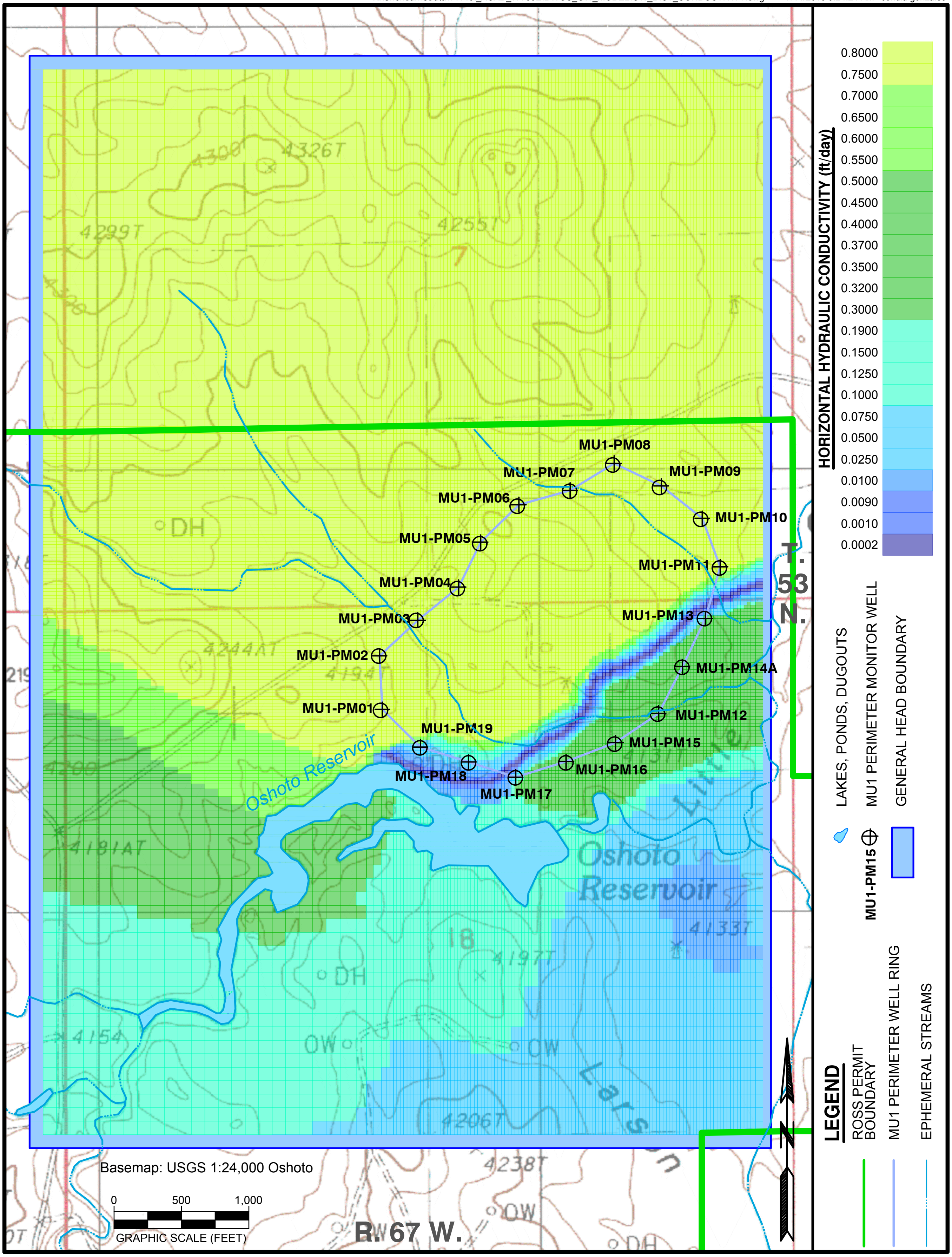

Figure 4. Spatial Distribution of Horizontal Hydraulic Conductivity Assigned to Layer 3

assigned to the OZ aquifer. The hydraulic conductivity was not spatially varied for the W shale.

Table 2. Summary of Horizontal Hydraulic Conductivity Values Used in the Model

Layer	Aquifer Unit	Model Hydraulic Conductivity Values (ft/day)			
		Minimum	**Maximum**	**Predominant Inside MU1 Wellfield Area**	**Predominant Outside MU1 Wellfield Area**
1	Upper Ore Zone	2.0E-4	0.75	0.75	0.75
2	W Shale	5.2E-4	5.0E-4	5.0E-4	5.0E-4
3	Lower Ore Zone	2.0E-4	0.75	0.75	0.75

Table 3. Summary of Vertical Hydraulic Conductivity Values Used in the Model

Layer	Aquifer Unit	Model Hydraulic Conductivity Values (ft/day)			
		Minimum	**Maximum**	**Predominant Inside MU1 Wellfield Area**	**Predominant Outside MU1 Wellfield Area**
1	Upper Ore Zone	1.45E-5	0.52	0.52	0.52
2	W Shale	6.55E-6	6.55E-6	6.55E-6	6.55E-6
3	Lower Ore Zone	1.45E-5	0.52	0.52	0.52

4.2.2 Specific Storage

As described in Section 2.0, estimated storage coefficients were developed for each layer based on those used in the Ross Groundwater Model and measured data from the MU1 aquifer tests. MODFLOW2005 utilizes specific storage (Ss) rather than a storage coefficient. As such, all storage coefficients were converted to a specific storage value prior to input in the model. Each layer was assigned a unique specific storage value which did not vary spatially. Specific storage values used for each layer are summarized in Table 4.

Table 4. Summary of Specific Storage Values by Layer

Layer	Aquifer Unit	Model Specific Storage Values
1	Upper Ore Zone	9.9E-06
2	W Shale	4.0E-06
3	Lower Ore Zone	2.0E-06

4.3 Boundary Conditions

The boundary conditions within the model vary slightly from layer to layer. For each layer, the boundary conditions are summarized below:

Layer 1 (upper OZ) and layer 3 (lower OZ) – The boundary conditions of these layers are represented by general head boundaries along all sides of the model domain. General head boundaries were chosen because they can be used to establish a potentiometric surface, but can be adjusted to not flood the model after a hydraulic stress is applied. Each general head boundary was assigned an elevation, as well as a conductance term. The TMR tool automatically sets general head boundary elevations estimated from the potentiometric surface of the parent regional model. The majority of the general head boundaries assigned by the TMR tool from the Ross Groundwater Model provided a potentiometric surface that reasonably matched the measured potentiometric surface in MU1. Slight modifications to the general head boundary elevations were made at selected locations in order to more closely match the measured potentiometric surface. The general head boundaries increased from 4,058 to 4,074 feet above mean level (amsl) west to east on the northern boundary; 4,074 down to 4,060, up to 4,070 feet amsl, and then down to 4027 feet amsl north to south on the eastern boundary; 4,027 down to 3,996 and up to 4,026 feet amsl east to west on the southern boundary; and 4,026 to 4,058 feet amsl south to north on the western boundary. The conductance term allows the modeler to, in effect, increase or decrease the hydraulic conductivity from the general head boundary cell. The conductance terms were also transferred from the Ross Groundwater Model by the TMR tool. By using the conductance terms developed by the TMR tool, the refined model accommodates recharge and regional potentiometric complexity evaluated in the Ross Groundwater Model without including the additional layers, model area, and boundary conditions that increased the complexity of the Ross Groundwater Model.

Layer 2 – This layer represents the confining W shale between the upper and lower OZ. The W-shale is not an aquifer, and has a very low hydraulic conductivity. As such, no boundary conditions were placed in this layer.

4.4 Calibration Targets and Goals

Calibration and verification of the model was a two-step process. The first calibration step was a steady-state simulation. The goal of the steady-state simulation was to construct an operable model that closely matched the modeled potentiometric surface elevations to the measured potentiometric surface elevations at the OZ wells within MU1 prior to the first 2015 aquifer test. During steady-state calibration, the hydraulic parameters imported into the MU1 Groundwater Model by the TMR tool were adjusted to more accurately reflect the measured values from the 2015 aquifer tests.

The second calibration step (verification) involved the construction of a transient model to simulate the aquifer tests performed in May 2015. The goal of the transient portion of the model was to closely simulate the model-predicted drawdowns to the measured drawdowns that occurred during the aquifer tests.

The calibration efforts focused on matching the modeled responses to the measured responses at the interior OZ observation wells. The pumping well in the simulated aquifer test was located in the OZ aquifer beneath the W-shale, as were the other interior OZ wells. As previously noted, the PM wells are completed across the entire OZ aquifer. Therefore, the calibration efforts focused primarily on the interior OZ wells because they are completed in the same portion of the aquifer as the pumping well.

The observed responses measured in the pumping well (MU1-OZ02) during the first May 2015 aquifer test were not utilized during calibration. The drawdown responses at the pumped well were measured inside the well bore rather than in the aquifer. Unless the well was 100 percent efficient, the drawdown in the well bore and the aquifer were different. Since the well is not likely 100 percent efficient, and 25 additional observation wells were available

to evaluate aquifer drawdowns, the pumping well was not necessary for calibration.

4.5 Calibration and Verification

Measured potentiometric heads at the interior OZ observation wells throughout MU1 were used as calibration targets. During calibration, model-computed water levels were compared to the observed water levels at the calibration targets. The chosen time for the steady-state calibration targets was May 5, 2015, at approximately 8:00 a.m., which was shortly before the first aquifer test began. The transient period began on May 5, 2015, at the beginning of the aquifer test, and ended on May 12, 2015, at the end of the recovery monitoring period. After each simulation, the model-computed target levels were subtracted from the observed target levels to produce a residual. A positive residual indicates that the computed water level is lower than the measured level. Conversely, a negative residual indicates that the computed water level is higher than the field-measured water level.

Simple statistics were then applied to the residuals to evaluate the improvement, or lack thereof, of each successive model simulation. The sum of squared residuals is particularly useful in determining trends toward or away from calibration in successive model runs. The closer the sum of squared residuals is to zero, the better the model calibration. Other statistical measures, such as the residual mean, were also used to evaluate the effectiveness of the model calibration. A residual mean close to zero indicates that the positive and negative residuals are balanced.

4.5.1 Calibration Approach

During steady-state calibration, the general head boundaries and hydraulic conductivities were adjusted until the residuals were optimized. After completing steady-state calibration, verification started by adding transient targets and the pumping well to the model. Figure 5 depicts the locations of the transient targets and the pumping well. The resulting model

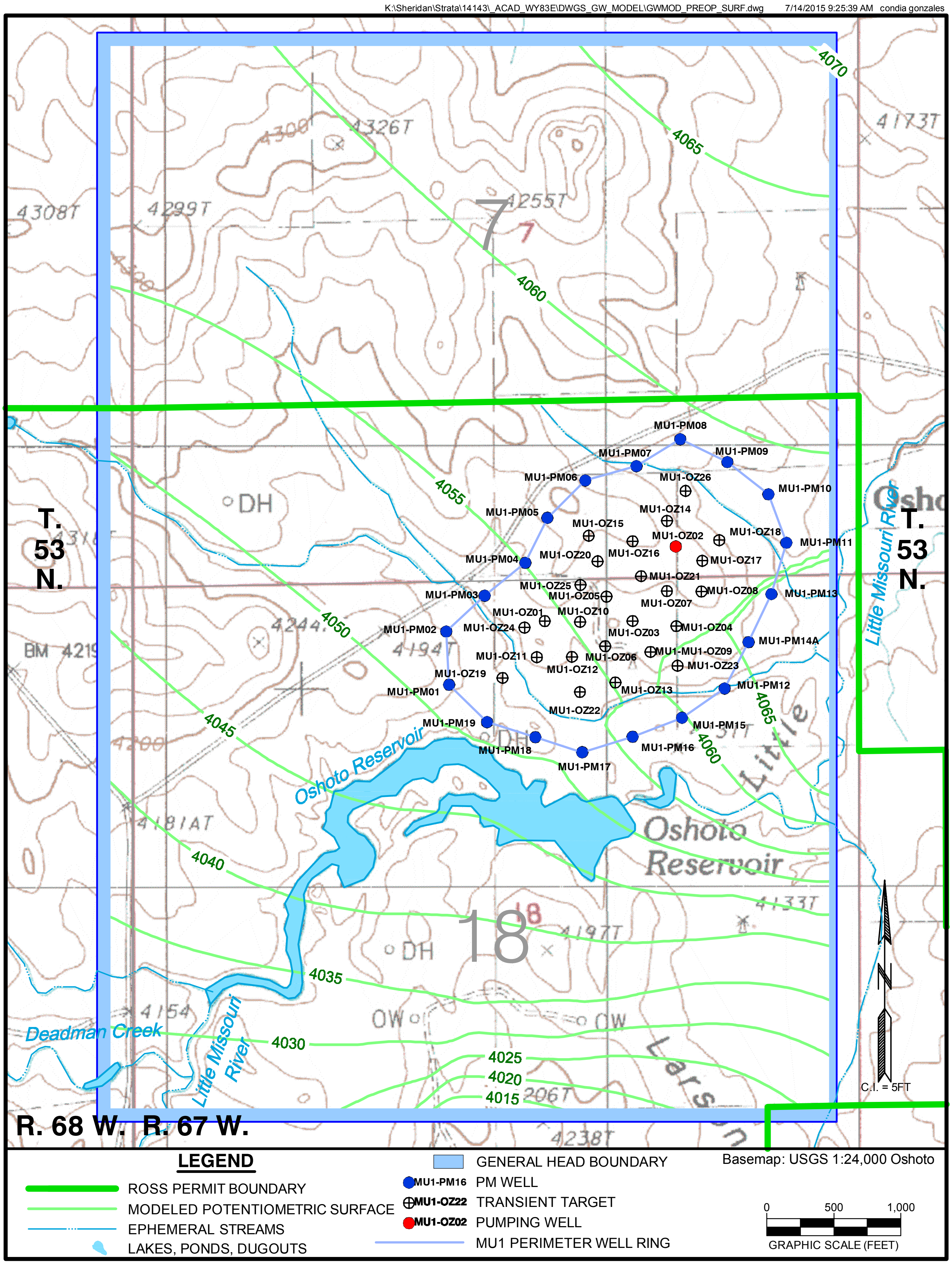

Figure 5. Model Calibrated Pre-Operational Potentiometric Surface for Layer 3

was a combined steady-state and transient model. The first time step was steady-state with no wells discharging. Each subsequent time step simulated the pumping well discharging at its measured discharge rate or the recovery period after the aquifer test. As previously mentioned, a low permeability area was modeled to simulate the lack of observed responses in observation wells in the southeastern portion of MU1. Additionally, the hydraulic conductivity outside of the wellfield was adjusted as necessary to calibrate the potentiometric surface.

As described in Attachment 5 and shown on Figure 4, the MU1 wellfield area northwest and southeast of the low permeability area, where most of the OZ observation wells are located, is relatively homogeneous. Simulating horizontal hydraulic conductivity heterogeneity in the MU1 pattern area during calibration did not improve the calibration. Therefore, it is concluded that outside of the low permeability area, the MU1 wellfield is relatively homogeneous.

4.5.2 Verification/Calibration Results

The resulting hydraulic conductivity distribution yielded a very good fit between the modeled potentiometric surface and the target potentiometric elevations. Appendix A summarizes the calibration targets as well as the calculated residuals and statistics from the calibrated model. The calibration was quite good with most of the residuals calculated at less than 2 feet. The calibrated pre-operational potentiometric surface is presented in Figure 5.

In addition to the calibration statistics, the hydrographs at target wells were evaluated to ensure that the shape of the calculated hydrograph reasonably matched the observed hydrograph. The shape of the hydrograph provides an additional metric beyond just considering the calibration statistics. The shape of the hydrograph demonstrates whether the modeled potentiometric surface at the target point is drawing down and recovering at a similar rate as the observed aquifer. Similar drawdown and recovery characteristics demonstrate a realistic operational simulation. Hydrographs from a number of

the wells observed in the calibration process are provided in Appendix B. The hydrographs in Appendix B demonstrate that the model-predicted and observed responses in MU1 generally follow similar drawdown and recovery trends.

As shown in Appendix A, the largest residual was 7.27 feet at MU1-OZ07. The total drawdown at this location was 15.23 feet. The second largest residual was at MU1-OZ21, which is the nearest well to MU1-OZ07. The residual at MU1-OZ21 was -6.71 feet. The total drawdown at this location was 27.58 feet. Because these two wells erred in opposite directions, the hydraulic conductivity could not be positively adjusted for one without negatively impacting the other. Due to the fact that the calibration was significantly better for multiple wells in the vicinity of these two, it was assumed the difficulty in calibrating to these two wells is related to well completions. The interior OZ wells have discrete completions across the ore-bearing intervals. Since these wells have different completion elevations across the OZ aquifer, they will likely respond differently. The effects of partial well completions would be greatest immediately adjacent to the pumping well, and the least farthest from the pumping well. Since both of these wells are close to the pumping well (less than 400 feet), this may explain why the modeled impacts in these wells do not match observed impacts as well as the modeled versus observed impacts in wells farther away.

4.6 Sensitivity Analysis

In order to assess which input parameters are most critical to the model results, a sensitivity analysis was performed on the calibrated model to determine which parameters impacted the calibration the most. In this analysis, three parameters most likely to influence model results were varied:

- horizontal hydraulic conductivity,
- vertical hydraulic conductivity, and
- specific storage.

The details and results from the sensitivity analysis for each parameter are presented in this section. For each parameter that was varied, a number of statistics are presented. These are based on the residuals calculated from the head targets in Appendix A. After the parameters were varied and the residuals were recalculated, the statistics (such as the sum of square residuals, residual mean, and residual standard deviation) were compared to the statistics of the original model to quantify the sensitivity of each parameter.

4.6.1 Model Sensitivity to Horizontal Hydraulic Conductivity

To evaluate the model's sensitivity to horizontal hydraulic conductivity, one zone within layer 3 was adjusted both up and down one order of magnitude. The zone chosen for adjustment was the zone that covers most of MU1. The results of the horizontal hydraulic conductivity sensitivity evaluation for layer 3 are presented in Table 5.

Table 5. Model Sensitivity to Horizontal Hydraulic Conductivity

Run	**Multiplier**	**Horizontal Conductivity (K_{xy}) (ft/day)**	**Sum of Square Residuals**	**Residual Mean**	**Residual Standard Deviation**
Parameter: K_x=K_y Zone: 48 K_x = 0.75 Layer 3 – Lower OZ Aquifer					
1	0.1	0.075	50,888	13.26	16.08
2	1	0.75	415	1.31	1.81
3	10	7.5	10,249	7.30	5.36

As shown in Table 5, layer 3 is very sensitive to changes in horizontal hydraulic conductivity, as seen in the considerable variance in the sum of square residuals. Given the fact that the hydraulic conductivities used in the model are close to the calculated values from the aquifer testing, it is not surprising that the calibrated values provide the best fit to measured data.

