APPENDIX I

Potentiometric Groundwater Surface Maps and Groundwater Velocity Calculations

Regional Aquifer

King County

Water and Land Resources Division
Department of Natural Resources and Parks
King Street Center
201 South Jackson Street, Suite 600
Seattle, WA 98104-3855
206.296.6519 Fax 206.296.0192

Memorandum

To: Tom Theno
King County Solid Waste Division

From: Sevin Bilir
King County Water & Land Resources Division

Re: **Potentiometric Groundwater Surface Mapping & Groundwater Velocity Calculations**
First Quarter 2012 Results
Cedar Hills Landfill, King County, Washington
Project No. 1033379 – Task 02.14.137.20

Date: May 2, 2012

King County Water & Land Resources Division (KCWLRD) submits this letter report on groundwater conditions during the first quarter of 2012 for the Cedar Hills Landfill (landfill), in accordance with the *Proposal for Potentiometric Groundwater Surface Maps & Groundwater Velocity Calculations* (KCWLRD, 2011). King County Solid Waste Division (KCSWD) personnel measured groundwater elevations at the landfill on January 3, 2012. These measurements were received by KCWLRD on April 10, 2012 and were used to:

1. Evaluate the potentiometric groundwater surface elevation for the regional aquifer;
2. Determine the groundwater flow direction and horizontal gradient for the regional aquifer; and
3. Calculate the groundwater velocity of the regional aquifer.

There have been no significant changes in the interpreted groundwater conditions since the report submitted for the first quarter of the 2011 monitoring event.

Groundwater Elevation Data

KCSWD attempted groundwater level measurements at 44 monitoring wells during the first quarter of 2012. These wells were completed in the regional aquifer as referred to in *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill* (Aspect, 2010).

Table 1 lists the well identifications, locations, well details, measured groundwater levels and calculated groundwater elevations for the regional aquifer. Well MW-77 was not accessible at the time of measurement. Wells with screened intervals within ten feet of the water table were used for potentiometric surface mapping purposes. A total of 26 wells with water levels within ten feet of the top of screen were selected.

Figure 1 shows well locations, groundwater elevations at the 26 selected wells, groundwater potentiometric surface contours, and interpreted groundwater flow direction in the regional aquifer for the January 3, 2012 measurement event.

Direction of Groundwater Flow

Figure 1 shows interpreted groundwater potentiometric surface contours and groundwater flow directions in the regional aquifer, based on the January 3, 2012 measurements. Groundwater elevations indicate that groundwater in the regional aquifer generally flowed north beneath the southern and central portions of the landfill with minor components of flow to the north-northwest and north-northeast. At the northern end of the landfill, groundwater generally flowed to the north-northeast and northeast.

Groundwater Parameters

Horizontal groundwater velocity was calculated using the following formula:

where: $$v = \frac{1}{n_{eff}} K \frac{\Delta H}{\Delta L}$$

v = Groundwater velocity [L/t]
n_{eff} = Effective porosity [dimensionless]
K = Hydraulic conductivity [L/t]
$\frac{\Delta H}{\Delta L}$ = Hydraulic gradient [L/L]

Horizontal groundwater velocity was calculated for the regional aquifer below the landfill. Horizontal groundwater velocity was calculated for the southern, central, and northern portions of the regional aquifer, based on spatial differences in aquifer parameters and hydraulic gradients. The hydraulic conductivity and effective porosity values were based on the range referred to in the *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill* (Aspect, 2010).

Table 2 presents a summary of the groundwater parameters used to calculate a groundwater velocity from the first quarter 2012 data. The hydraulic gradient was greatest under the southern portion of the landfill and smallest under the northern portion. On January 3, 2012, average horizontal groundwater velocity within the regional aquifer ranged from 0.01 feet per day (ft/d) under the southern portion of the landfill to 2.1 ft/d under the central portion of the landfill.

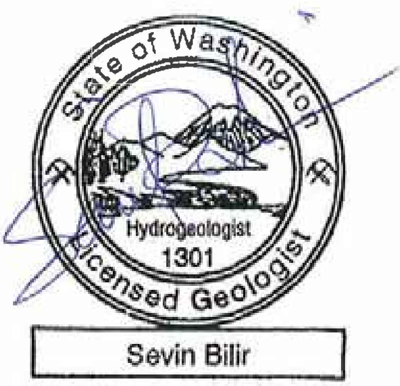
References

Aspect Consulting (Aspect). 2010. *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill.* Unpublished work. April 30.

King County Water & Land Resources Division (KCWLRD). 2012. *Proposal for Potentiometric Groundwater Surface Maps & Groundwater Velocity Calculations.* Unpublished.

Thank you for the opportunity to provide hydrogeologic services to the KCSWD. Please contact me if you have any questions.

Sincerely,



Sevin Bilir, WA LHG
Environmental Scientist III
King County Water & Land Resources Division

Attachments

Table 1: Groundwater Elevations - First Quarter 2012
Table 2: Groundwater Parameters - First Quarter 2012
Figure 1: Groundwater Potentiometric Surface Map - First Quarter 2012 – Regional Aquifer

Table 1: Groundwater Elevations – First Quarter 2012

Cedar Hills Landfill

King County, Washington

Regional Aquifer Unit	Well Identification	X (ft)	Y (ft)	Top of Casing Elevation (ft MSL)	Top of Screen Elevation (ft)	Bottom of Screen Elevation (ft)	January 3, 2012 Measured Depth to Water (ft)	January 3, 2012 Groundwater Elevations (ft MSL)
Wells with water levels within 10 feet of the top of screen	MW-60	1701154.47	167873.20	567.15	334.81	325.81	228.61	338.54
	MW-64	1701980.27	168772.19	596.55	334.03	320.23	266.43	330.12
	MW-66	1699750.19	174250.32	531.28	294.39	280.59	239.44	291.84
	MW-67	1701776.69	172610.65	516.43	297.80	284.00	222.24	294.19
	MW-68	1701917.32	170609.35	647.07	311.29	292.29	333.78	313.29
	MW-69	1698061.86	172400.20	653.69	293.57	279.97	358.17	295.52
	MW-70	1698412.97	168699.89	530.57	322.75	309.05	206.26	324.31
	MW-72	1698229.92	170987.71	671.87	303.63	294.03	363.41	308.46
	MW-73	1698954.95	174995.59	485.70	288.11	278.81	191.89	293.81
	MW-74R	1700386.85	173813.79	531.26	289.90	280.40	241.36	289.90
	MW-76	1700376.23	167193.13	491.71	351.06	341.56	138.26	353.45
	MW-78	1698881.94	169027.58	537.35	322.34	309.84	213.72	323.63
	MW-80	1701309.78	172964.99	530.41	279.17	269.67	240.69	289.72
	MW-81	1702568.87	172113.99	493.66	309.19	300.19	185.10	308.56
	MW-82	1699553.72	167725.31	474.85	348.88	339.38	125.07	349.78
	MW-83	1697939.89	167212.27	496.81	350.19	340.69	144.98	351.83
	MW-84	1698602.89	173894.54	530.80	292.46	282.96	237.23	293.57
	MW-85	1701828.95	173694.52	531.76	282.56	273.06	247.55	284.21
	MW-86	1701331.25	174917.90	536.04	283.43	274.63	249.96	286.08
	MW-87	1700670.27	173493.76	537.31	283.68	274.38	249.61	287.70
	MW-88	1701807.87	174303.06	513.68	281.52	272.22	228.17	285.51
	MW-93	1702259.35	169851.24	632.15	319.87	310.07	309.8	322.35
	MW-94	1698674.21	167210.22	495.51	357.22	348.52	143.20	352.31
	MW-95	1697265.32	169426.92	571.54	314.60	305.90	252.50	319.04
	MW-100	1700791.72	169610.46	620.32	319.06	309.06	299.05	321.27
	MW-106	1702536.99	173461.69	475.47	280.04	270.04	194.15	281.32
Wells with water levels greater than 10 feet above the top of screen	MW-21	1697901.86	173876.38	420.66	263.22	255.22	126.22	294.44
	MW-22P	1701844.34	173088.17	517.09	236.02	231.22	233.71	283.38
	MW-24	1699582.39	167767.76	475.99	286.76	281.76	146.45	329.54
	MW-43	1701274.23	174327.14	547.06	245.63	235.63	264.37	282.69
	MW-54	1702154.28	168435.53	580.43	250.25	228.25	279.23	301.17
	MW-56	1698980.77	167214.82	480.33	323.15	313.15	128.03	352.30
	MW-57	1699993.32	167201.99	456.64	326.65	311.65	104.10	352.54
	MW-58A	1699006.59	167207.16	479.27	270.05	260.05	150.18	329.09
	MW-59	1699983.91	167193.44	457.13	285.08	275.08	124.97	332.16
	MW-65	1701602.10	167146.55	545.83	317.71	308.91	210.22	335.61
	MW-75	1701059.70	173432.42	532.40	271.10	261.00	247.00	285.40
	MW-89	1701799.57	174319.44	512.82	229.20	219.90	233.01	278.18
	MW-90	1702203.13	174300.67	502.22	235.16	226.16	222.89	279.33
	MW-91	1701023.09	173423.94	532.02	260.81	240.71	248.30	283.72
	MW-99	1702556.06	172098.73	493.64	221.77	212.77	201.77	291.87
	NPW-1	1701906.96	171138.99	646.33	299.87	284.87	334.01	312.32
	NPW-3	1701922.88	170663.28	645.81	284.87	276.87	336.81	309.00
Not used	MW-77	1700007.63	168999.71	552.67	320.47	310.97	NM	NM

Notes
1. Water level measurements made by KCSWD personnel.
2. Reference datum for XY coordinates is the North American Datum of 1927 (NAD27)
3. Elevations reported in feet above Mean Sea Level based on the National Geodetic Vertical Datum, 1929.
4. NM, not measured due to no access

Table 2: Groundwater Parameters – First Quarter 2012

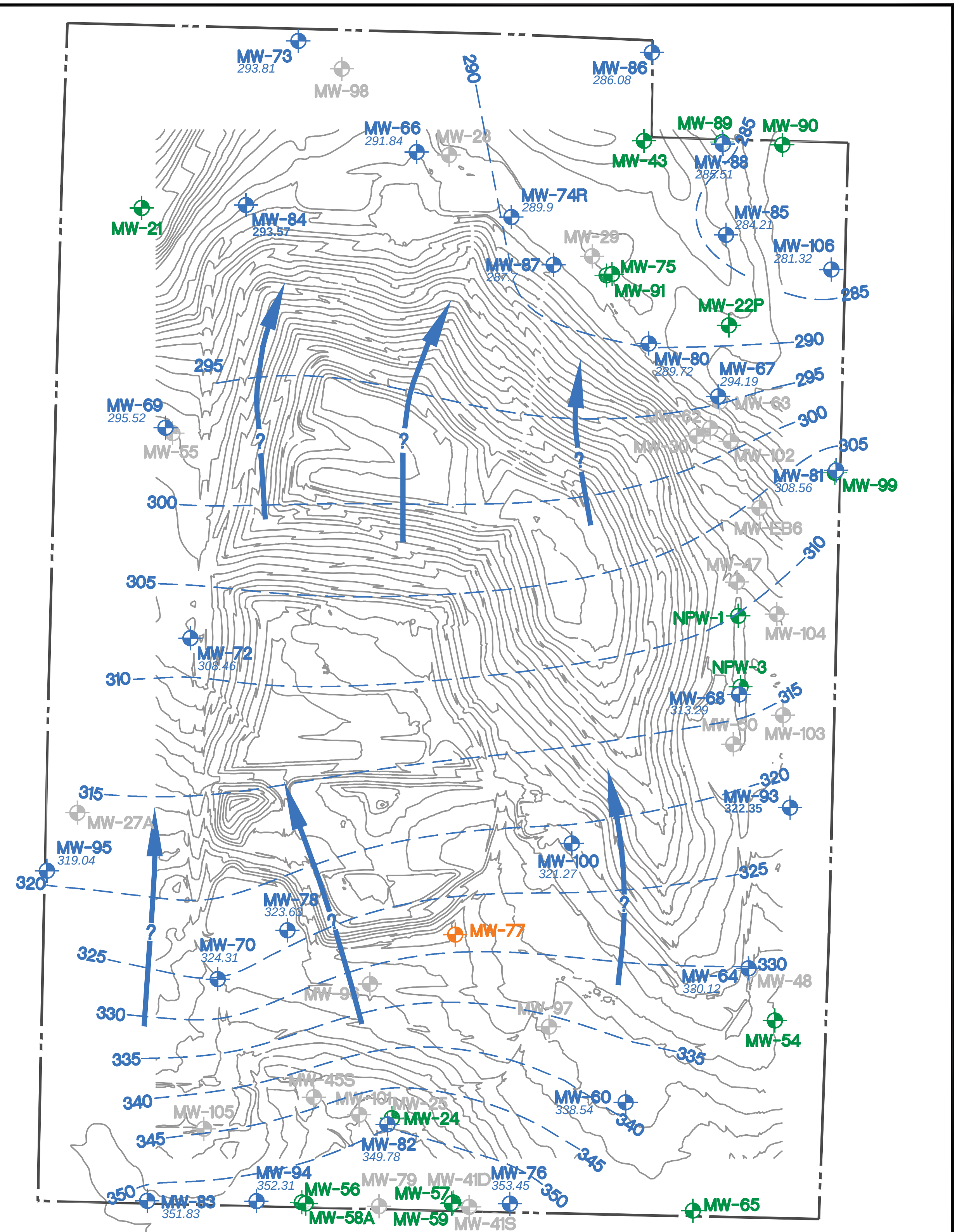
Cedar Hills Landfill

King County, Washington

Regional Aquifer Zone Beneath the Landfill	Horizontal Hydraulic Conductivity (K)			Horizontal Hydraulic Gradient	Effective Porosity (n_{eff})	Horizontal Groundwater Velocity (v)	General Groundwater Flow Direction
	Range	(cm/s)	(ft/d)	(ft/ft)		(ft/d)	
Northern	Minimum	2.10E-03	6	0.0069	24%	0.173	N, NNE, NE
	Maximum	4.20E-02	120	0.0069	24%	3	
	Mean	2.10E-02	60	0.0069	24%	1.7	
Central	Minimum	2.10E-03	6	0.0083	24%	0.21	NNW, N
	Maximum	4.20E-02	120	0.0083	24%	4.2	
	Mean	2.10E-02	60	0.0083	24%	2.1	
Southern	Minimum	6.40E-06	0.018	0.012	26%	0.001	NNE, NE
	Maximum	6.40E-04	1.8	0.012	26%	0.1	
	Mean	6.40E-05	0.18	0.012	26%	0.01	

Notes

1. Horizontal hydraulic conductivity values and effective porosity values from *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill (Aspect, 2010).*
2. Hydraulic gradients measured from the potentiometric surface map shown on Figure 1.
3. Mean hydraulic conductivity values are the geometric mean of the high and low values.
4. NNE, north-northeast; NNW, north-northwest; NE, northeast; N, north



Legend

MW-X XXX.XX	Well completed in Regional Aquifer within 10 feet of the water table
MW-X	Wells completed in Regional Aquifer more than 10 ft below water table
MW-X XXX.XX	Wells not accessible
MW-X	Wells screened in discontinuous Perched Zones

300 — — — Regional Aquifer Groundwater Elevation Contour *(feet MSL)*.

? Inferred Horizontal Groundwater Flow Path

N

0 1000 2000

Feet

Notes:

1. Groundwater January 3, 2012
2. Only wells completed in the Regional Aquifer within 10 feet of the water table were used for contouring

King County

Groundwater Potentiometric Surface Map

First Quarter 2012 - Regional Aquifer

Cedar Hills Landfill

King County, Washington

DATE: April 2012

DESIGNED BY: SB

DRAWN BY: LMT

REVISED BY: SB

PROJECT NO. 1033379

FIGURE NO. 1

CH_1Q2012.dwg

Water and Land Resources Division
Department of Natural Resources and Parks
King Street Center
201 South Jackson Street, Suite 600
Seattle, WA 98104-3855
206.296.6519 Fax 206.296.0192

Memorandum

To: Tom Theno
King County Solid Waste Division

From: Sevin Bilir
King County Water & Land Resources Division

Re: **Potentiometric Groundwater Surface Mapping & Groundwater Velocity Calculations**
Second Quarter 2012 Results
Cedar Hills Landfill, King County, Washington
Project No. 1033379 – Task 02.14.137.20

Date: July 31, 2012

King County Water & Land Resources Division (KCWLRD) submits this letter report on groundwater conditions during the second quarter of 2012 for the Cedar Hills Landfill (landfill), in accordance with the *Proposal for Potentiometric Groundwater Surface Maps & Groundwater Velocity Calculations* (KCWLRD, 2011). King County Solid Waste Division (KCSWD) personnel measured groundwater elevations at the landfill on April 2, 2012. These measurements were received by KCWLRD on June 18, 2012 and were used to:

1. Evaluate the potentiometric groundwater surface elevation for the regional aquifer;
2. Determine the groundwater flow direction and horizontal gradient for the regional aquifer; and
3. Calculate the groundwater velocity of the regional aquifer.

There have been no significant changes in the interpreted groundwater conditions since the report submitted for the first quarter of the 2011 monitoring event.

Groundwater Elevation Data

KCSWD attempted groundwater level measurements at 44 monitoring wells during the second quarter of 2012. These wells were completed in the regional aquifer as referred to in *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill* (Aspect, 2010).

Table 1 lists the well identifications, locations, well details, measured groundwater levels and calculated groundwater elevations for the regional aquifer. Well MW-68 was not measured due to a broken meter at the time of measurement. Wells with screened intervals within ten feet of the water table were used for potentiometric surface mapping purposes. A total of 26 wells with water levels within ten feet of the top of screen were selected.

Figure 1 shows well locations, groundwater elevations at the 26 selected wells, groundwater potentiometric surface contours, and interpreted groundwater flow direction in the regional aquifer for the April 4, 2012 measurement event.

Direction of Groundwater Flow

Figure 1 shows interpreted groundwater potentiometric surface contours and groundwater flow directions in the regional aquifer, based on the April 2, 2012 measurements. Groundwater elevations indicate that groundwater in the regional aquifer generally flowed north beneath the southern and central portions of the landfill with minor components of flow to the north-northwest and north-northeast. At the northern end of the landfill, groundwater generally flowed to the north-northeast and northeast.

Groundwater Parameters

Horizontal groundwater velocity was calculated using the following formula:

where: $$v = \frac{1}{n_{eff}} K \frac{\Delta H}{\Delta L}$$

v = Groundwater velocity [L/t]
n_{eff} = Effective porosity [dimensionless]
K = Hydraulic conductivity [L/t]
$\frac{\Delta H}{\Delta L}$ = Hydraulic gradient [L/L]

Horizontal groundwater velocity was calculated for the regional aquifer below the landfill. Horizontal groundwater velocity was calculated for the southern, central, and northern portions of the regional aquifer, based on spatial differences in aquifer parameters and hydraulic gradients. The hydraulic conductivity and effective porosity values were based on the range referred to in the *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill* (Aspect, 2010).

Table 2 presents a summary of the groundwater parameters used to calculate a groundwater velocity from the second quarter 2012 data. The hydraulic gradient was greatest under the southern portion of the landfill and smallest under the northern portion. On April 2, 2012, average horizontal groundwater velocity within the regional aquifer ranged from 0.011 feet per day (ft/d) under the southern portion of the landfill to 2 ft/d under the central portion of the landfill.

References

Aspect Consulting (Aspect). 2010. *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill*. Unpublished work. April 30.

King County Water & Land Resources Division (KCWLRD). 2012. *Proposal for Potentiometric Groundwater Surface Maps & Groundwater Velocity Calculations*. Unpublished.

Thank you for the opportunity to provide hydrogeologic services to the KCSWD. Please contact me if you have any questions.

Sincerely,

Sevin Bilir, WA LHG
Environmental Scientist III
King County Water & Land Resources Division

Attachments

Table 1:	Groundwater Elevations - Second Quarter 2012
Table 2:	Groundwater Parameters - Second Quarter 2012
Figure 1:	Groundwater Potentiometric Surface Map - Second Quarter 2012 – Regional Aquifer

Table 1: Groundwater Elevations – Second Quarter 2012

Cedar Hills Landfill

King County, Washington

Regional Aquifer Unit	Well Identification	X (ft)	Y (ft)	Top of Casing Elevation (ft MSL)	Top of Screen Elevation (ft)	Bottom of Screen Elevation (ft)	April 2, 2012 Measured Depth to Water (ft)	April 2, 2012 Groundwater Elevations (ft MSL)
Wells with water levels within 10 feet of the top of screen	MW-60	1701154.47	167873.20	567.15	334.81	325.81	224.17	342.98
	MW-64	1701980.27	168772.19	596.55	334.03	320.23	266.37	330.18
	MW-66	1699750.19	174250.32	531.28	294.39	280.59	239.17	292.11
	MW-67	1701776.69	172610.65	516.43	297.80	284.00	222.17	294.26
	MW-69	1698061.86	172400.20	653.69	293.57	279.97	358.37	295.32
	MW-70	1698412.97	168699.89	530.57	322.75	309.05	206.12	324.45
	MW-72	1698229.92	170987.71	671.87	303.63	294.03	363.48	308.39
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	MW-74R	1700386.85	173813.79	531.26	289.90	280.40	241.20	290.06
	MW-76	1700376.23	167193.13	491.71	351.06	341.56	131.74	359.97
	MW-77	1700007.63	168999.71	552.67	320.47	310.97	227.71	324.96
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	MW-82	1699553.72	167725.31	474.85	348.88	339.38	120.79	354.06
	MW-83	1697939.89	167212.27	496.81	350.19	340.69	143.43	353.38
	MW-84	1698602.89	173894.54	530.80	292.46	282.96	237.23	293.57
	MW-85	1701828.95	173694.52	531.76	282.56	273.06	246.63	285.13
	MW-86	1701331.25	174917.90	536.04	283.43	274.63	249.44	286.60
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	MW-88	1701807.87	174303.06	513.68	281.52	272.22	227.53	286.15
	MW-93	1702259.35	169851.24	632.15	319.87	310.07	309.68	322.47
	MW-94	1698674.21	167210.22	495.51	357.22	348.52	138.37	357.14
	MW-95	1697265.32	169426.92	571.54	314.60	305.90	252.58	318.96
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	MW-106	1702536.99	173461.69	475.47	280.04	270.04	191.23	284.24
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	MW-43	1701274.23	174327.14	547.06	245.63	235.63	263.54	283.52
	MW-54	1702154.28	168435.53	580.43	250.25	228.25	278.88	301.55
	MW-56	1698980.77	167214.82	480.33	323.15	313.15	123.46	356.87
	MW-57	1699993.32	167201.99	456.64	326.65	311.65	97.38	359.26
	MW-58A	1699006.59	167207.16	479.27	270.05	260.05	148.96	330.31
	MW-59	1699983.91	167193.44	457.13	285.08	275.08	123.04	334.09
	MW-65	1701602.10	167146.55	545.83	317.71	308.91	208.63	337.20
	MW-75	1701059.70	173432.42	532.40	271.10	261.00	246.30	286.10
	MW-89	1701799.57	174319.44	512.82	229.20	219.90	231.93	280.89
	MW-90	1702203.13	174300.67	502.22	235.16	226.16	221.15	281.07
	MW-91	1701023.09	173423.94	532.02	260.81	240.71	247.58	284.44
	MW-99	1702556.06	172098.73	493.64	221.77	212.77	201.37	292.27
	NPW-1	1701906.96	171138.99	646.33	299.87	284.87	334.31	312.02
	NPW-3	1701922.88	170663.28	645.81	284.87	276.87	332.63	313.18
Not used	MW-68	1701917.32	170609.35	647.07	311.29	292.29	NM	NM

Notes

1. Water level measurements made by KCSWD personnel.
2. Reference datum for XY coordinates is the North American Datum of 1927 (NAD27)
3. Elevations reported in feet above Mean Sea Level based on the National Geodetic Vertical Datum, 1929.
4. NM, not measured due to broken meter
5. NI, no information

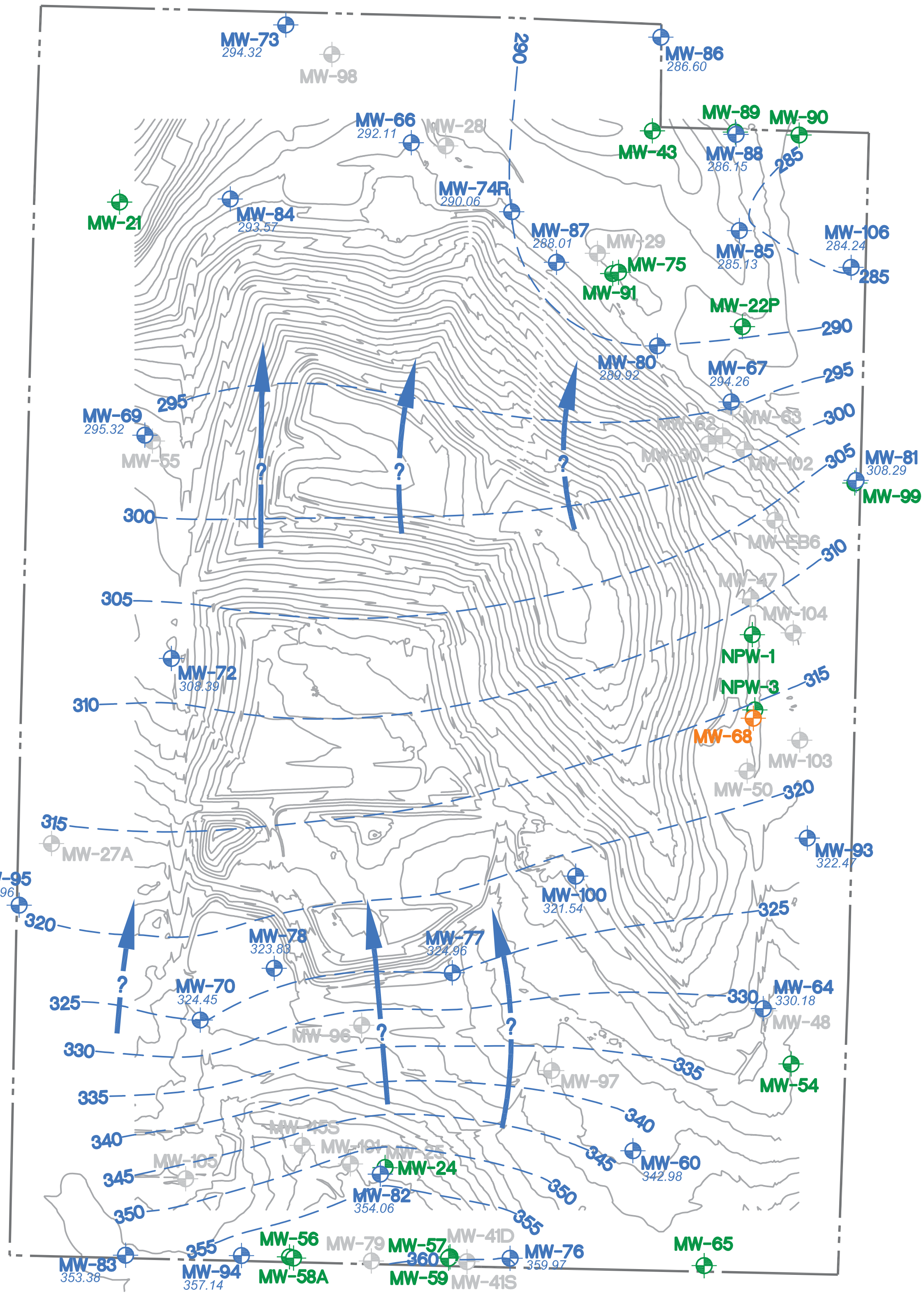
Table 2: Groundwater Parameters – Second Quarter 2012

Cedar Hills Landfill

King County, Washington

Regional Aquifer Zone Beneath the Landfill	Horizontal Hydraulic Conductivity (K)			Horizontal Hydraulic Gradient	Effective Porosity (n_{eff})	Horizontal Groundwater Velocity (v)	General Groundwater Flow Direction
	Range	(cm/s)	(ft/d)	(ft/ft)		(ft/d)	
Northern	Minimum	2.10E-03	6	0.0070	24%	0.175	N, NNE, NE
	Maximum	4.20E-02	120	0.0070	24%	3.5	
	Mean	2.10E-02	60	0.0070	24%	1.75	
Central	Minimum	2.10E-03	6	0.0080	24%	0.2	NNW, N
	Maximum	4.20E-02	120	0.0080	24%	4	
	Mean	2.10E-02	60	0.0080	24%	2	
Southern	Minimum	6.40E-06	0.018	0.016	26%	0.001	NNE, NE
	Maximum	6.40E-04	1.8	0.016	26%	0.111	
	Mean	6.40E-05	0.18	0.016	26%	0.011	

Notes
1. Horizontal hydraulic conductivity values and effective porosity values from
Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill (Aspect, 2010).
2. Hydraulic gradients measured from the potentiometric surface map shown on Figure 1.
3. Mean hydraulic conductivity values are the geometric mean of the high and low values.
4. NNE, north-northeast; NNW, north-northwest; NE, northeast; N, north



Legend

MW-X XXX.XX	Well completed in Regional Aquifer within 10 feet of the water table
MW-X	Wells completed in Regional Aquifer more than 10 ft below water table
MW-X XXX.XX	Wells not accessible
MW-X	Wells screened in discontinuous Perched Zones

300 — — — Regional Aquifer Groundwater Elevation Contour *(feet MSL)*.

? — Inferred Horizontal Groundwater Flow Path

N

0 1000 2000

Feet

Notes:

1. Groundwater April 2, 2012
2. Only wells completed in the Regional Aquifer within 10 feet of the water table were used for contouring.

King County

Groundwater Potentiometric Surface Map

Second Quarter 2012 - Regional Aquifer

Cedar Hills Landfill

King County, Washington

DATE: June 2012	PROJECT NO.	1033379
DESIGNED BY: SB		
DRAWN BY: LMT	FIGURE NO.	1
REVISED BY: SB		

CH_2Q2012.dwg

King County

Water and Land Resources Division
Department of Natural Resources and Parks
King Street Center
201 South Jackson Street, Suite 600
Seattle, WA 98104-3855
206.296.6519 Fax 206.296.0192

Memorandum

To: Tom Theno
King County Solid Waste Division

From: Sevin Bilir
King County Water & Land Resources Division

Re: **Potentiometric Groundwater Surface Mapping & Groundwater Velocity Calculations**
Third Quarter 2012 Results
Cedar Hills Landfill, King County, Washington
Project No. 1033379 – Task 02.14.137.20

Date: October 23, 2012

King County Water & Land Resources Division (KCWLRD) submits this letter report on groundwater conditions during the third quarter of 2012 for the Cedar Hills Landfill (landfill), in accordance with the *Proposal for Potentiometric Groundwater Surface Maps & Groundwater Velocity Calculations* (KCWLRD, 2011). King County Solid Waste Division (KCSWD) personnel measured groundwater elevations at the landfill on July 2, 2012. These measurements were received by KCWLRD on September 11, 2012 and were used to:

1. Evaluate the potentiometric groundwater surface elevation for the regional aquifer;
2. Determine the groundwater flow direction and horizontal gradient for the regional aquifer; and
3. Calculate the groundwater velocity of the regional aquifer.

There have been no significant changes in the interpreted groundwater conditions since the report submitted for the first quarter of the 2011 monitoring event.

Groundwater Elevation Data

KCSWD attempted groundwater level measurements at 44 monitoring wells during the third quarter of 2012. These wells were completed in the regional aquifer as referred to in *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill* (Aspect, 2010).

Table 1 lists the well identifications, locations, well details, measured groundwater levels and calculated groundwater elevations for the regional aquifer. Well MW-77 was not accessible at the time of measurement. Wells with screened intervals within ten feet of the water table were used for potentiometric surface mapping purposes. A total of 24 wells with water levels within ten feet of the top of screen were selected.

Figure 1 shows well locations, groundwater elevations at the 24 selected wells, groundwater potentiometric surface contours, and interpreted groundwater flow direction in the regional aquifer for the July 2, 2012 measurement event.

Direction of Groundwater Flow

Figure 1 shows interpreted groundwater potentiometric surface contours and groundwater flow directions in the regional aquifer, based on the July 2, 2012 measurements. Groundwater elevations indicate that groundwater in the regional aquifer generally flowed north beneath the southern and central portions of the landfill with minor components of flow to the north-northwest and north-northeast. At the northern end of the landfill, groundwater generally flowed to the north-northeast and northeast.

Groundwater Parameters

Horizontal groundwater velocity was calculated using the following formula:

where: $$v = \frac{1}{n_{eff}} K \frac{\Delta H}{\Delta L}$$

v = Groundwater velocity [L/t]

n_{eff} = Effective porosity [dimensionless]

K = Hydraulic conductivity [L/t]

$\frac{\Delta H}{\Delta L}$ = Hydraulic gradient [L/L]

Horizontal groundwater velocity was calculated for the regional aquifer below the landfill. Horizontal groundwater velocity was calculated for the southern, central, and northern portions of the regional aquifer, based on spatial differences in aquifer parameters and hydraulic gradients. The hydraulic conductivity and effective porosity values were based on the range referred to in the *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill* (Aspect, 2010).

Table 2 presents a summary of the groundwater parameters used to calculate a groundwater velocity from the third quarter 2012 data. The hydraulic gradient was greatest under the southern portion of the landfill and smallest under the northern portion. On July 2, 2012, average horizontal groundwater velocity within the regional aquifer ranged from 0.011 feet per day (ft/d) under the southern portion of the landfill to 1.47 ft/d under the central portion of the landfill.

References

Aspect Consulting (Aspect). 2010. *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill.* Unpublished work. April 30.

King County Water & Land Resources Division (KCWLRD). 2012. *Proposal for Potentiometric Groundwater Surface Maps & Groundwater Velocity Calculations.* Unpublished.

Thank you for the opportunity to provide hydrogeologic services to the KCSWD. Please contact me if you have any questions.

Sincerely,

State of Washington
Hydrogeologist
1301
Licensed Geologist
Sevin Bilir

Sevin Bilir, WA LHG
Environmental Scientist III
King County Water & Land Resources Division

Attachments

Table 1:	Groundwater Elevations - Third Quarter 2012
Table 2:	Groundwater Parameters - Third Quarter 2012
Figure 1:	Groundwater Potentiometric Surface Map - Third Quarter 2012 – Regional Aquifer

Cedar Hills Landfill
King County, Washington

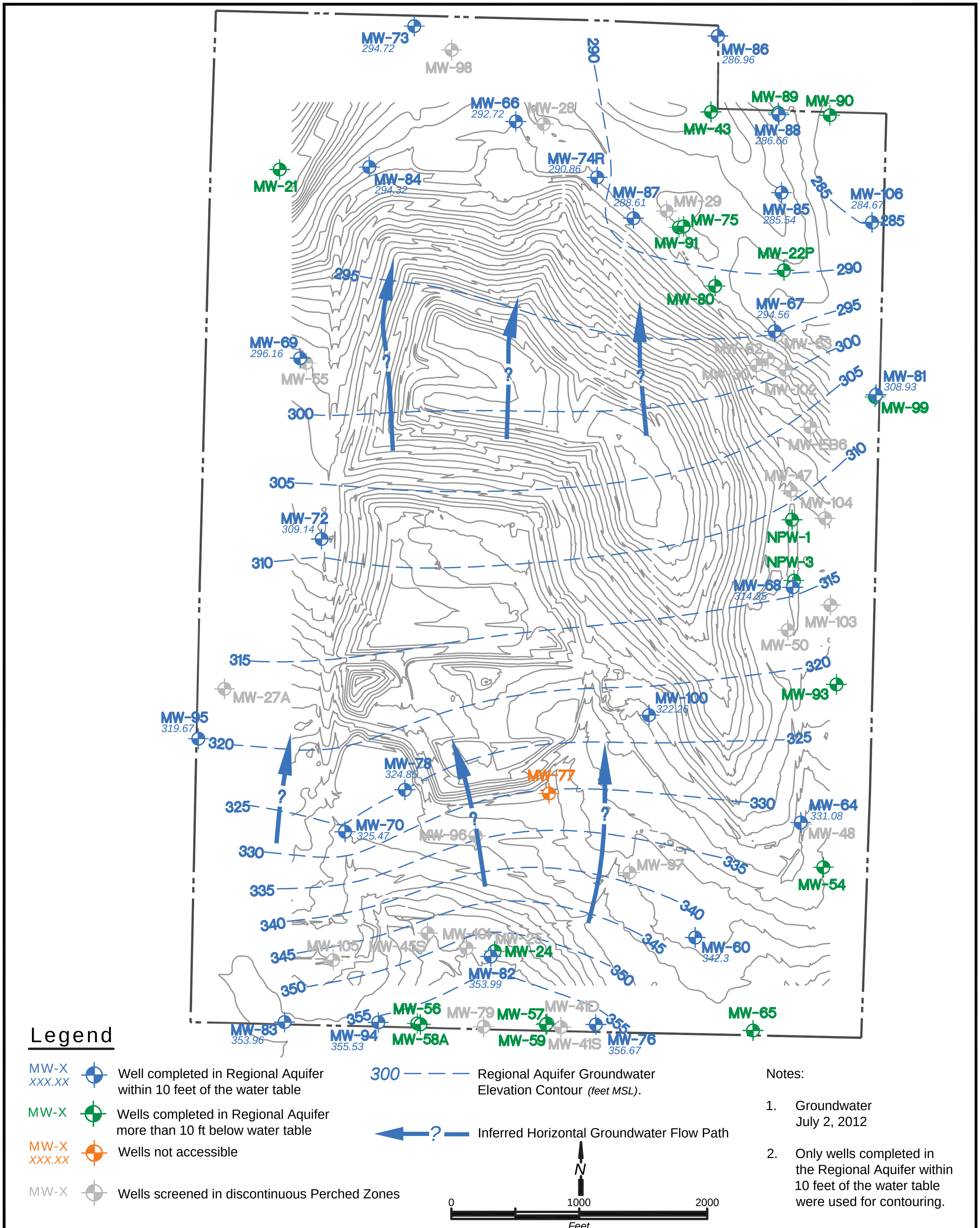
							July/2/2012	
Regional Aquifer Unit	Well Identification	X (ft)	Y (ft)	Top of Casing Elevation (ft MSL)	Top of Screen Elevation (ft)	Bottom of Screen Elevation (ft)	Measured Depth to Water (ft)	Groundwater Elevations (ft MSL)
Wells with water levels within 10 feet of the top of screen	MW-60	1701154.47	167873.20	567.15	334.81	325.81	224.85	342.30
	MW-64	1701980.27	168772.19	596.55	334.03	320.23	265.47	331.08
	MW-66	1699750.19	174250.32	531.28	294.39	280.59	238.56	292.72
	MW-67	1701776.69	172610.65	516.43	297.80	284.00	221.87	294.56
	MW-68	1701917.32	170609.35	647.07	311.29	292.29	332.72	314.35
	MW-69	1698061.86	172400.20	653.69	293.57	279.97	357.53	296.16
	MW-70	1698412.97	168699.89	530.57	322.75	309.05	205.10	325.47
	MW-72	1698229.92	170987.71	671.87	303.63	294.03	362.73	309.14
	MW-73	1698954.95	174995.59	485.70	288.11	278.81	190.98	294.72
	MW-74R	1700386.85	173813.79	531.26	289.90	280.40	240.40	290.86
	MW-76	1700376.23	167193.13	491.71	351.06	341.56	135.04	356.67
	MW-78	1698881.94	169027.58	537.35	322.34	309.84	212.50	324.85
	MW-81	1702568.87	172113.99	493.66	309.19	300.19	184.73	308.93
	MW-82	1699553.72	167725.31	474.85	348.88	339.38	120.86	353.99
	MW-83	1697939.89	167212.27	496.81	350.19	340.69	142.85	353.96
	MW-84	1698602.89	173894.54	530.80	292.46	282.96	236.48	294.32
	MW-85	1701828.95	173694.52	531.76	282.56	273.06	246.22	285.54
	MW-86	1701331.25	174917.90	536.04	283.43	274.63	249.08	286.96
	MW-87	1700670.27	173493.76	537.31	283.68	274.38	248.70	288.61
	MW-88	1701807.87	174303.06	513.68	281.52	272.22	227.02	286.66
	MW-94	1698674.21	167210.22	495.51	357.22	348.52	139.98	355.53
	MW-95	1697265.32	169426.92	571.54	314.60	305.90	251.87	319.67
	MW-100	1700791.72	169610.46	620.32	319.06	309.06	298.06	322.26
	MW-106	1702536.99	173461.69	475.47	280.04	270.04	190.80	284.67
Wells with water levels greater than 10 feet above the top of screen	MW-21	1697901.86	173876.38	420.66	263.22	255.22	125.55	295.11
	MW-22P	1701844.34	173088.17	517.09	236.02	231.22	232.71	284.38
	MW-24	1699582.39	167767.76	475.99	286.76	281.76	144.64	331.35
	MW-43	1701274.23	174327.14	547.06	245.63	235.63	263.35	283.71
	MW-54	1702154.28	168435.53	580.43	250.25	228.25	278.08	302.35
	MW-56	1698980.77	167214.82	480.33	323.15	313.15	124.70	355.63
	MW-57	1699993.32	167201.99	456.64	326.65	311.65	100.37	356.27
	MW-58A	1699006.59	167207.16	479.27	270.05	260.05	148.52	330.75
	MW-59	1699983.91	167193.44	457.13	285.08	275.08	123.03	334.10
	MW-65	1701602.10	167146.55	545.83	317.71	308.91	208.47	337.36
	MW-75	1701059.70	173432.42	532.40	271.10	261.00	245.94	286.46
	MW-80	1701309.78	172964.99	530.41	279.17	269.67	239.80	290.61
	MW-89	1701799.57	174319.44	512.82	229.20	219.90	231.99	280.83
	MW-90	1702203.13	174300.67	502.22	235.16	226.16	221.60	280.62
	MW-91	1701023.09	173423.94	532.02	260.81	240.71	247.19	284.83
	MW-93	1702259.35	169851.24	632.15	319.87	310.07	300.06	332.09
	MW-99	1702556.06	172098.73	493.64	221.77	212.77	200.90	292.74
	NPW-1	1701906.96	171138.99	646.33	299.87	284.87	333.83	312.50
	NPW-3	1701922.88	170663.28	645.81	284.87	276.87	331.90	313.91
Not used	MW-77	1700007.63	168999.71	552.67	320.47	310.97	NA	NA

Notes
1. Water level measurements made by KCSWD personnel.
2. Reference datum for XY coordinates is the North American Datum of 1927 (NAD27)
3. Elevations reported in feet above Mean Sea Level based on the National Geodetic Vertical Datum, 1929.
4. NM, not measured due to broken meter
5. NI, no information

King County, Washington

	Horizontal Hydraulic Conductivity (K)			Horizontal Hydraulic Gradient	Effective Porosity (n_{eff})	Horizontal Groundwater Velocity (v)	General Groundwater Flow Direction
Regional Aquifer Zone Beneath the Landfill	Range	(cm/s)	(ft/d)	(ft/ft)		(ft/d)	
Northern	Minimum	2.10E-03	6	0.006	24%	0.147	N, NNE, NE
	Maximum	4.20E-02	120	0.006	24%	2.94	
	Mean	2.10E-02	60	0.006	24%	1.47	
Central	Minimum	2.10E-03	6	0.008	24%	0.20	NNW, N
	Maximum	4.20E-02	120	0.008	24%	4.1	
	Mean	2.10E-02	60	0.008	24%	2.0	
Southern	Minimum	6.40E-06	0.018	0.015	26%	0.0011	NNE, NE
	Maximum	6.40E-04	1.8	0.015	26%	0.11	
	Mean	6.40E-05	0.18	0.015	26%	0.011	

Notes
1. Horizontal hydraulic conductivity values and effective porosity values from
Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill (Aspect, 2010).
2. Hydraulic gradients measured from the potentiometric surface map shown on Figure 1.
3. Mean hydraulic conductivity values are the geometric mean of the high and low values.
4. NNE, north-northeast; NNW, north-northwest; NE, northeast; N, north



King County

Groundwater Potentiometric Surface Map

Third Quarter 2012 - Regional Aquifer

Cedar Hills Landfill

King County, Washington

DATE: September 2012	PROJECT NO. 1033379
DESIGNED BY: SB	
DRAWN BY: LMT	FIGURE NO. 1
REVISED BY: SB	

CH_3Q2012.dwg

King County

Water and Land Resources Division
Department of Natural Resources and Parks
King Street Center
201 South Jackson Street, Suite 600
Seattle, WA 98104-3855
206.296.6519 Fax 206.296.0192

Memorandum

To: Tom Theno
King County Solid Waste Division

From: Sevin Bilir
King County Water & Land Resources Division

Re: **Potentiometric Groundwater Surface Mapping & Groundwater Velocity Calculations**
Fourth Quarter 2012 Results
Cedar Hills Landfill, King County, Washington
Project No. 1033379 – Task 02.14.137.20

Date: January 17, 2013

King County Water & Land Resources Division (KCWLRD) submits this letter report on groundwater conditions during the fourth quarter of 2012 for the Cedar Hills Landfill (landfill), in accordance with the *Proposal for Potentiometric Groundwater Surface Maps & Groundwater Velocity Calculations* (KCWLRD, 2011). King County Solid Waste Division (KCSWD) personnel measured groundwater elevations at the landfill on October 1, 2012. These measurements were received by KCWLRD on December 11, 2012 and were used to:

1. Evaluate the potentiometric groundwater surface elevation for the regional aquifer;
2. Determine the groundwater flow direction and horizontal gradient for the regional aquifer; and
3. Calculate the groundwater velocity of the regional aquifer.

With the exception of the minor local effects of the pumping at NPW-1, there have been no significant changes in the interpreted groundwater conditions since the report submitted for the first quarter of the 2011 monitoring event.

Groundwater Elevation Data

KCSWD attempted groundwater level measurements at 44 monitoring wells during the fourth quarter of 2012. These wells were completed in the regional aquifer as referred to in *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill* (Aspect, 2010).

Table 1 lists the well identifications, locations, well details, measured groundwater levels and calculated groundwater elevations for the regional aquifer. Wells with screened intervals within ten feet of the water table were used for potentiometric surface mapping purposes. A total of 27 wells with water levels within ten feet of the top of screen were selected.

Figure 1 shows well locations, groundwater elevations at the 27 selected wells, groundwater potentiometric surface contours, and interpreted groundwater flow direction in the regional aquifer for the October 1, 2012 measurement event.

Direction of Groundwater Flow

Figure 1 shows interpreted groundwater potentiometric surface contours and groundwater flow directions in the regional aquifer, based on the October 1, 2012 measurements. Groundwater elevations indicate that groundwater in the regional aquifer generally flowed north beneath the southern and central portions of the landfill with minor components of flow to the north-northwest and north-northeast. At the northern end of the landfill, groundwater generally flowed to the north-northeast and northeast.

NPW-1 is one of the production wells supplying the on-site non-potable reservoir and showed lower than normal water levels. This occurs occasionally when water level measurements occur close to a pumping cycle at MPW-1. As a result of this, NPW-1 was included in the contour mapping and shows a minor change in the local flow direction to the west in the area between the well and MW-81.

Groundwater Parameters

Horizontal groundwater velocity was calculated using the following formula:

where: $$v = \frac{1}{n_{eff}} K \frac{\Delta H}{\Delta L}$$

v = Groundwater velocity [L/t]
n_{eff} = Effective porosity [dimensionless]
K = Hydraulic conductivity [L/t]
$\frac{\Delta H}{\Delta L}$ = Hydraulic gradient [L/L]

Horizontal groundwater velocity was calculated for the regional aquifer below the landfill. Horizontal groundwater velocity was calculated for the southern, central, and northern portions of the regional aquifer, based on spatial differences in aquifer parameters and hydraulic gradients. The hydraulic conductivity and effective porosity values were based on the range referred to in the *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill* (Aspect, 2010).

Table 2 presents a summary of the groundwater parameters used to calculate a groundwater velocity from the fourth quarter 2012 data. The hydraulic gradient was greatest under the southern portion of the landfill and smallest under the northern portion. On October 1, 2012, average horizontal groundwater velocity within the regional aquifer ranged from 0.012 feet per day (ft/d) under the southern portion of the landfill to 2.2 ft/d under the central portion of the landfill.

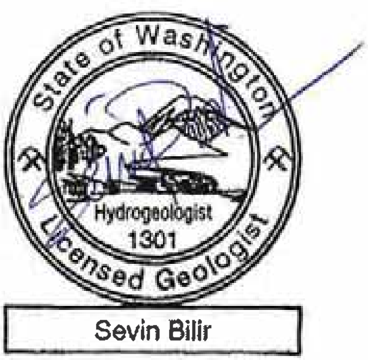
References

Aspect Consulting (Aspect). 2010. *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill.* Unpublished work. April 30.

King County Water & Land Resources Division (KCWLRD). 2012. *Proposal for Potentiometric Groundwater Surface Maps & Groundwater Velocity Calculations.* Unpublished.

Thank you for the opportunity to provide hydrogeologic services to the KCSWD. Please contact me if you have any questions.

Sincerely,



Sevin Bilir, WA LHG
Environmental Scientist III
King County Water & Land Resources Division

<u>Attachments</u>

Table 1: Groundwater Elevations - Fourth Quarter 2012
Table 2: Groundwater Parameters - Fourth Quarter 2012
Figure 1: Groundwater Potentiometric Surface Map - Fourth Quarter 2012 – Regional Aquifer

Table 1: Groundwater Elevations – Fourth Quarter 2012

Cedar Hills Landfill

King County, Washington

Regional Aquifer Unit	Well Identification	X (ft)	Y (ft)	Top of Casing Elevation (ft MSL)	Top of Screen Elevation (ft)	Bottom of Screen Elevation (ft)	October 1, 2012 Measured Depth to Water (ft)	October 1, 2012 Groundwater Elevations (ft MSL)
Wells with water levels within 10 feet of the top of screen	MW-60	1701154.47	167873.20	567.15	334.81	325.81	227.33	339.82
	MW-64	1701980.27	168772.19	596.55	334.03	320.23	265.88	330.67
	MW-66	1699750.19	174250.32	531.28	294.39	280.59	239.10	292.18
	MW-67	1701776.69	172610.65	516.43	297.80	284.00	221.71	294.72
	MW-68	1701917.32	170609.35	647.07	311.29	292.29	333.22	313.85
	MW-69	1698061.86	172400.20	653.69	293.57	279.97	357.55	296.14
	MW-70	1698412.97	168699.89	530.57	322.75	309.05	205.53	325.04
	MW-72	1698229.92	170987.71	671.87	303.63	294.03	362.63	309.24
	MW-73	1698954.95	174995.59	485.70	288.11	278.81	191.64	294.06
	MW-74R	1700386.85	173813.79	531.26	289.90	280.40	240.75	290.51
	MW-76	1700376.23	167193.13	491.71	351.06	341.56	139.60	352.11
	MW-77	1700007.63	168999.71	552.67	320.47	310.97	228.25	324.42
	MW-78	1698881.94	169027.58	537.35	322.34	309.84	213.01	324.34
	MW-81	1702568.87	172113.99	493.66	309.19	300.19	185.18	308.48
	MW-82	1699553.72	167725.31	474.85	348.88	339.38	123.76	351.09
	MW-83	1697939.89	167212.27	496.81	350.19	340.69	144.19	352.62
	MW-84	1698602.89	173894.54	530.80	292.46	282.96	236.76	294.04
	MW-85	1701828.95	173694.52	531.76	282.56	273.06	246.98	284.78
	MW-86	1701331.25	174917.90	536.04	283.43	274.63	249.72	286.32
	MW-87	1700670.27	173493.76	537.31	283.68	274.38	249.09	288.22
	MW-88	1701807.87	174303.06	513.68	281.52	272.22	227.64	286.04
	MW-93	1702259.35	169851.24	632.15	319.87	310.07	309.24	322.91
	MW-94	1698674.21	167210.22	495.51	357.22	348.52	142.42	353.09
	MW-95	1697265.32	169426.92	571.54	314.60	305.90	251.80	319.74
	MW-100	1700791.72	169610.46	620.32	319.06	309.06	298.50	321.82
	MW-106	1702536.99	173461.69	475.47	280.04	270.04	191.58	283.89
	NPW-1	1701906.96	171138.99	646.33	299.87	284.87	346.25	300.08
Wells with water levels greater than 10 feet above the top of screen	MW-21	1697901.86	173876.38	420.66	263.22	255.22	125.75	294.91
	MW-22P	1701844.34	173088.17	517.09	236.02	231.22	233.48	283.61
	MW-24	1699582.39	167767.76	475.99	286.76	281.76	145.95	330.04
	MW-43	1701274.23	174327.14	547.06	245.63	235.63	264.10	282.96
	MW-54	1702154.28	168435.53	580.43	250.25	228.25	279.29	301.14
	MW-56	1698980.77	167214.82	480.33	323.15	313.15	127.47	352.86
	MW-57	1699993.32	167201.99	456.64	326.65	311.65	104.29	352.35
	MW-58A	1699006.59	167207.16	479.27	270.05	260.05	149.87	329.40
	MW-59	1699983.91	167193.44	457.13	285.08	275.08	124.71	332.42
	MW-65	1701602.10	167146.55	545.83	317.71	308.91	210.00	335.83
	MW-75	1701059.70	173432.42	532.40	271.10	261.00	246.53	285.87
	MW-80	1701309.78	172964.99	530.41	279.17	269.67	240.14	290.27
	MW-89	1701799.57	174319.44	512.82	229.20	219.90	232.85	279.97
	MW-90	1702203.13	174300.67	502.22	235.16	226.16	222.60	279.62
	MW-91	1701023.09	173423.94	532.02	260.81	240.71	249.42	282.60
	MW-99	1702556.06	172098.73	493.64	221.77	212.77	201.61	292.03
	NPW-3	1701922.88	170663.28	645.81	284.87	276.87	332.41	313.40

Notes

1. Water level measurements made by KCSWD personnel.
2. Reference datum for XY coordinates is the North American Datum of 1927 (NAD27)
3. Elevations reported in feet above Mean Sea Level based on the National Geodetic Vertical Datum, 1929.

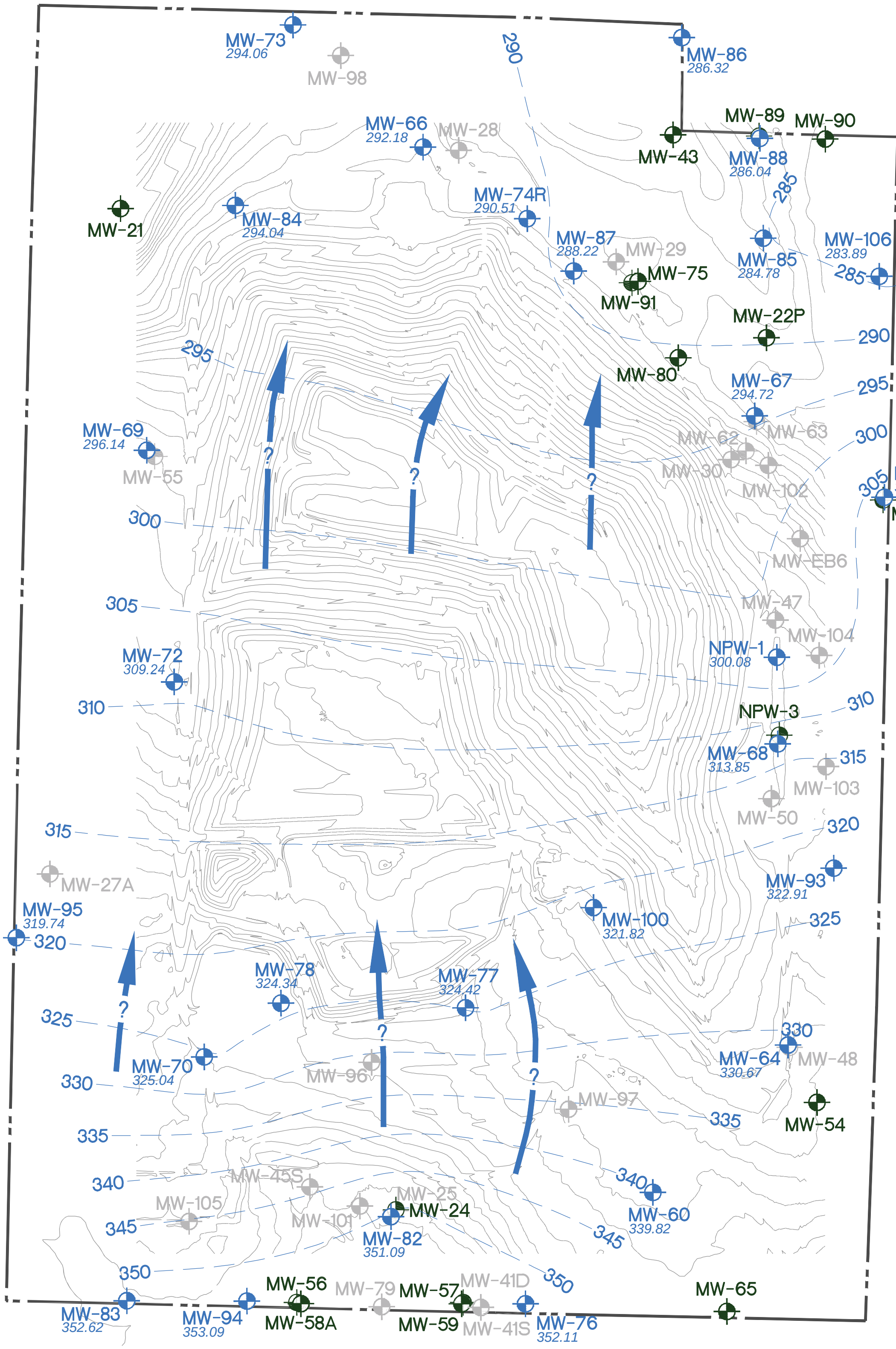
Table 2: Groundwater Parameters – Fourth Quarter 2012

Cedar Hills Landfill

King County, Washington

Regional Aquifer Zone Beneath the Landfill	Range	Horizontal Hydraulic Conductivity (*K*) (cm/s)	Horizontal Hydraulic Conductivity (*K*) (ft/d)	Horizontal Hydraulic Gradient (ft/ft)	Effective Porosity (n_{eff})	Horizontal Groundwater Velocity (*v*) (ft/d)	General Groundwater Flow Direction
Northern	Minimum	2.10E-03	6	0.005	24%	0.135	N, NNE, NE
	Maximum	4.20E-02	120	0.005	24%	2.69	
	Mean	2.10E-02	60	0.005	24%	1.35	
Central	Minimum	2.10E-03	6	0.009	24%	0.22	NNW, N
	Maximum	4.20E-02	120	0.009	24%	4.4	
	Mean	2.10E-02	60	0.009	24%	2.2	
Southern	Minimum	6.40E-06	0.018	0.018	26%	0.0012	NNE, NE
	Maximum	6.40E-04	1.8	0.018	26%	0.12	
	Mean	6.40E-05	0.18	0.018	26%	0.012	

Notes
1. Horizontal hydraulic conductivity values and effective porosity values from *Potentiometric Groundwater Surface Mapping and Groundwater Velocity Calculation – Cedar Hills Landfill (Aspect, 2010).*
2. Hydraulic gradients measured from the potentiometric surface map shown on Figure 1.
3. Mean hydraulic conductivity values are the geometric mean of the high and low values.
4. NNE, north-northeast; NNW, north-northwest; NE, northeast; N, north



Legend

MW-X
XXX.XX
Well completed in Regional Aquifer within 10 feet of the water table

MW-X
Wells completed in Regional Aquifer more than 10 ft below water table

MW-X
Wells screened in discontinuous Perched Zones

300 Regional Aquifer Groundwater Elevation Contour *(feet MSL)*.

? Inferred Horizontal Groundwater Flow Path

N

0 1000 2000
Feet

Notes:

1. Groundwater measurements made on October 1, 2012.
2. Only wells completed in the Regional Aquifer within 10 feet of the water table were used for contouring.

King County

Groundwater Potentiometric Surface Map
Fourth Quarter 2012 - Regional Aquifer
Cedar Hills Landfill
King County, Washington

DATE: December 2012	PROJECT NO. 1033379
DESIGNED BY: SB	
DRAWN BY: KK	FIGURE NO. 1
REVISED BY: SB	

CH_4Q2012.dwg

APPENDIX II

Time-Concentration Plots
Monitoring Well Hydrographs

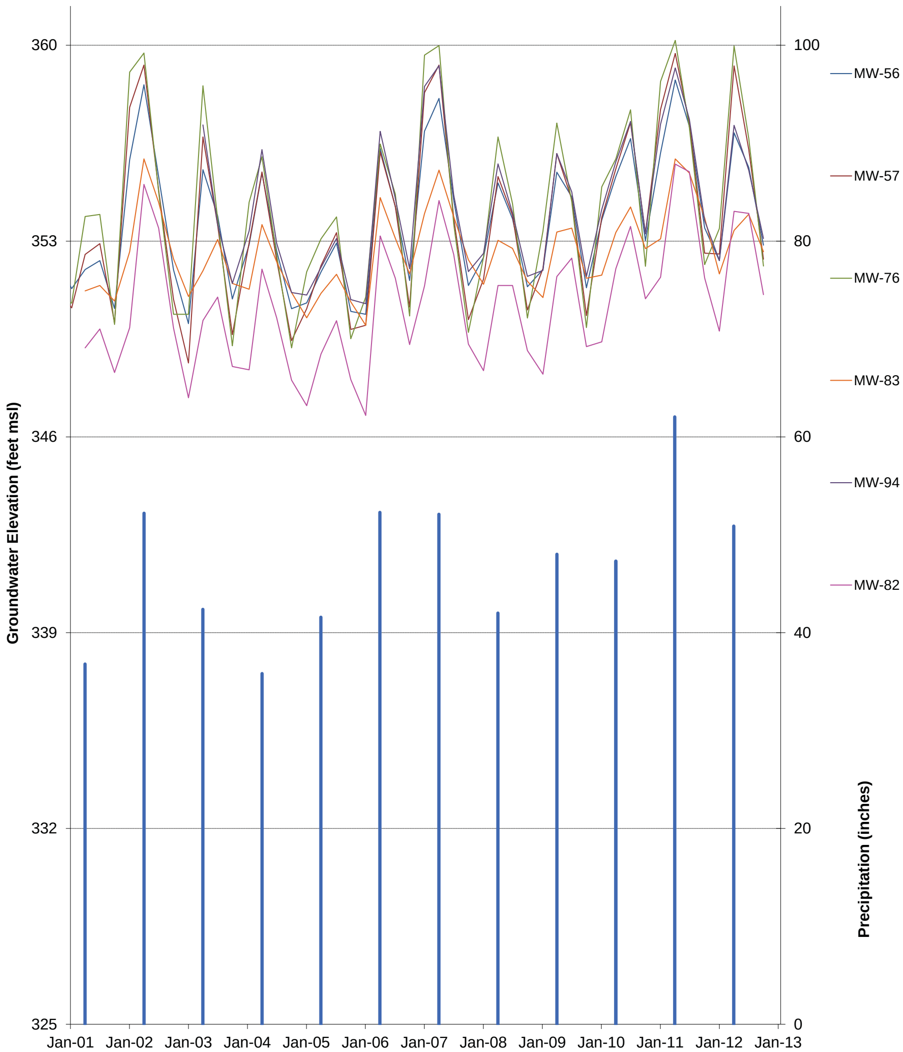
Regional Aquifer

North and West Perched Wells

East Main Hill Perched Zone

South Solid Waste Area Perched Wells

Regional Aquifer



Groundwater Elevation (feet msl)
360
353
346
339
332
325
Precipitation (inches)
100
80
60
40
20
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
MW-56
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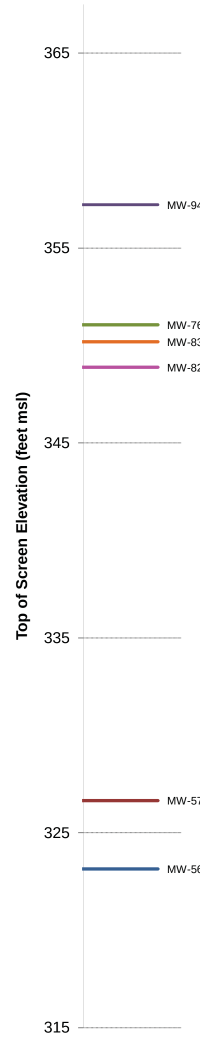
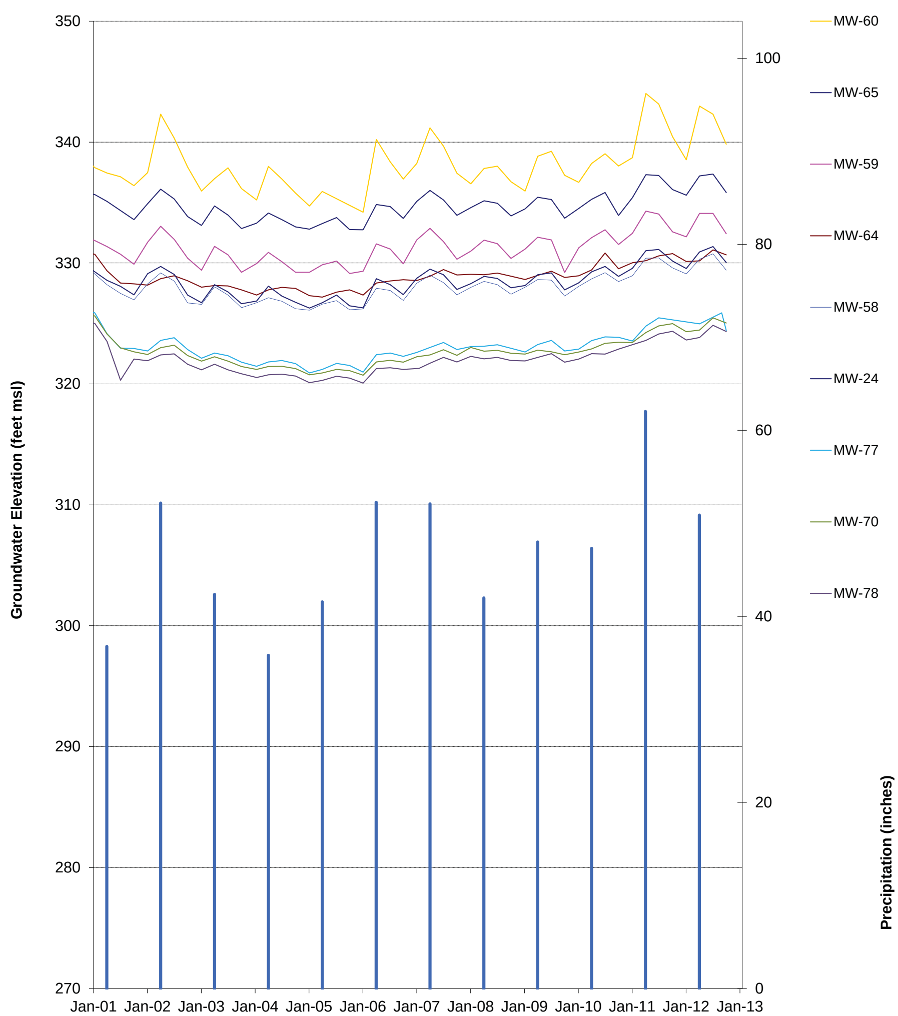
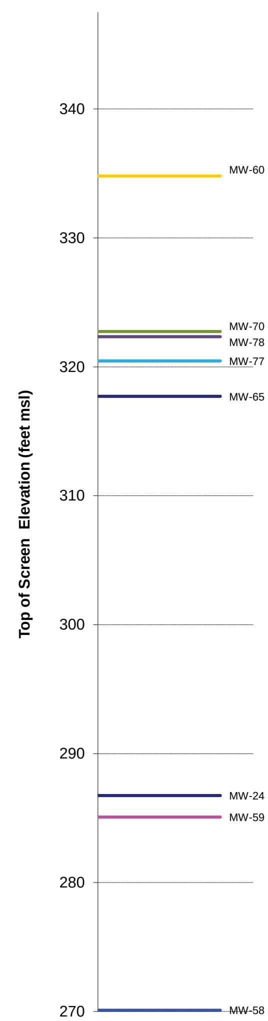
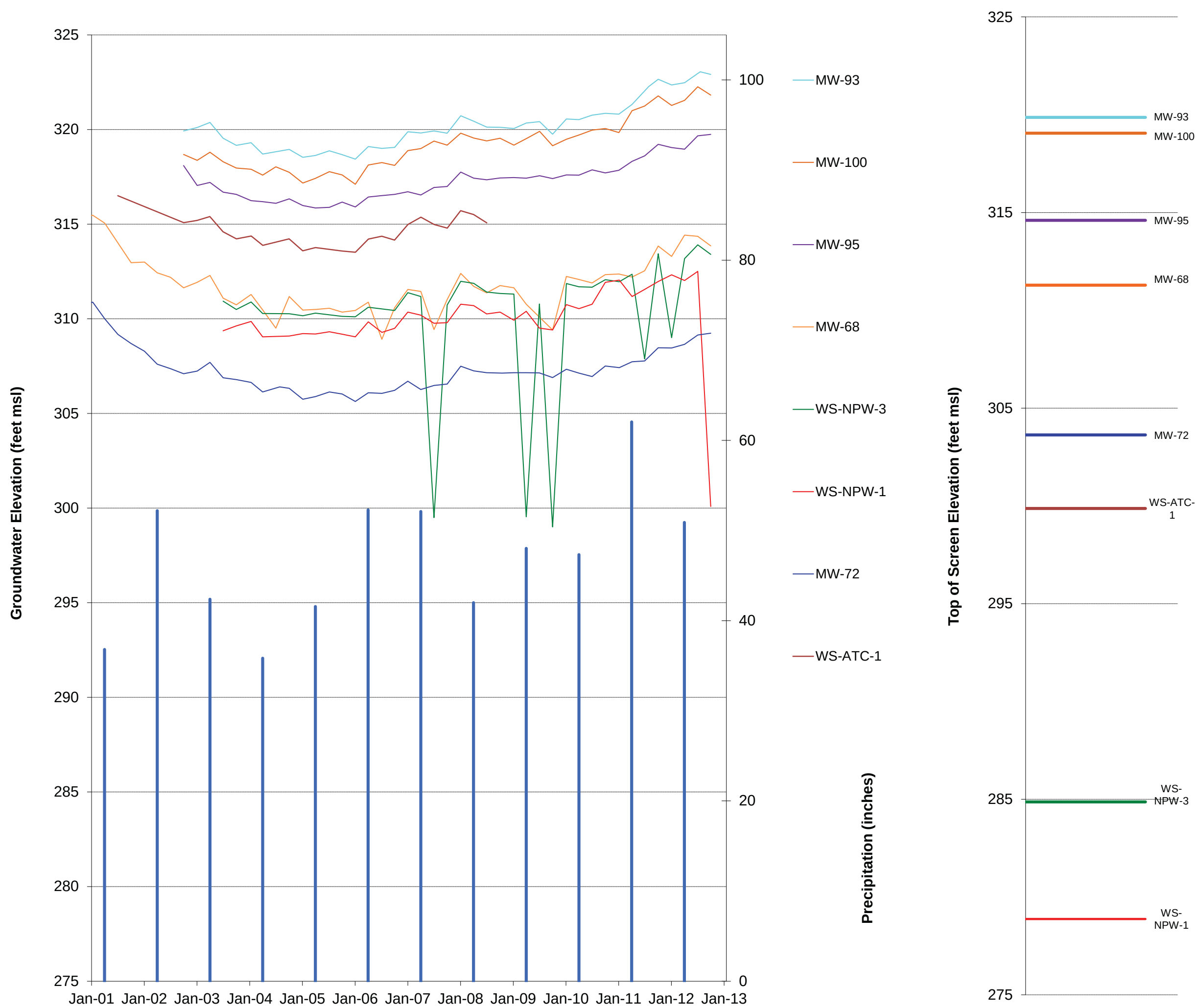
MW-83
MW-94
MW-82

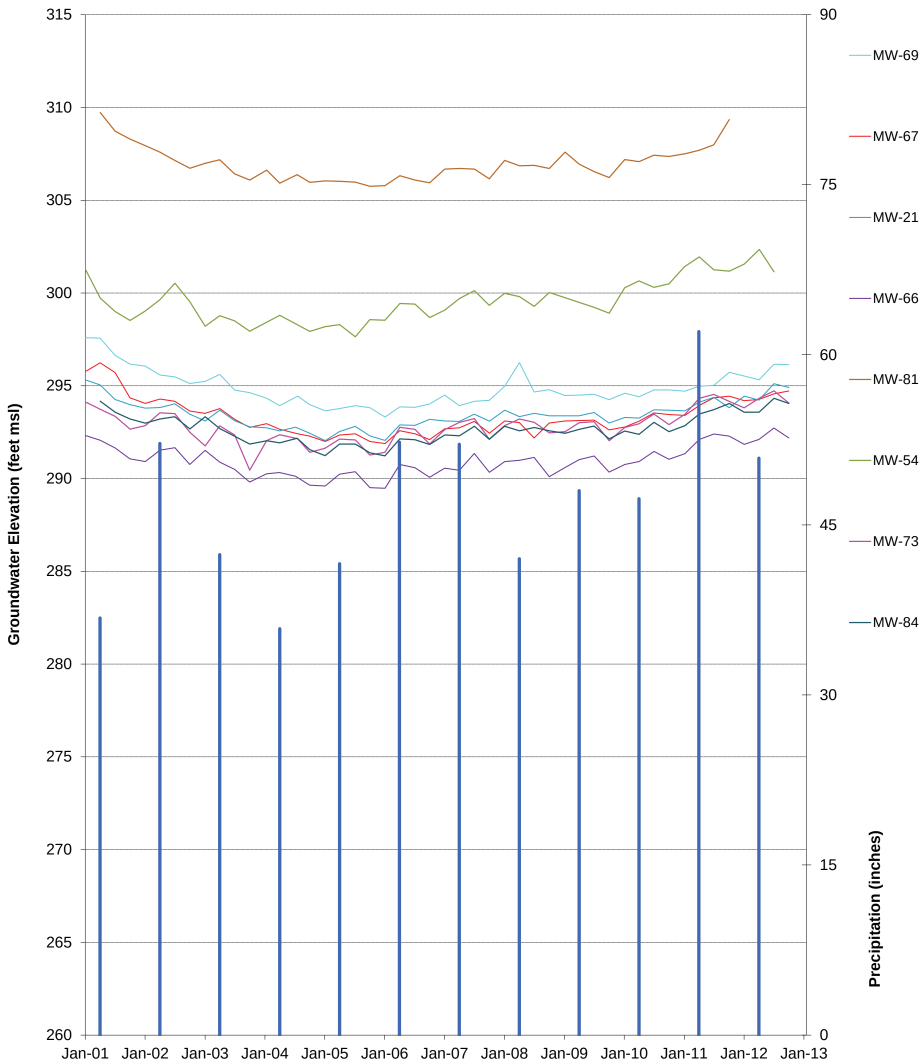


Top of Screen Elevation (feet msl)
365
355
345
335
325
315
MW-94
MW-76
MW-83
MW-82
MW-57
MW-56

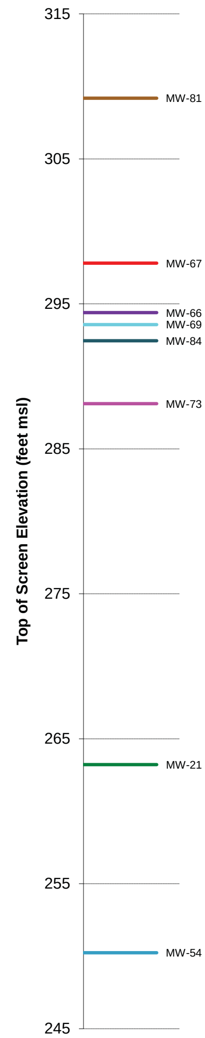

Groundwater Elevation (feet msl)
350
340
330
320
310
300
290
280
270
100
80
60
40
20
0
Precipitation (inches)
Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13
MW-60
MW-65
MW-59
MW-64
MW-58
MW-24
MW-77
MW-70
MW-78


Top of Screen Elevation (feet msl)
340
330
320
310
300
290
280
270
MW-60
MW-70
MW-78
MW-77
MW-65
MW-24
MW-59
MW-58

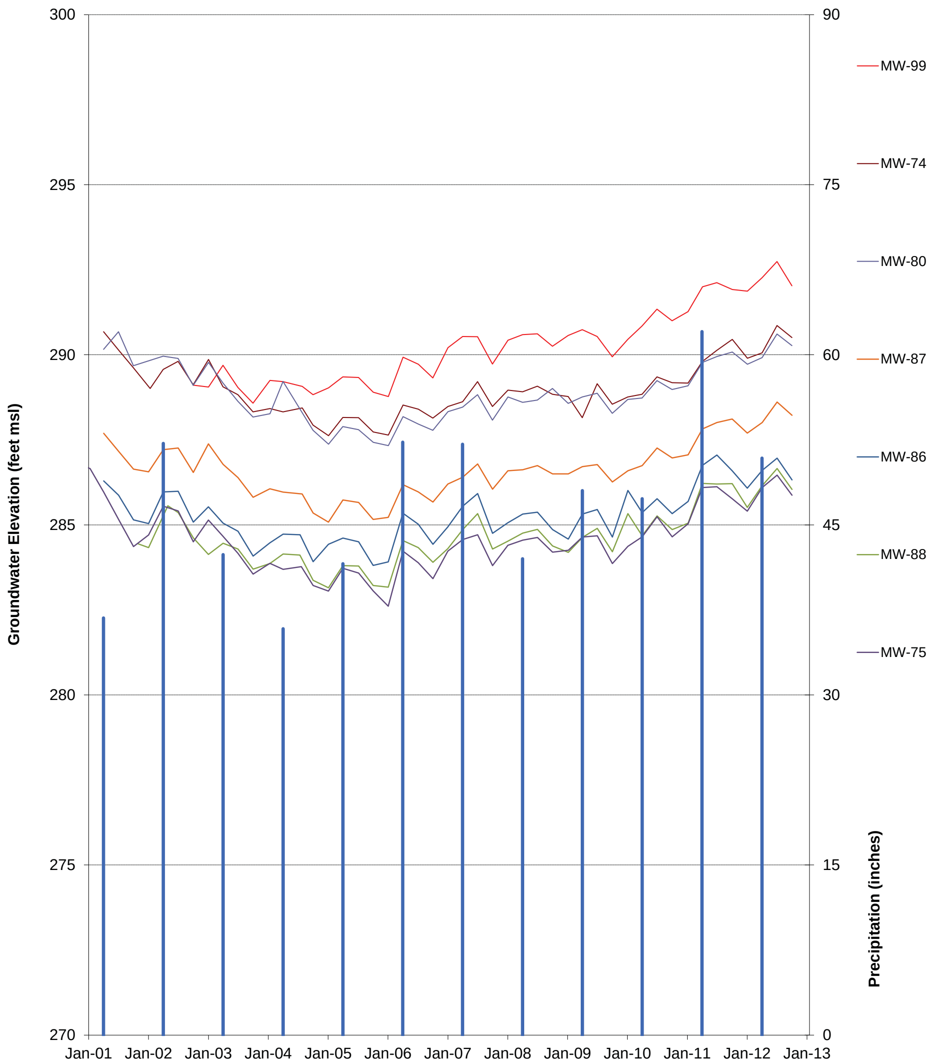

Groundwater Elevation (feet msl)
325
320
315
310
305
300
295
290
285
280
275
Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13
100
80
60
40
20
0
Precipitation (inches)
MW-93
MW-100
MW-95
MW-68
WS-NPW-3
WS-NPW-1
MW-72
WS-ATC-1
Top of Screen Elevation (feet msl)
325
315
305
295
285
275
MW-93
MW-100
MW-95
MW-68
MW-72
WS-ATC-1
WS-NPW-3
WS-NPW-1



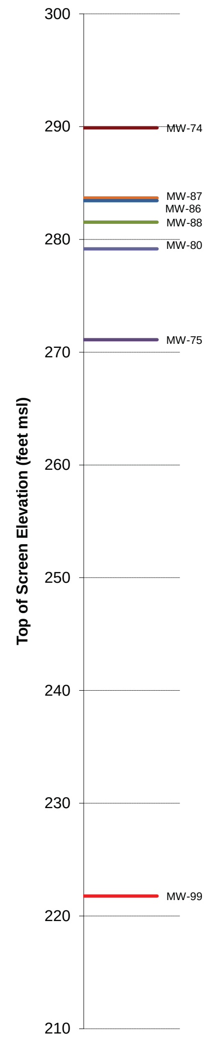
Groundwater Elevation (feet msl)
Precipitation (inches)
315
310
305
300
295
290
285
280
275
270
265
260
90
75
60
45
30
15
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
MW-69
MW-67
MW-21
MW-66
MW-81
MW-54
MW-73
MW-84



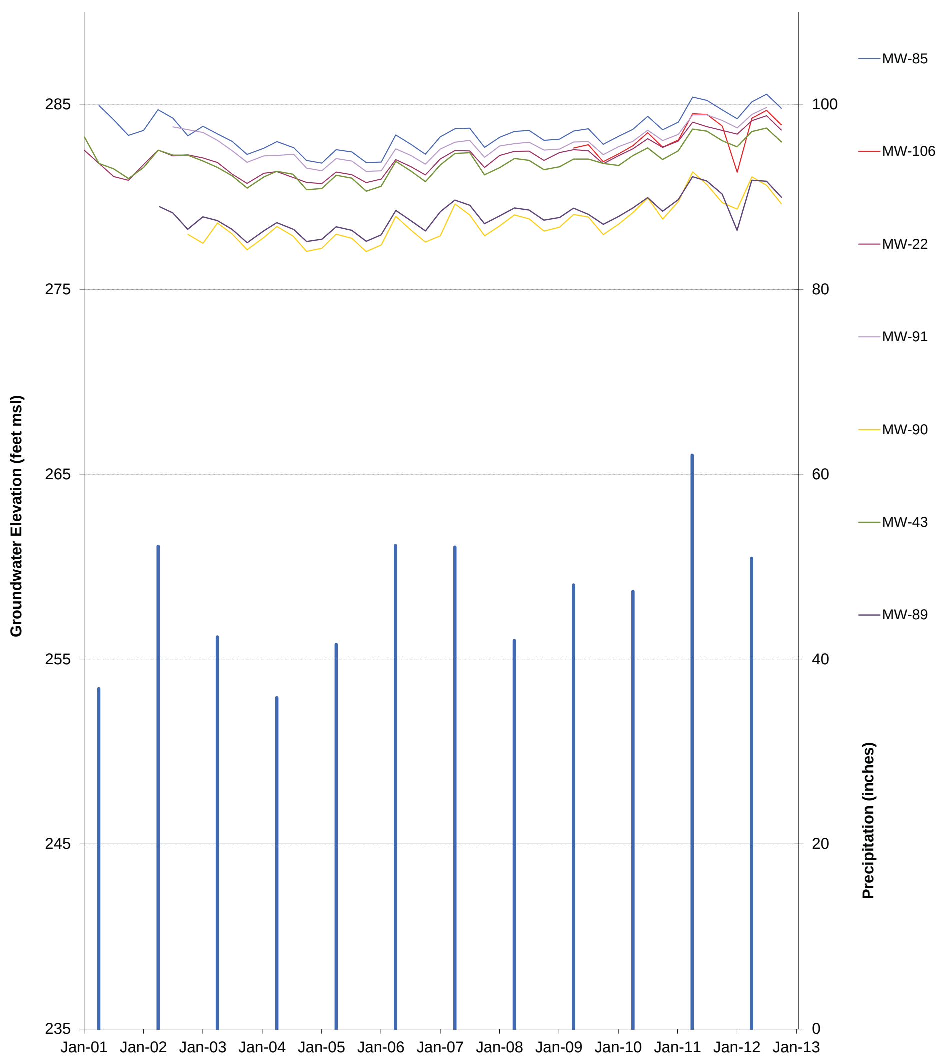
Top of Screen Elevation (feet msl)
315
305
295
285
275
265
255
245
MW-81
MW-67
MW-66
MW-69
MW-84
MW-73
MW-21
MW-54

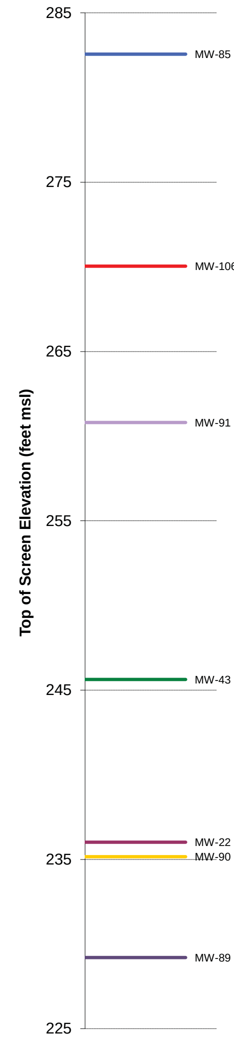


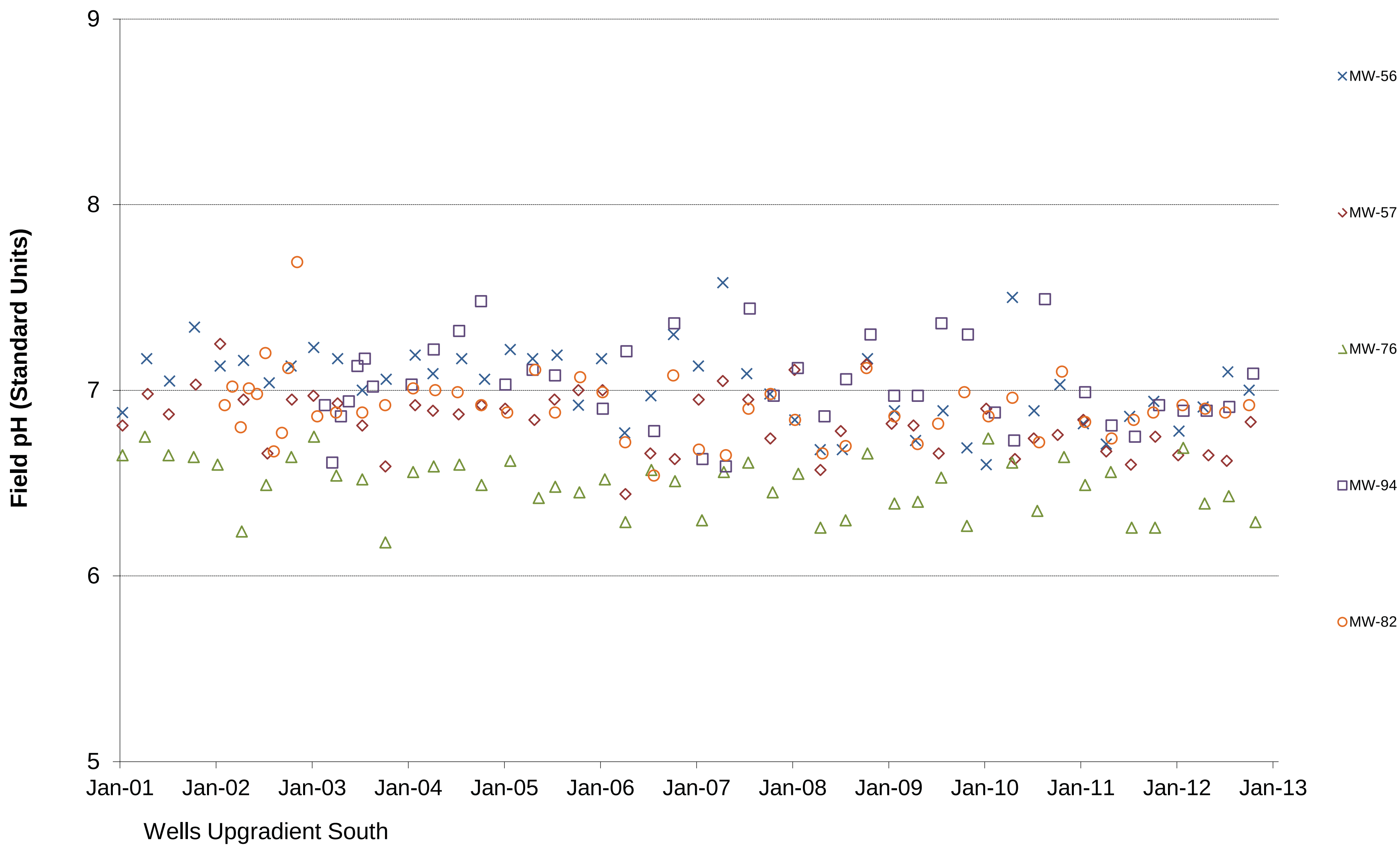
Groundwater Elevation (feet msl)
Precipitation (inches)
300
295
290
285
280
275
270
90
75
60
45
30
15
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
MW-99
MW-74
MW-80
MW-87
MW-86
MW-88
MW-75



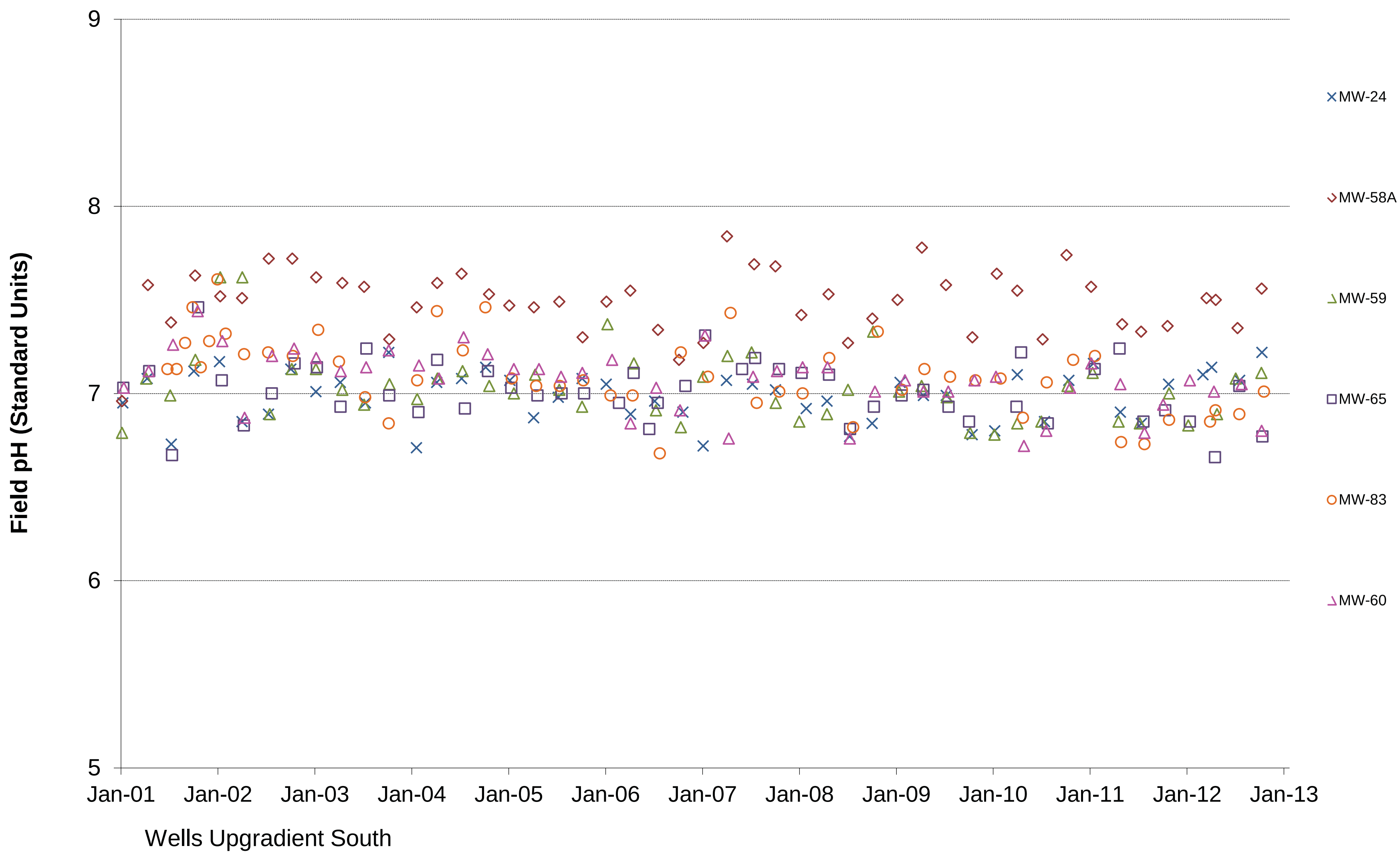
Top of Screen Elevation (feet msl)
300
290
280
270
260
250
240
230
220
210
MW-74
MW-87
MW-86
MW-88
MW-80
MW-75
MW-99


Groundwater Elevation (feet msl)
285
275
265
255
245
235
100
80
60
40
20
0
Precipitation (inches)
Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13
MW-85
MW-106
MW-22
MW-91
MW-90
MW-43
MW-89

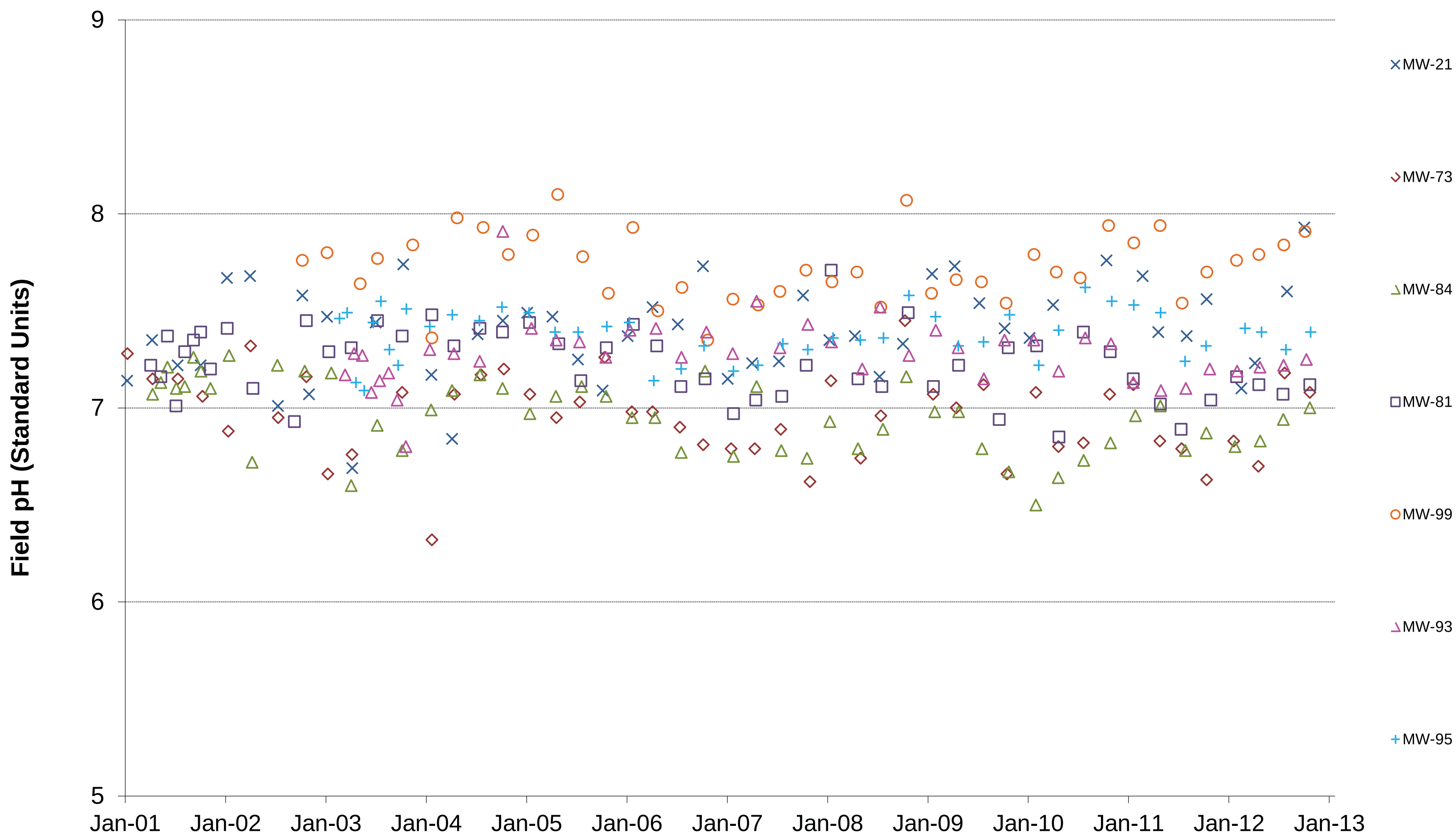

Top of Screen Elevation (feet msl)
285
275
265
255
245
235
225
MW-85
MW-106
MW-91
MW-43
MW-22
MW-90
MW-89



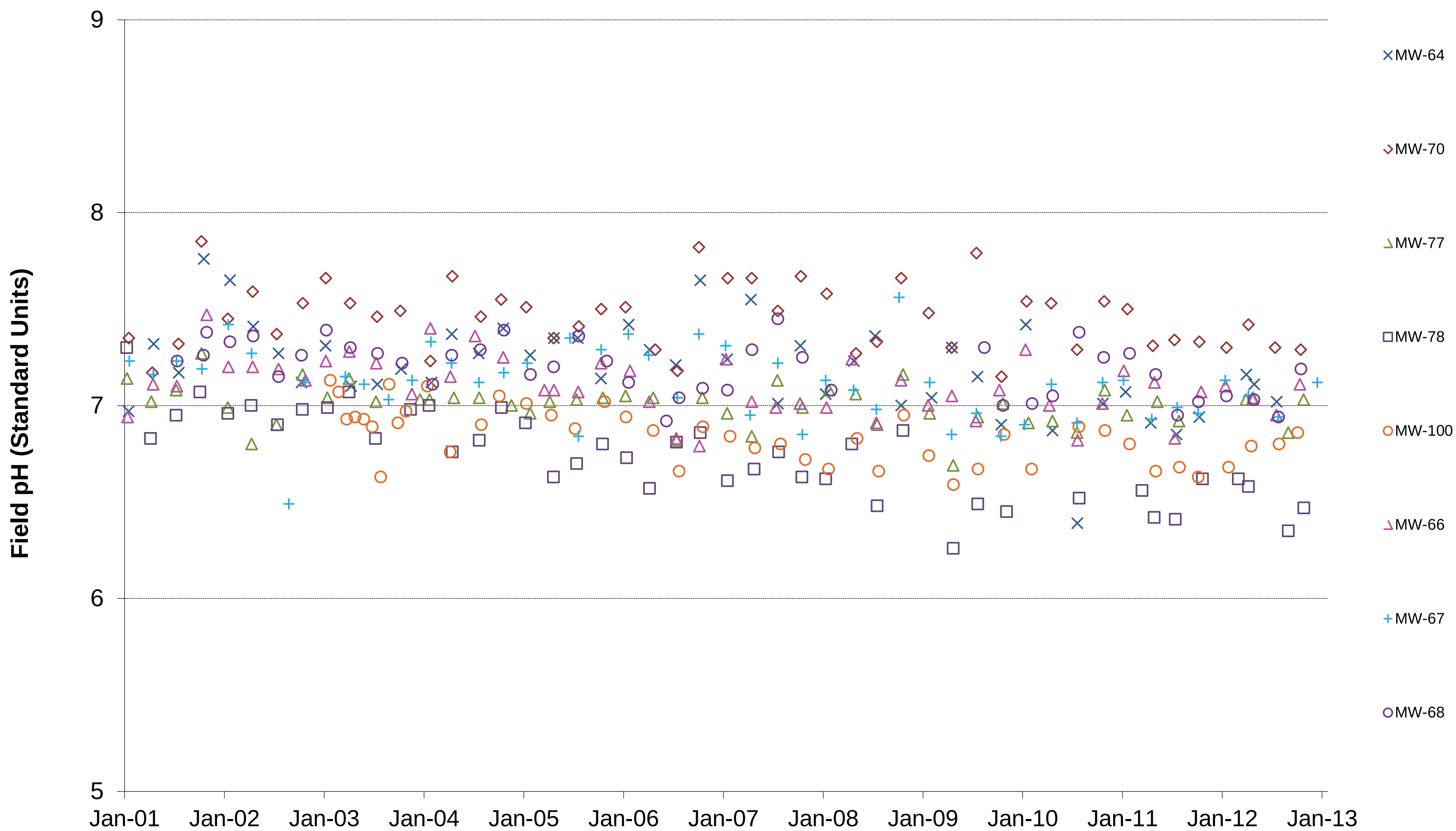
Field pH (Standard Units)
9
8
7
6
5
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-56
MW-57
MW-76
MW-94
MW-82



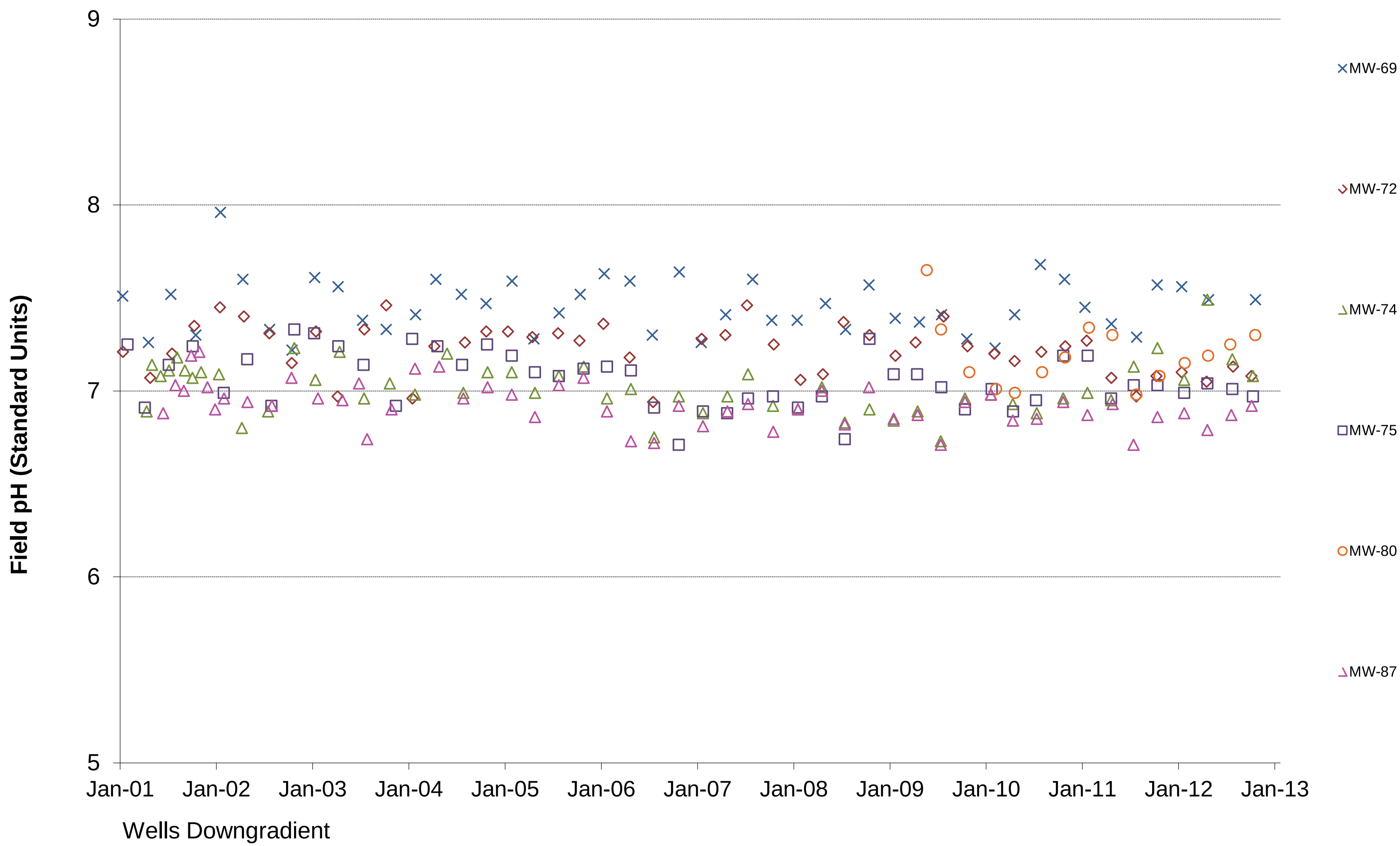
Field pH (Standard Units)
9
8
7
6
5
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-24
MW-58A
MW-59
MW-65
MW-83
MW-60

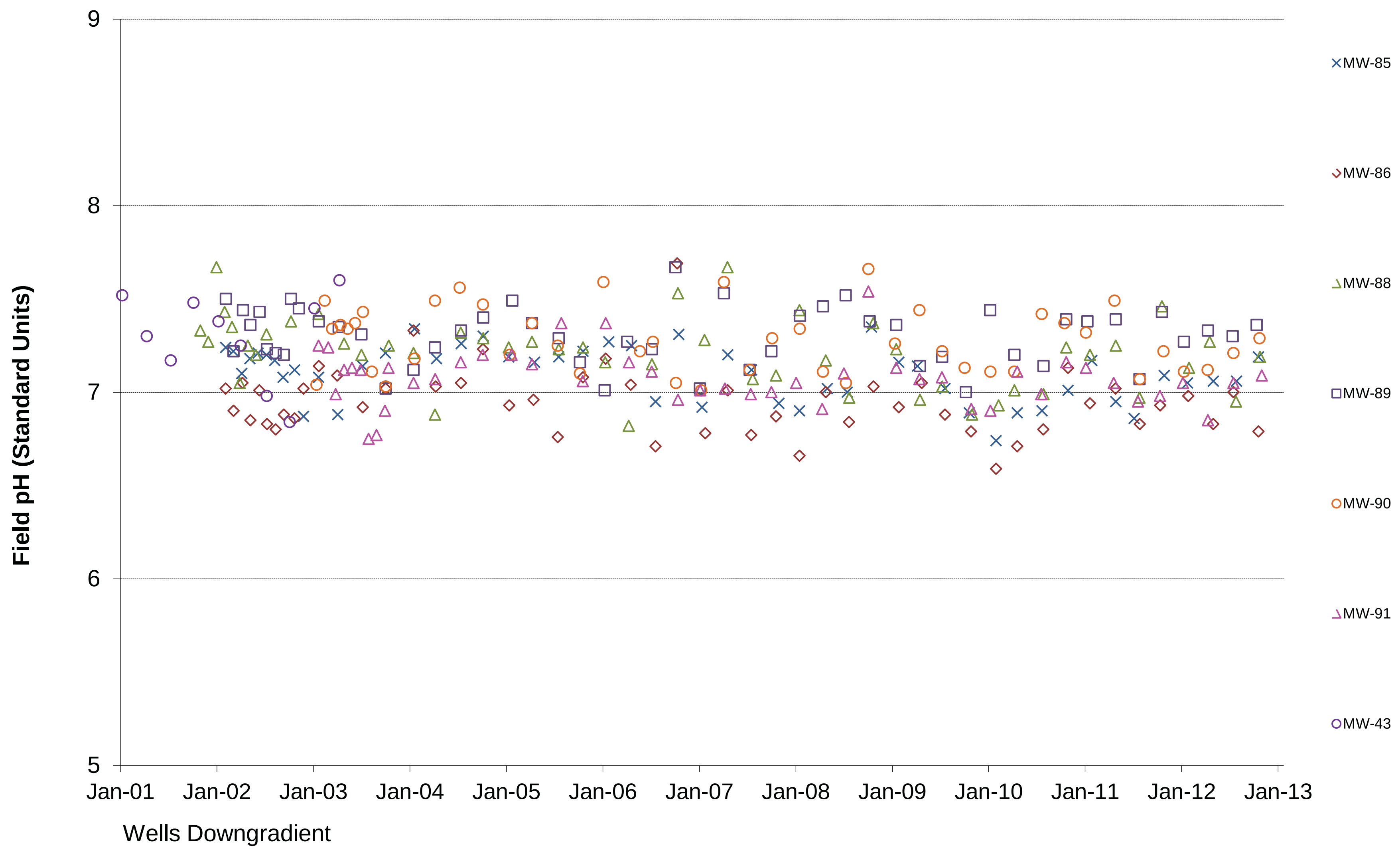


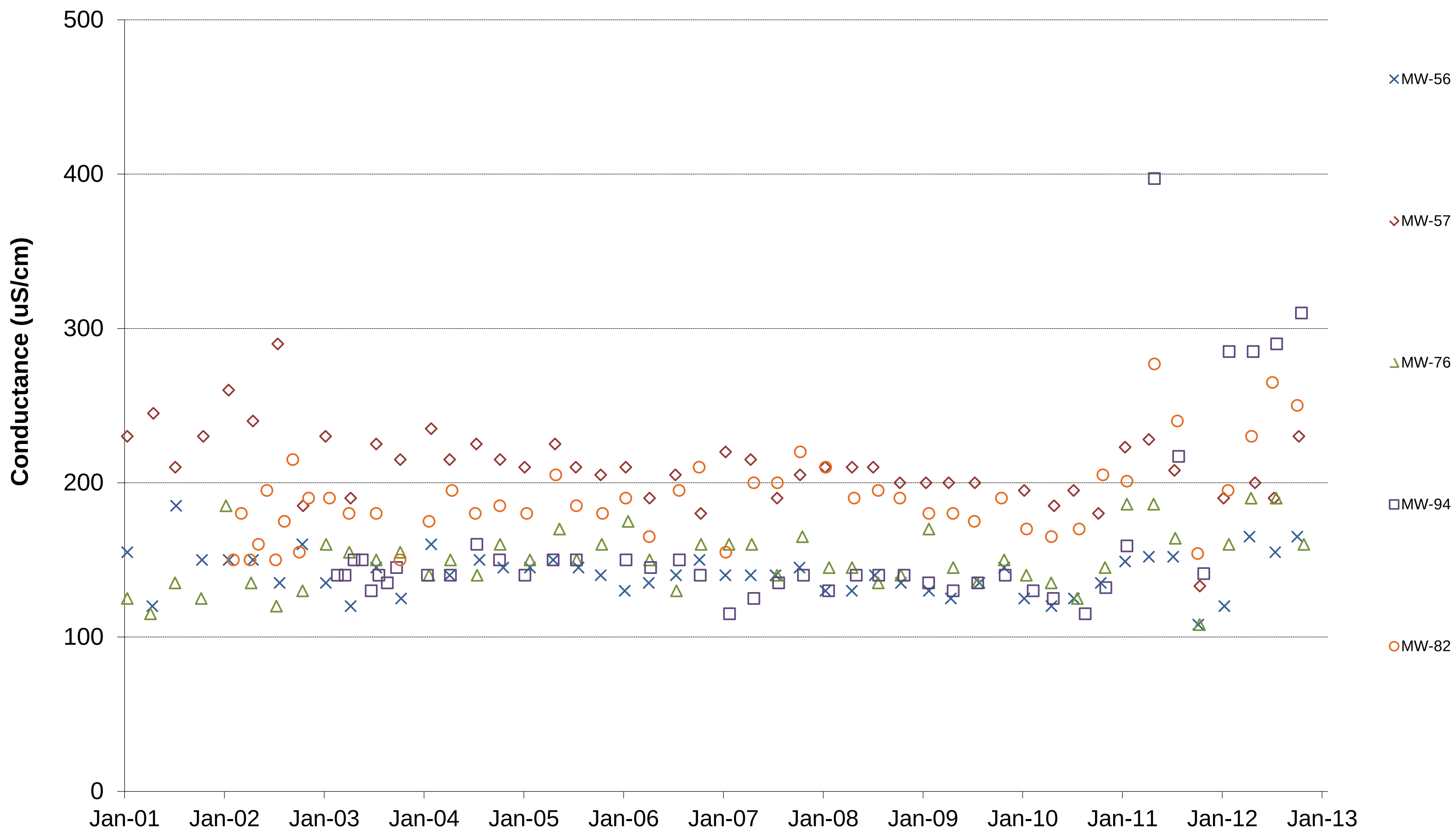
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient



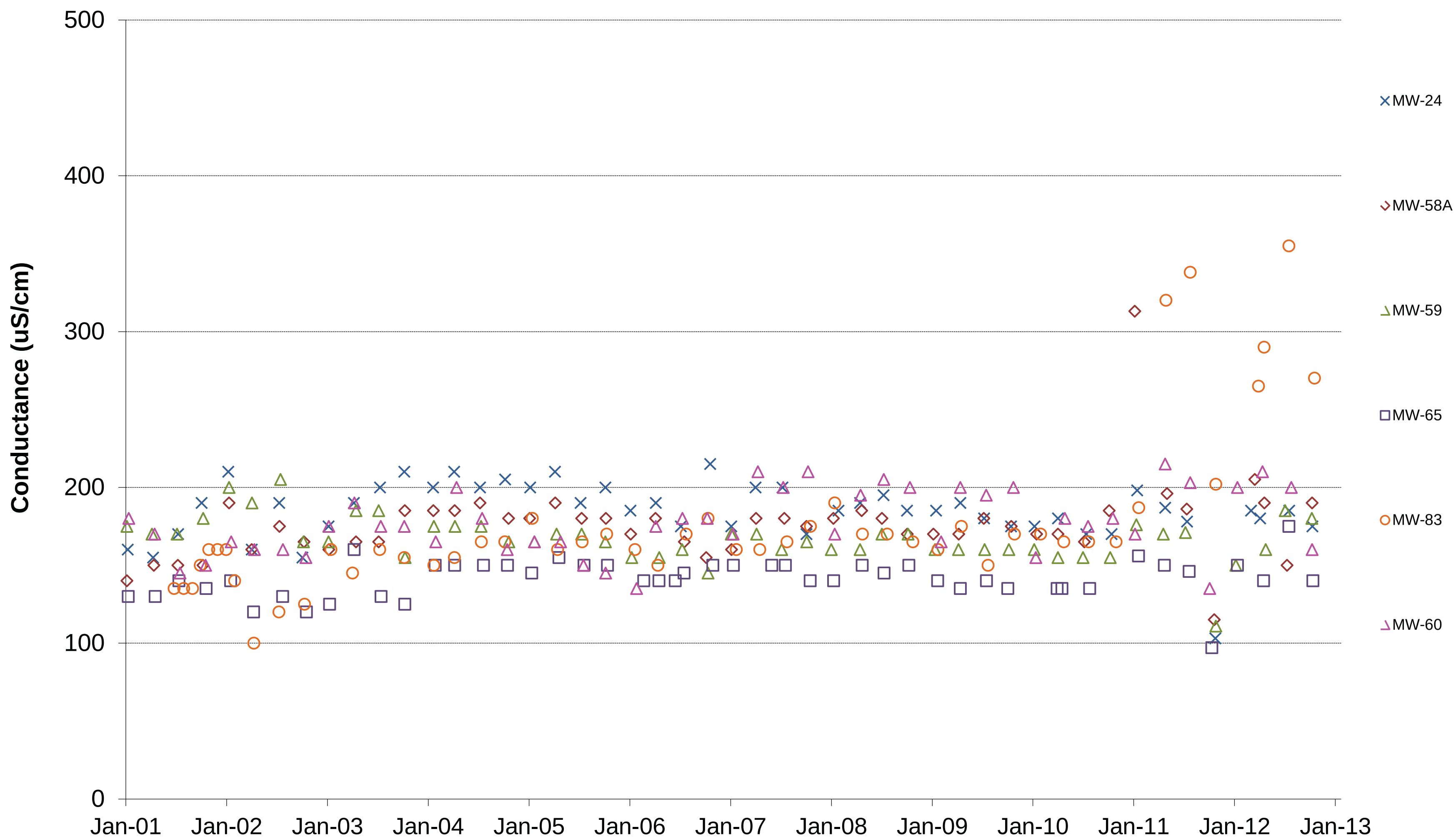
Wells Vertical to Key Facilities and Interior to Landfill Footprint


Field pH (Standard Units)
9
8
7
6
5
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87

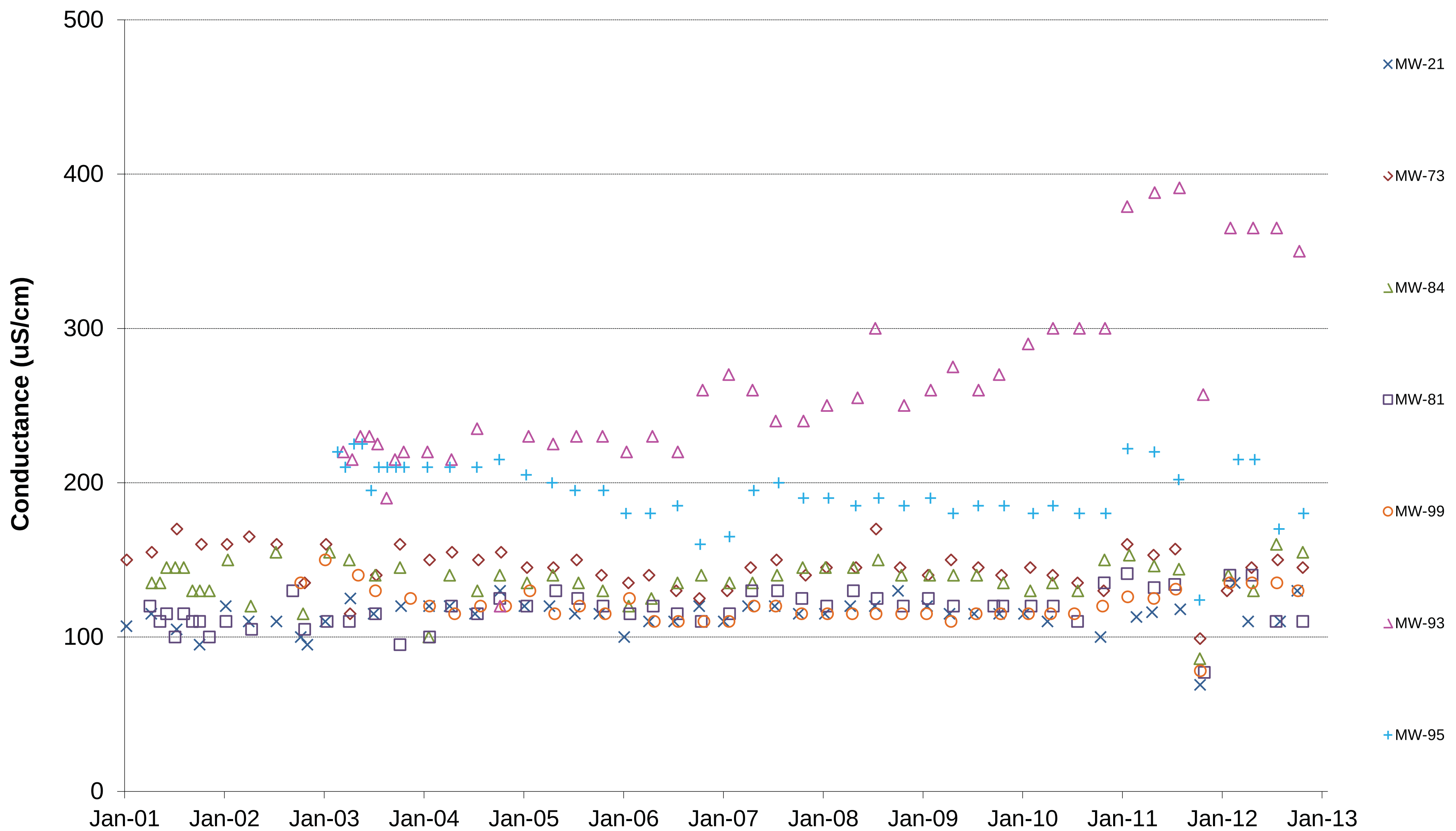

9
8
7
6
5
Field pH (Standard Units)
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43



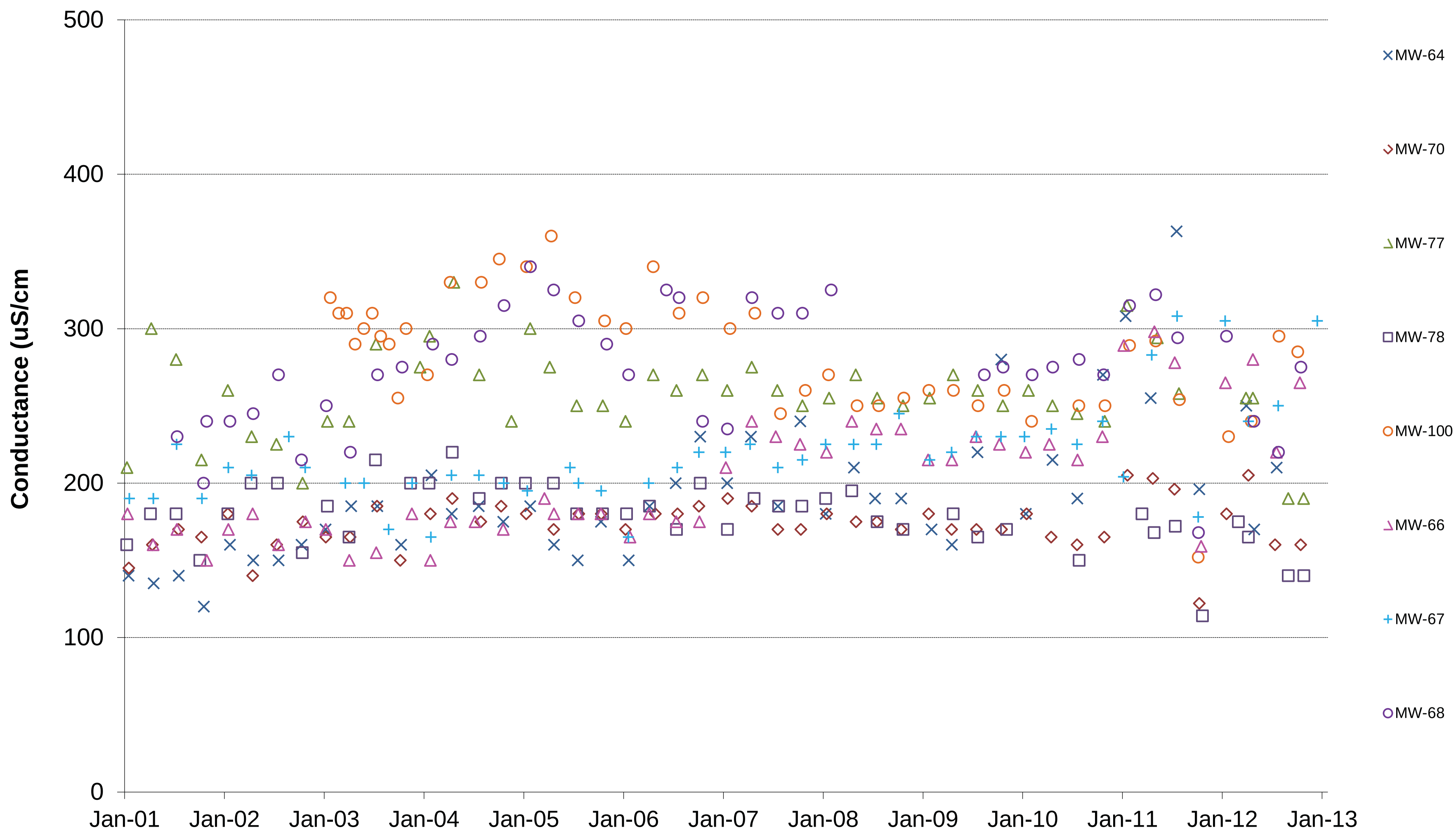
Wells Upgradient South



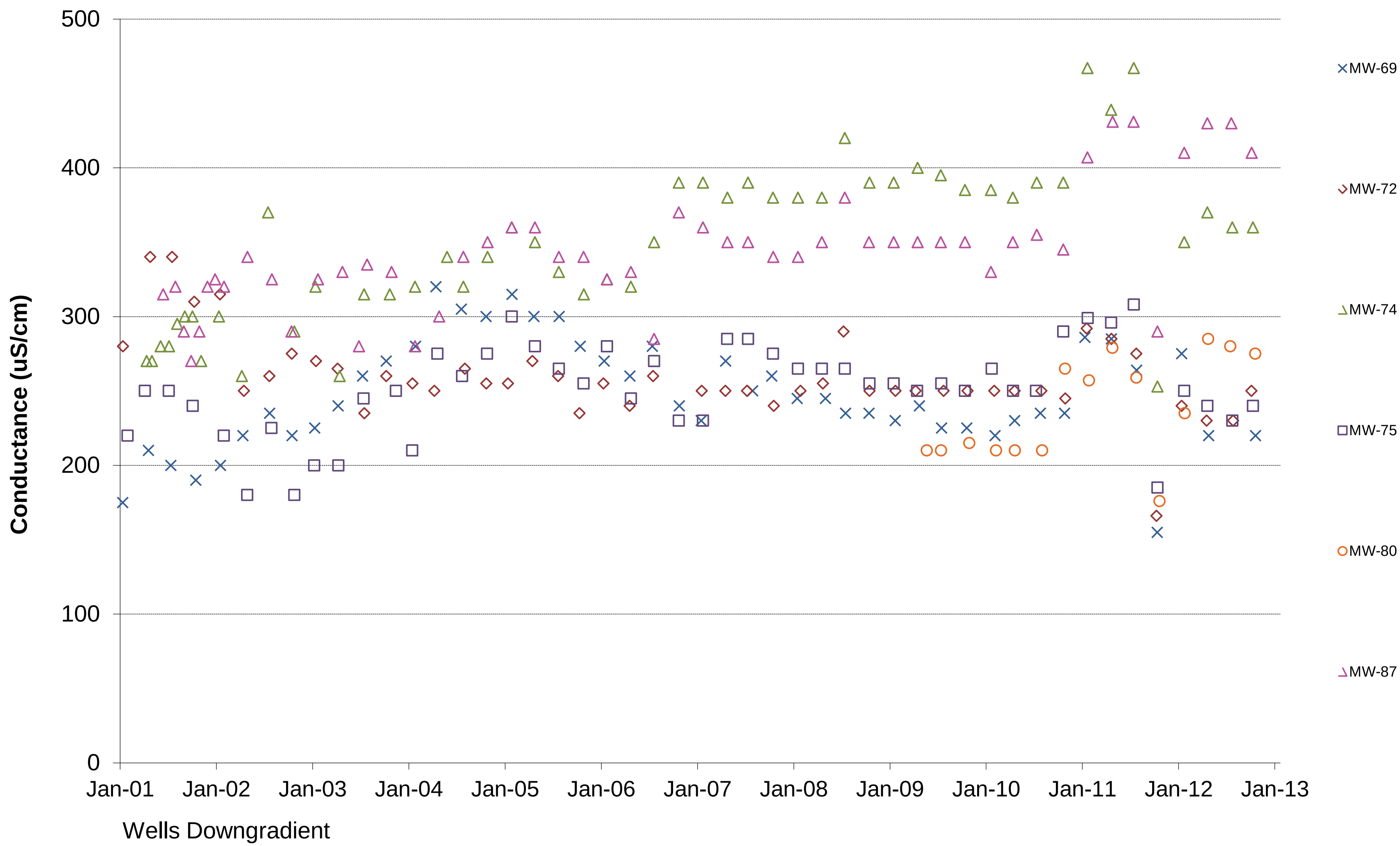
Wells Upgradient South

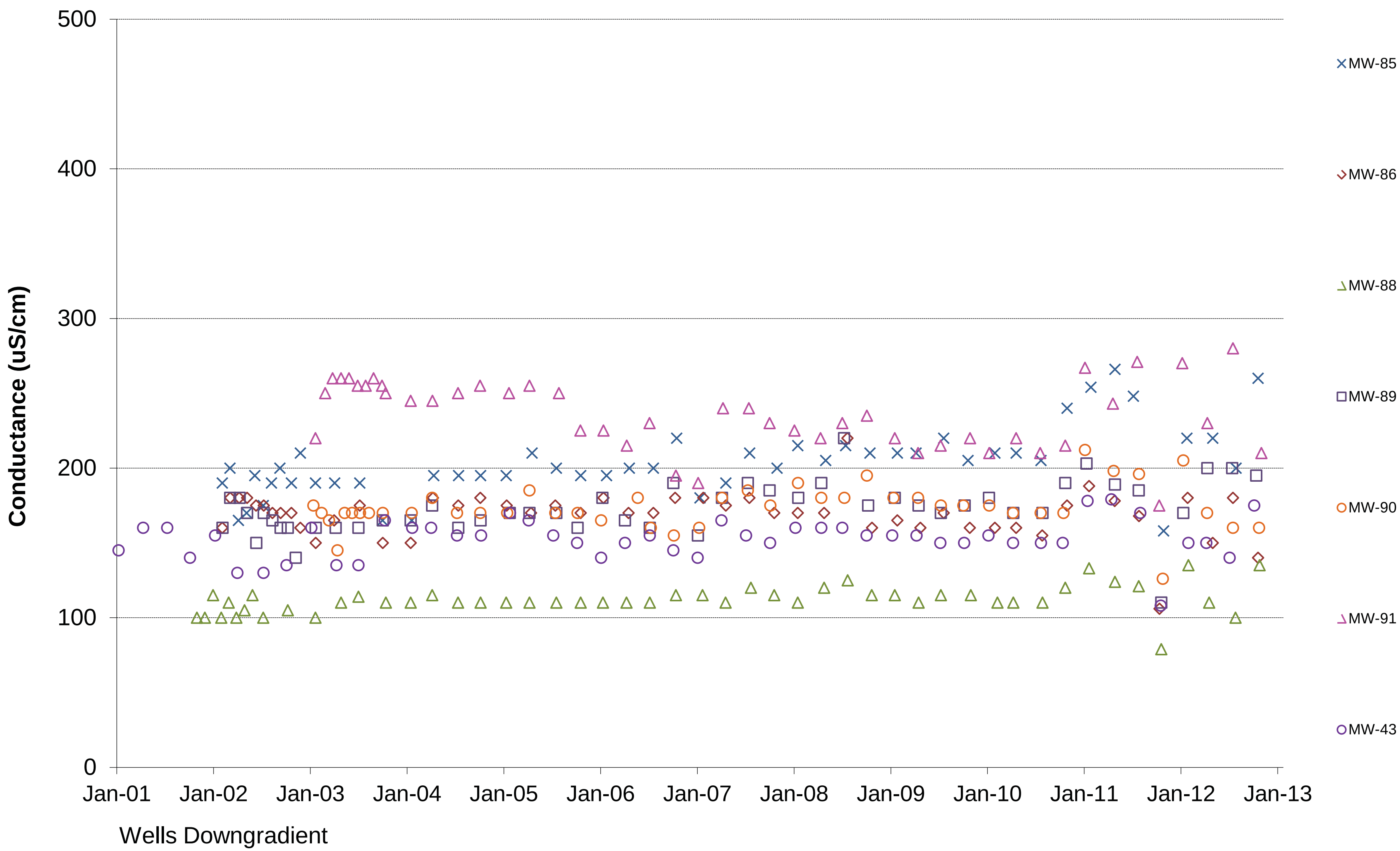


Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient

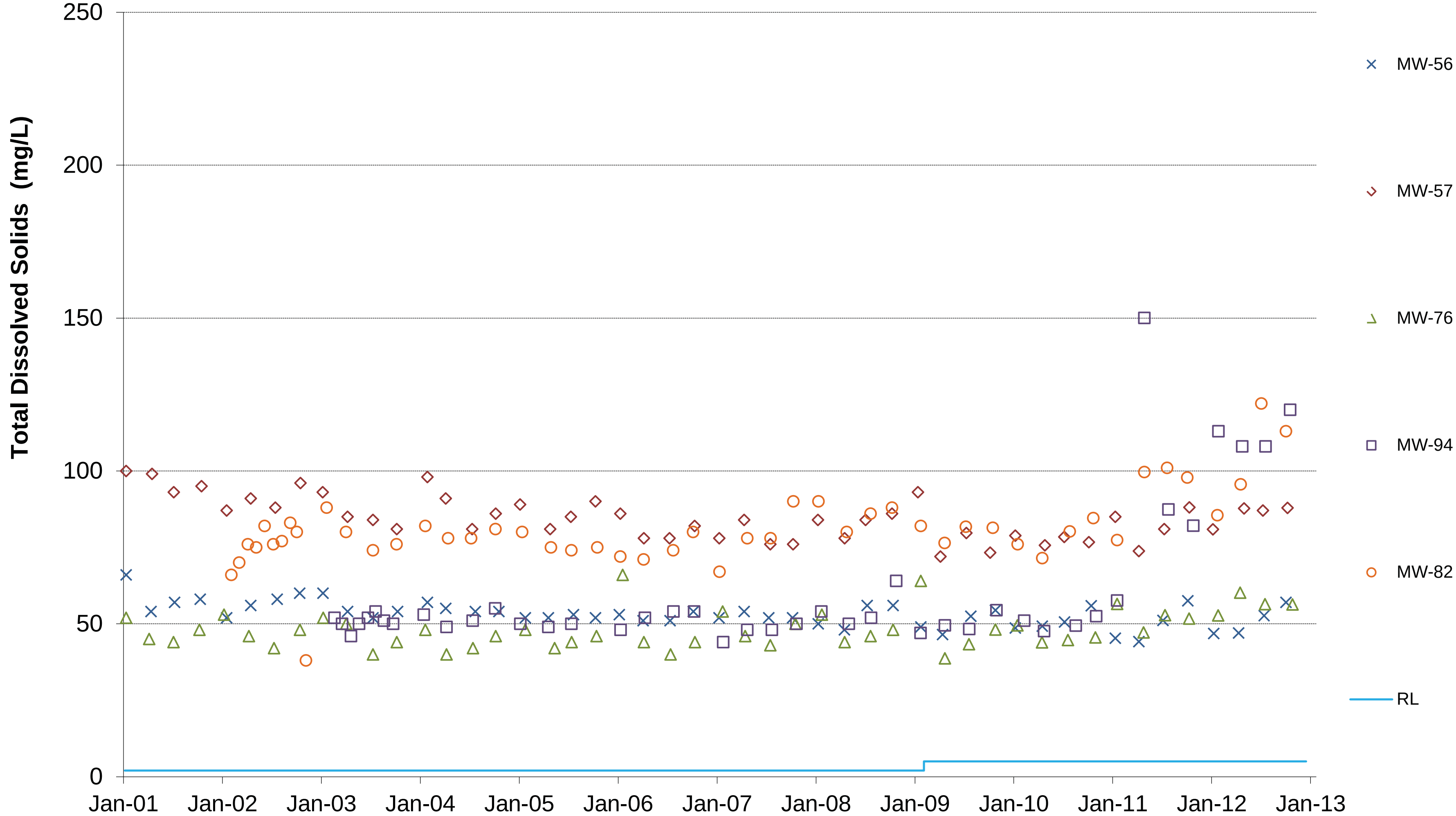


Wells Vertical to Key Facilities and Interior to Landfill Footprint

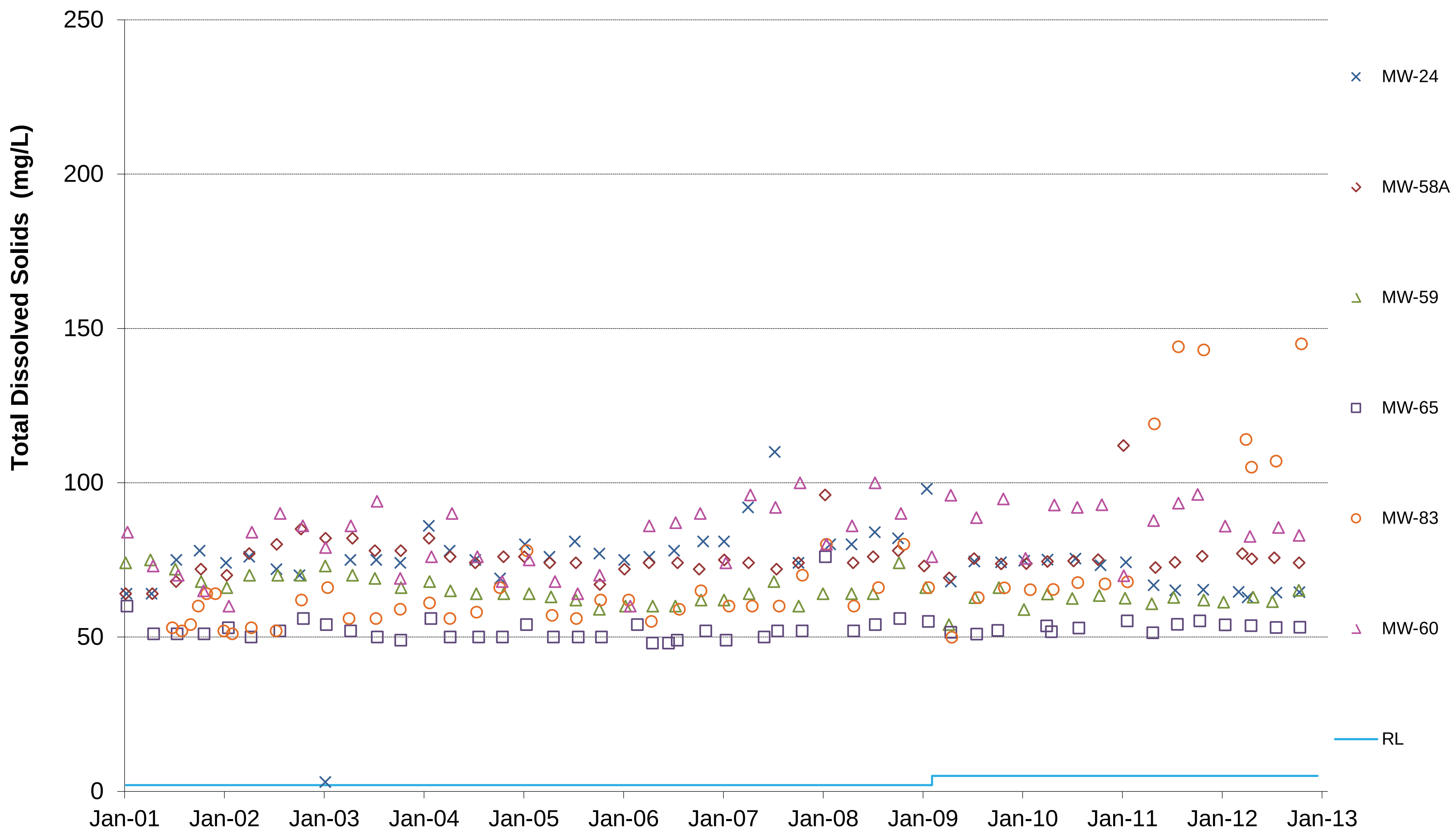

Conductance (uS/cm)
500
400
300
200
100
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87



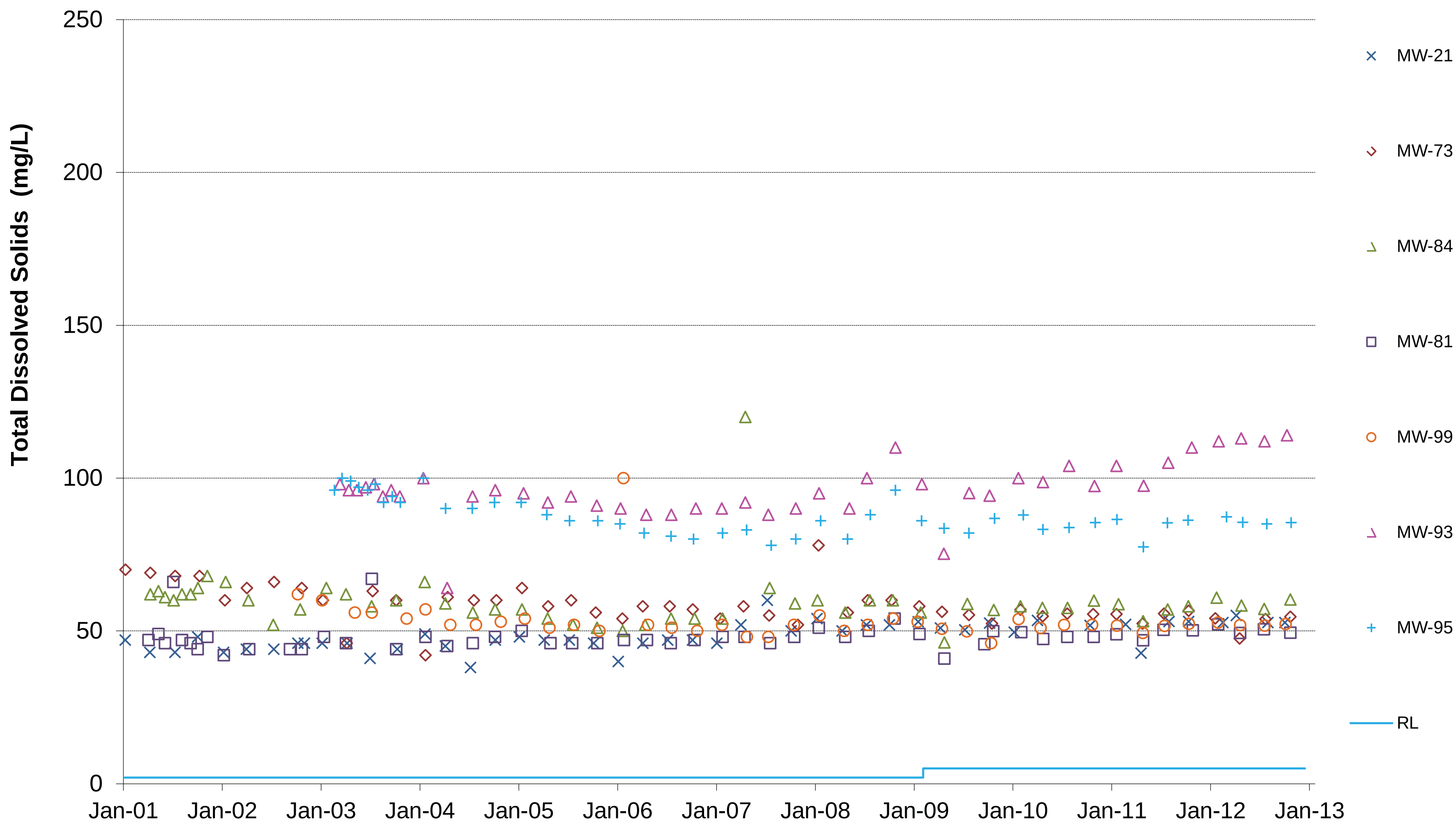
Conductance (uS/cm)
500
400
300
200
100
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43



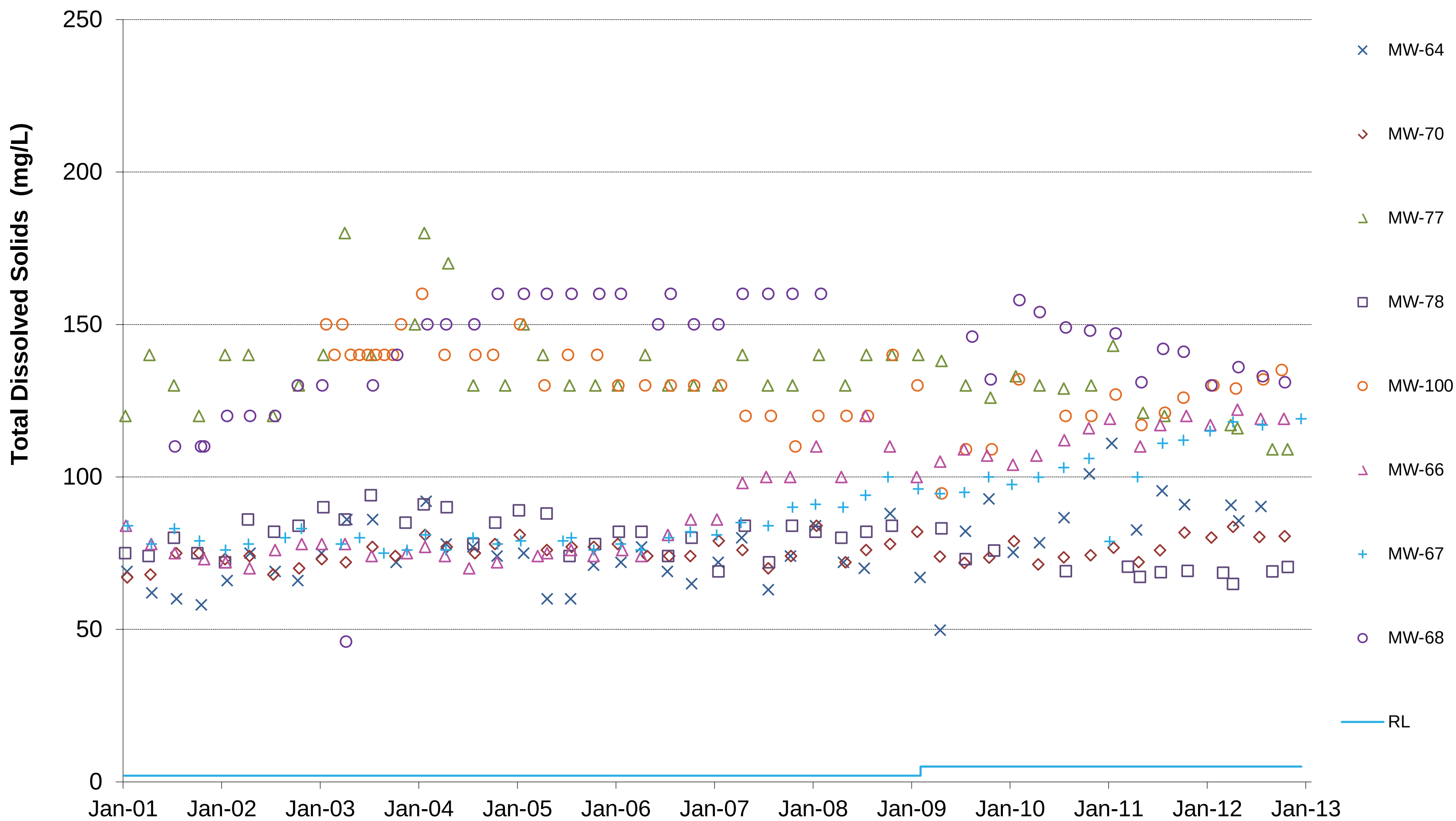
Wells Upgradient South



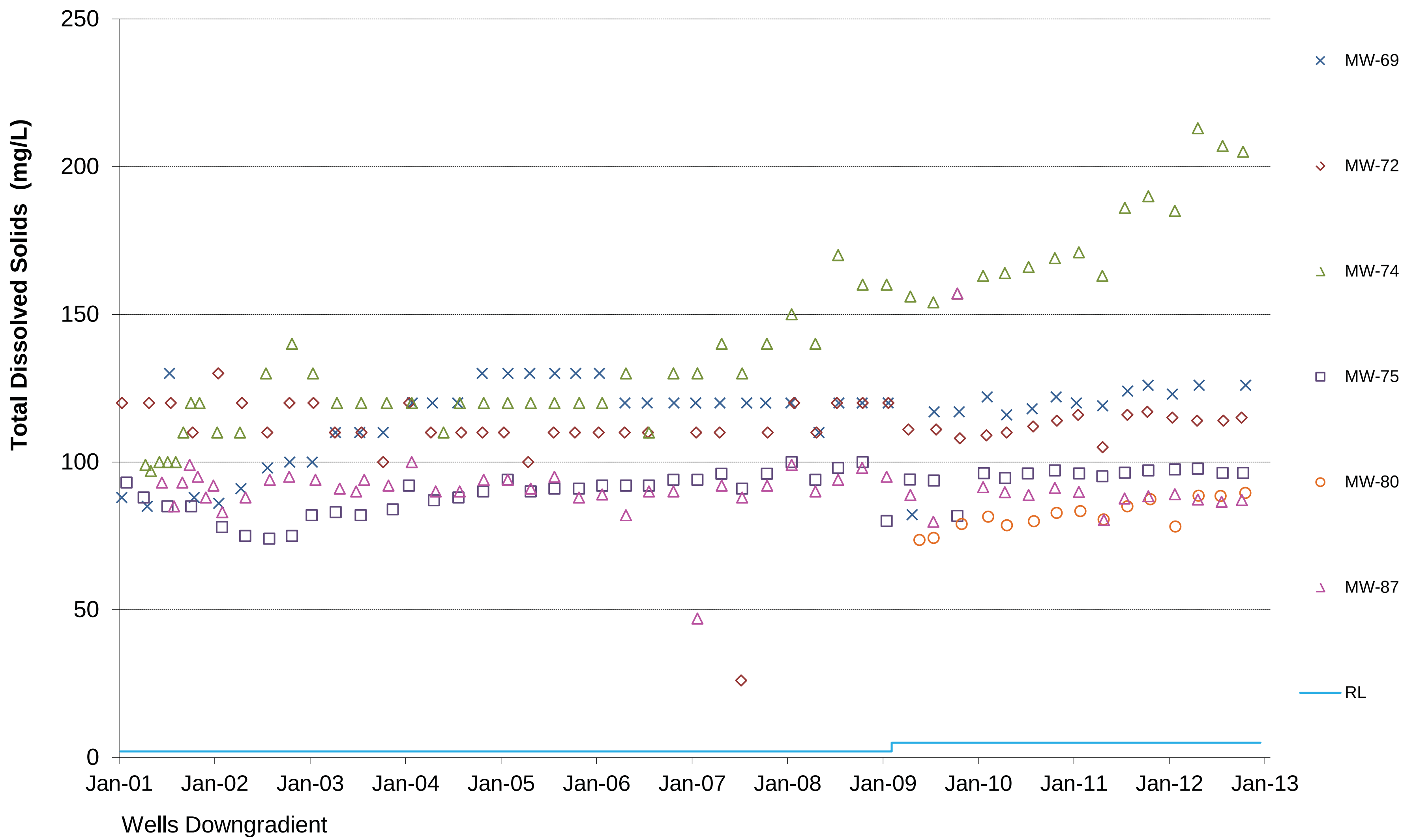
Wells Upgradient South



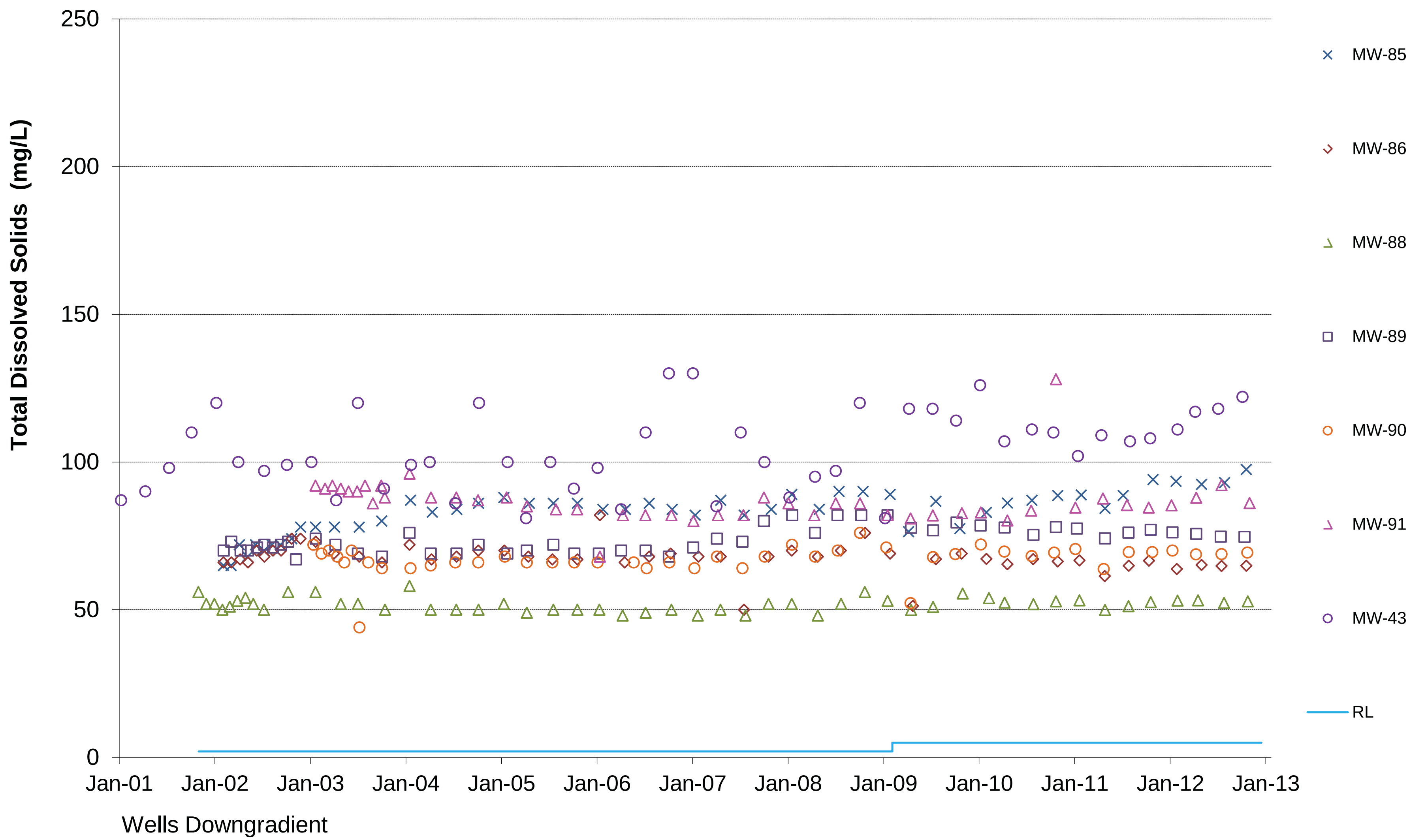
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient

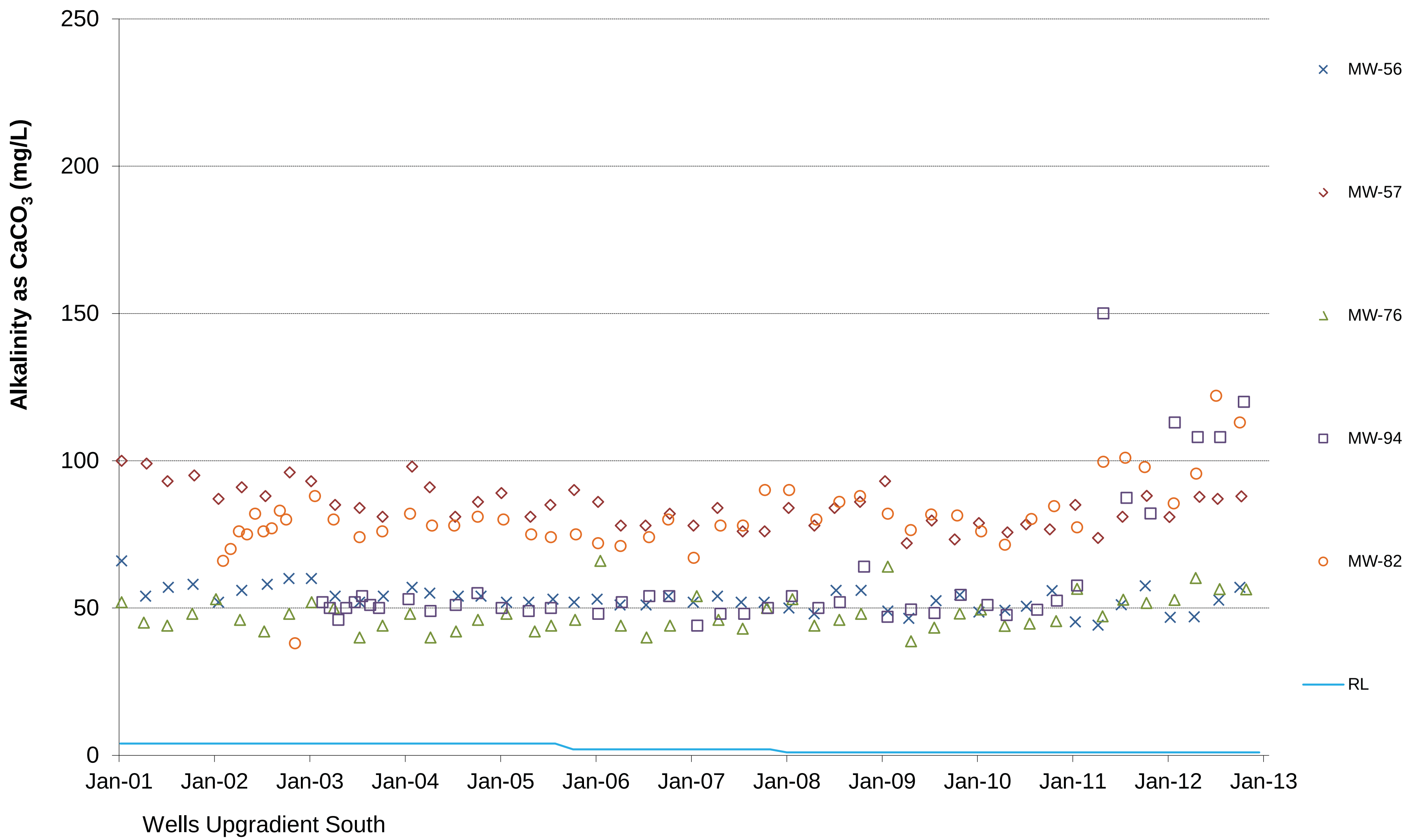


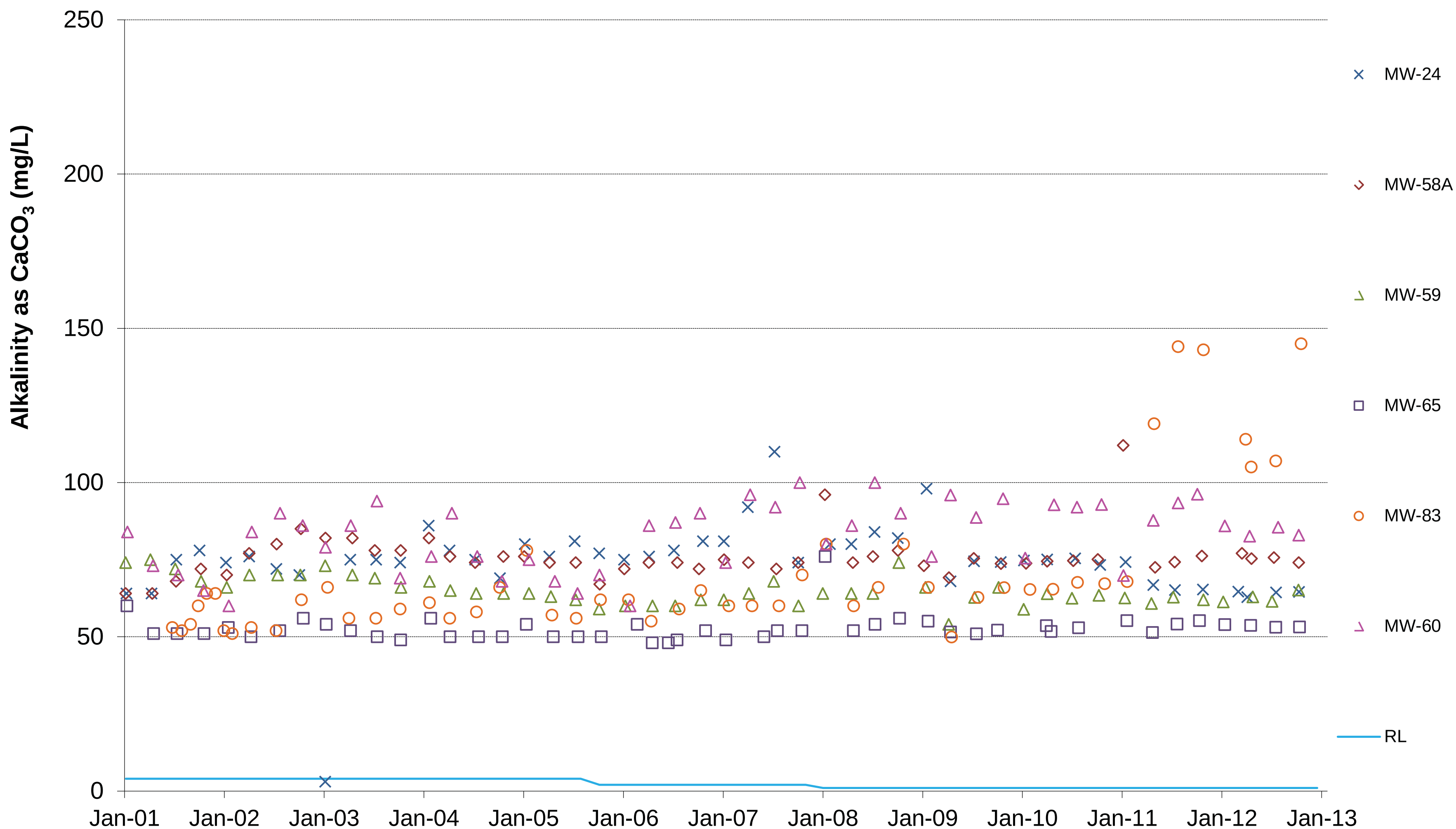
Wells Vertical to Key Facilities and Interior to Landfill Footprint



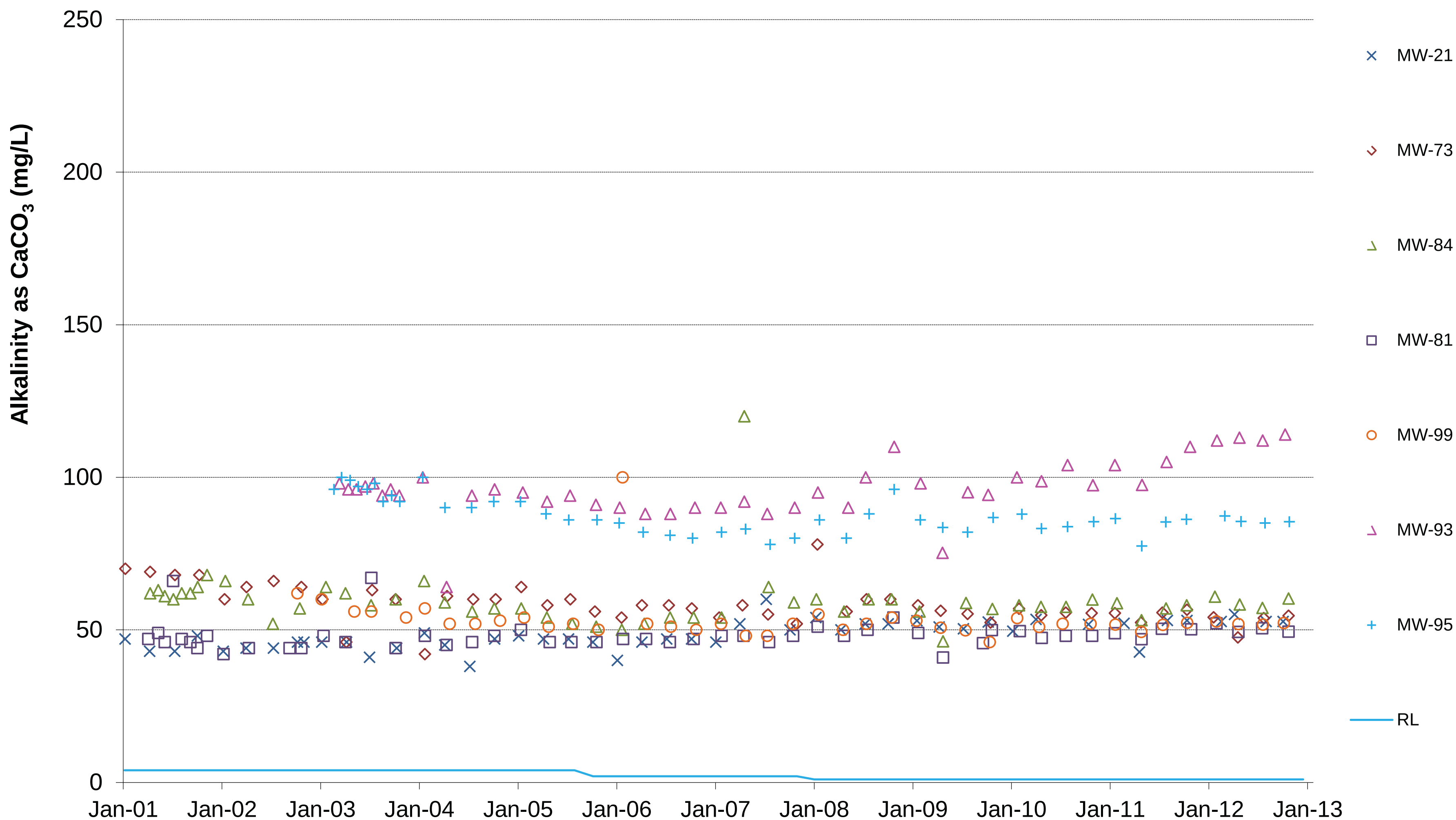
Total Dissolved Solids (mg/L)
250
200
150
100
50
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL


Total Dissolved Solids (mg/L)
250
200
150
100
50
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL

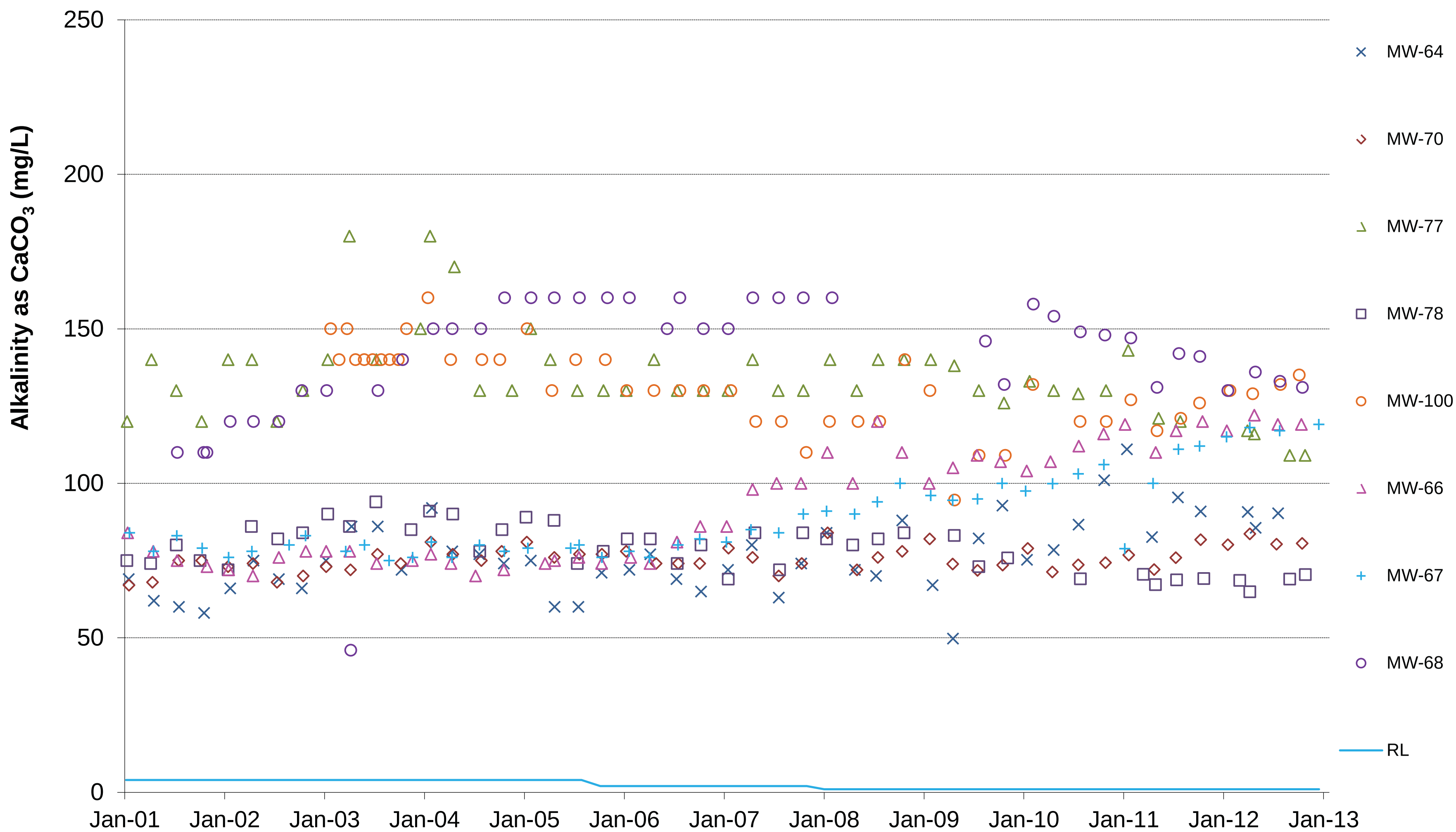

Alkalinity as $CaCO_3$ (mg/L)
250
200
150
100
50
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-56
MW-57
MW-76
MW-94
MW-82
RL



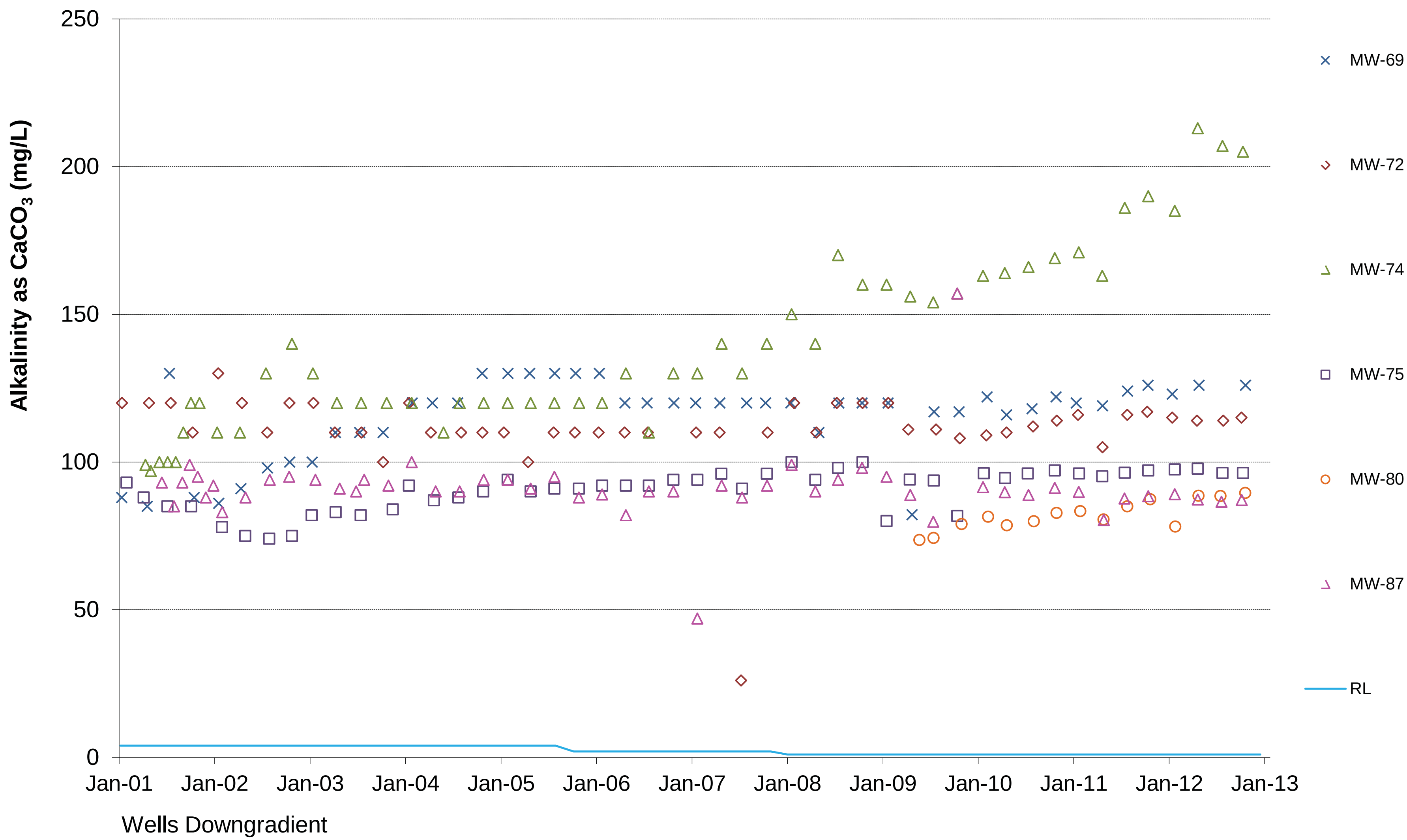
Wells Upgradient South



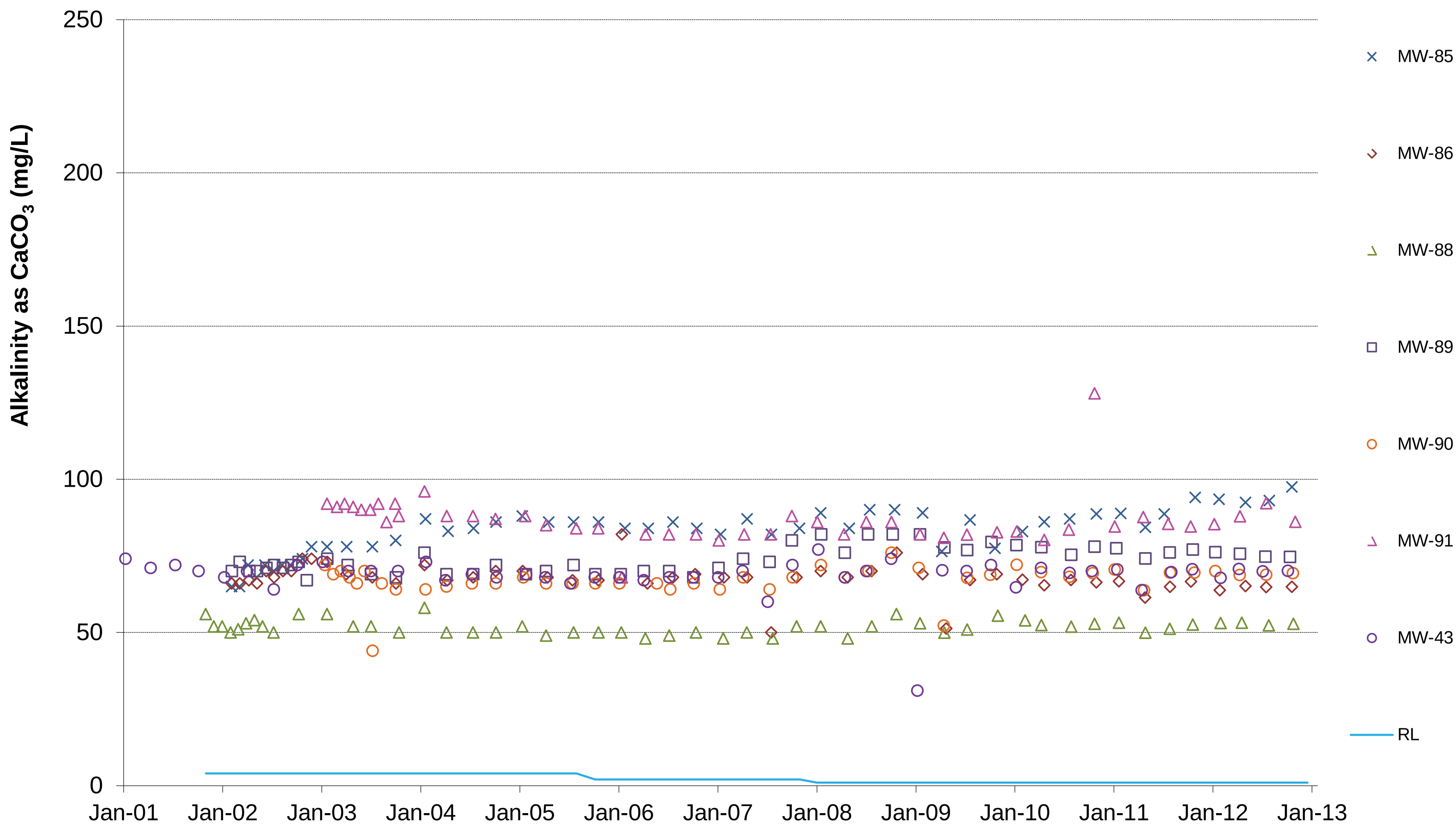
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient



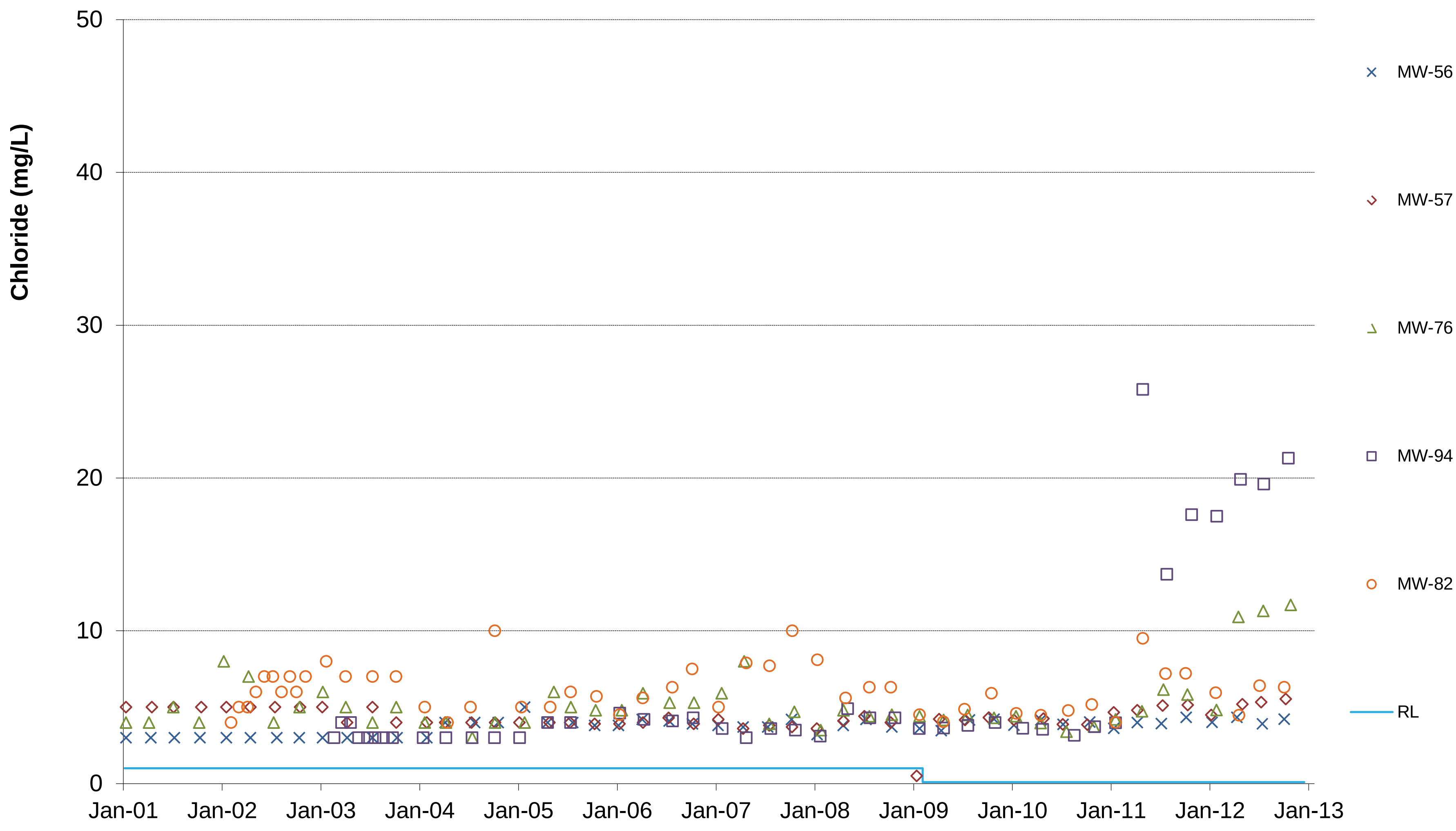
Wells Vertical to Key Facilities and Interior to Landfill Footprint