4.6.2 Model Sensitivity to Vertical Hydraulic Conductivity

To evaluate the model's sensitivity to vertical hydraulic conductivity, one zone within layer 3 was adjusted both up and down one order of magnitude. As with the horizontal hydraulic conductivity sensitivity analysis, the zone chosen for adjustment was the zone that covers most of MU1. The results of

the vertical hydraulic conductivity sensitivity evaluation are presented in Table 6.

Table 6. Model Sensitivity to Vertical Hydraulic Conductivity

Run	Multiplier	Vertical Conductivity (K_z) (ft/day)	Sum of Square Residuals	Residual Mean	Residual Standard Deviation
Parameter: K_z Zone: 48 K_z = 0.52 Layer 3 – Lower OZ Aquifer					
1	0.1	0.052	415	1.31	1.81
2	1	0.52	415	1.31	1.81
3	10	5.2	415	1.31	1.81

As shown in Table 6 by the lack of variance in the sum of square residuals, layer 3 is not sensitive to changes in the vertical hydraulic conductivity. Therefore, further evaluation regarding the vertical and horizontal hydraulic conductivity ratios is not likely to improve model calibration.

4.6.3 Model Sensitivity to Hydraulic Conductivity in the W-Shale

Based on geophysical logs at exploration/delineation drill holes and monitor wells throughout MU1, the W shale is a local confining interval, while outside of MU1 the W shale is not continuous. To evaluate the model sensitivity to the hydraulic properties of the W shale, the horizontal and vertical hydraulic conductivities of the W-shale were adjusted up and down by an order of magnitude. Table 7 summarizes the results of the W shale sensitivity analysis.

Table 7. Model Sensitivity to Hydraulic Conductivity in the W Shale

Run	Multiplier	Horizontal Conductivity (K_x,K_y) (ft/day)	Vertical Conductivity (K_z) (ft/day)	Sum of Square Residuals	Residual Mean	Residual Standard Deviation
Parameter: K_x, K_y, K_z Zone: 1 Layer 2 – W shale						
1	0.1	5E-5	6.5E-7	419	1.32	1.82
2	1	0.0005	6.5E-6	415	1.31	1.81
3	10	0.005	6.5E-5	404	1.25	1.80

As shown in Table 7, the model is not highly sensitive to changes in W shale hydraulic properties. In the event that there are areas within MU1 where

the W shale is not a confining interval, it is not expected to substantially affect model predictions.

4.6.4 Model Sensitivity to Specific Storage

The storage coefficient dictates how much water can be removed from an aquifer per unit of drawdown. Specific storage is used for confined aquifers. Within the MU1 groundwater model, all the layers are highly confined. A higher storage coefficient corresponds to a greater amount of water in storage. To assess how dependent the results of the model were on the specific storage, the specific storage was adjusted up and down by an order of magnitude. The results of the specific storage sensitivity analysis are presented in Table 8.

Table 8. Model Sensitivity to Specific Storage

Run	Multiplier	Specific Storage	Sum of Square Residuals	Residual Mean	Residual Standard Deviation
Parameter: Ss Zone: 8 Layer 3 – Lower OZ Aquifer					
1	0.1	2.0E-7	7,978	5.96	7.11
2	1	2.0E-6	415	1.31	1.81
3	10	2.0E-7	7,087	5.06	5.80

As shown in Table 8, layer 3 is sensitive to changes in specific storage. Since most of the significant stressors to the aquifer system are located within layer 3, increasing the specific storage increases the volume or amount of water available, which in turn decreases the average drawdown in the aquifer. Conversely, a decrease in the specific storage results in less water, thus increasing the drawdown in the aquifer. Based on the calibration statistics in Table 8, the calibrated storage coefficient value used in layer 3 represents the aquifer system rather well, especially considering that the calibrated storage coefficient used in layer 3 is based on measured aquifer test data.

4.6.5 Summary of Sensitivity Analysis

Based on the sensitivity analysis results presented herein, the most sensitive parameter within the groundwater model is the horizontal hydraulic

conductivity. Fortunately, numerous measured hydraulic conductivity values from the May 2015 aquifer tests were available to improve model calibration by serving as reliable starting values of horizontal hydraulic conductivity. Outside of the MU1 wellfield area, the hydraulic conductivity has been estimated by previous modeling activity and aquifer tests performed in the greater Ross area. The hydraulic conductivity values presented in the calibrated model were developed based on available head, hydraulic conductivity targets, and water level responses during the aquifer tests. As a result, the general hydraulic conductivity trends presented within the model reasonably represent in-situ conditions, acknowledging that the hydraulic conductivity value assigned to each specific cell may vary from actual values at the observation wells calculated from aquifer testing.

5.0 ISR SIMULATION

The calibrated model was used to simulate ISR operations within MU1. The primary goals of the ISR simulation were to simulate operational conditions specific to MU1; verify that an inward hydraulic gradient will be maintained under balanced wellfield conditions; and evaluate the bleed rates required to ensure that an inward hydraulic gradient will be maintained.

The ISR process includes both recovery and injection wells. In a balanced wellfield, the recovery wells pump at a slightly higher rate than the injection wells. This produces a cone of depression around the recovery wells, and around the wellfield itself. The excess water removed from the aquifer by the recovery wells and not returned to the injection stream is referred to as bleed. Bleed is typically referenced as a percent of the recovery rate. The cone of depression developed from the bleed prevents injected fluids from leaving the general pattern area. This section describes the MU1 ISR simulation in more detail.

5.1 Pattern Configuration

The MU1 patterns used for this simulation are based on Strata's current plan for wellfield construction. In MU1, Strata is currently planning on using a 7-spot pattern in which six injection wells are placed in a hexagonal pattern around one recovery well. The MU1 wellfield is split into four modules/well houses. The operational simulation for the MU1 wellfield only considered the recovery and injection wells associated with one module. The simulated module contains 60 injection wells and 27 recovery (or production) wells.

The simulated pattern was located within MU1 on the northwest side of the low permeability area (i.e., in the main portion of MU1). The majority of Strata's patterns will be located northwest of the low permeability area, while only a few wells are planned southeast of the low permeability zone. To evaluate ISR operations on the southeast side of the low permeability area, a pattern with 10 injection wells and 2 production wells was simulated in this area.

5.2 Operational Parameters

In the approved Ross permit and license applications, Strata anticipated that the overall wellfield bleed would be maintained between 0.5 and 2.0 percent. Wellfield simulations performed in the Ross Groundwater Model demonstrated that it would be possible to maintain control of the wellfields with a 1.25 percent bleed. As such, the initial starting bleed estimated for both pattern areas was 1.25 percent.

During the production simulations, bleed rates within Strata's previously specified 0.5 to 2.0 percent bleed were modeled to evaluate the effect on operations. The module in the main portion of MU1 was modeled at a rate of 540 gallons per minute (gpm), which translates to 20 gpm per production well. Bleed rates during production were simulated at both 1.25 and 0.50 percent, which represents bleed rates of 6.75 and 2.7 gpm, respectively. The simulation was modeled over the first 90-day period following startup. The first 90-day period was chosen because during this time period, the initial cone of

depression in the aquifer must be established, which will require the most bleed and thus induce the most stress.

With the 7-spot pattern, one injection well can serve up to three production wells, but some injection wells will only serve one or two production wells. Through an iterative process, the flow rates in each injection well were adjusted to balance the simulation pattern. Injection flows were adjusted no lower than 2 gpm and no higher than 20 gpm per well for the simulations.

Since only a small portion of the wellfield will be southeast of the low permeability area, a small pattern was simulated in this portion of the wellfield. Each recovery well was simulated at 20 gpm for a total pattern flow rate of 40 gpm. Bleed rates were simulated at 1.25 percent, which equates to a bleed rate of 0.5 gpm. An iterative process was used to adjust the injection rate at each injection well to maintain a balanced pattern. Well injection rates were adjusted no lower than 2 gpm per well, and approached 8 gpm at a maximum. This simulation was also modeled over the first 90-day startup period.

5.3 ISR Simulation Results

Figure 6 depicts the flow direction arrows and potentiometric surface for the wellfield module simulation in the main portion of MU1 at 1.25 percent bleed after 90 days of operation. As shown in Figure 6, an inward hydraulic gradient is maintained in the wellfield during the simulation. Model-predicted hydrographs at representative PM wells during operations north, west, and south of the simulated patterns are provided in Appendix C. The hydrographs show that a 1.25 percent bleed is sufficient to induce drawdown in the PM wells northwest of the low permeability area over the 90-day simulation.

To assess how less bleed may affect the simulation, it was then rebalanced with a 0.5 percent bleed. Figure 7 shows the flow direction arrows and potentiometric surface for the northwest pattern simulation at 0.5 percent bleed after 90 days of operation. Hydrographs at select PM wells are provided in Appendix C. As in the case of using 1.25 percent bleed, a 0.5 percent bleed was sufficient to induce drawdown in all applicable PM wells

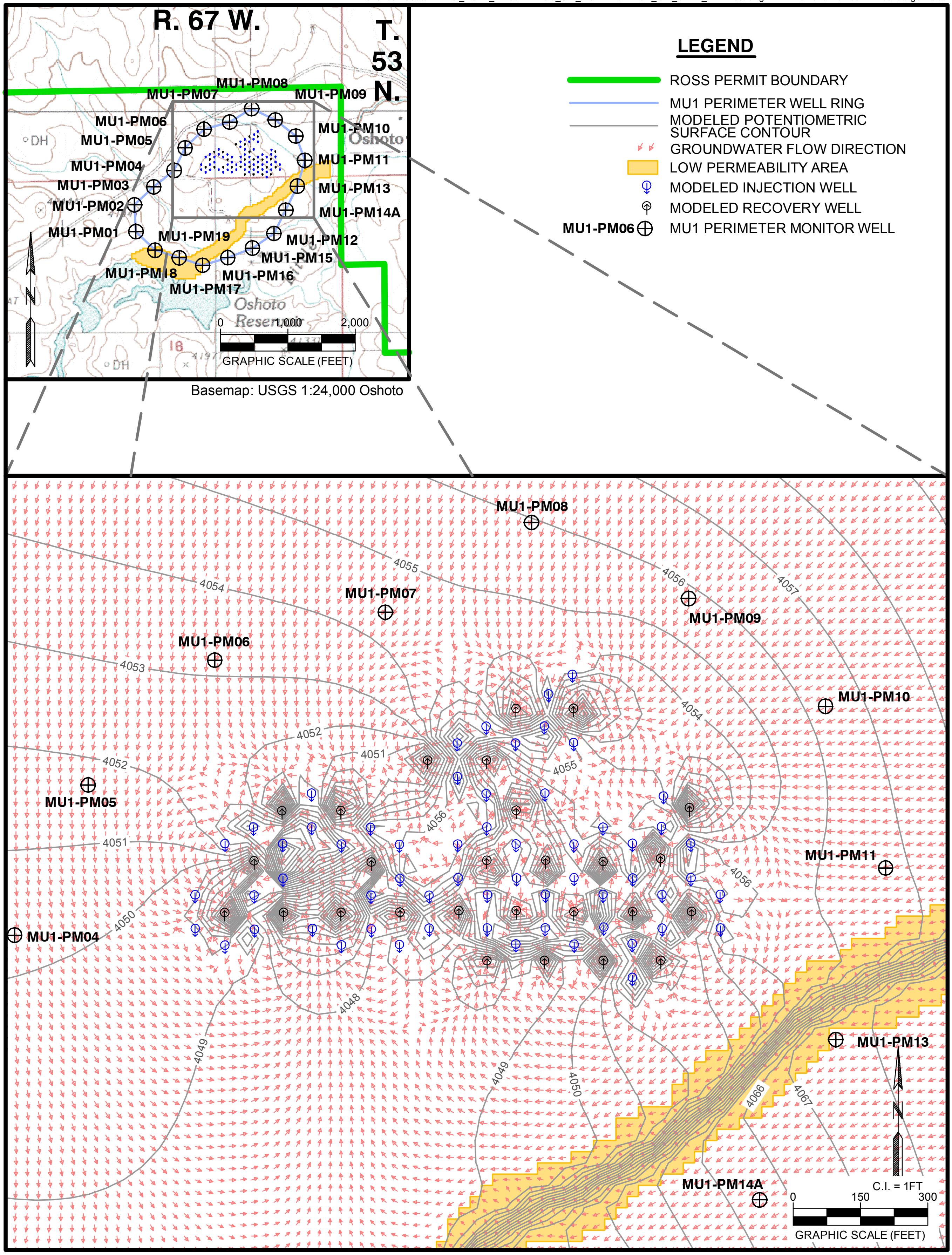

Figure 6. Simulated Module in the Main Portion of MU1 at 1.25 Percent Bleed

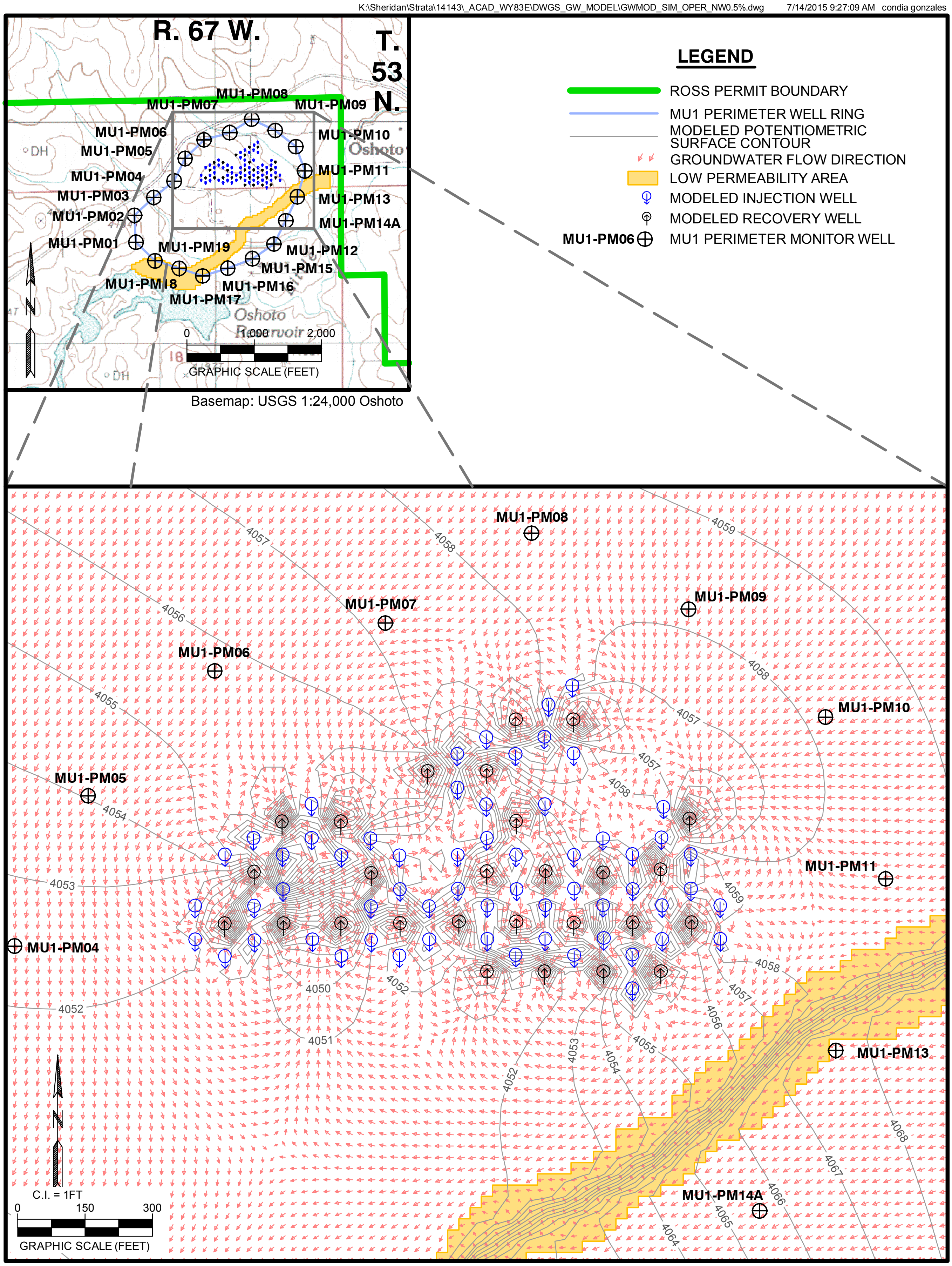

Figure 7. Simulated Module in the Main Portion of MU1 at 0.5 Percent Bleed

over the 90-day simulation. Furthermore, a comparison between Figures 6 and 7 demonstrates that a 0.5 percent bleed induces less drawdown in the water elevations adjacent to the pattern area. However, an inward hydraulic gradient is still maintained at 0.5 percent bleed.

A similar analysis was conducted within the wellfield pattern area in the southeastern portion of MU1. Figure 8 shows the groundwater flow direction and the potentiometric surface modeled in the southeastern wellfield at 1.25 percent bleed after 90 days of operation. As can be seen in Figure 8, a 1.25 percent bleed was sufficient to maintain an inward hydraulic gradient. Hydrographs at representative PM wells east and south of the simulated pattern are provided in Appendix D. The hydrographs also show that the modeled bleed was sufficient to induce a drawdown in applicable PM wells.

The ISR simulations demonstrate that the previously estimated bleed rate range of 0.5 to 2.0 percent is supported given site-specific characteristics in MU1. Further, the simulations indicate that for the main portion of the MU1 wellfield, it will be possible to maintain an inward hydraulic gradient with bleed rates on the lower end of Strata's estimated bleed range (0.5 to 1.25 percent). It is important to note that the simulated patterns southeast of the low permeability area were very small and the total bleed, even at 1.25 percent was also minor at 0.5 gpm. Based on the modeling of MU1, it is predicted that larger pattern areas will require a smaller bleed percentage than smaller pattern areas simply because the quantity of bleed is higher. The area of low permeability may also decrease the amount of bleed required to maintain an inward hydraulic gradient in the pattern areas. As shown in the simulations, the area of low permeability results in a boundary adjacent to the pattern that increases the induced drawdown on the side of the pattern opposite the low permeability area. This analysis also demonstrates that 7-spot patterns can be successfully utilized in MU1.