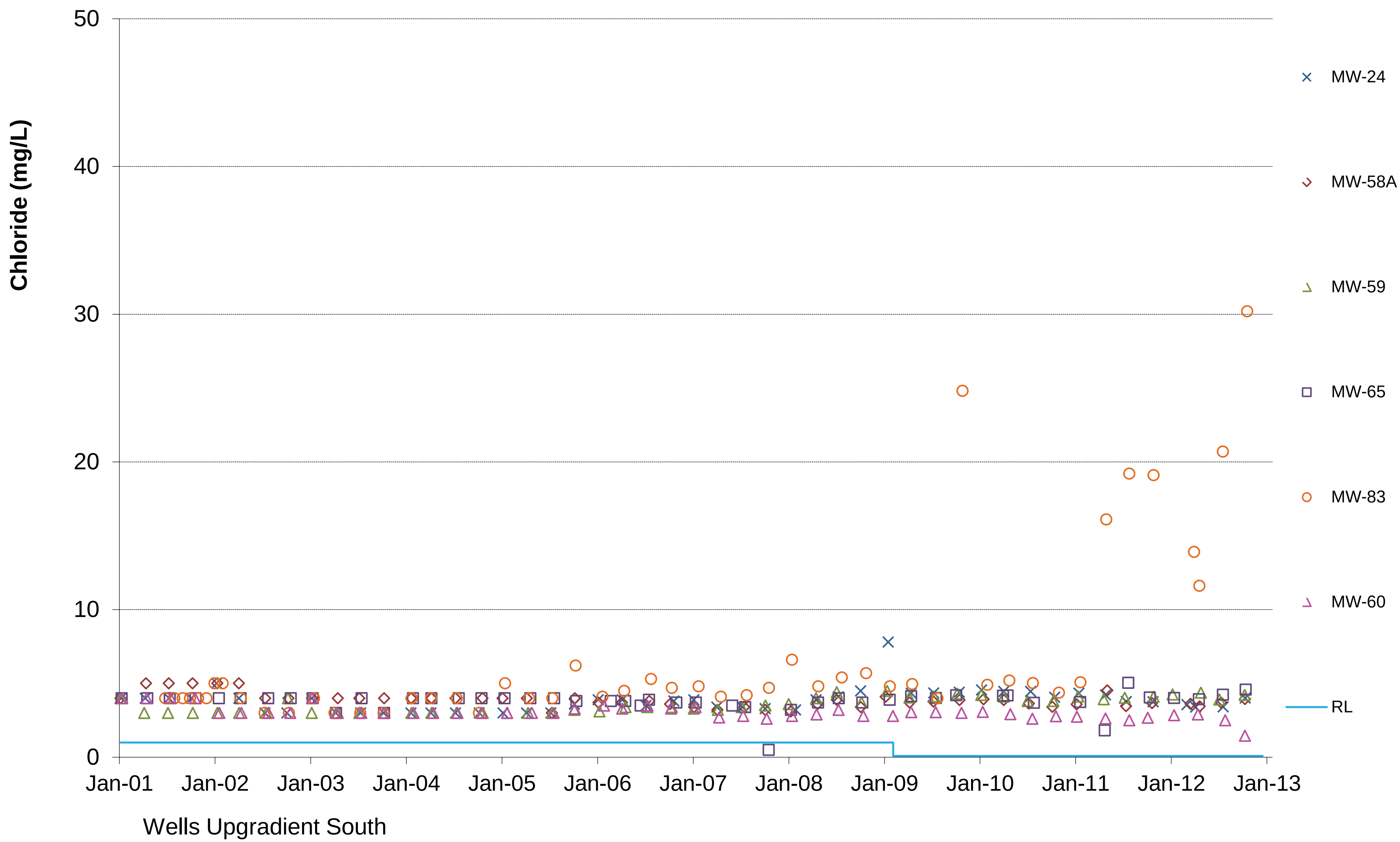
Alkalinity as $CaCO_3$ (mg/L)
250
200
150
100
50
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL

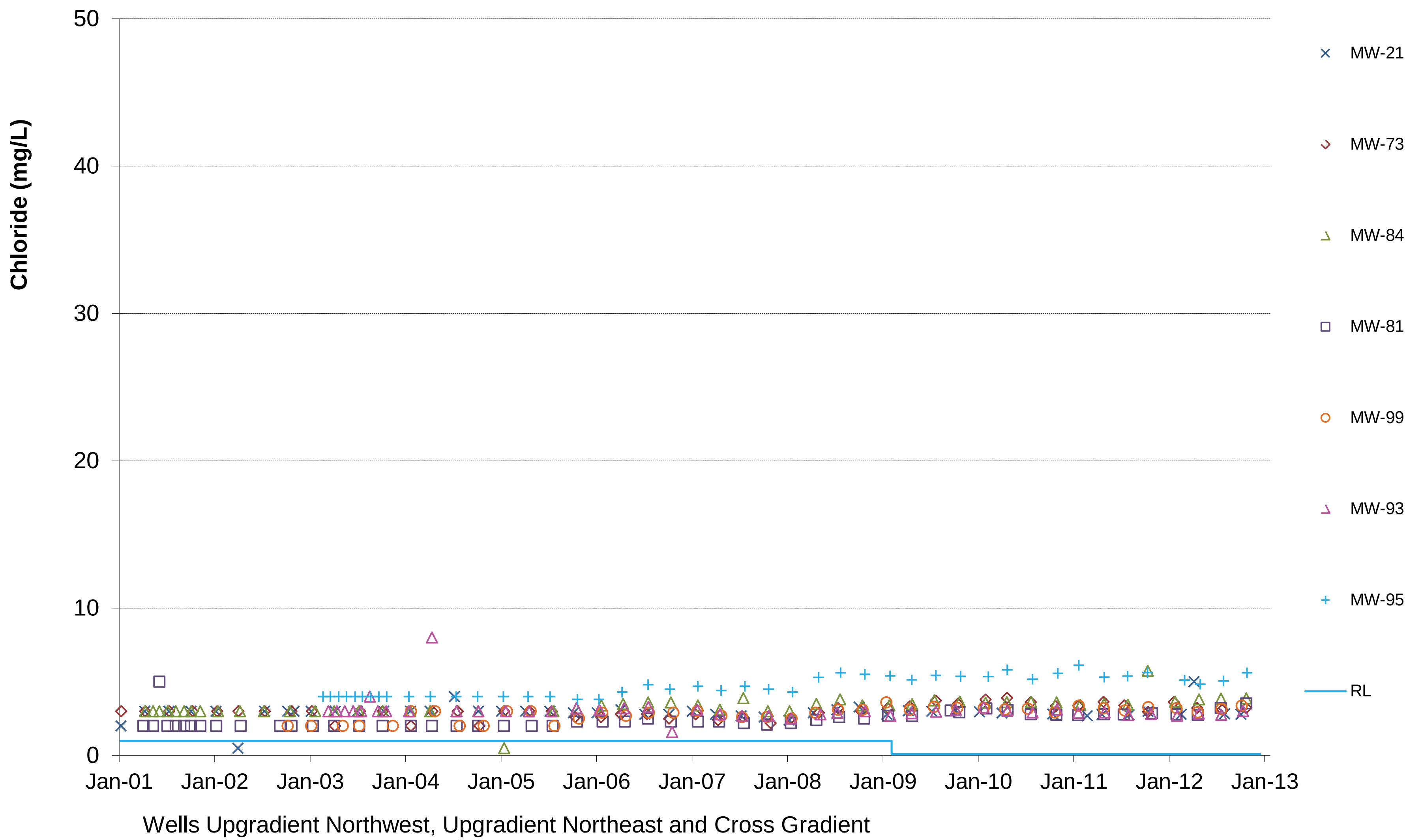


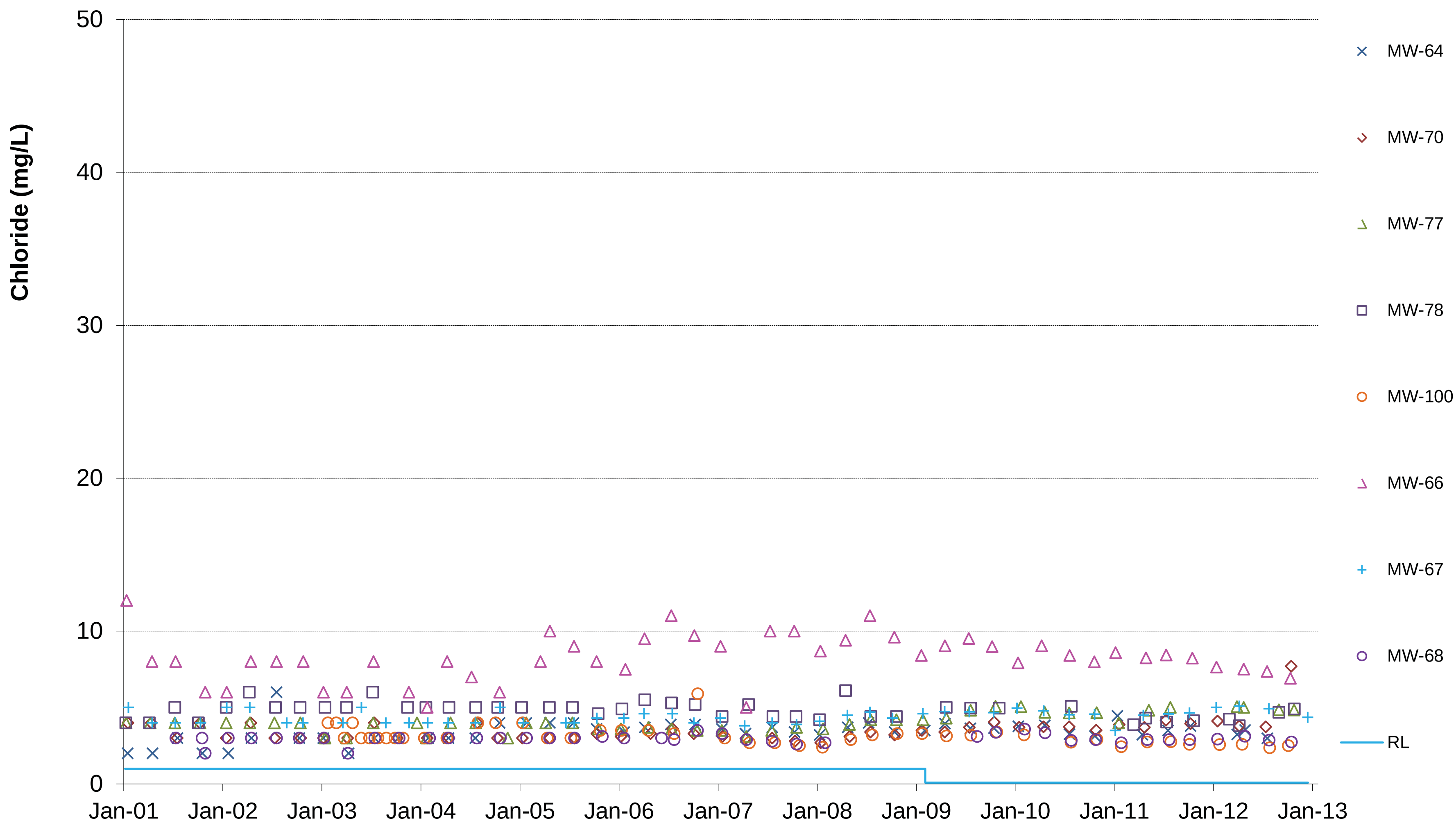
Wells Downgradient



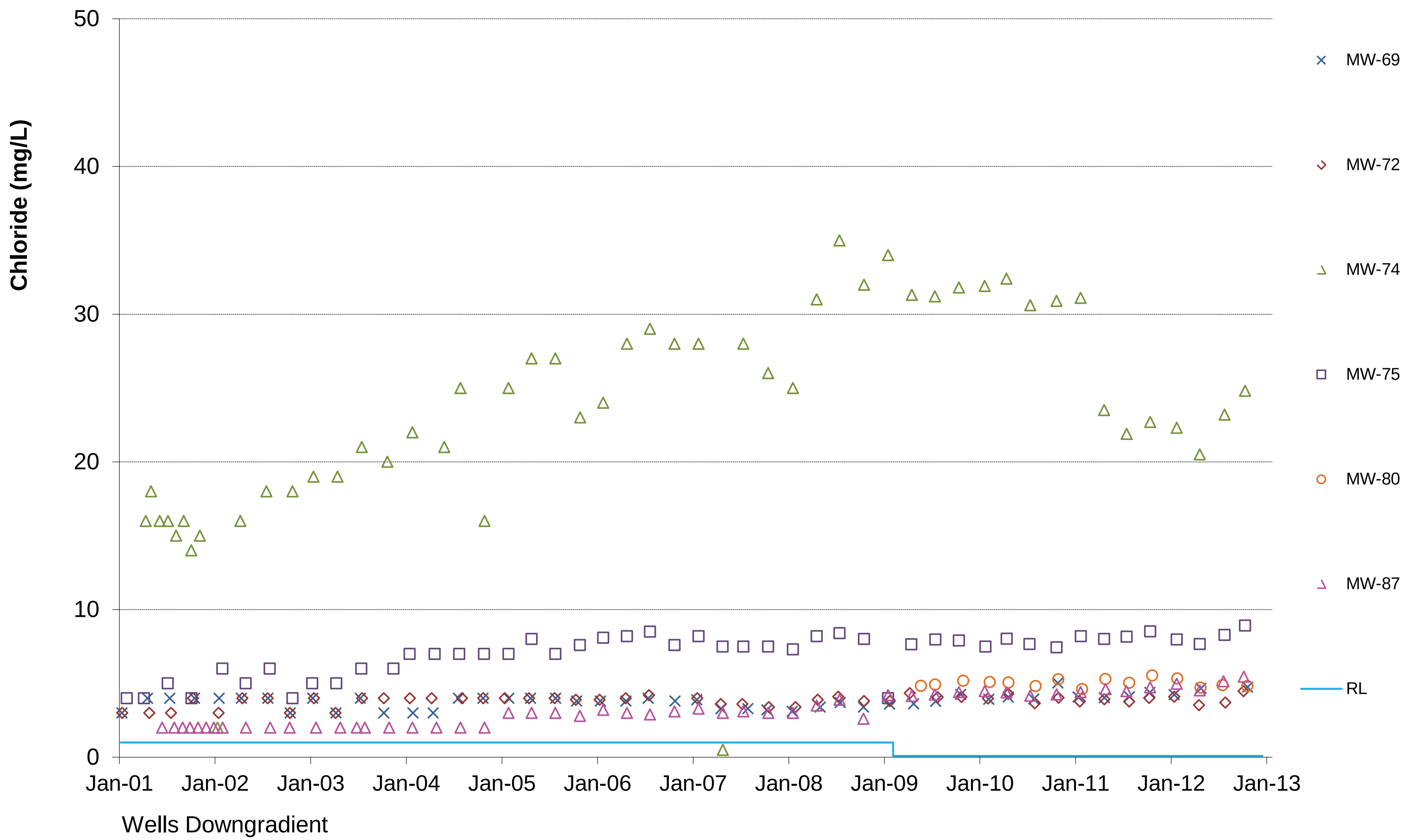
Wells Upgradient South


Chloride (mg/L)
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
MW-24
MW-58A
MW-59
MW-65
MW-83
MW-60
RL
Wells Upgradient South

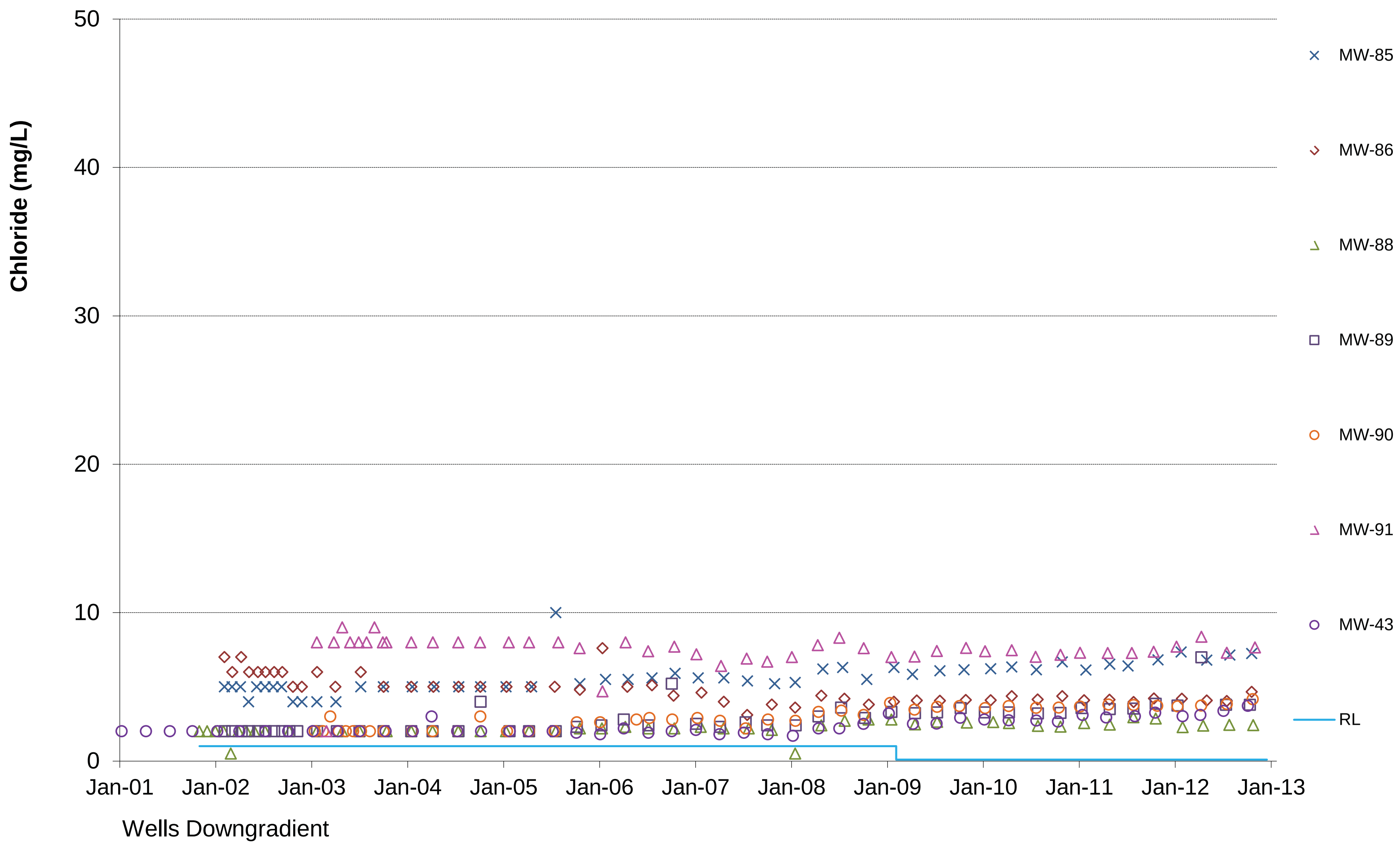

Chloride (mg/L)
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient
MW-21
MW-73
MW-84
MW-81
MW-99
MW-93
MW-95
RL

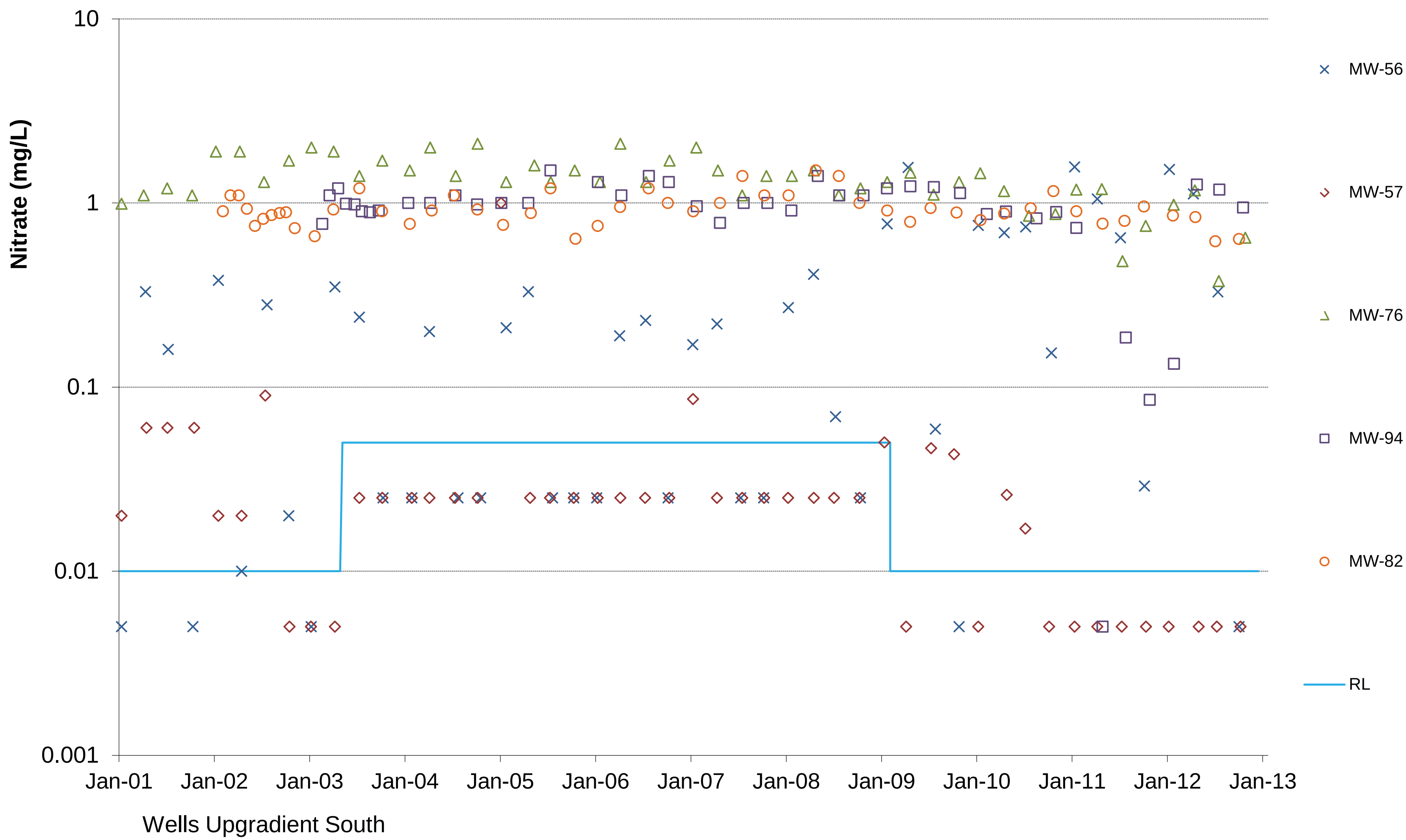


Wells Vertical to Key Facilities and Interior to Landfill Footprint

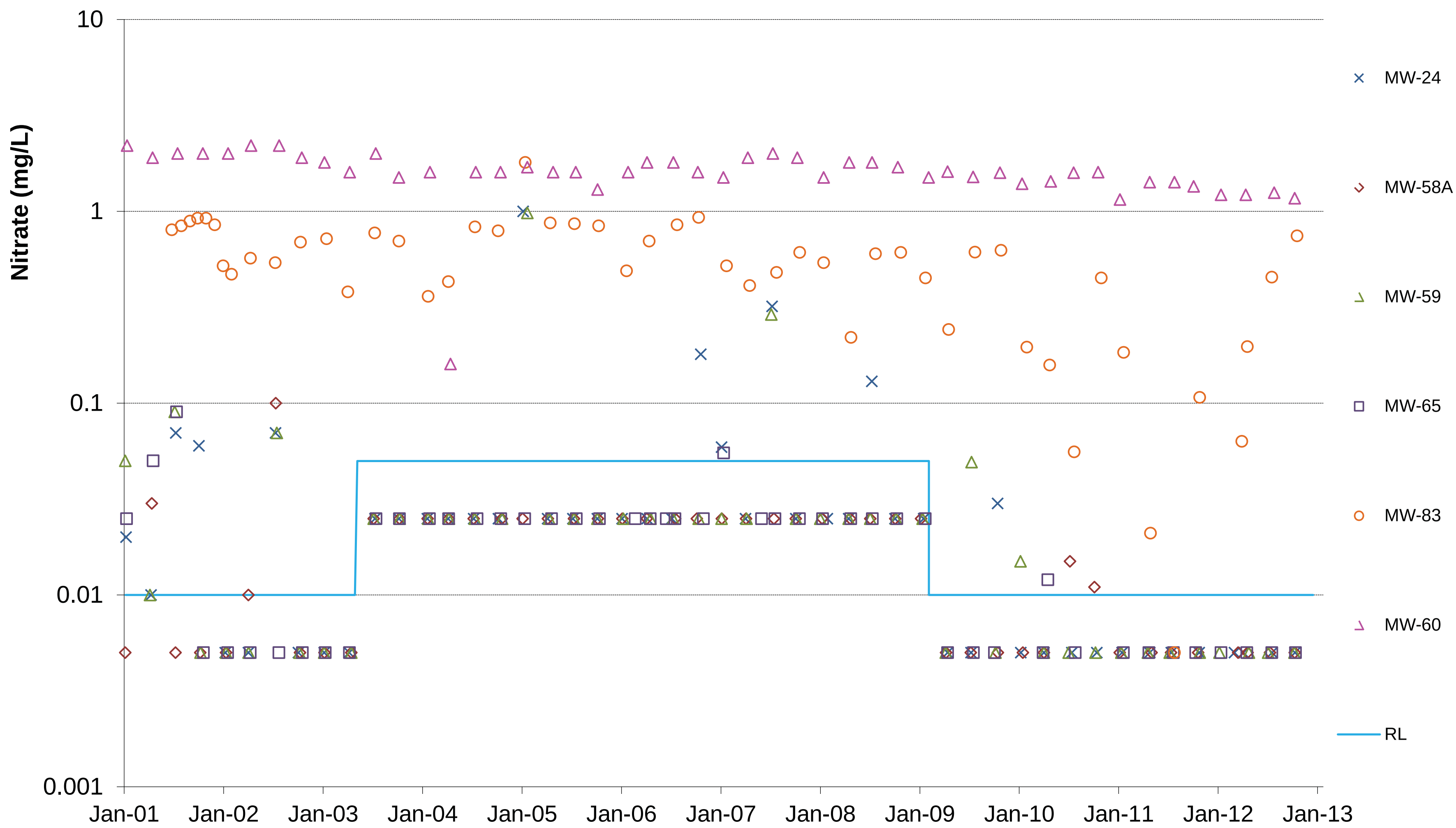


Chloride (mg/L)
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL

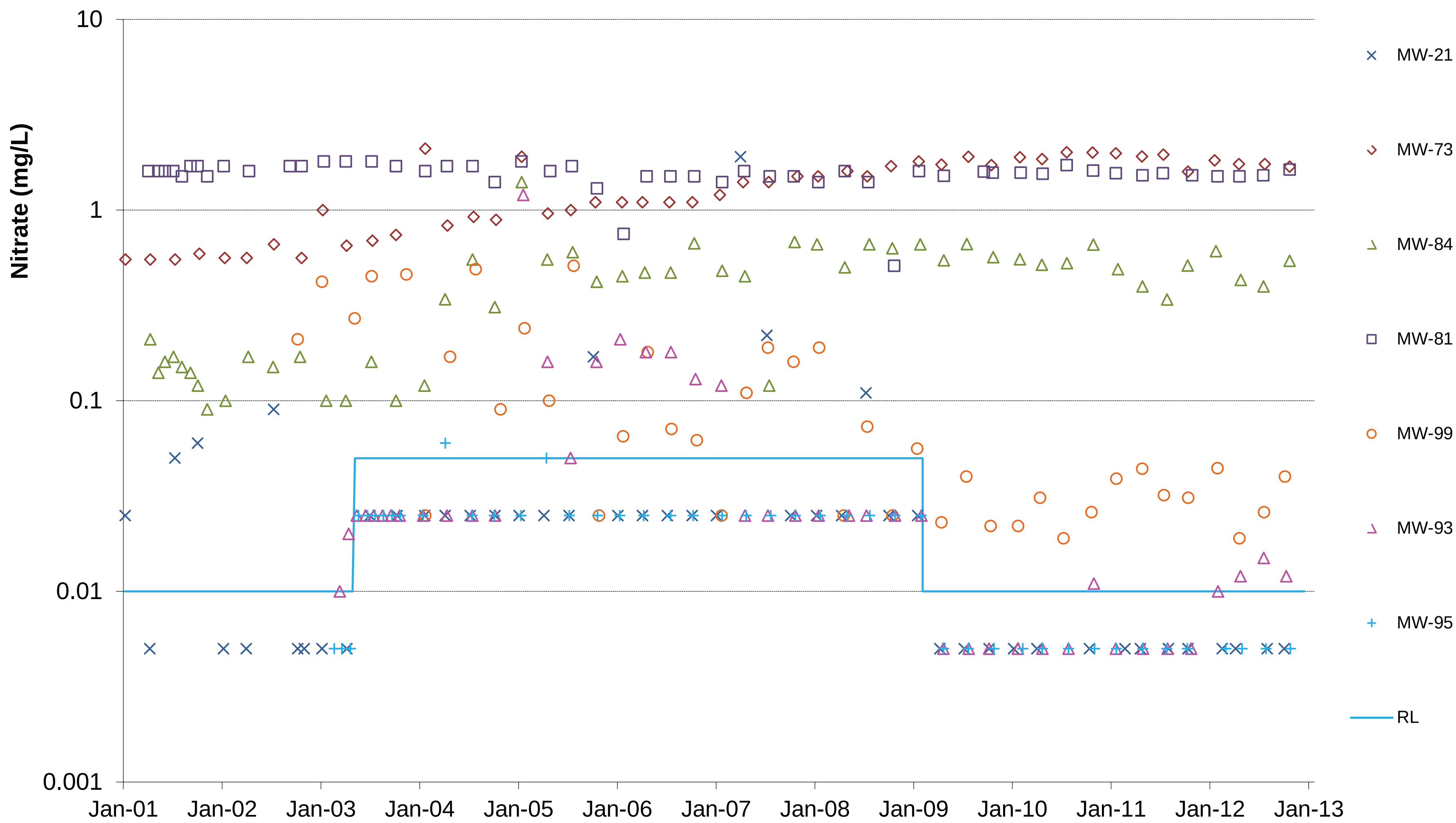

Chloride (mg/L)
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL



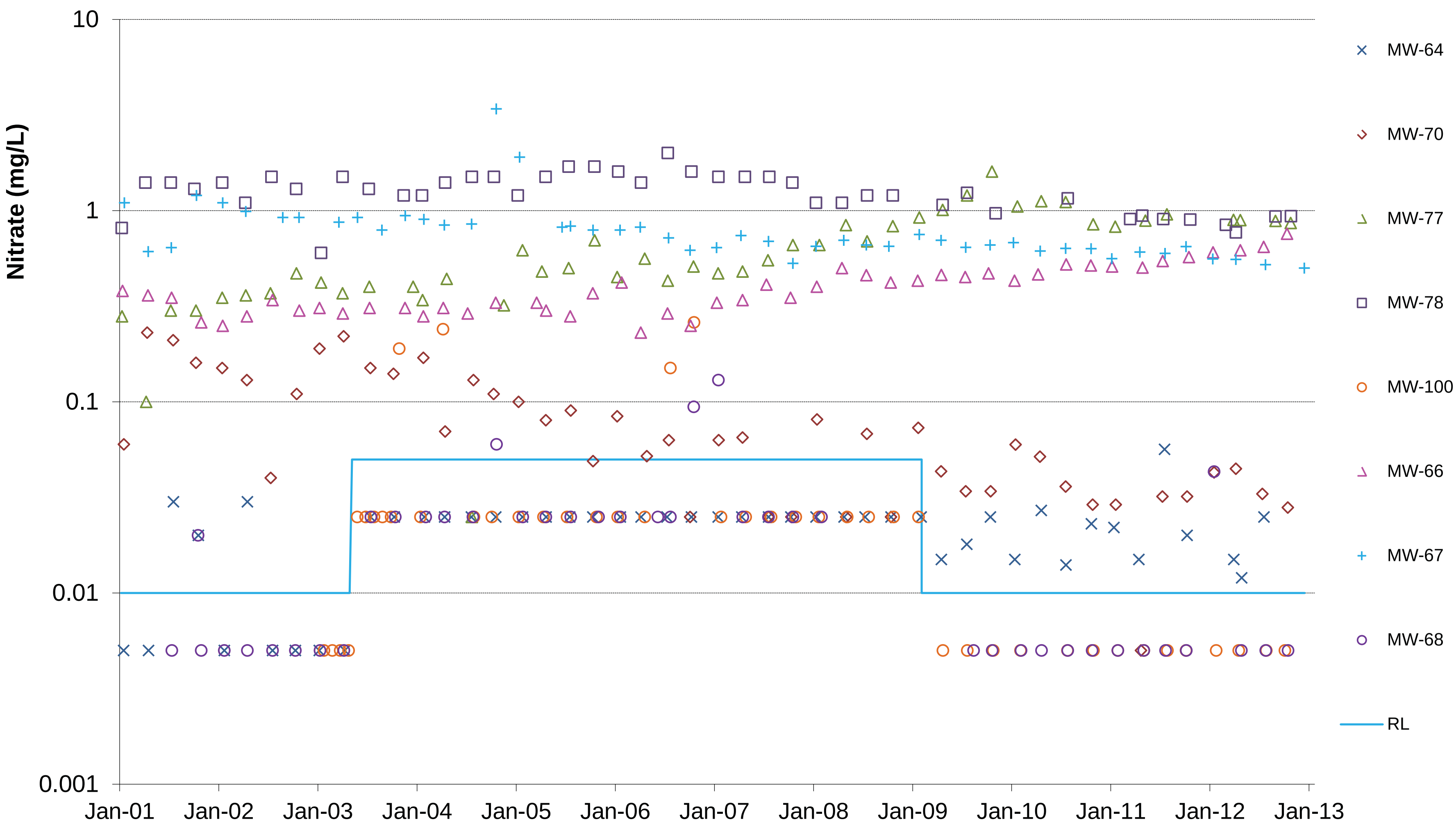
Nitrate (mg/L)
10
1
0.1
0.01
0.001
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-56
MW-57
MW-76
MW-94
MW-82
RL



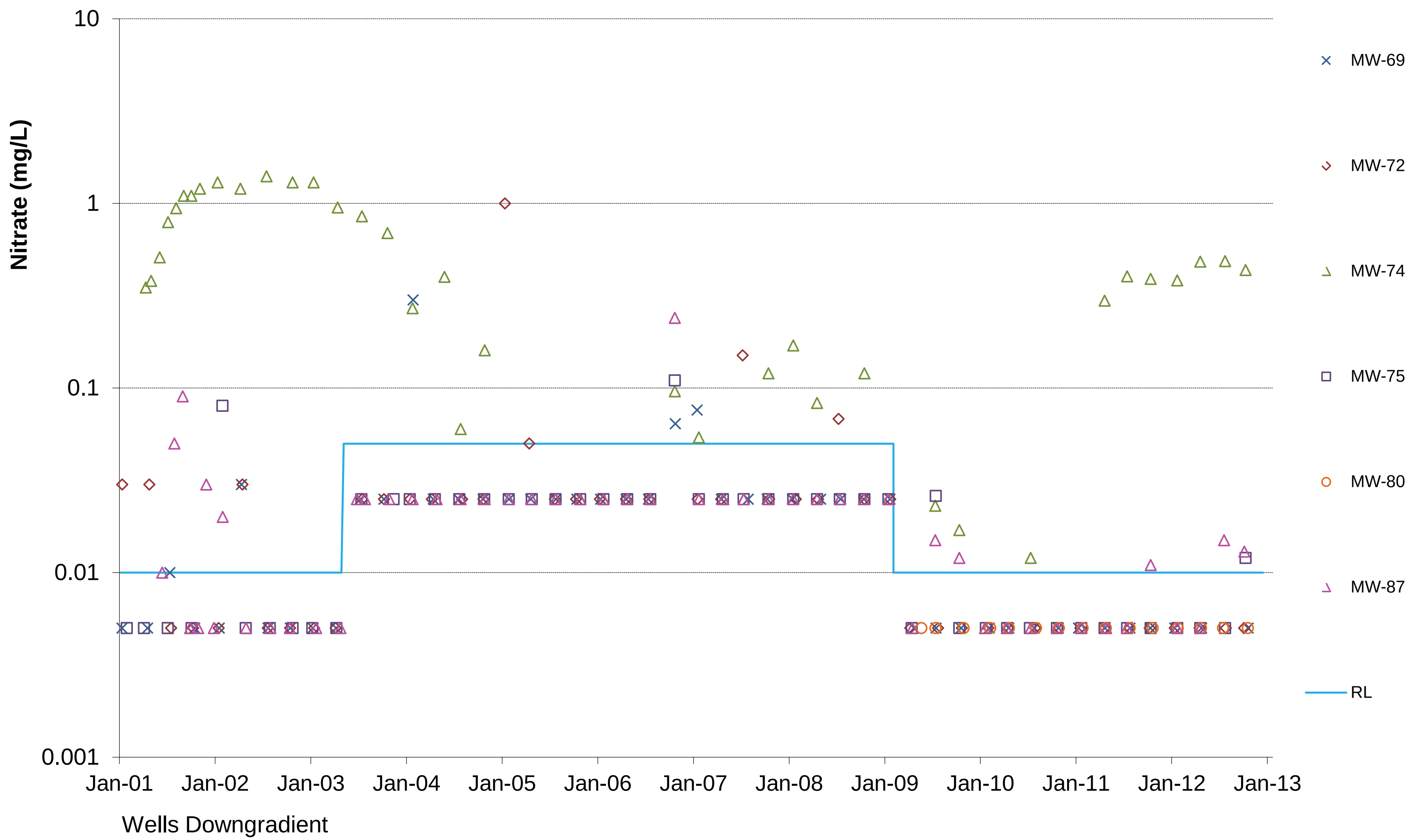
Wells Upgradient South

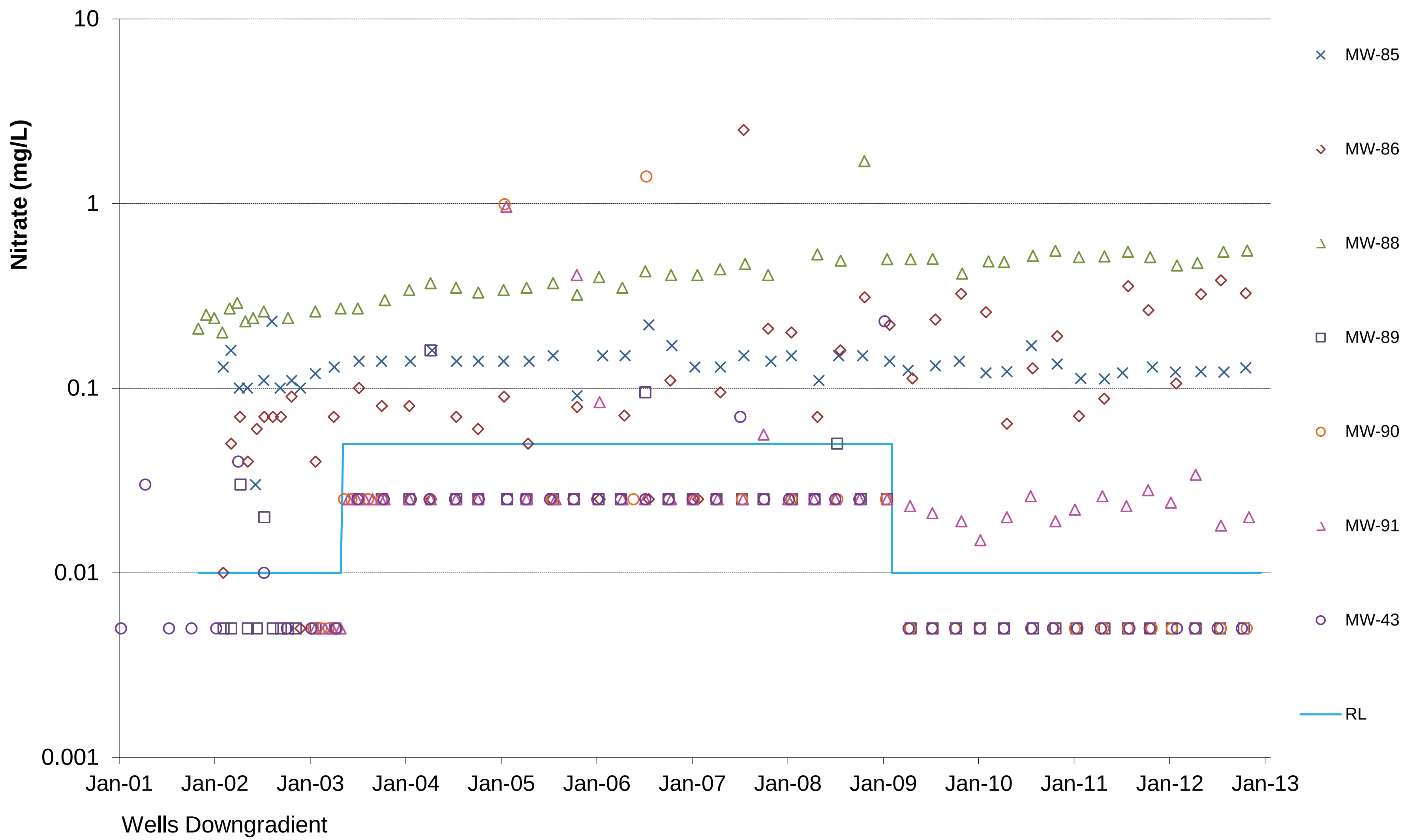


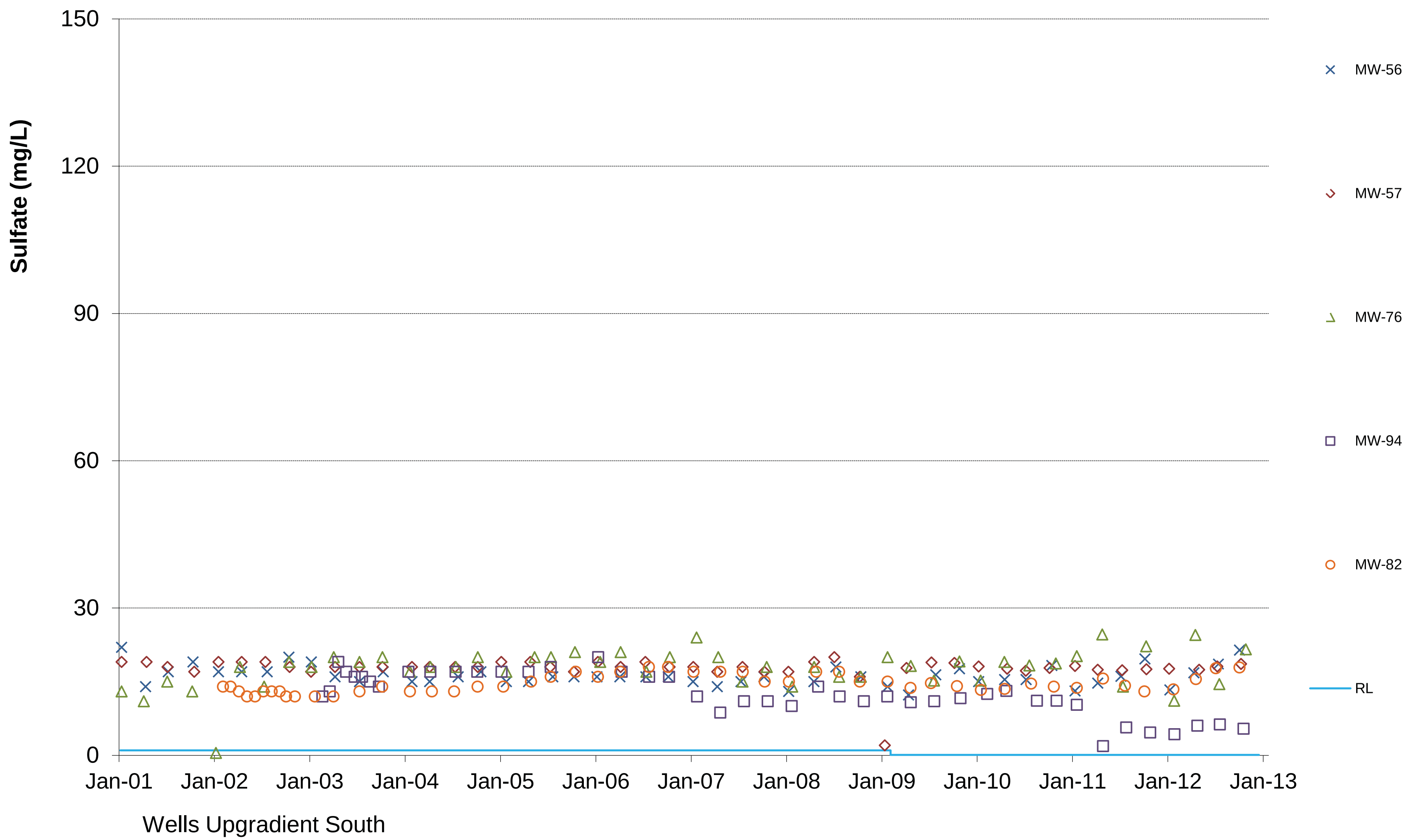
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient



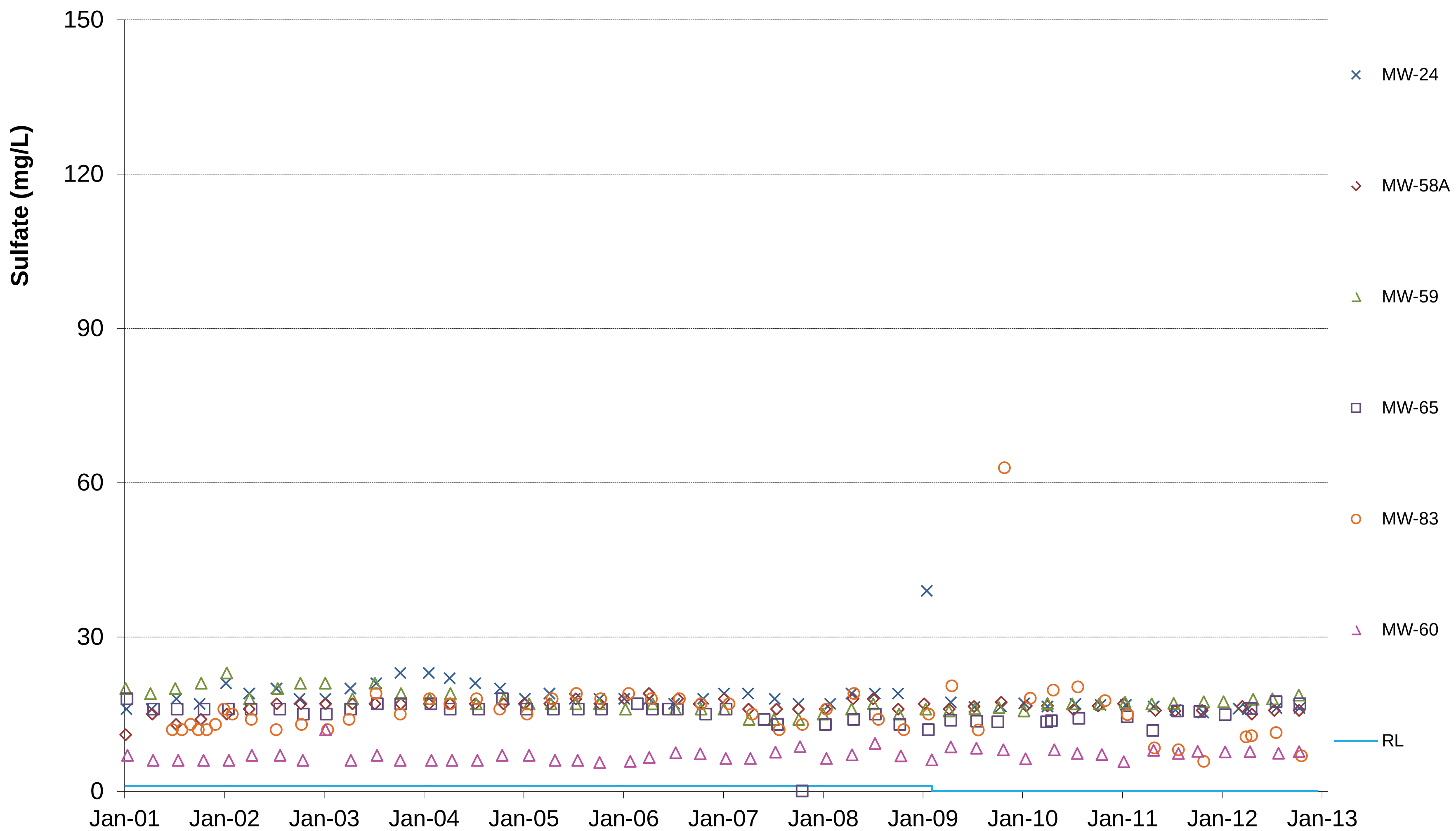
Wells Vertical to Key Facilities and Interior to Landfill Footprint


Nitrate (mg/L)
10
1
0.1
0.01
0.001
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL

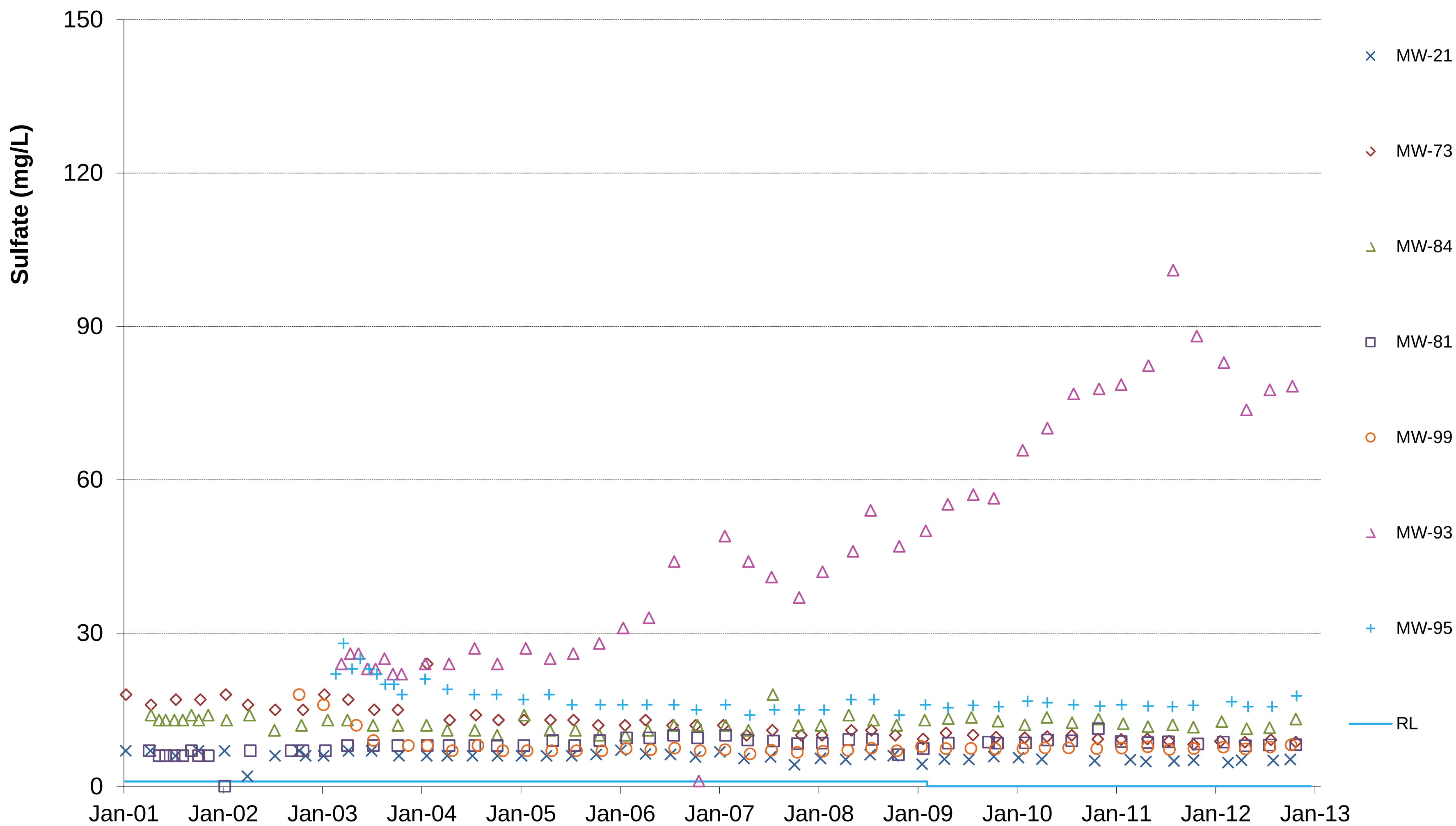

Nitrate (mg/L)
10
1
0.1
0.01
0.001
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL



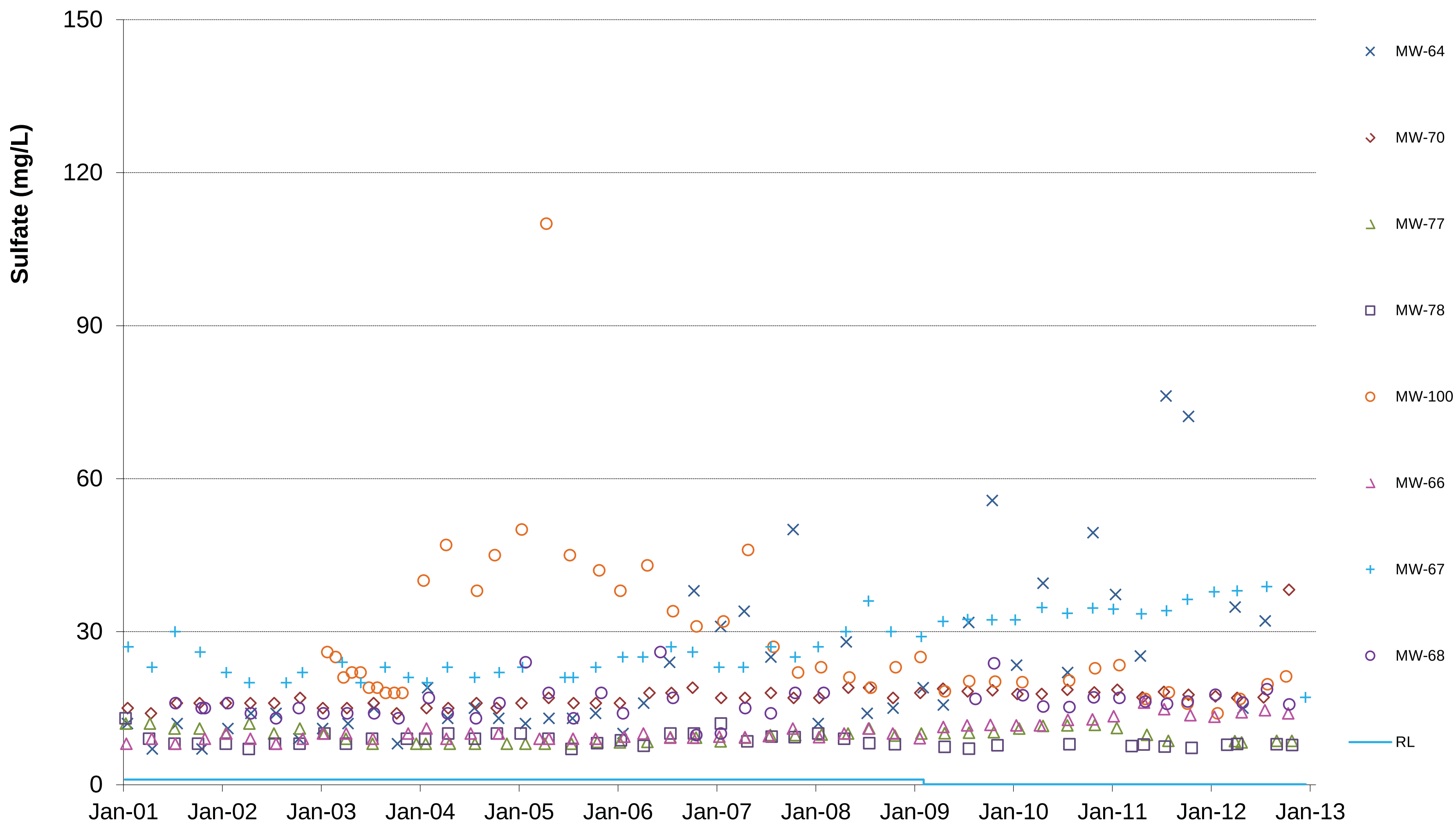
Sulfate (mg/L)
150
120
90
60
30
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-56
MW-57
MW-76
MW-94
MW-82
RL



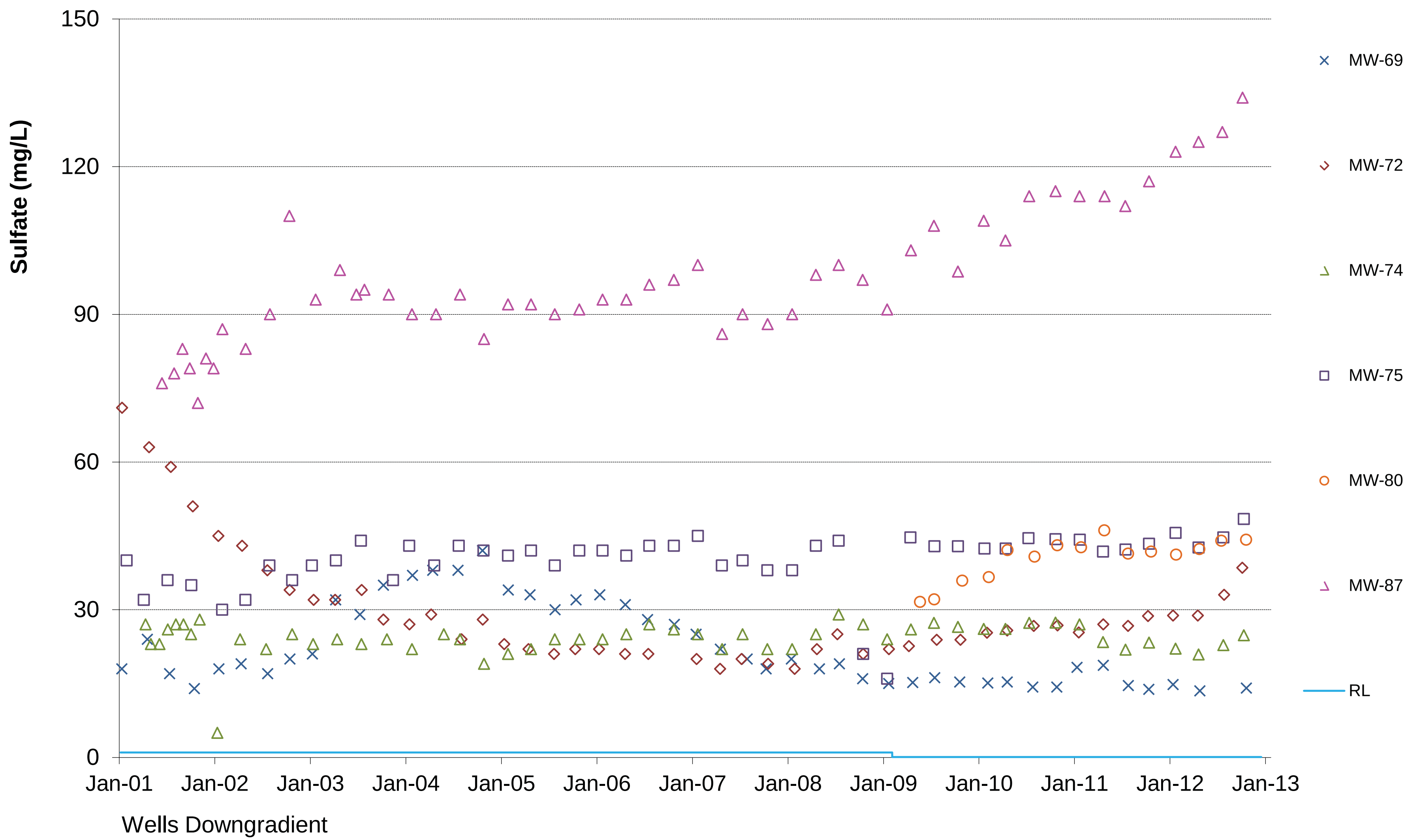
Wells Upgradient South



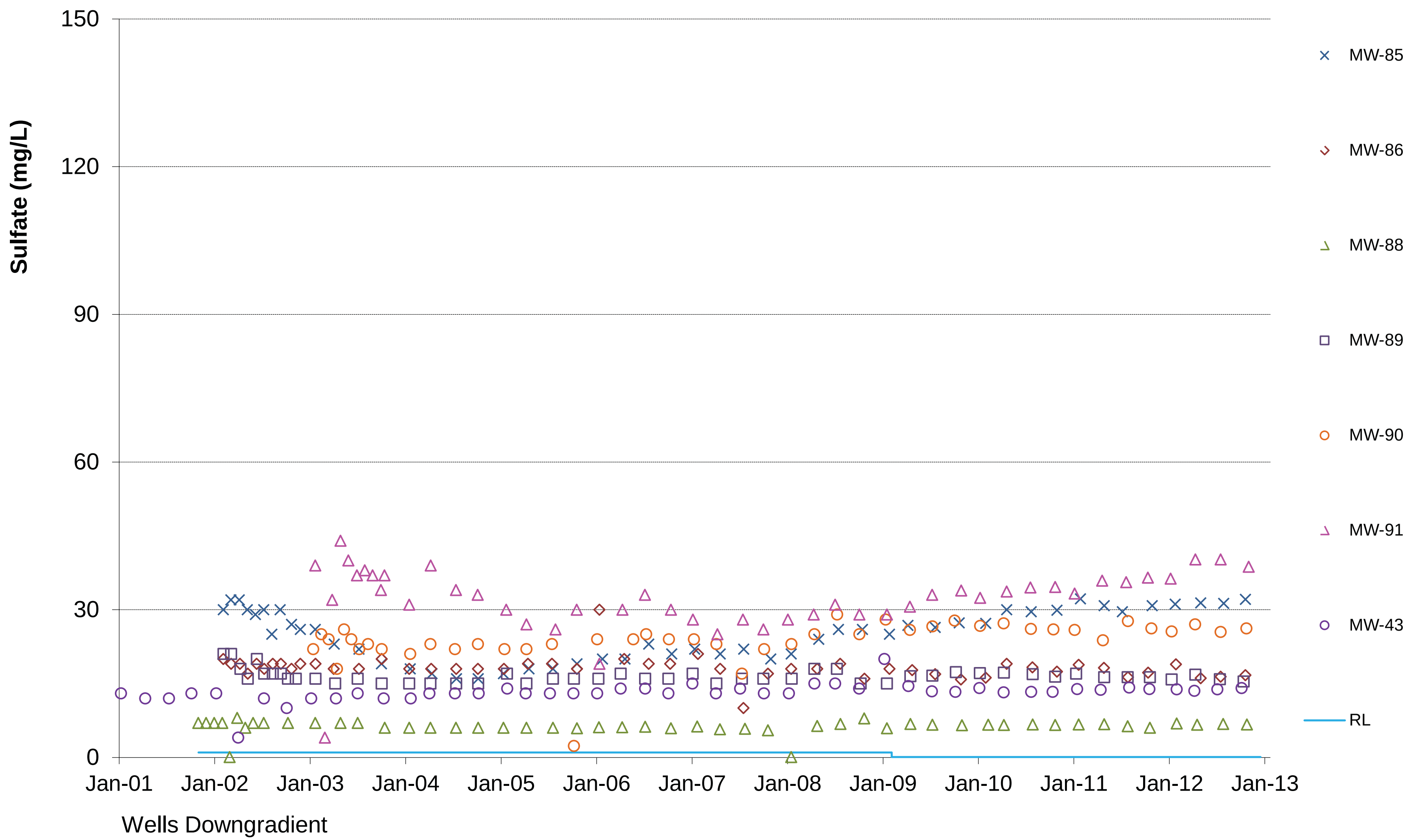
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient

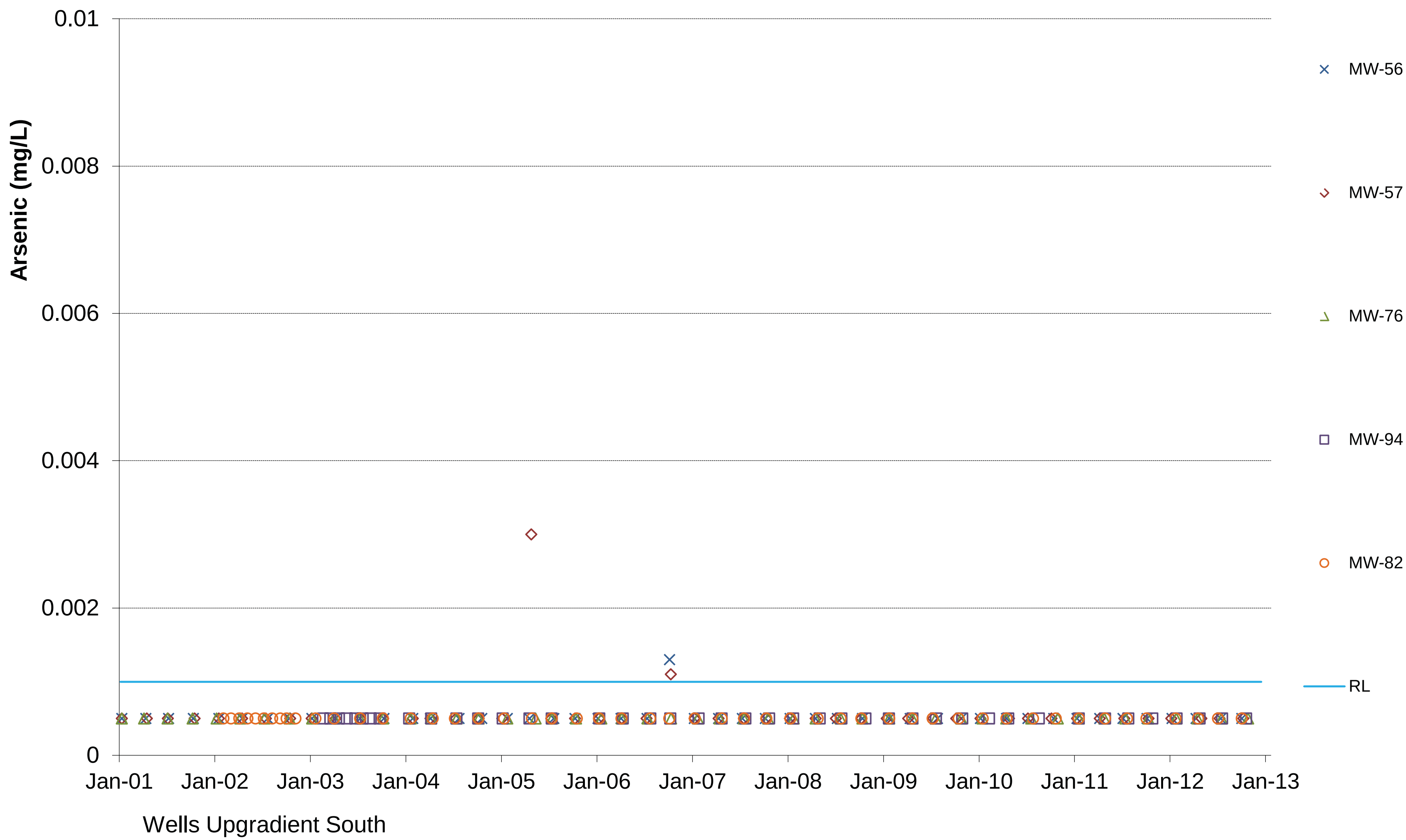


Wells Vertical to Key Facilities and Interior to Landfill Footprint

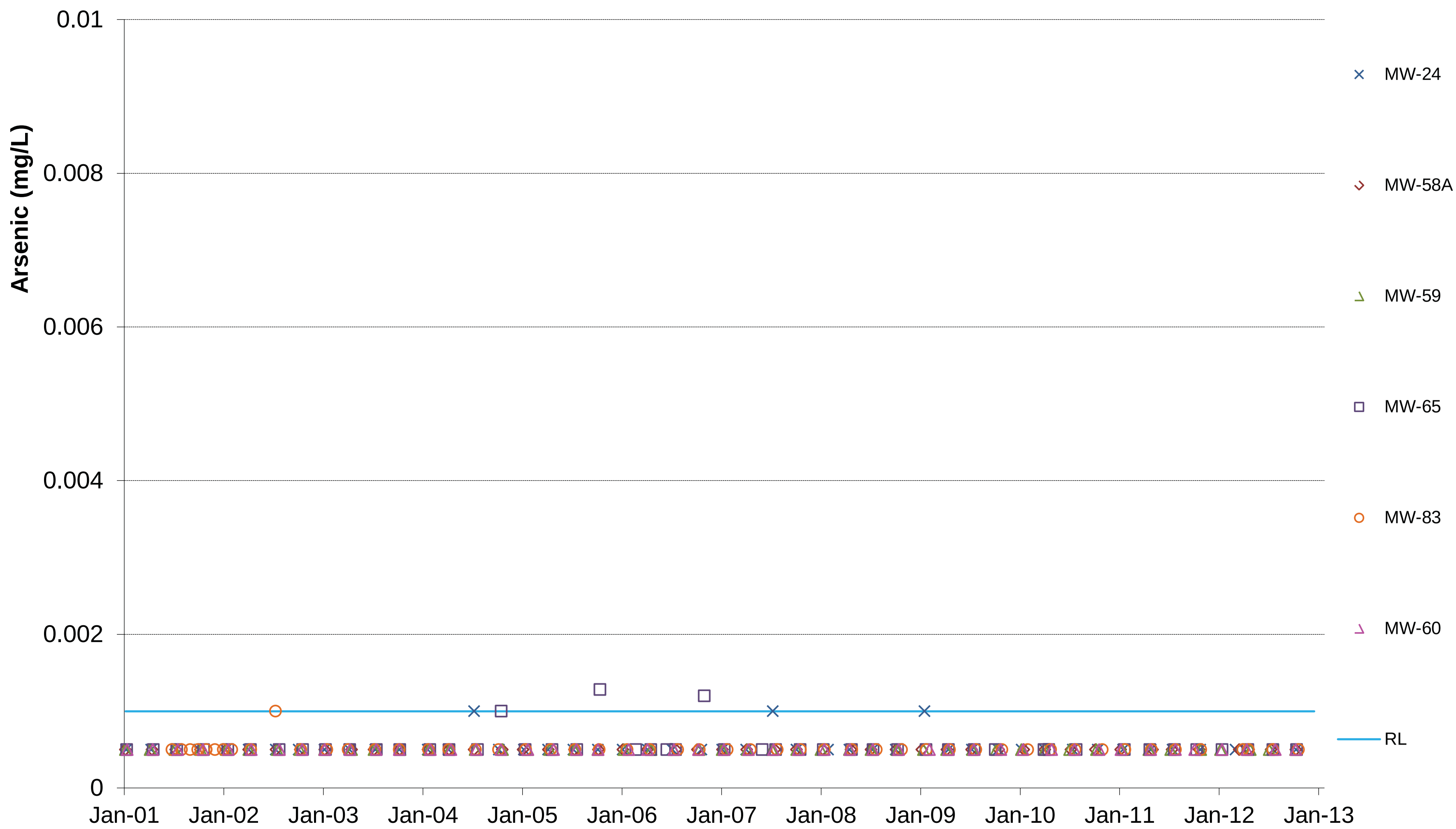


Sulfate (mg/L)
150
120
90
60
30
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL

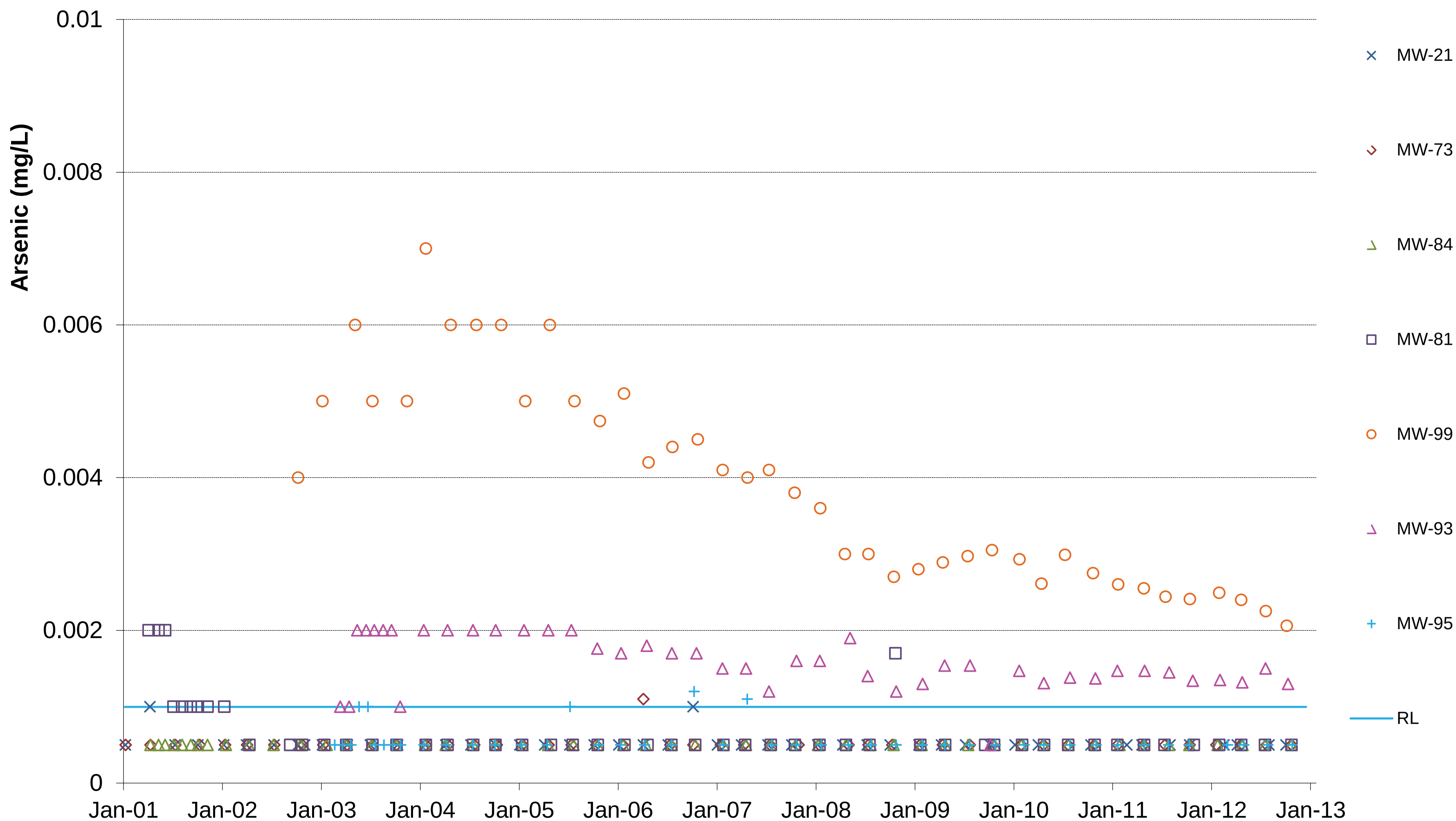

Sulfate (mg/L)
150
120
90
60
30
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL



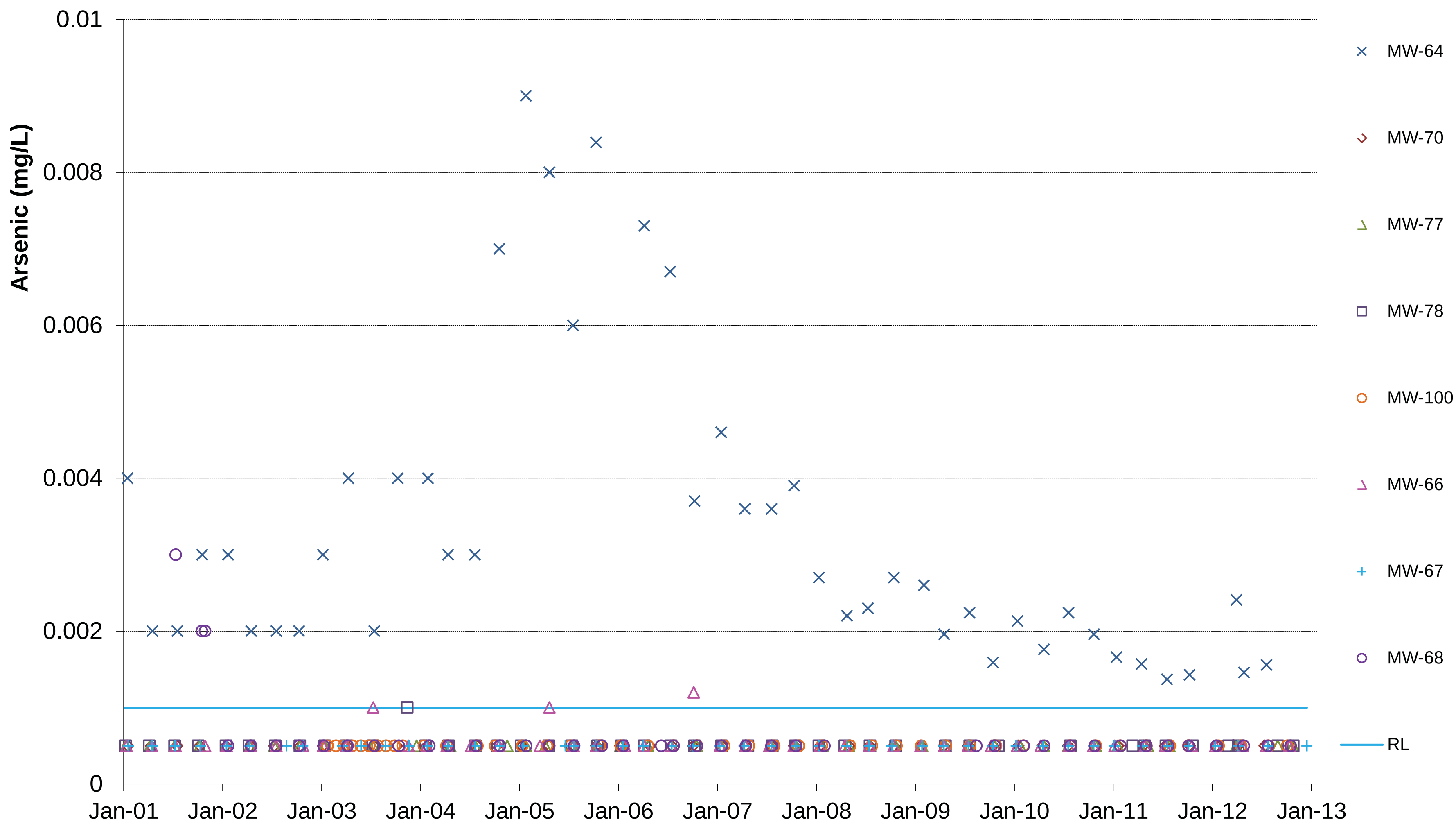
Arsenic (mg/L)
0.01
0.008
0.006
0.004
0.002
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-56
MW-57
MW-76
MW-94
MW-82
RL



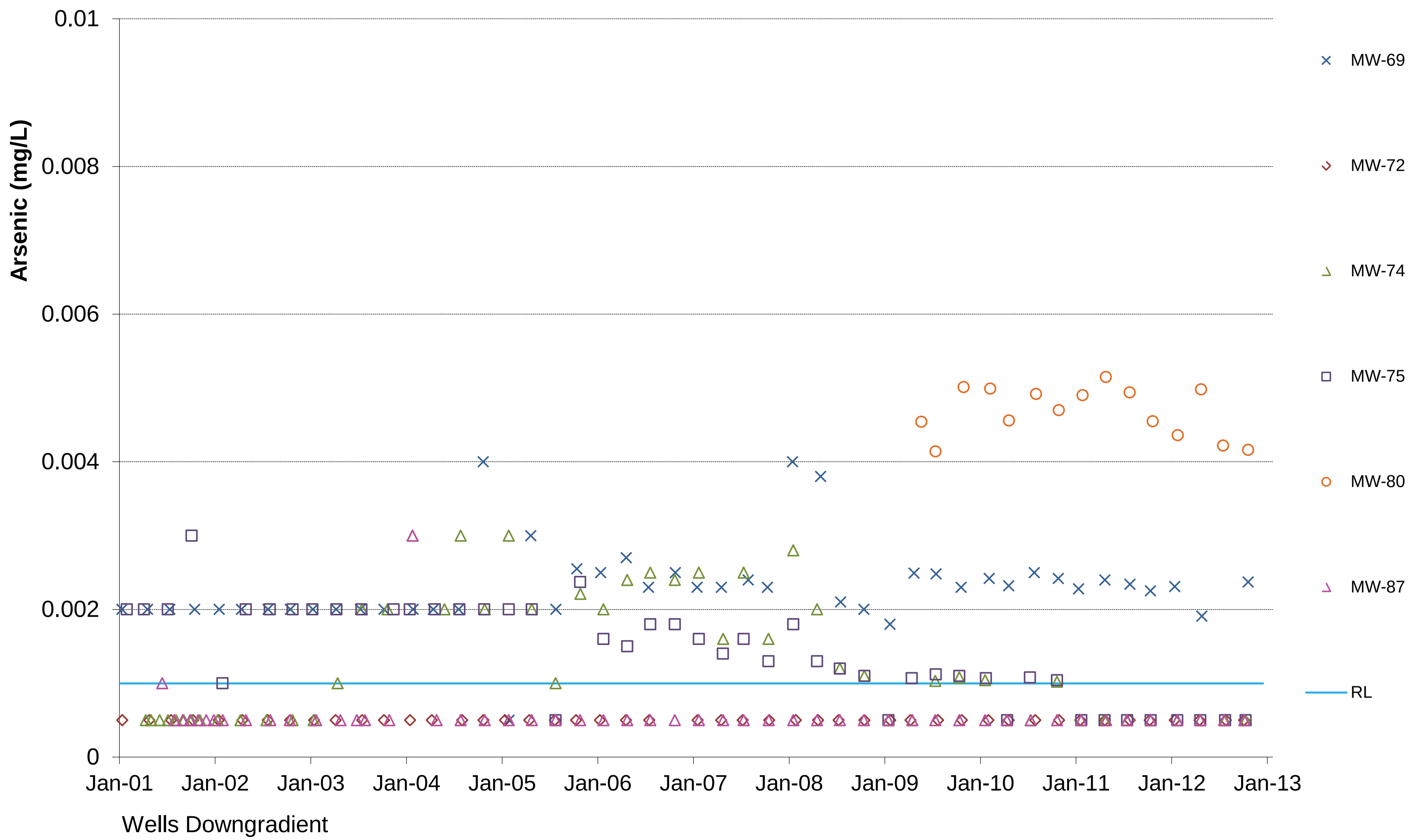
Wells Upgradient South



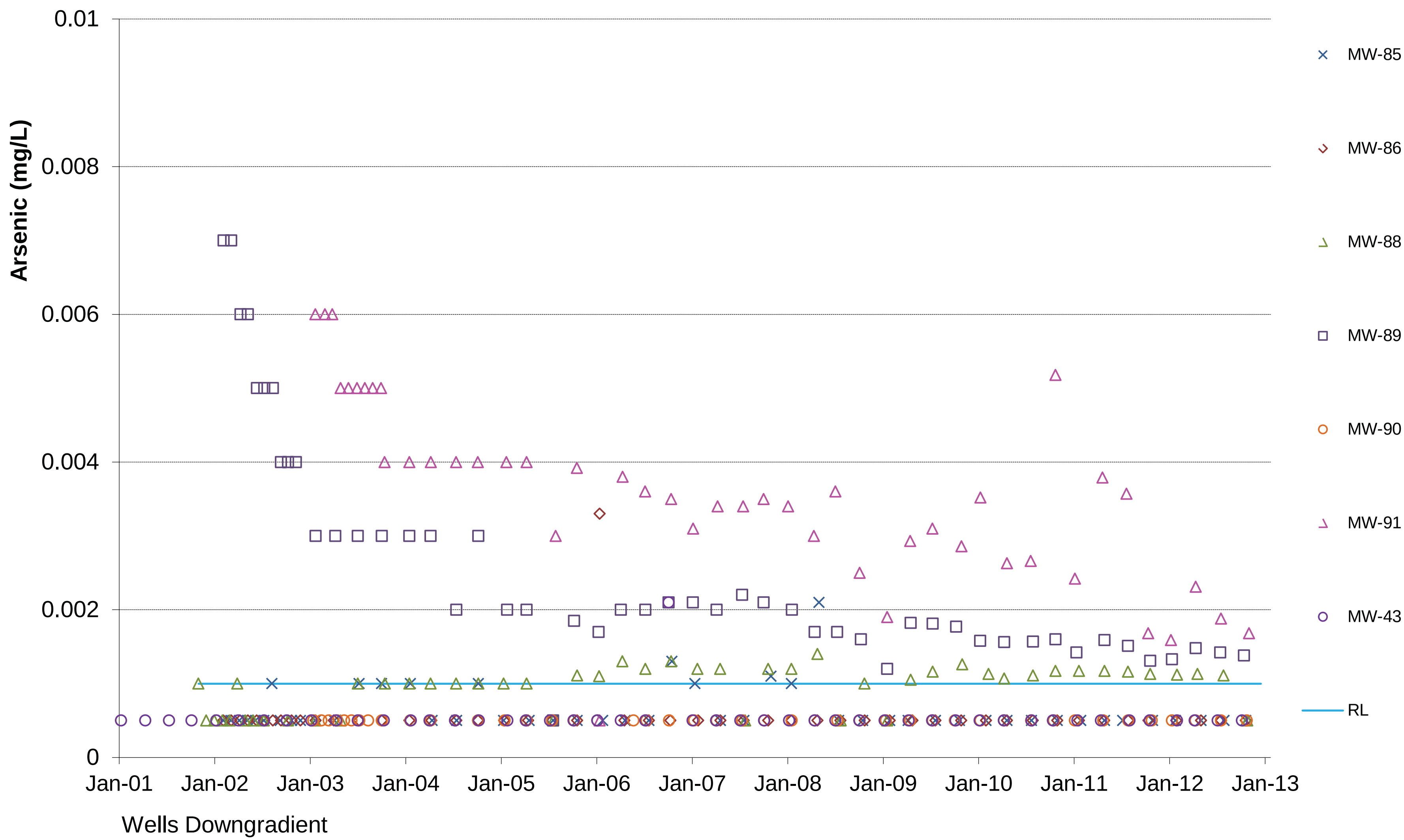
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient

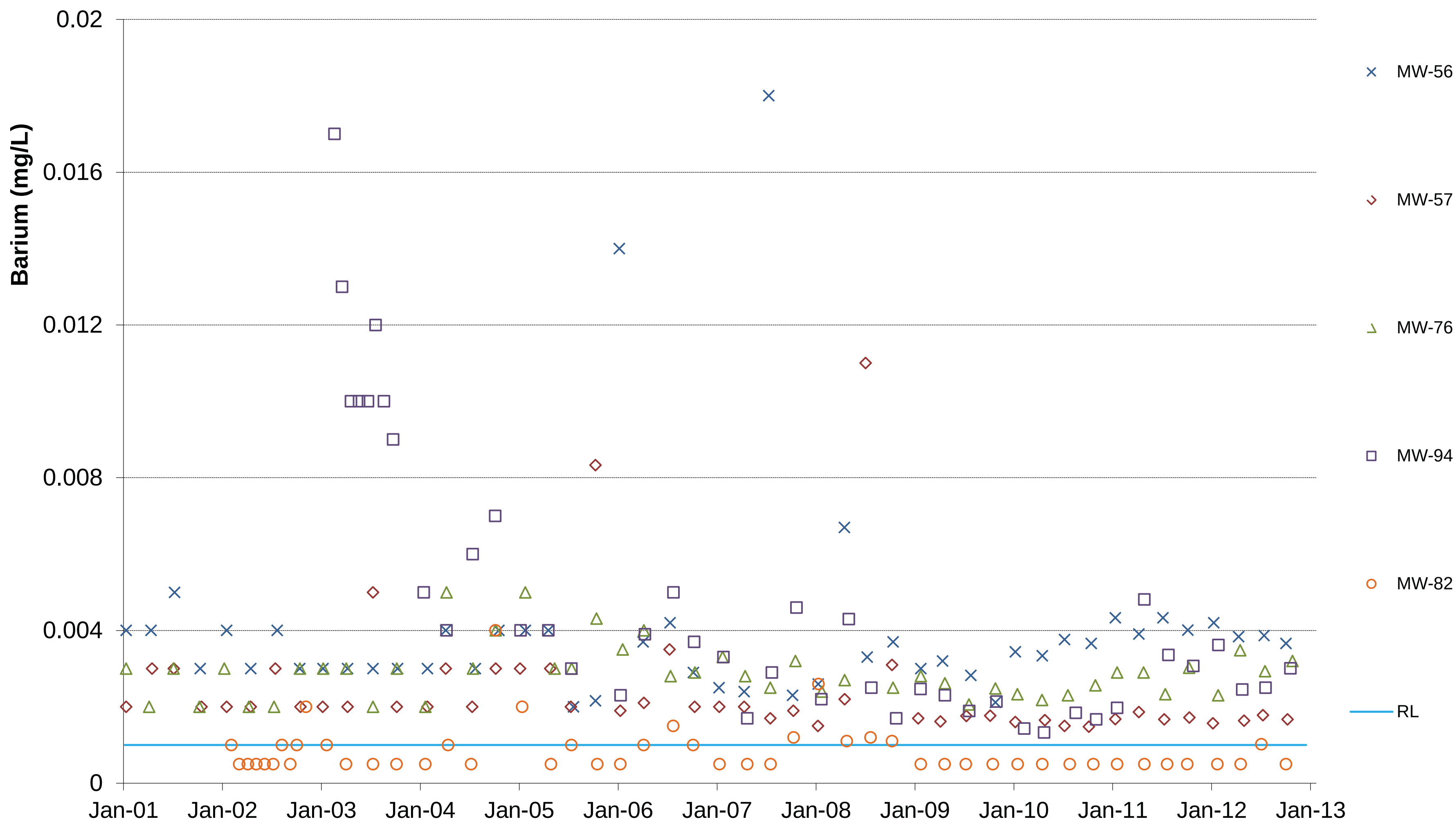


Wells Vertical to Key Facilities and Interior to Landfill Footprint

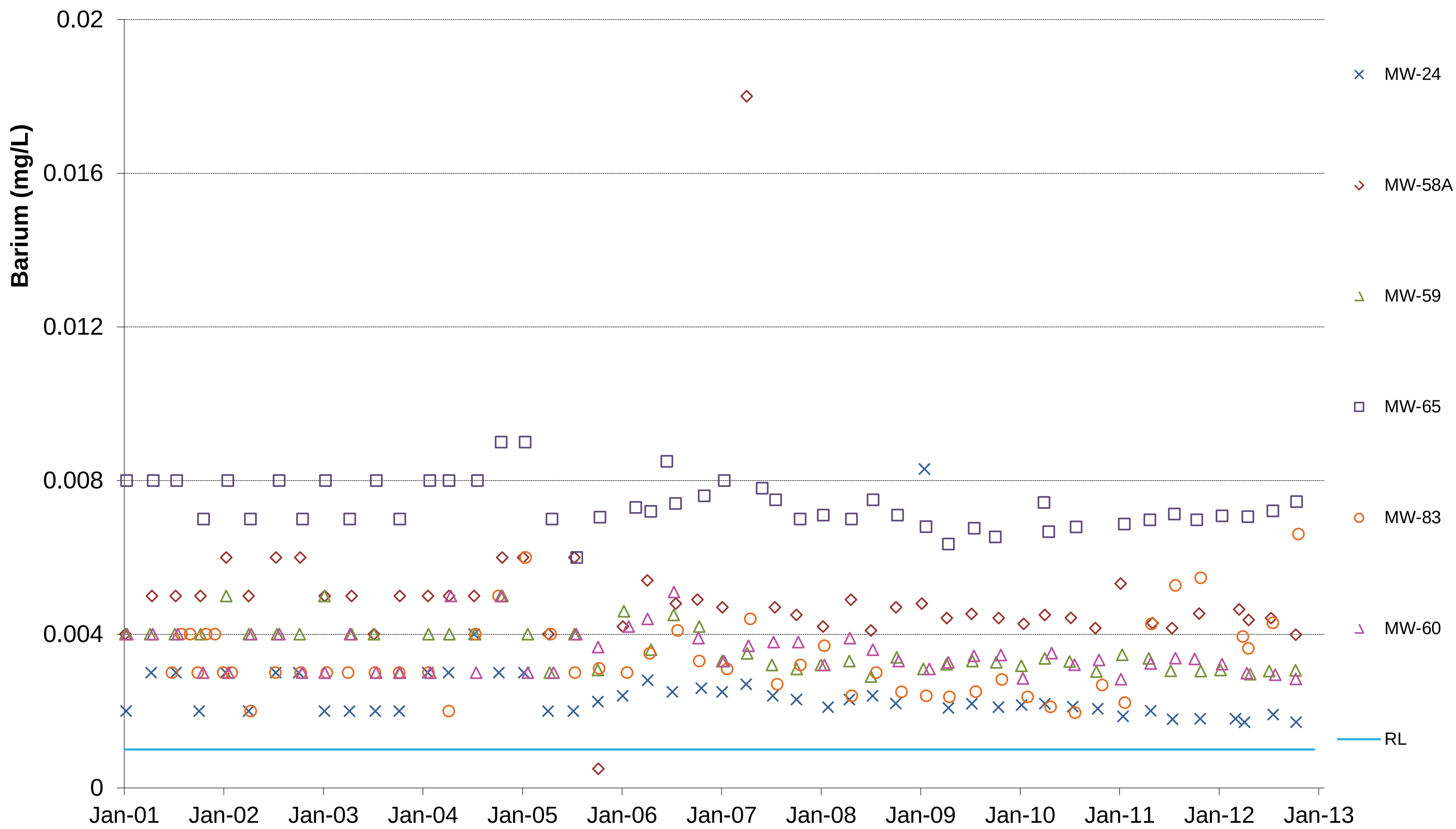


Arsenic (mg/L)
0.01
0.008
0.006
0.004
0.002
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL

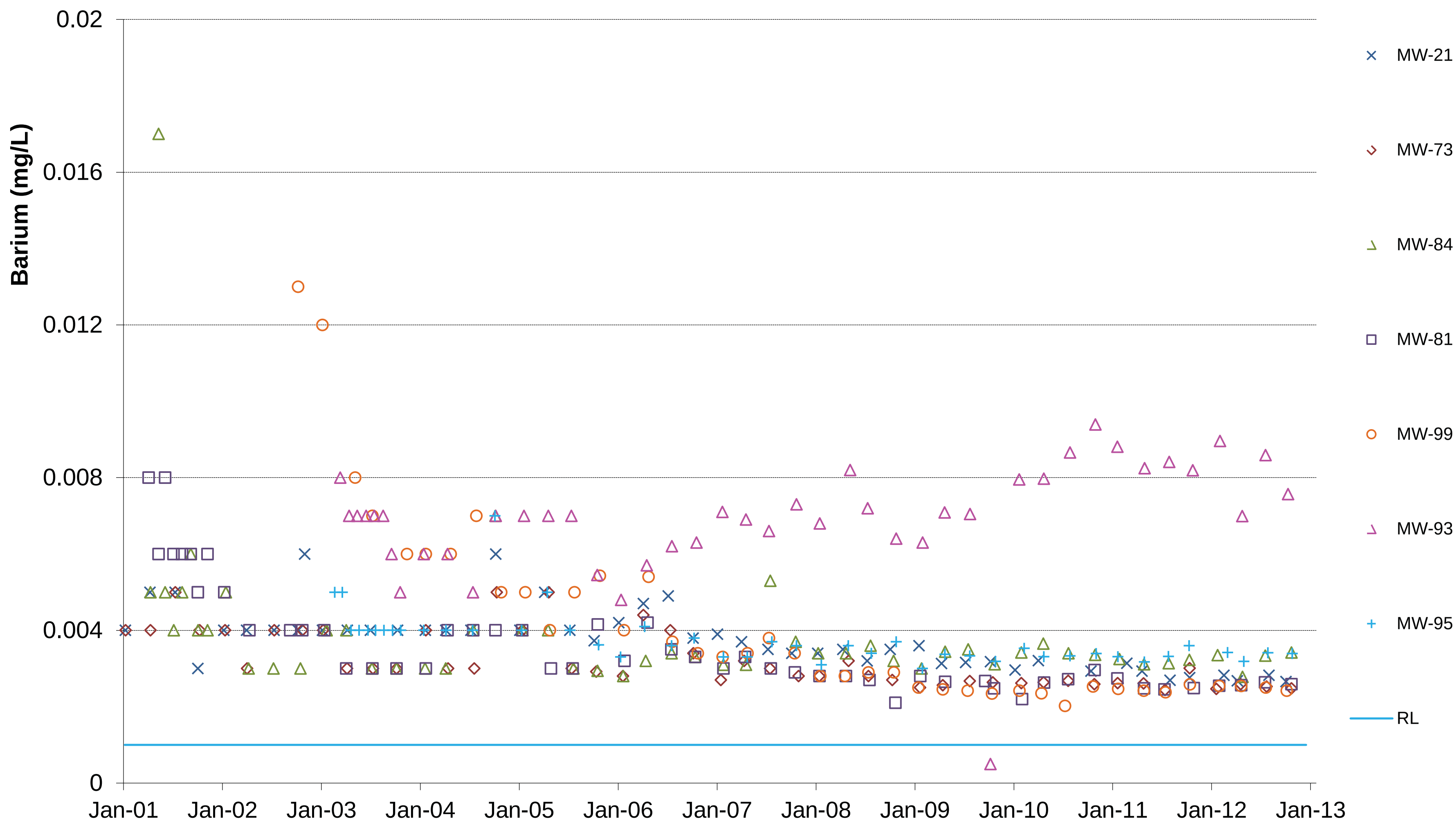

Arsenic (mg/L)
0.01
0.008
0.006
0.004
0.002
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL



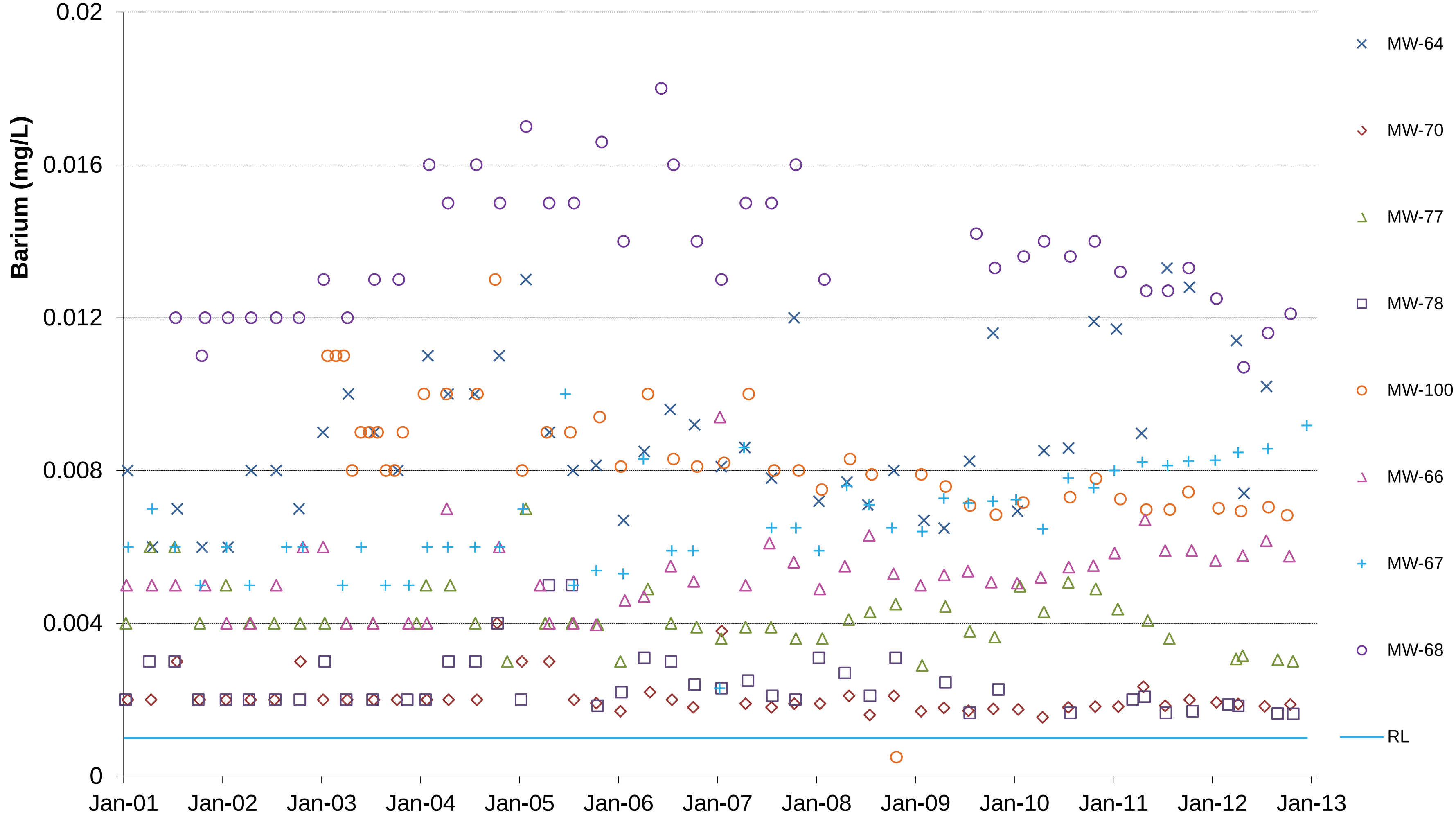
Wells Upgradient South



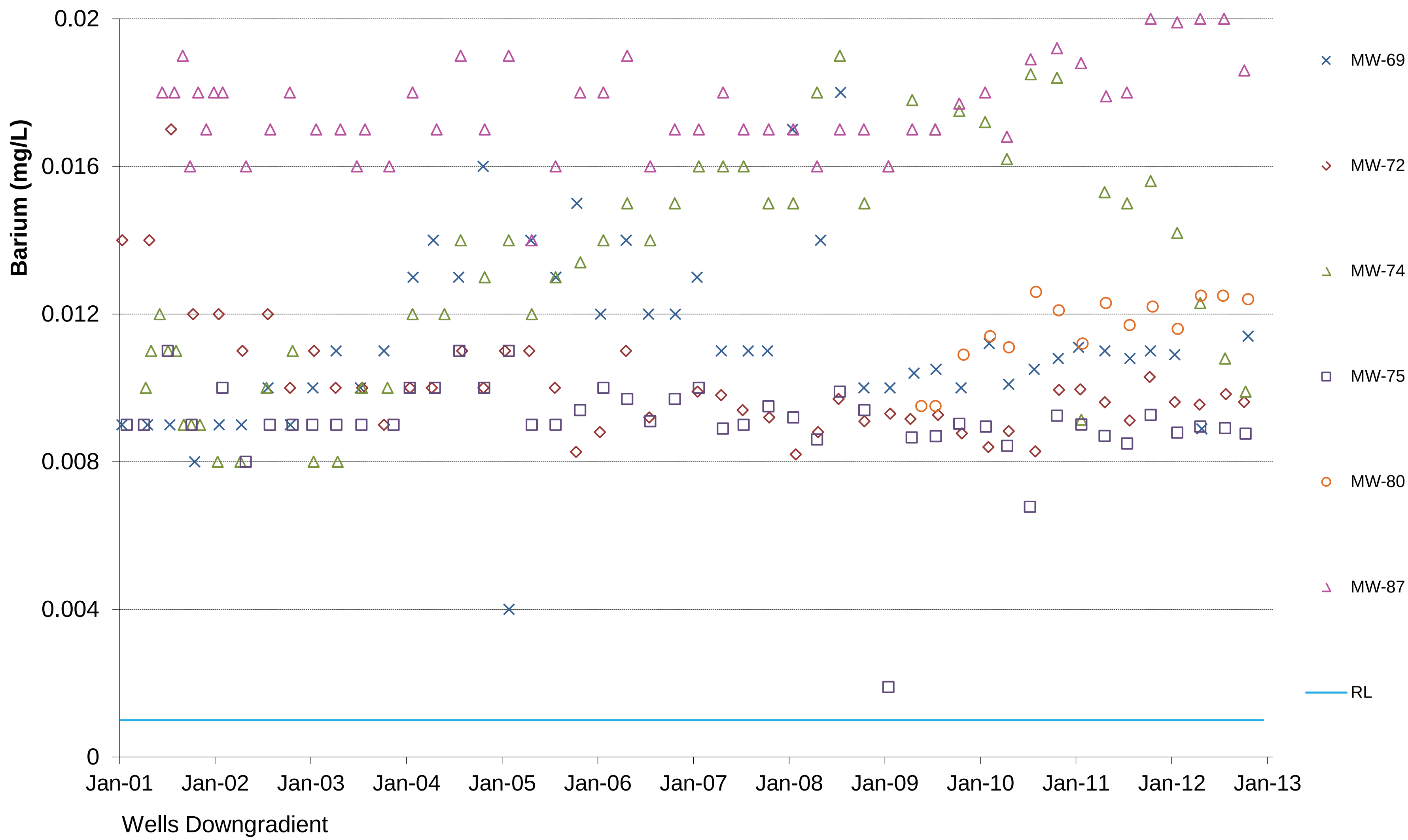
Wells Upgradient South



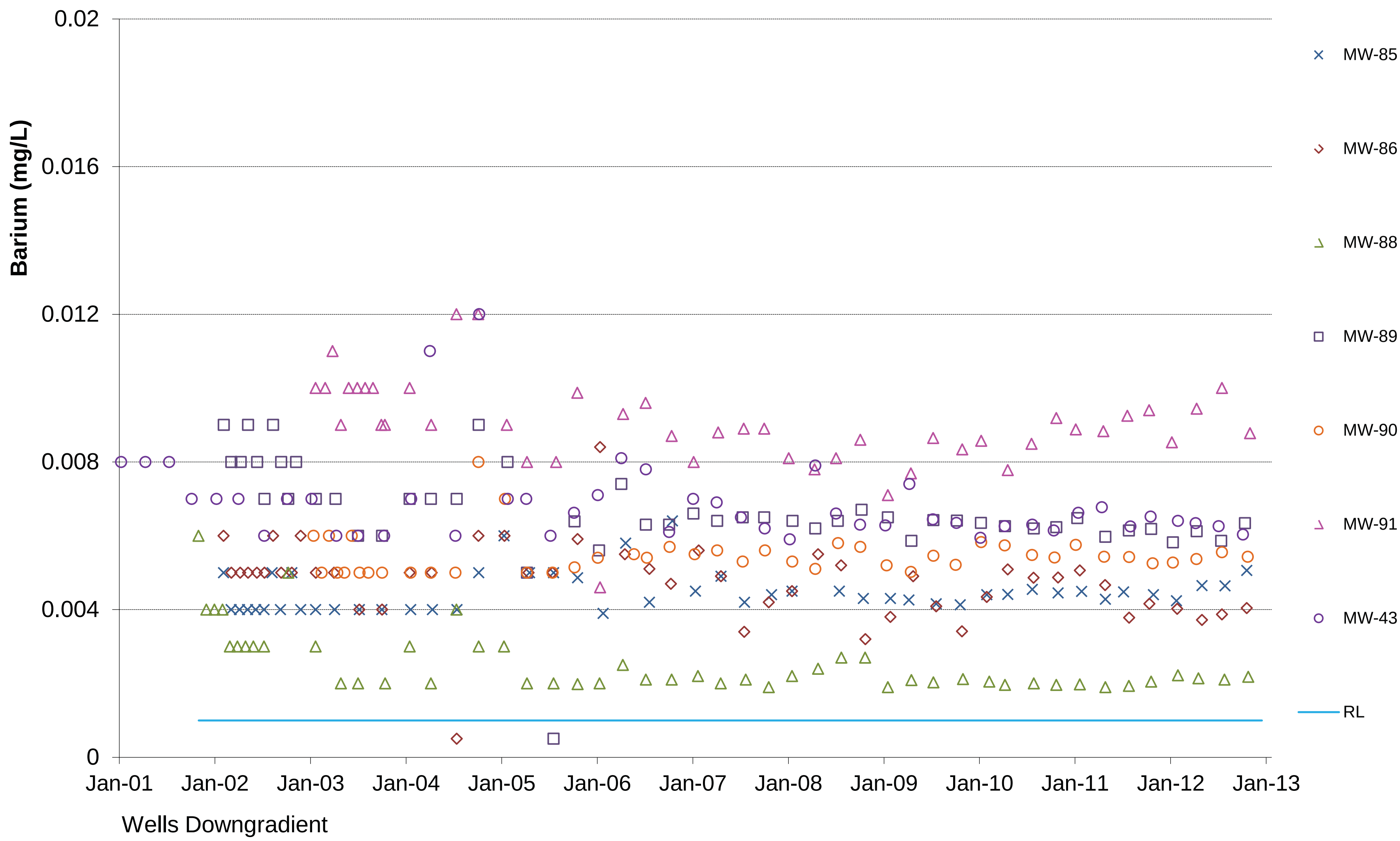
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient

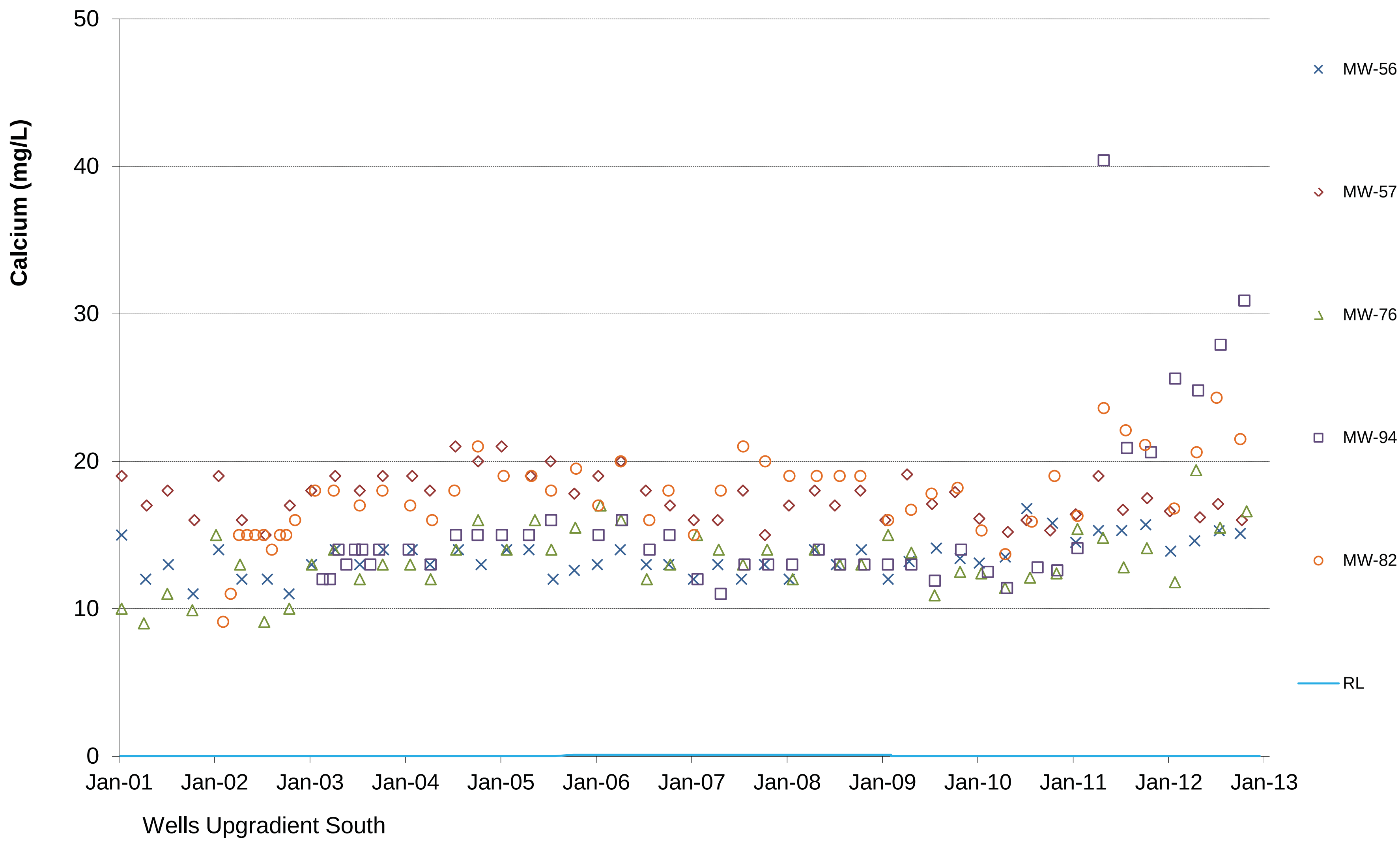


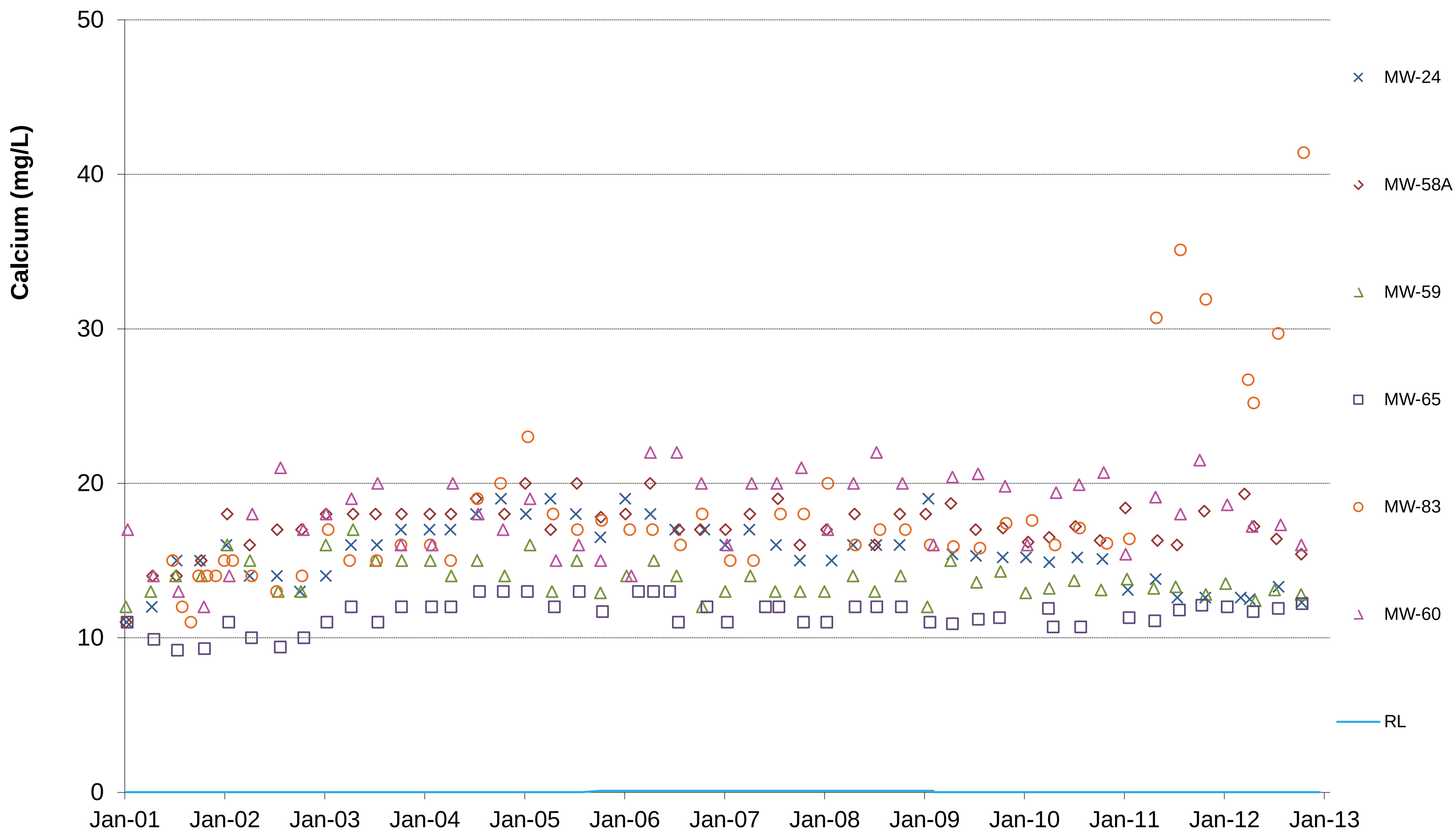
Wells Vertical to Key Facilities and Interior to Landfill Footprint



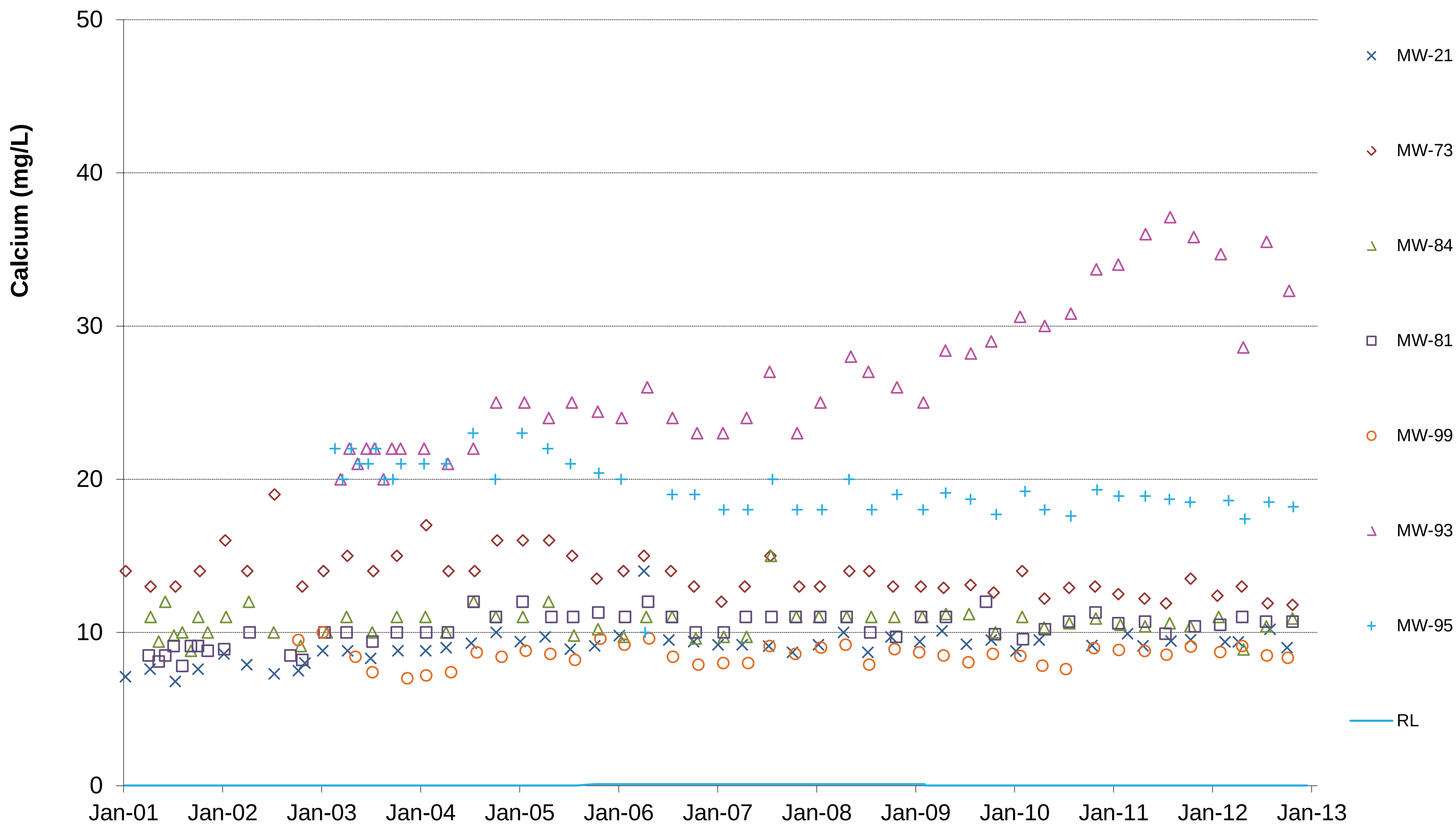
Barium (mg/L)
0.02
0.016
0.012
0.008
0.004
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL


Barium (mg/L)
0.02
0.016
0.012
0.008
0.004
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL

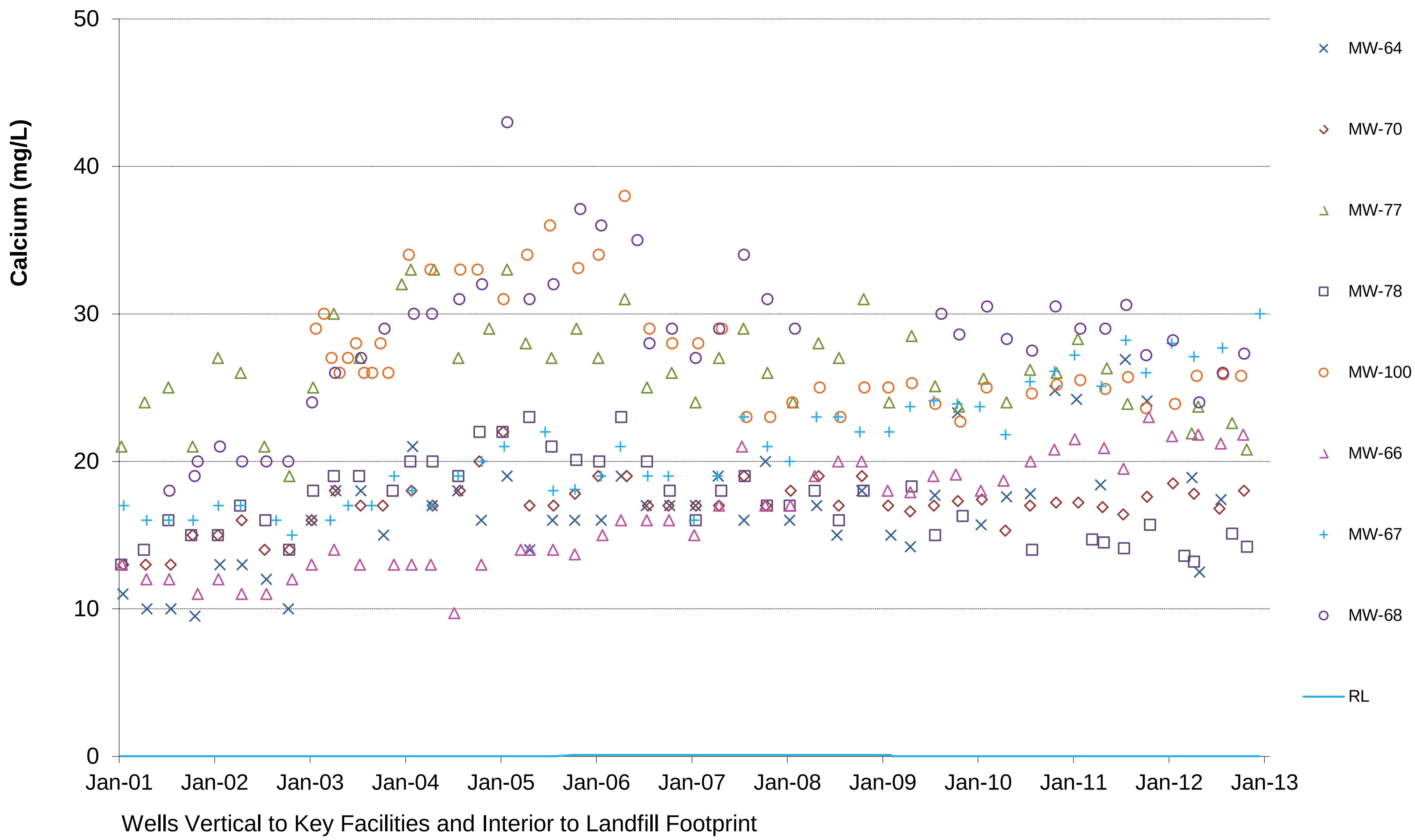

Calcium (mg/L)
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-56
MW-57
MW-76
MW-94
MW-82
RL

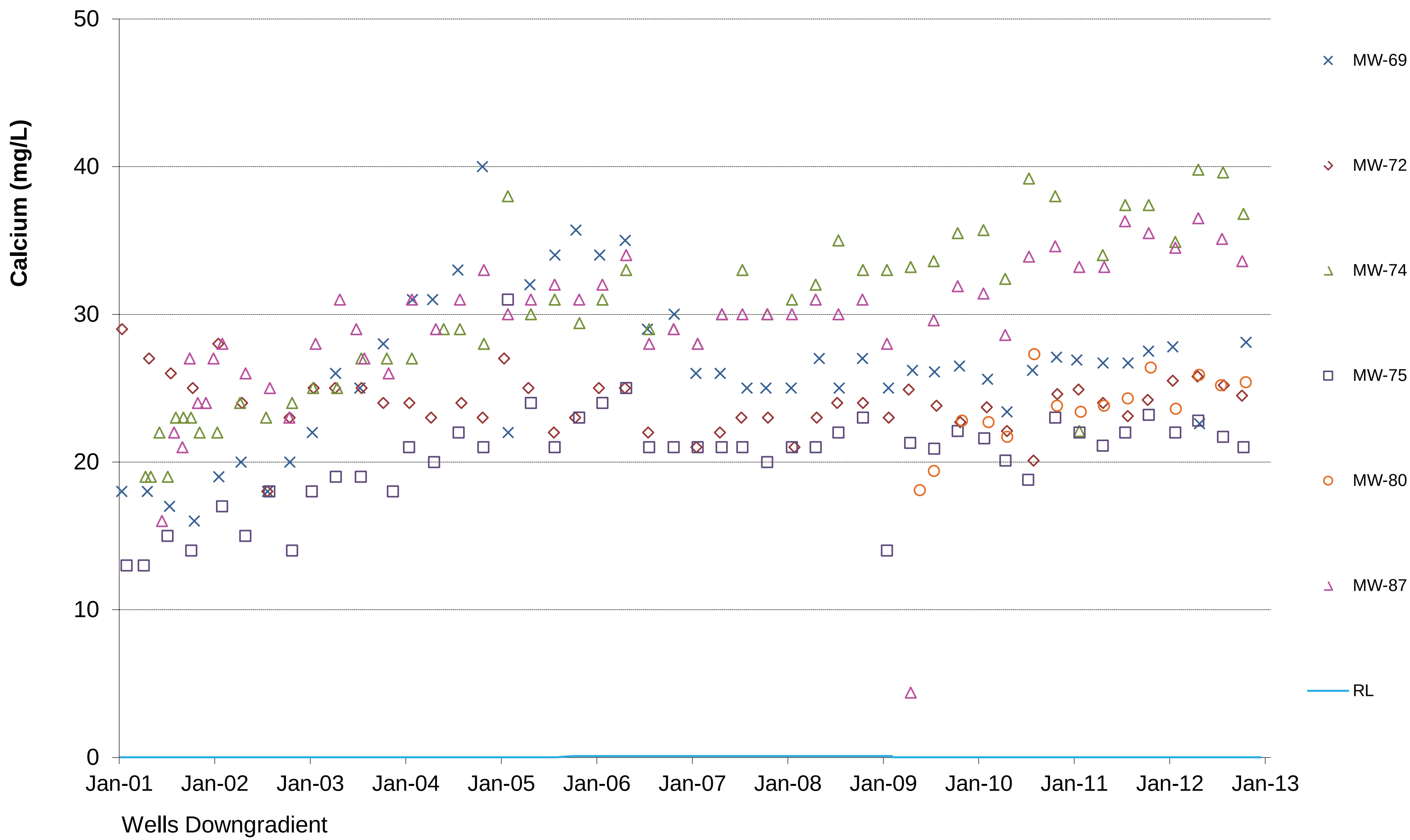


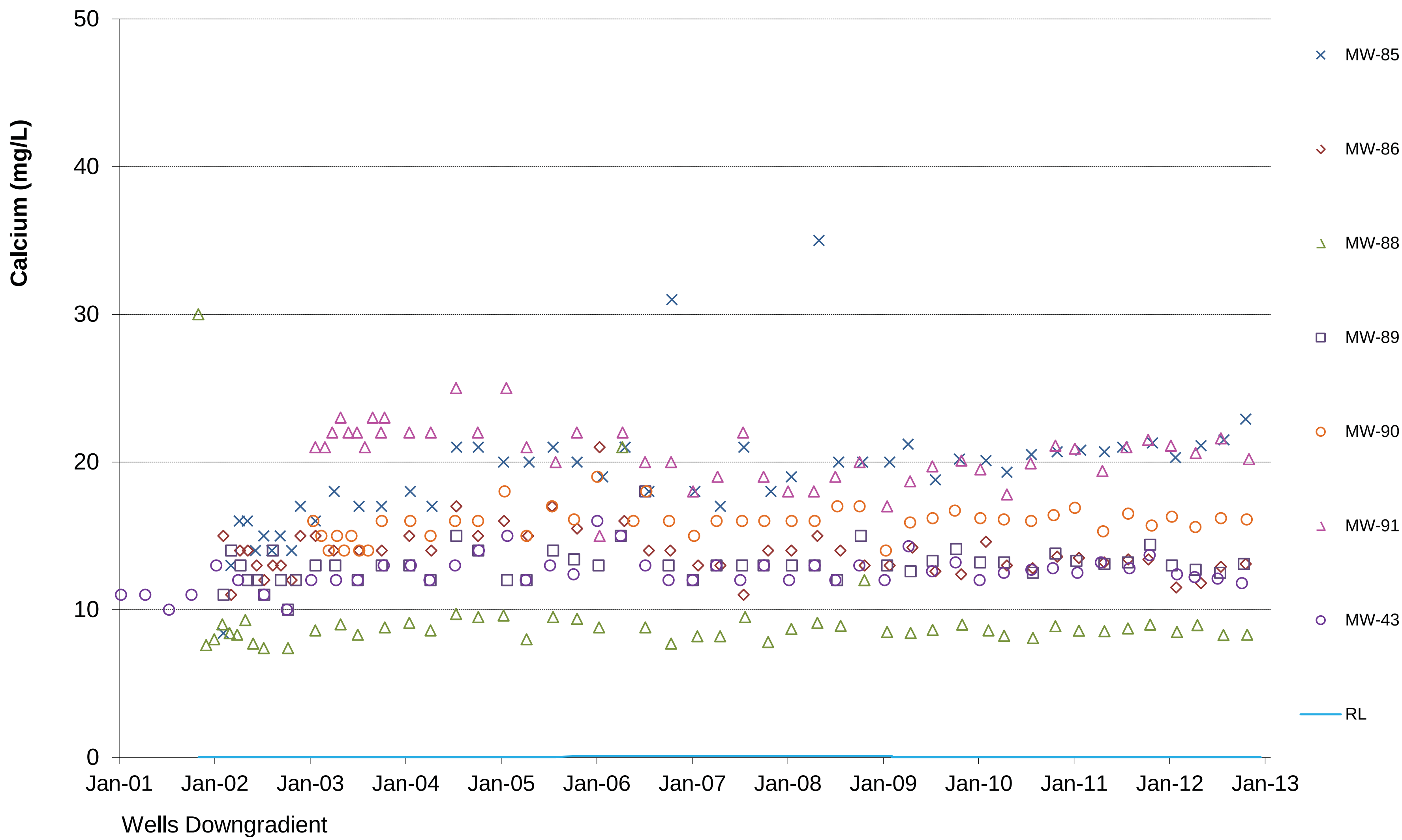
Wells Upgradient South

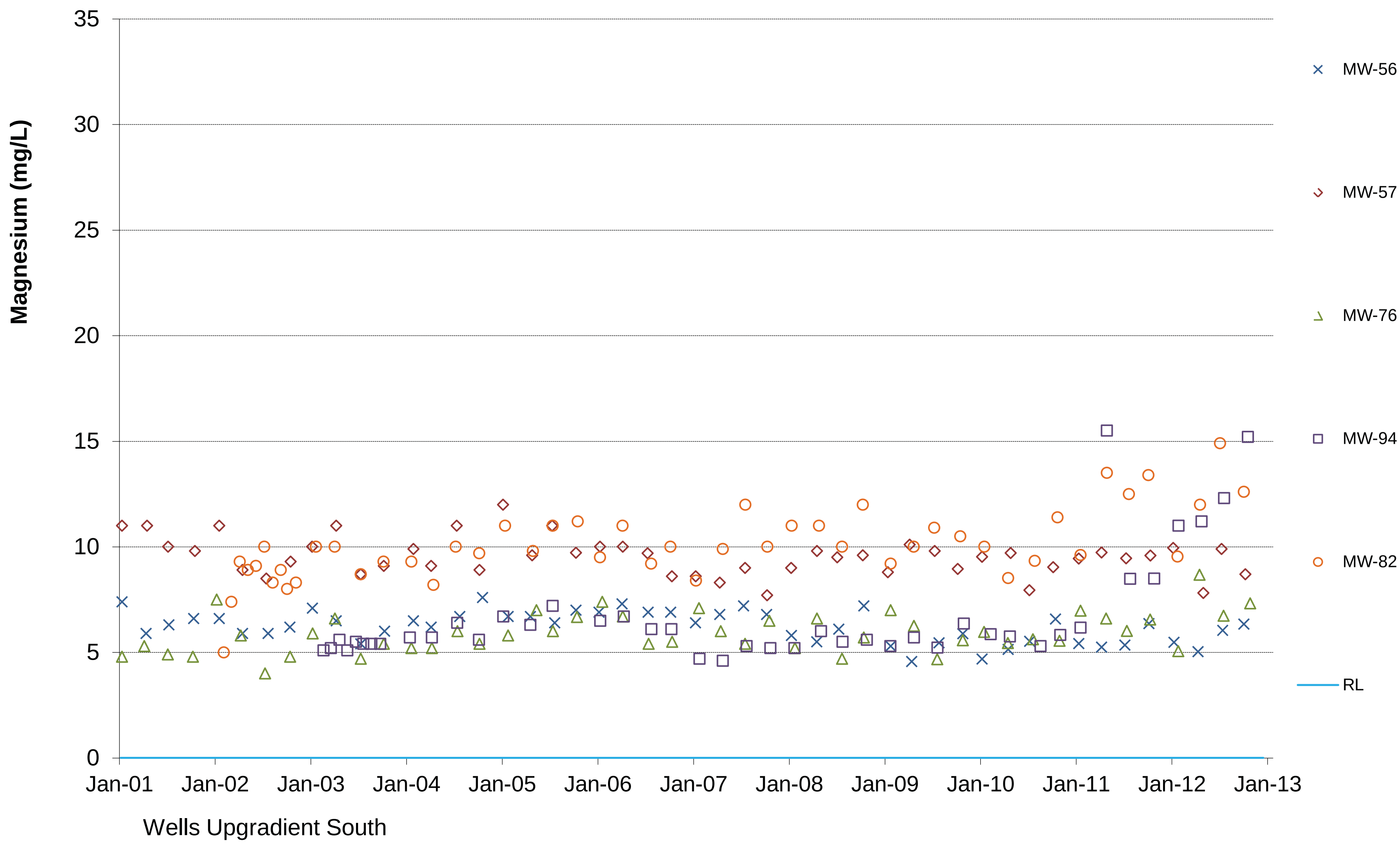


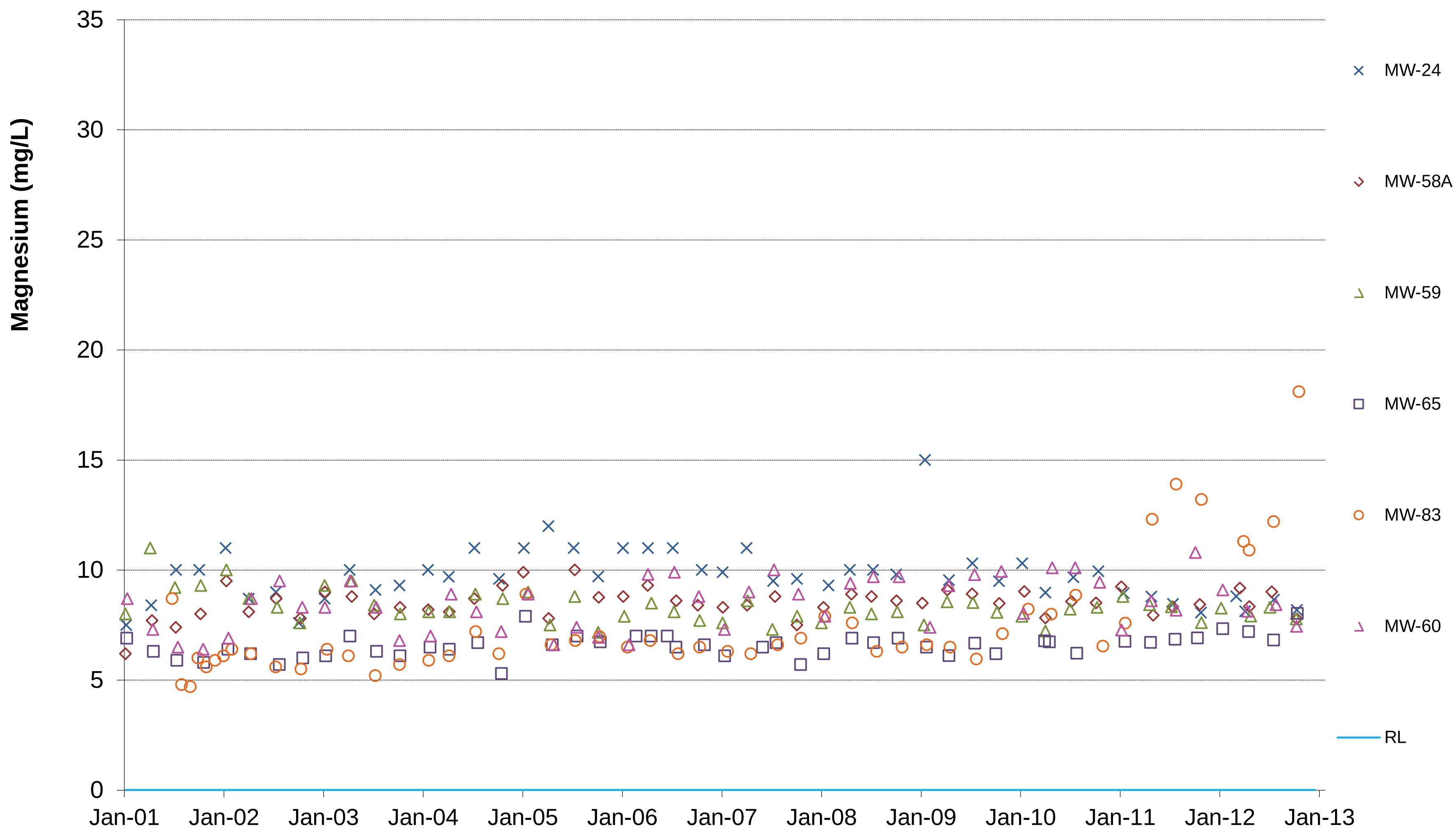
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient


Calcium (mg/L)
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
MW-64
MW-70
MW-77
MW-78
MW-100
MW-66
MW-67
MW-68
RL
Wells Vertical to Key Facilities and Interior to Landfill Footprint

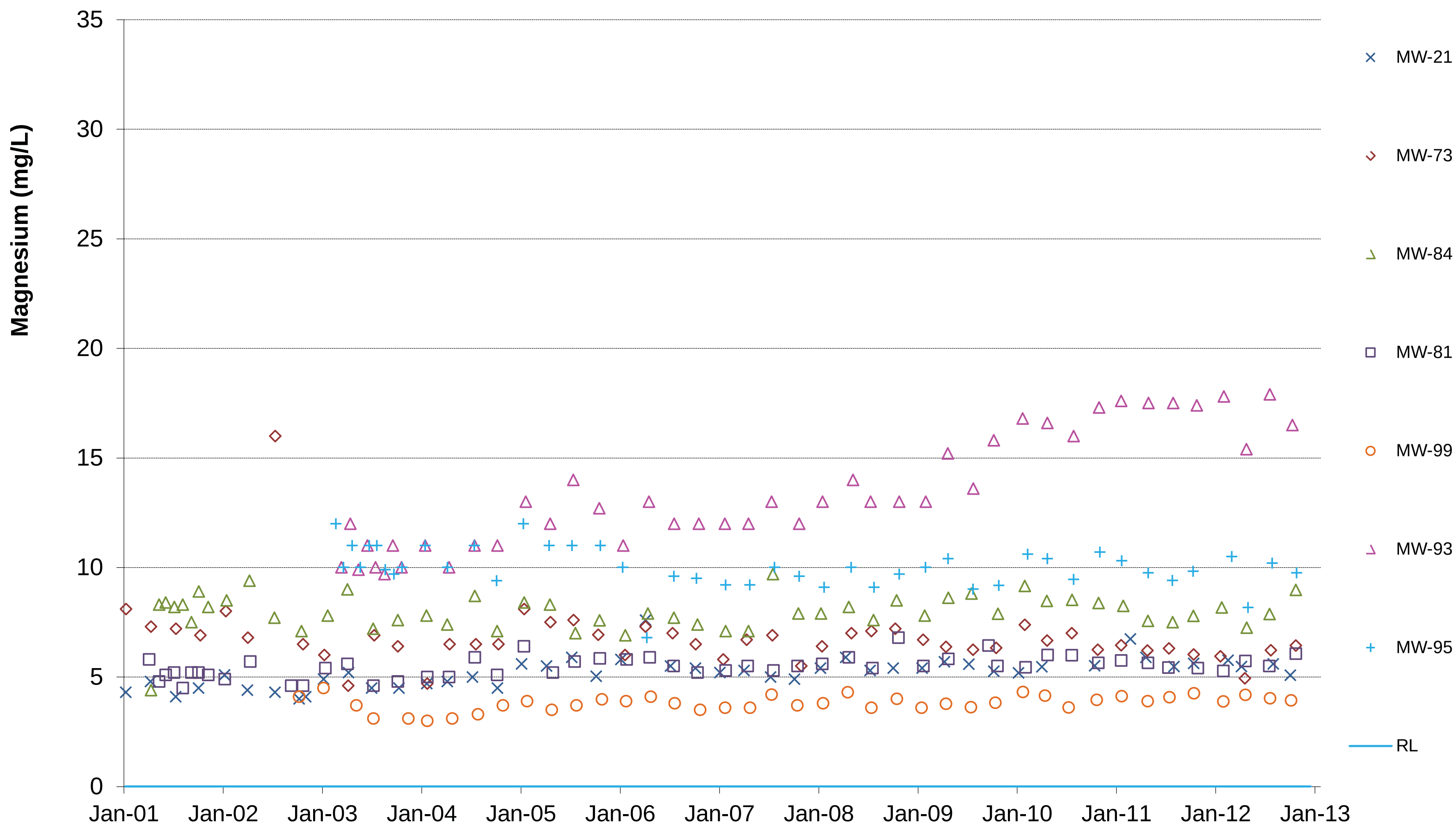

Calcium (mg/L)
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL


Calcium (mg/L)
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL

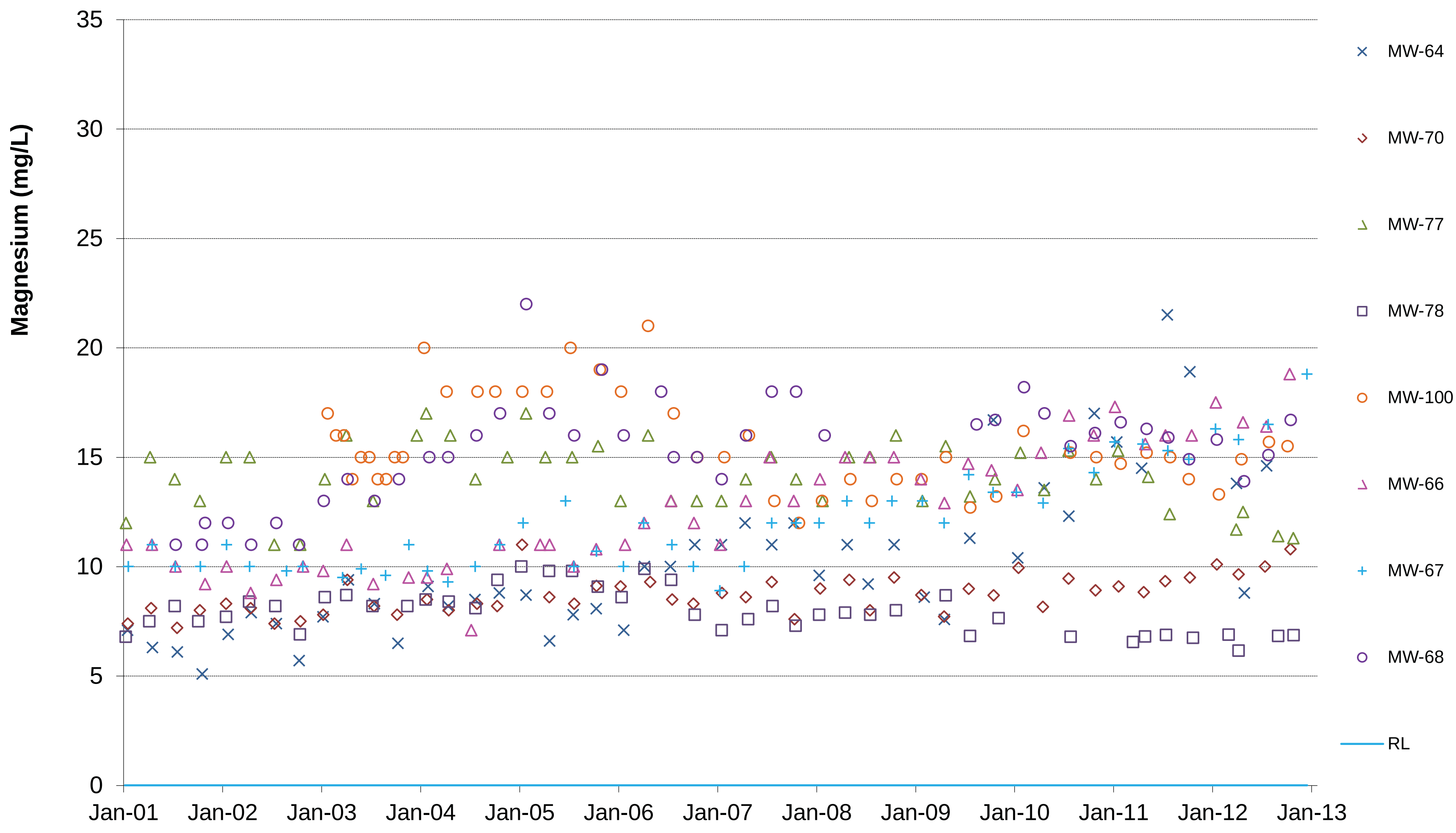

Magnesium (mg/L)
35
30
25
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
MW-56
MW-57
MW-76
MW-94
MW-82
RL
Wells Upgradient South



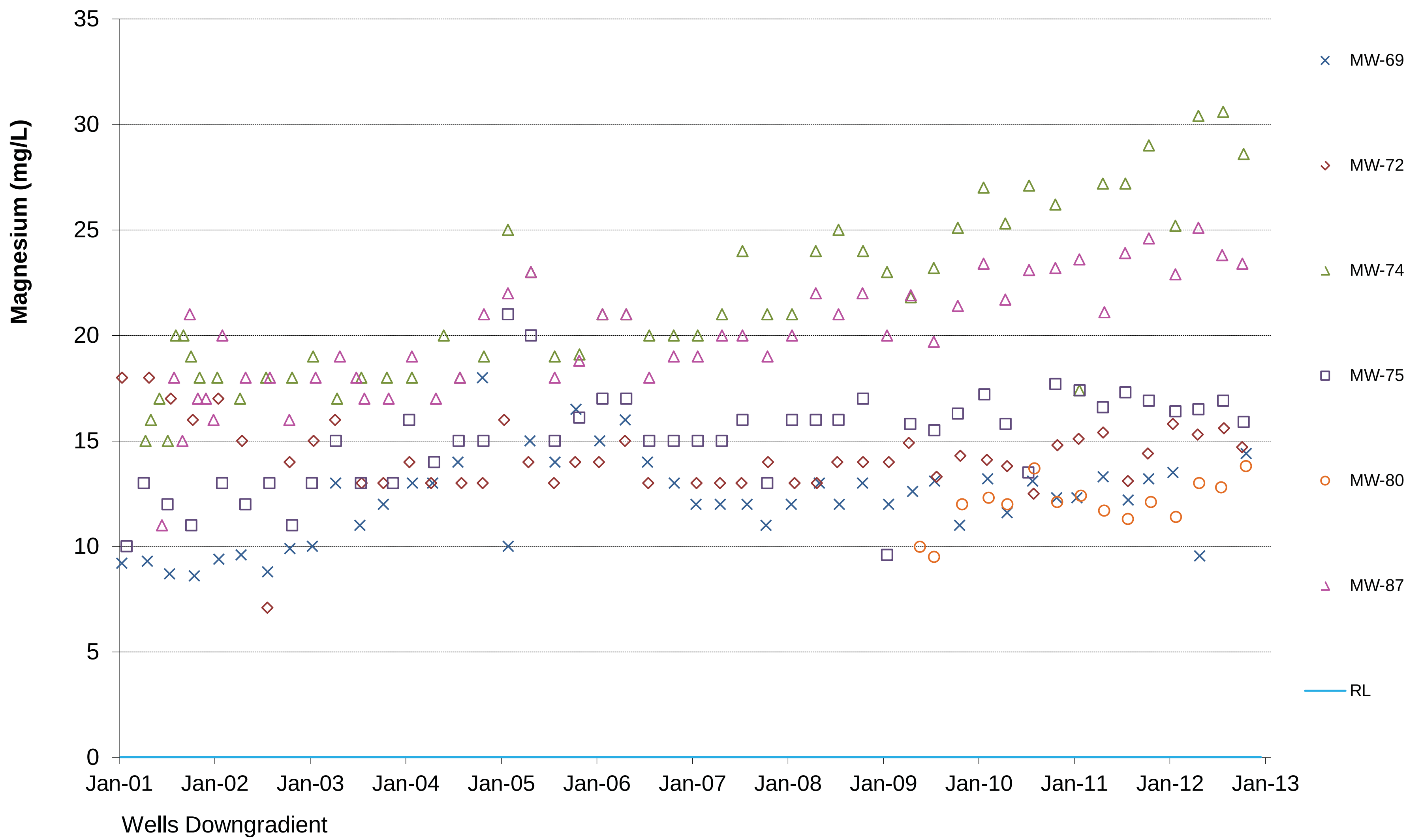
Wells Upgradient South



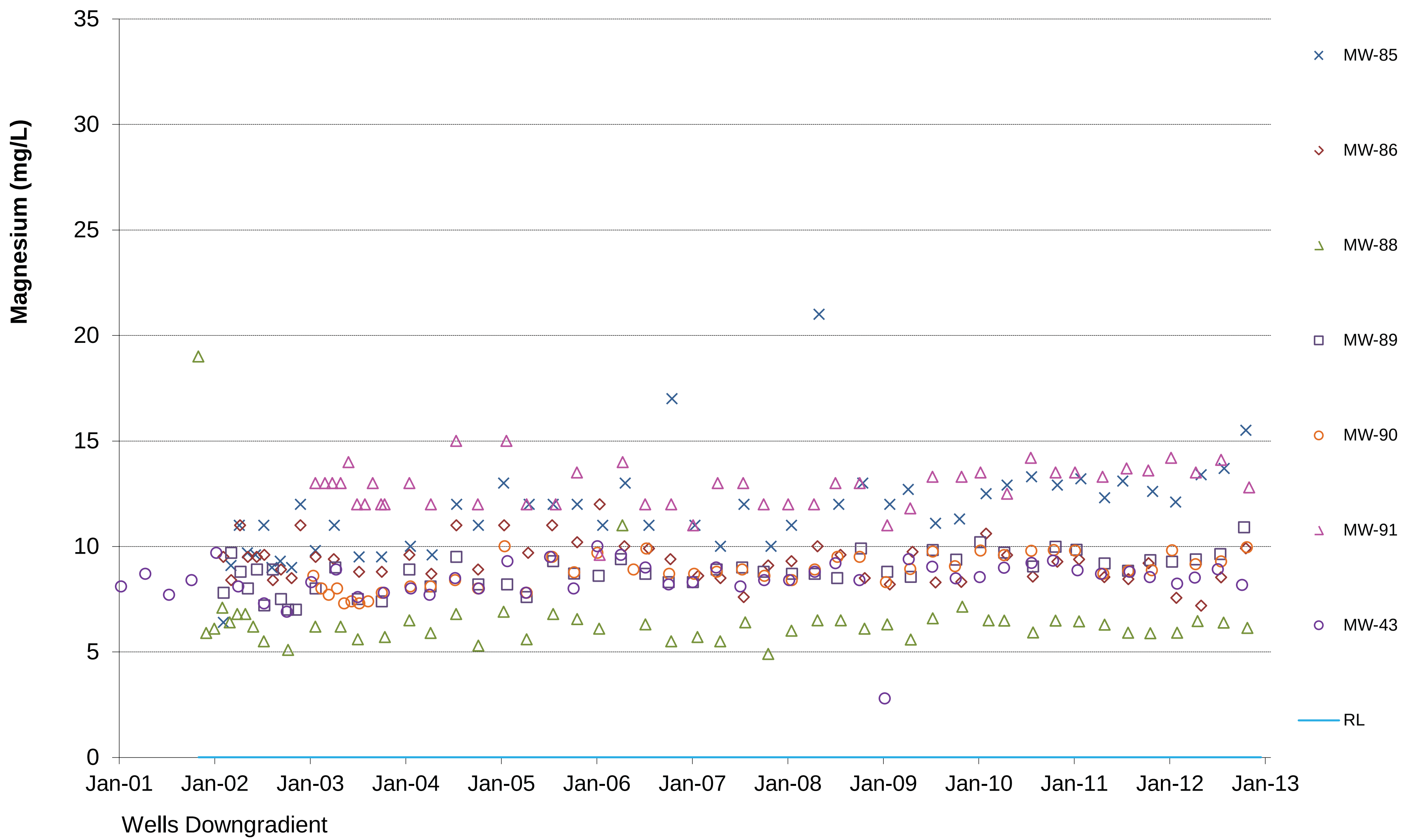
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient

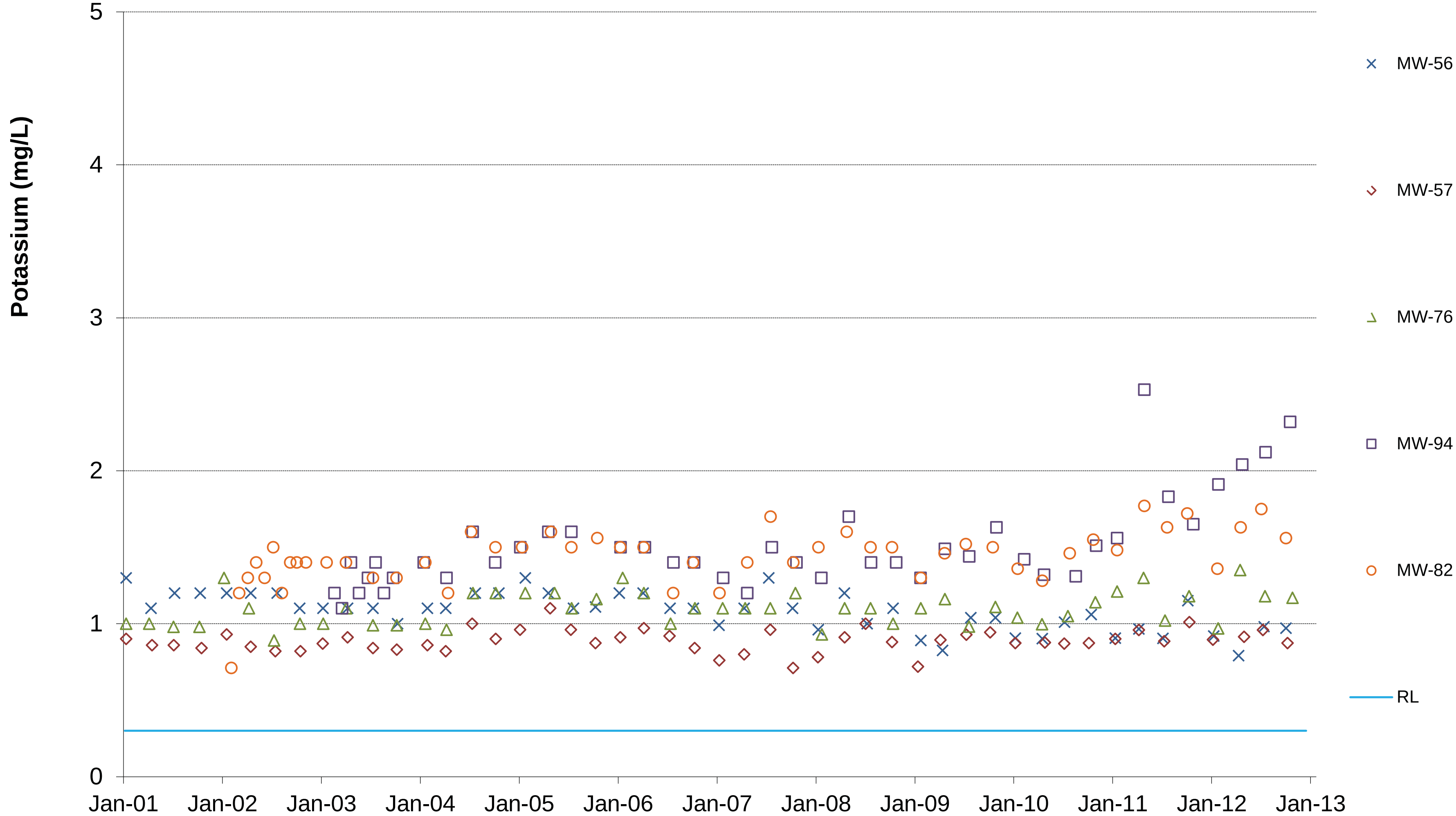


Wells Vertical to Key Facilities and Interior to Landfill Footprint

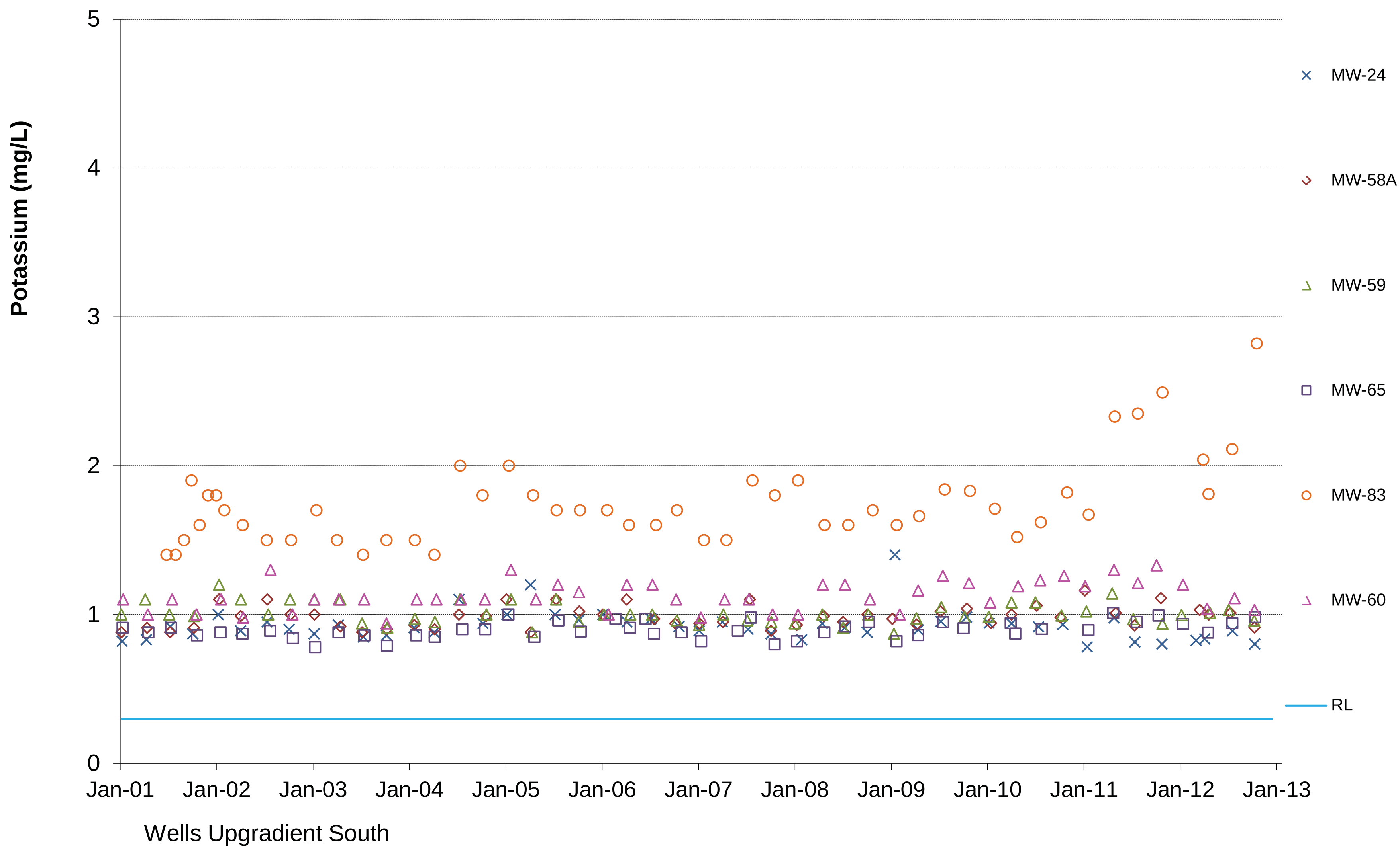


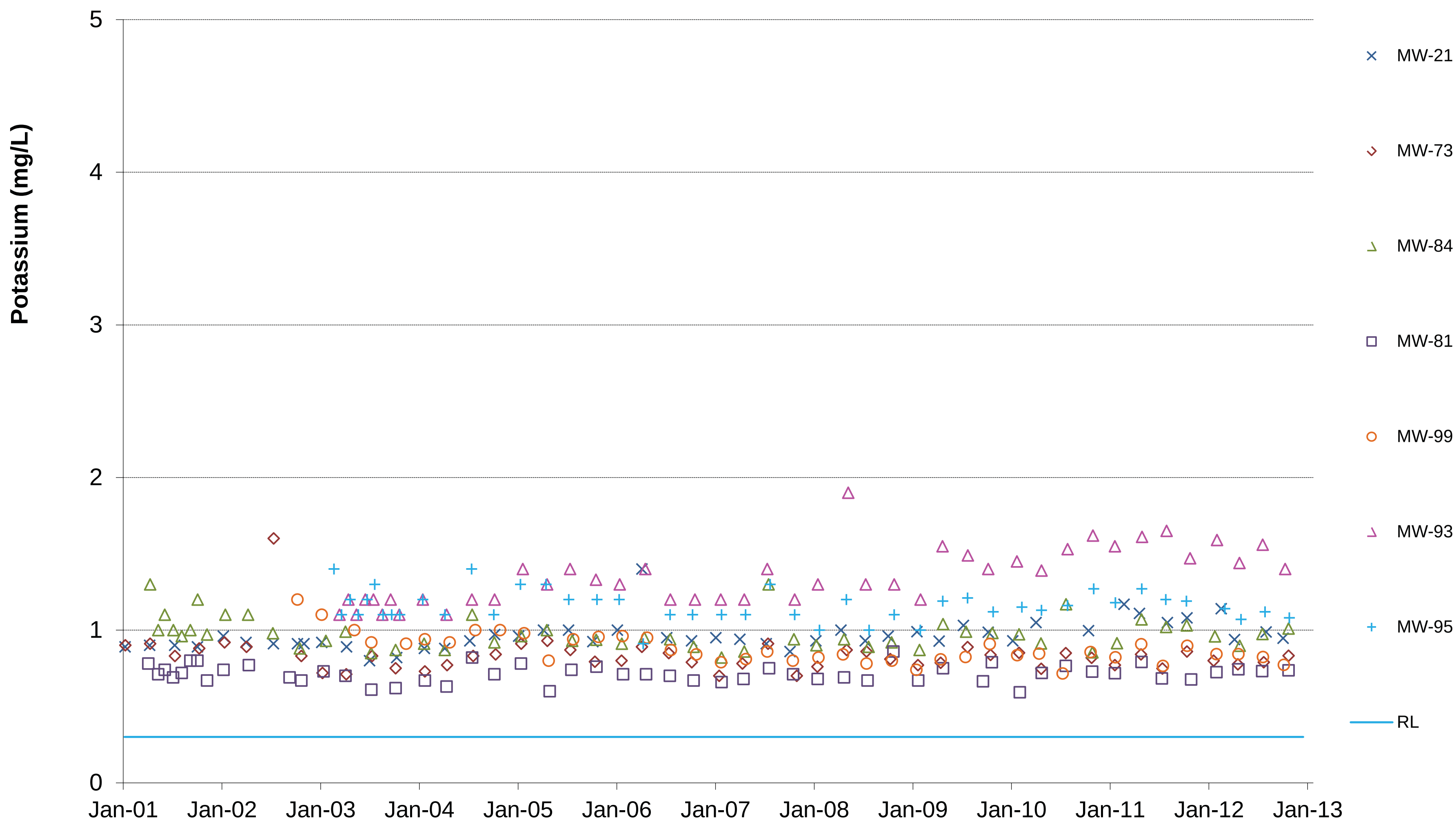
Magnesium (mg/L)
35
30
25
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL


Magnesium (mg/L)
35
30
25
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL

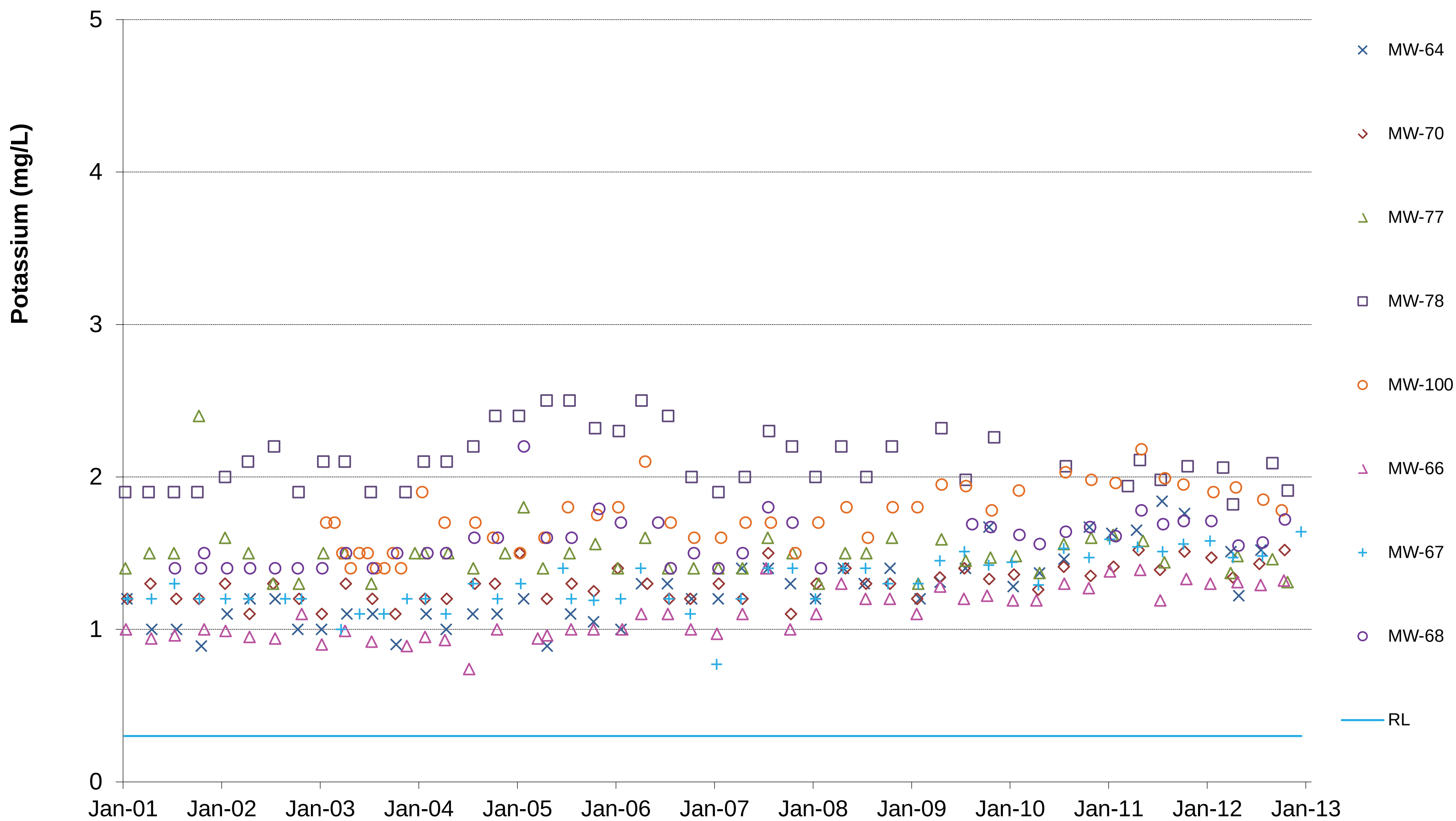


Wells Upgradient South

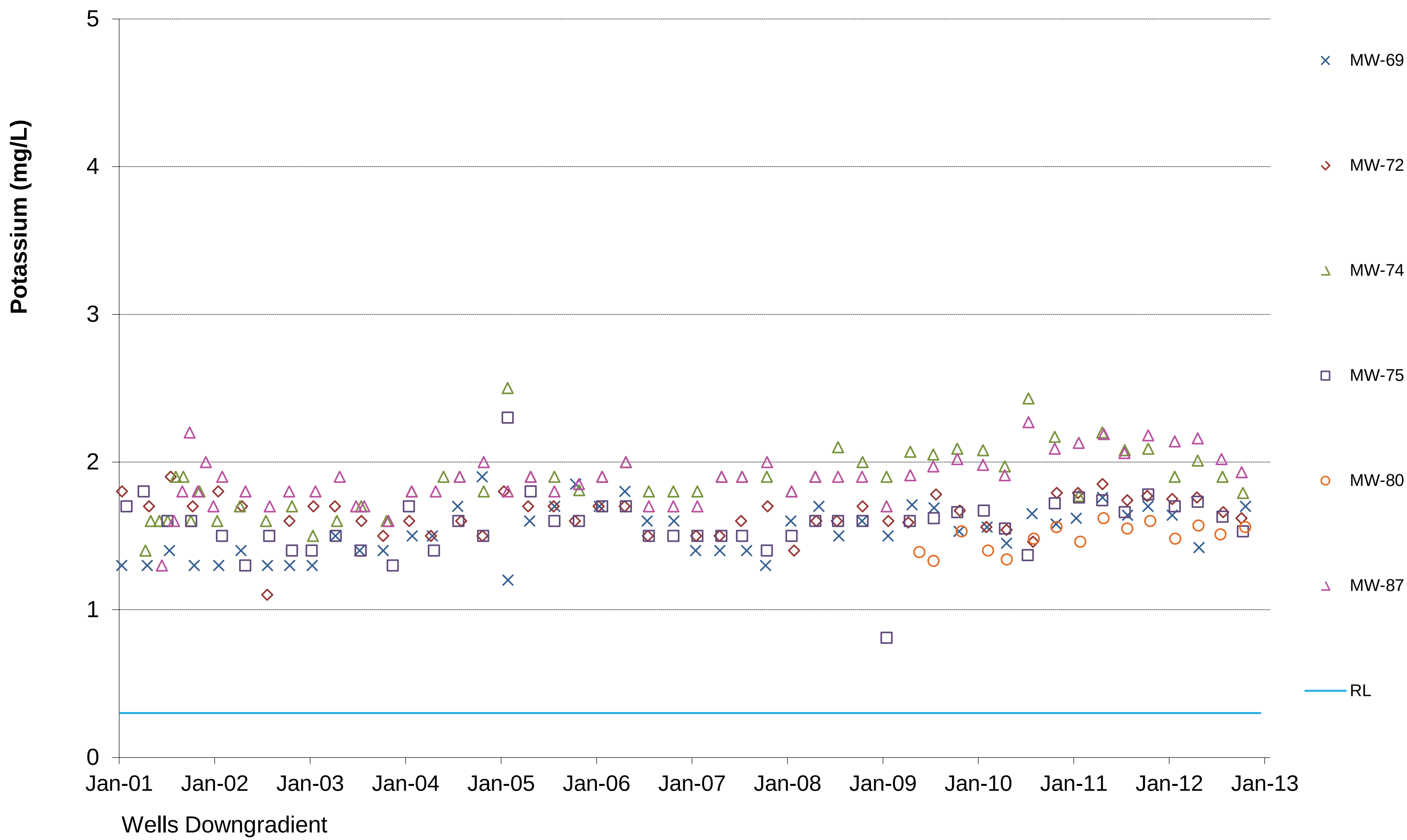

Potassium (mg/L)
5
4
3
2
1
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-24
MW-58A
MW-59
MW-65
MW-83
MW-60
RL

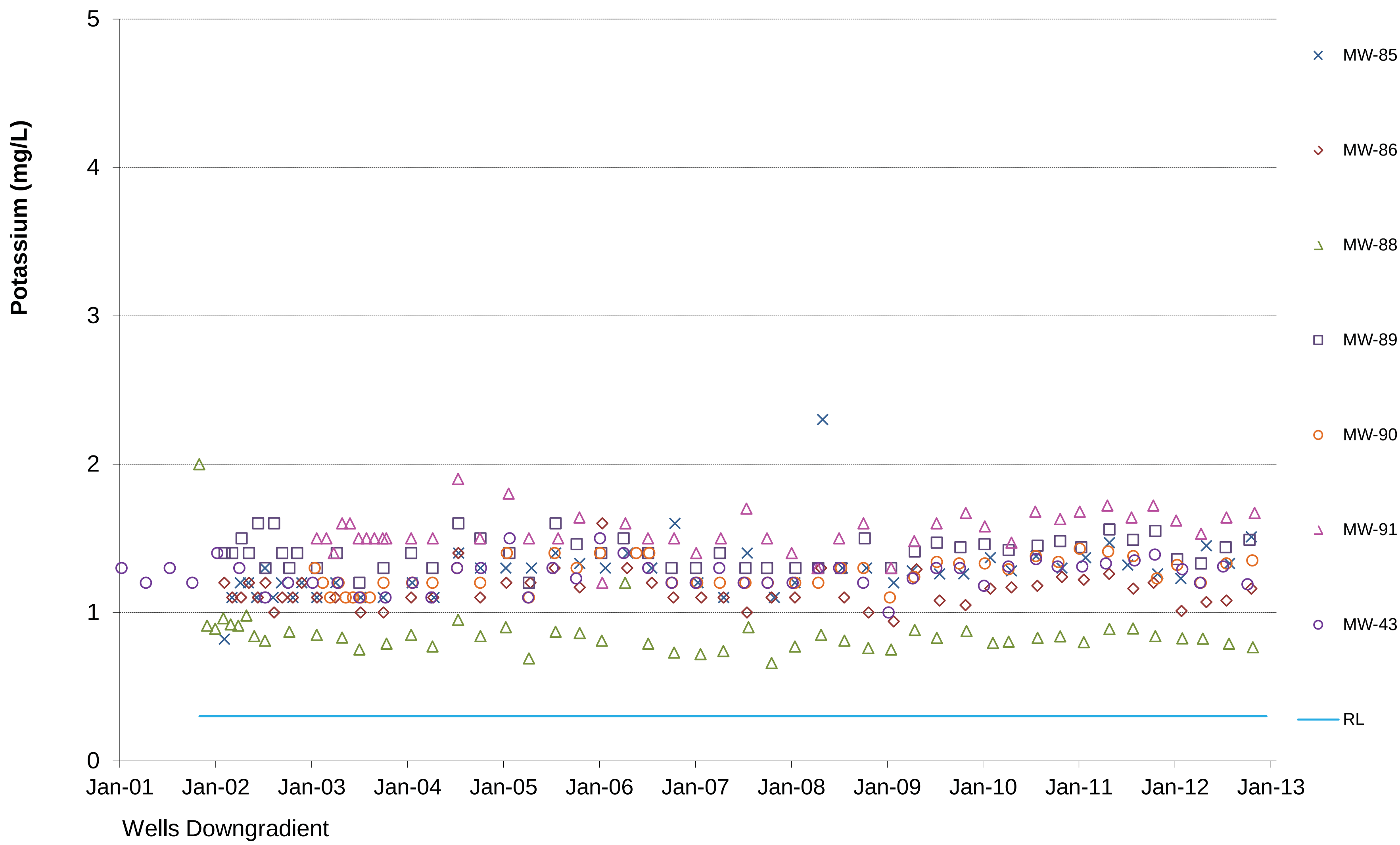


Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient

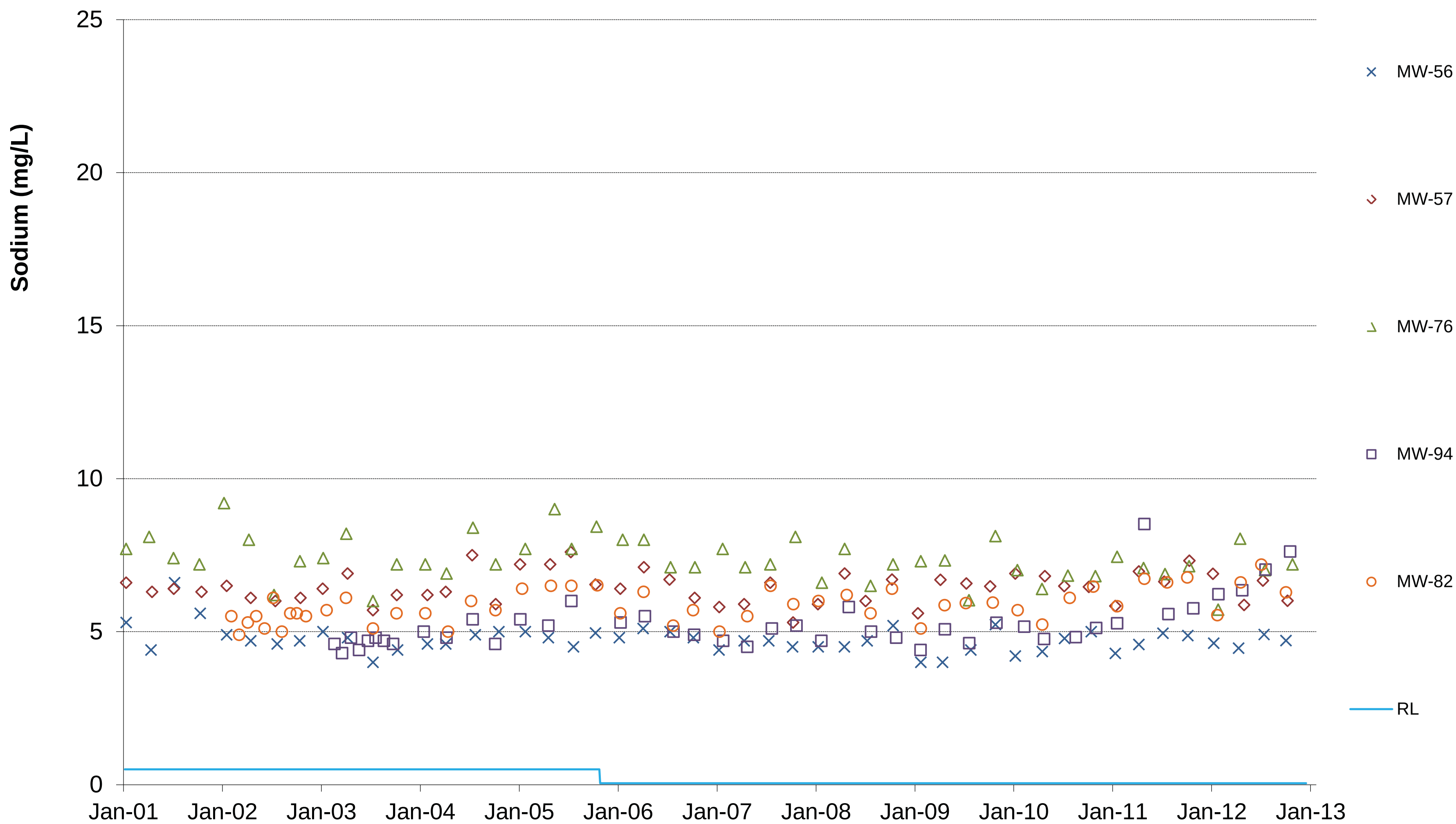


Wells Vertical to Key Facilities and Interior to Landfill Footprint

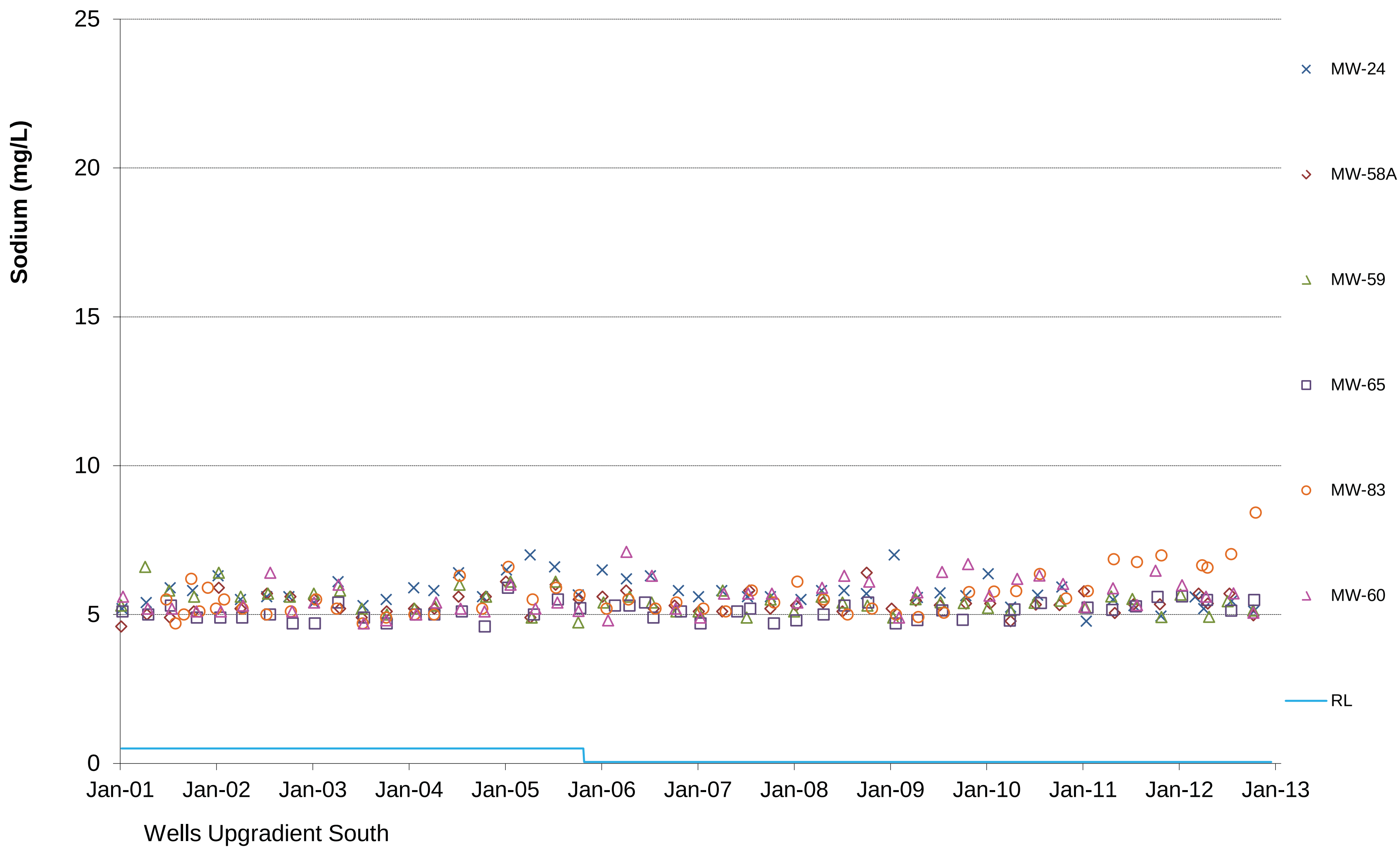

Potassium (mg/L)
5
4
3
2
1
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL