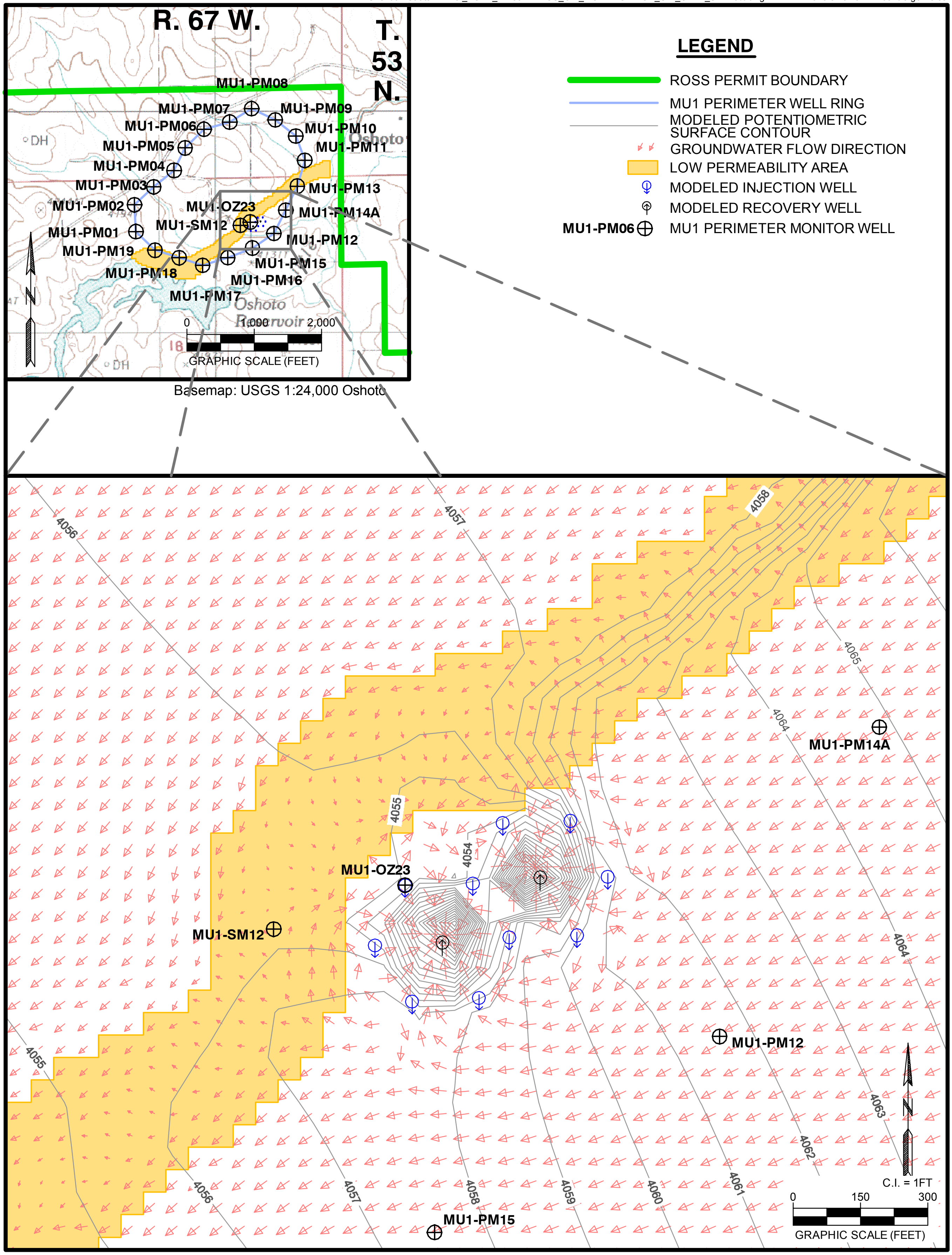

Figure 8. Simulated Patterns in the Southeastern Portion of MU1 at 1.25 Percent

5.4 Southeastern Pattern Area Detailed Analysis

During the aquifer testing described in Attachment 5 of the wellfield data package, a minor response in the overlying SM aquifer was observed in the second aquifer test conducted at MU1-OZ23. As described in Attachment 5, the response is thought to be the result of one or more unplugged drill holes, since poor ground conditions had prevented Strata from being able to re-abandon several historic drill holes prior to the second aquifer test. As soon as ground conditions improved, Strata re-abandoned the additional drill holes and then conducted a third aquifer test at MU1-OZ23. During the third aquifer test a minor response in MU1-SM12 (the nearest overlying SM well) was observed. However, the response observed in the third test was reduced compared to the response in the second test. The fact that the drill hole re-abandonment activities reduced the observed response demonstrates that the conduit between the OZ and SM aquifers is likely due to an improperly abandoned drill hole that cannot be found or is in a cultural site where it cannot be re-abandoned.

MU1-OZ23 is located within the well patterns simulated in the southeastern portion of MU1. An obvious concern is whether an improperly abandoned borehole in the vicinity of MU1-OZ23 may allow fluids to migrate into the overlying aquifer during operations. To assess the potential for a vertical migration into the overlying aquifer, a detailed evaluation was conducted in the southeastern portion of MU1.

The detailed evaluation focused on the southeastern wellfield simulation conducted at 1.25 percent bleed. The modeled injection rates ranged from 2 gpm up to 7.9 gpm in this scenario. In this modeled scenario, two injection wells, the wells between the two recovery wells, were assigned flow rates of 7.9 gpm. It is at these two injection wells that the highest aquifer injection pressures were observed during the simulation. In order to increase the model resolution in the detailed simulation, the grid cells were reduced to 3.125 by 3.125 feet within the southeastern pattern area. Target points, to record water

levels, were then placed in the model at locations 2, 4, 8, and 16 feet from the injection well with the highest flowrate and injection pressure. As with the previous simulations, this simulation was conducted over the first 90 days of operations. During the simulation, it was assumed that the injection wells and the recovery wells would be turned on simultaneously.

Figure 9 depicts the model-predicted potentiometric contours in the wellfield after 90 days of operations within the southeastern pattern area, as well as the target point locations adjacent to the injection well. Hydrographs were developed for each target point and are included in Appendix E. As shown on the hydrographs in Appendix E, the aquifer will experience the highest injection pressures immediately following field startup, which will then decline slightly as the water levels in the field begin to draw down. The maximum modeled water elevation in the well 2 feet from the injection well was 4,081.9 feet amsl. The hydrographs and Figure 9 demonstrate that further from the injection well, maximum water elevations induced by injection decrease. For example, at the target point 16 feet from the injection well the peak predicted water level is 4,069.3 feet.

The natural water elevation measured in MU1-SM12 during the aquifer tests was approximately 4,094 feet. For comparison, the natural water elevation in the OZ aquifer at MU1-OZ23 is approximately 4,062 feet. Therefore, under natural conditions, the hydraulic head in the SM aquifer is approximately 32 feet higher than that in the OZ aquifer. The model demonstrates that under normal, balanced wellfield operations, the maximum water level observed adjacent to the injection well with the highest flow rate will still be approximately 12 feet below the natural water level in the SM aquifer. Therefore, the risk of vertical migration into the SM aquifer is low. The detailed analysis in the southeastern pattern area demonstrates that the risk of fluid movement into the SM aquifer is low because there is a significant downward gradient between the SM and OZ aquifers and the per well injection rates are not sufficiently elevated in the aquifer to induce injection pressures that would reverse the natural downward hydraulic gradient.

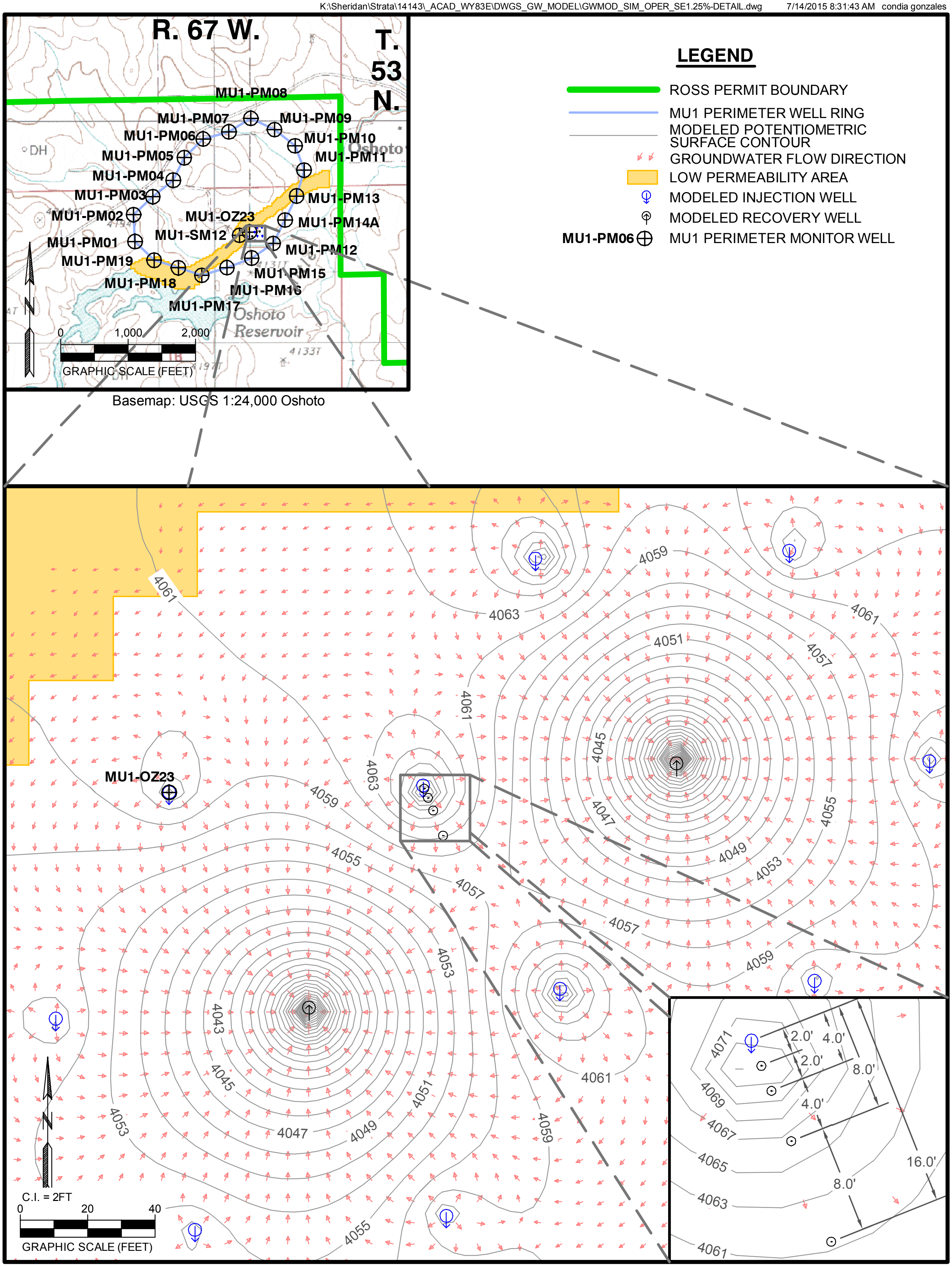

Figure 9. Detailed Simulation of Patterns in the Southeastern Portion of MU1 at 1.25 Percent Bleed

5.5. Excursion Control and Retrieval

An extensive excursion control and retrieval analysis was detailed in the Ross Groundwater Model Report. The hydraulic parameters used in the Ross Groundwater Model Report are similar to the hydraulic parameters in this analysis, and the analyses performed here demonstrate that wellfield control in MU1 utilizing 7-spot patterns is appropriate to maintain wellfield control. Therefore, it is reasonable to assume the excursion control and retrieval analysis performed in the Ross Groundwater Model is valid for the MU1 Groundwater Model. A new excursion and retrieval analysis specific to MU1 was not deemed necessary.

5.6 Summary and Conclusions

The MU1 Groundwater Model is a derivative of Strata's Ross Groundwater Model. The MU1 Groundwater Model was constructed to satisfy the following goals:

1. Refinement of the Ross Groundwater Model to simulate operational conditions specific to MU1.
2. Verification that the previous analyses in the Ross Groundwater Model are still valid given the collection of additional site-specific data.
3. Verification that an inward hydraulic gradient can be maintained under balanced wellfield conditions.
4. Verification that bleed rates between 0.5% and 2.0% are sufficient to maintain hydraulic control.

The data used to construct the groundwater model were compiled from observation wells, exploratory drilling, and aquifer tests developed by Strata.

The groundwater model includes three separate phases: (1) calibration to steady-state pre-operational conditions; (2) verification to transient conditions during the May 2015 aquifer tests; and (3) a 90-day uranium recovery simulation. During the steady-state pre-operational calibration, model parameters were adjusted to represent conditions prior to the aquifer

tests performed in 2015. During the transient verification phase, model parameters were adjusted to match model-predicted results with measured drawdowns that occurred during the aquifer tests performed by Strata in May 2015. The pre-operational, steady-state surface was used at the beginning of the operational simulations after it had been further calibrated using the May 2015 aquifer test data. The operational simulations evaluated hypothetical patterns on both sides of the low permeability area and considered two bleed rates.

The first and second goals of the MU1 Groundwater Model were accomplished when the Ross Groundwater Model was refined using the TMR tool in Groundwater Vistas to develop updated boundary conditions within the MU1 model domain. The MU1 Groundwater Model was further refined to reflect the hydraulic characteristics measured over the course of the MU1 aquifer tests described in Attachment 5. The calibrated aquifer parameters used in the MU1 Groundwater Model are similar to the aquifer parameters used in the Ross Groundwater Model. In addition, wellfield control was generally very similar in this modeling procedure as it was for previous models constructed. Therefore, the previously conducted wellfield analyses are valid for the MU1 area.

The third and fourth goals of the MU1 Groundwater Model were accomplished through the series of operational simulations conducted for the MU1 wellfield. All simulations demonstrated that an inward hydraulic gradient will be maintained at bleed rates between 0.5 and 1.25 percent. In fact, modeling performed for MU1 indicates that for larger wellfields, bleed rates as low as 0.5 percent may be reasonable. The modeling demonstrates that the existence of a low permeability area within the southeastern portion of MU1 will not prevent ISR operations from occurring safely on either side of the low permeability area. Furthermore, the existence of the low permeability area may actually decrease the bleed requirements needed to maintain an inward hydraulic gradient within the perimeter ring.

The ISR simulations in the MU1 Groundwater Model demonstrate that ISR operations can be conducted safely on both sides of the low permeability area. Strata's proposed 7-spot patterns sufficiently allow for operational control of the wellfields. This is due to injection being distributed to more wells. This was demonstrated in a more detailed simulation conducted in the southeastern wellfield area to assess the risk of an excursion into the SM aquifer.

As noted in Attachment 5, a small response to pumping, attributed to one or more un-locatable drill holes, was observed in the SM aquifer. The detailed analysis in the southeastern wellfield area demonstrates that the risk of a vertical migration into the SM aquifer is low because there is a significant downward gradient between the SM and OZ aquifers, and the per well injection rates are not high enough to induce injection pressures that would reverse the natural gradient between the aquifers.

6.0 REFERENCES

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WWC Engineering, 2011, Groundwater Modeling of Potential Impacts associated with the Ross Uranium Project. Addendum 2 of the approved Mine Plan for WDEQ/LQD Permit to Mine No. 802 Mine Plan Addendum 2.

WWC Engineering, 2015, Mine Unit 1 Aquifer Test Results and Analysis.

ATTACHMENT 6

Appendix A

Calibration Targets, Residuals, and Statistics for Calibrated Model

Calibration Targets, Residuals, and Statistics for Calibrated Model

Name	Time (days)	Easting[1]	Northing[1]	Layer	Observed Elevation (ft amsl)	Computed Elevation (ft amsl)	Weight	Residual
MU1-OZ01	1.00	712102	1488609	3	4055.94	4054.60	1	1.35
MU1-OZ01	3.24	712102	1488609	3	4047.41	4049.63	1	-2.22
MU1-OZ01	4.16	712102	1488609	3	4044.96	4047.52	1	-2.56
MU1-OZ01	7.26	712102	1488609	3	4051.28	4049.54	1	1.75
MU1-OZ01	8.22	712102	1488609	3	4052.45	4050.37	1	2.08
MU1-OZ03	1.00	712755	1488607	3	4056.36	4056.03	1	0.33
MU1-OZ03	3.24	712755	1488607	3	4045.31	4044.49	1	0.82
MU1-OZ03	4.16	712755	1488607	3	4042.64	4041.63	1	1.01
MU1-OZ03	7.26	712755	1488607	3	4051.24	4050.19	1	1.05
MU1-OZ03	8.22	712755	1488607	3	4052.49	4051.42	1	1.07
MU1-OZ04	1.00	713078	1488569	3	4056.91	4056.72	1	0.19
MU1-OZ04	3.24	713078	1488569	3	4042.34	4041.33	1	1.01
MU1-OZ04	4.16	713078	1488569	3	4039.69	4038.24	1	1.46
MU1-OZ04	7.26	713078	1488569	3	4051.89	4050.83	1	1.06
MU1-OZ04	8.22	713078	1488569	3	4053.12	4052.19	1	0.93
MU1-OZ05	1.00	712561	1488789	3	4056.22	4055.93	1	0.29
MU1-OZ05	3.24	712561	1488789	3	4046.01	4045.46	1	0.55
MU1-OZ05	4.16	712561	1488789	3	4043.28	4042.79	1	0.49
MU1-OZ05	7.26	712561	1488789	3	4051.12	4050.35	1	0.77
MU1-OZ05	8.22	712561	1488789	3	4052.39	4051.49	1	0.90
MU1-OZ06	1.00	712552	1488420	3	4056.00	4055.30	1	0.70
MU1-OZ06	3.24	712552	1488420	3	4045.53	4047.60	1	-2.07
MU1-OZ06	4.16	712552	1488420	3	4042.99	4044.97	1	-1.98
MU1-OZ06	7.26	712552	1488420	3	4050.98	4049.52	1	1.46
MU1-OZ06	8.22	712552	1488420	3	4052.21	4050.62	1	1.59
MU1-OZ07	1.00	713010	1488830	3	4057.29	4056.99	1	0.30
MU1-OZ07	3.24	713010	1488830	3	4045.36	4038.14	1	7.22
MU1-OZ07	4.16	713010	1488830	3	4042.41	4035.14	1	7.27
MU1-OZ07	7.26	713010	1488830	3	4052.01	4051.33	1	0.68
MU1-OZ07	8.22	713010	1488830	3	4053.34	4052.66	1	0.68
MU1-OZ08	1.00	713267	1488827	3	4057.53	4057.53	1	0.00
MU1-OZ08	3.24	713267	1488827	3	4039.99	4037.93	1	2.06
MU1-OZ08	4.16	713267	1488827	3	4037.34	4034.89	1	2.45
MU1-OZ08	7.26	713267	1488827	3	4052.53	4052.06	1	0.47
MU1-OZ08	8.22	713267	1488827	3	4053.76	4053.42	1	0.34
MU1-OZ09	1.00	712888	1488377	3	4056.64	4055.83	1	0.81
MU1-OZ09	3.24	712888	1488377	3	4044.47	4045.64	1	-1.17
MU1-OZ09	4.16	712888	1488377	3	4041.86	4042.75	1	-0.89
MU1-OZ09	7.26	712888	1488377	3	4051.65	4049.84	1	1.81
MU1-OZ09	8.22	712888	1488377	3	4052.88	4051.08	1	1.80
MU1-OZ10	1.00	712355	1488601	3	4055.74	4055.18	1	0.56

Calibration Targets, Residuals, and Statistics for Calibrated Model (Cont.)

Name	Time (days)	Easting[1]	Northing[1]	Layer	Observed Elevation (ft amsl)	Computed Elevation (ft amsl)	Weight	Residual
MU1-OZ10	3.24	712355	1488601	3	4047.19	4048.17	1	-0.98
MU1-OZ10	4.16	712355	1488601	3	4044.62	4045.73	1	-1.11
MU1-OZ10	7.26	712355	1488601	3	4050.72	4049.70	1	1.02
MU1-OZ10	8.22	712355	1488601	3	4051.98	4050.71	1	1.27
MU1-OZ11	1.00	712040	1488338	3	4054.77	4054.02	1	0.75
MU1-OZ11	3.24	712040	1488338	3	4049.03	4050.11	1	-1.08
MU1-OZ11	4.16	712040	1488338	3	4046.64	4048.11	1	-1.47
MU1-OZ11	7.26	712040	1488338	3	4050.09	4049.00	1	1.09
MU1-OZ11	8.22	712040	1488338	3	4051.07	4049.77	1	1.30
MU1-OZ12	1.00	712306	1488341	3	4055.32	4054.68	1	0.64
MU1-OZ12	3.24	712306	1488341	3	4047.93	4049.21	1	-1.28
MU1-OZ12	4.16	712306	1488341	3	4045.42	4046.88	1	-1.45
MU1-OZ12	7.26	712306	1488341	3	4050.35	4049.19	1	1.16
MU1-OZ12	8.22	712306	1488341	3	4051.61	4050.13	1	1.48
MU1-OZ13	1.00	712627	1488150	3	4055.77	4055.07	1	0.71
MU1-OZ13	3.24	712627	1488150	3	4046.75	4048.54	1	-1.79
MU1-OZ13	4.16	712627	1488150	3	4044.26	4045.93	1	-1.67
MU1-OZ13	7.26	712627	1488150	3	4050.81	4049.17	1	1.64
MU1-OZ13	8.22	712627	1488150	3	4052.00	4050.26	1	1.74
MU1-OZ14	1.00	713011	1489353	3	4058.27	4057.92	1	0.35
MU1-OZ14	3.24	713011	1489353	3	4035.38	4035.21	1	0.17
MU1-OZ14	4.16	713011	1489353	3	4032.93	4032.62	1	0.31
MU1-OZ14	7.26	713011	1489353	3	4053.71	4053.11	1	0.60
MU1-OZ14	8.22	713011	1489353	3	4054.81	4054.26	1	0.55
MU1-OZ15	1.00	712429	1489241	3	4057.69	4056.51	1	1.18
MU1-OZ15	3.24	712429	1489241	3	4044.83	4047.18	1	-2.35
MU1-OZ15	4.16	712429	1489241	3	4042.59	4044.84	1	-2.25
MU1-OZ15	7.26	712429	1489241	3	4053.39	4051.57	1	1.82
MU1-OZ15	8.22	712429	1489241	3	4054.88	4052.55	1	2.33
MU1-OZ16	1.00	712755	1489200	3	4057.91	4057.13	1	0.78
MU1-OZ16	3.24	712755	1489200	3	4036.27	4039.96	1	-3.69
MU1-OZ16	4.16	712755	1489200	3	4033.85	4037.32	1	-3.47
MU1-OZ16	7.26	712755	1489200	3	4053.37	4051.96	1	1.41
MU1-OZ16	8.22	712755	1489200	3	4054.48	4053.11	1	1.37
MU1-OZ17	1.00	713273	1489055	3	4058.02	4057.90	1	0.12
MU1-OZ17	3.24	713273	1489055	3	4034.26	4034.53	1	-0.26
MU1-OZ17	4.16	713273	1489055	3	4031.68	4031.69	1	-0.01
MU1-OZ17	7.26	713273	1489055	3	4053.24	4052.85	1	0.39
MU1-OZ17	8.22	713273	1489055	3	4054.4	4054.12	1	0.28
MU1-OZ18	1.00	713400	1489208	3	4058.37	4058.38	1	-0.01
MU1-OZ18	3.24	713400	1489208	3	4038.00	4039.68	1	-1.68

Calibration Targets, Residuals, and Statistics for Calibrated Model (Cont.)

Name	Time (days)	Easting[1]	Northing[1]	Layer	Observed Elevation (ft amsl)	Computed Elevation (ft amsl)	Weight	Residual
MU1-OZ18	4.16	713400	1489208	3	4035.5	4037.10	1	-1.60
MU1-OZ18	7.26	713400	1489208	3	4053.73	4053.87	1	-0.14
MU1-OZ18	8.22	713400	1489208	3	4054.83	4055.03	1	-0.20
MU1-OZ19	1.00	711788	1488184	3	4052.57	4053.03	1	-0.46
MU1-OZ19	3.24	711788	1488184	3	4049.4	4050.49	1	-1.09
MU1-OZ19	4.16	711788	1488184	3	4047.27	4048.88	1	-1.61
MU1-OZ19	7.26	711788	1488184	3	4048.66	4048.60	1	0.06
MU1-OZ19	8.22	711788	1488184	3	4049.66	4049.17	1	0.50
MU1-OZ20	1.00	712495	1489053	3	4057.51	4056.28	1	1.23
MU1-OZ20	3.24	712495	1489053	3	4043.97	4045.70	1	-1.73
MU1-OZ20	4.16	712495	1489053	3	4041.64	4043.19	1	-1.55
MU1-OZ20	7.26	712495	1489053	3	4053.1	4051.03	1	2.07
MU1-OZ20	8.22	712495	1489053	3	4054.11	4052.09	1	2.02
MU1-OZ21	1.00	712817	1488940	3	4057.52	4056.76	1	0.76
MU1-OZ21	3.24	712817	1488940	3	4032.8	4039.51	1	-6.71
MU1-OZ21	4.16	712817	1488940	3	4030.25	4036.66	1	-6.41
MU1-OZ21	7.26	712817	1488940	3	4052.76	4051.22	1	1.54
MU1-OZ21	8.22	712817	1488940	3	4053.92	4052.46	1	1.46
MU1-OZ22	1.00	712363	1488080	3	4055.39	4054.51	1	0.88
MU1-OZ22	3.24	712363	1488080	3	4049.59	4049.72	1	-0.13
MU1-OZ22	4.16	712363	1488080	3	4047.29	4047.40	1	-0.11
MU1-OZ22	7.26	712363	1488080	3	4050.75	4048.90	1	1.85
MU1-OZ22	8.22	712363	1488080	3	4051.86	4049.83	1	2.03
MU1-OZ23	1.00	713089	1488274	3	4061.65	4061.78	1	-0.13
MU1-OZ23	3.24	713089	1488274	3	4061.9	4061.78	1	0.12
MU1-OZ23	4.16	713089	1488274	3	4061.85	4061.76	1	0.09
MU1-OZ23	7.26	713089	1488274	3	4061.83	4061.70	1	0.14
MU1-OZ23	8.22	713089	1488274	3	4061.95	4061.68	1	0.27
MU1-OZ24	1.00	711951	1488559	3	4054.53	4054.11	1	0.42
MU1-OZ24	3.24	711951	1488559	3	4048.9	4050.23	1	-1.33
MU1-OZ24	4.16	711951	1488559	3	4047.04	4048.33	1	-1.29
MU1-OZ24	7.26	711951	1488559	3	4050.03	4049.34	1	0.69
MU1-OZ24	8.22	711951	1488559	3	4051.14	4050.06	1	1.08
MU1-OZ25	1.00	712367	1488876	3	4056.99	4055.67	1	1.32
MU1-OZ25	3.24	712367	1488876	3	4045.5	4047.44	1	-1.94
MU1-OZ25	4.16	712367	1488876	3	4043.08	4045.00	1	-1.92
MU1-OZ25	7.26	712367	1488876	3	4052.46	4050.37	1	2.09
MU1-OZ25	8.22	712367	1488876	3	4053.54	4051.39	1	2.15
MU1-OZ26	1.00	713149	1489575	3	4058.56	4058.58	1	-0.02
MU1-OZ26	3.24	713149	1489575	3	4041.74	4044.15	1	-2.41
MU1-OZ26	4.16	713149	1489575	3	4039.38	4041.86	1	-2.48

Calibration Targets, Residuals, and Statistics for Calibrated Model (Cont.)

Name	Time (days)	Easting[1]	Northing[1]	Layer	Observed Elevation (ft amsl)	Computed Elevation (ft amsl)	Weight	Residual
MU1-OZ26	7.26	713149	1489575	3	4054.16	4054.36	1	-0.20
MU1-OZ26	8.22	713149	1489575	3	4055.19	4055.38	1	-0.19

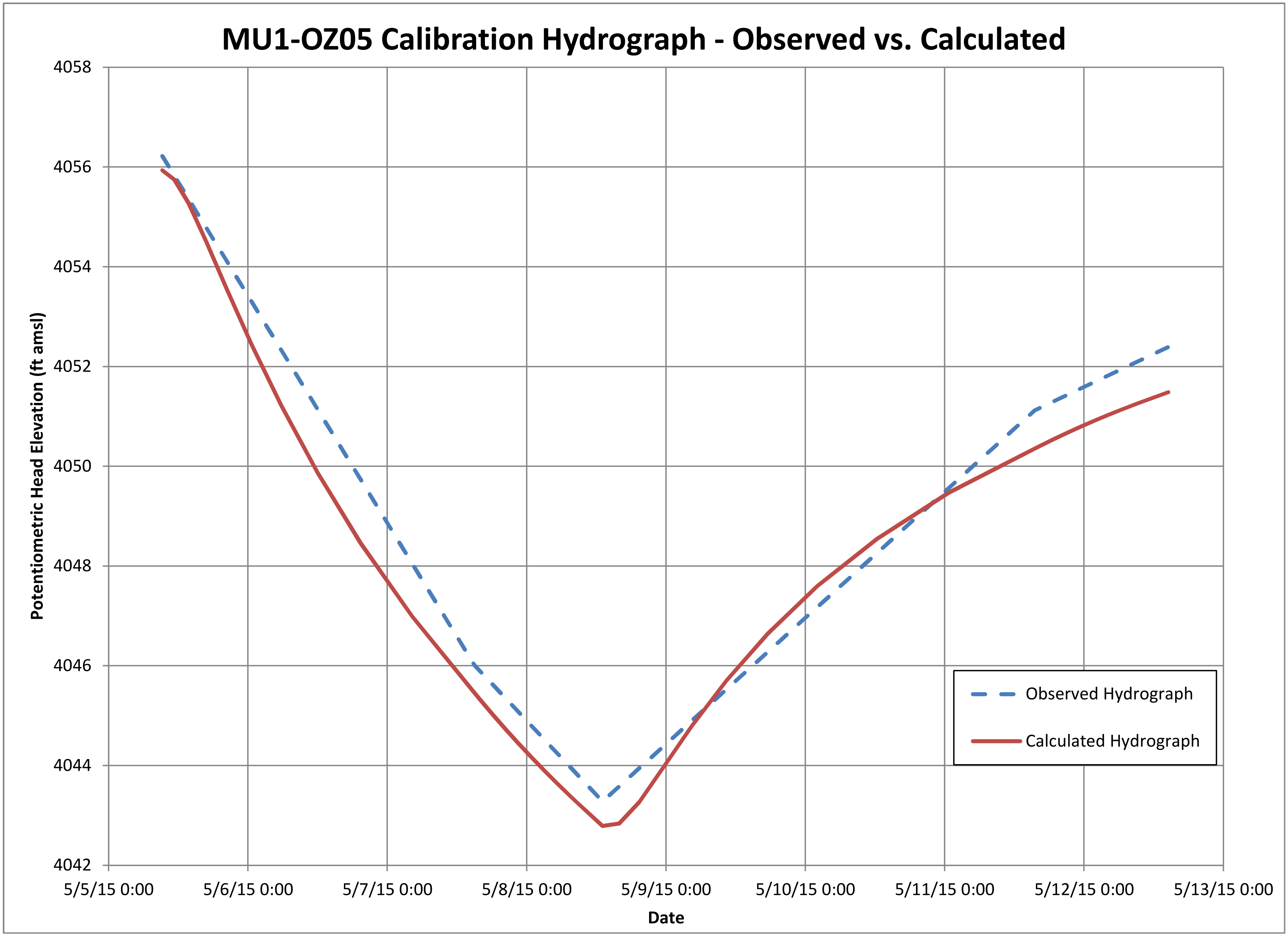
[1]Northing and Easting coordinates based on NAD83WY-WYEF

Residual Mean	0.20
Absolute Residual Mean	1.31
Residual Standard Deviation	1.81
Sum of Squares	415.13
Minimum Residual	-6.71
Maximum Residual	7.27
Number of Observations	125

ATTACHMENT 6

Appendix B

Calibration Hydrographs


MU1-OZ05 Calibration Hydrograph - Observed vs. Calculated
Potentiometric Head Elevation (ft amsl)
4058
4056
4054
4052
4050
4048
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4042
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5/6/15 0:00
5/7/15 0:00
5/8/15 0:00
5/9/15 0:00
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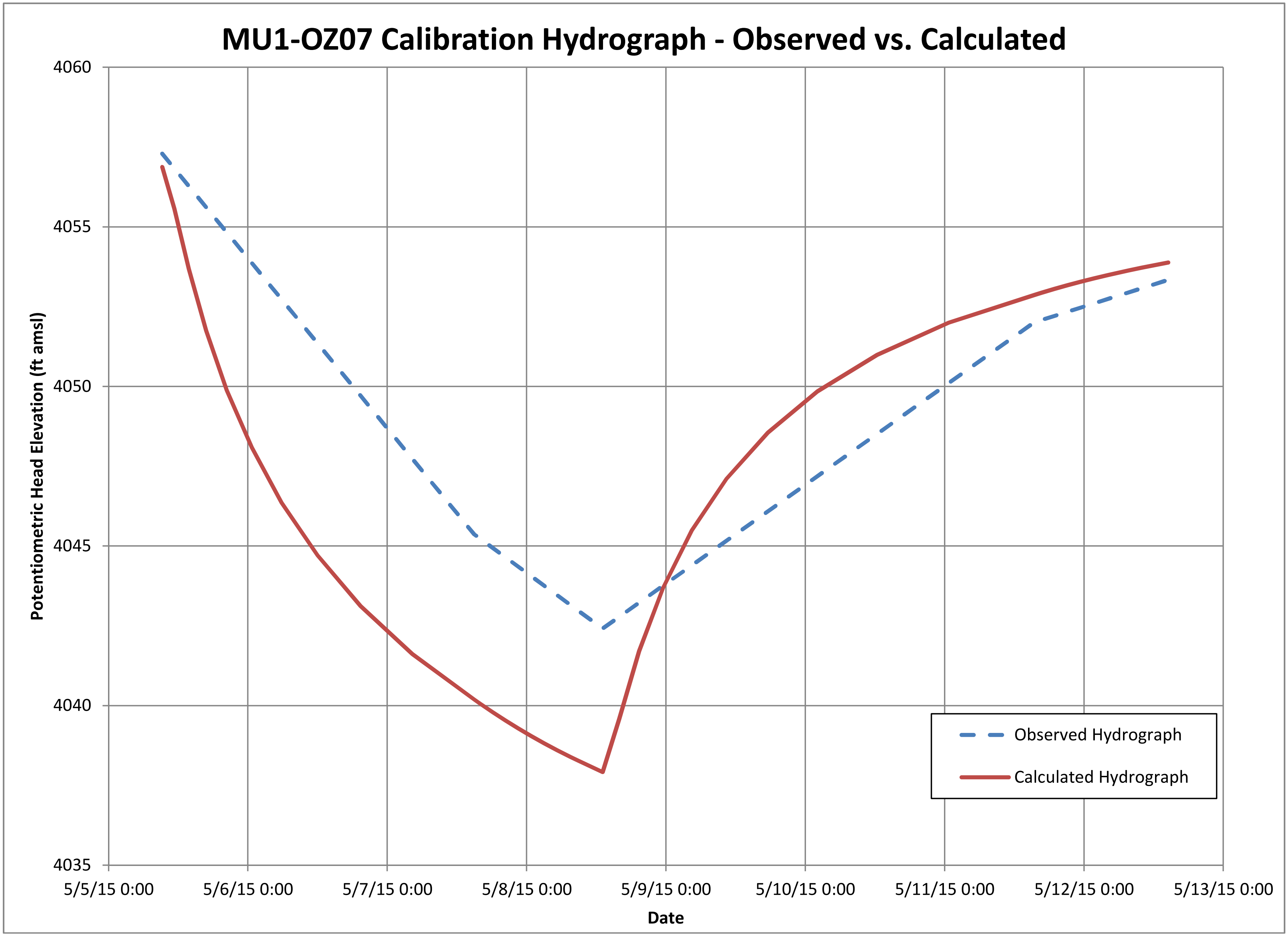
Date
Observed Hydrograph
Calculated Hydrograph