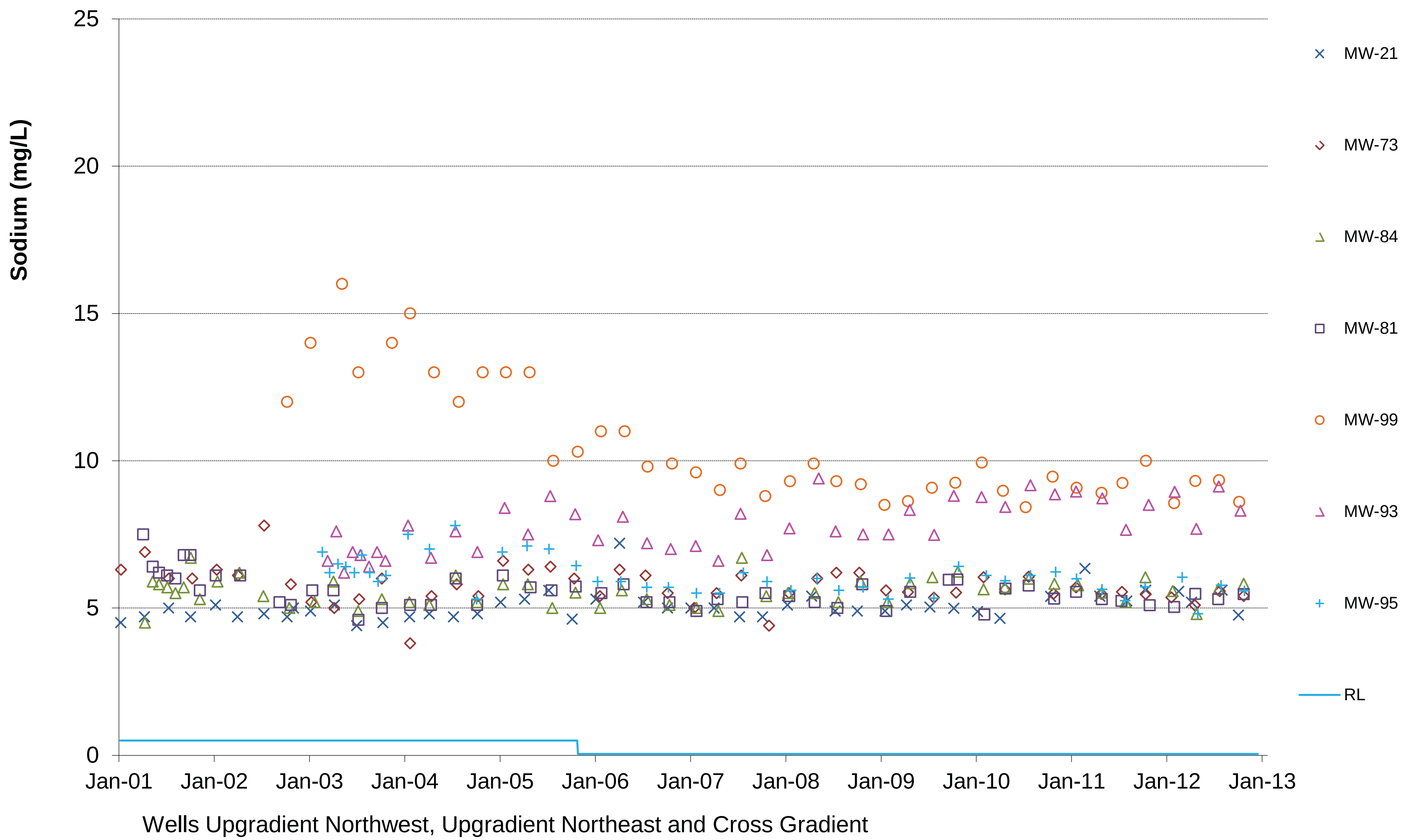


Potassium (mg/L)
5
4
3
2
1
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL

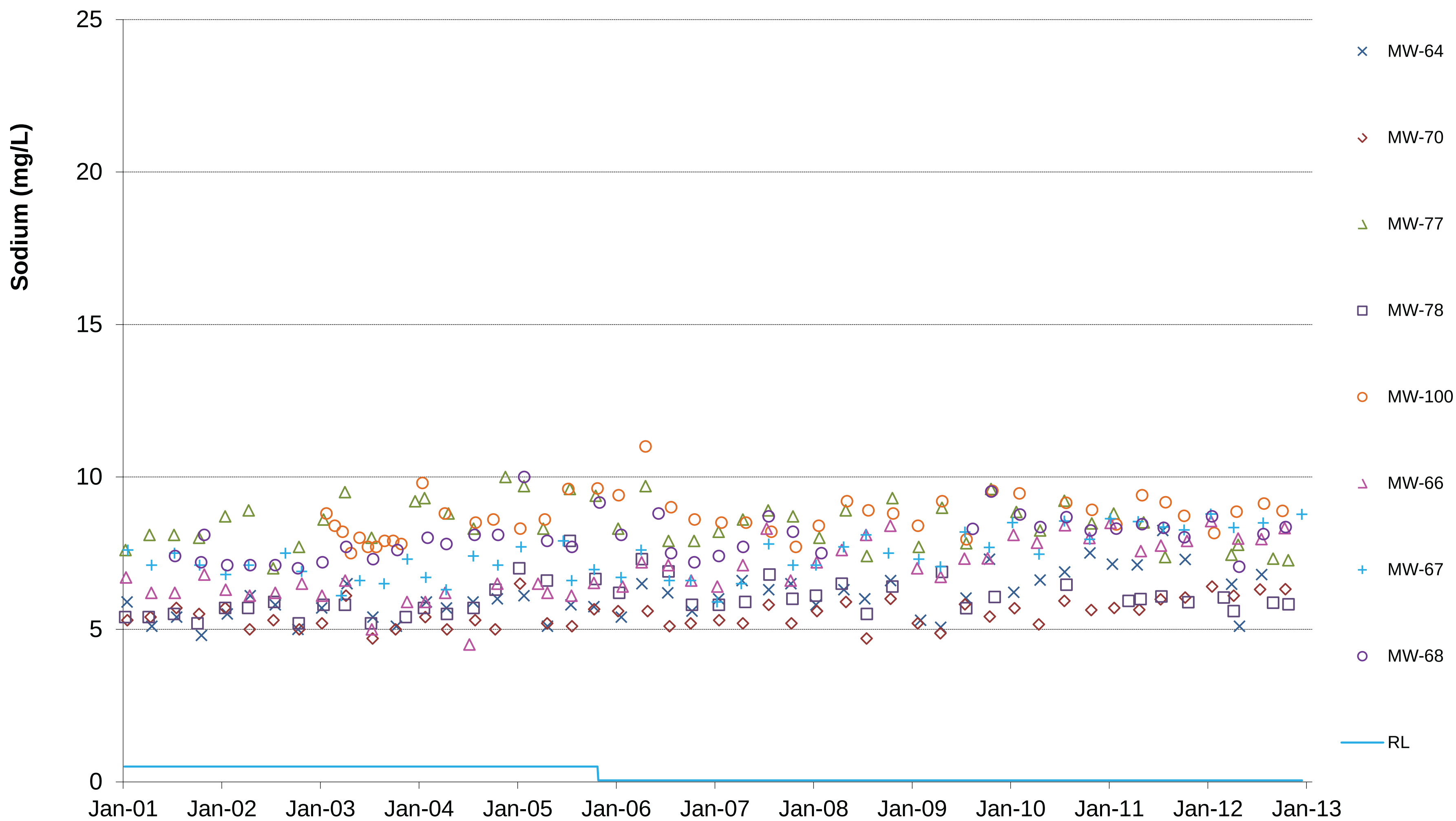


Wells Upgradient South

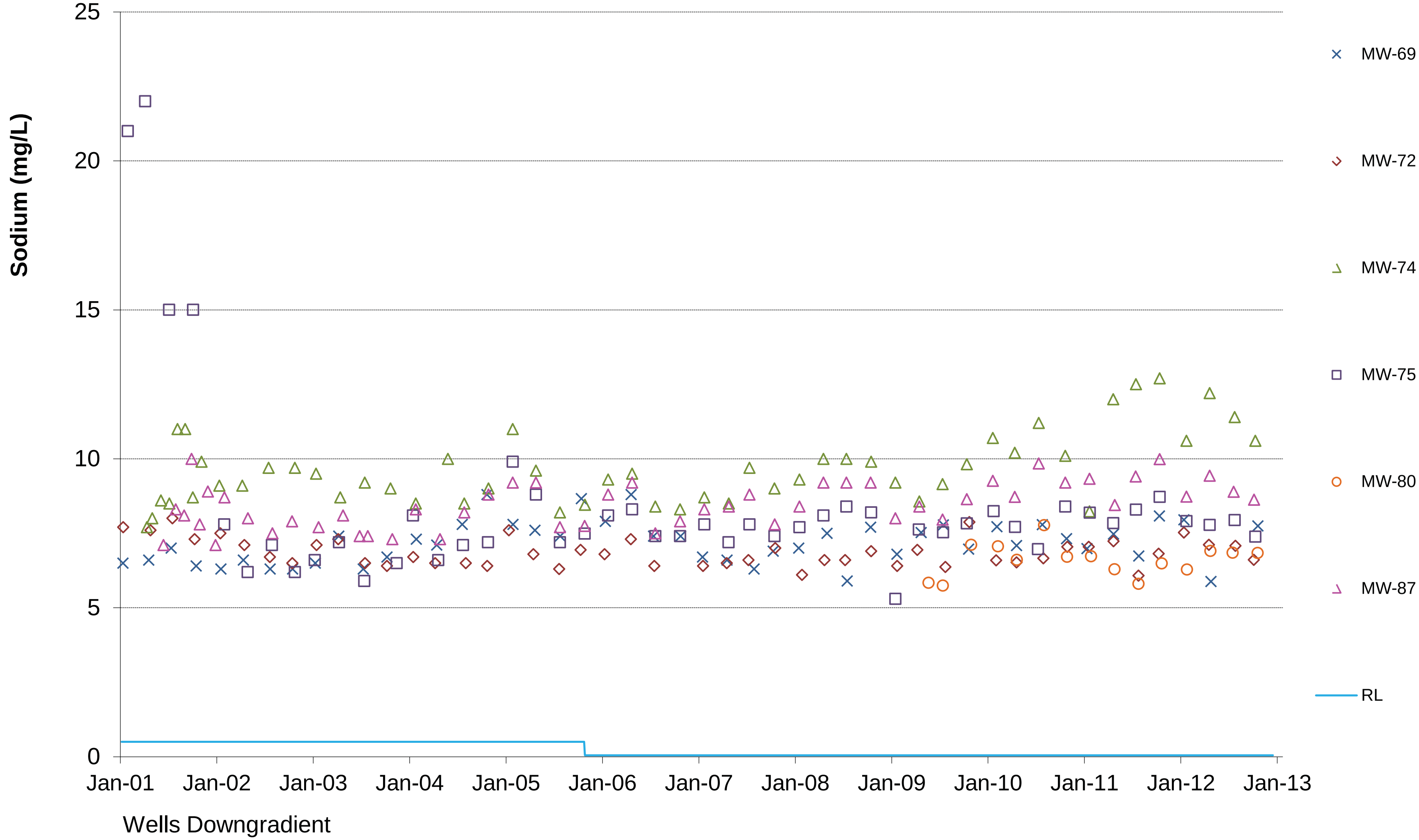

Sodium (mg/L)
25
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
MW-24
MW-58A
MW-59
MW-65
MW-83
MW-60
RL
Wells Upgradient South



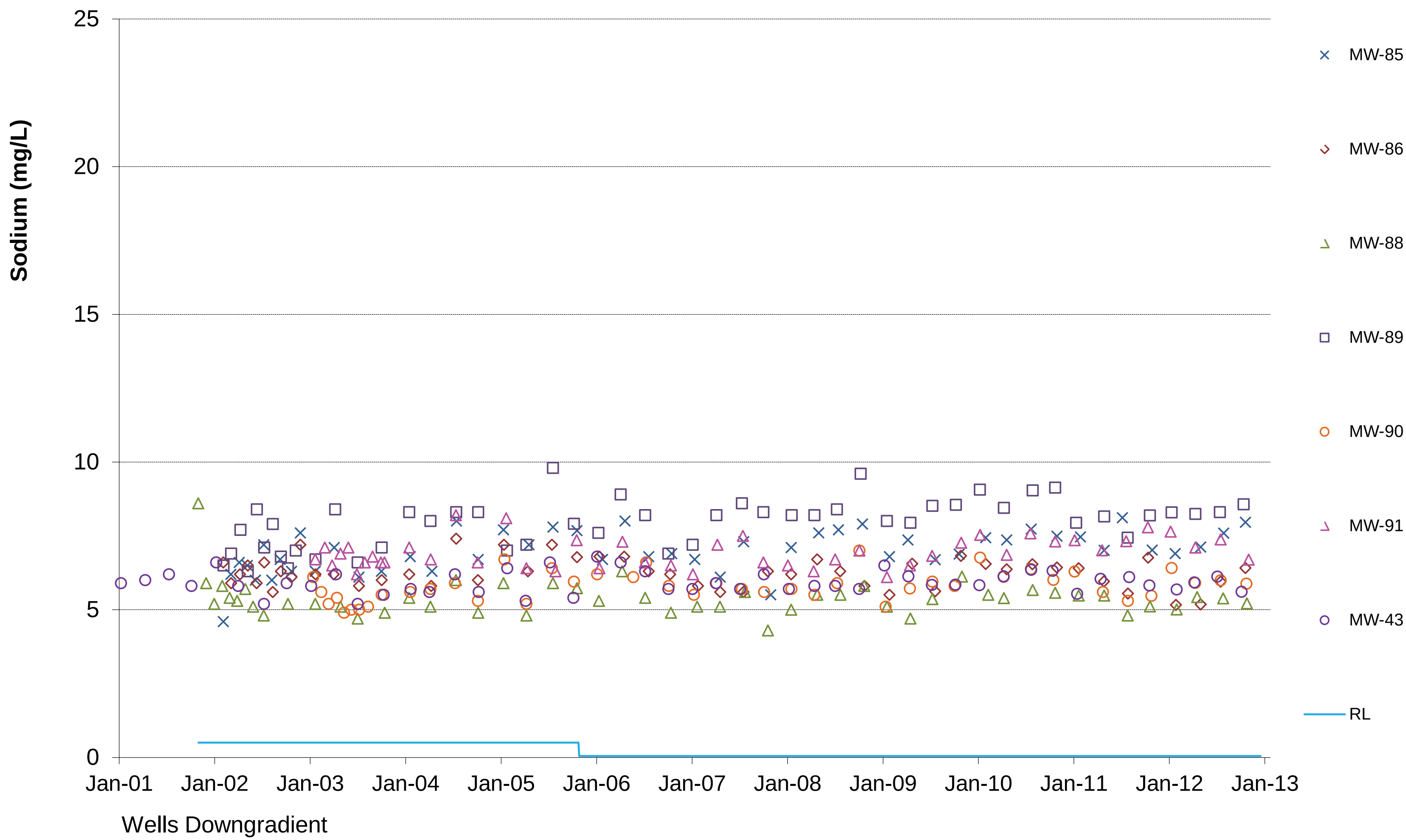
Sodium (mg/L)
25
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient
MW-21
MW-73
MW-84
MW-81
MW-99
MW-93
MW-95
RL

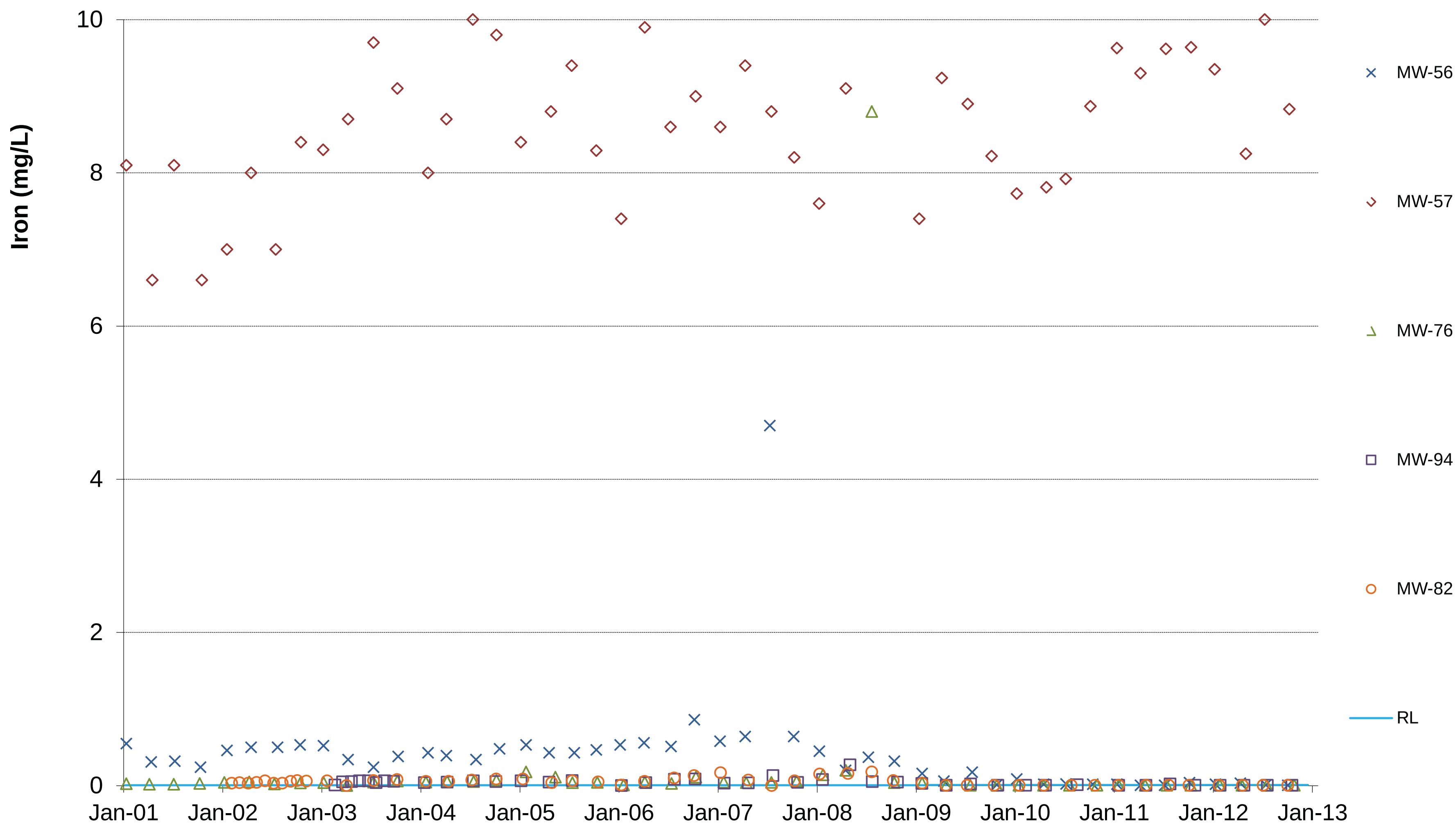


Wells Vertical to Key Facilities and Interior to Landfill Footprint

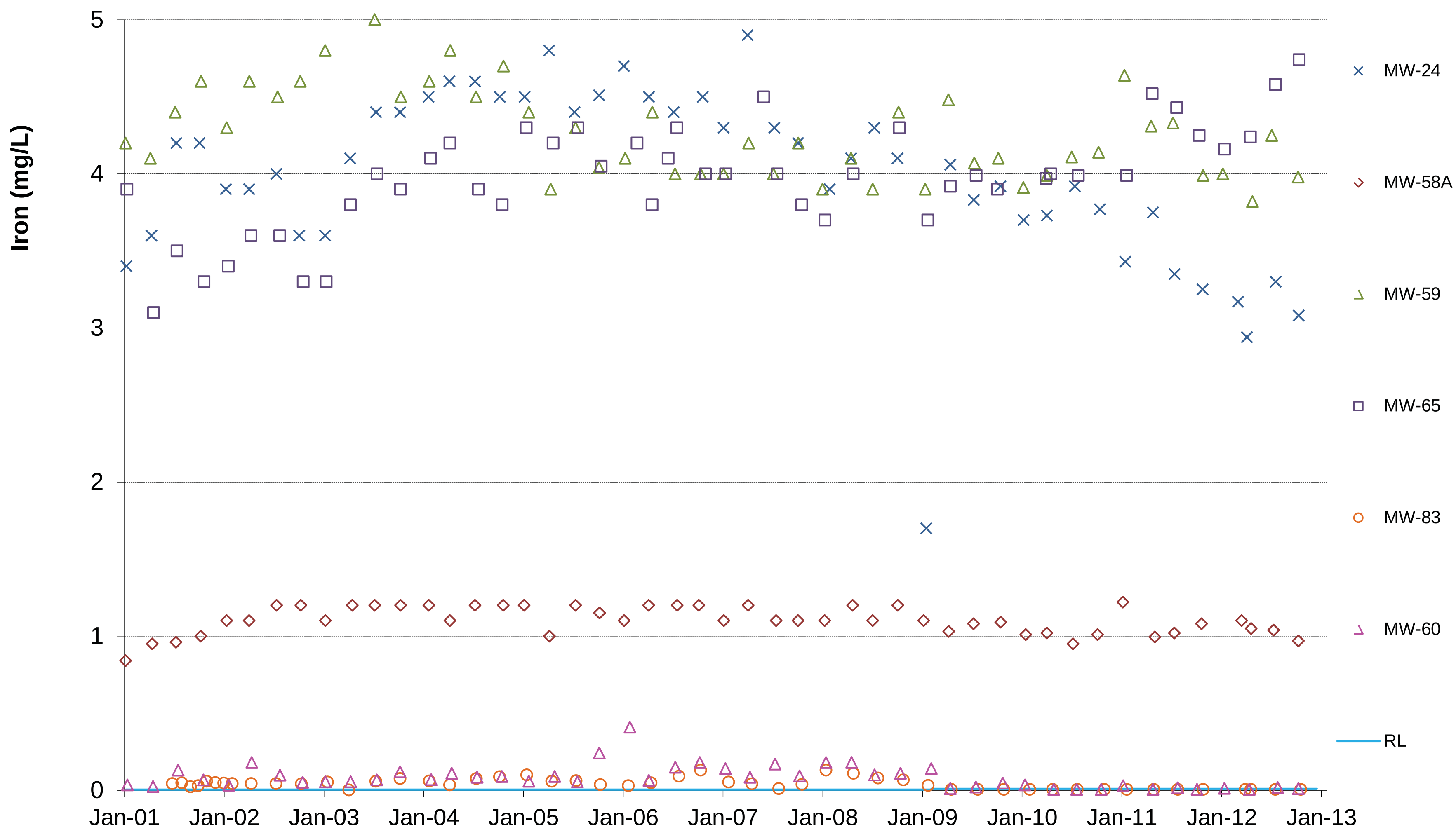


Sodium (mg/L)
25
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL

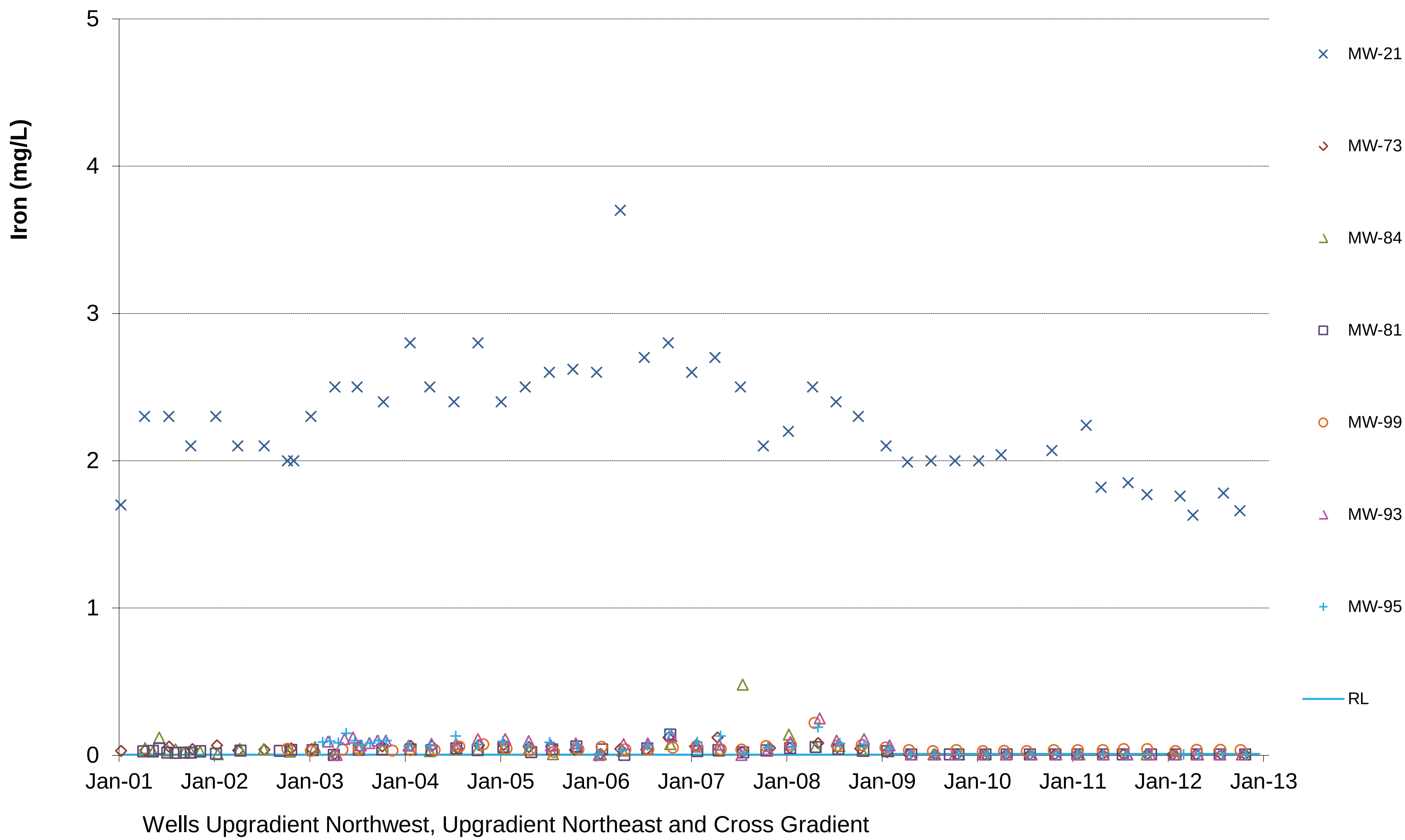

Sodium (mg/L)
25
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL

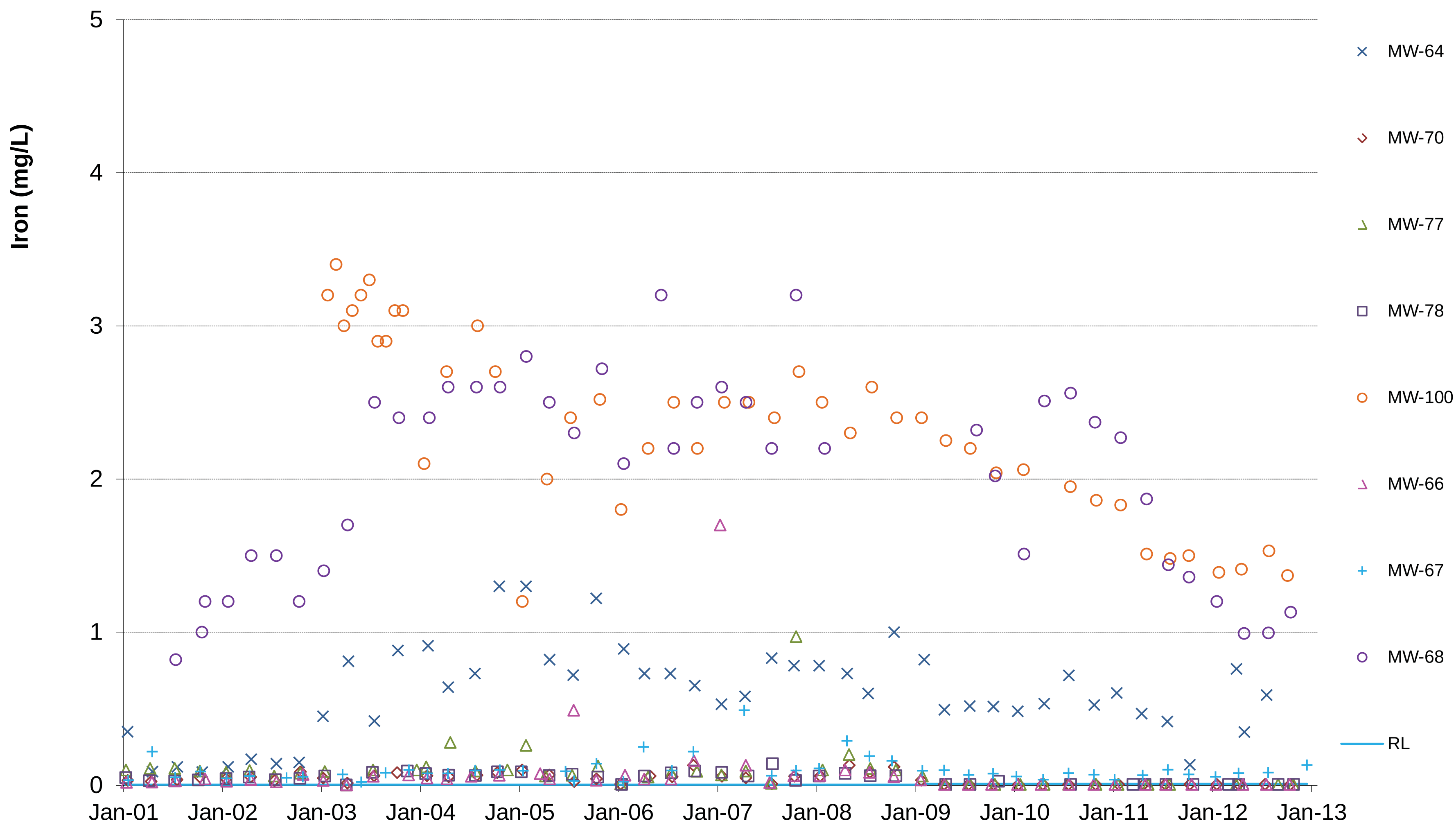


Wells Upgradient South

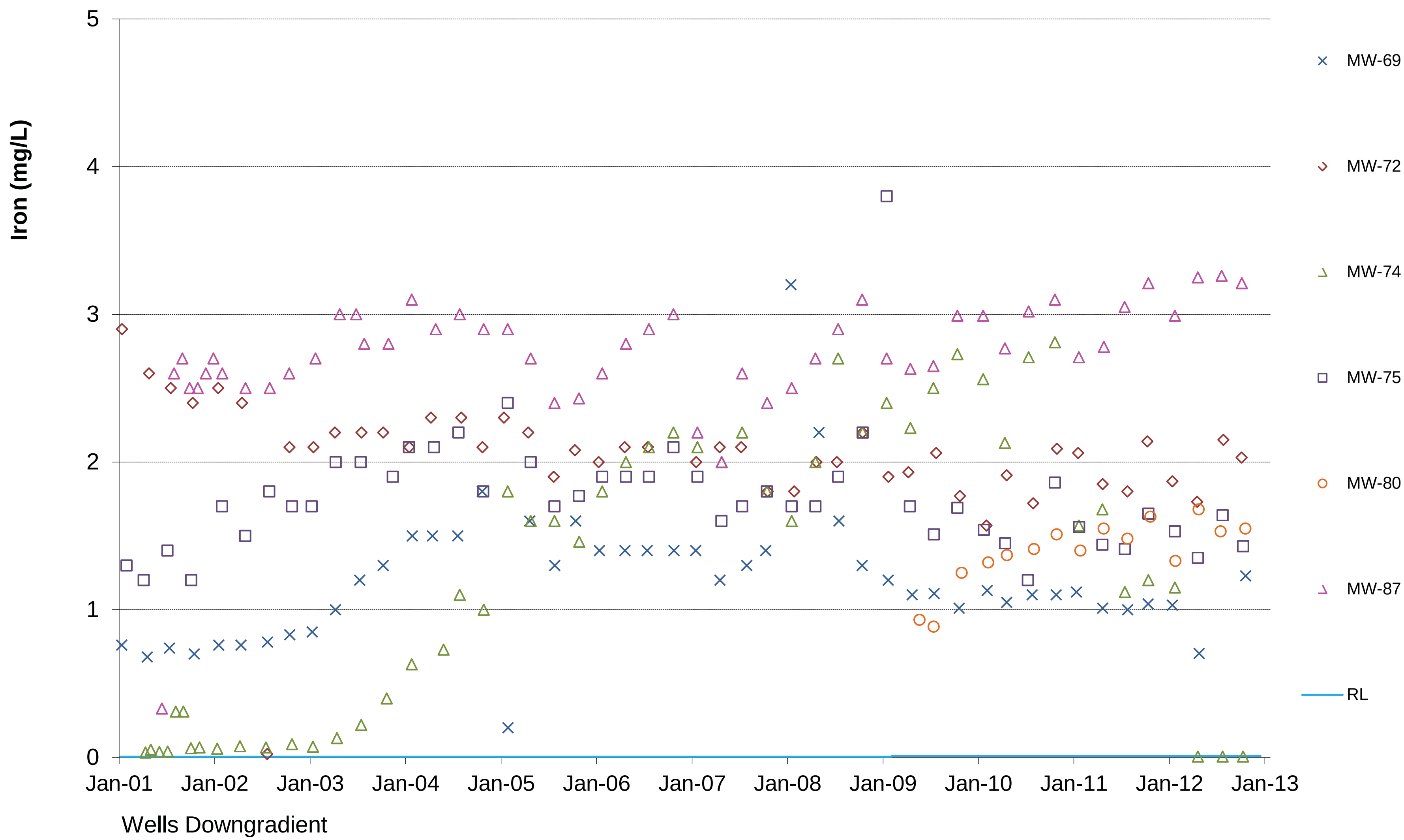


Wells Upgradient South

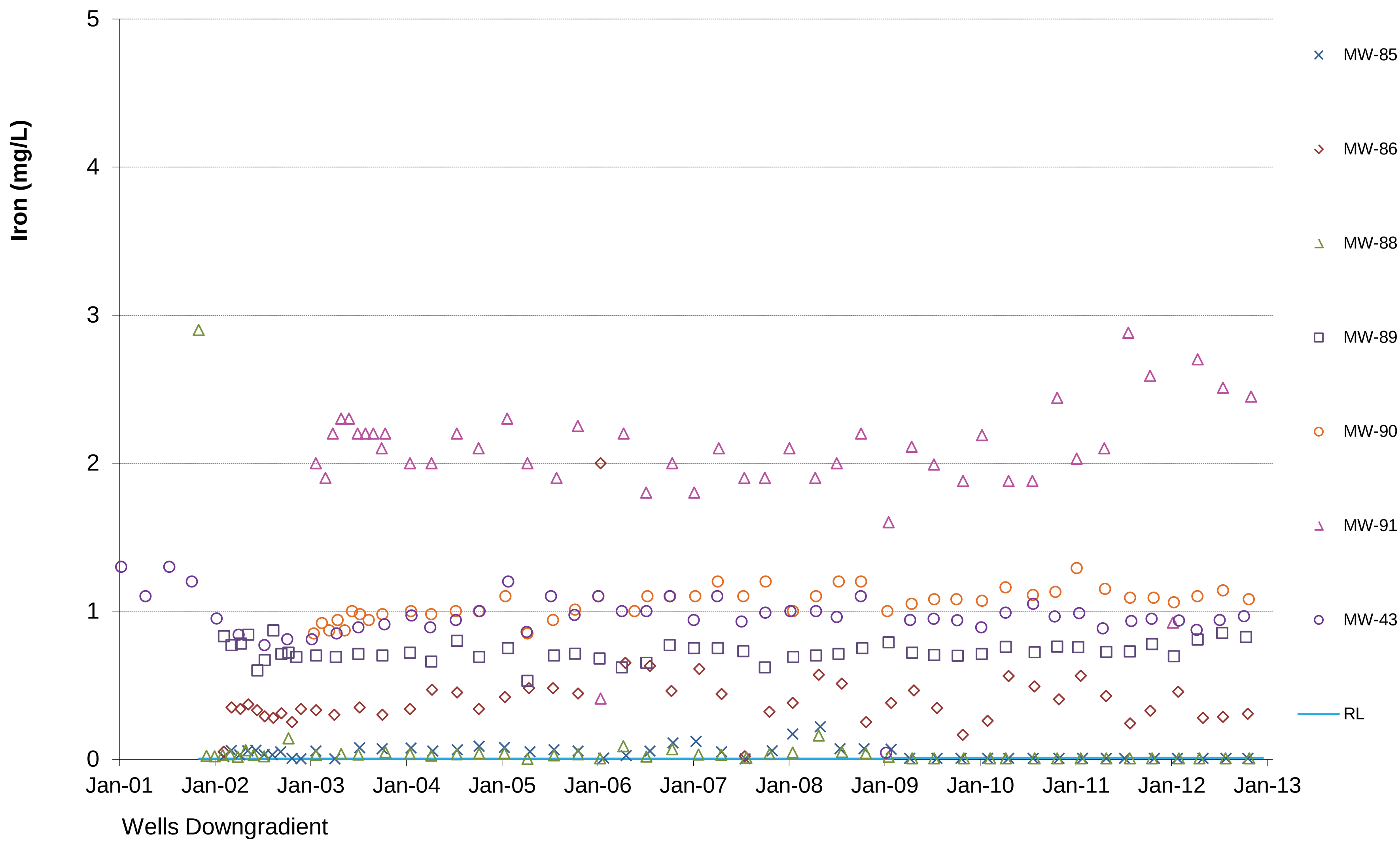

Iron (mg/L)
5
4
3
2
1
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient
MW-21
MW-73
MW-84
MW-81
MW-99
MW-93
MW-95
RL



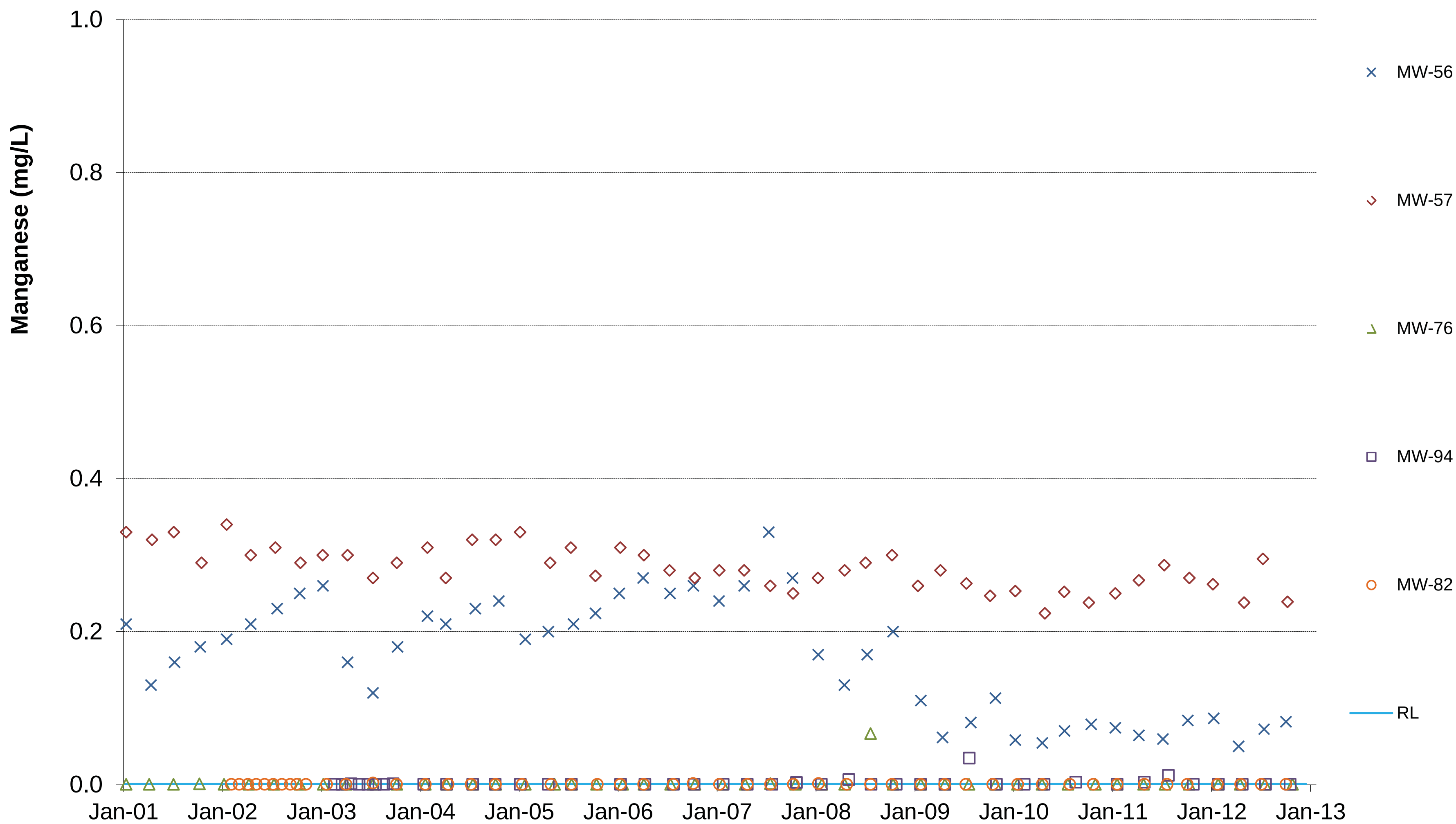
Wells Vertical to Key Facilities and Interior to Landfill Footprint



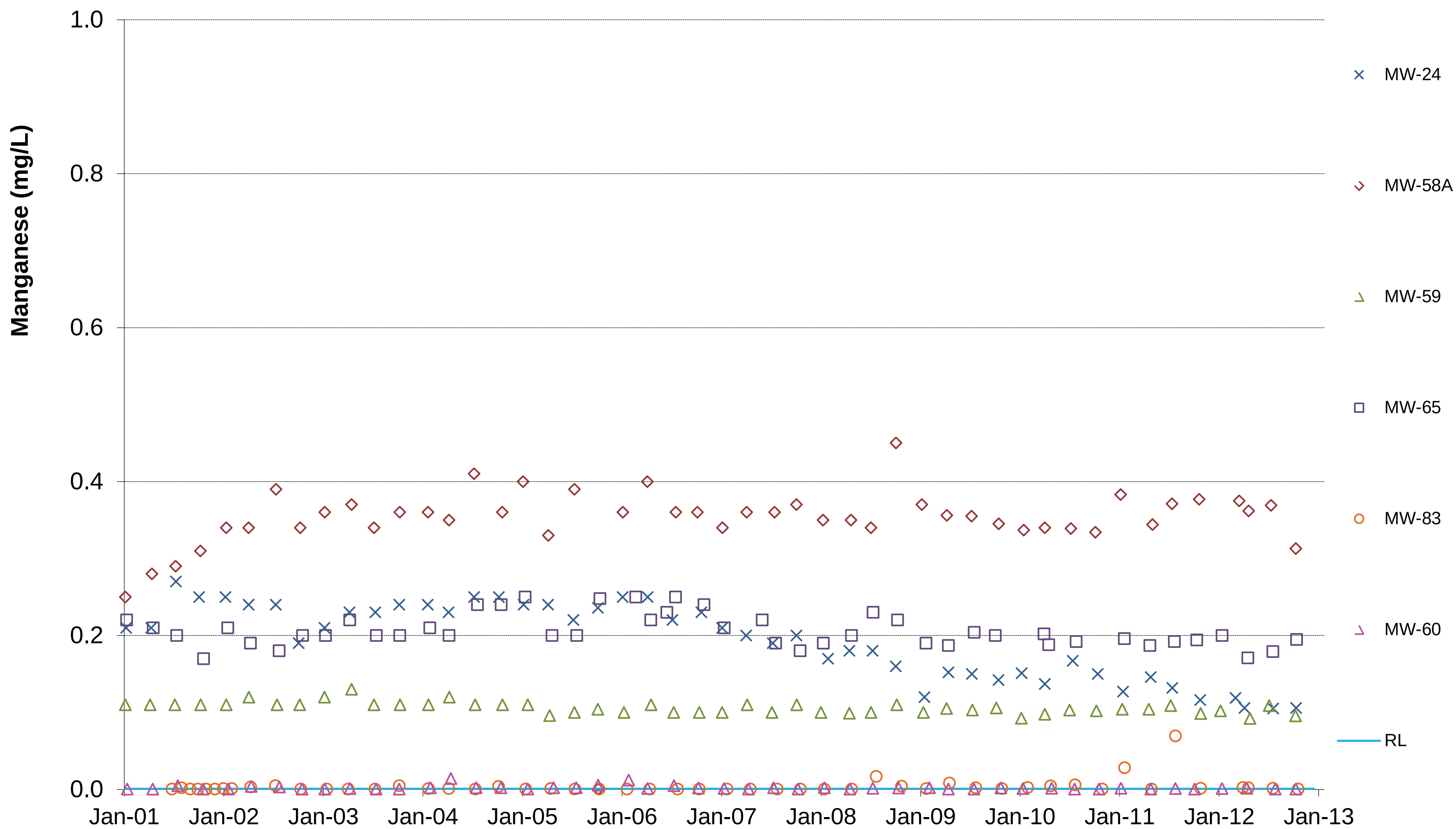
Iron (mg/L)
5
4
3
2
1
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL



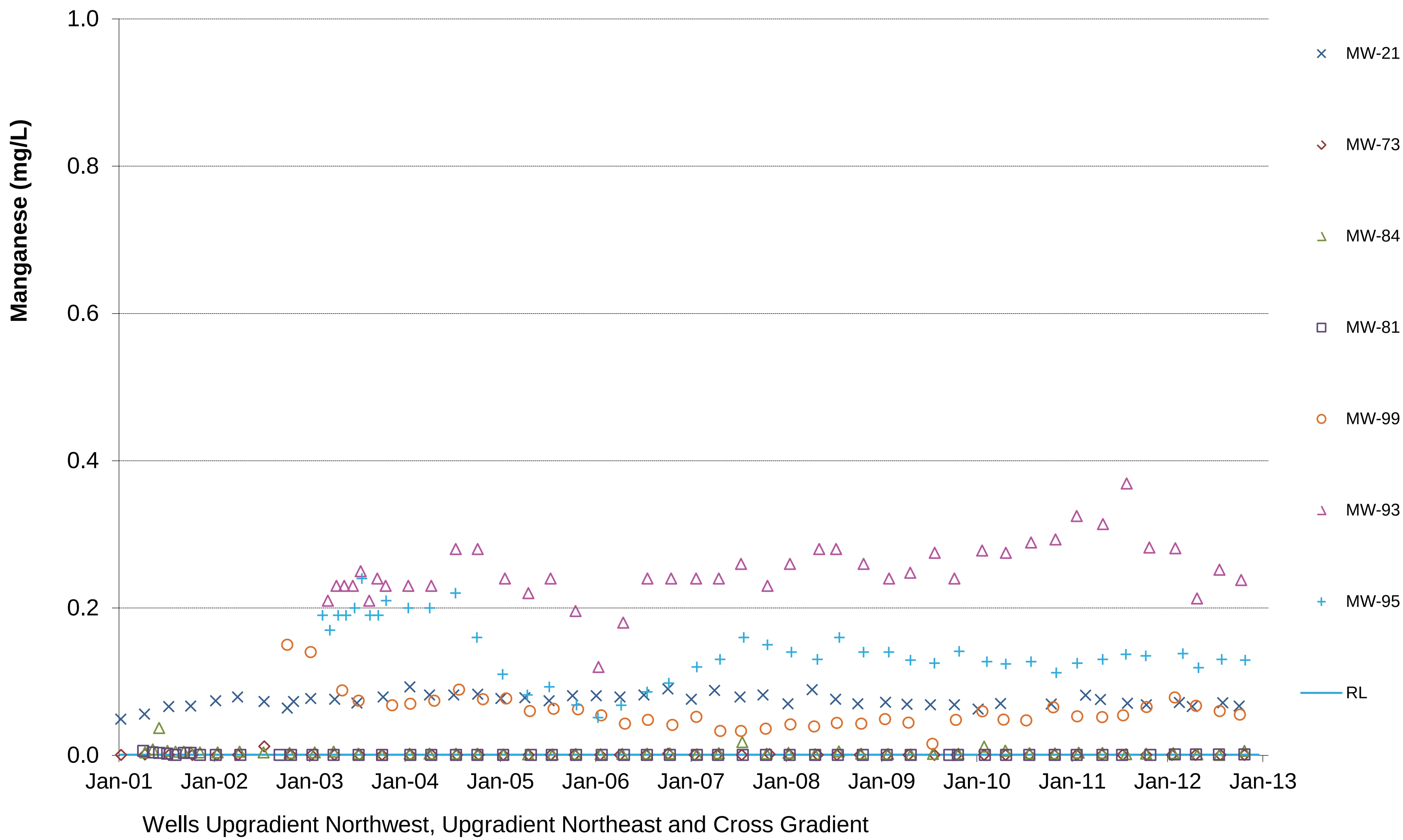
Iron (mg/L)
5
4
3
2
1
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL

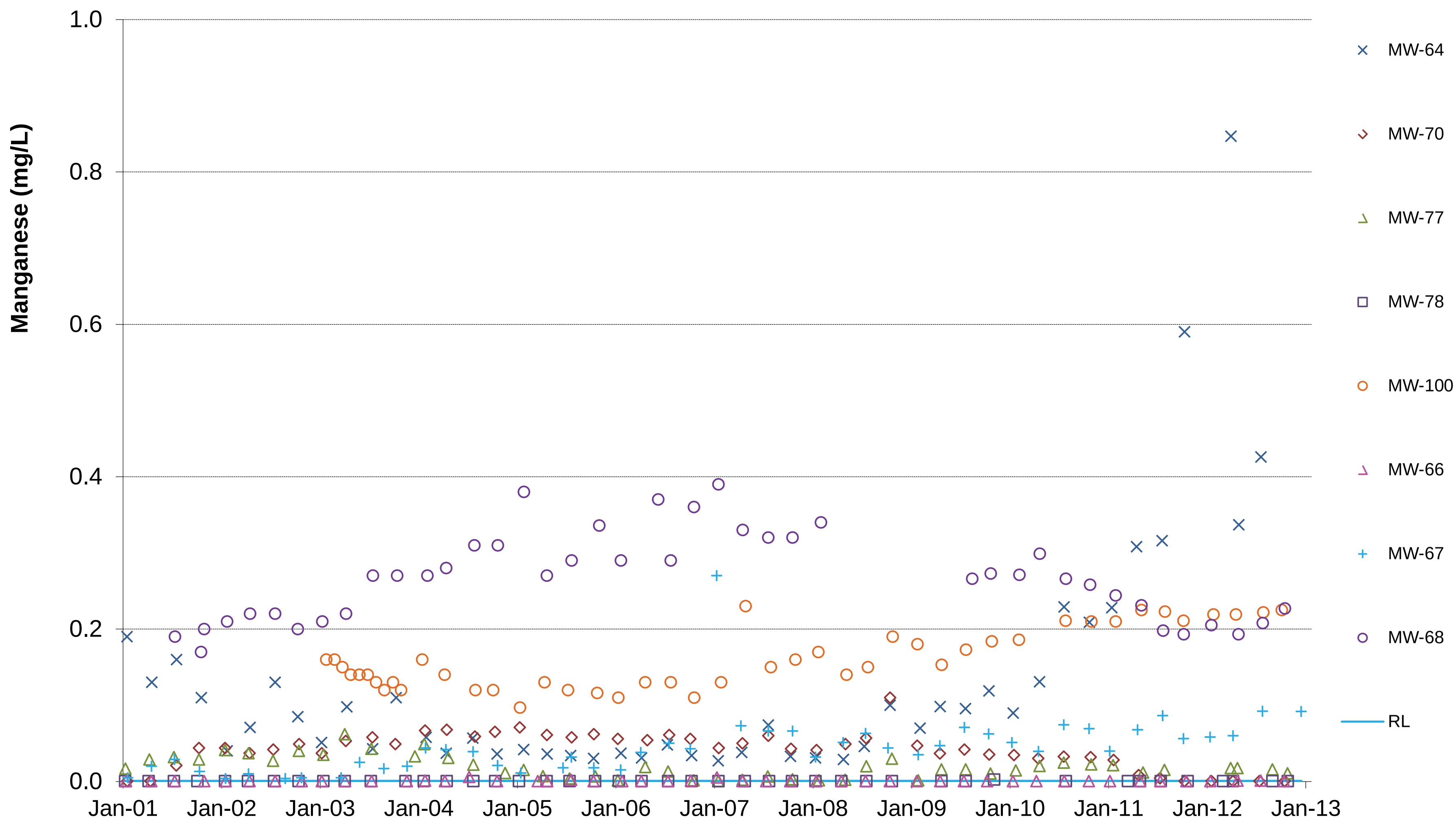


Wells Upgradient South

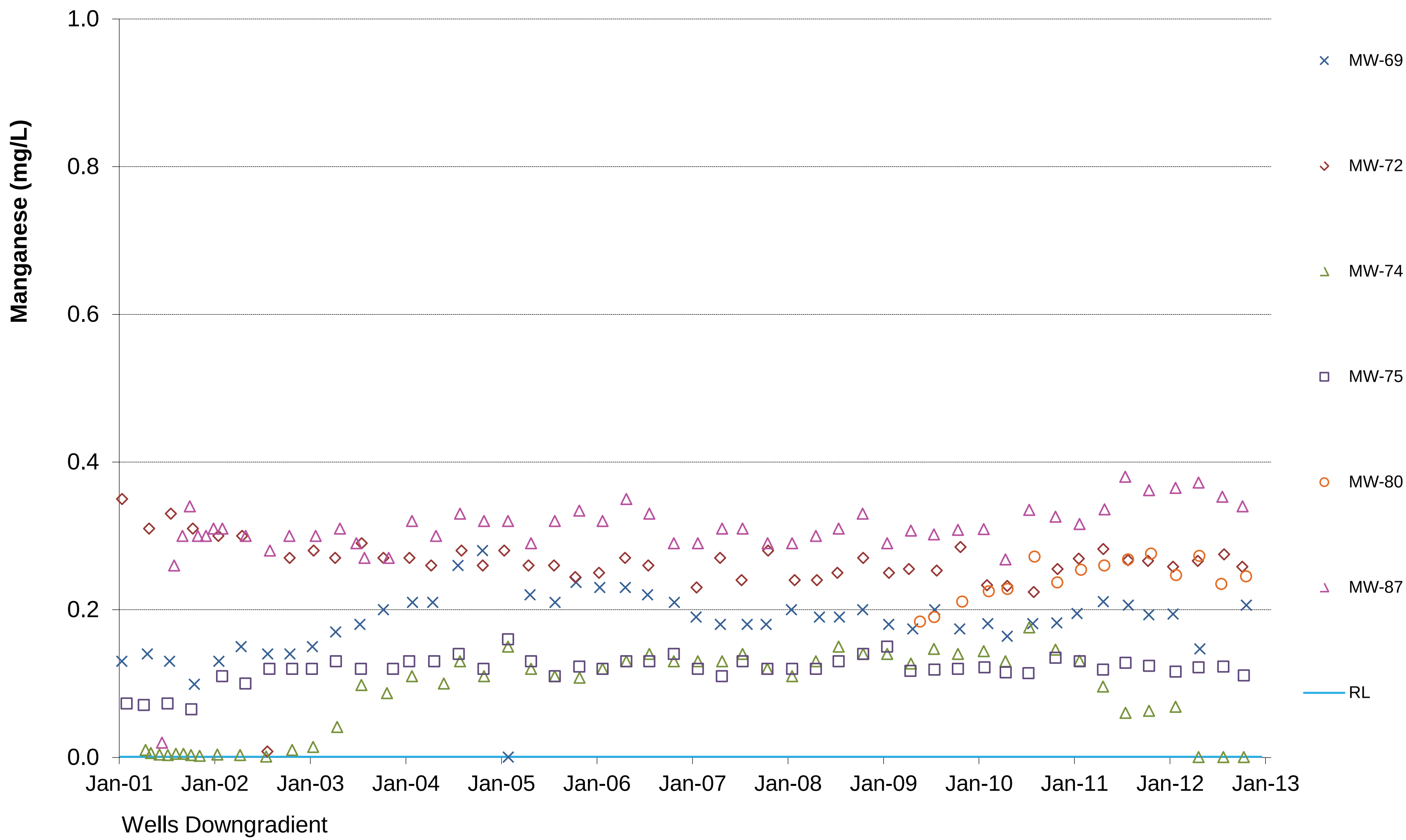


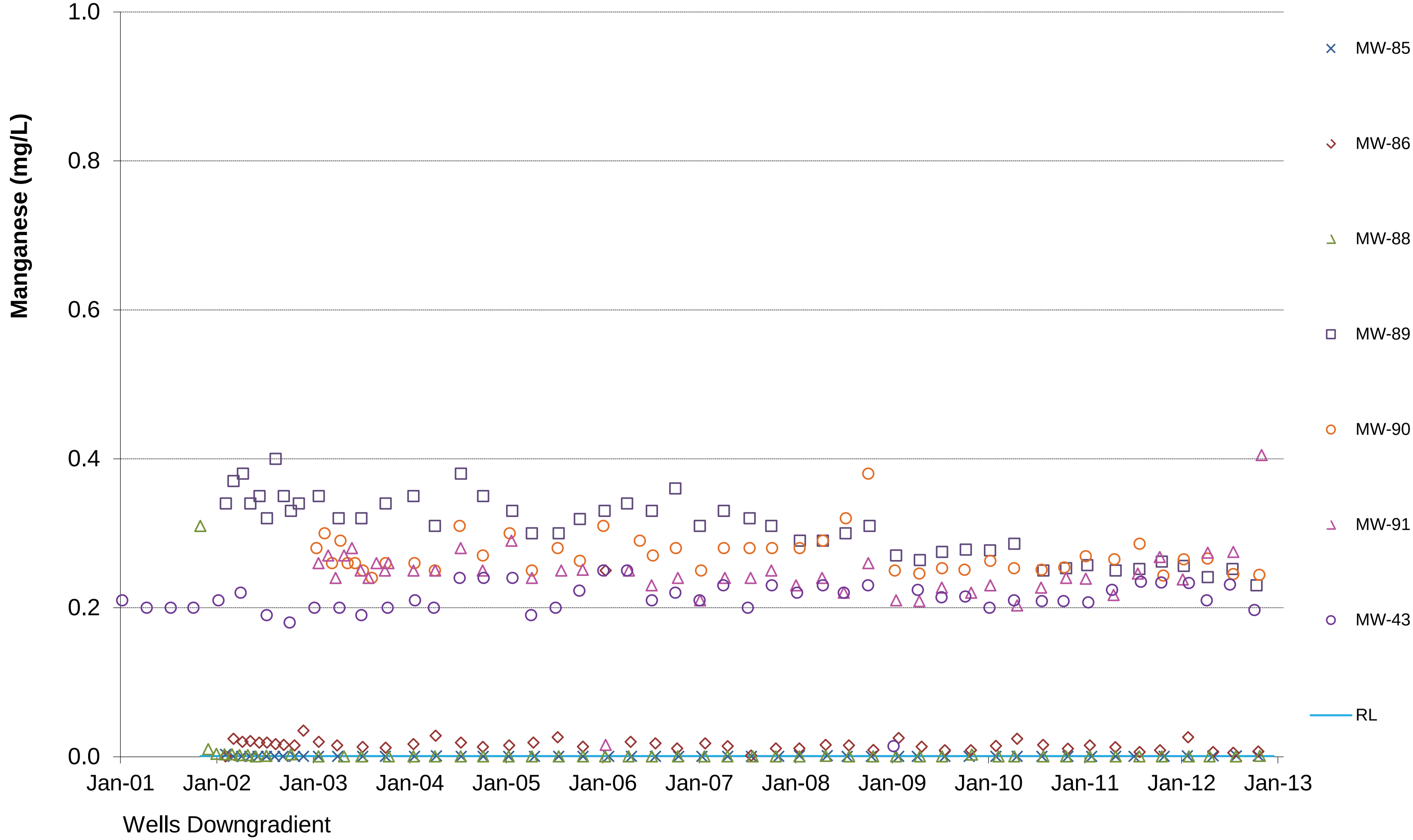
Wells Upgradient South


Manganese (mg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient
MW-21
MW-73
MW-84
MW-81
MW-99
MW-93
MW-95
RL

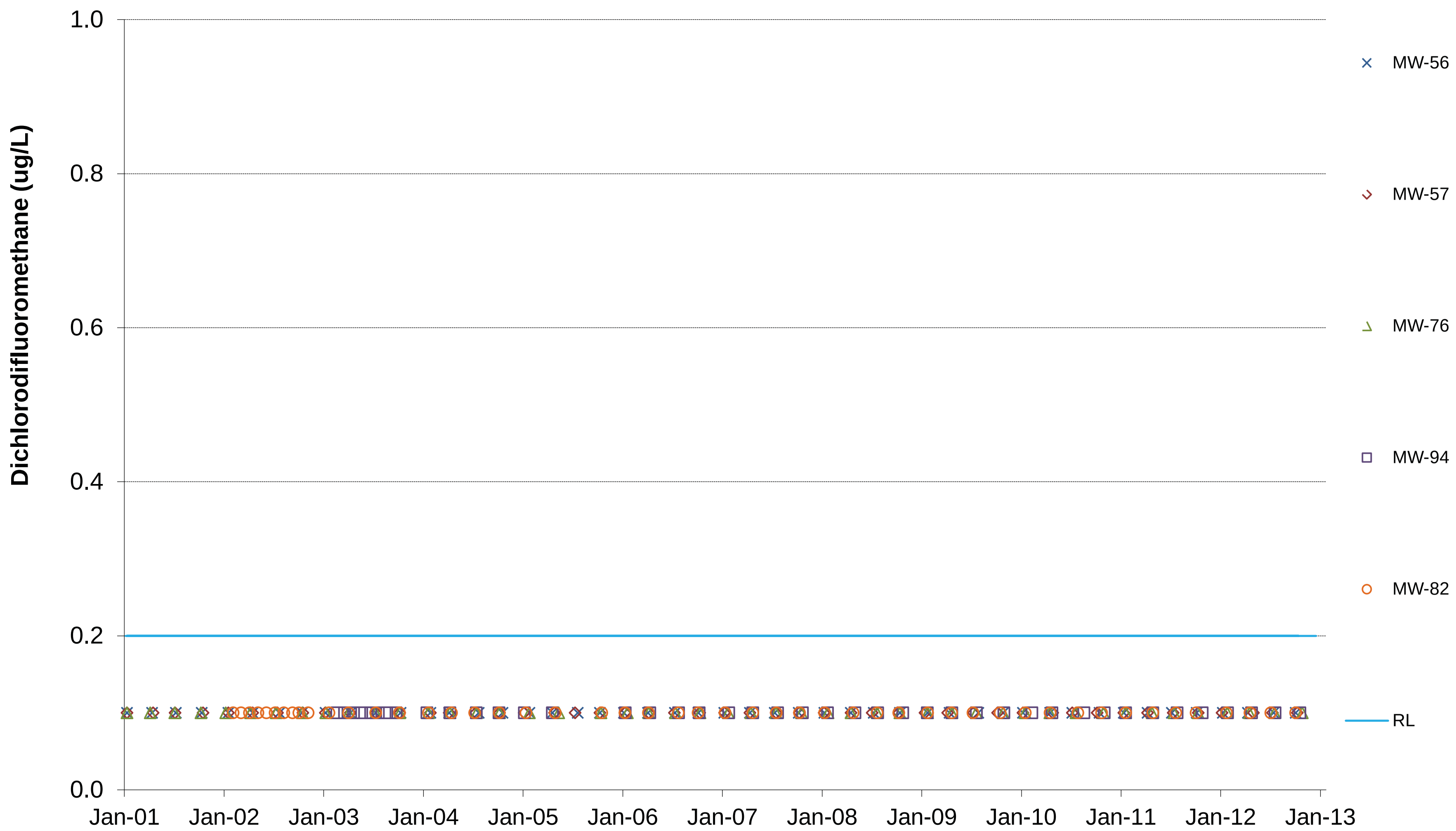


Wells Vertical to Key Facilities and Interior to Landfill Footprint

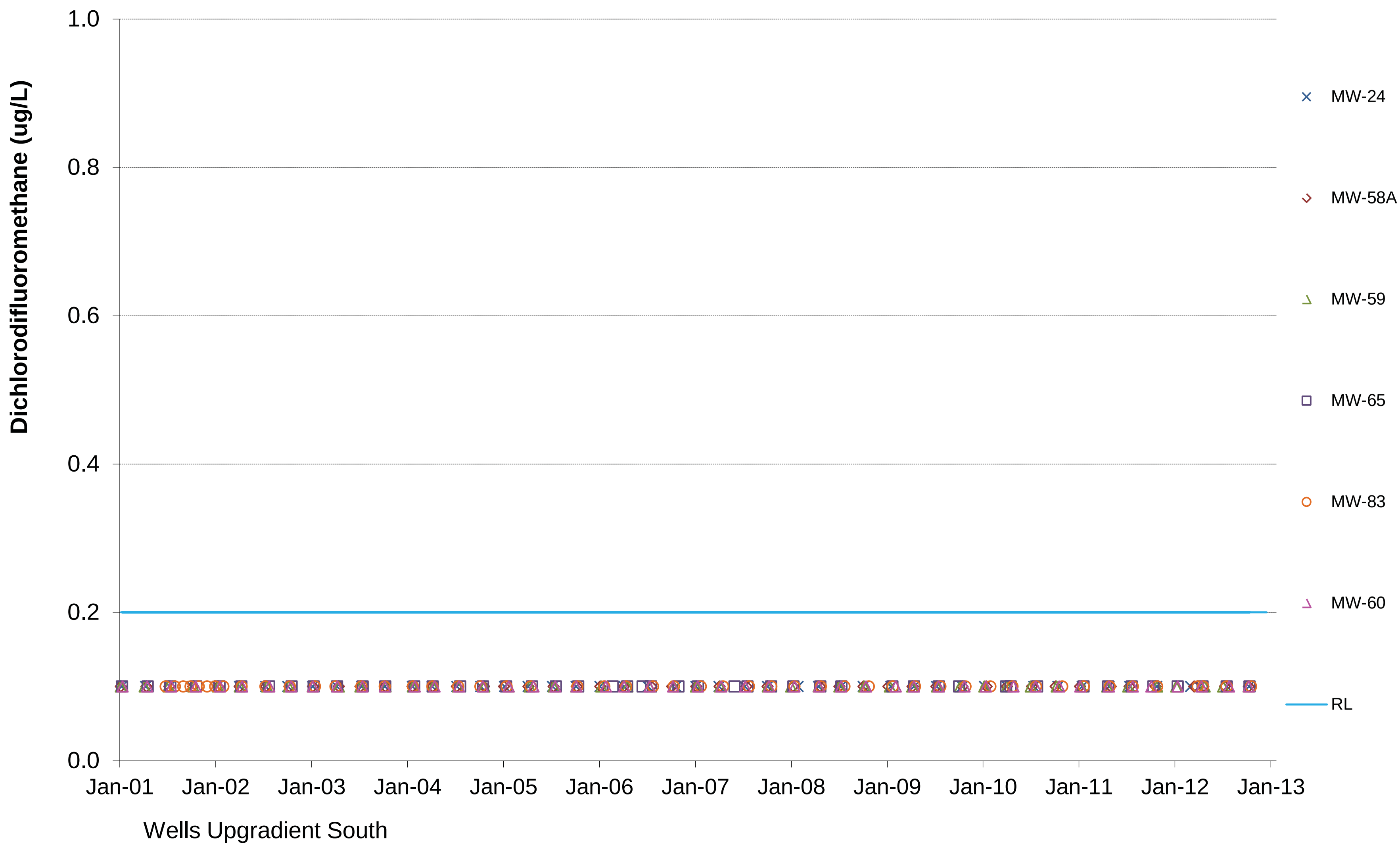

Manganese (mg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL



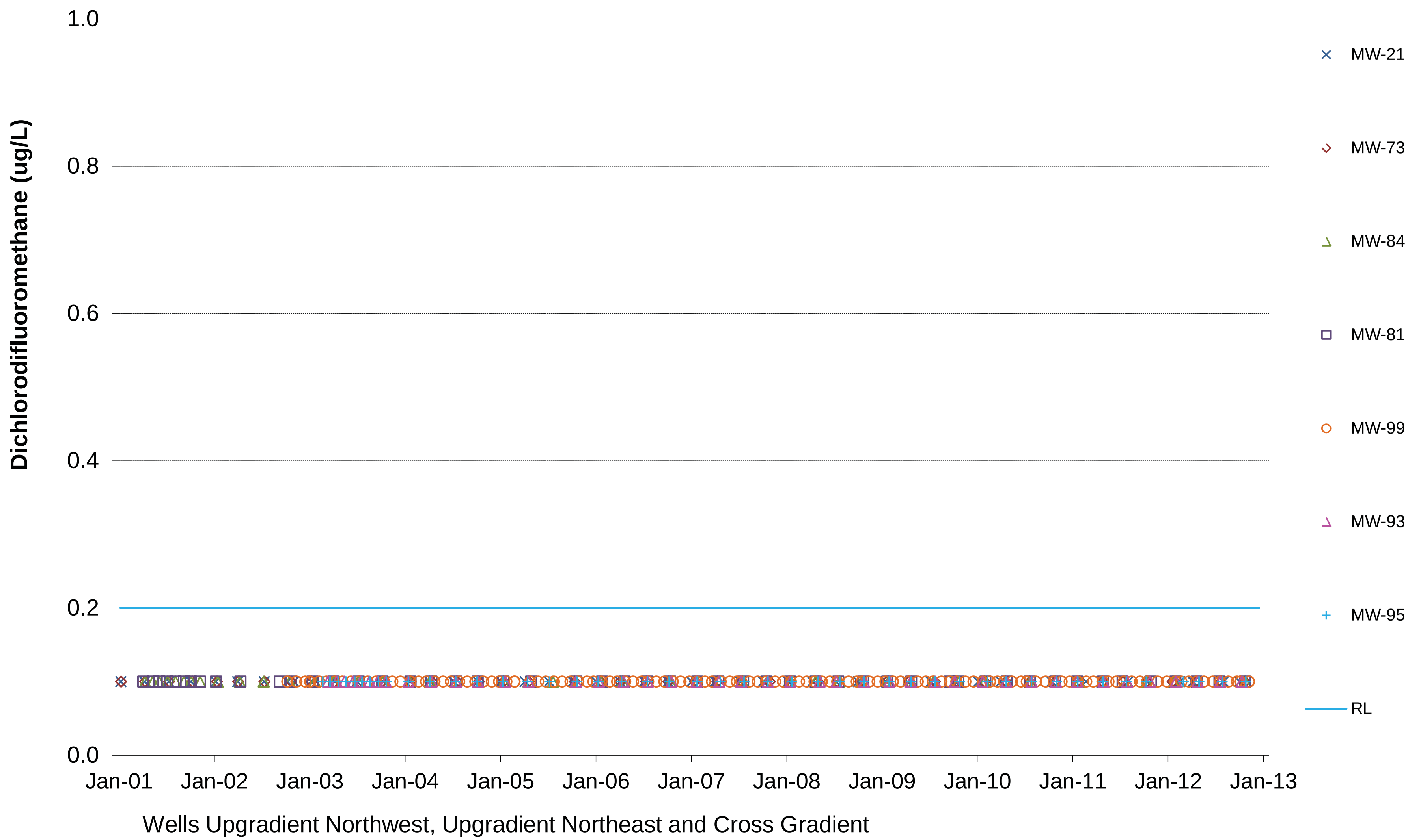
Manganese (mg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL

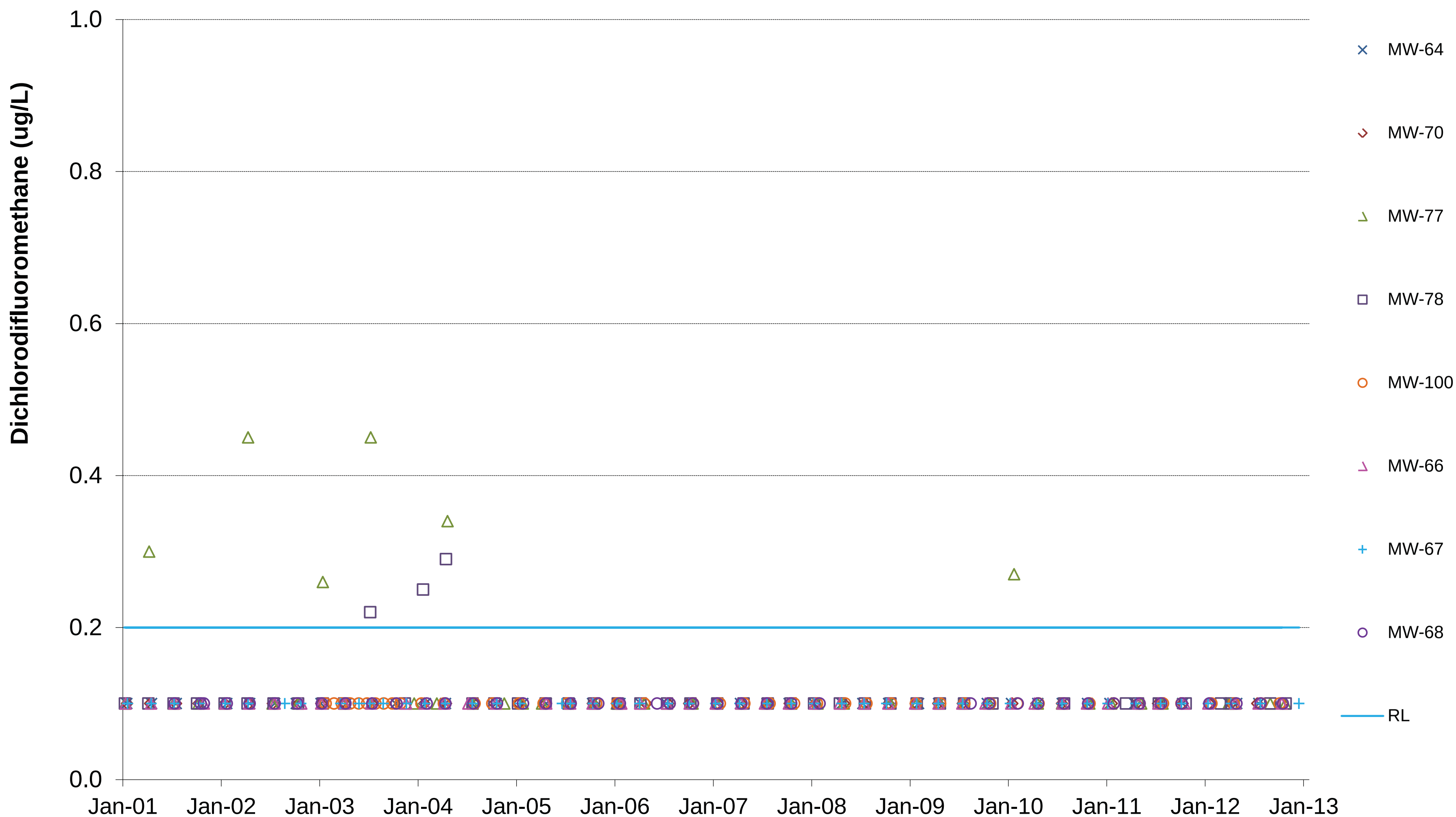


Wells Upgradient South

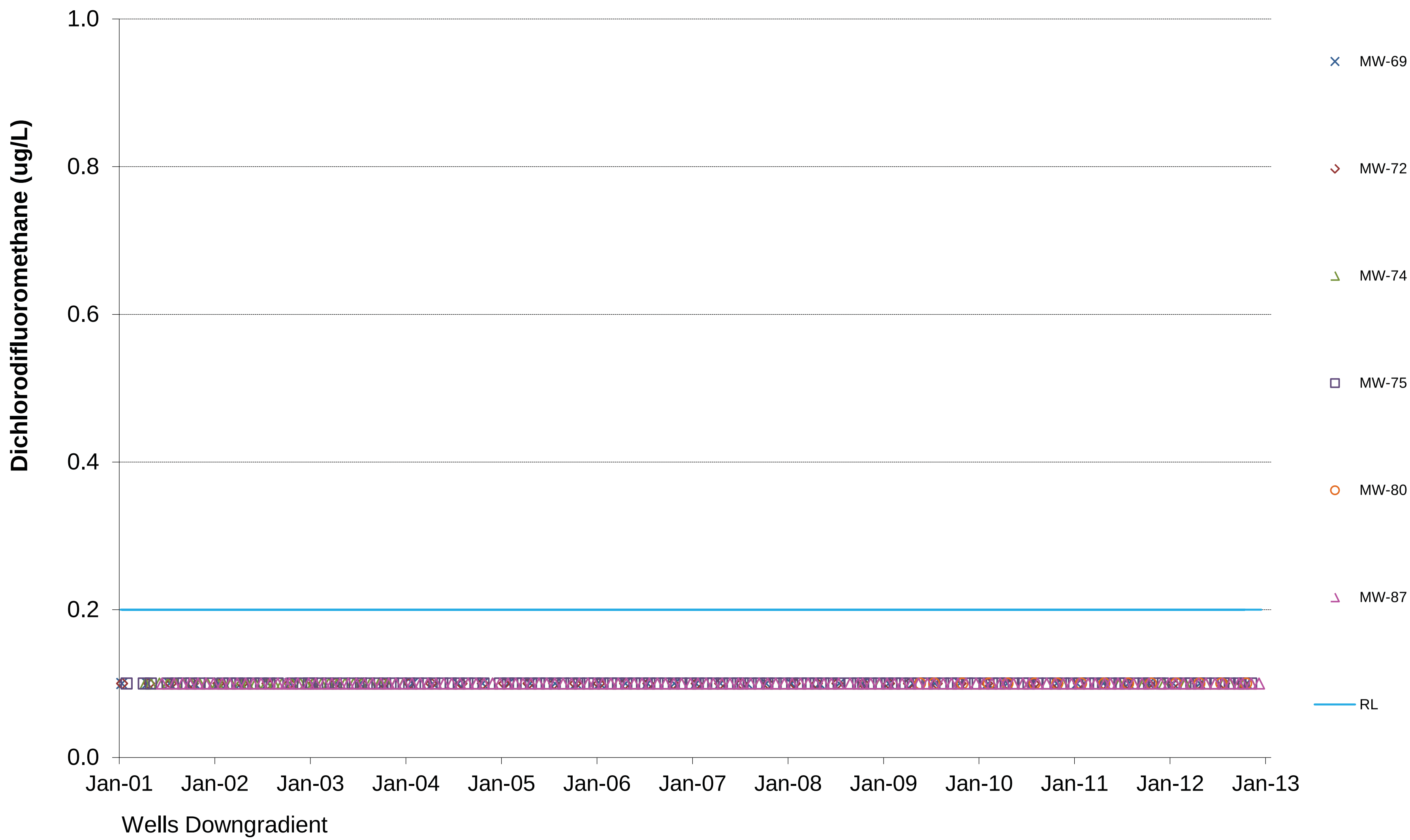


Dichlorodifluoromethane (ug/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
MW-24
MW-58A
MW-59
MW-65
MW-83
MW-60
RL
Wells Upgradient South

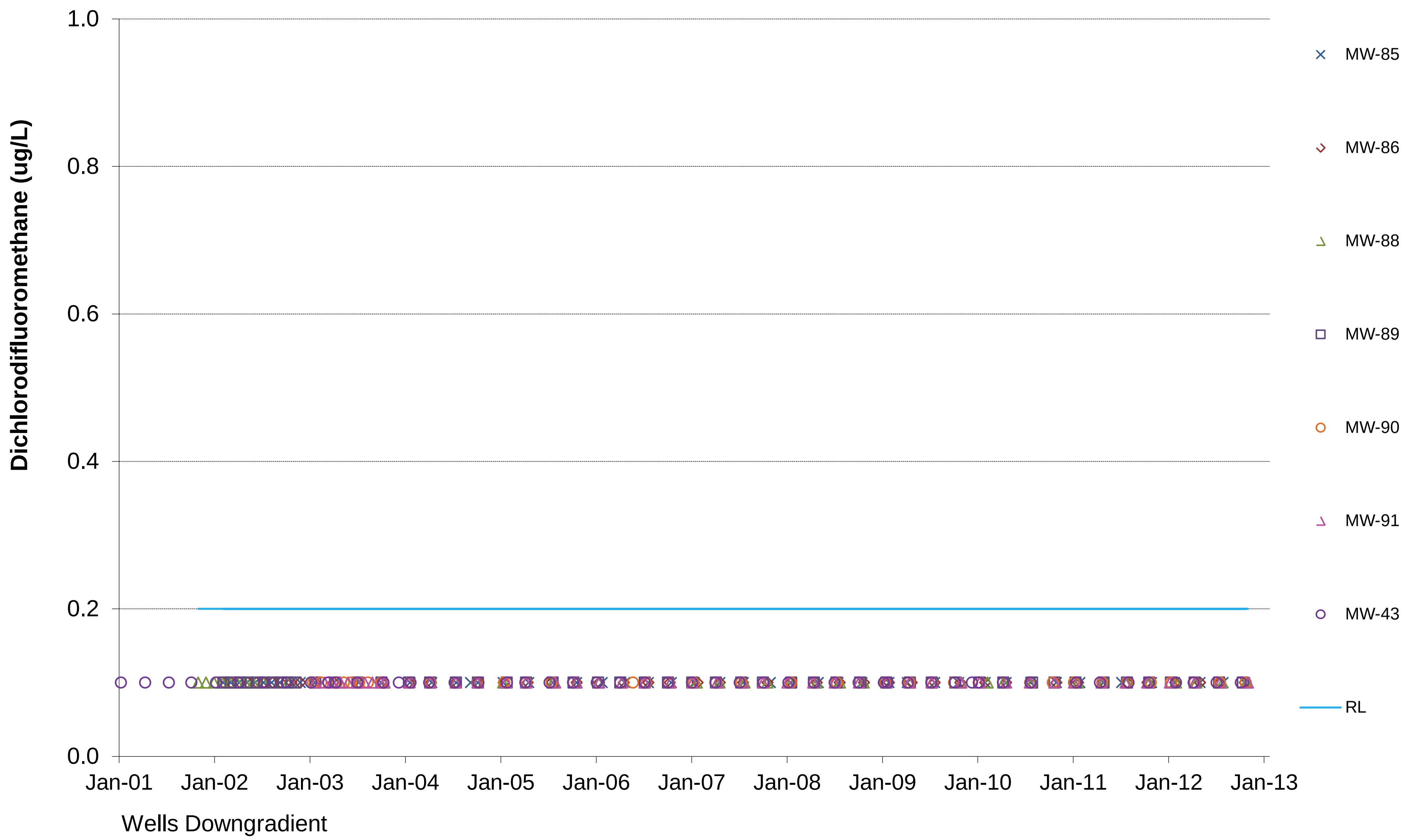

Dichlorodifluoromethane (ug/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient
MW-21
MW-73
MW-84
MW-81
MW-99
MW-93
MW-95
RL



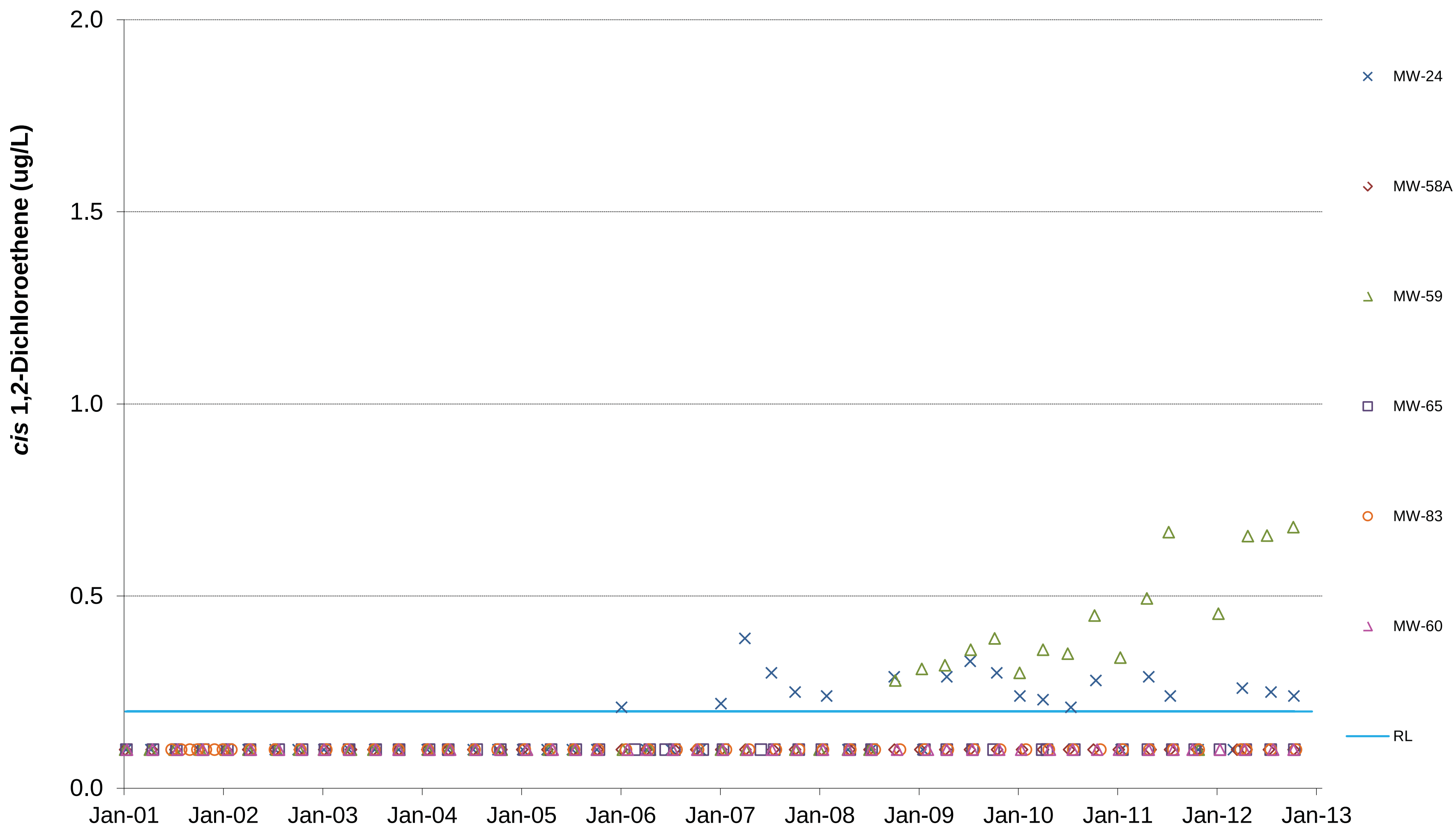
Wells Vertical to Key Facilities and Interior to Landfill Footprint