MU1-OZ07 Calibration Hydrograph - Observed vs. Calculated
Potentiometric Head Elevation (ft amsl)
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4055
4050
4045
4040
4035
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5/6/15 0:00
5/7/15 0:00
5/8/15 0:00
5/9/15 0:00
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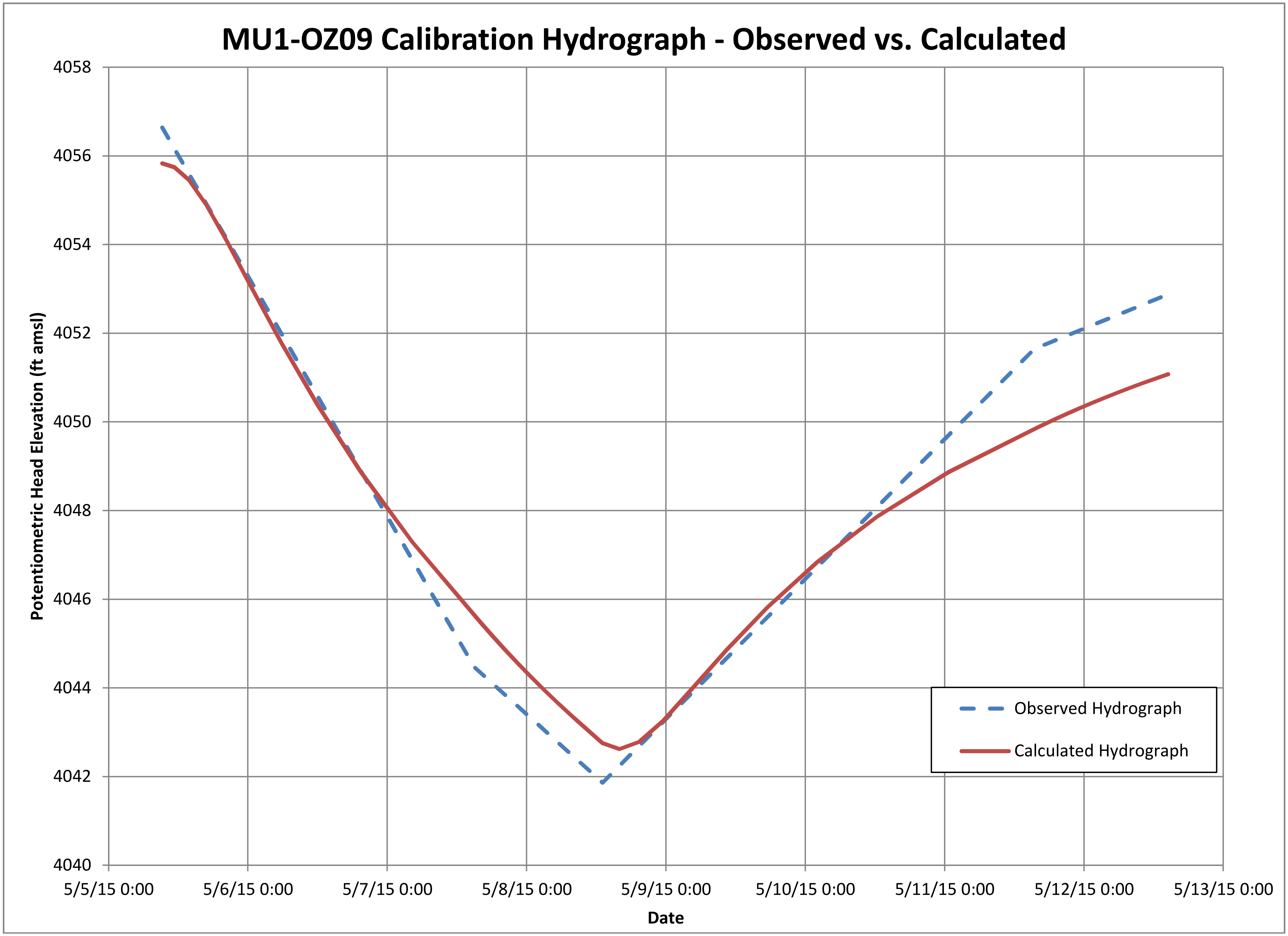
5/13/15 0:00
Date
Observed Hydrograph
Calculated Hydrograph


MU1-OZ09 Calibration Hydrograph - Observed vs. Calculated
Potentiometric Head Elevation (ft amsl)
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4056
4054
4052
4050
4048
4046
4044
4042
4040
5/5/15 0:00
5/6/15 0:00
5/7/15 0:00
5/8/15 0:00
5/9/15 0:00
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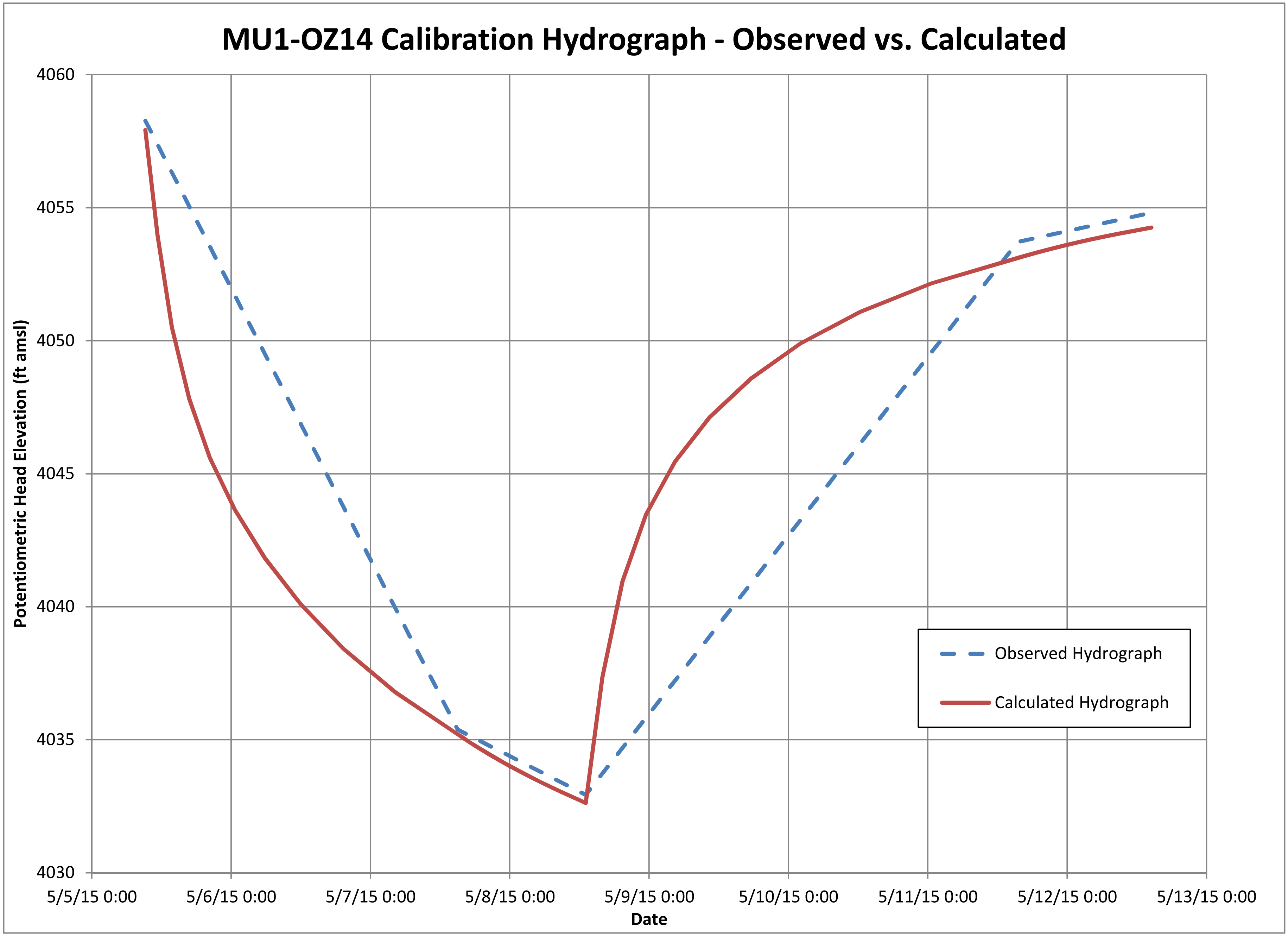
5/13/15 0:00
Date
Observed Hydrograph
Calculated Hydrograph


MU1-OZ14 Calibration Hydrograph - Observed vs. Calculated
Potentiometric Head Elevation (ft amsl)
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4055
4050
4045
4040
4035
4030
5/5/15 0:00
5/6/15 0:00
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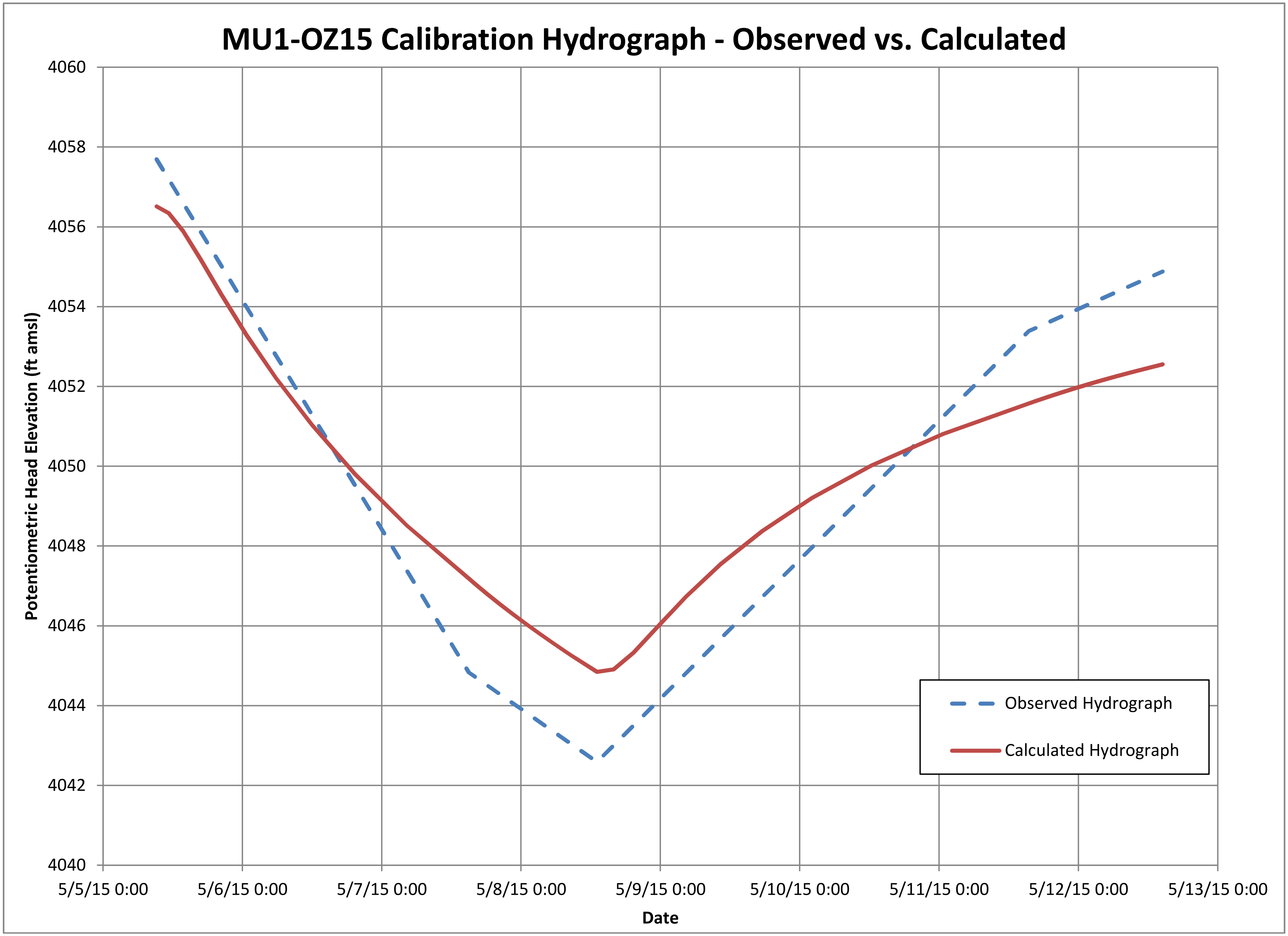
Date
Observed Hydrograph
Calculated Hydrograph


MU1-OZ15 Calibration Hydrograph - Observed vs. Calculated
Potentiometric Head Elevation (ft amsl)
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4058
4056
4054
4052
4050
4048
4046
4044
4042
4040
5/5/15 0:00
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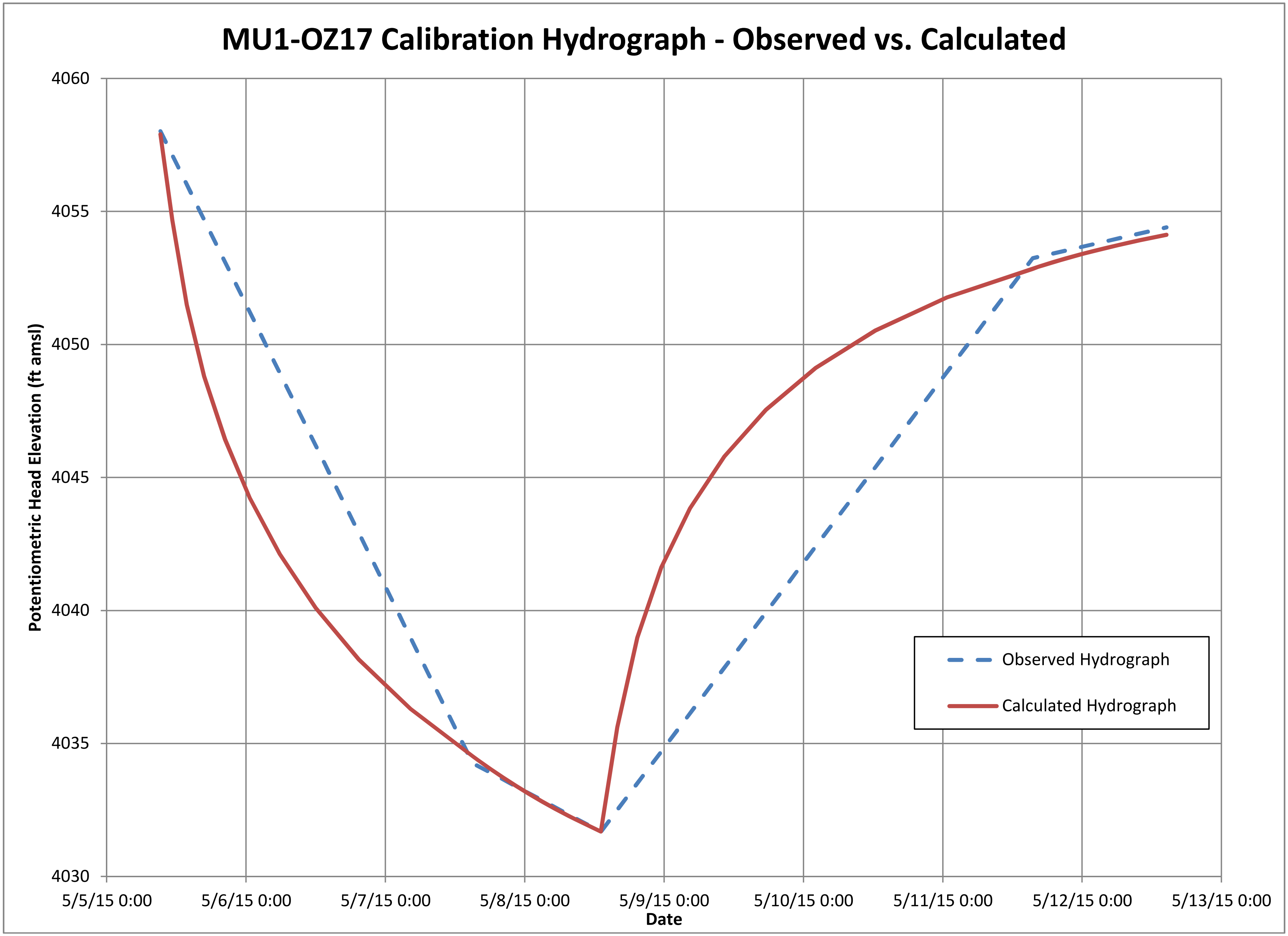
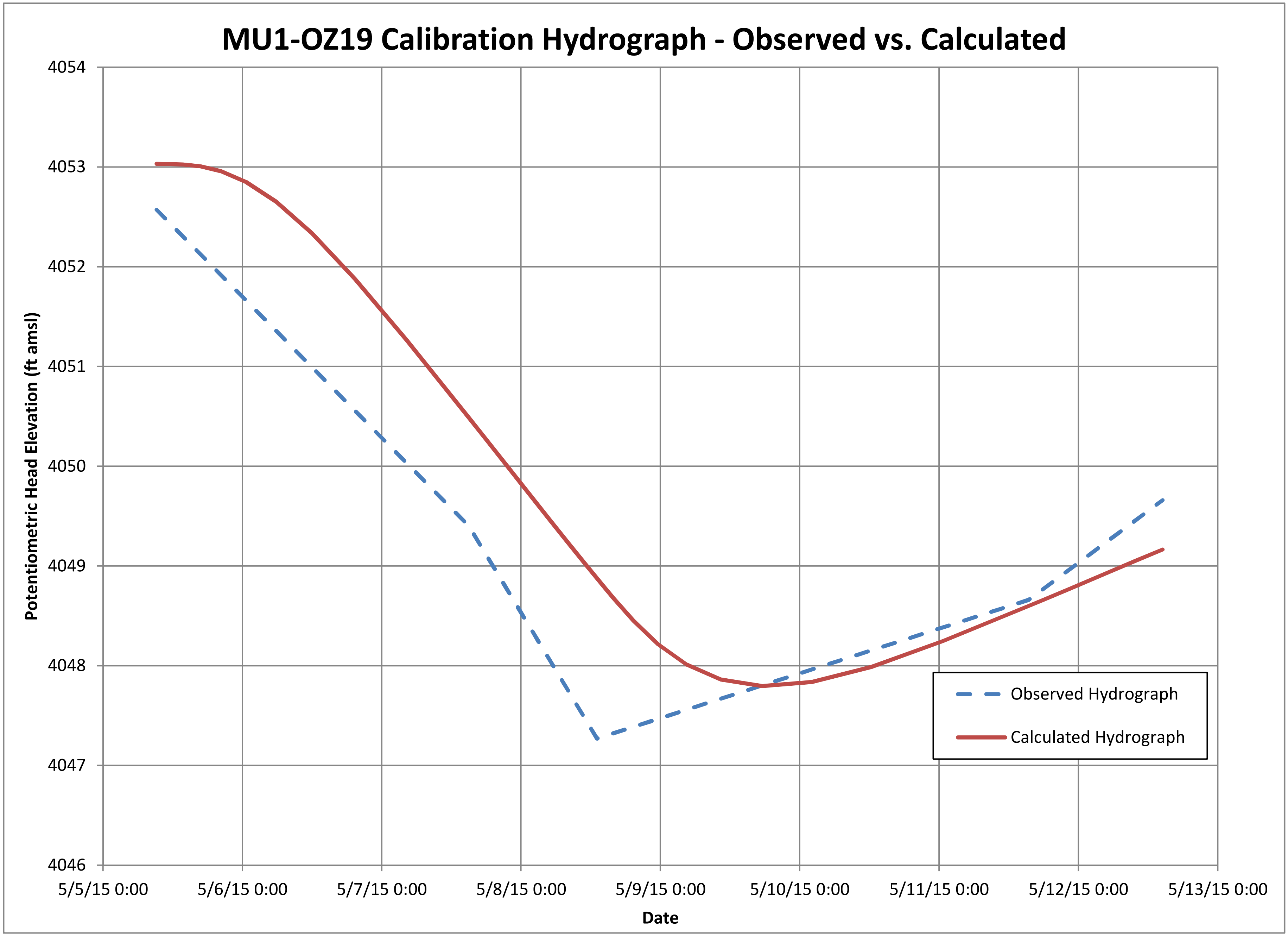
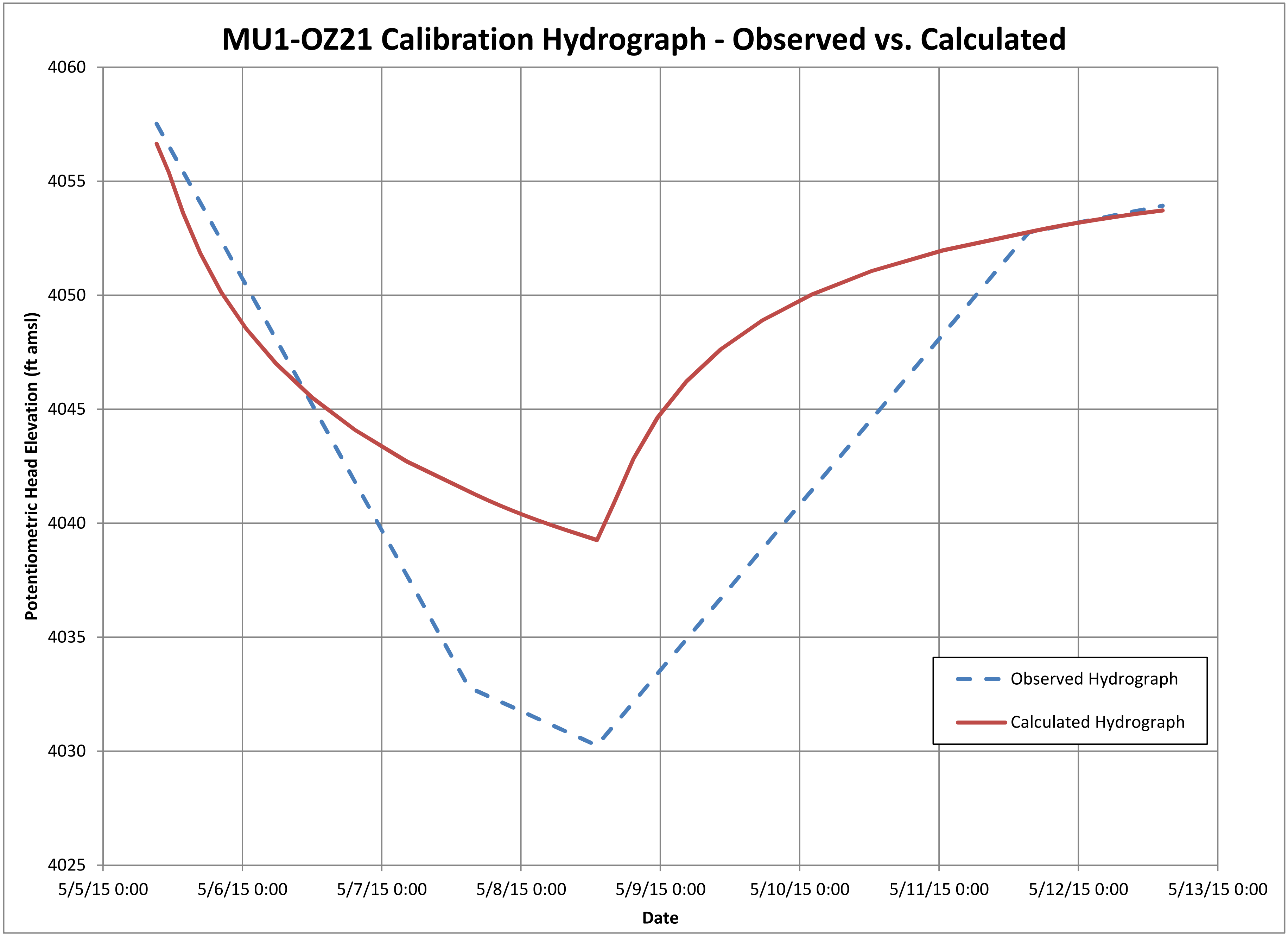
5/13/15 0:00
Date
Observed Hydrograph
Calculated Hydrograph


MU1-OZ17 Calibration Hydrograph - Observed vs. Calculated
Potentiometric Head Elevation (ft amsl)
4060
4055
4050
4045
4040
4035
4030
5/5/15 0:00
5/6/15 0:00
5/7/15 0:00
5/8/15 0:00
5/9/15 0:00
5/10/15 0:00
5/11/15 0:00
5/12/15 0:00
5/13/15 0:00
Date
Observed Hydrograph
Calculated Hydrograph


MU1-OZ19 Calibration Hydrograph - Observed vs. Calculated
Potentiometric Head Elevation (ft amsl)
4054
4053
4052
4051
4050
4049
4048
4047
4046
5/5/15 0:00
5/6/15 0:00
5/7/15 0:00
5/8/15 0:00
5/9/15 0:00
5/10/15 0:00
5/11/15 0:00
5/12/15 0:00
5/13/15 0:00
Date
Observed Hydrograph
Calculated Hydrograph

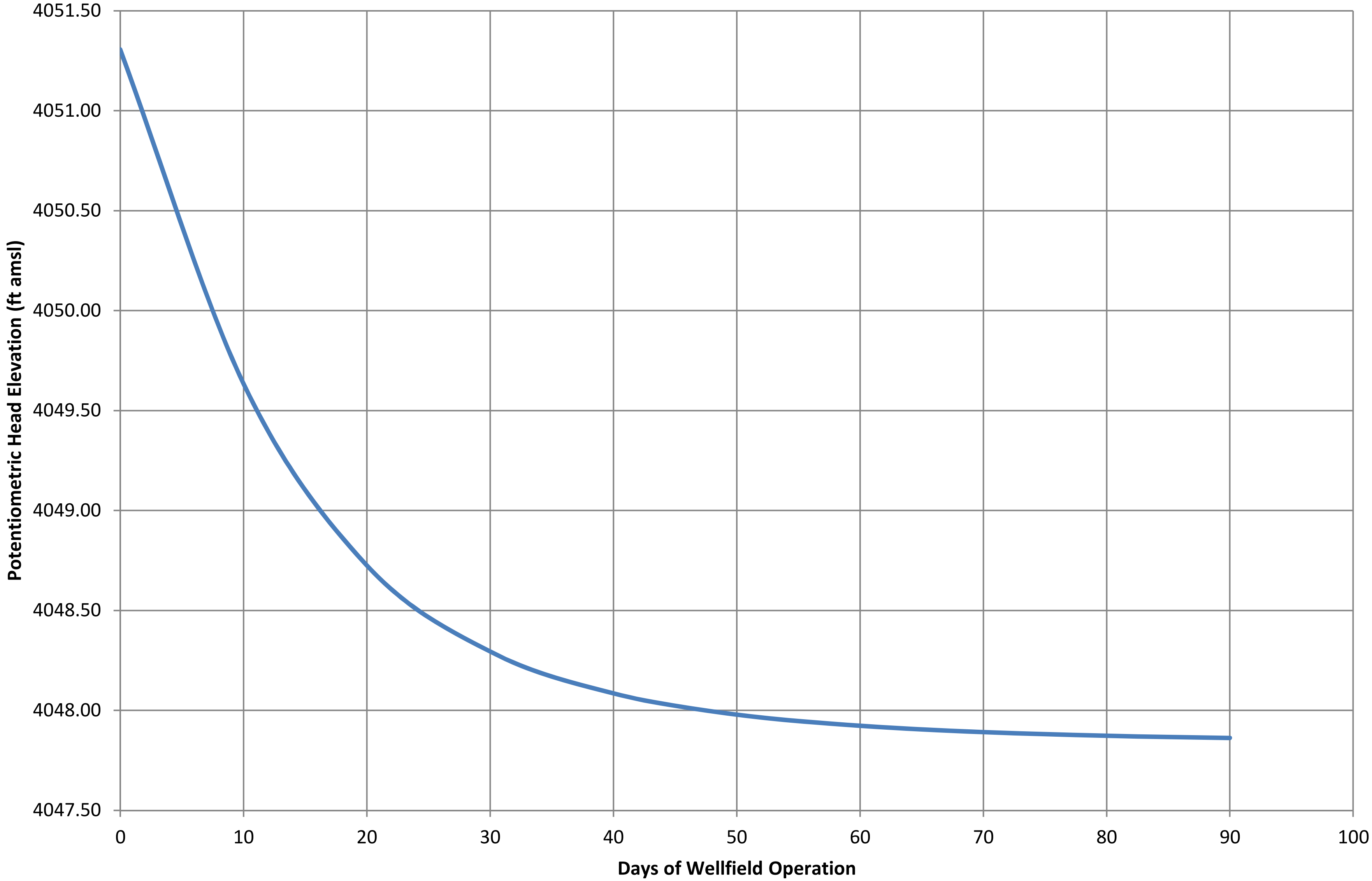

MU1-OZ21 Calibration Hydrograph - Observed vs. Calculated
Potentiometric Head Elevation (ft amsl)
4060
4055
4050
4045
4040
4035
4030
4025
5/5/15 0:00
5/6/15 0:00
5/7/15 0:00
5/8/15 0:00
5/9/15 0:00
5/10/15 0:00
5/11/15 0:00
5/12/15 0:00
5/13/15 0:00
Date
Observed Hydrograph
Calculated Hydrograph