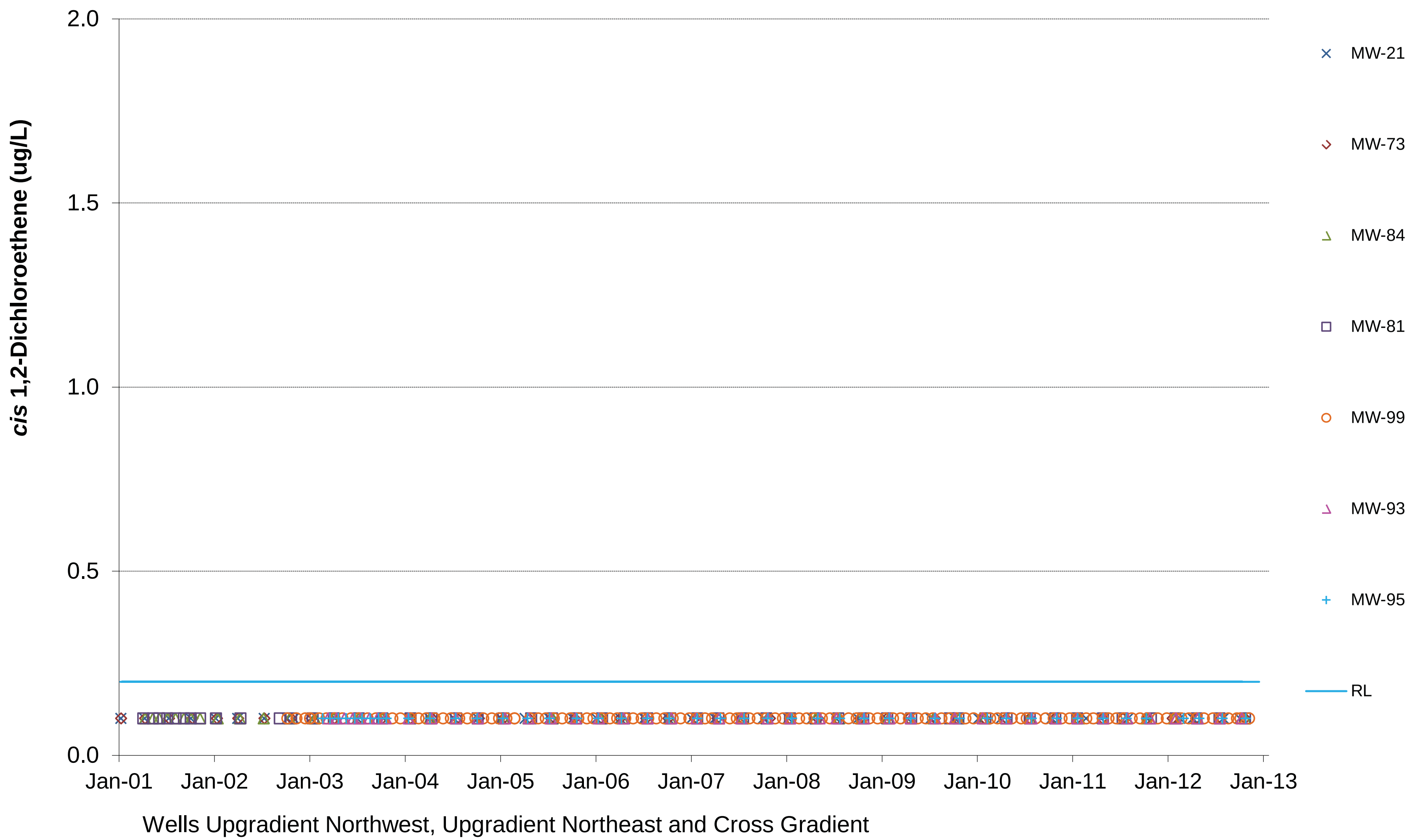
Dichlorodifluoromethane (ug/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL

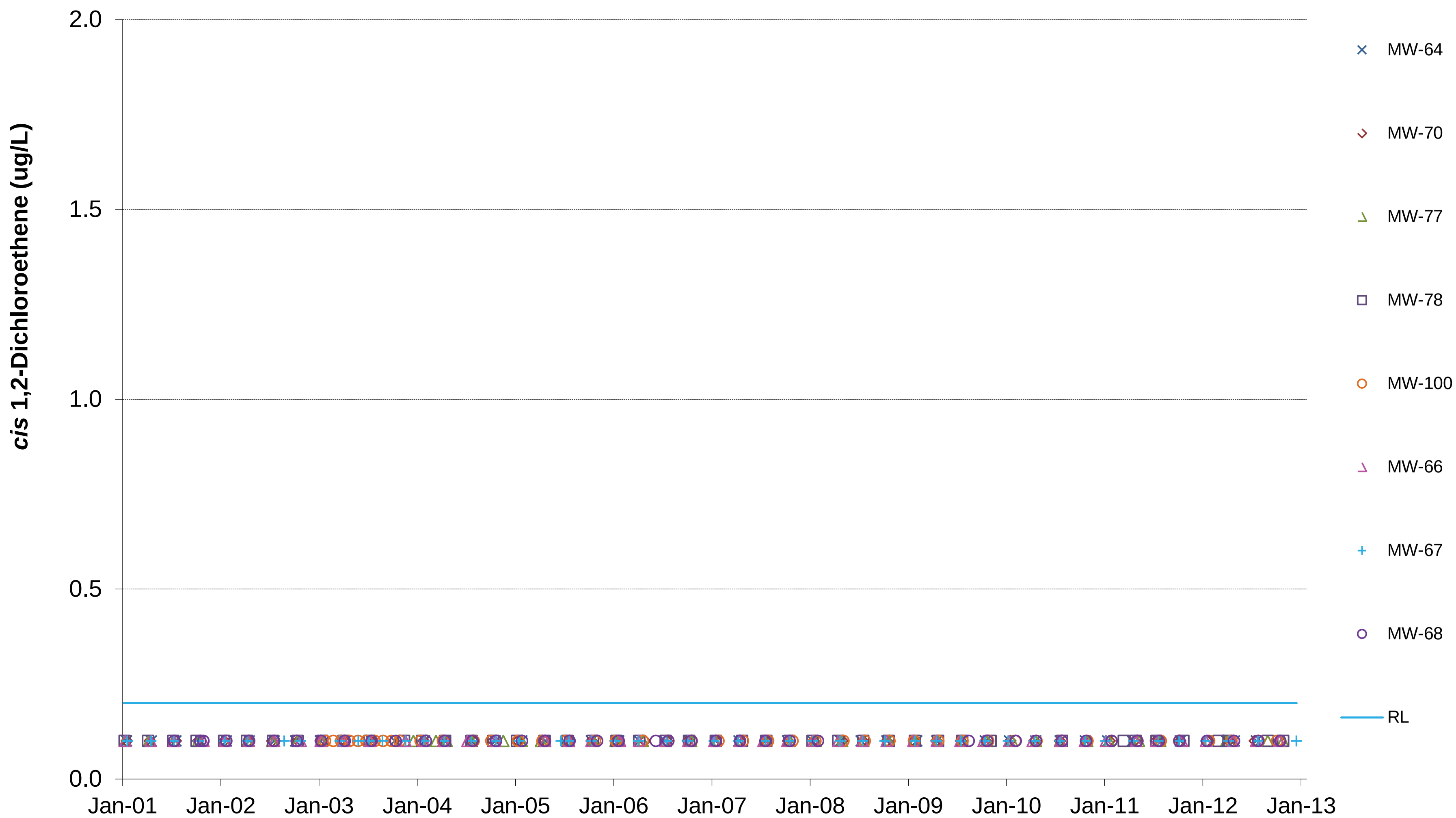

Dichlorodifluoromethane (ug/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL

cis 1,2-Dichloroethene (ug/L)
2.0
1.5
1.0
0.5
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-56
MW-57
MW-76
MW-94
MW-82
RL

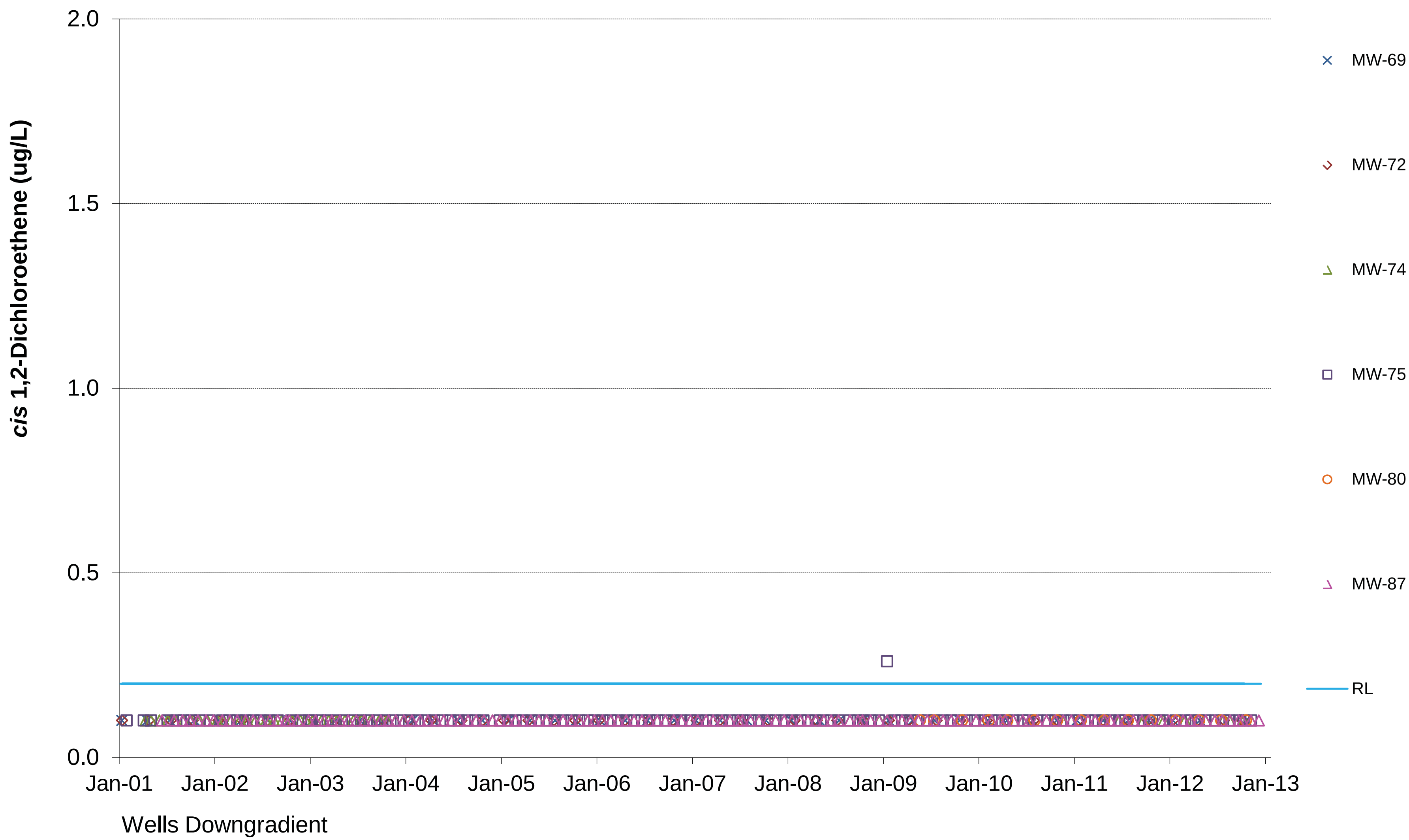


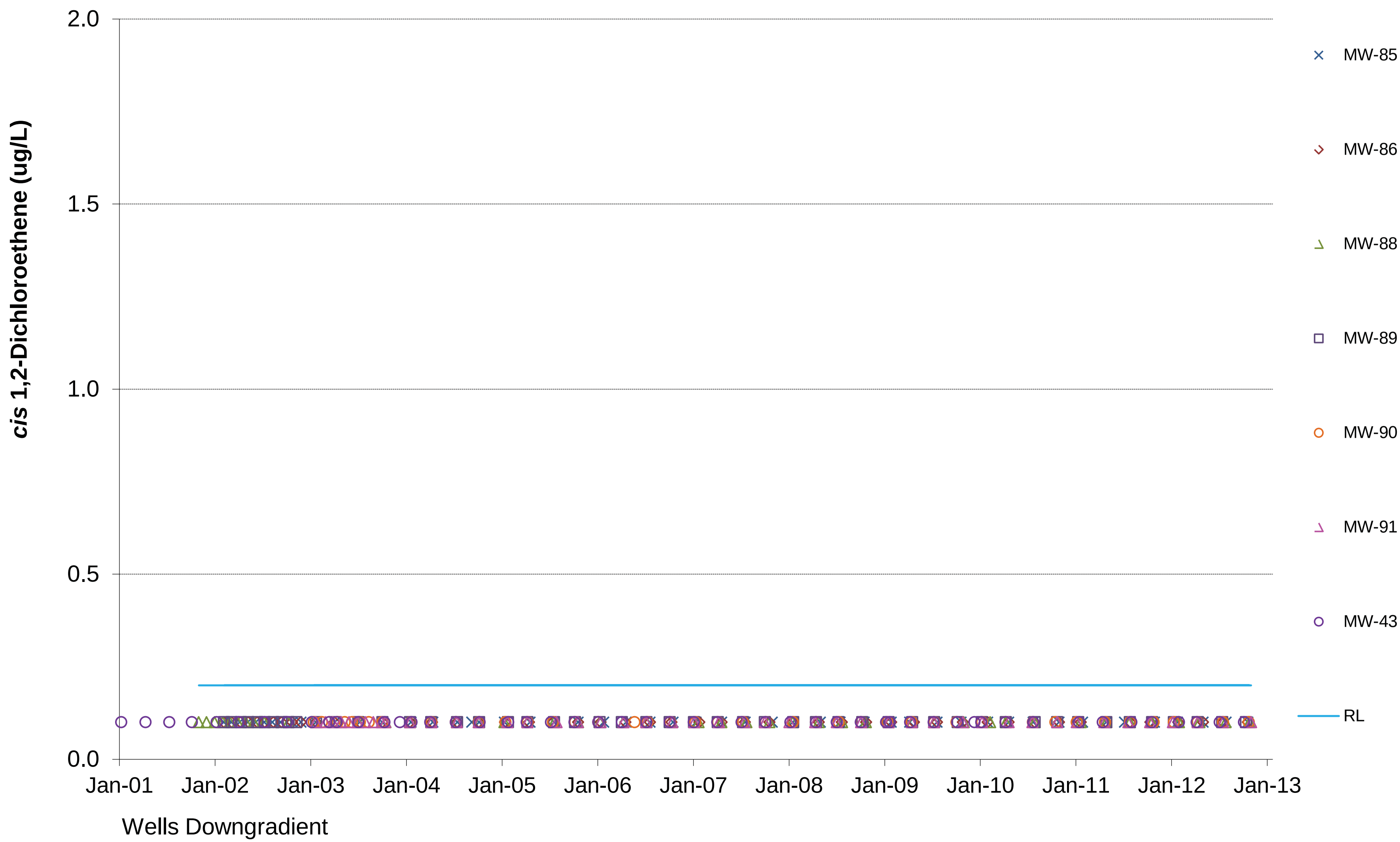
Wells Upgradient South

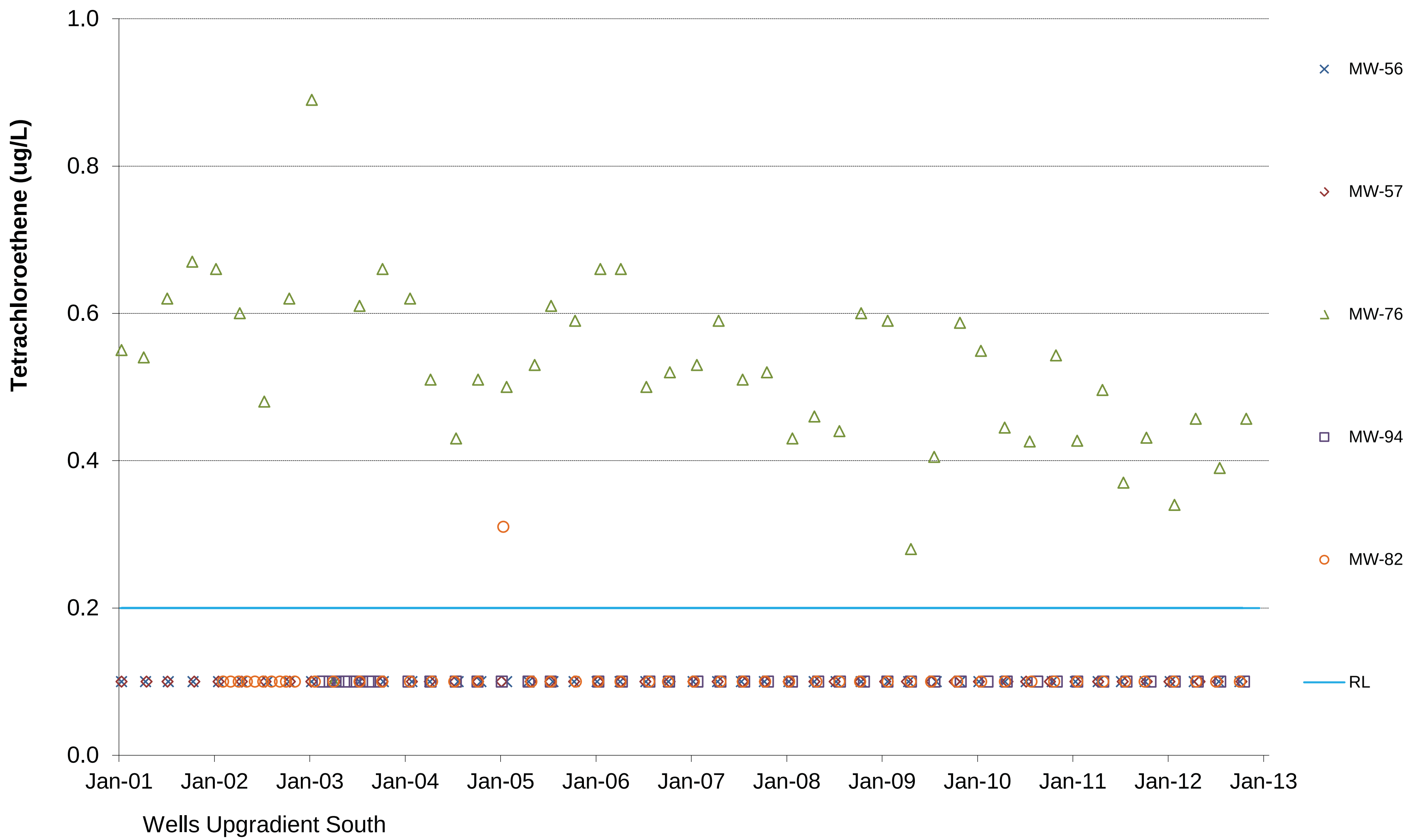

cis 1,2-Dichloroethene (ug/L)
2.0
1.5
1.0
0.5
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient
MW-21
MW-73
MW-84
MW-81
MW-99
MW-93
MW-95
RL

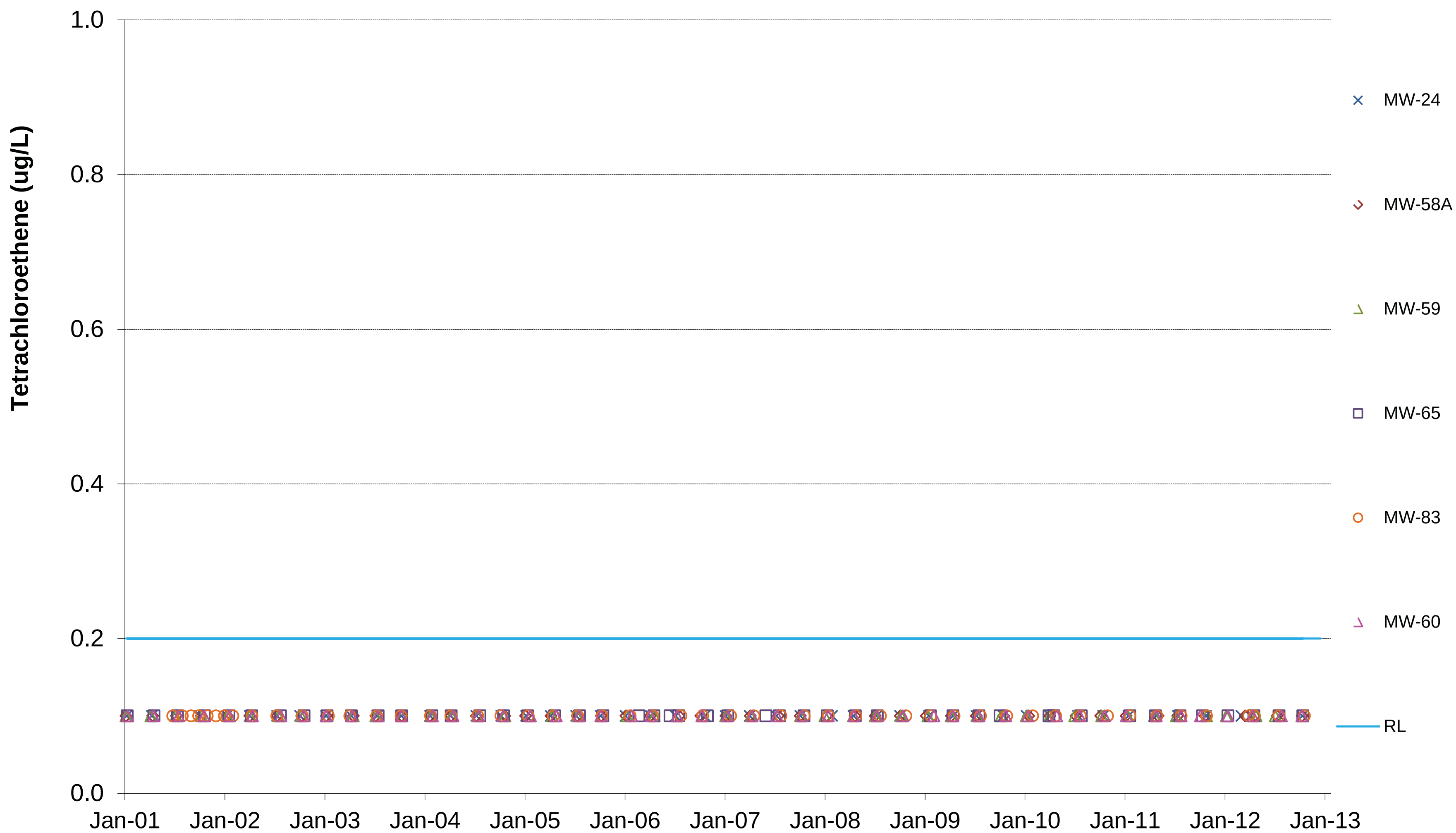


Wells Vertical to Key Facilities and Interior to Landfill Footprint

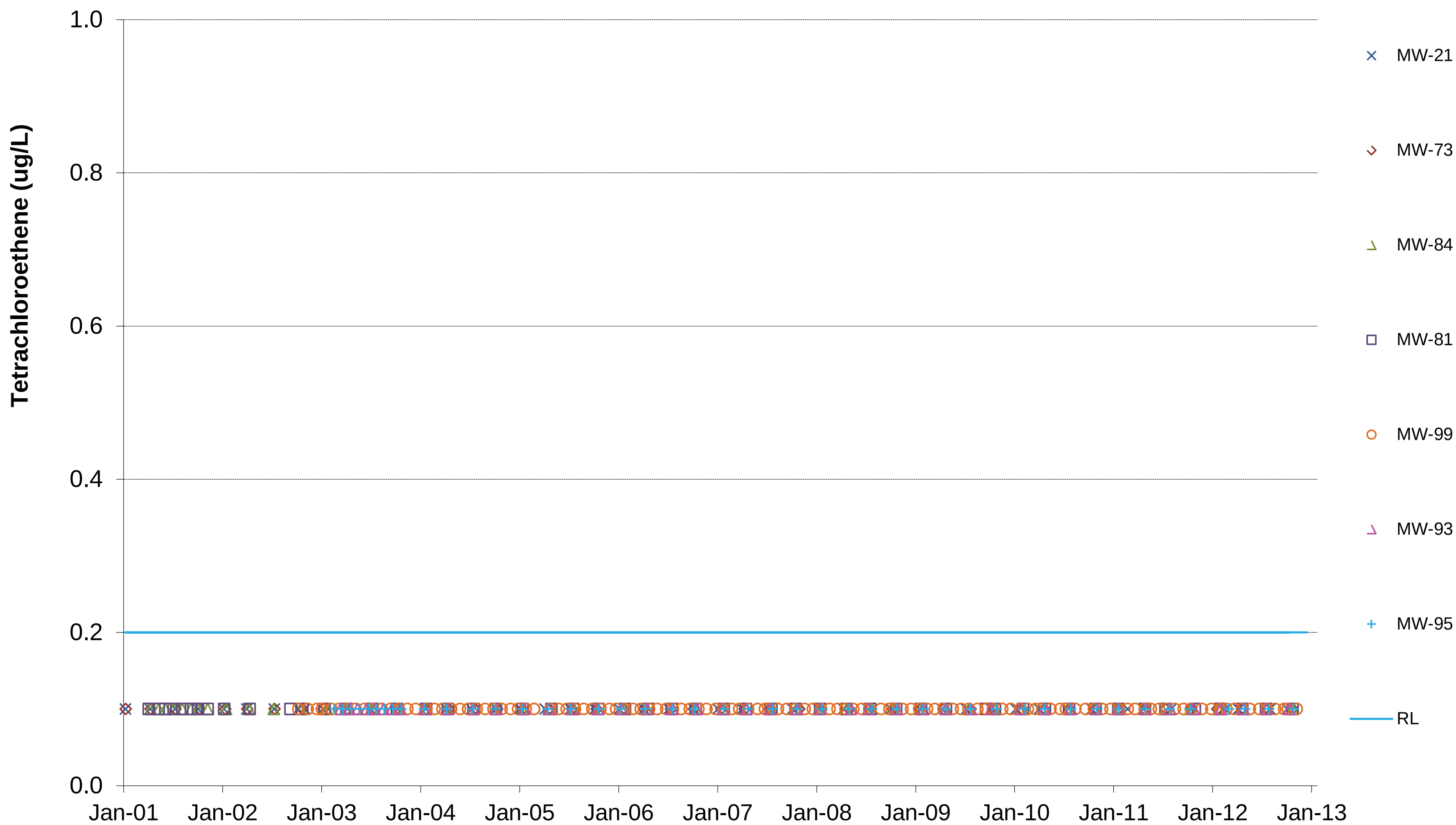

cis 1,2-Dichloroethene (ug/L)
2.0
1.5
1.0
0.5
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL


cis 1,2-Dichloroethene (ug/L)
2.0
1.5
1.0
0.5
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL

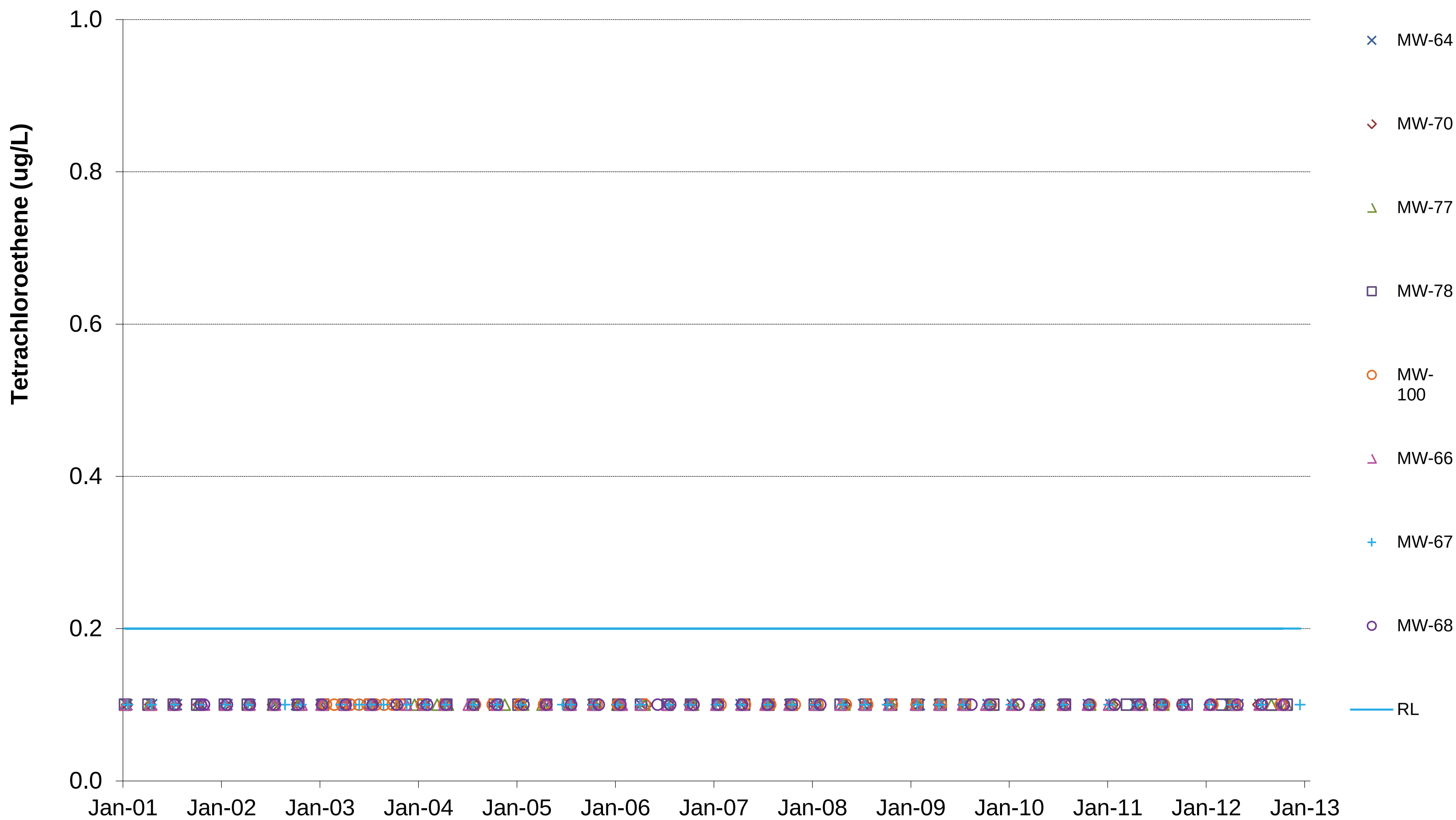

Tetrachloroethene (ug/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-56
MW-57
MW-76
MW-94
MW-82
RL



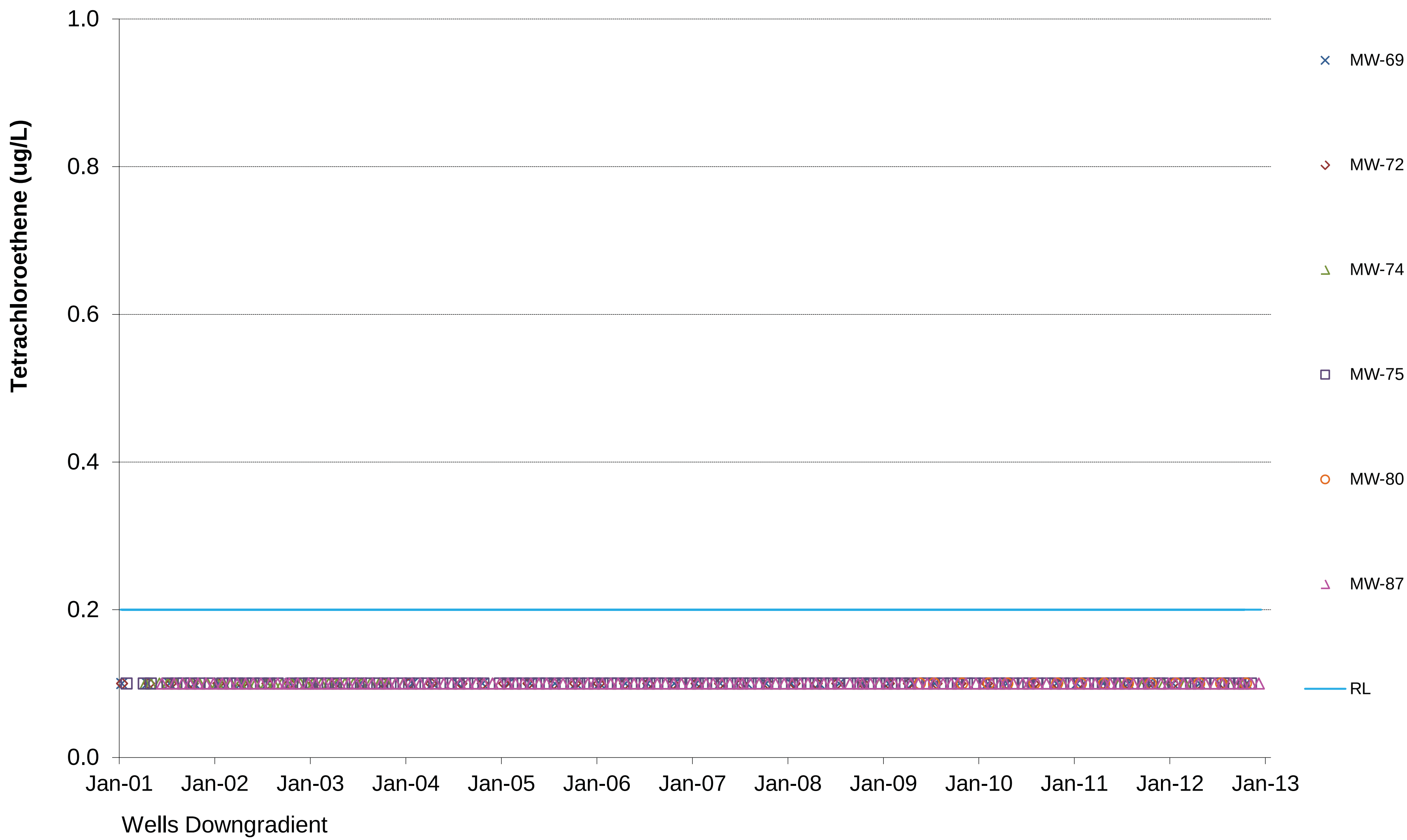
Wells Upgradient South

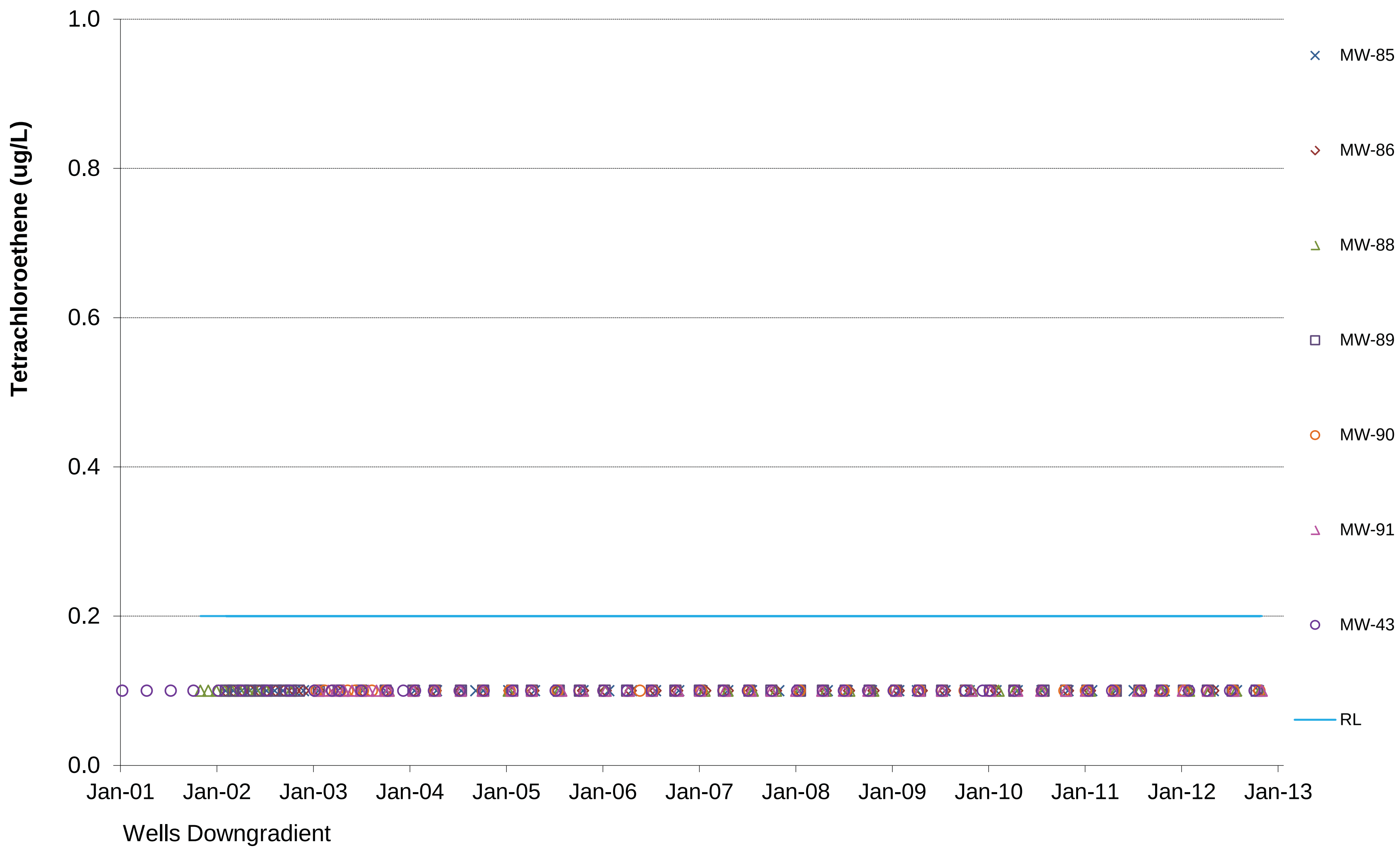


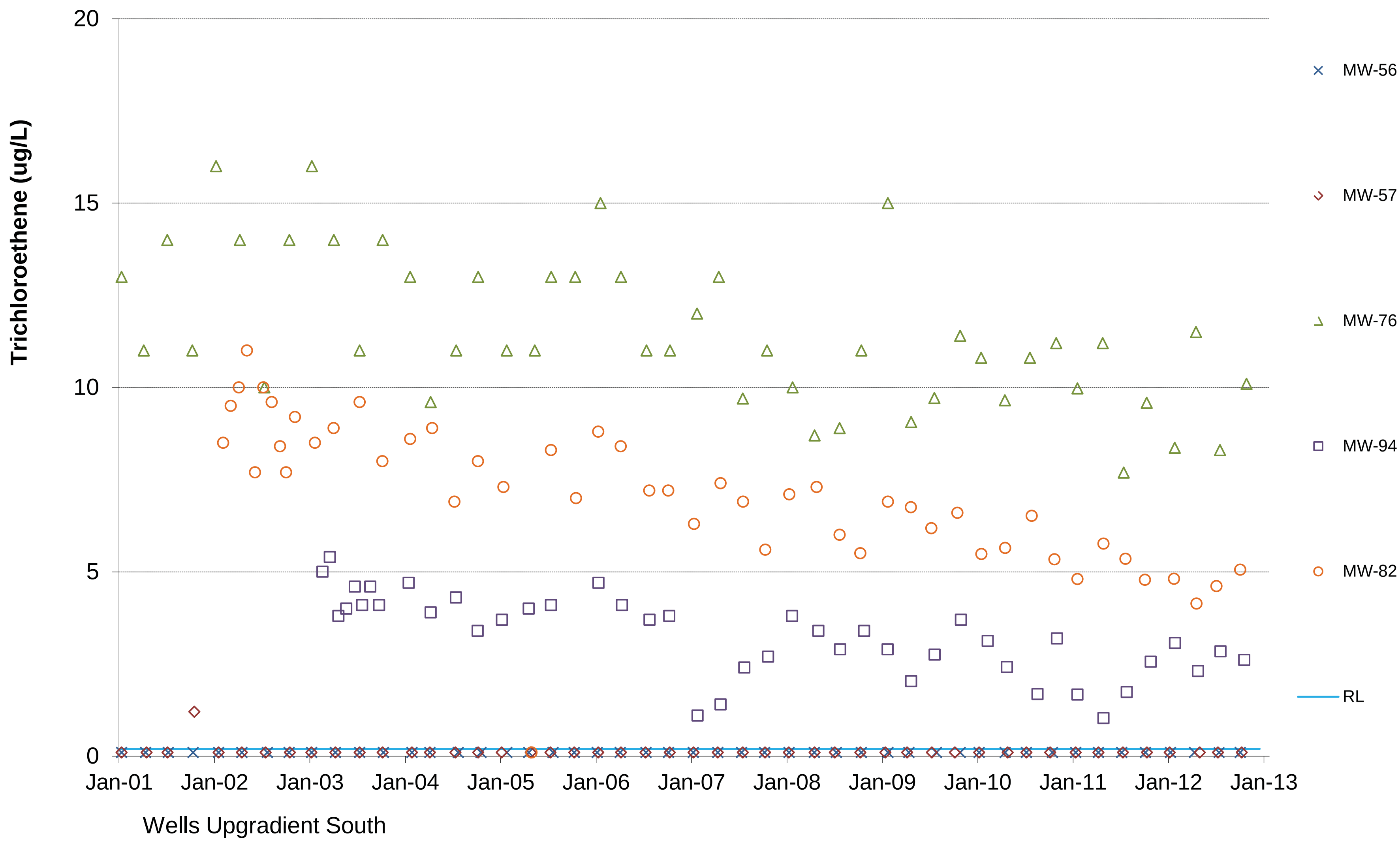
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient

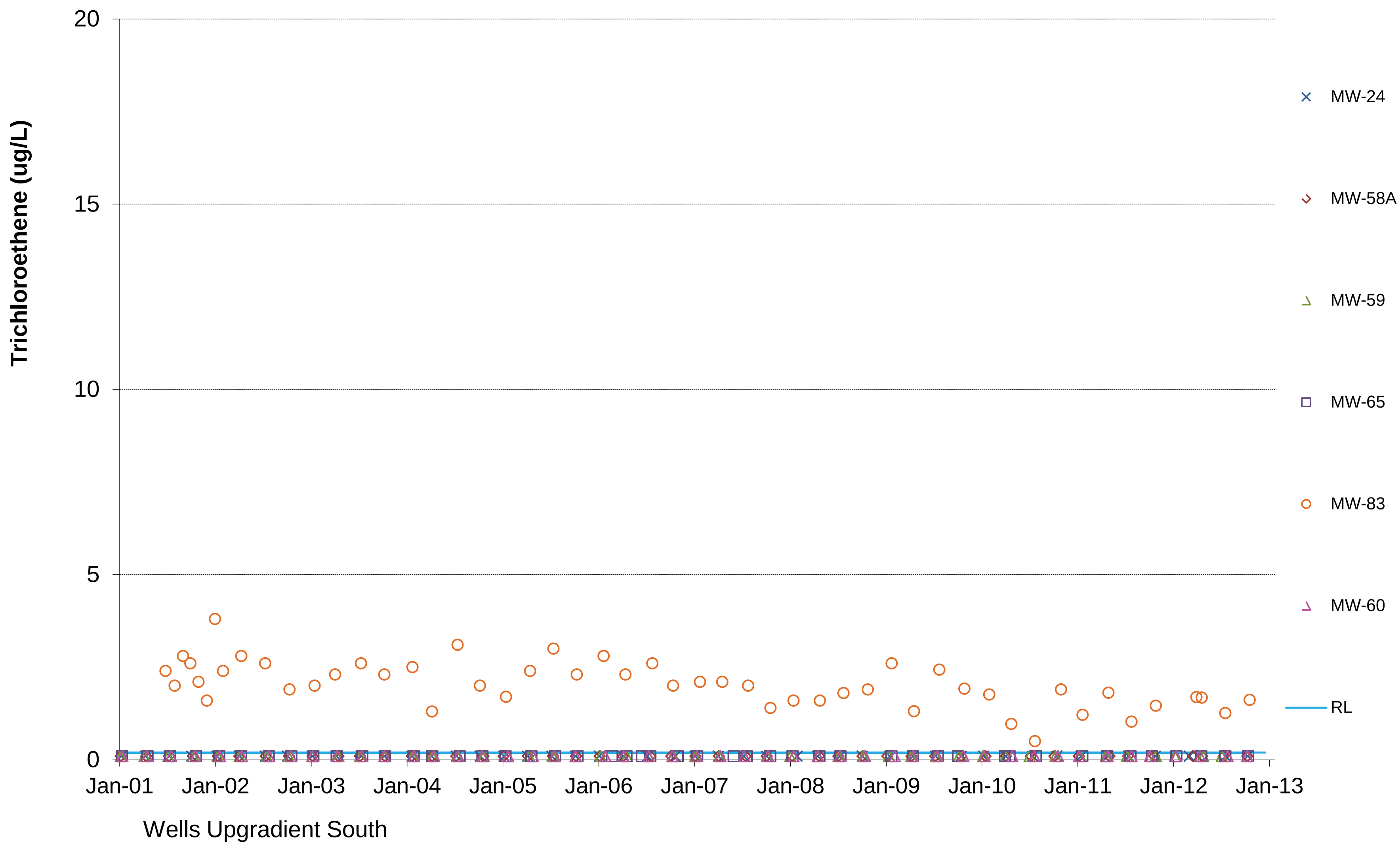


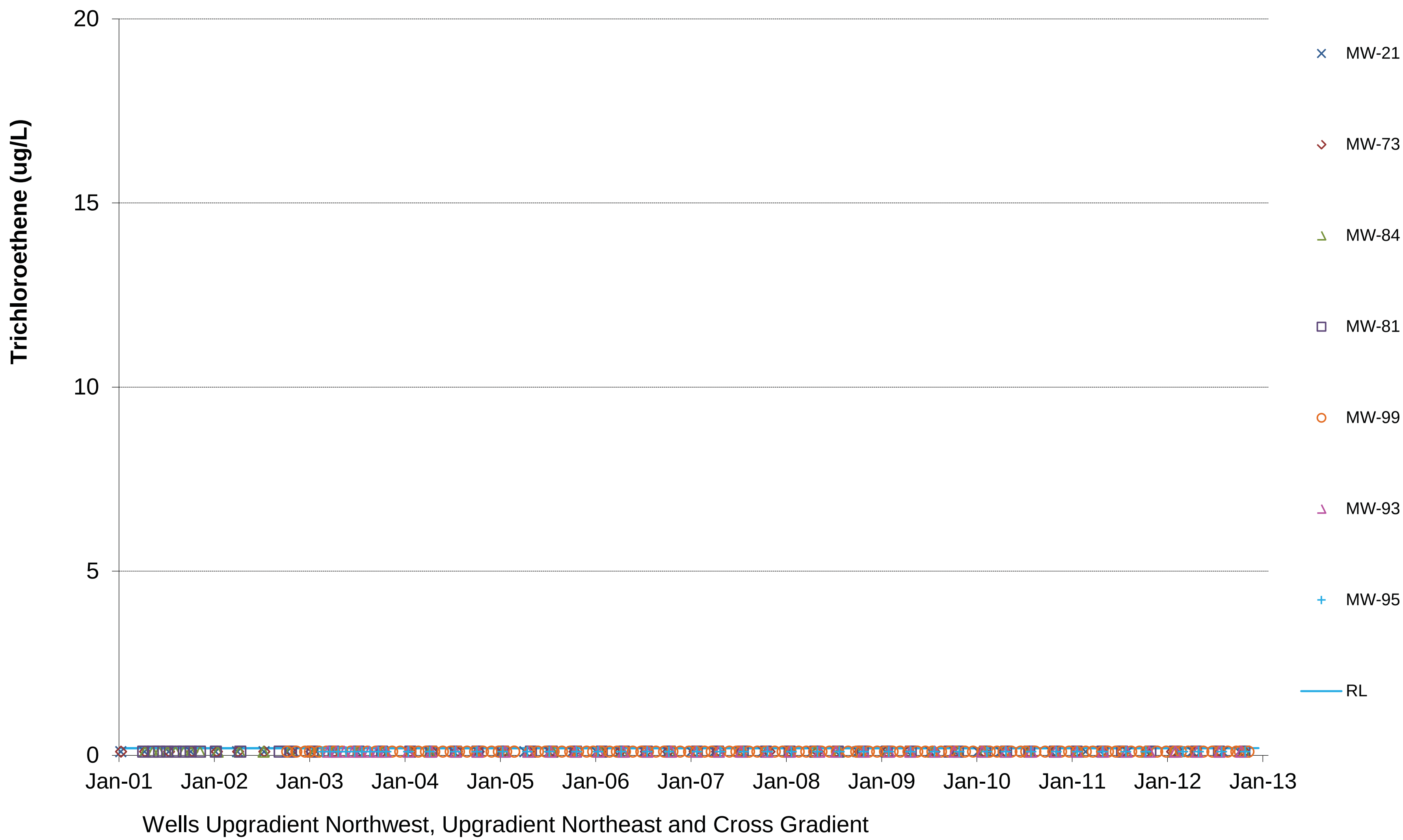
Wells Vertical to Key Facilities and Interior to Landfill Footprint

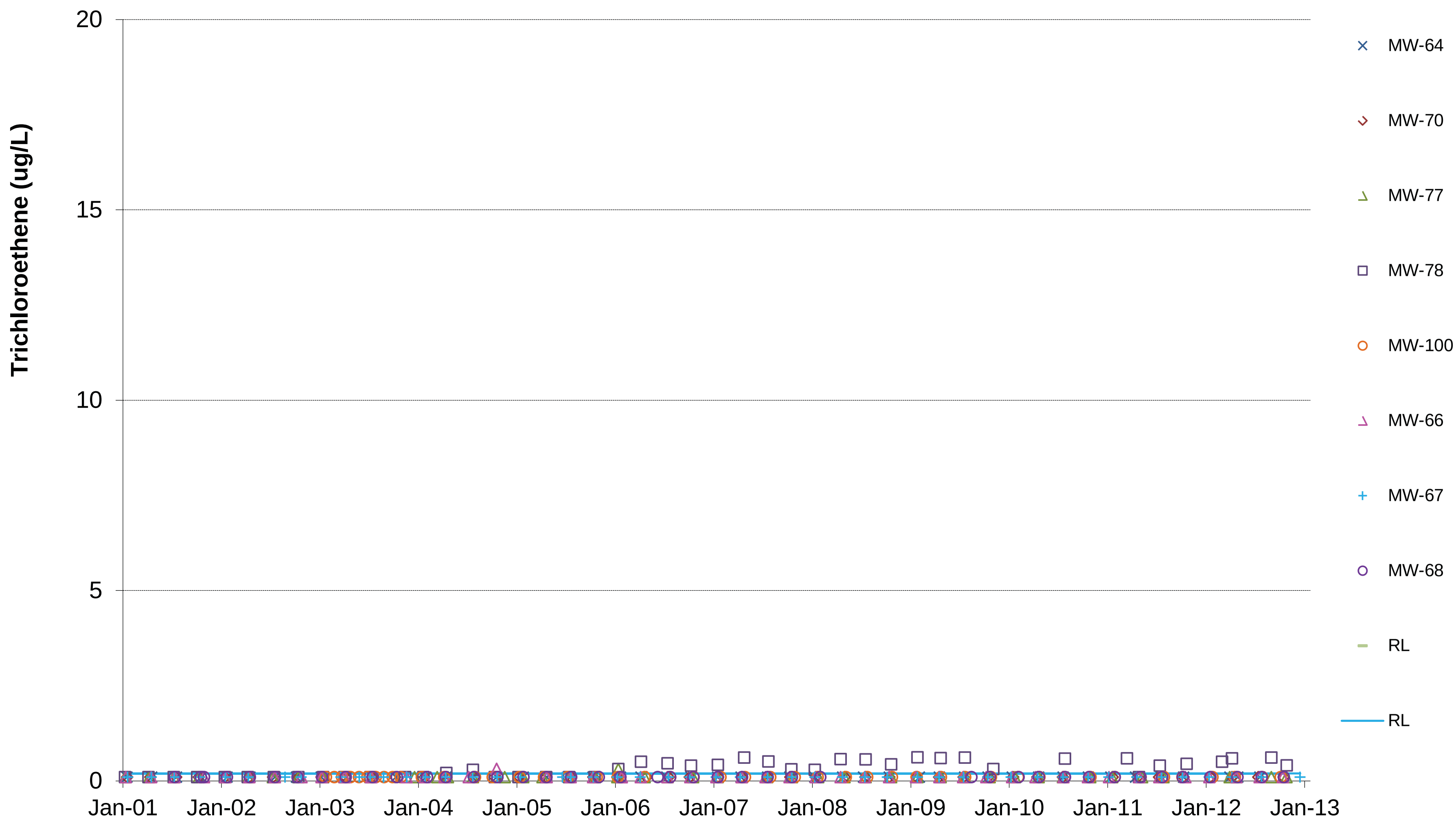

Tetrachloroethene (ug/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL


Tetrachloroethene (ug/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL

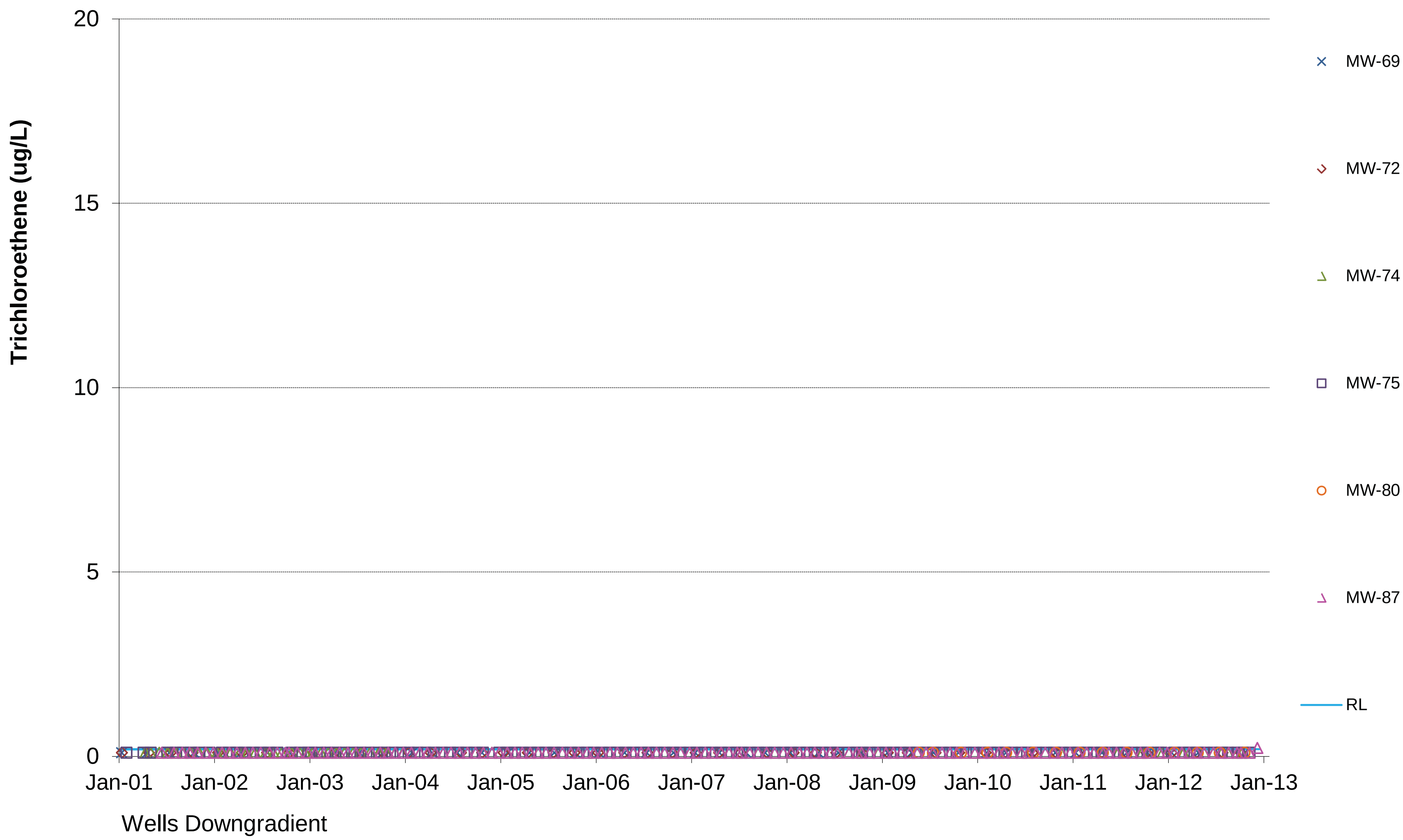

Trichloroethene (ug/L)
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-56
MW-57
MW-76
MW-94
MW-82
RL

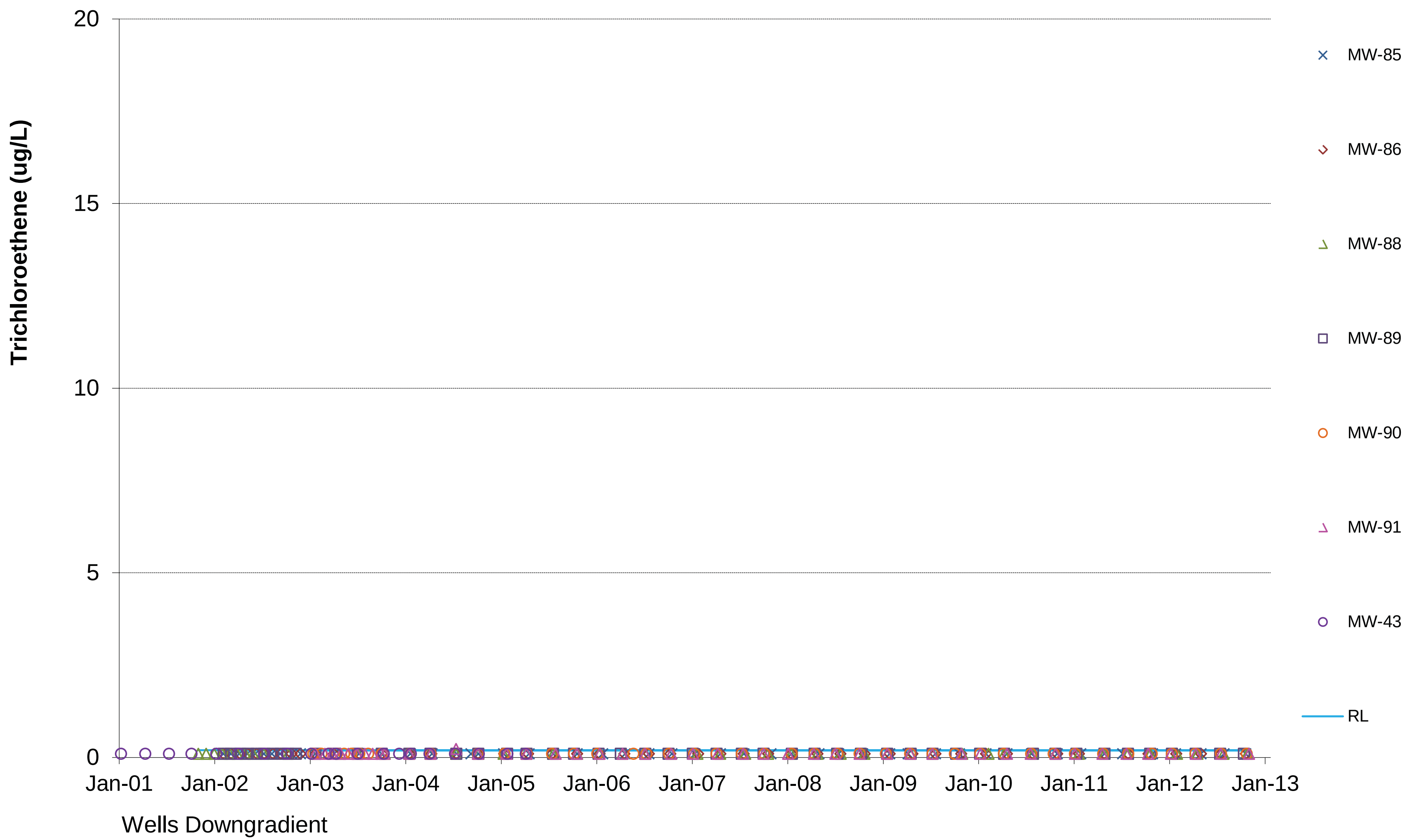

Trichloroethene (ug/L)
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-24
MW-58A
MW-59
MW-65
MW-83
MW-60
RL


Trichloroethene (ug/L)
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient
MW-21
MW-73
MW-84
MW-81
MW-99
MW-93
MW-95
RL

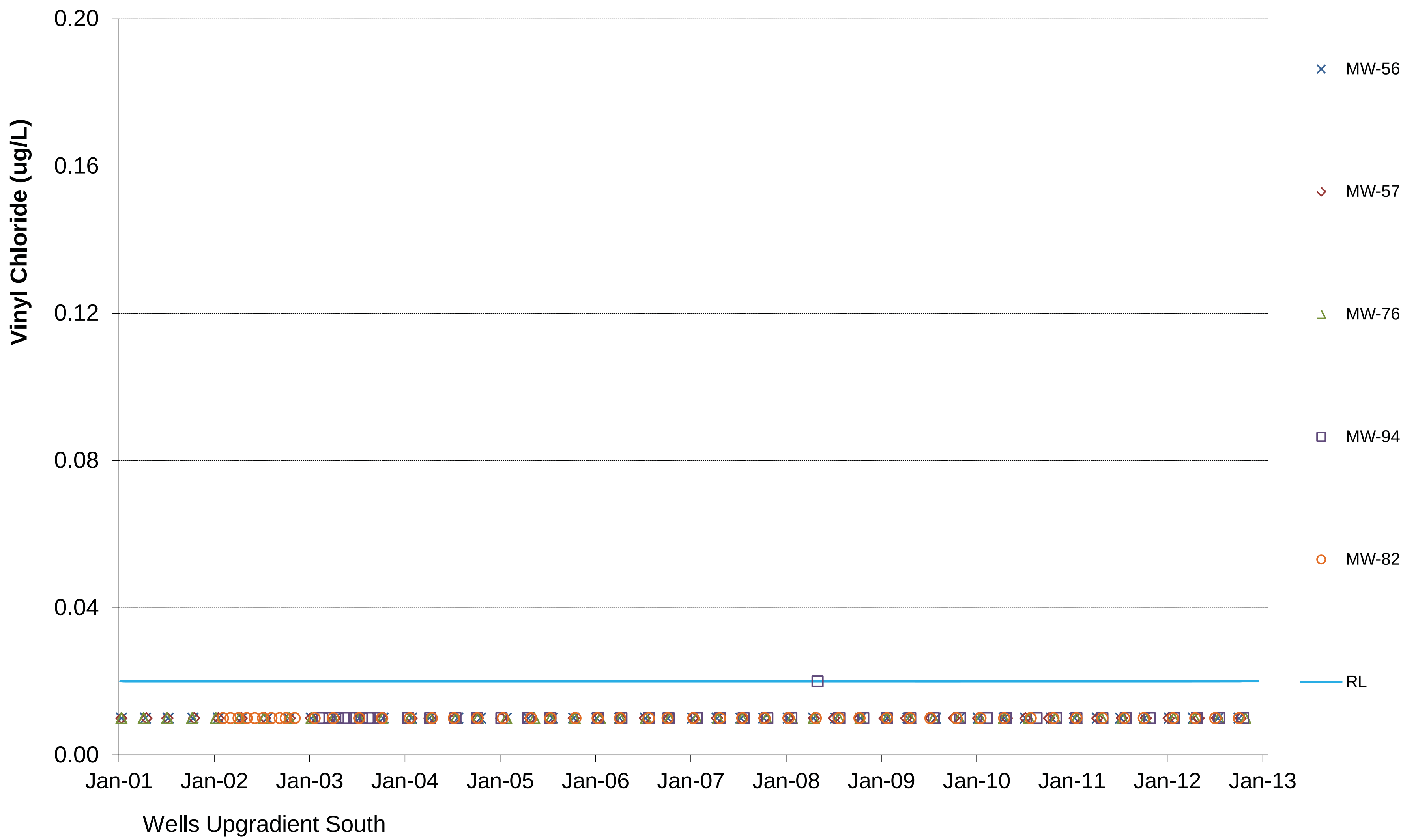


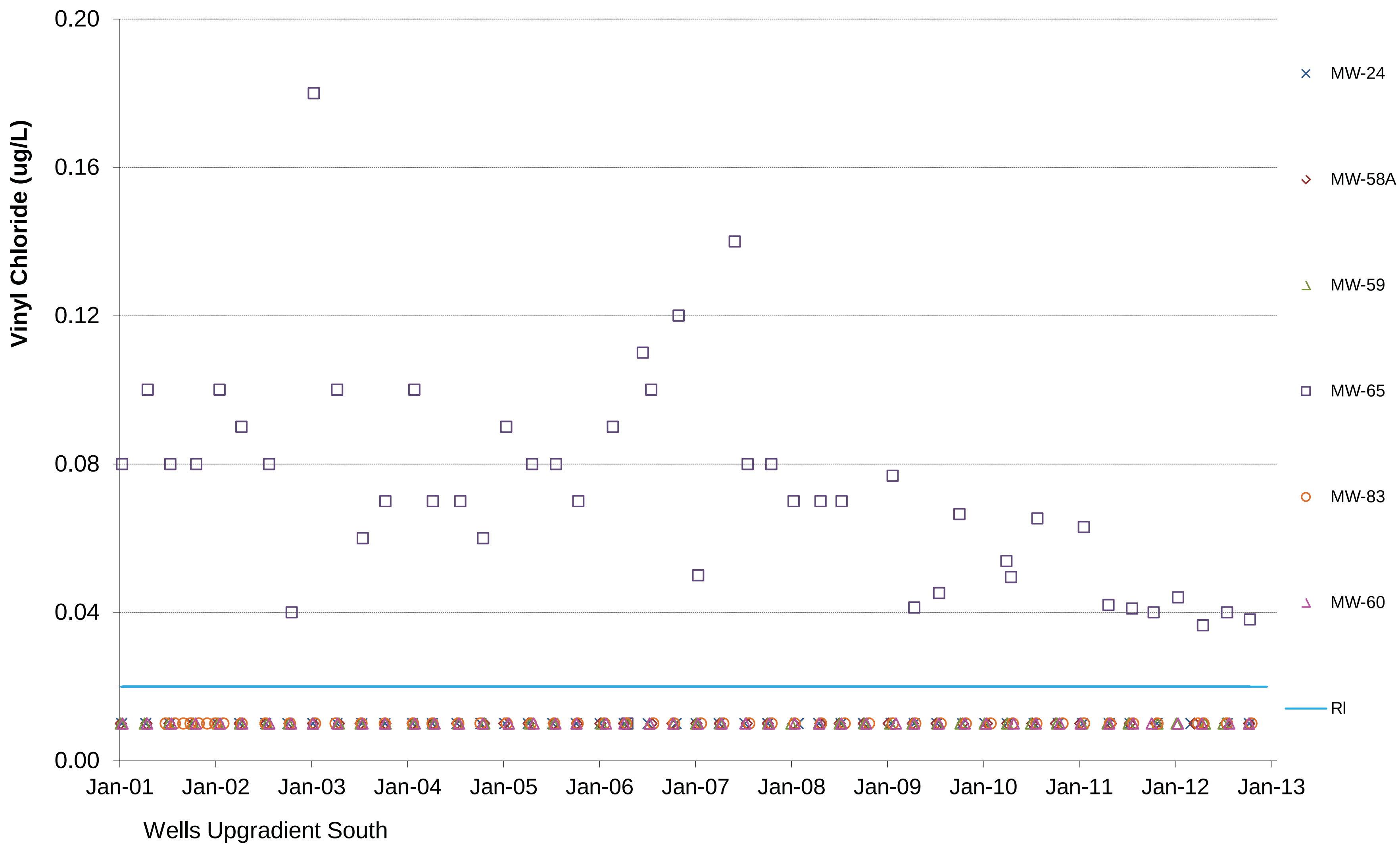
Wells Vertical to Key Facilities and Interior to Landfill Footprint

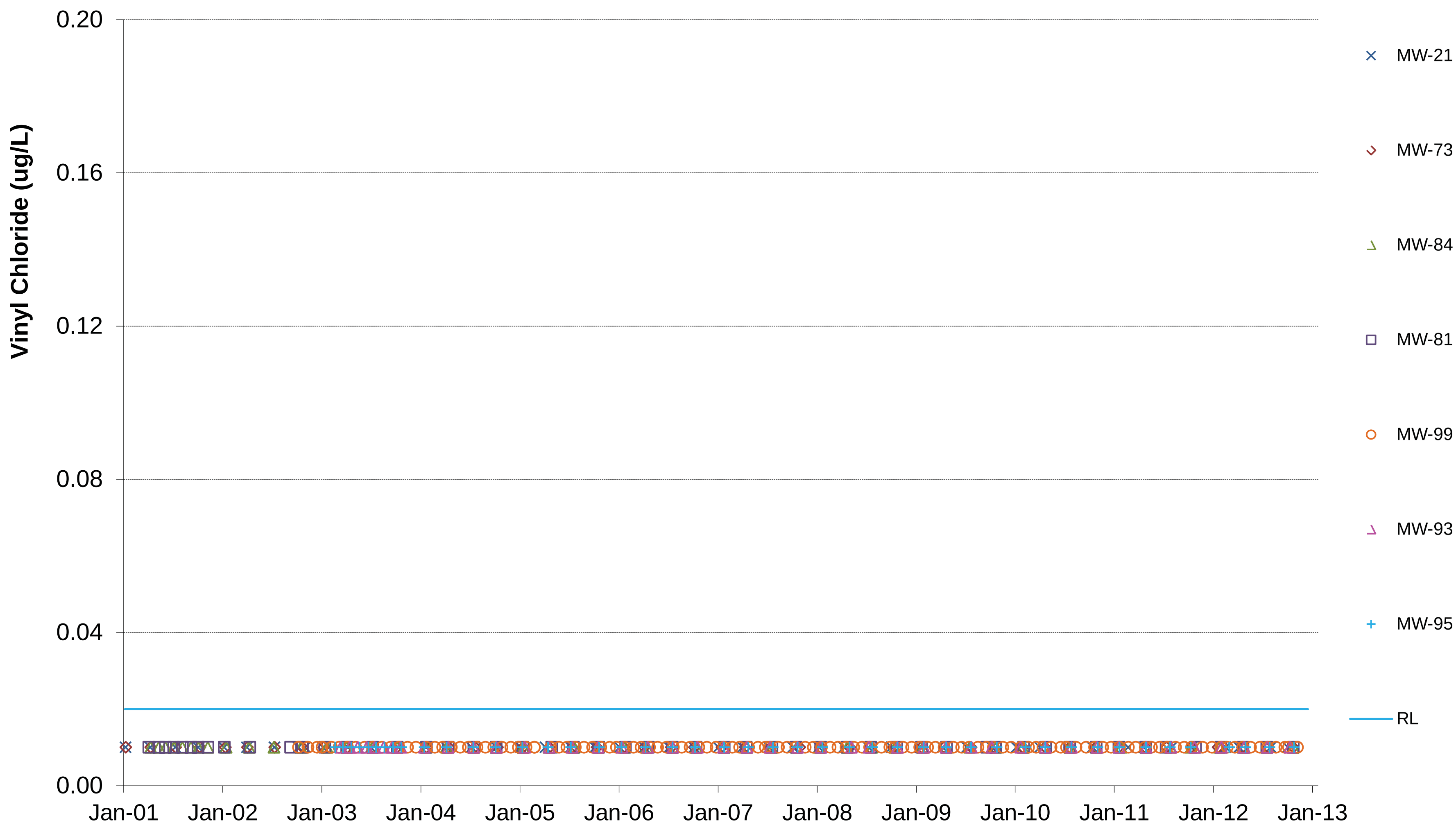

Trichloroethene (ug/L)
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL



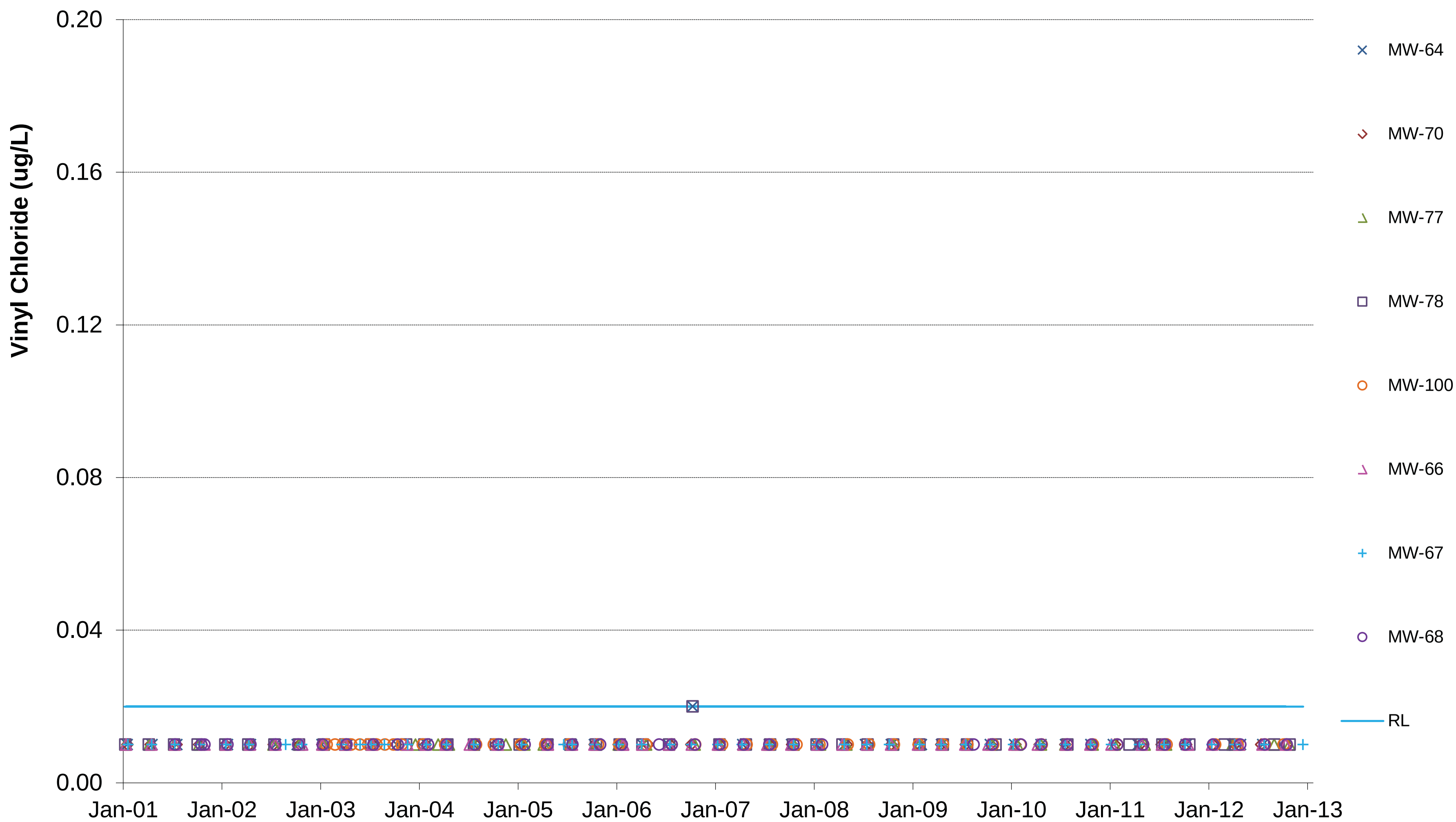
Trichloroethene (ug/L)
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL


Vinyl Chloride (ug/L)
0.20
0.16
0.12
0.08
0.04
0.00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-56
MW-57
MW-76
MW-94
MW-82
RL

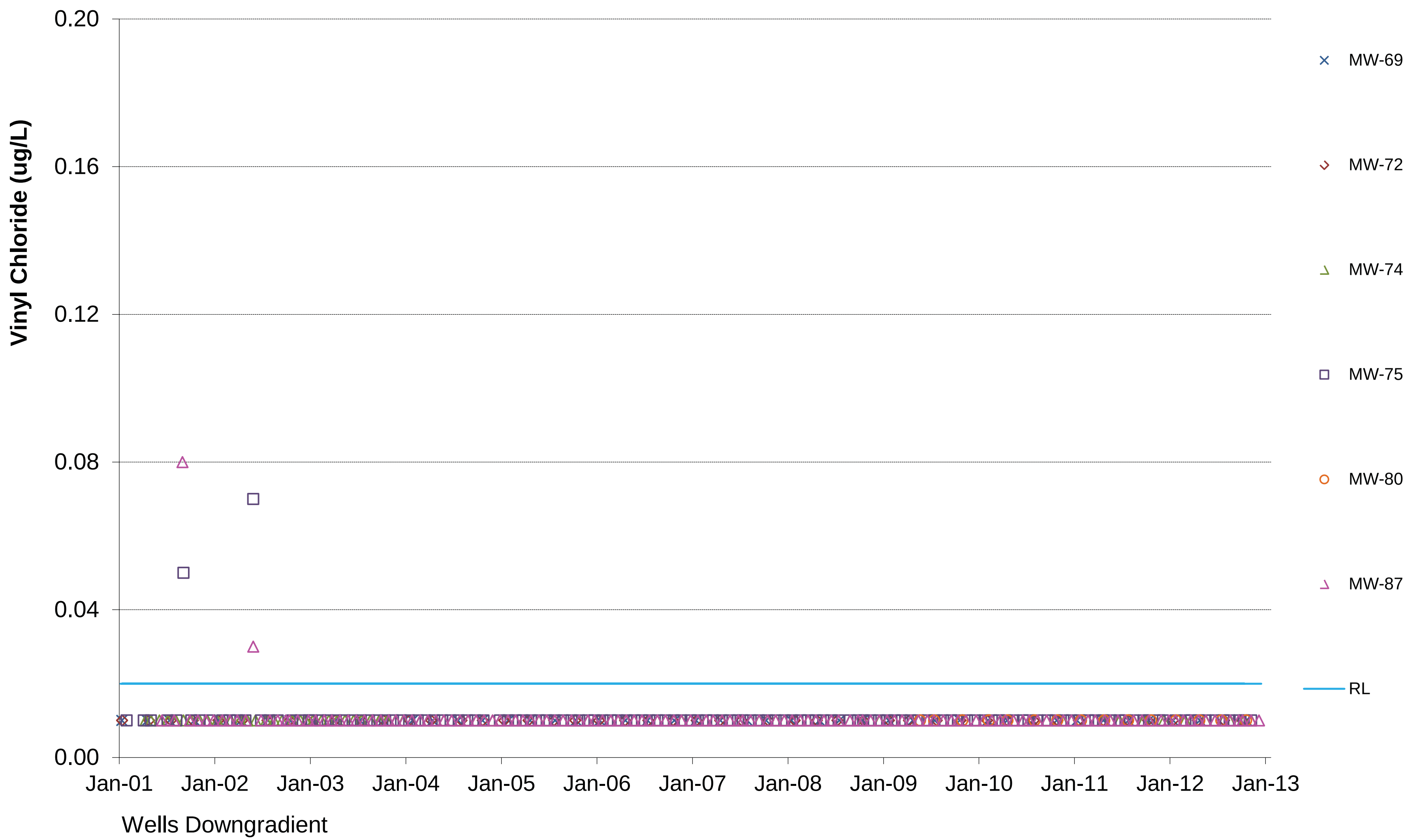

Vinyl Chloride (ug/L)
0.20
0.16
0.12
0.08
0.04
0.00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Upgradient South
MW-24
MW-58A
MW-59
MW-65
MW-83
MW-60
RI

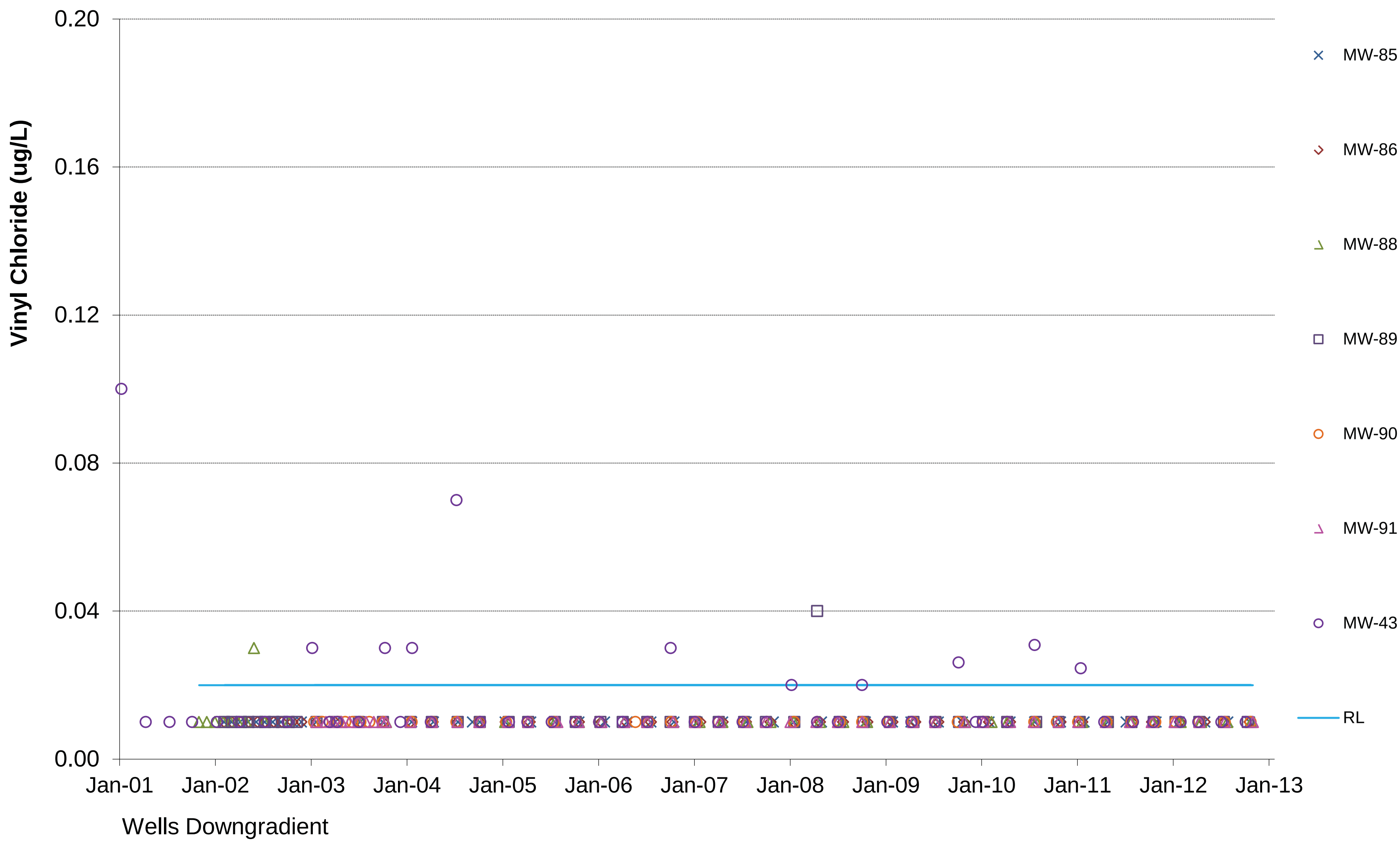


Wells Upgradient Northwest, Upgradient Northeast and Cross Gradient



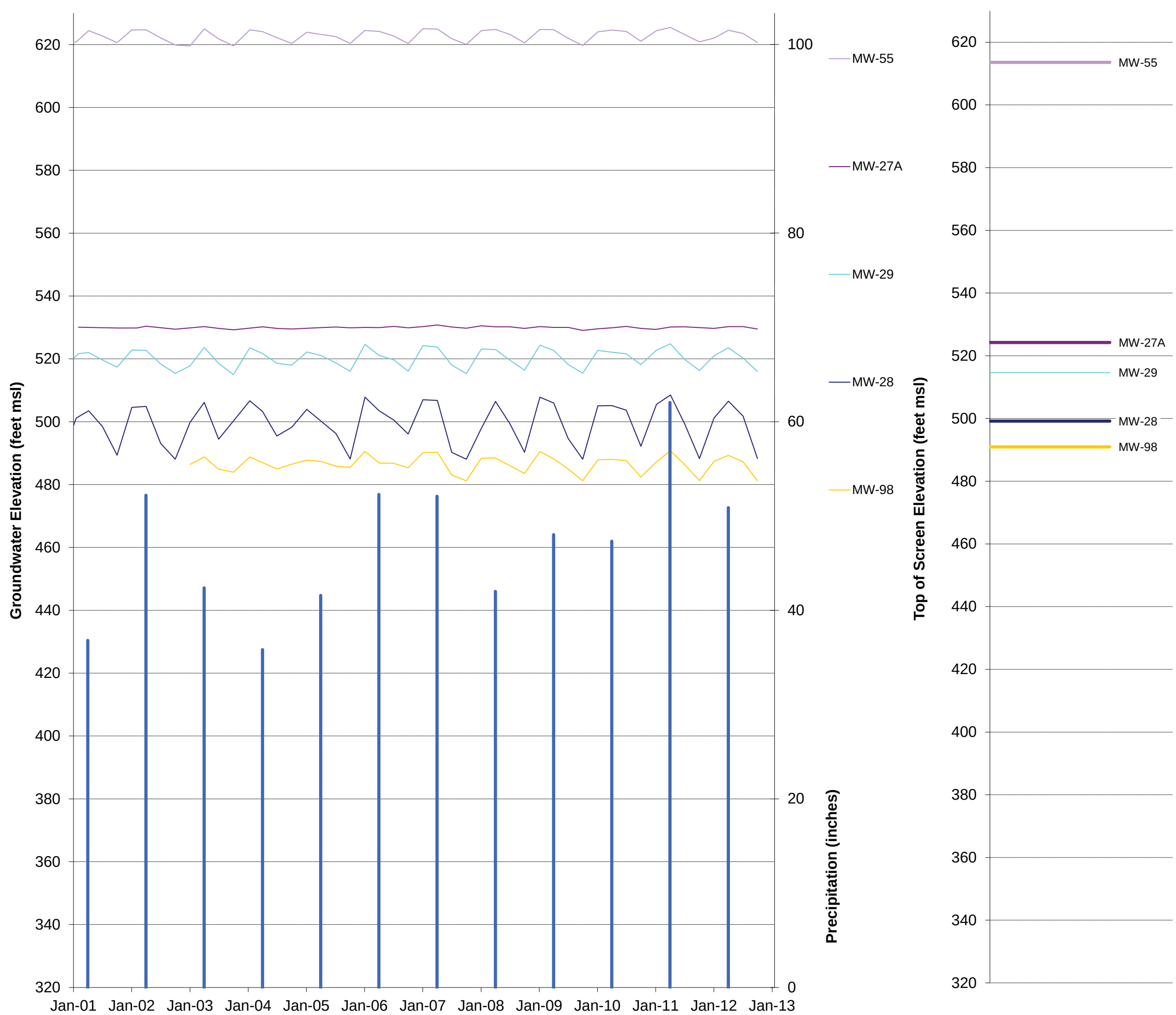
Wells Vertical to Key Facilities and Interior to Landfill Footprint


Vinyl Chloride (ug/L)
0.20
0.16
0.12
0.08
0.04
0.00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-69
MW-72
MW-74
MW-75
MW-80
MW-87
RL

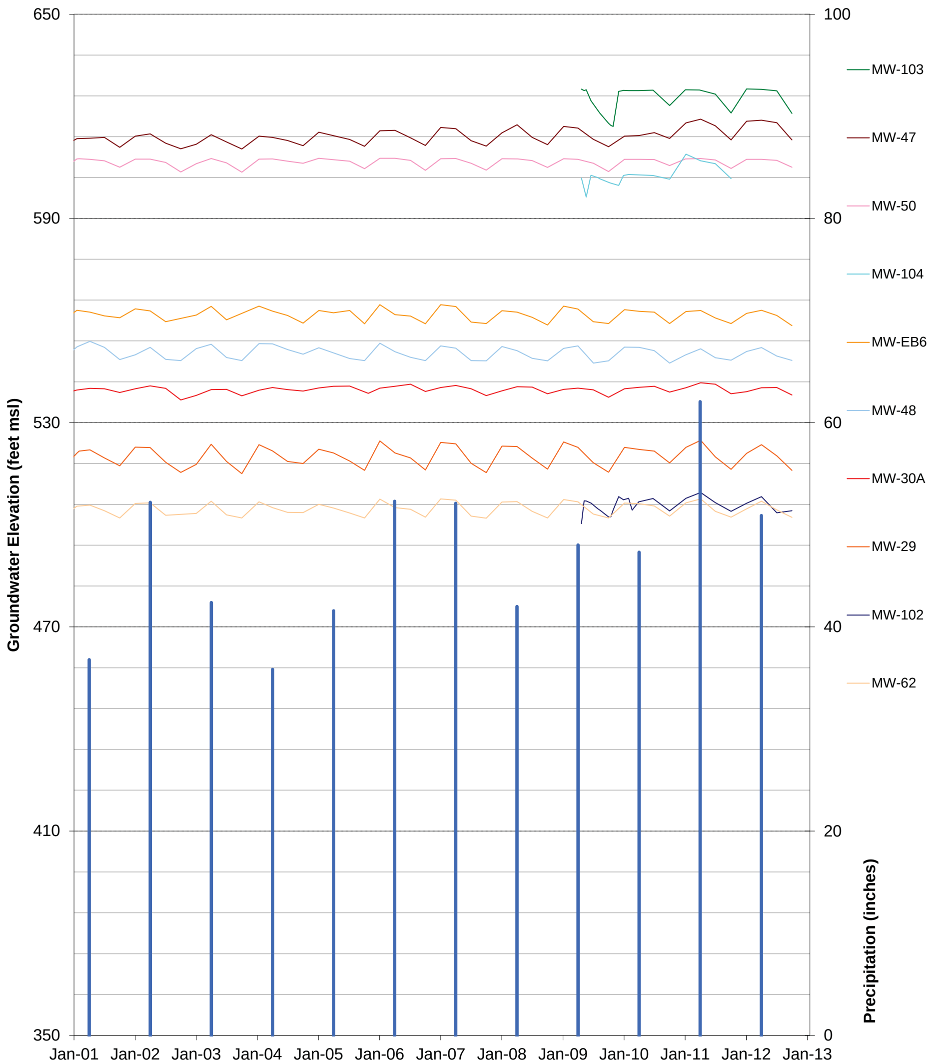

Vinyl Chloride (ug/L)
0.20
0.16
0.12
0.08
0.04
0.00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Wells Downgradient
MW-85
MW-86
MW-88
MW-89
MW-90
MW-91
MW-43
RL