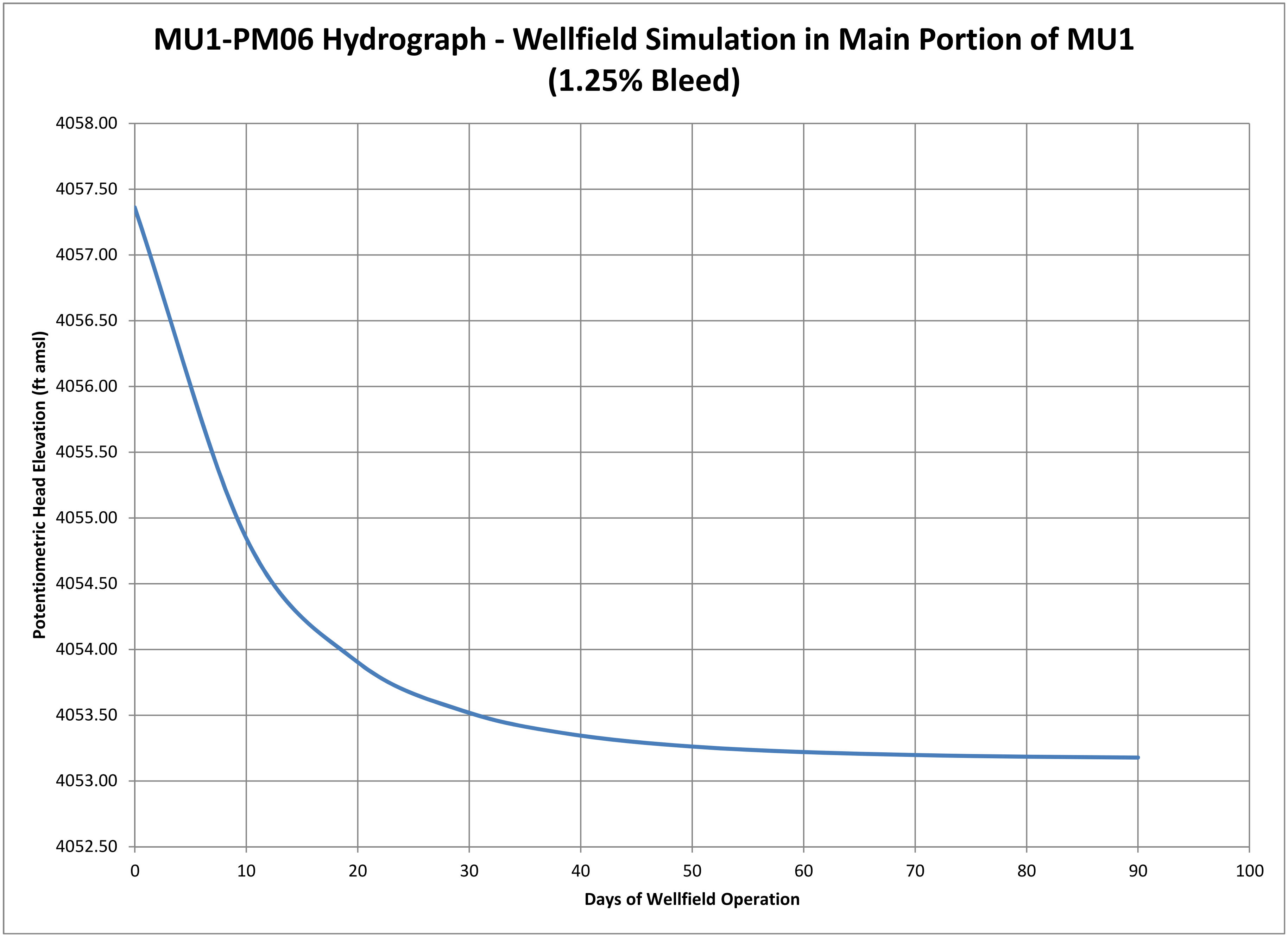
ATTACHMENT 6

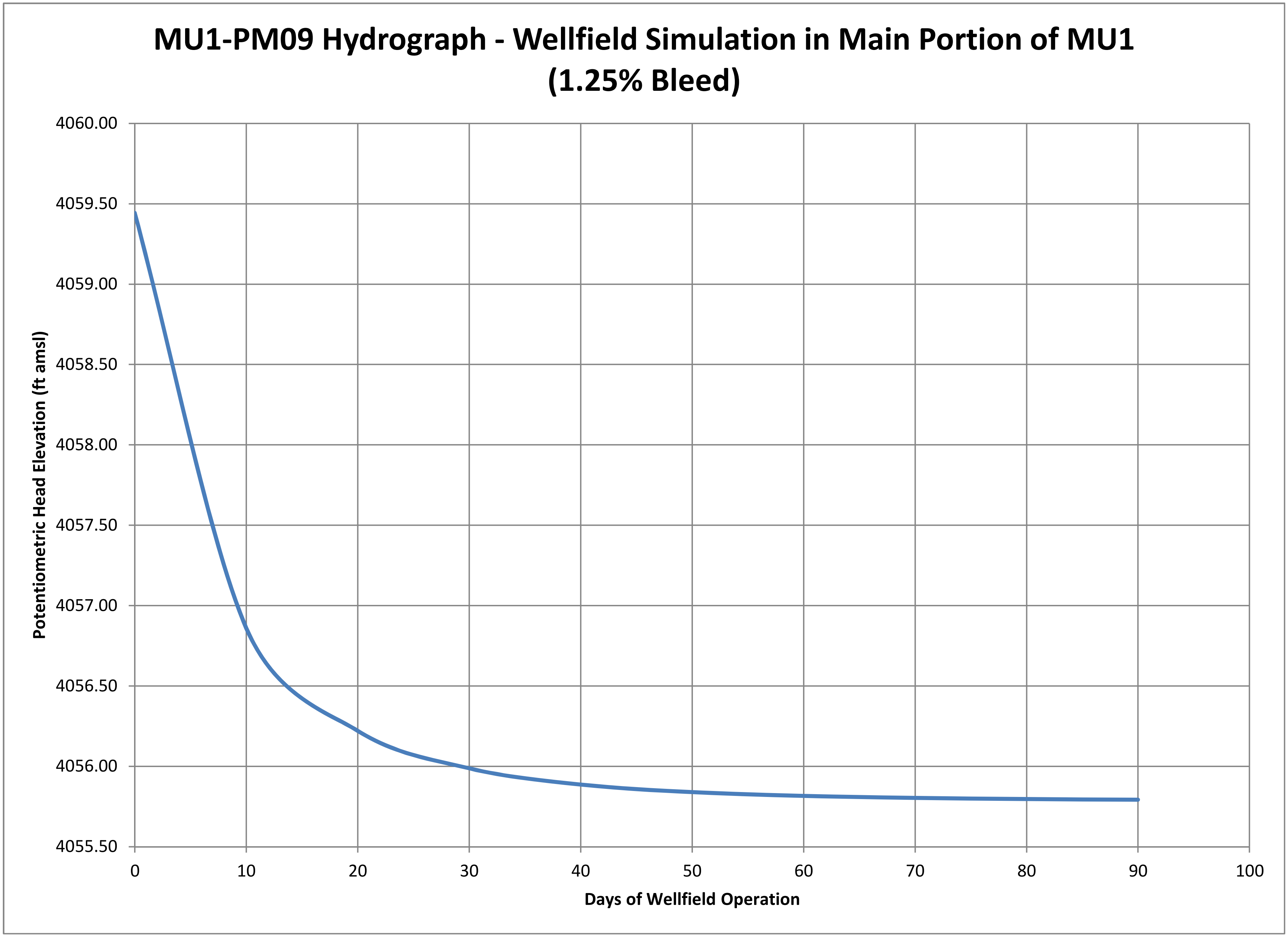
Appendix C

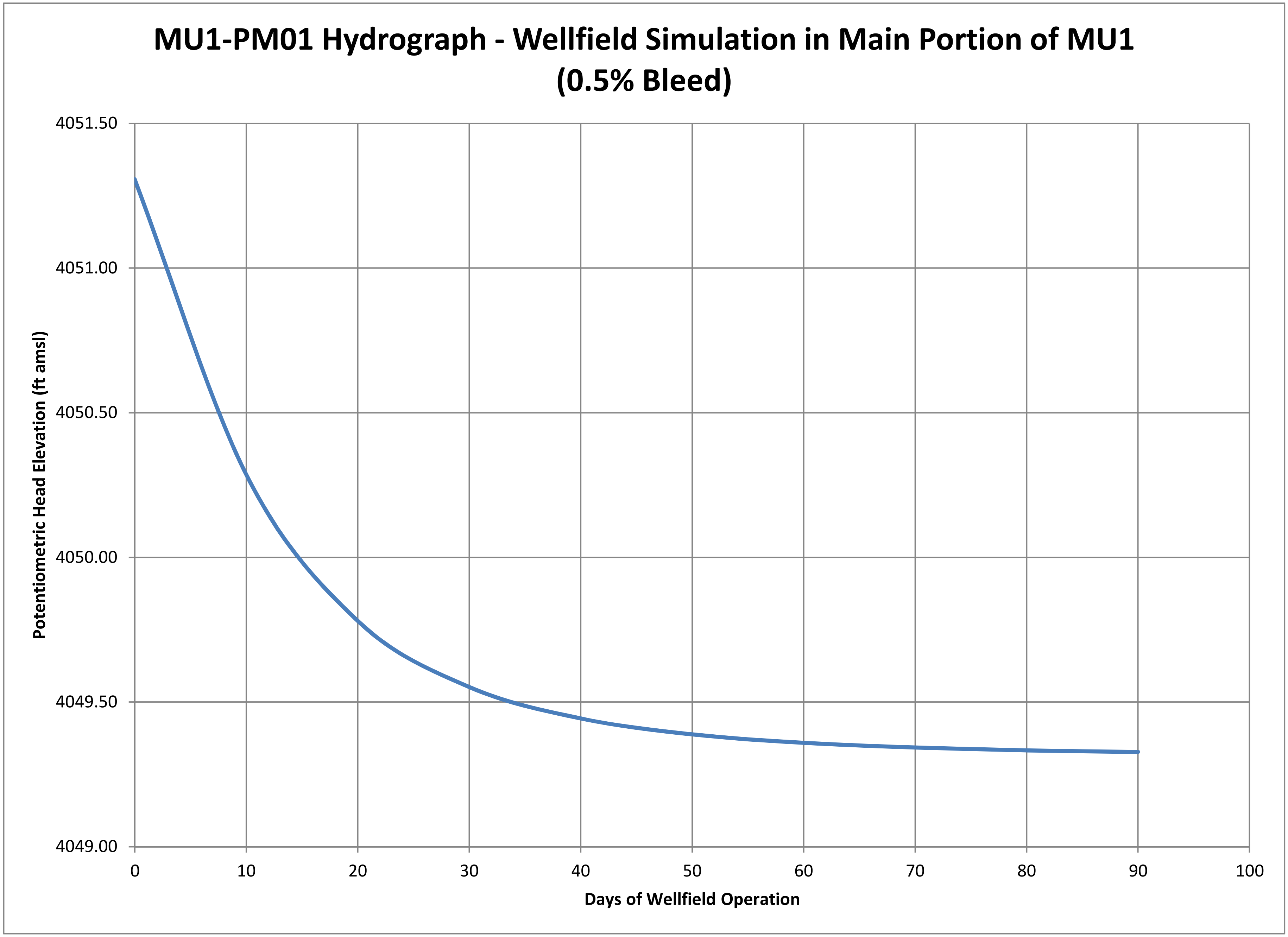
Hydrographs at PM Wells During Operational Simulation in the Main Portion of MU1

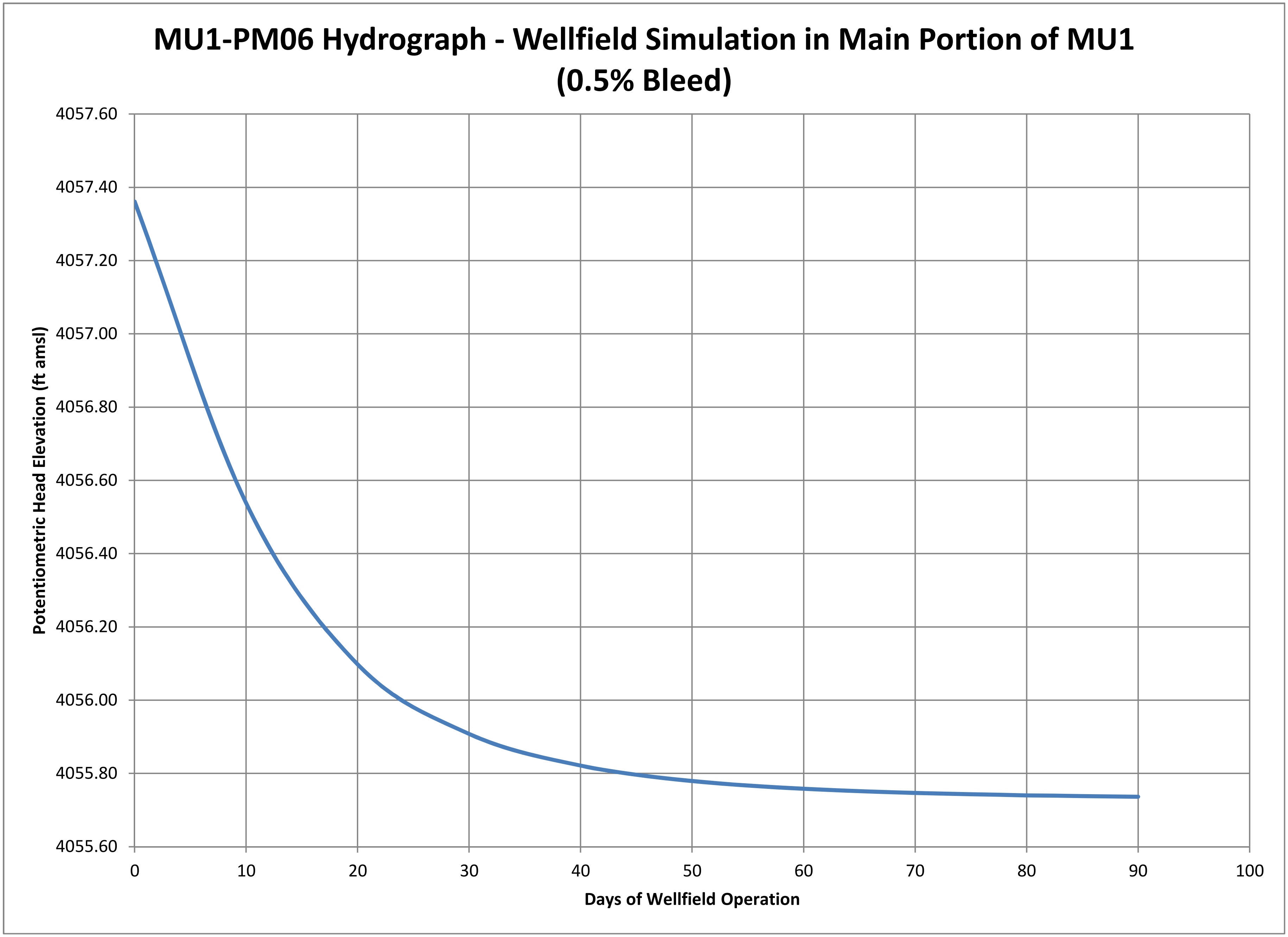
MU1-PM01 Hydrograph - Wellfield Simulation in Main Portion of MU1 (1.25% Bleed)

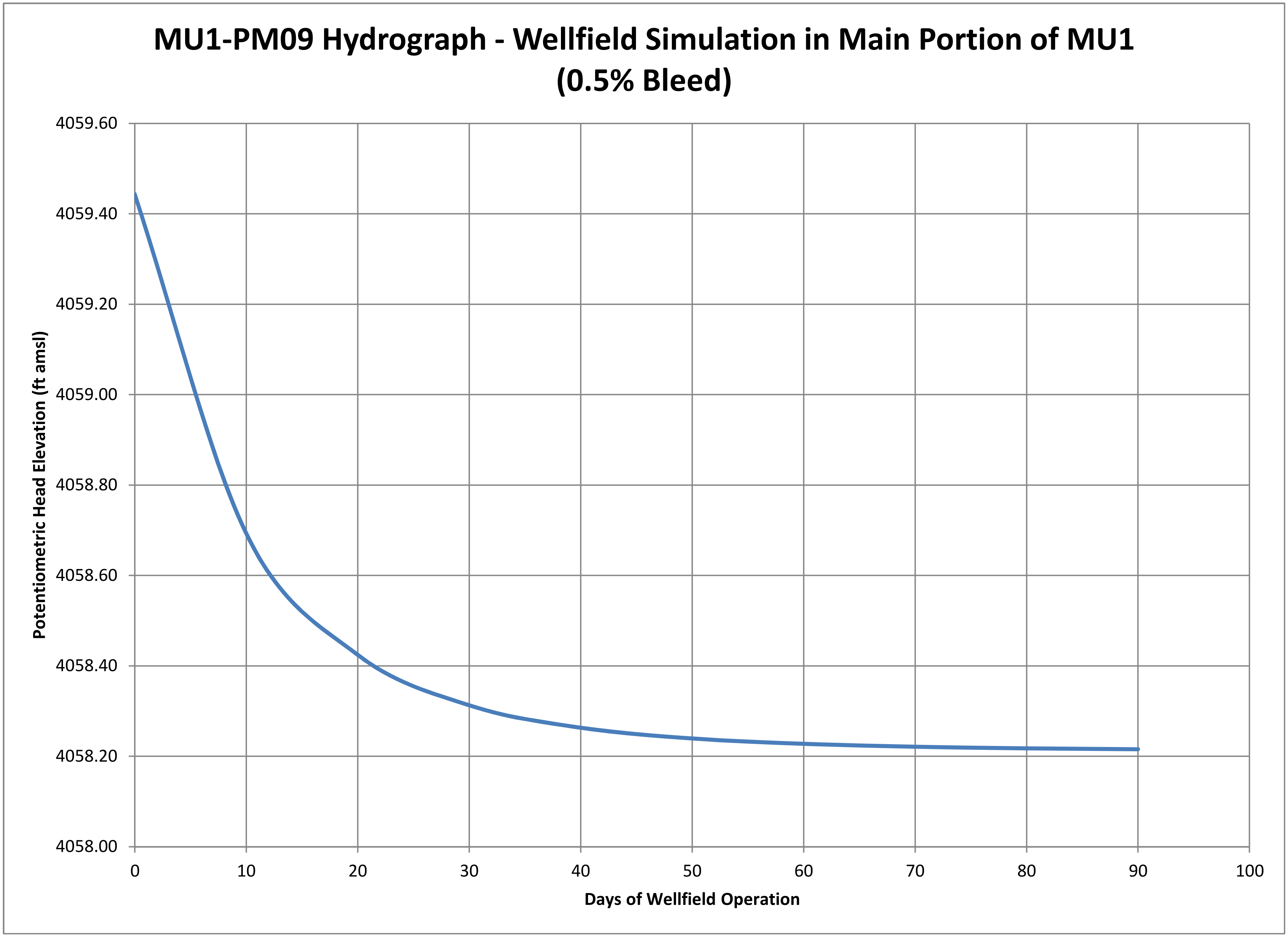



MU1-PM06 Hydrograph - Wellfield Simulation in Main Portion of MU1
(1.25% Bleed)
Potentiometric Head Elevation (ft amsl)
4058.00
4057.50
4057.00
4056.50
4056.00
4055.50
4055.00
4054.50
4054.00
4053.50
4053.00
4052.50
0
10
20
30
40
50
60
70
80
90
100
Days of Wellfield Operation


MU1-PM09 Hydrograph - Wellfield Simulation in Main Portion of MU1
(1.25% Bleed)
Potentiometric Head Elevation (ft amsl)
4060.00
4059.50
4059.00
4058.50
4058.00
4057.50
4057.00
4056.50
4056.00
4055.50
0
10
20
30
40
50
60
70
80
90
100
Days of Wellfield Operation


MU1-PM01 Hydrograph - Wellfield Simulation in Main Portion of MU1
(0.5% Bleed)
Potentiometric Head Elevation (ft amsl)
4051.50
4051.00
4050.50
4050.00
4049.50
4049.00
0
10
20
30
40
50
60
70
80
90
100
Days of Wellfield Operation

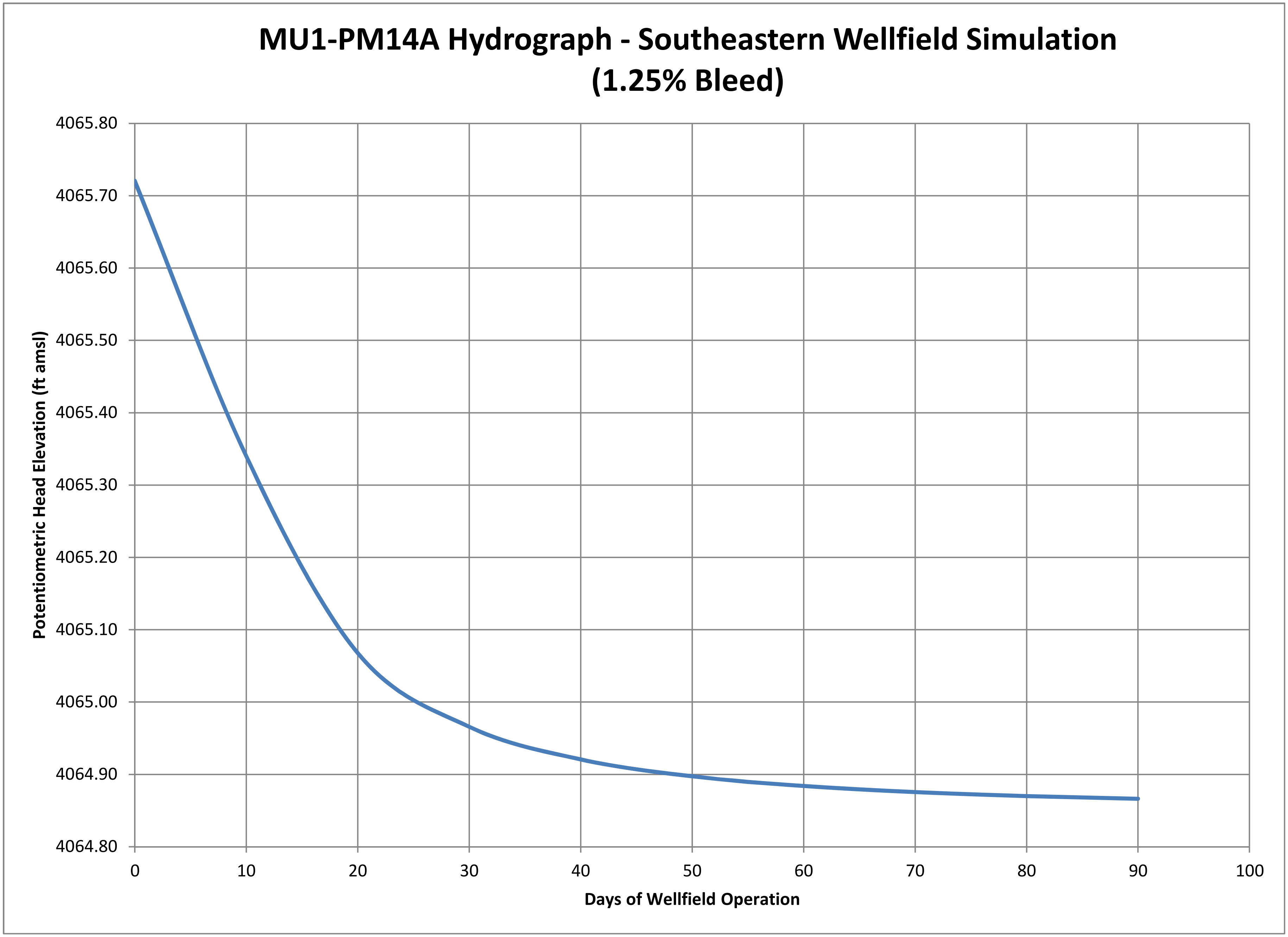

MU1-PM06 Hydrograph - Wellfield Simulation in Main Portion of MU1
(0.5% Bleed)
Potentiometric Head Elevation (ft amsl)
4057.60
4057.40
4057.20
4057.00
4056.80
4056.60
4056.40
4056.20
4056.00
4055.80
4055.60
0
10
20
30
40
50
60
70
80
90
100
Days of Wellfield Operation

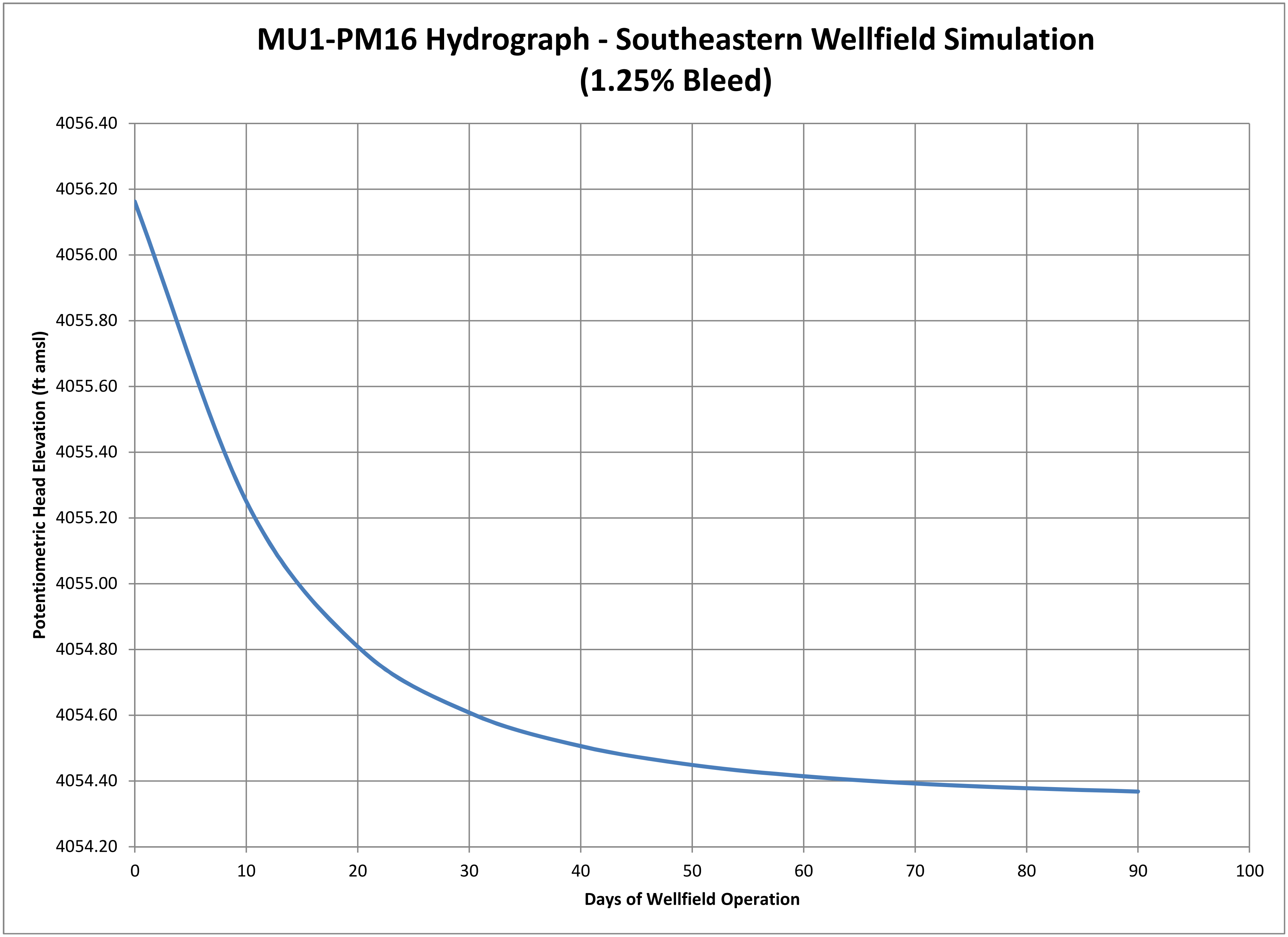

MU1-PM09 Hydrograph - Wellfield Simulation in Main Portion of MU1
(0.5% Bleed)
Potentiometric Head Elevation (ft amsl)
4059.60
4059.40
4059.20
4059.00
4058.80
4058.60
4058.40
4058.20
4058.00
0
10
20
30
40
50
60
70
80
90
100
Days of Wellfield Operation

ATTACHMENT 6

Appendix D

Hydrographs at PM Wells During Operational Simulation in the Southeastern Portion of MU1

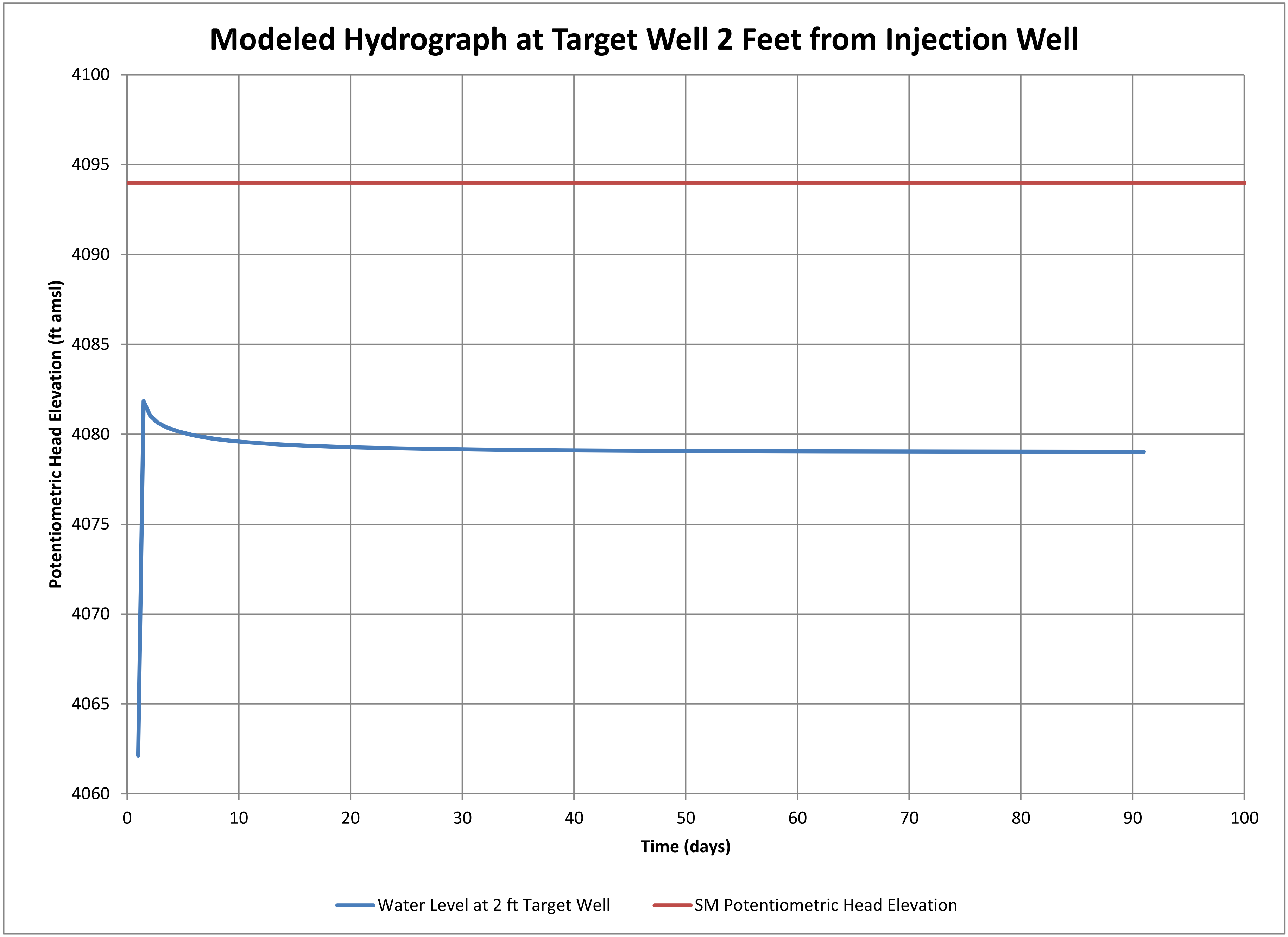

MU1-PM14A Hydrograph - Southeastern Wellfield Simulation
(1.25% Bleed)
Potentiometric Head Elevation (ft amsl)
4065.80
4065.70
4065.60
4065.50
4065.40
4065.30
4065.20
4065.10
4065.00
4064.90
4064.80
0
10
20
30
40
50
60
70
80
90
100
Days of Wellfield Operation

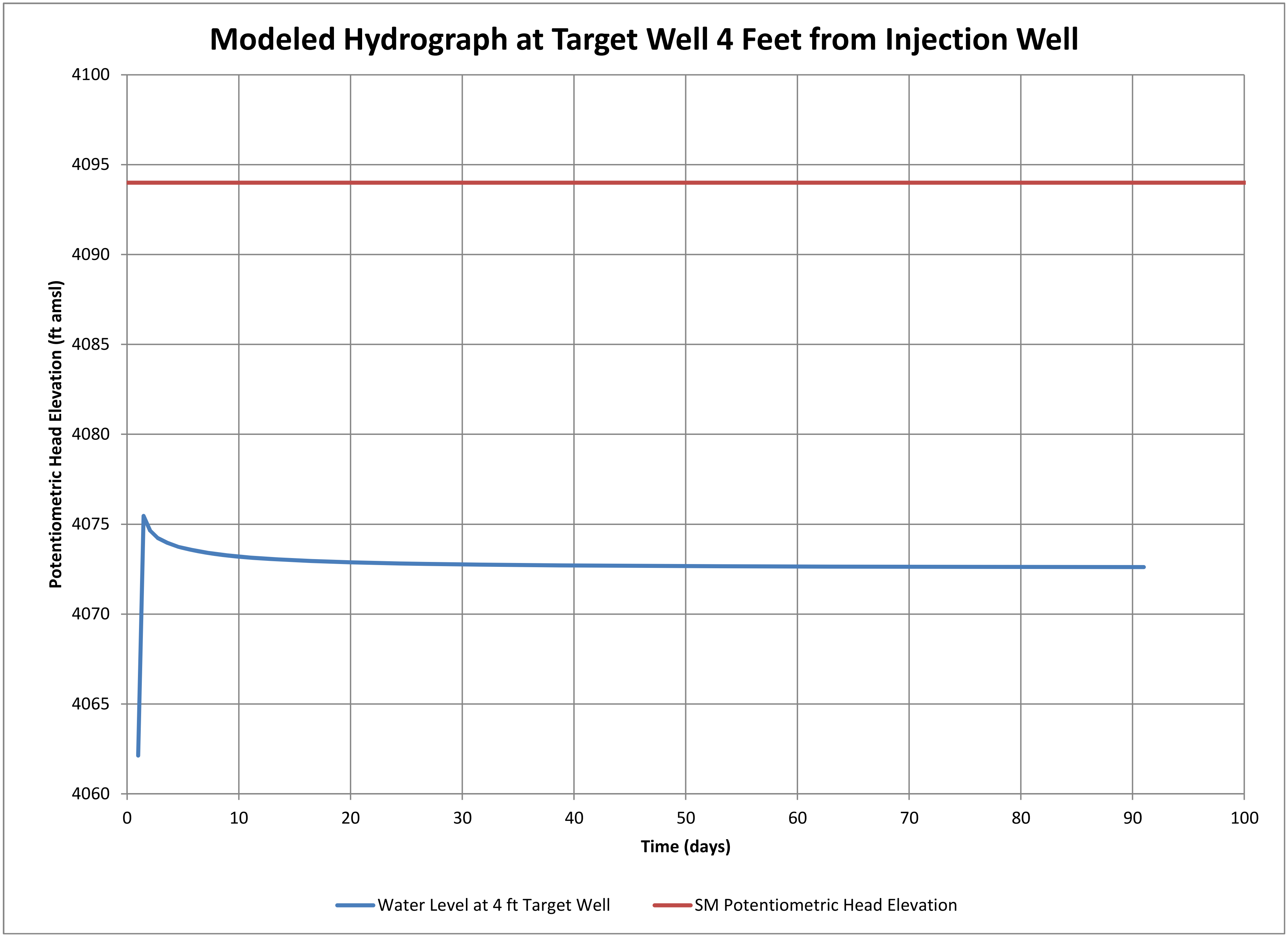

MU1-PM16 Hydrograph - Southeastern Wellfield Simulation
(1.25% Bleed)
Potentiometric Head Elevation (ft amsl)
4056.40
4056.20
4056.00
4055.80
4055.60
4055.40
4055.20
4055.00
4054.80
4054.60
4054.40
4054.20
0
10
20
30
40
50
60
70
80
90
100
Days of Wellfield Operation

ATTACHMENT 6

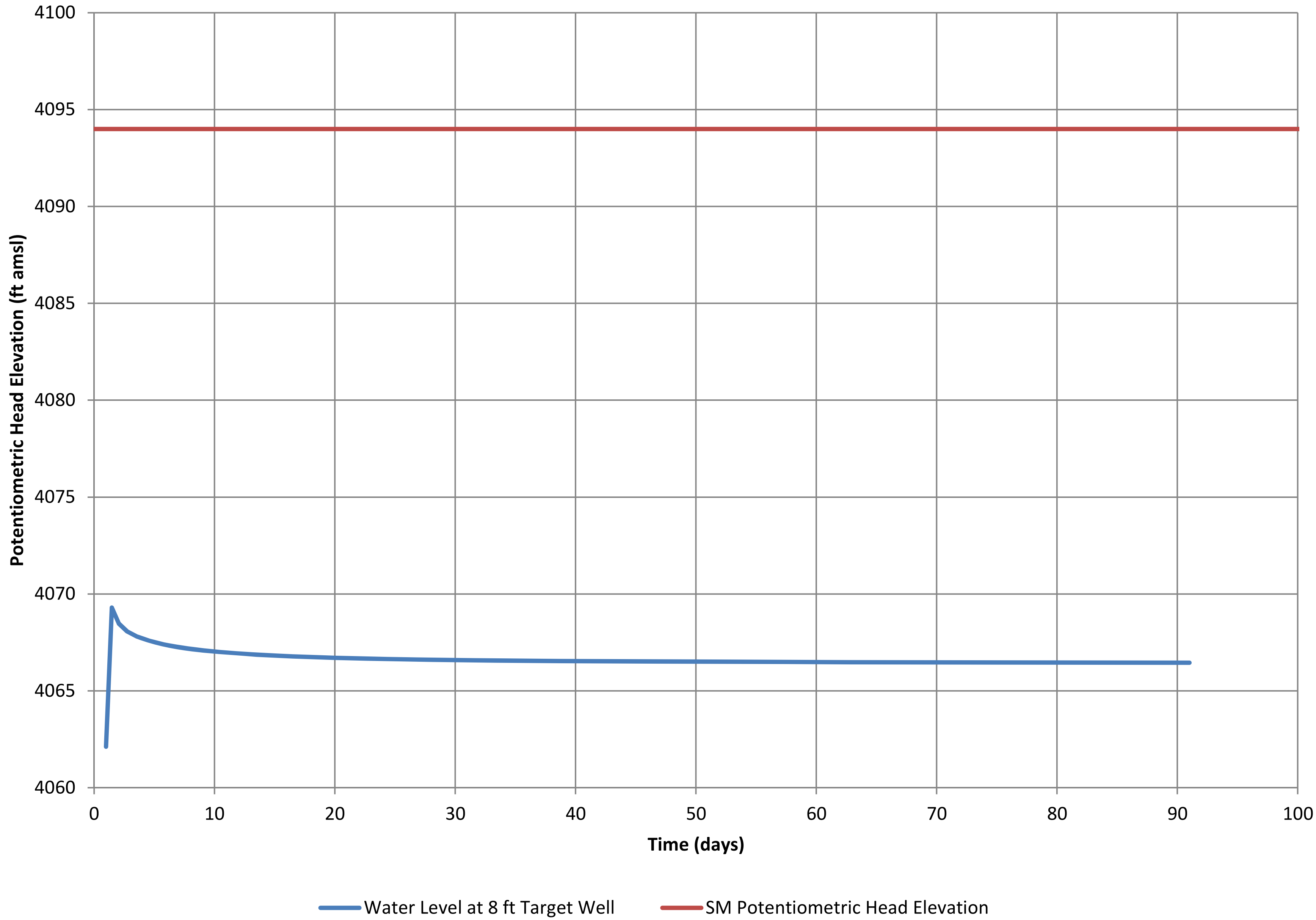
Appendix E

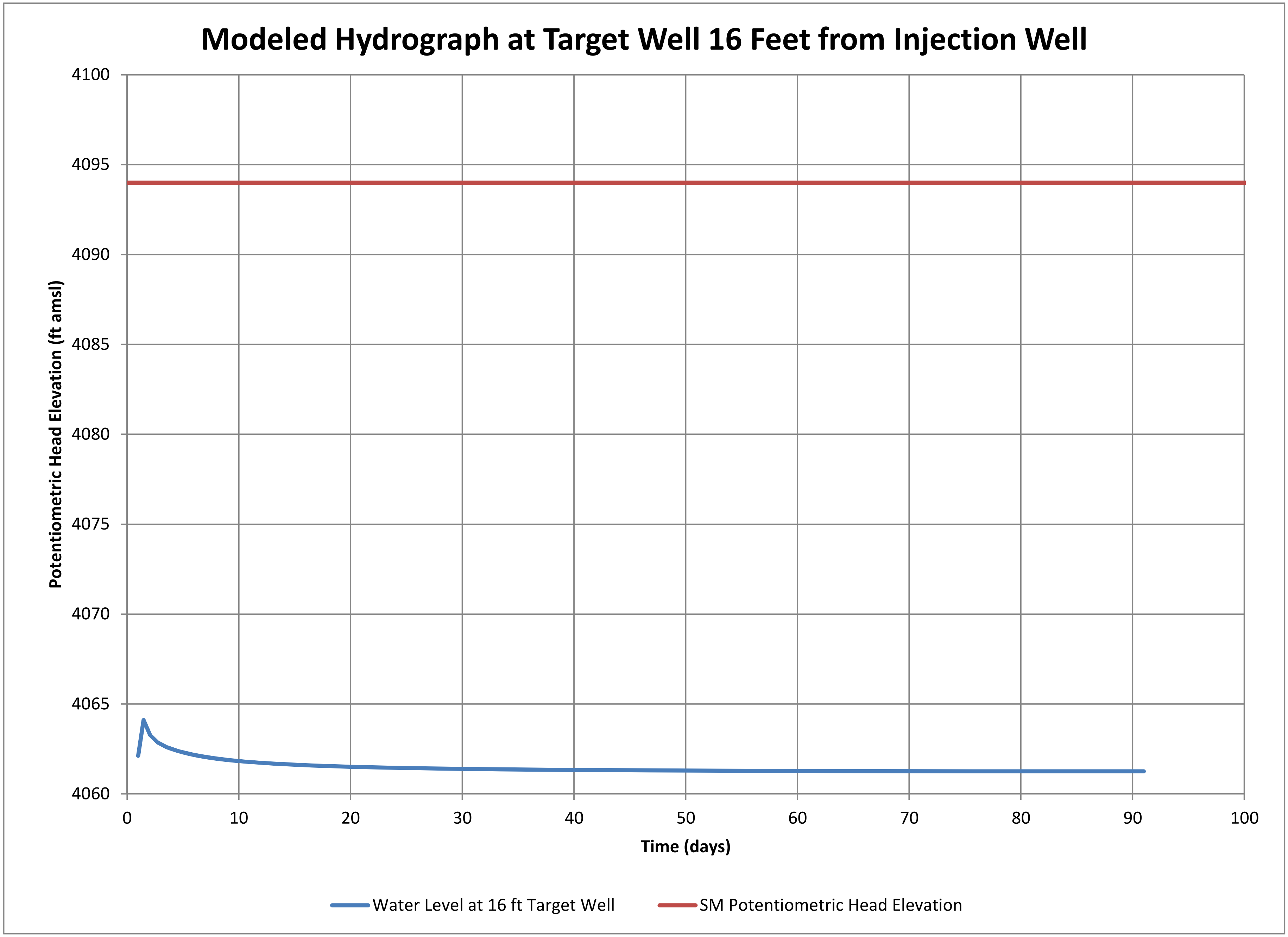
Hydrographs at Southeastern Wellfield Detailed Analysis Target Points


Modeled Hydrograph at Target Well 2 Feet from Injection Well
Potentiometric Head Elevation (ft amsl)
4100
4095
4090
4085
4080
4075
4070
4065
4060
0
10
20
30
40
50
60
70
80
90
100
Time (days)
Water Level at 2 ft Target Well
SM Potentiometric Head Elevation


Modeled Hydrograph at Target Well 4 Feet from Injection Well
Potentiometric Head Elevation (ft amsl)
4100
4095
4090
4085
4080
4075
4070
4065
4060
0
10
20
30
40
50
60
70
80
90
100
Time (days)
Water Level at 4 ft Target Well
SM Potentiometric Head Elevation

Modeled Hydrograph at Target Well 8 Feet from Injection Well




Modeled Hydrograph at Target Well 16 Feet from Injection Well
Potentiometric Head Elevation (ft amsl)
4100
4095
4090
4085
4080
4075
4070
4065
4060
0
10
20
30
40
50
60
70
80
90
100
Time (days)
Water Level at 16 ft Target Well
SM Potentiometric Head Elevation