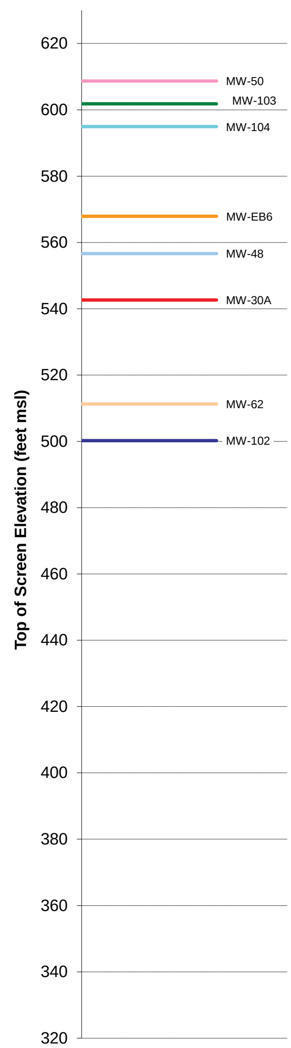
Perched Zones

PERCHED ZONES GROUNDWATER ELEVATIONS
NORTH AND WEST WELLS



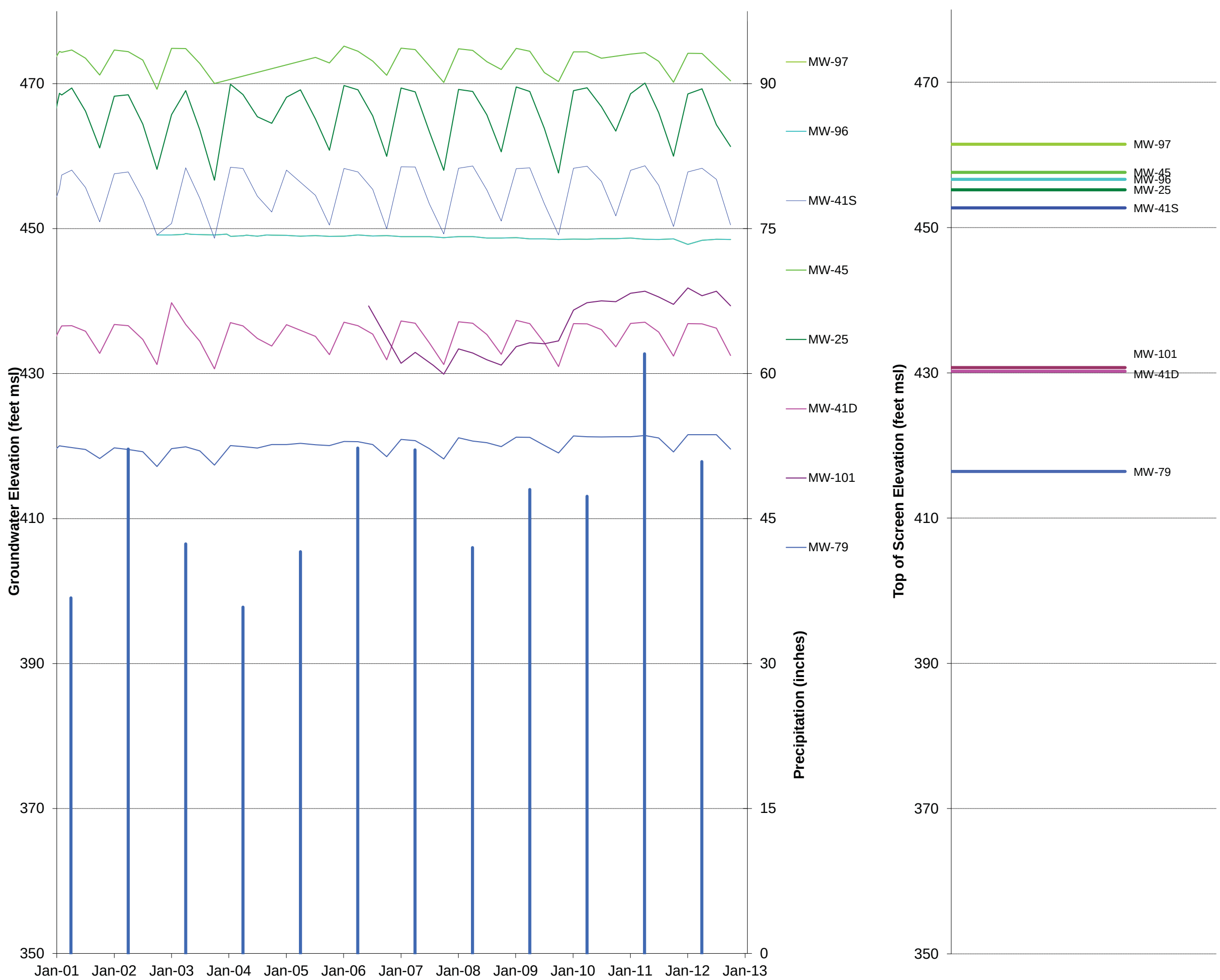
PERCHED ZONES GROUNDWATER ELEVATIONS
EAST MAIN HILL

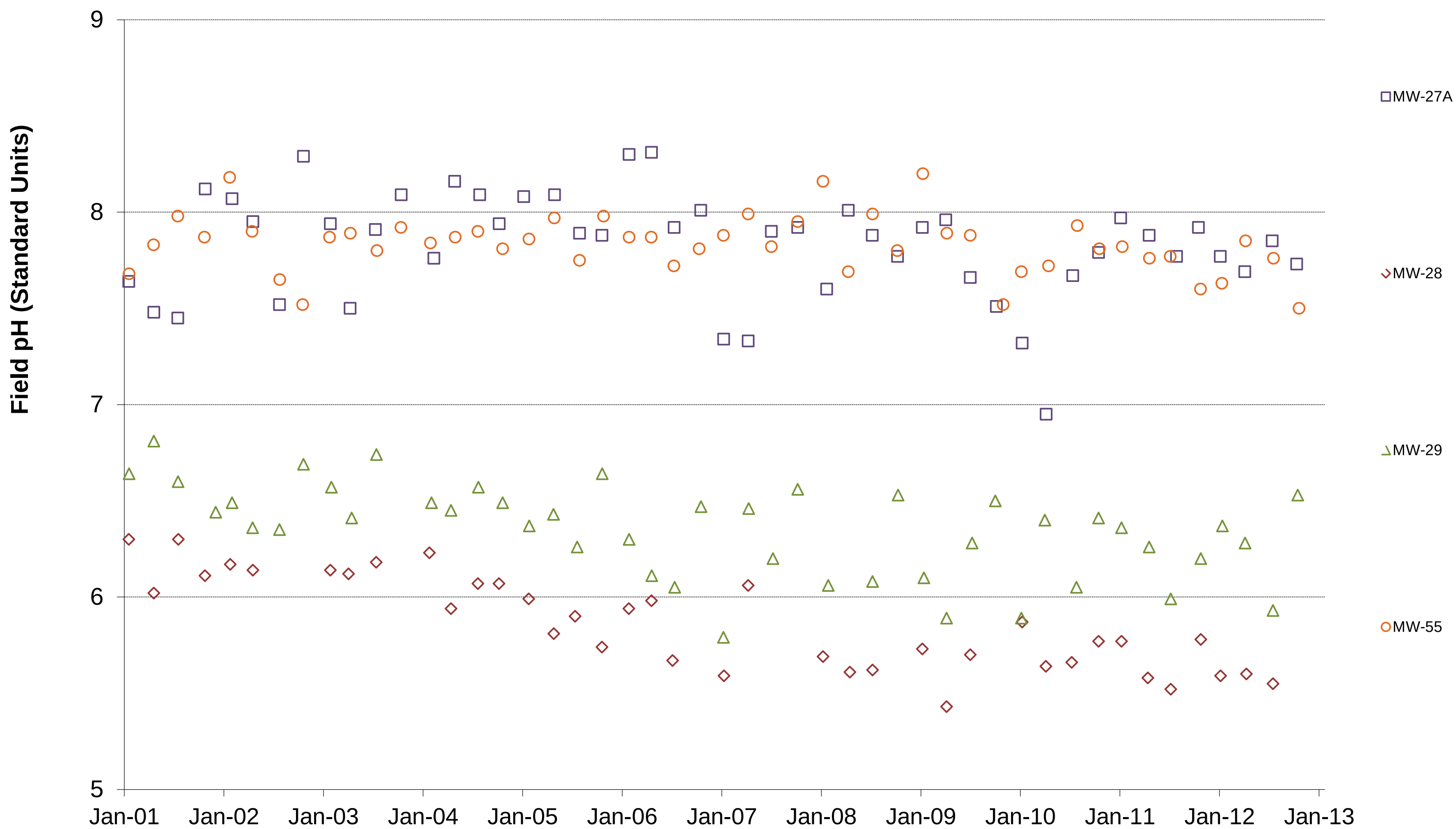




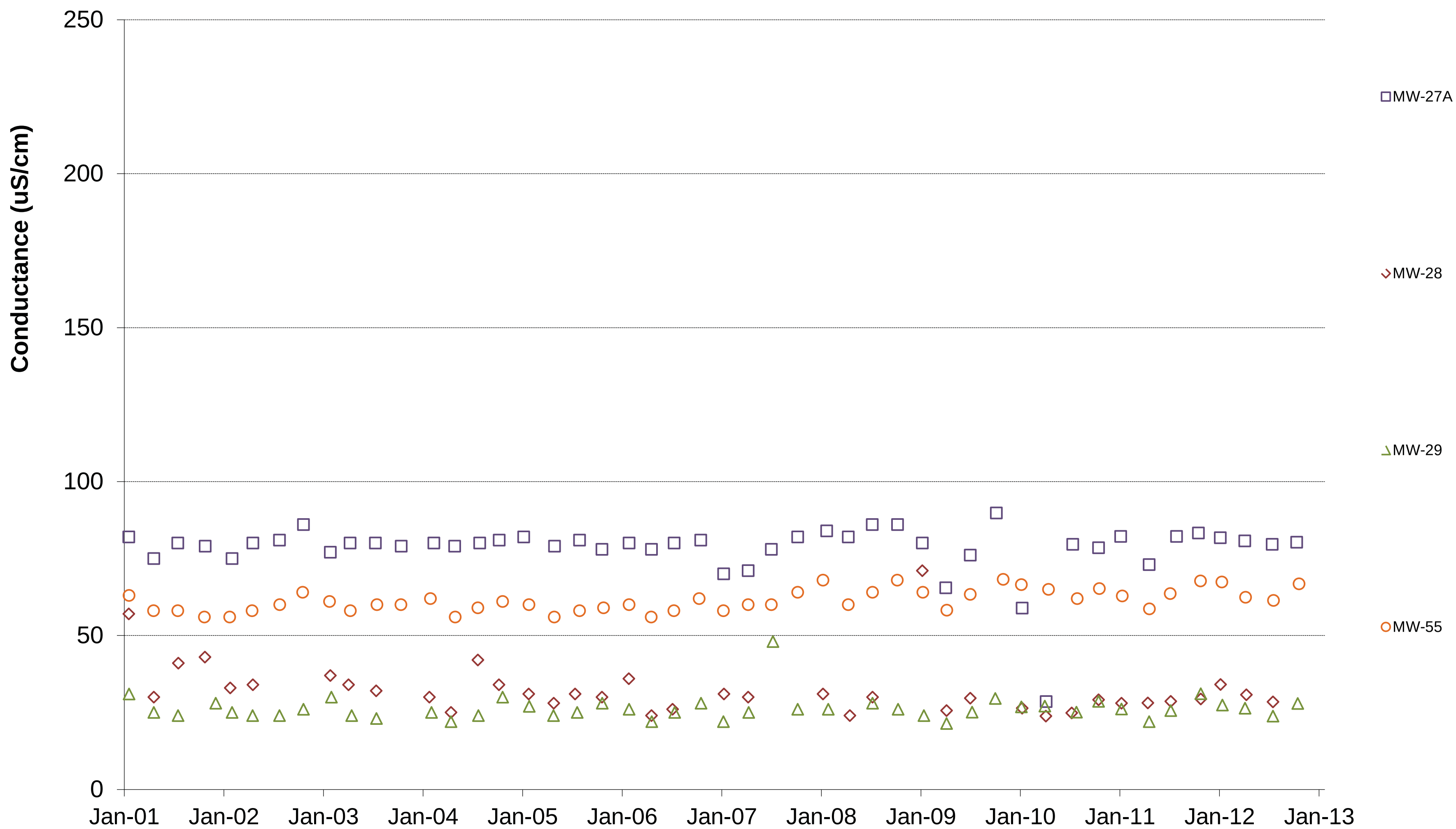
PERCHED ZONES GROUNDWATER ELEVATIONS

SOUTH SOLID WASTE AREA

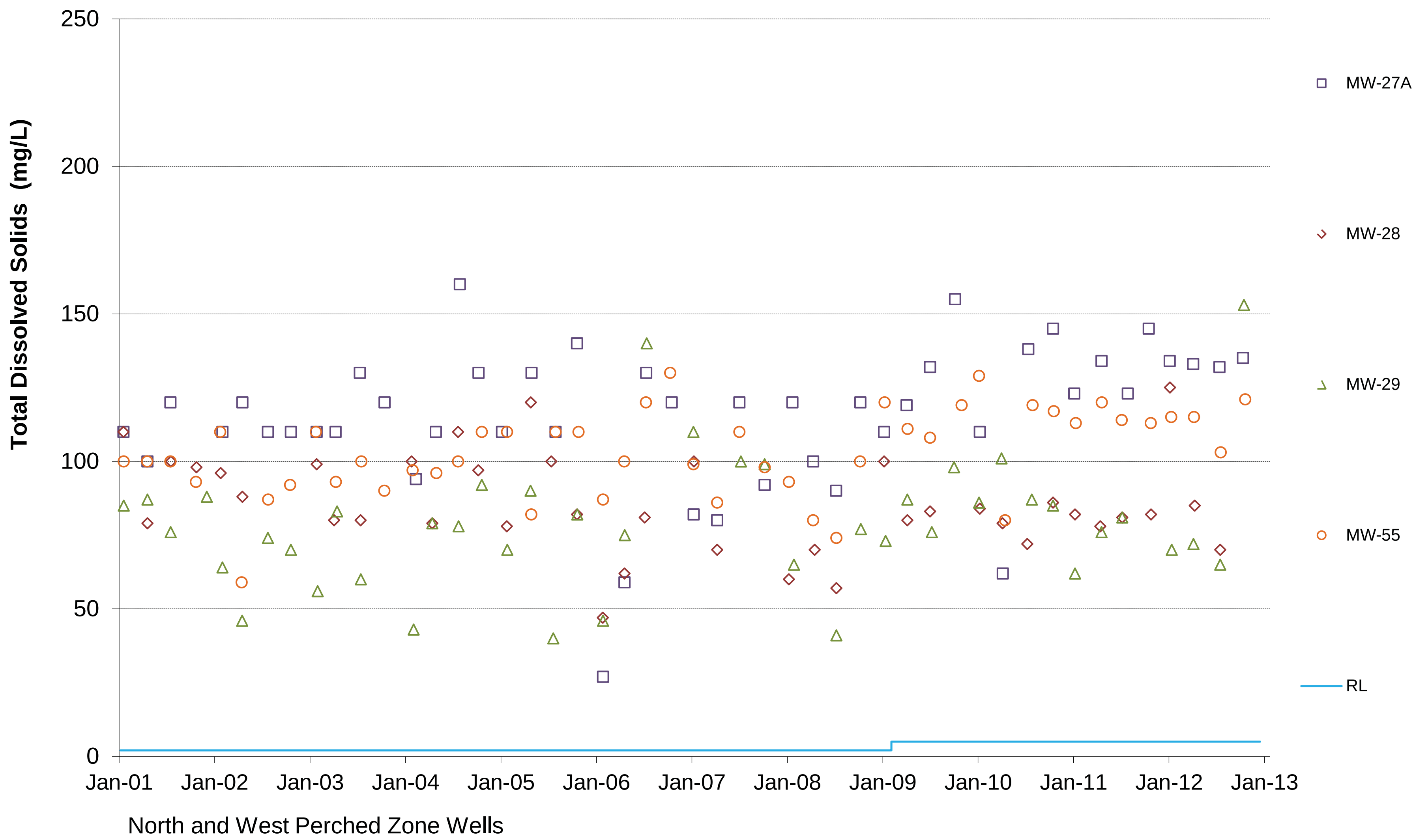


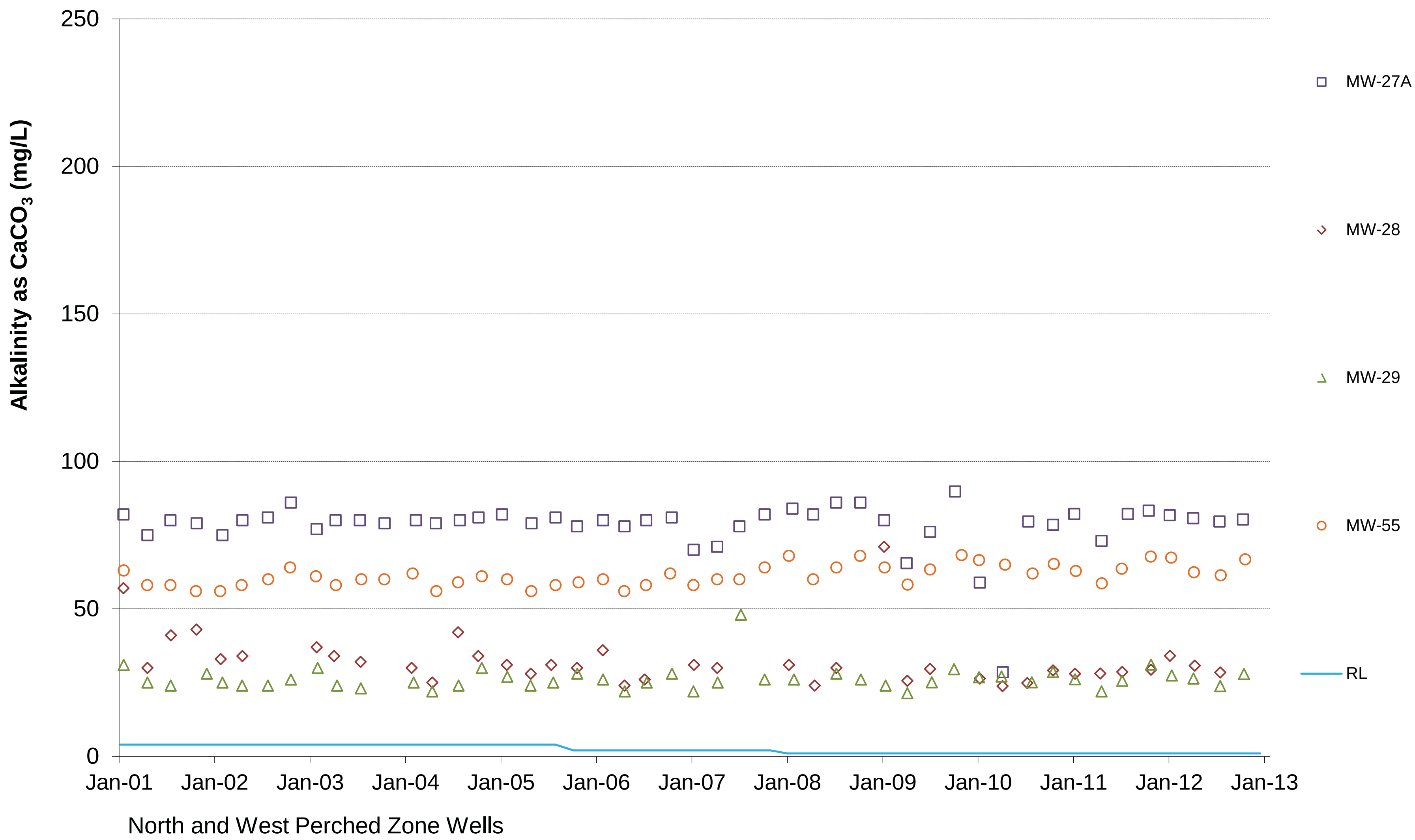


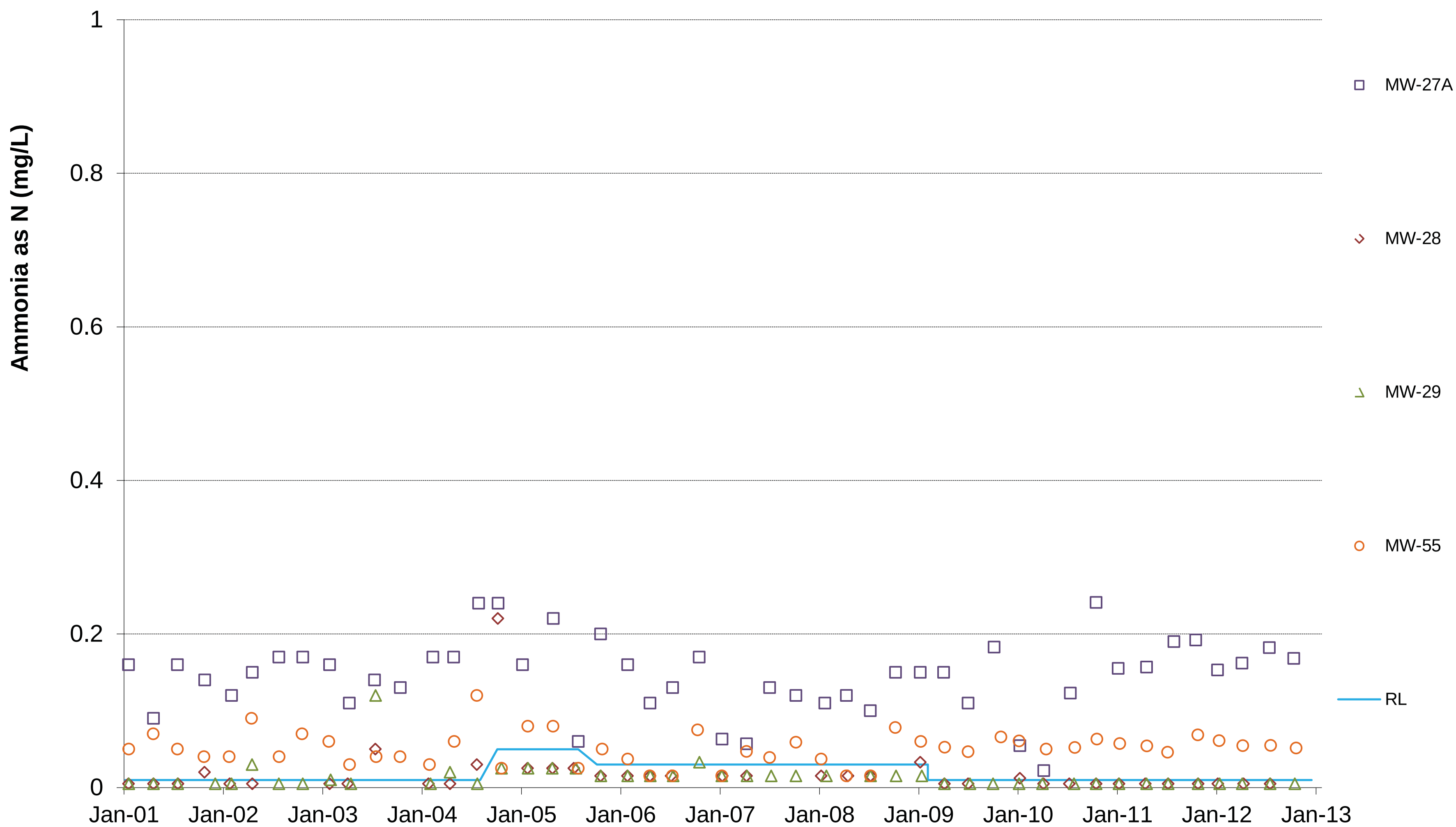
North and West Perched Zone Wells



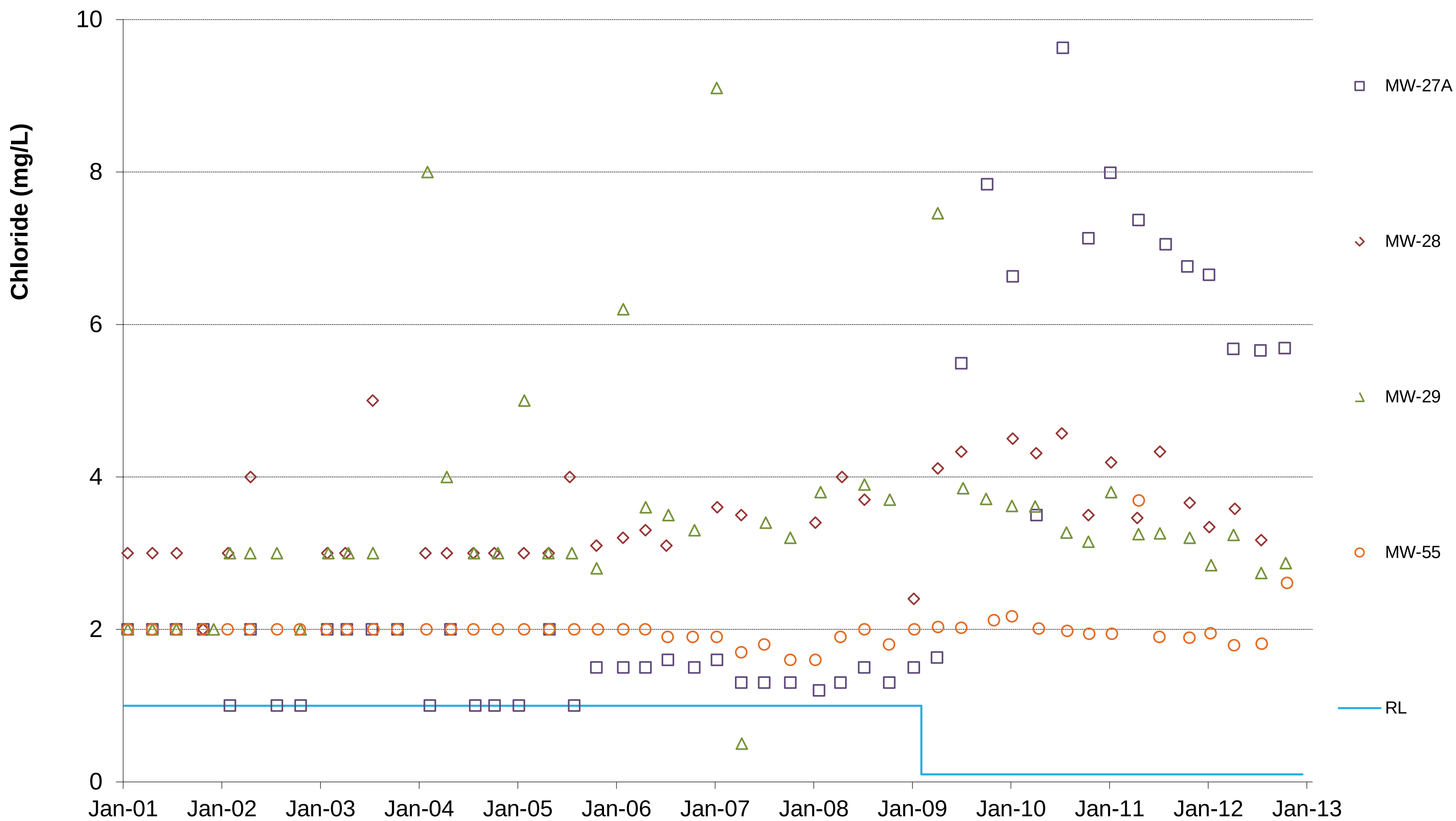
North and West Perched Zone Wells


Total Dissolved Solids (mg/L)
250
200
150
100
50
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
MW-27A
MW-28
MW-29
MW-55
RL
North and West Perched Zone Wells

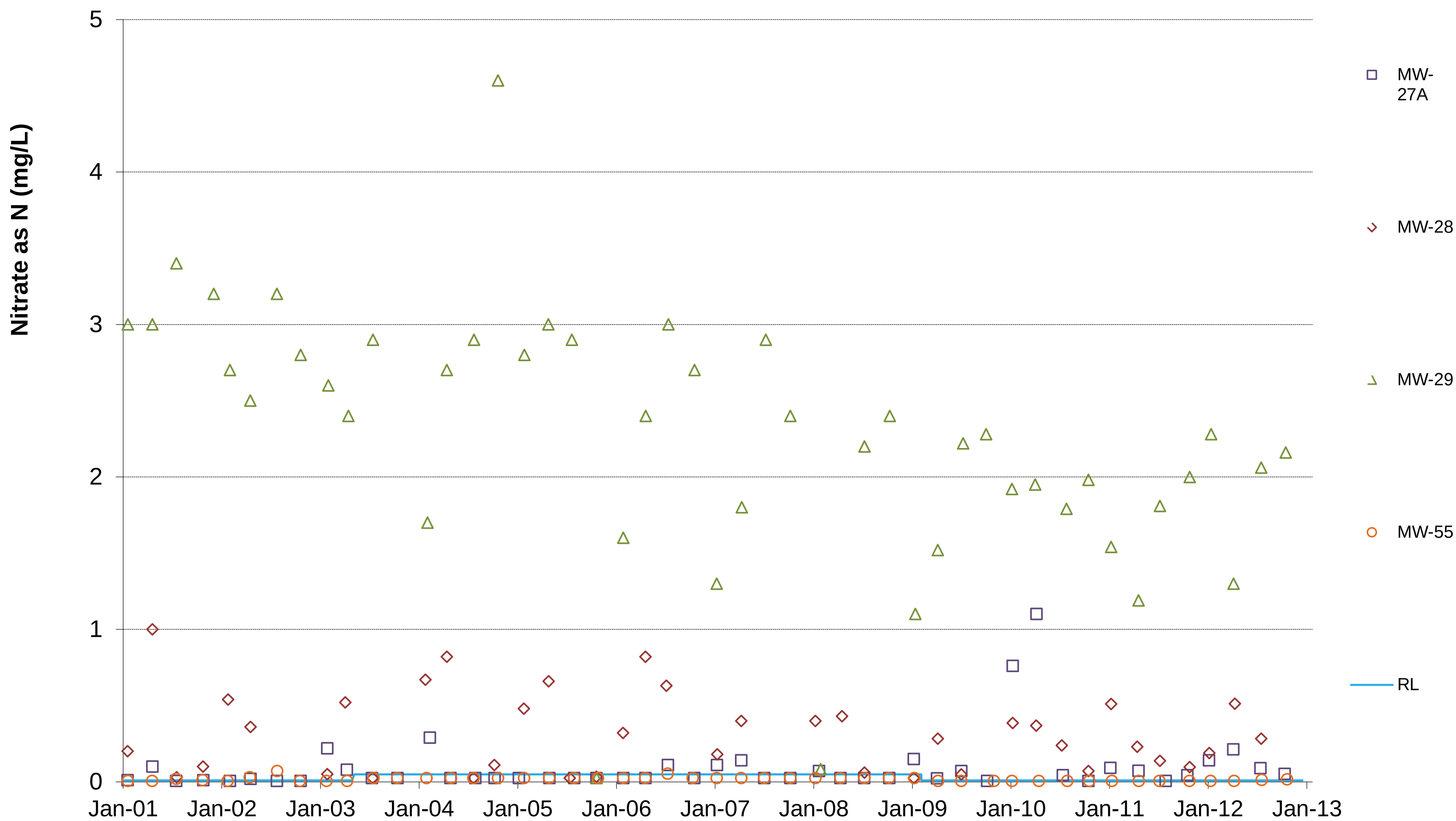

Alkalinity as $CaCO_3$ (mg/L)
250
200
150
100
50
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
North and West Perched Zone Wells
MW-27A
MW-28
MW-29
MW-55
RL



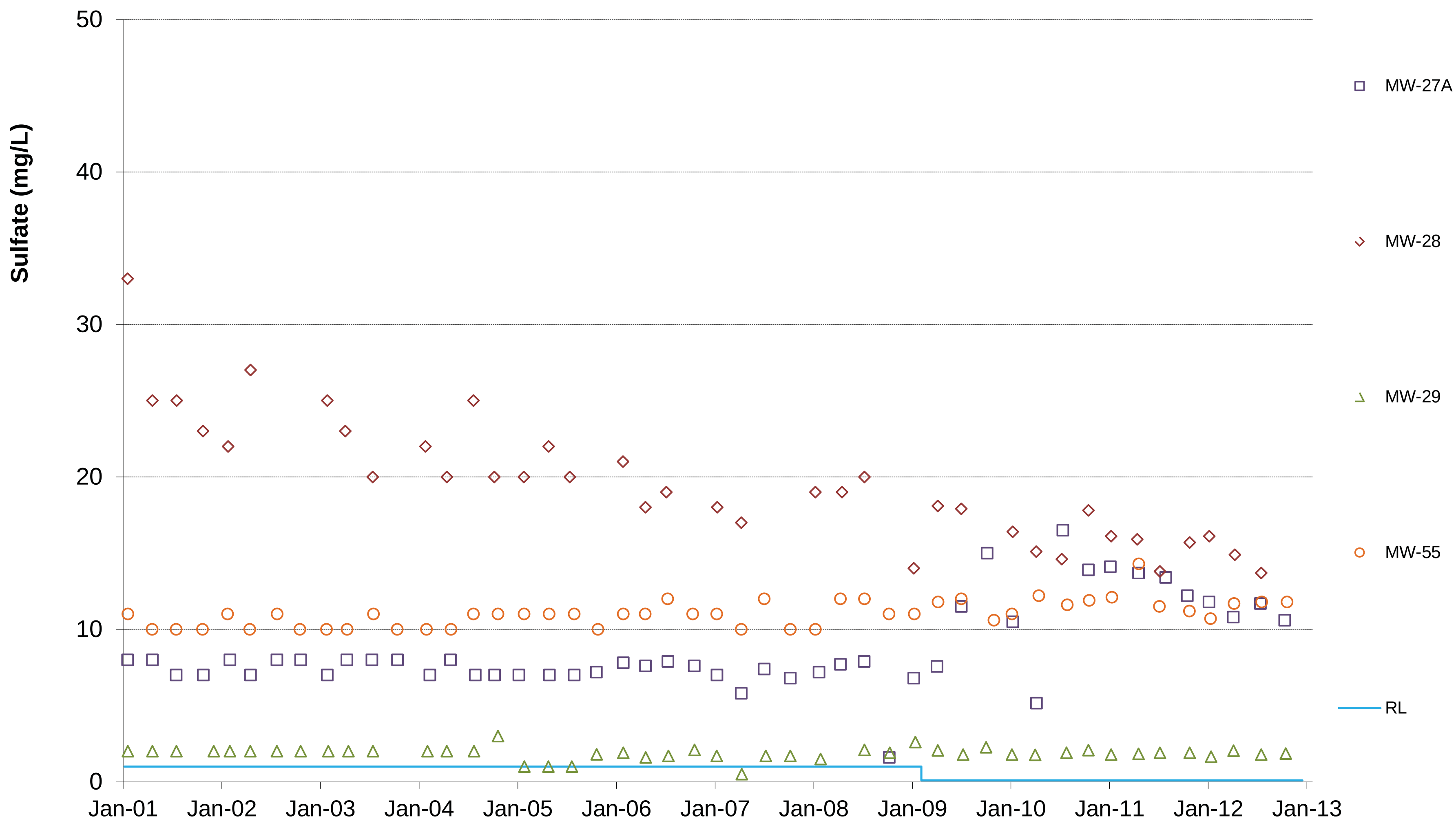
North and West Perched Zone Wells



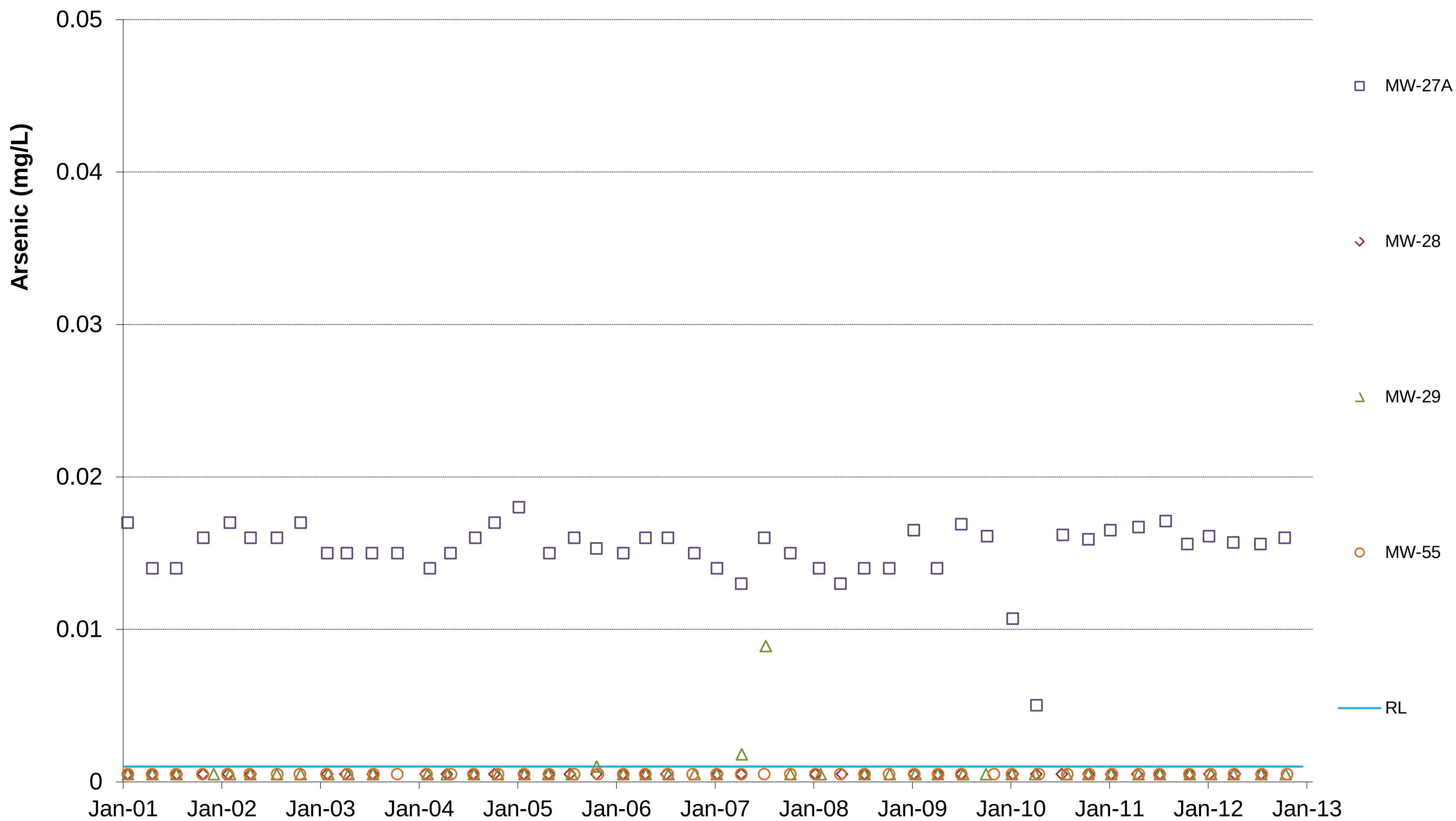
North and West Perched Zone Wells



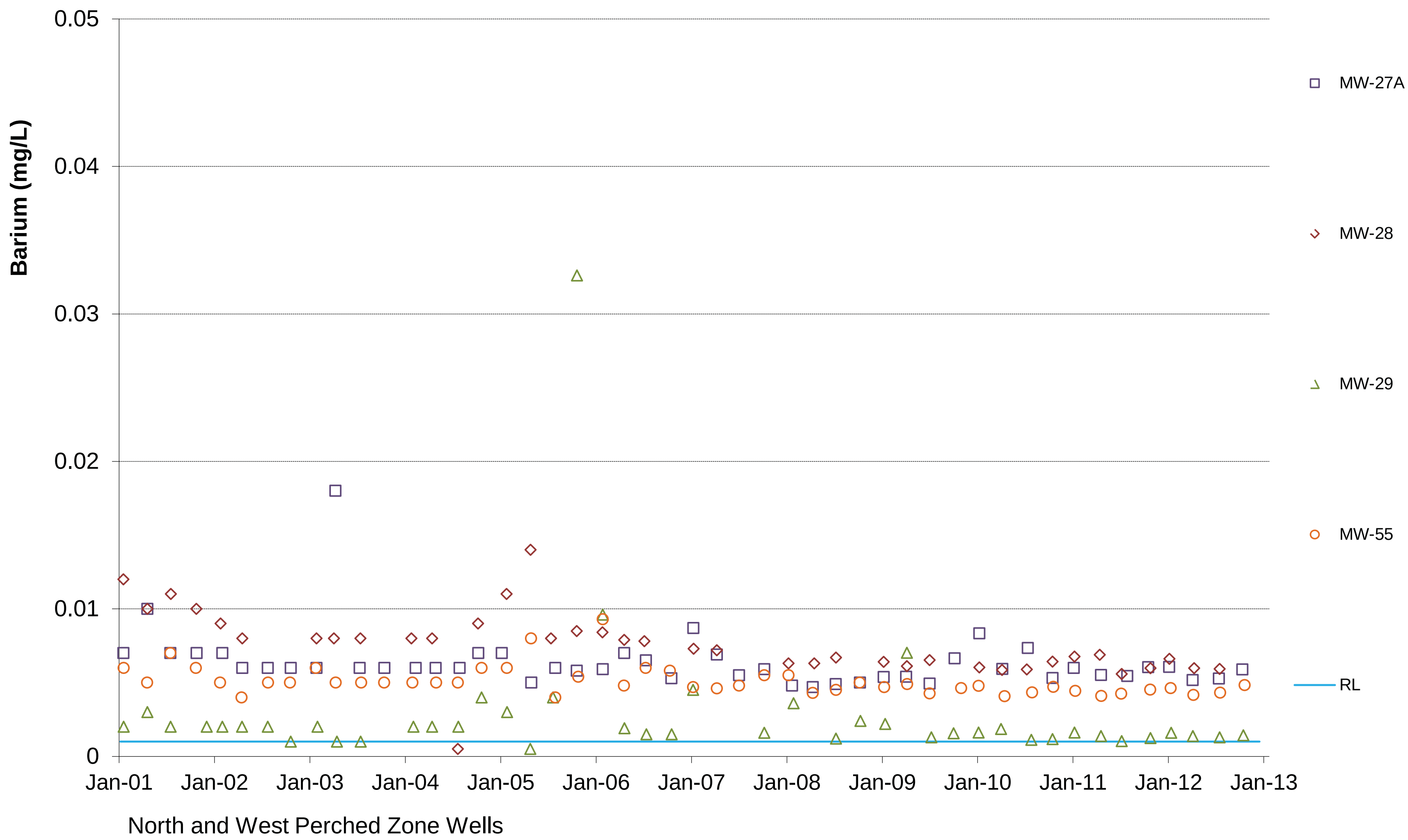
North and West Perched Zone Wells

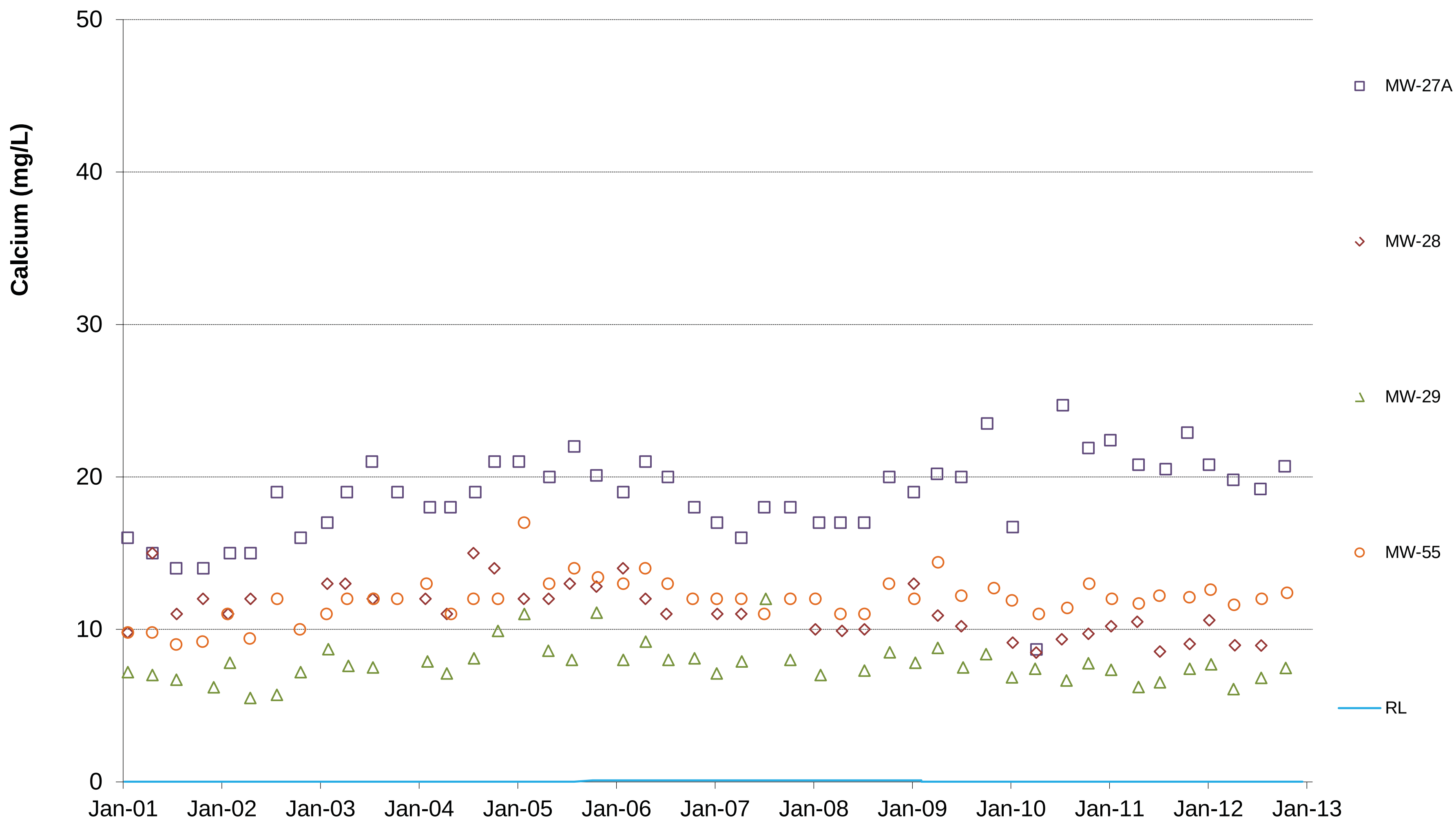


North and West Perched Zone Wells

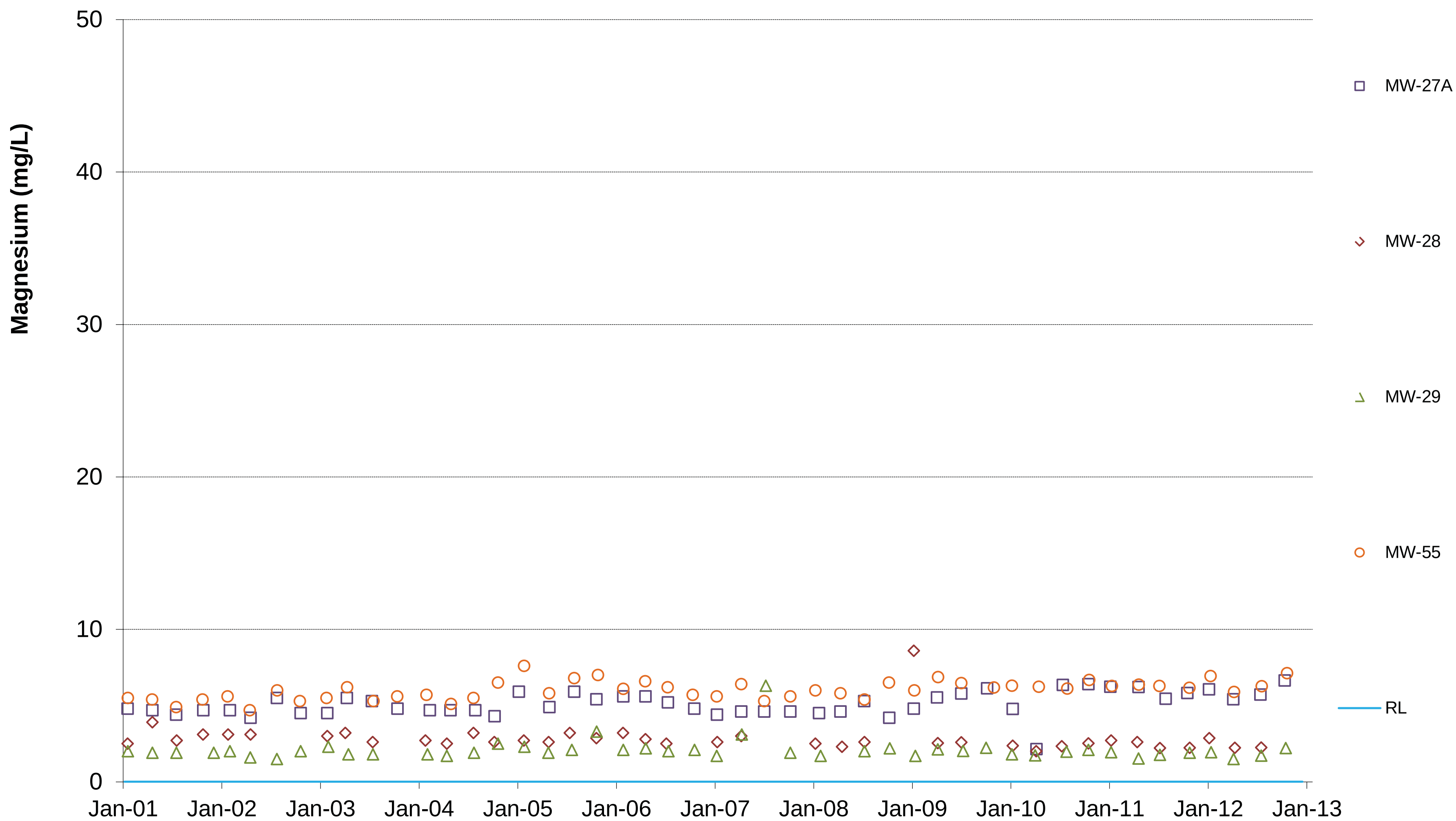


North and West Perched Zone Wells

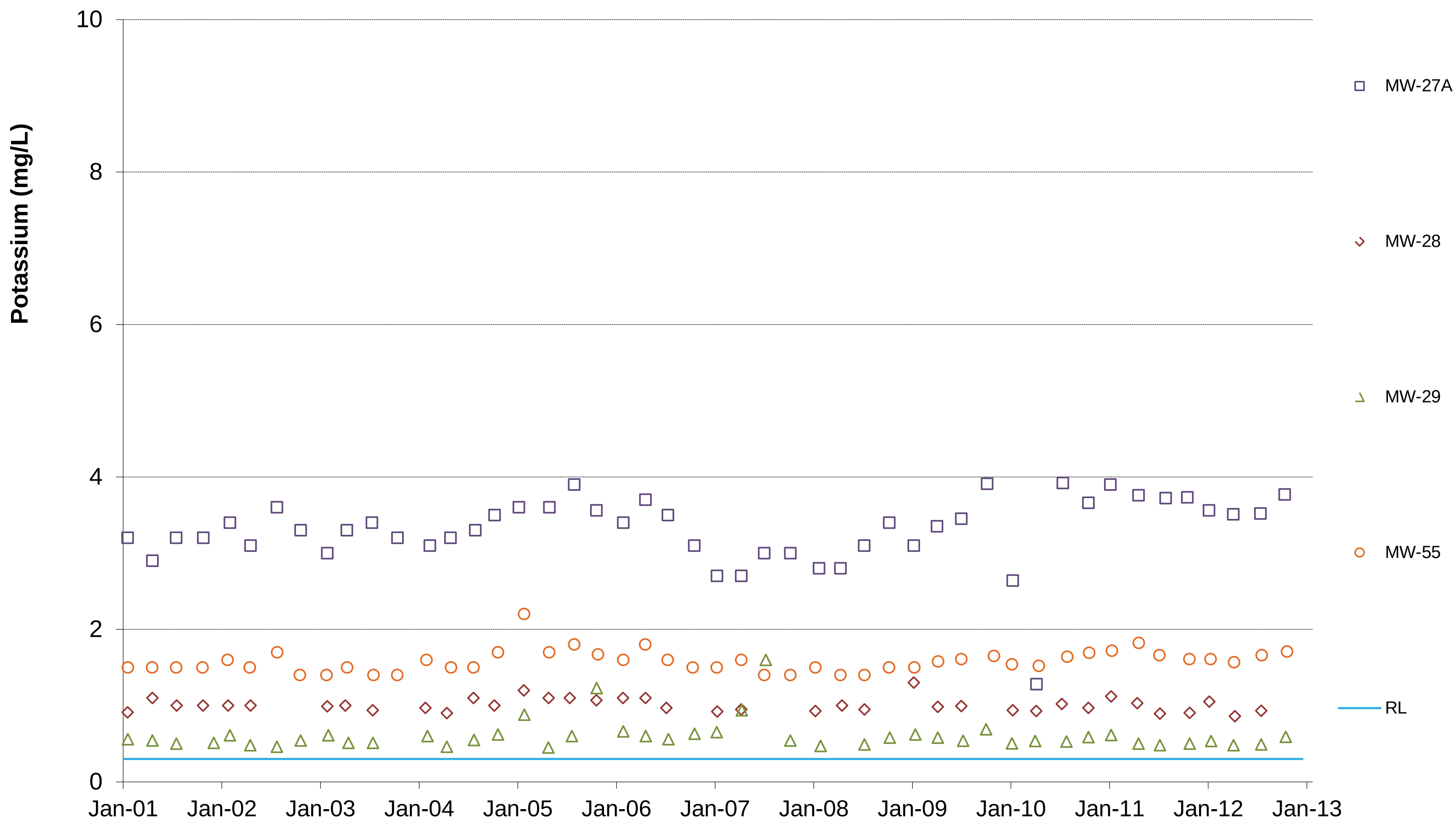

Barium (mg/L)
0.05
0.04
0.03
0.02
0.01
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
North and West Perched Zone Wells
MW-27A
MW-28
MW-29
MW-55
RL



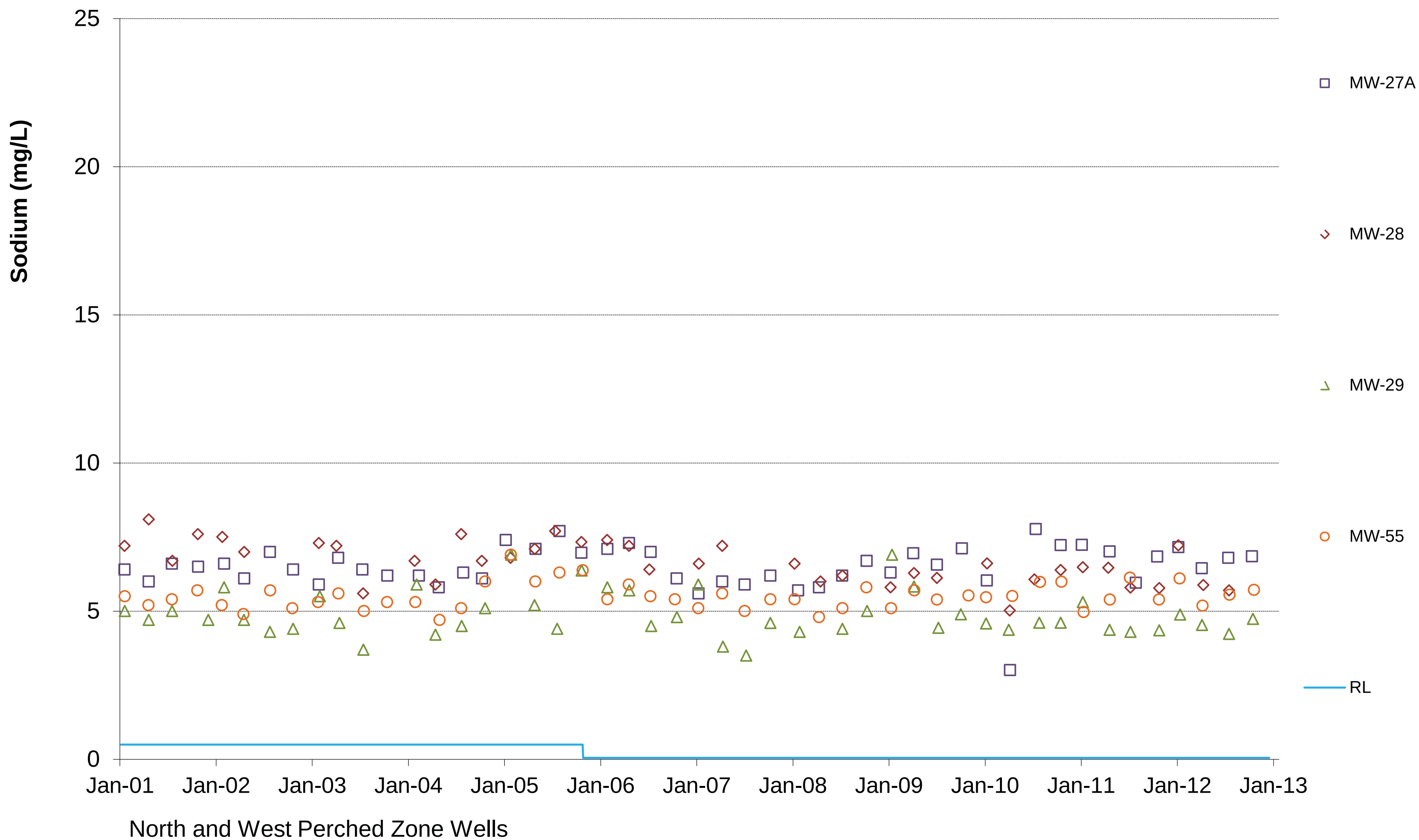
North and West Perched Zone Wells

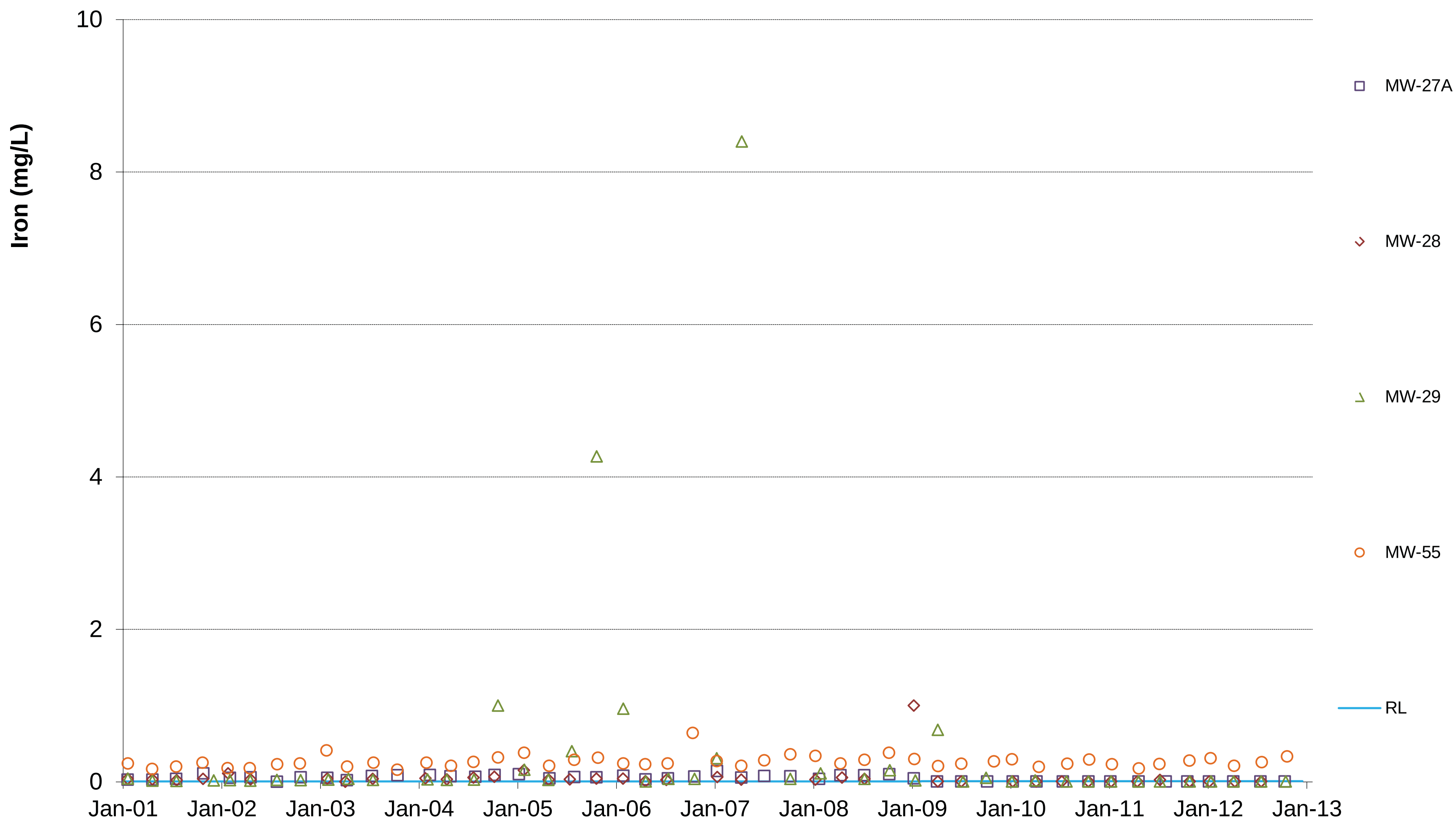


North and West Perched Zone Wells

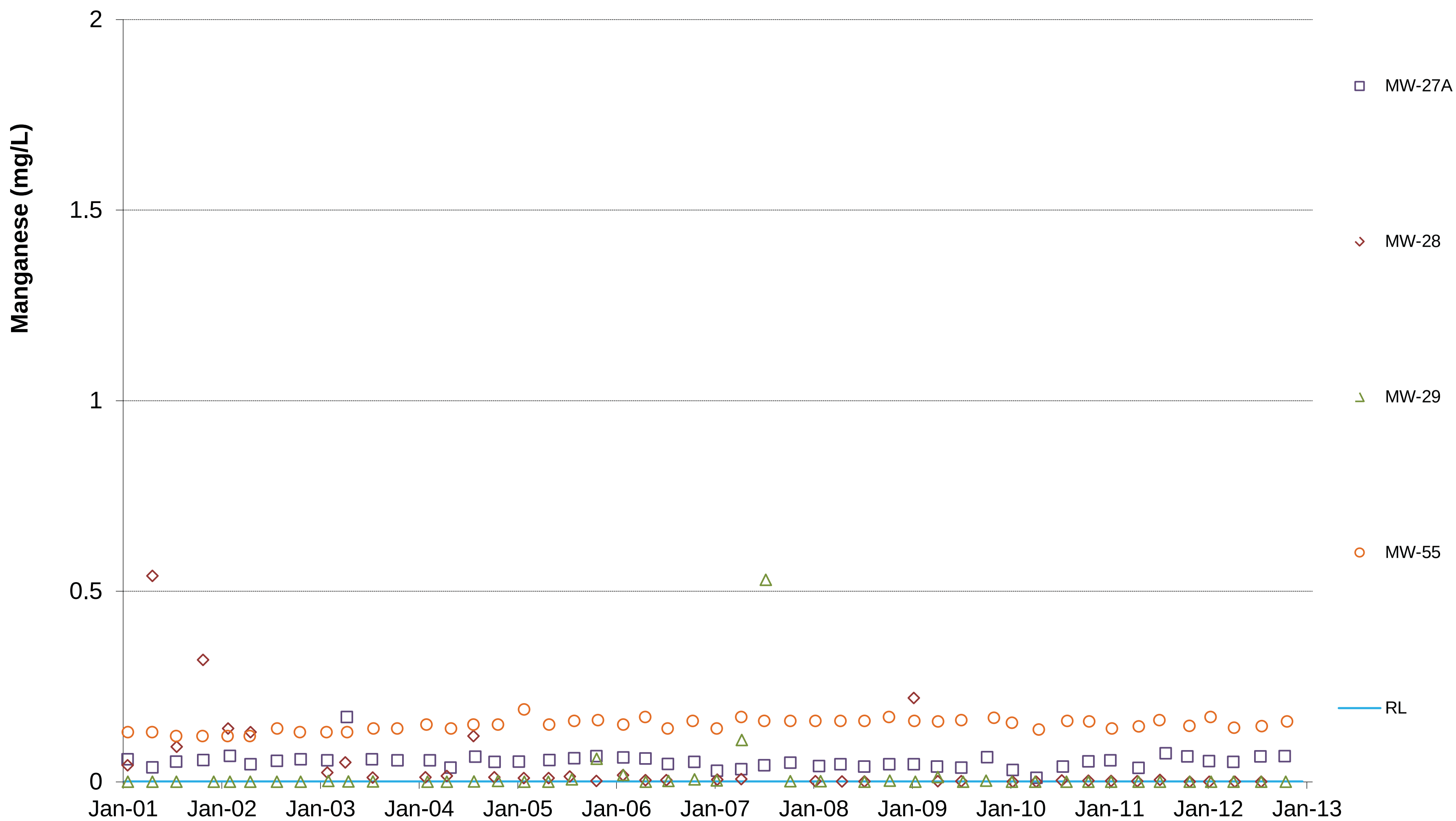


North and West Perched Zone Wells

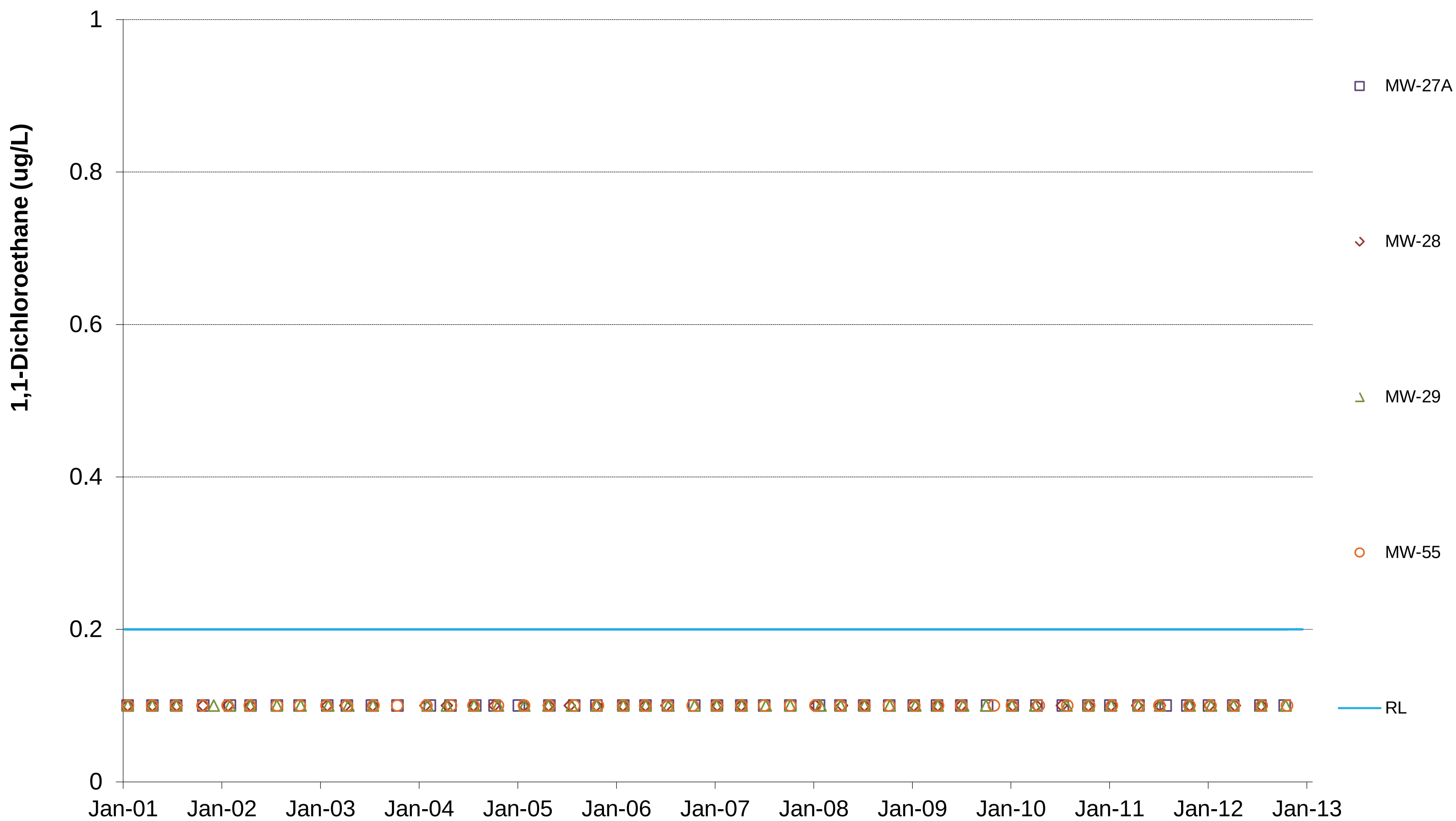

Sodium (mg/L)
25
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
North and West Perched Zone Wells
MW-27A
MW-28
MW-29
MW-55
RL



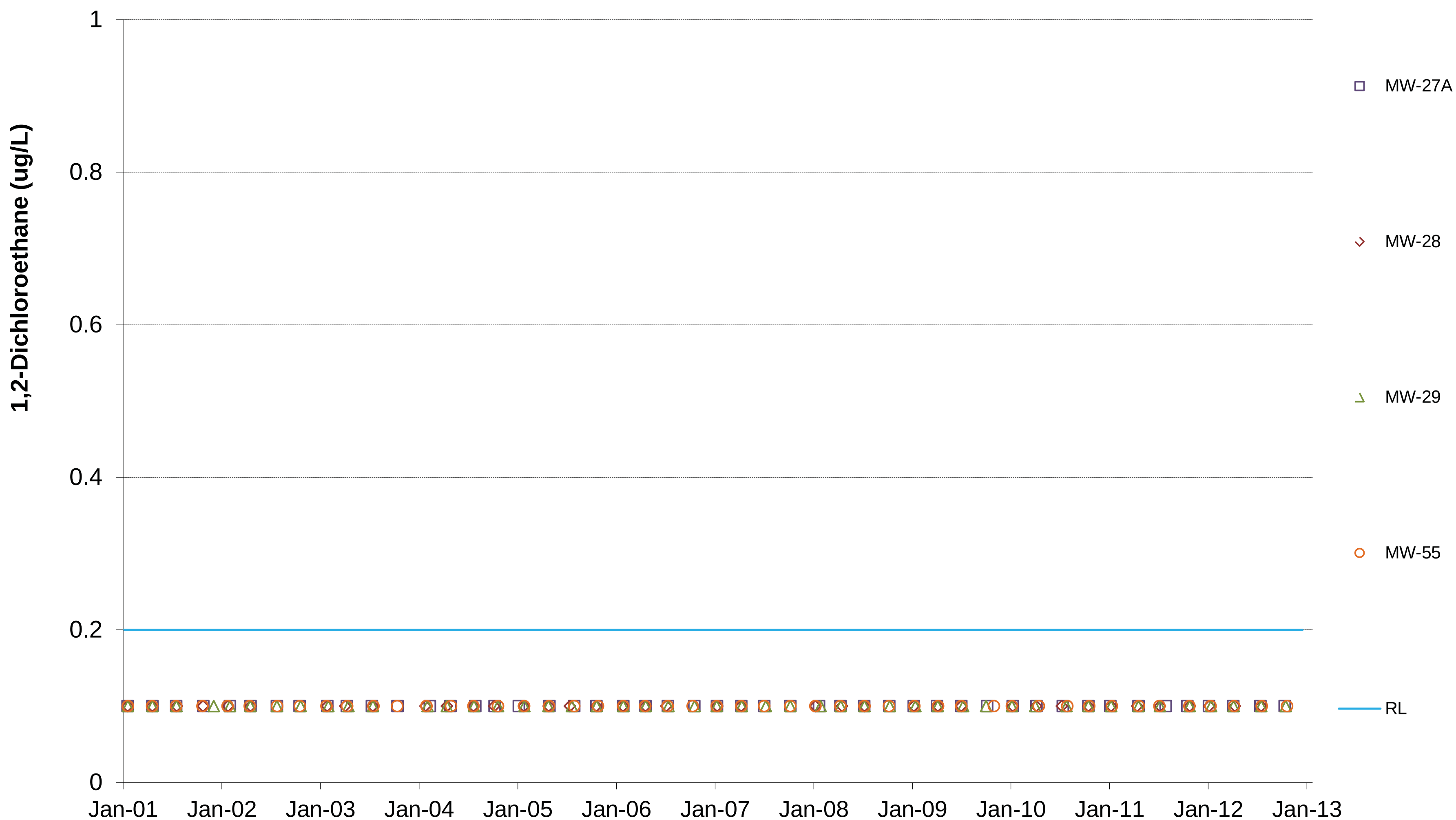
North and West Perched Zone Wells



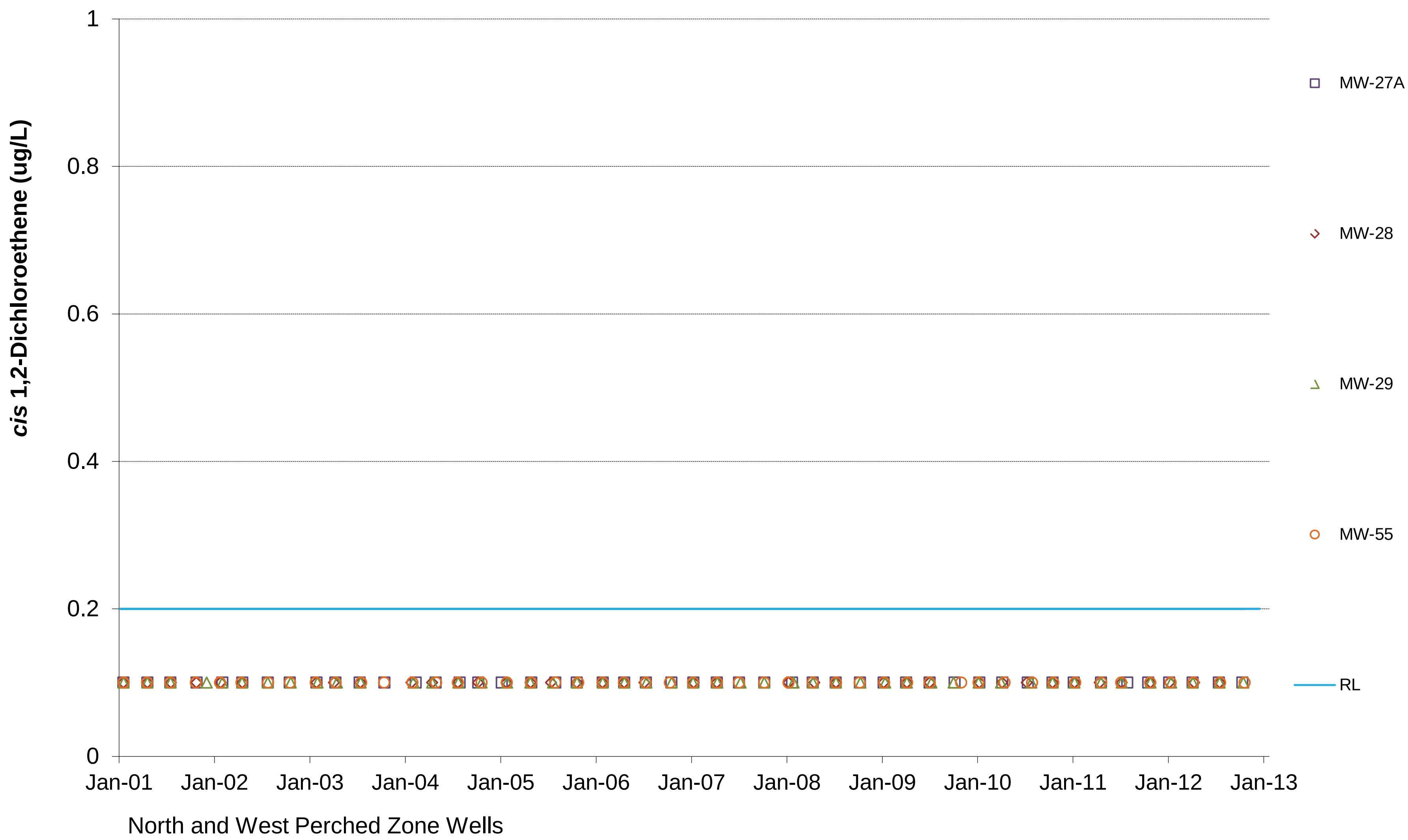
North and West Perched Zone Wells



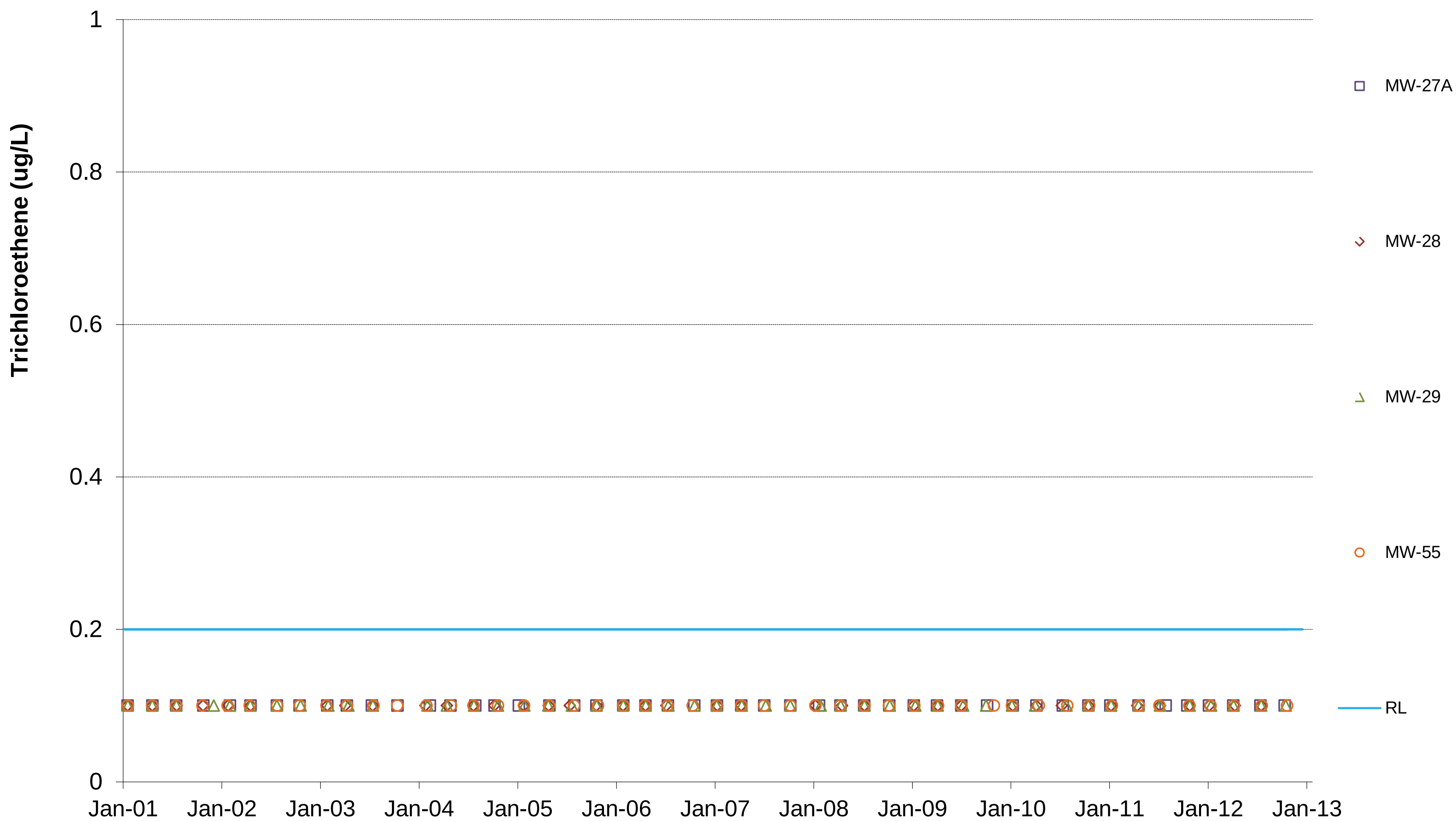
North and West Perched Zone Wells



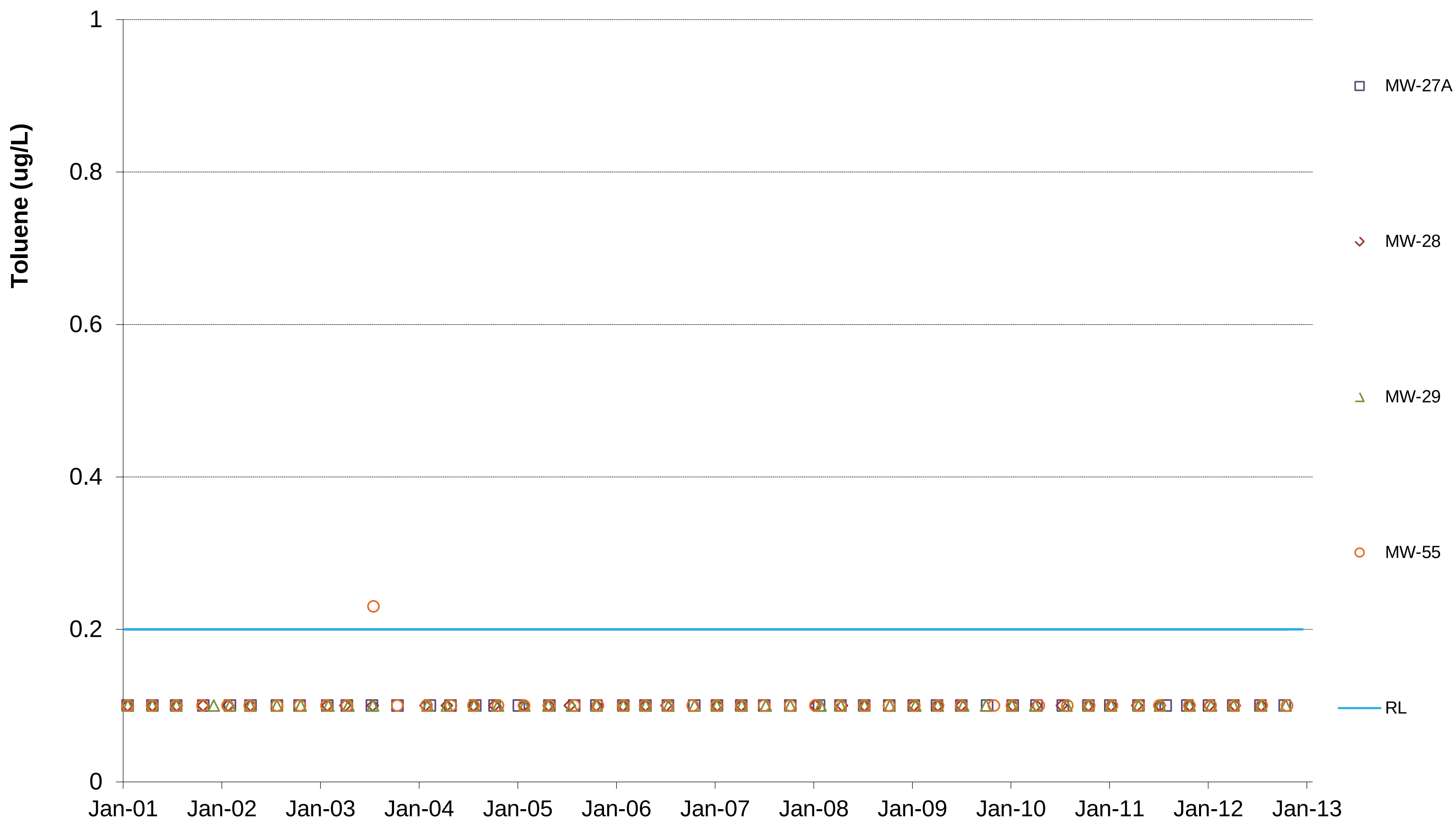
North and West Perched Zone Wells



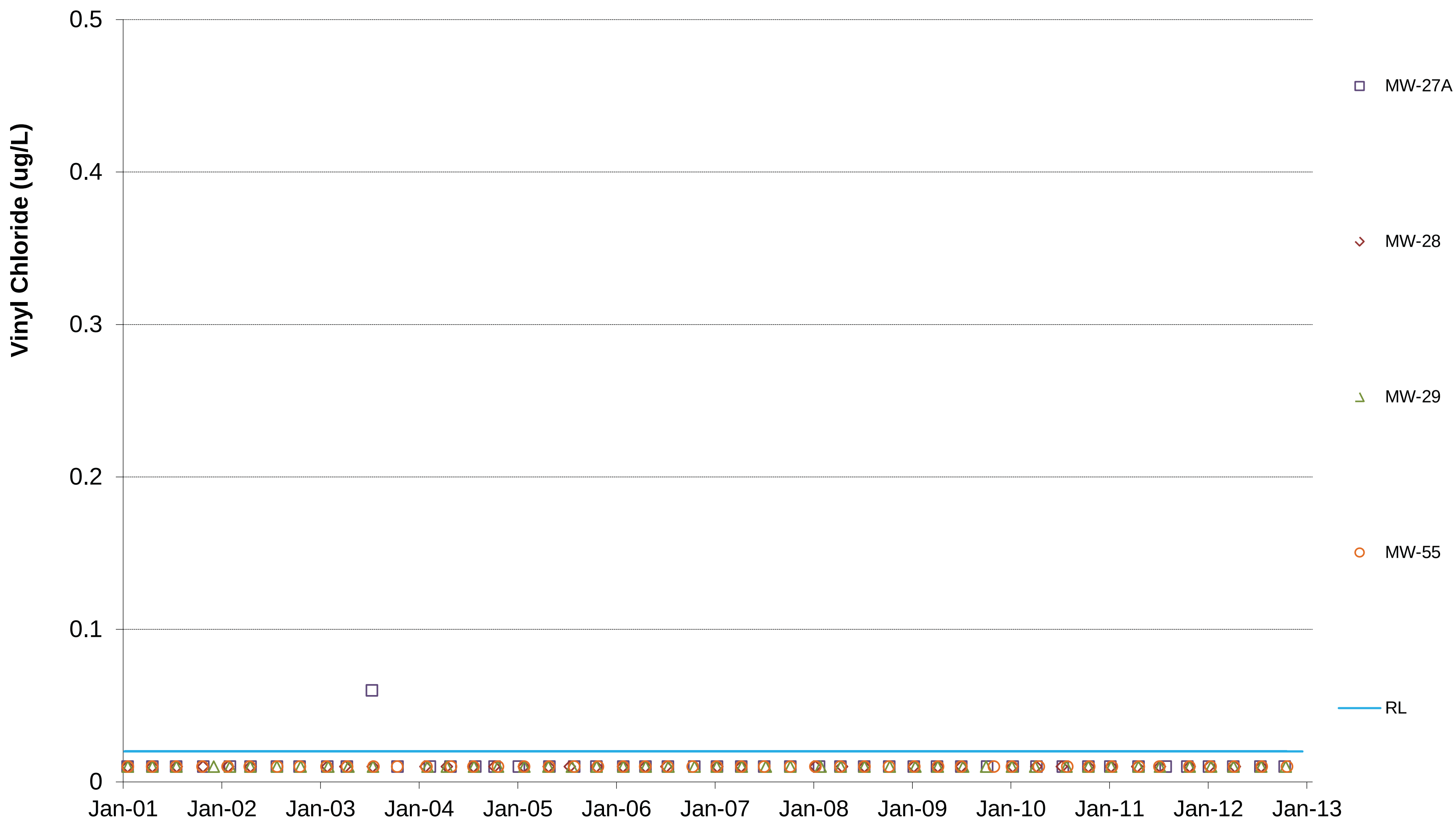
cis 1,2-Dichloroethene (ug/L)
1
0.8
0.6
0.4
0.2
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
North and West Perched Zone Wells
MW-27A
MW-28
MW-29
MW-55
RL



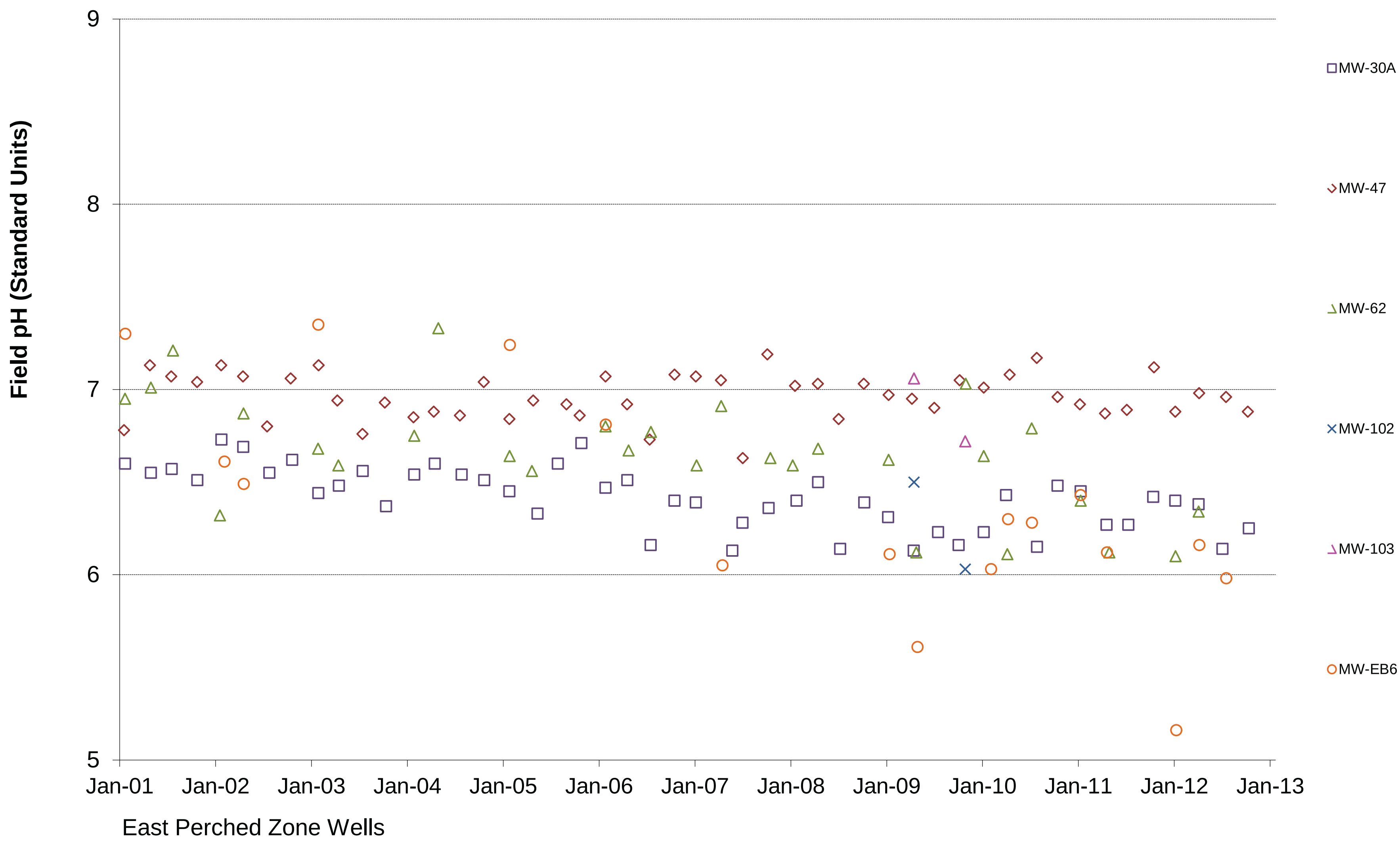
North and West Perched Zone Wells

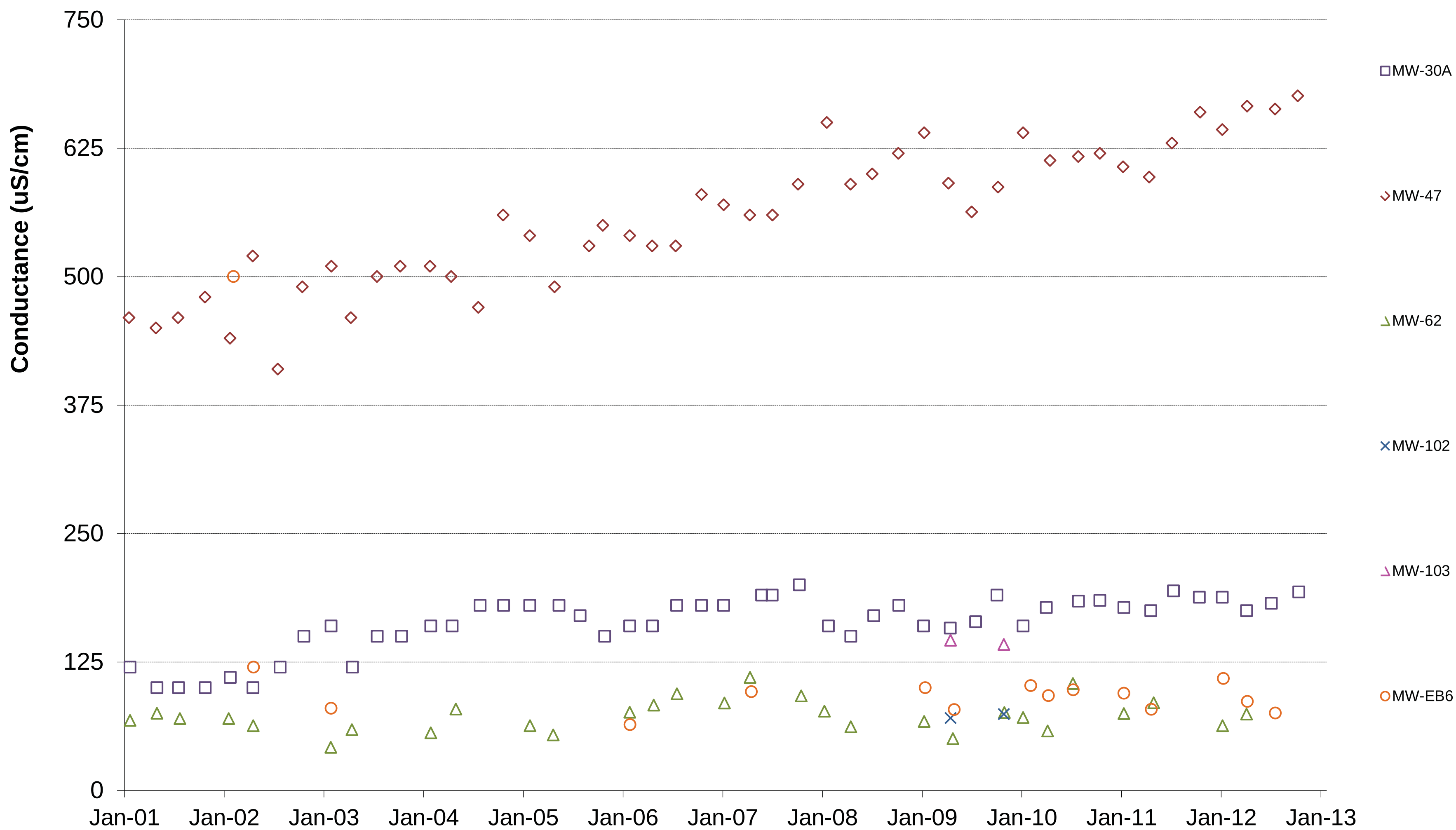


North and West Perched Zone Wells

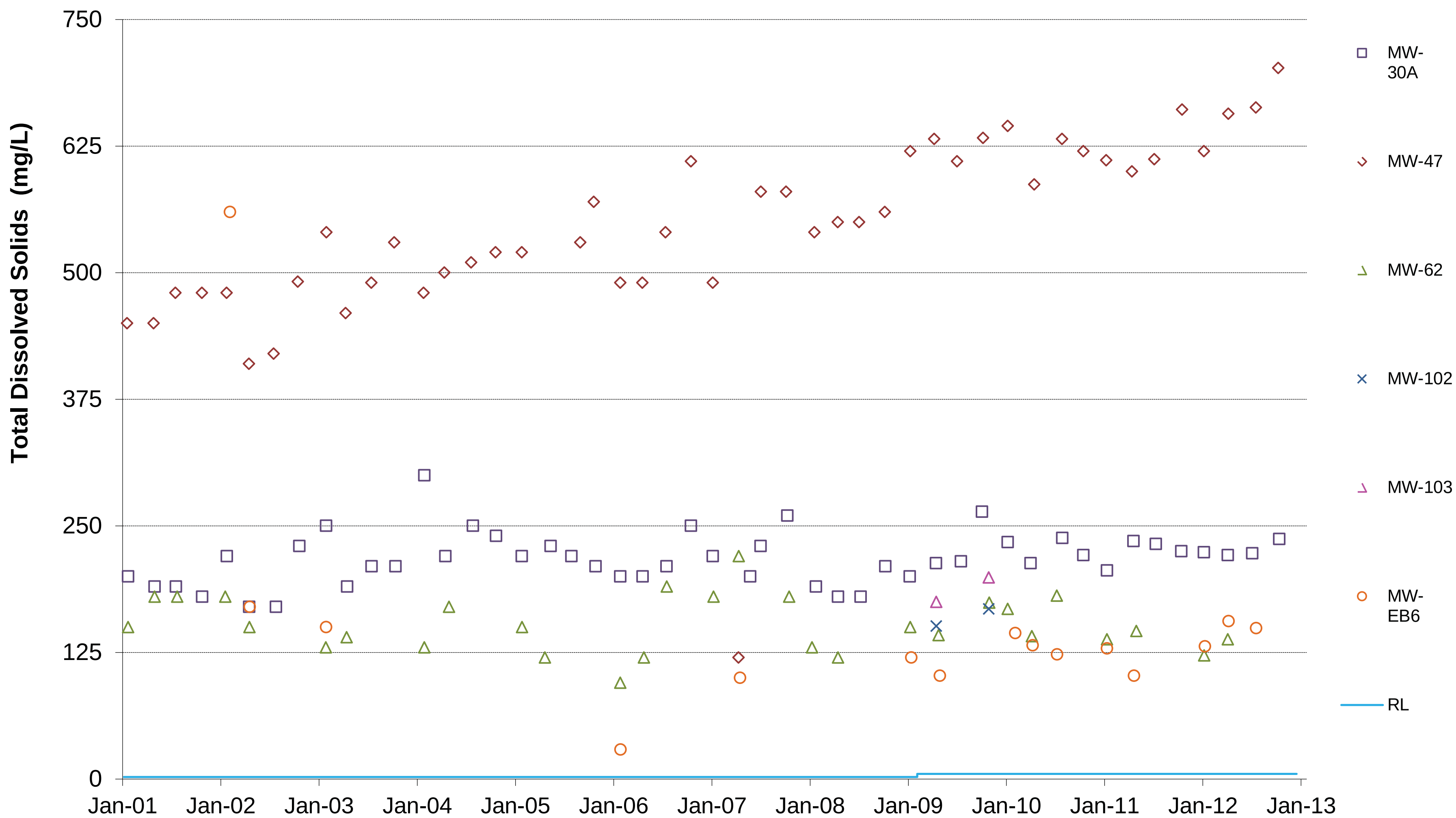


North and West Perched Zone Wells

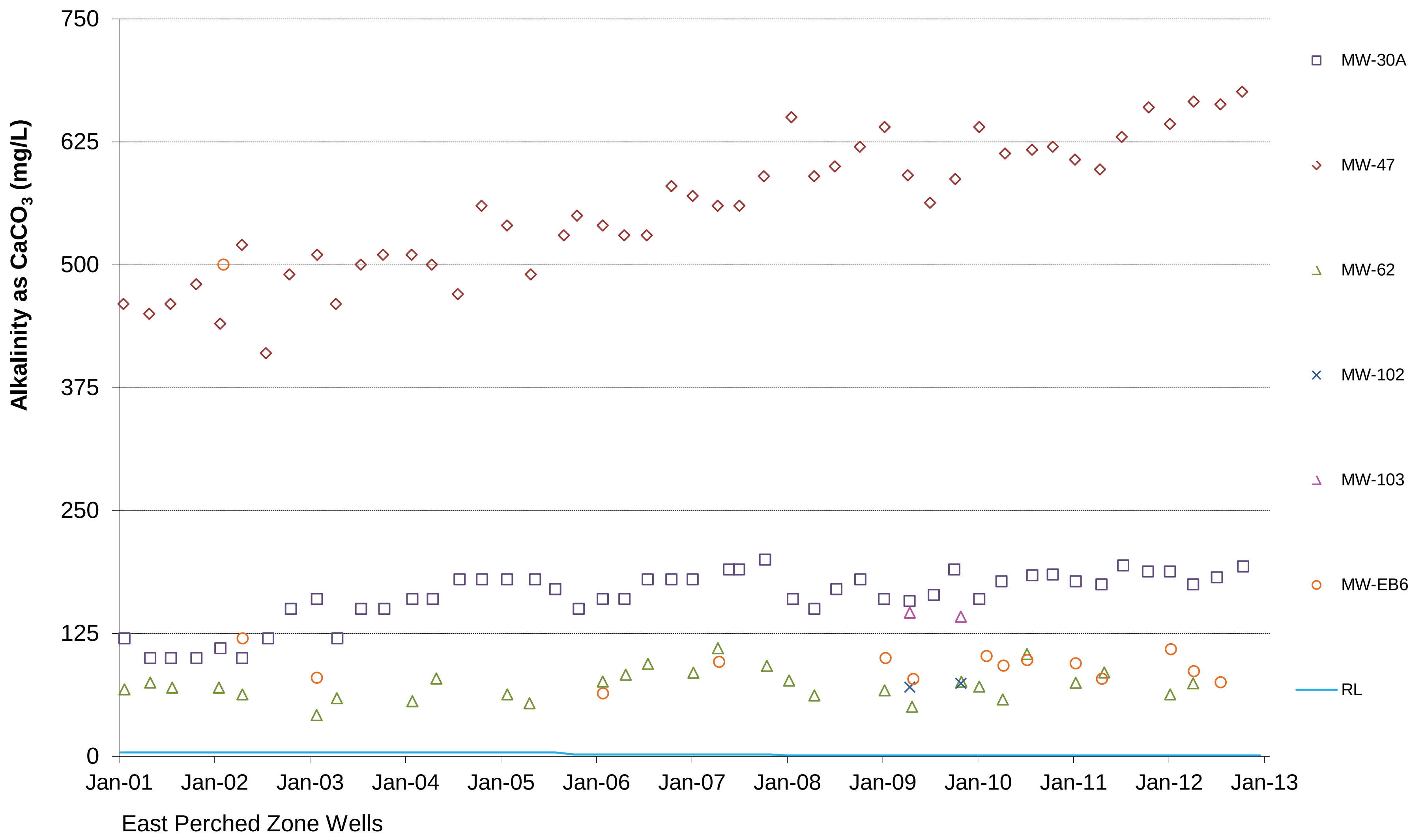

Field pH (Standard Units)
9
8
7
6
5
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
East Perched Zone Wells
MW-30A
MW-47
MW-62
MW-102
MW-103
MW-EB6

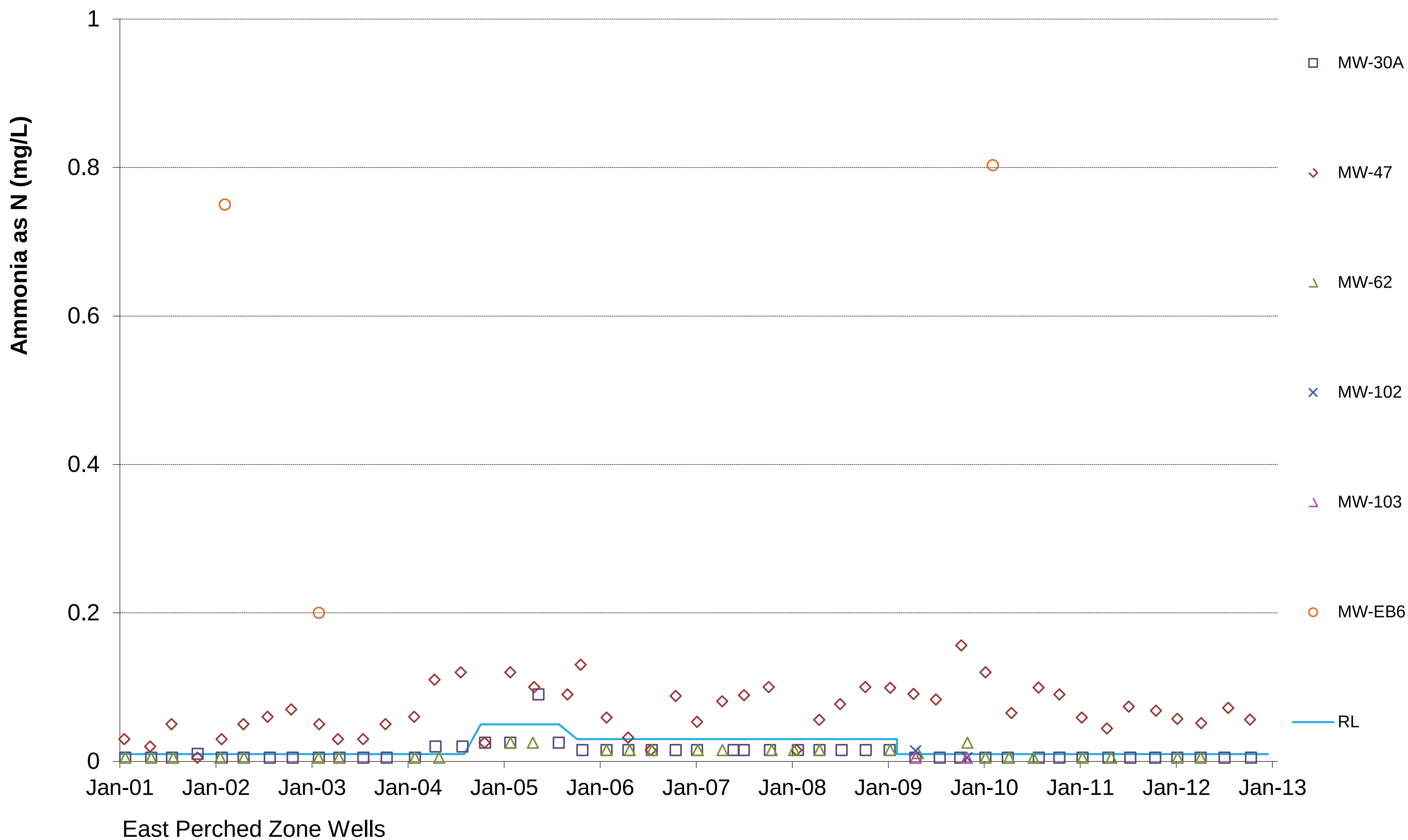


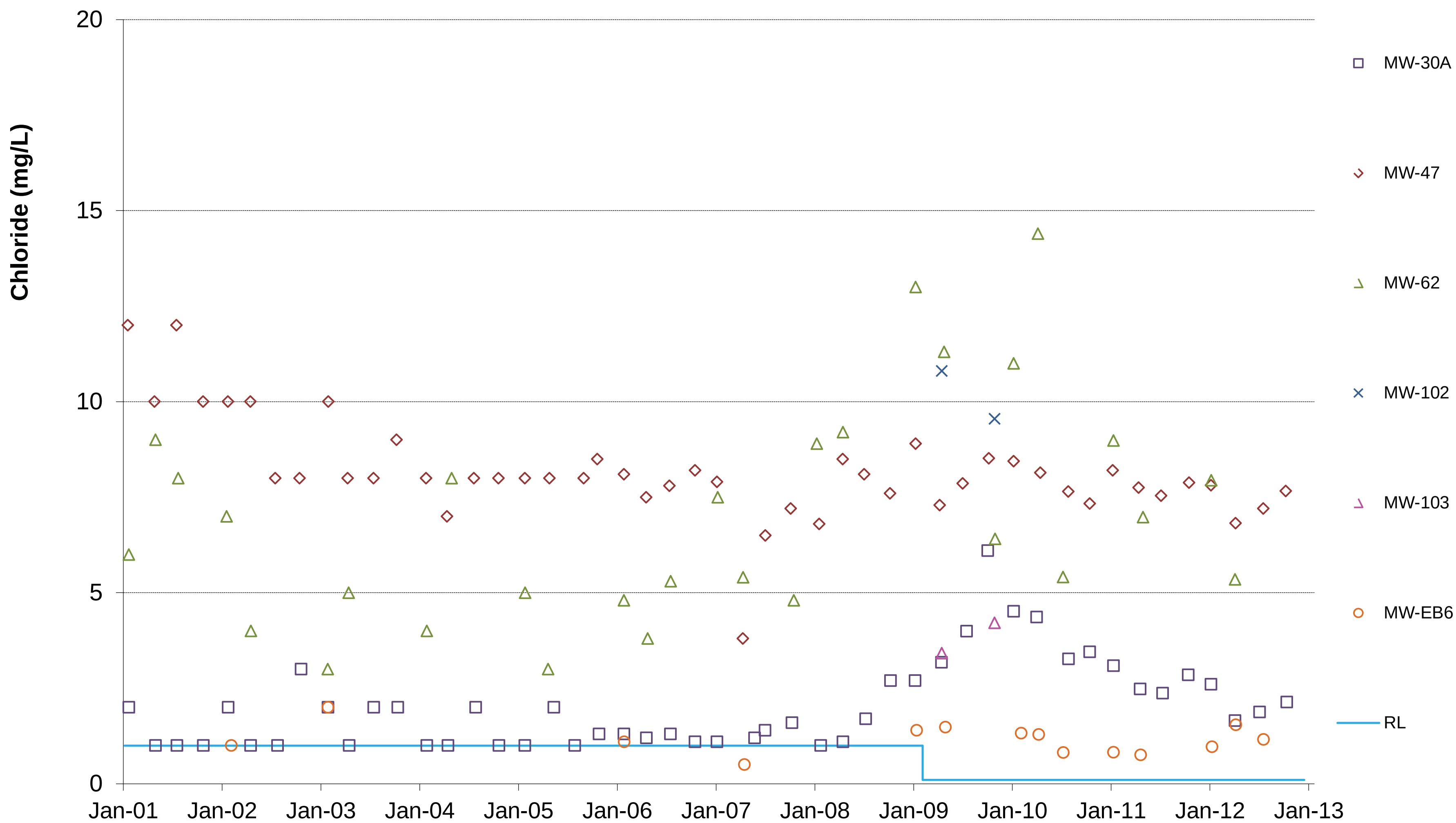
East Perched Zone Wells



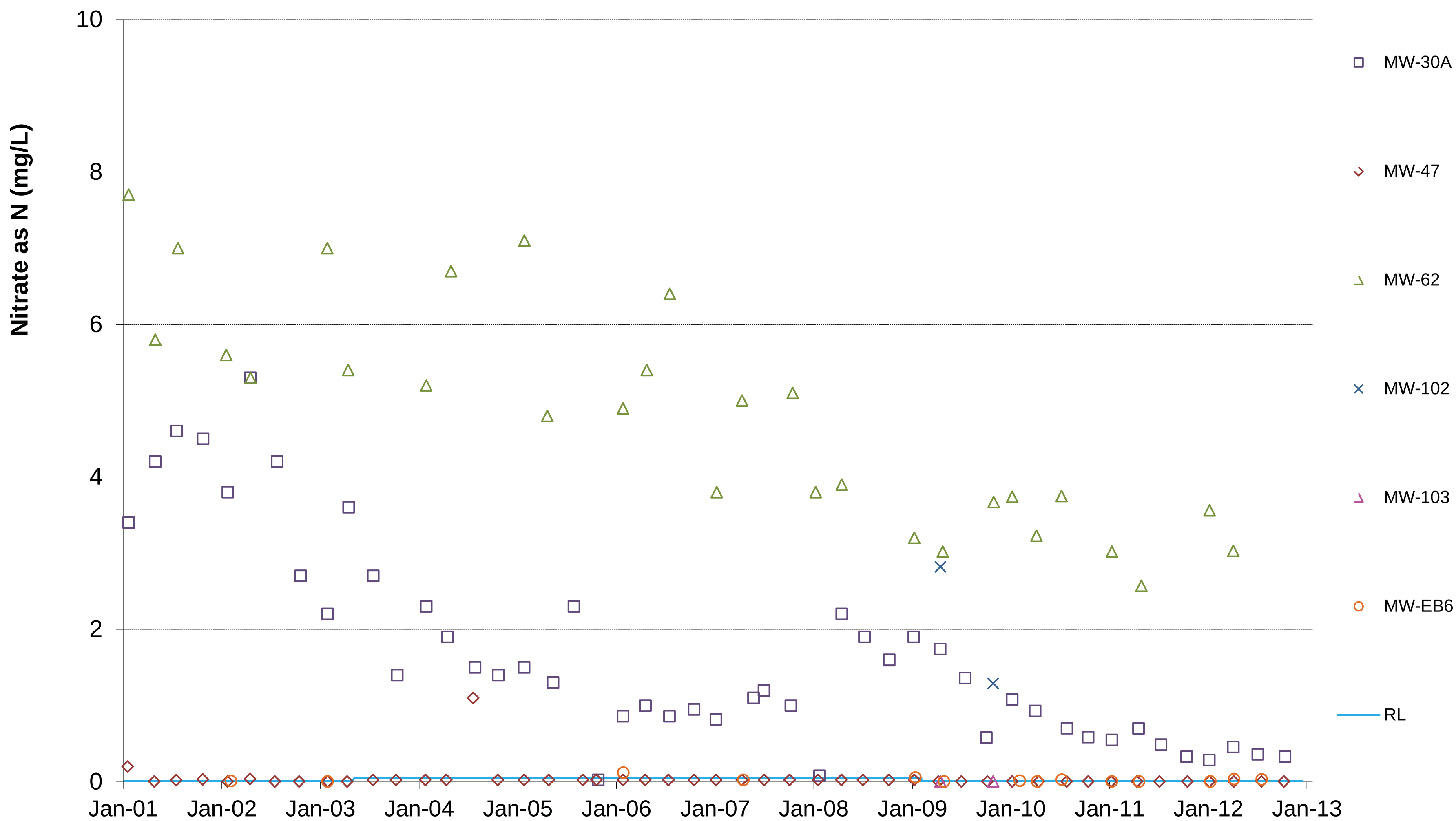
East Perched Zone Wells


Alkalinity as $CaCO_3$ (mg/L)
750
625
500
375
250
125
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
East Perched Zone Wells
MW-30A
MW-47
MW-62
MW-102
MW-103
MW-EB6
RL

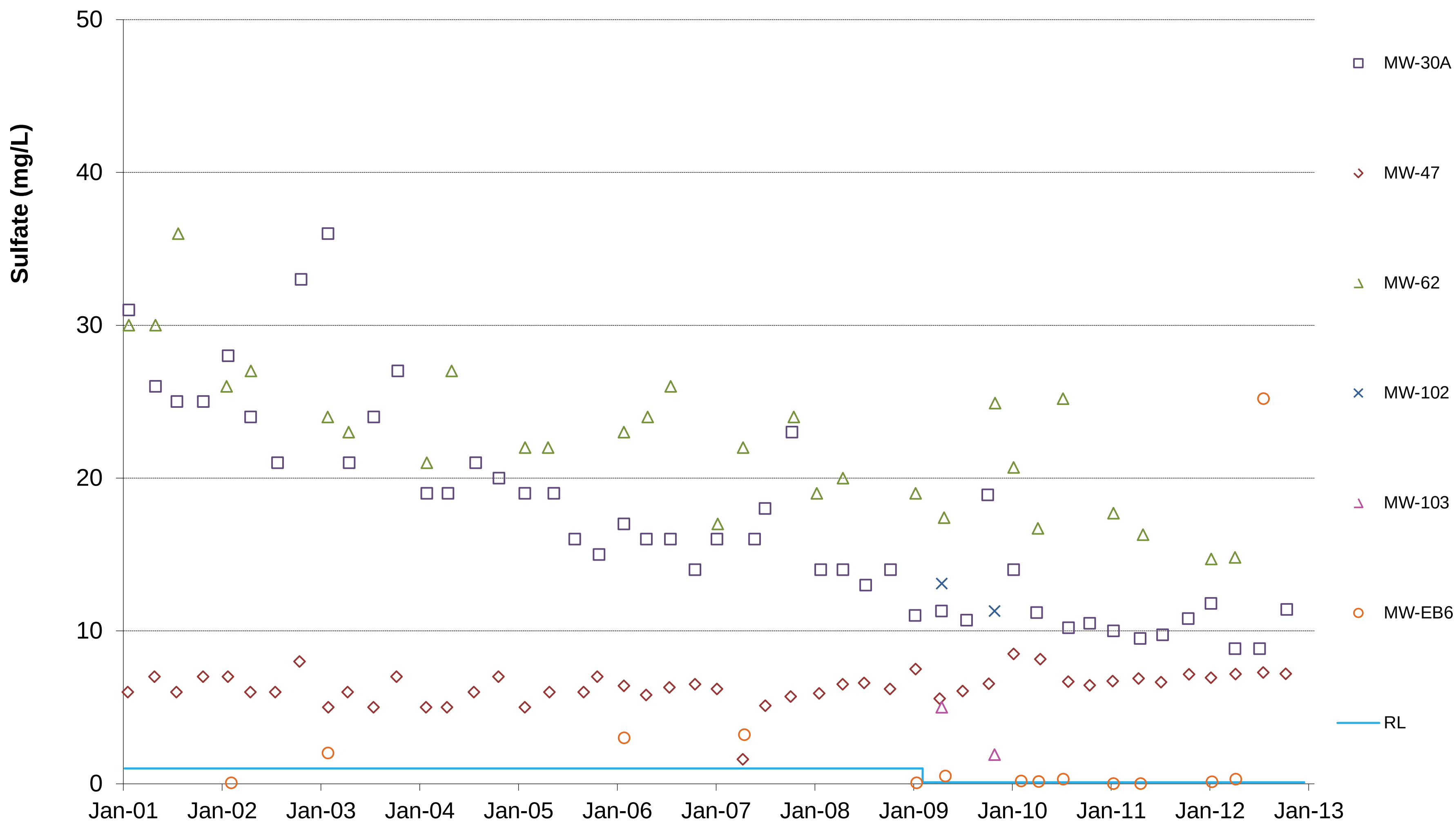

Ammonia as N (mg/L)
1
0.8
0.6
0.4
0.2
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
East Perched Zone Wells
MW-30A
MW-47
MW-62
MW-102
MW-103
MW-EB6
RL



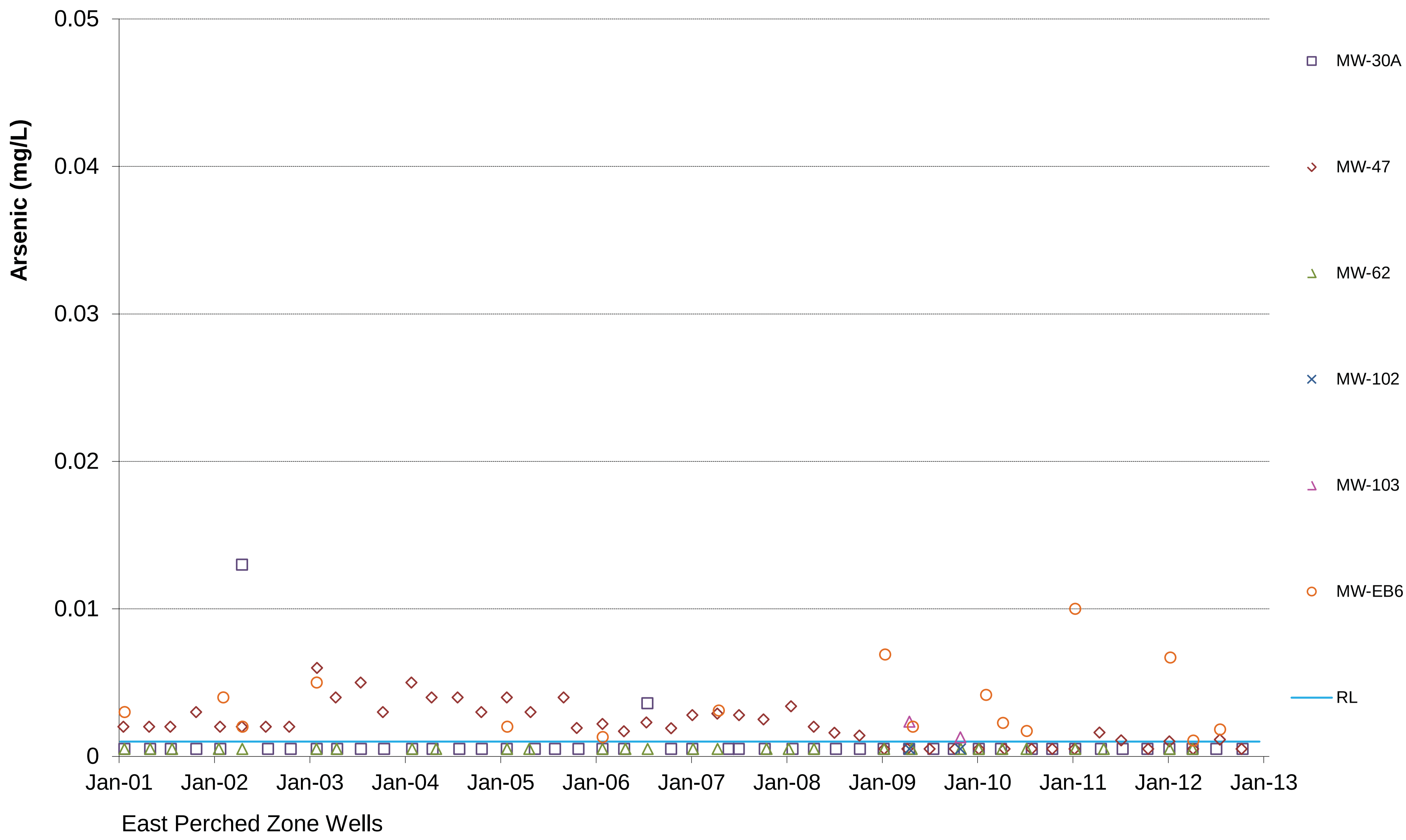
East Perched Zone Wells



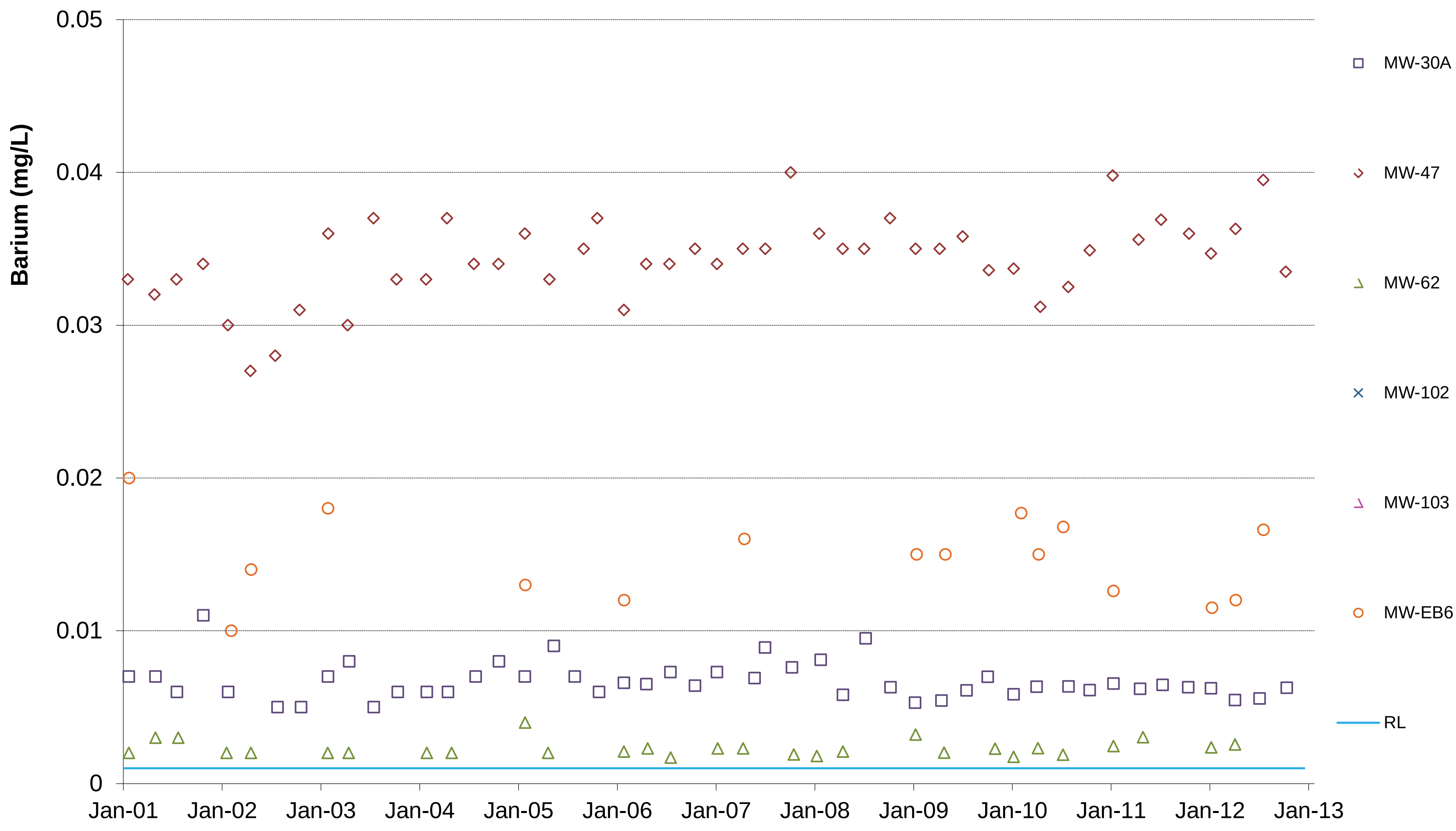
East Perched Zone Wells



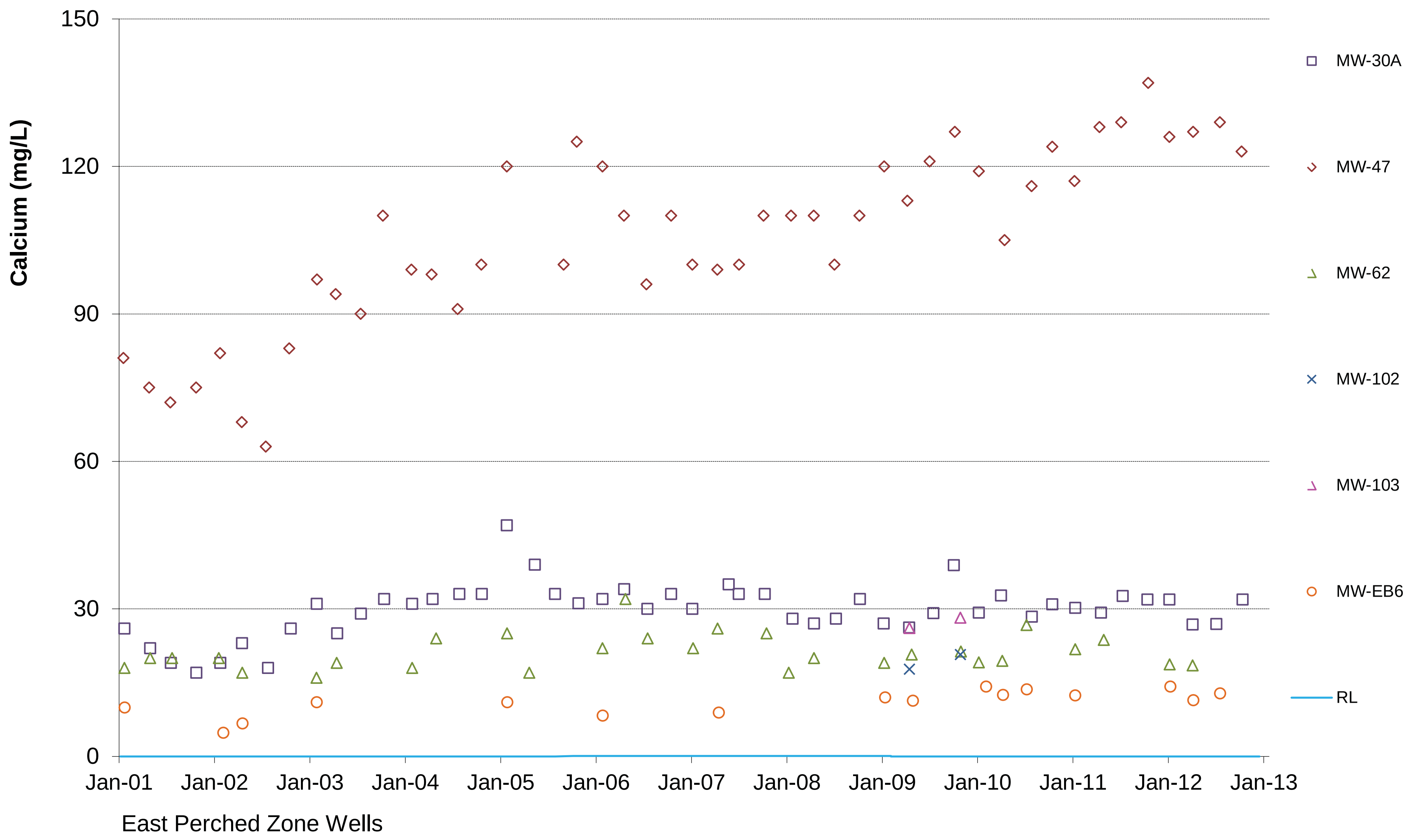
East Perched Zone Wells

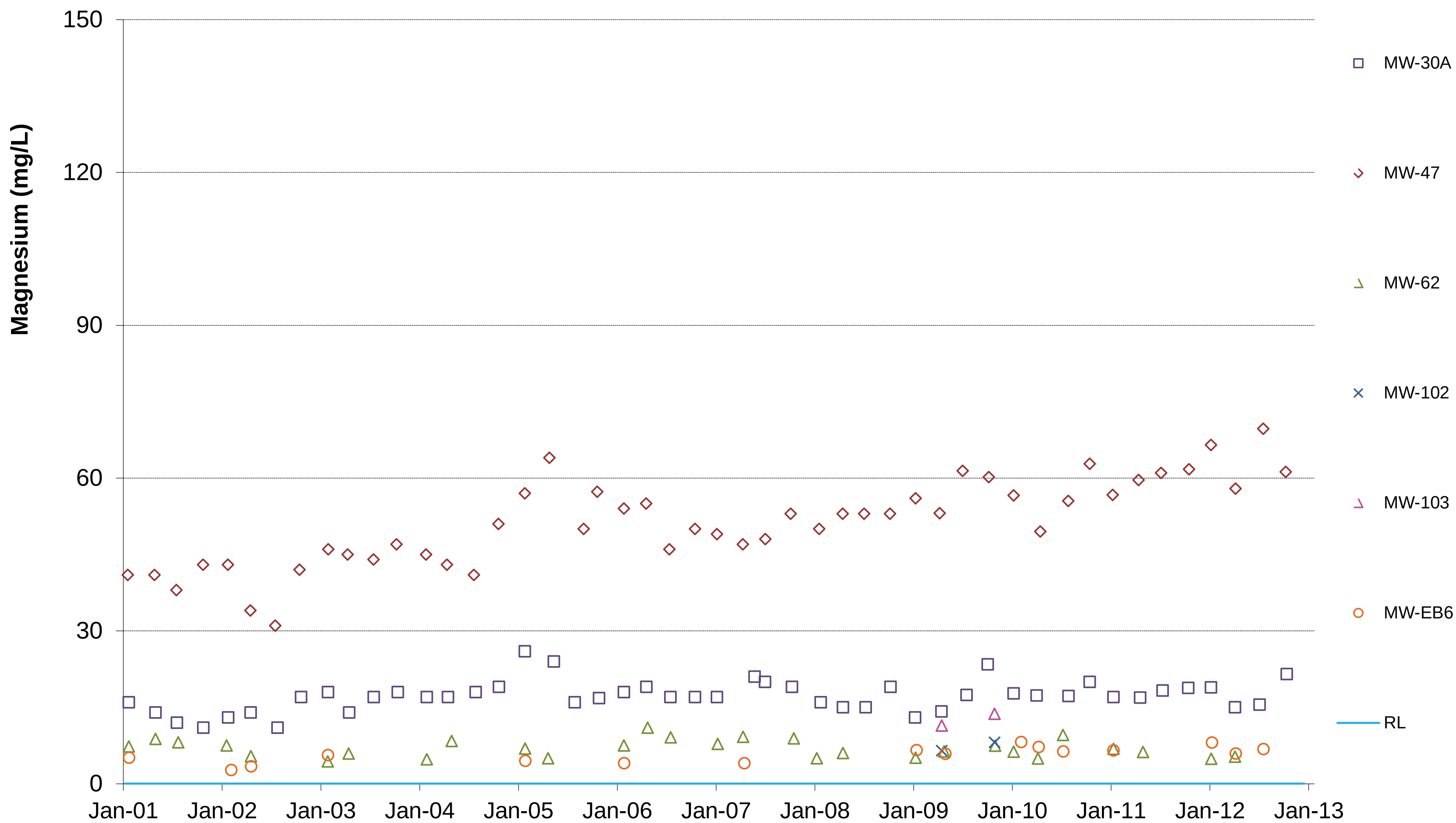


Arsenic (mg/L)
0.05
0.04
0.03
0.02
0.01
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
East Perched Zone Wells
MW-30A
MW-47
MW-62
MW-102
MW-103
MW-EB6
RL

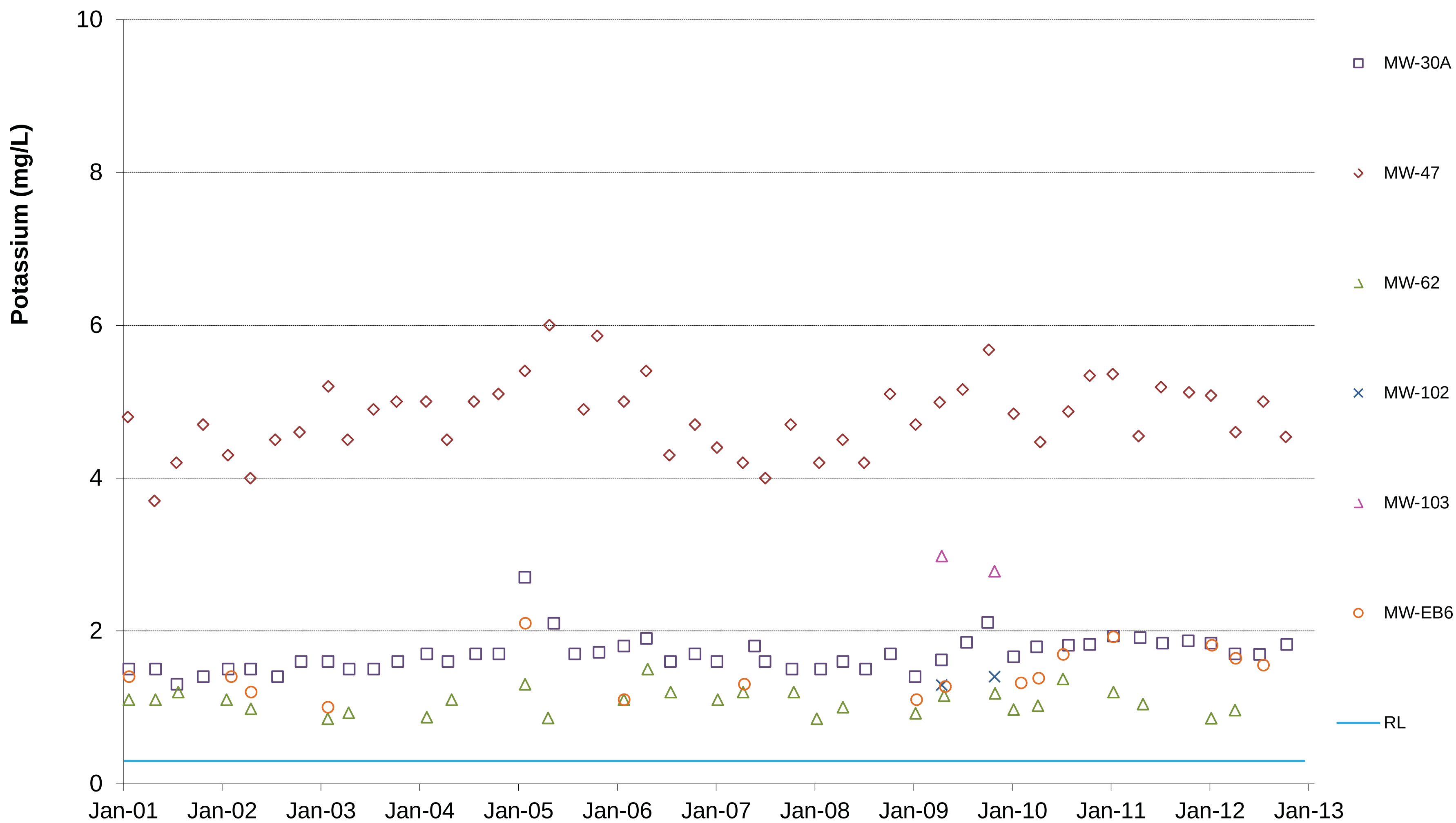


East Perched Zone Wells

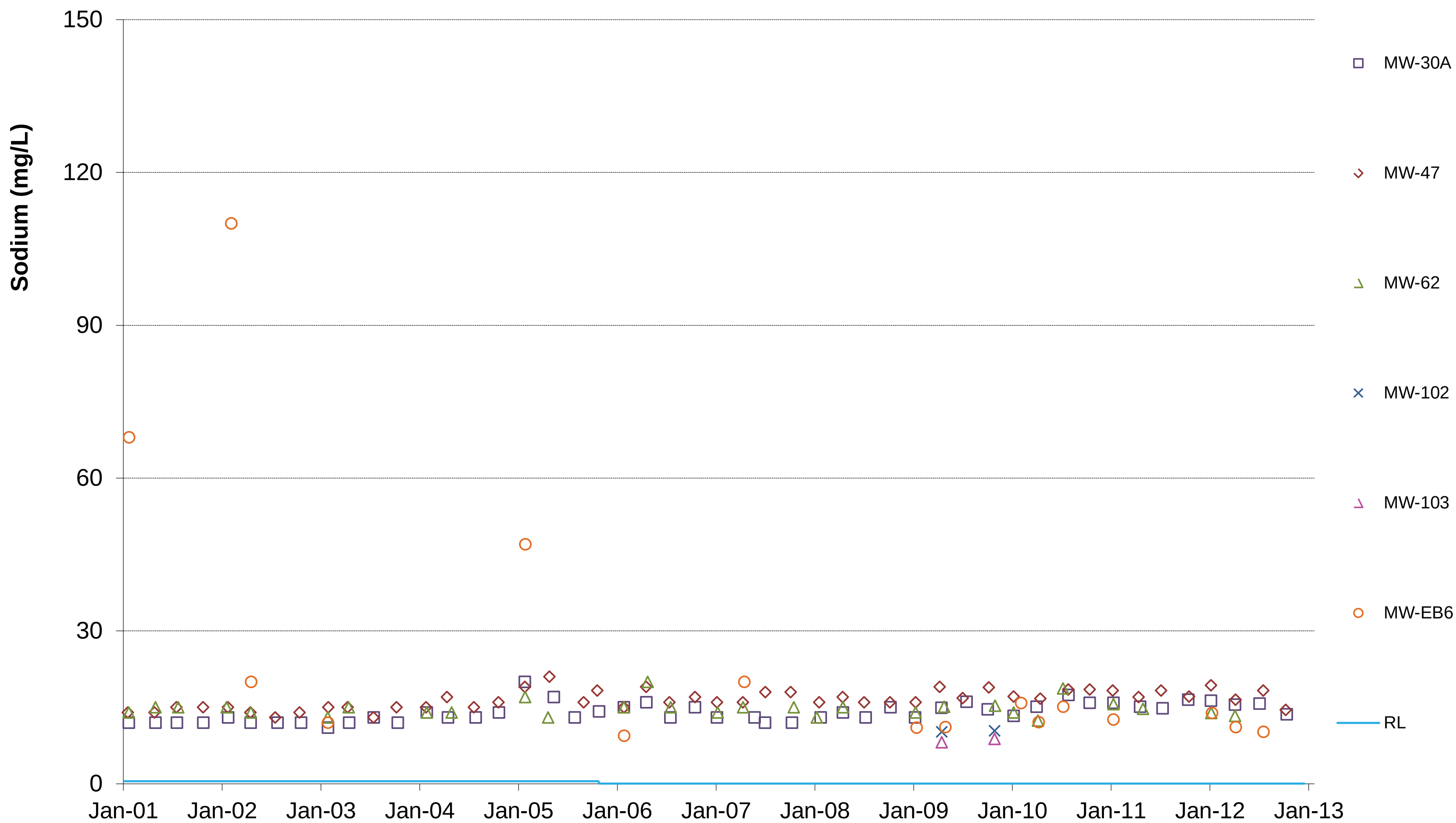

Calcium (mg/L)
150
120
90
60
30
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
East Perched Zone Wells
MW-30A
MW-47
MW-62
MW-102
MW-103
MW-EB6
RL



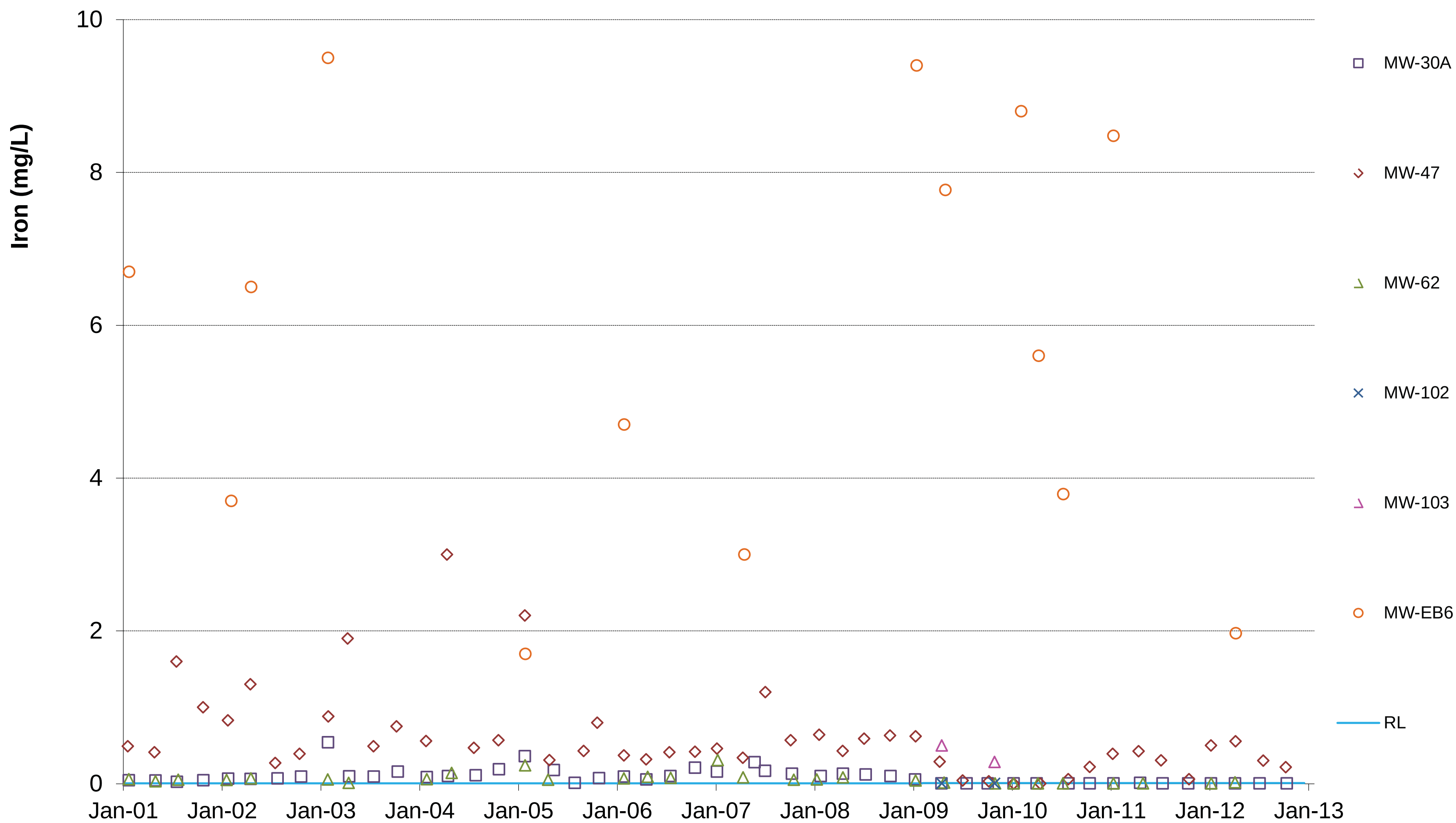
East Perched Zone Wells



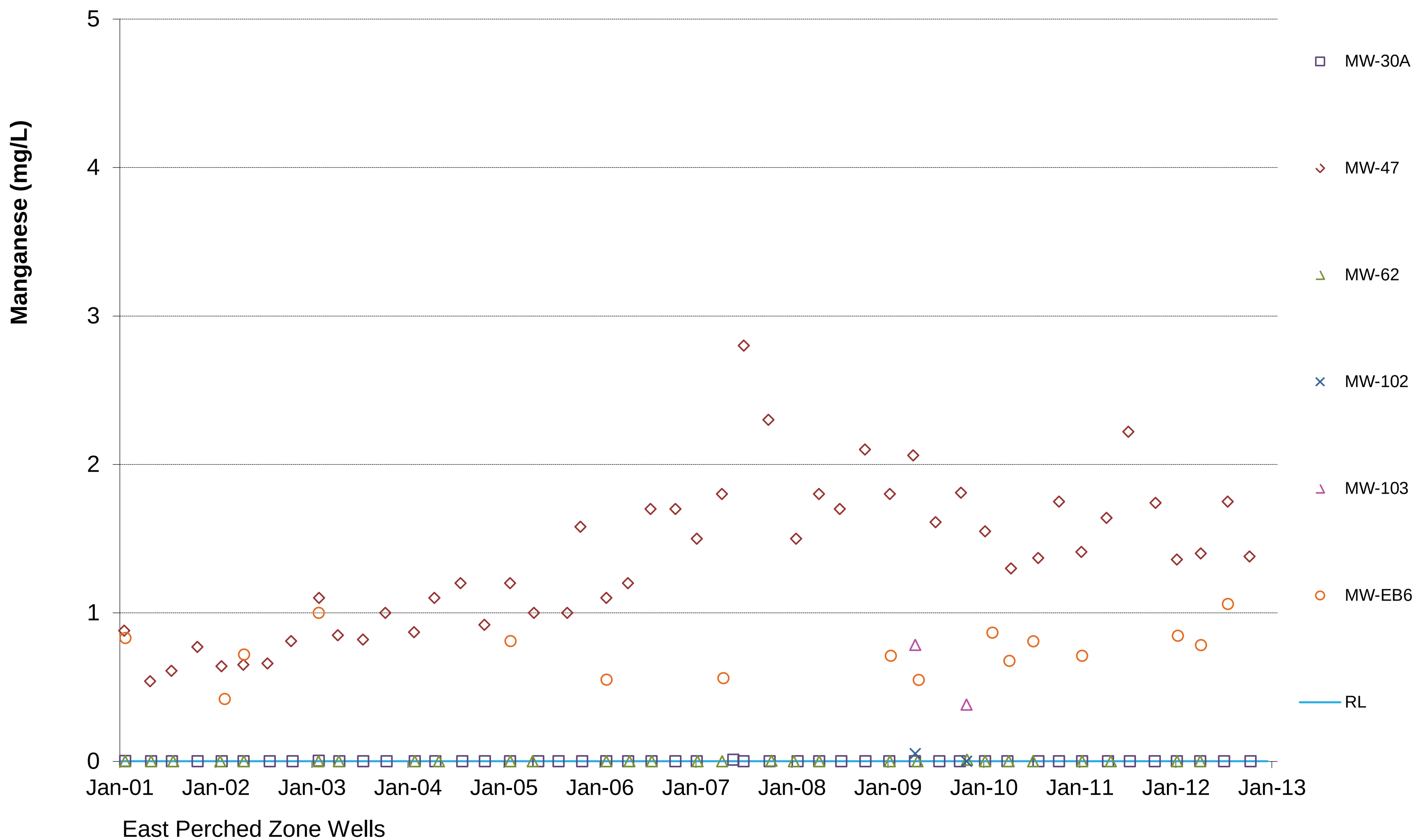
East Perched Zone Wells



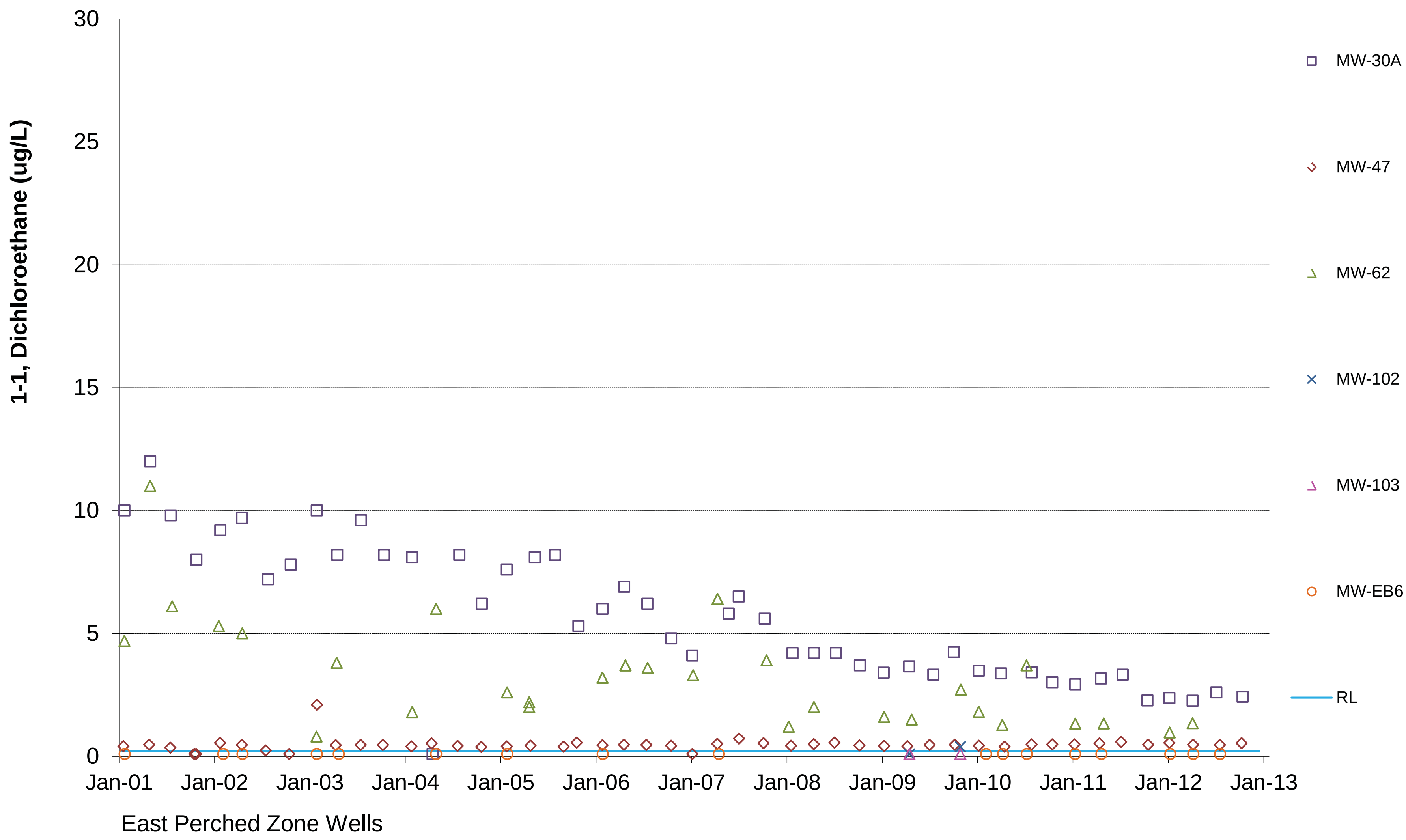
East Perched Zone Wells



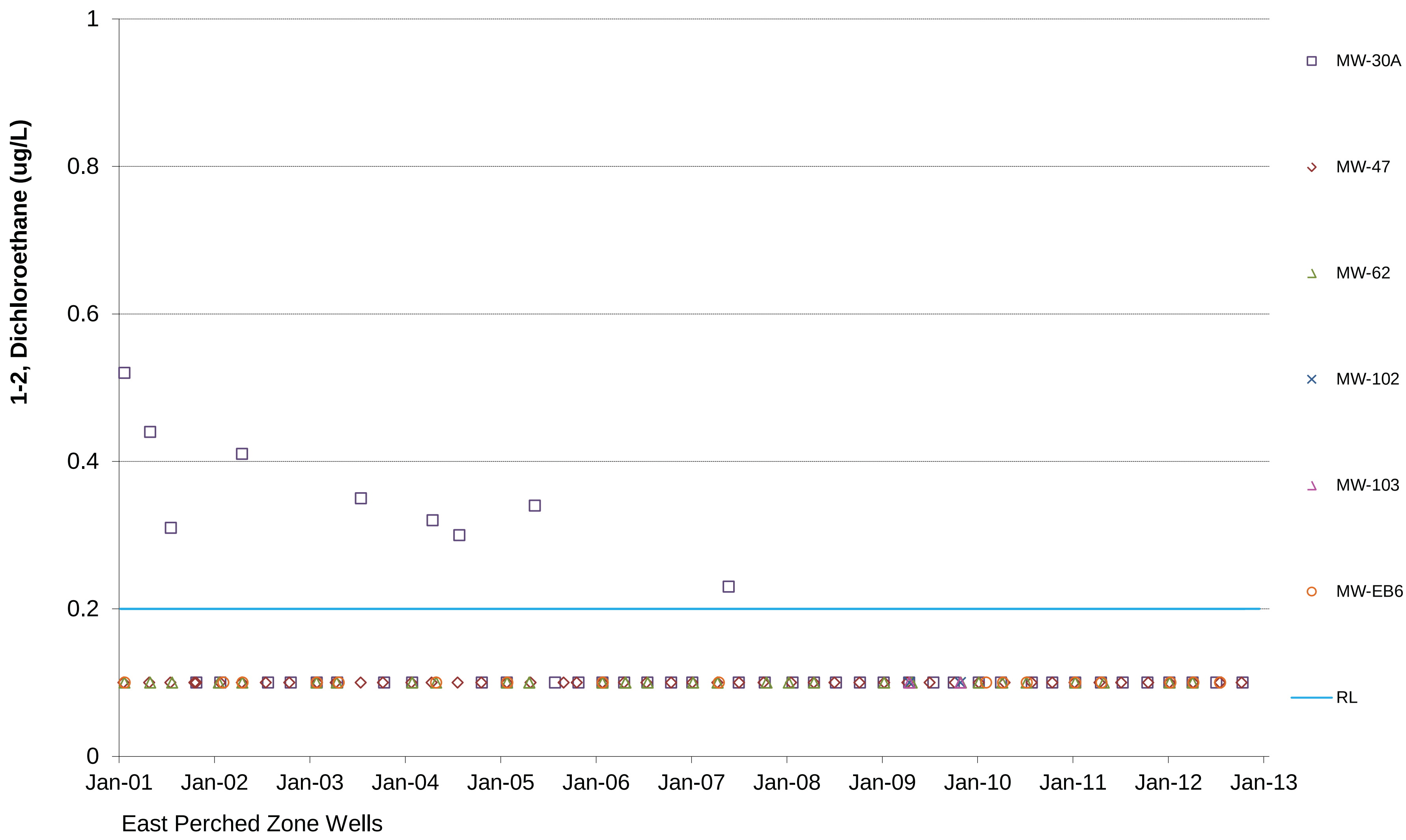
East Perched Zone Wells

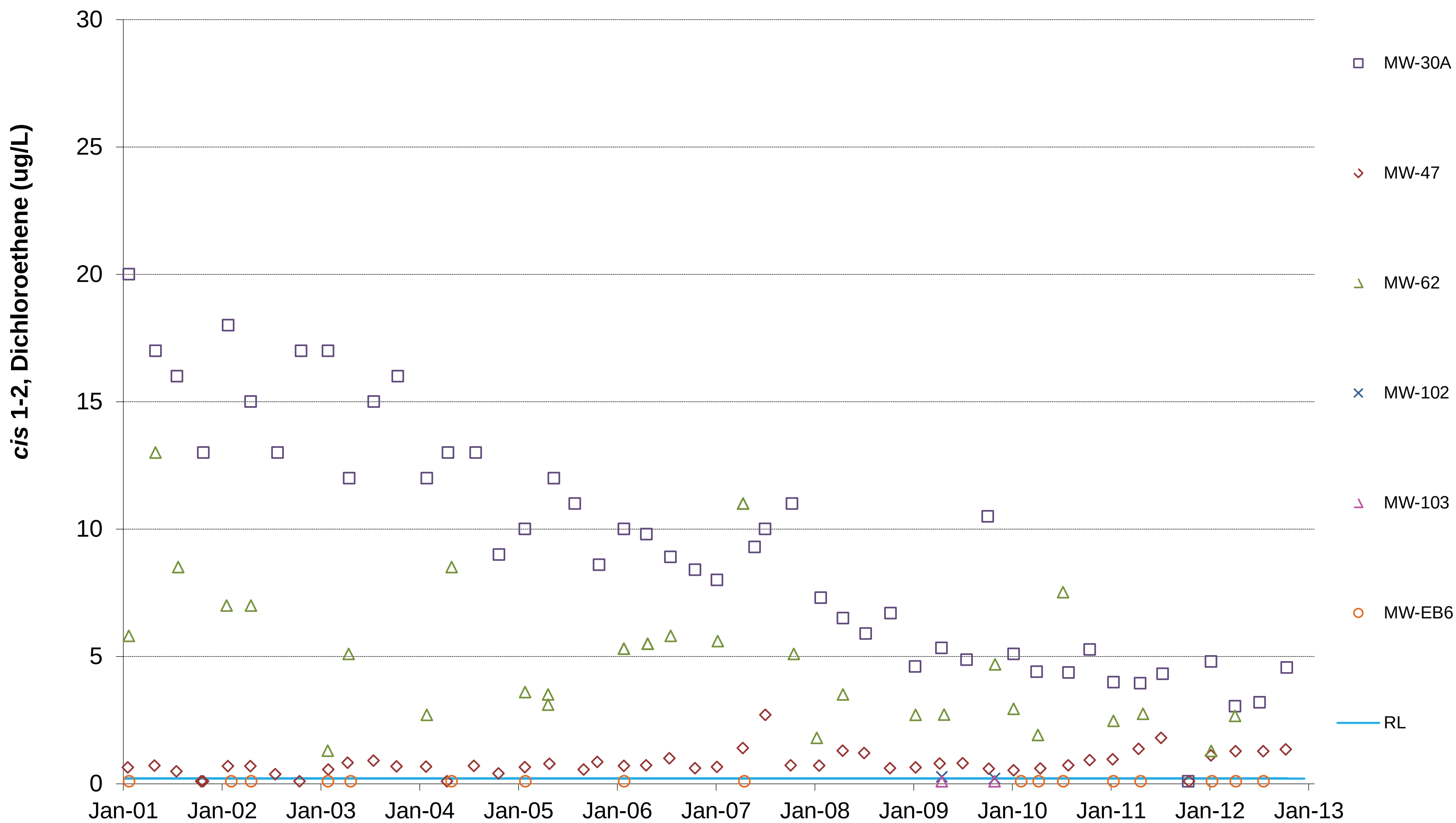


Manganese (mg/L)
5
4
3
2
1
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
East Perched Zone Wells
MW-30A
MW-47
MW-62
MW-102
MW-103
MW-EB6
RL



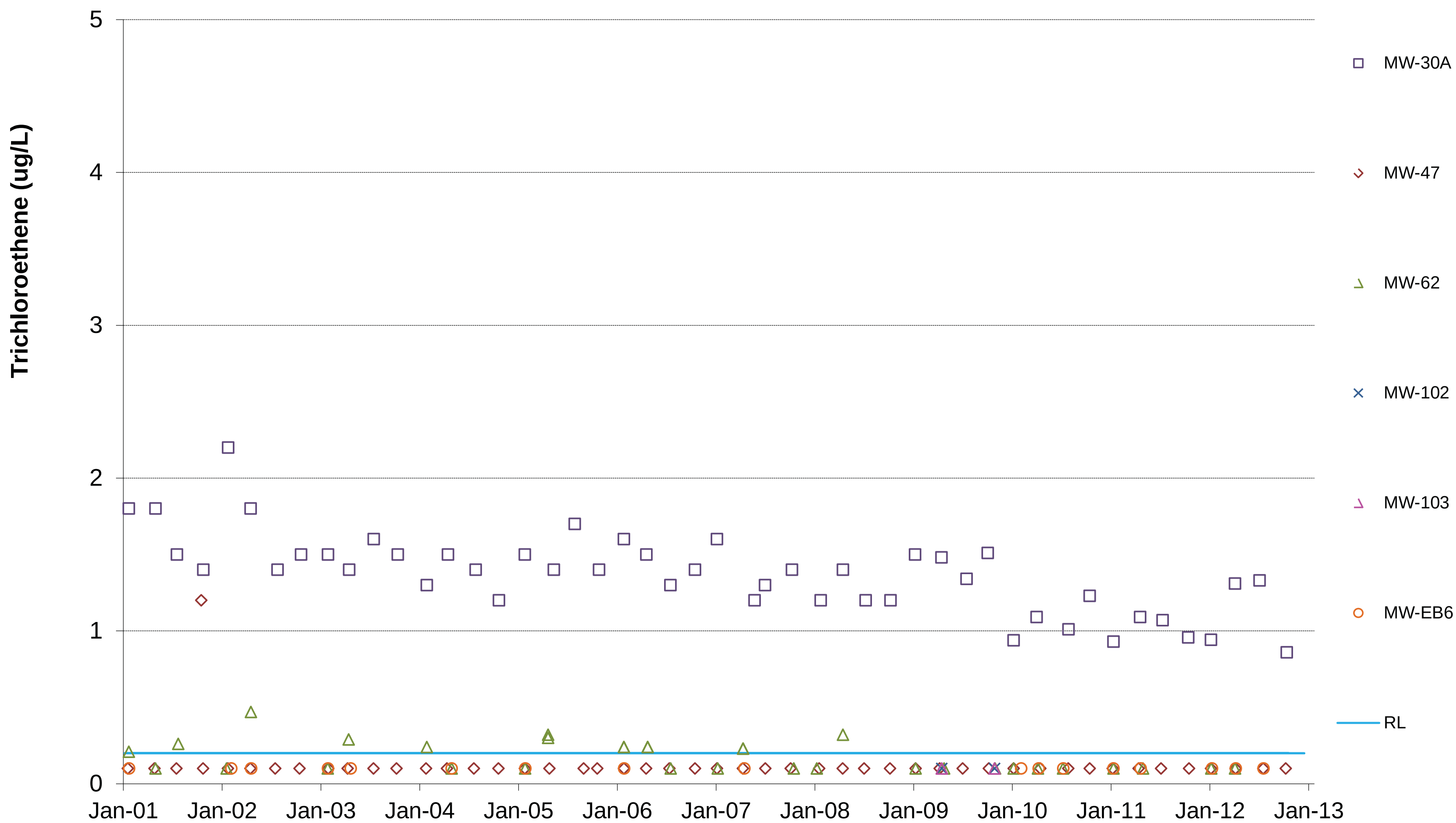
1-1, Dichloroethane (ug/L)
30
25
20
15
10
5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
East Perched Zone Wells
MW-30A
MW-47
MW-62
MW-102
MW-103
MW-EB6
RL


1-2, Dichloroethane (ug/L)
1
0.8
0.6
0.4
0.2
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
East Perched Zone Wells
MW-30A
MW-47
MW-62
MW-102
MW-103
MW-EB6
RL

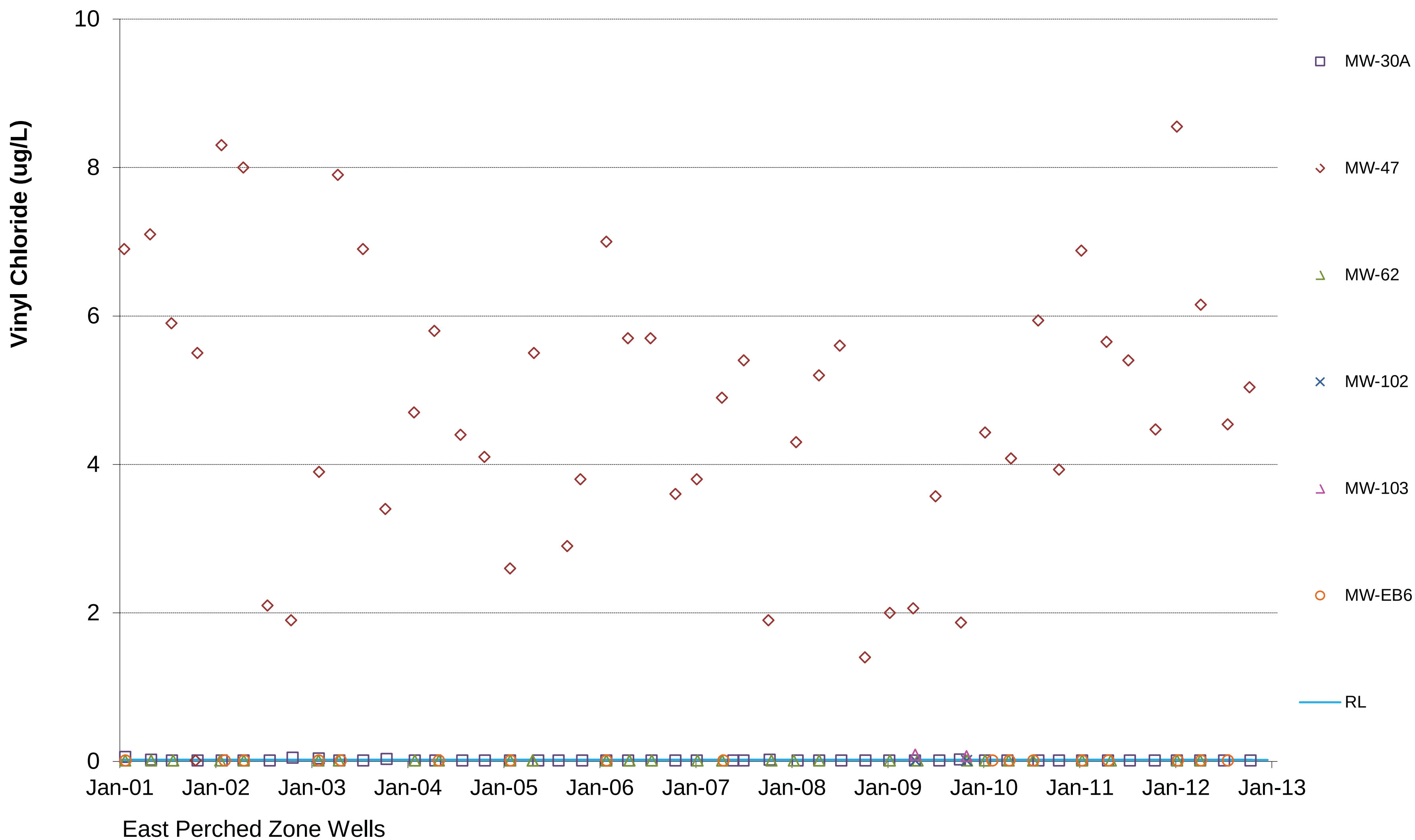


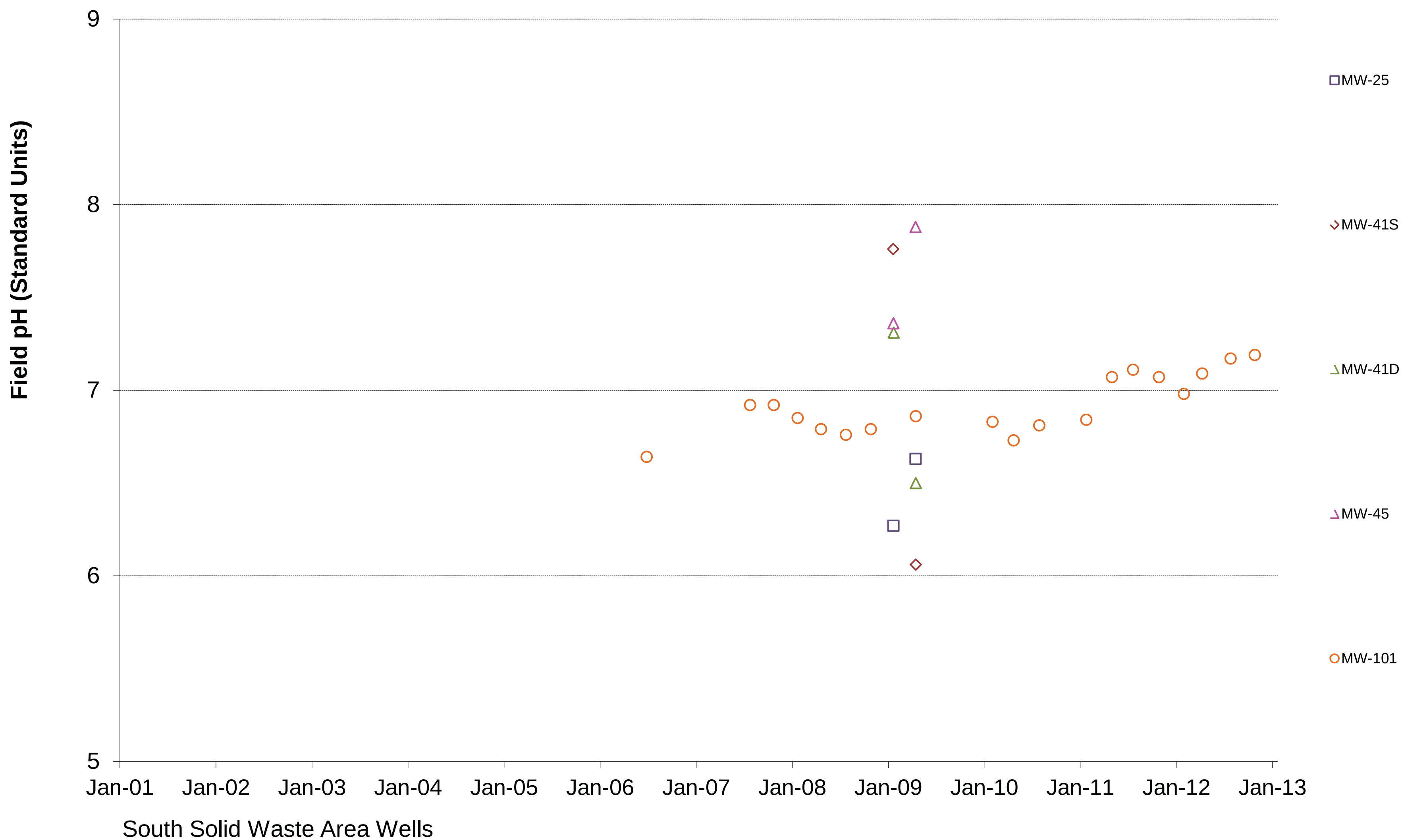
East Perched Zone Wells

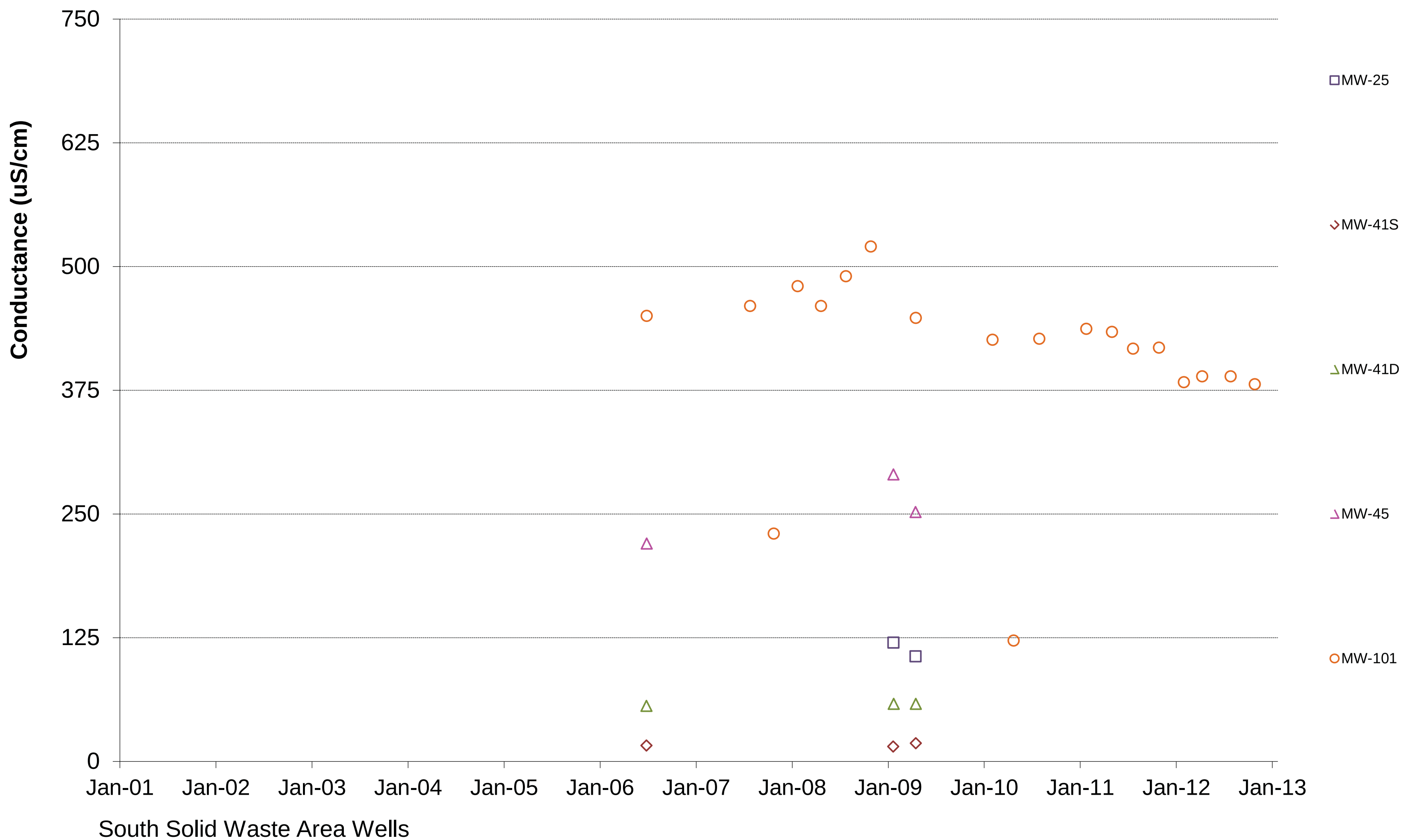
East Perched Zone Wells



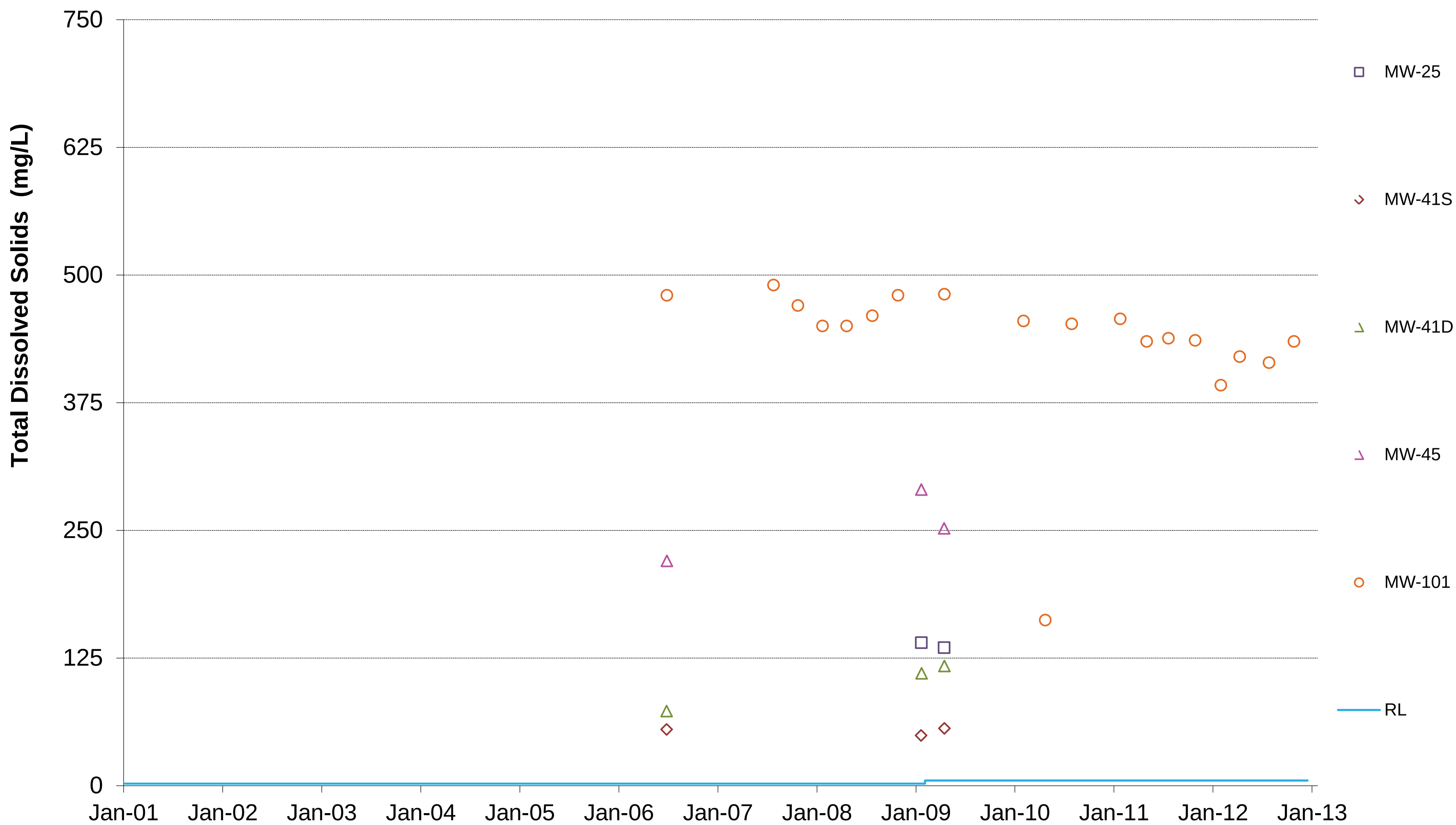
East Perched Zone Wells


Vinyl Chloride (ug/L)
10
8
6
4
2
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
East Perched Zone Wells
MW-30A
MW-47
MW-62
MW-102
MW-103
MW-EB6
RL

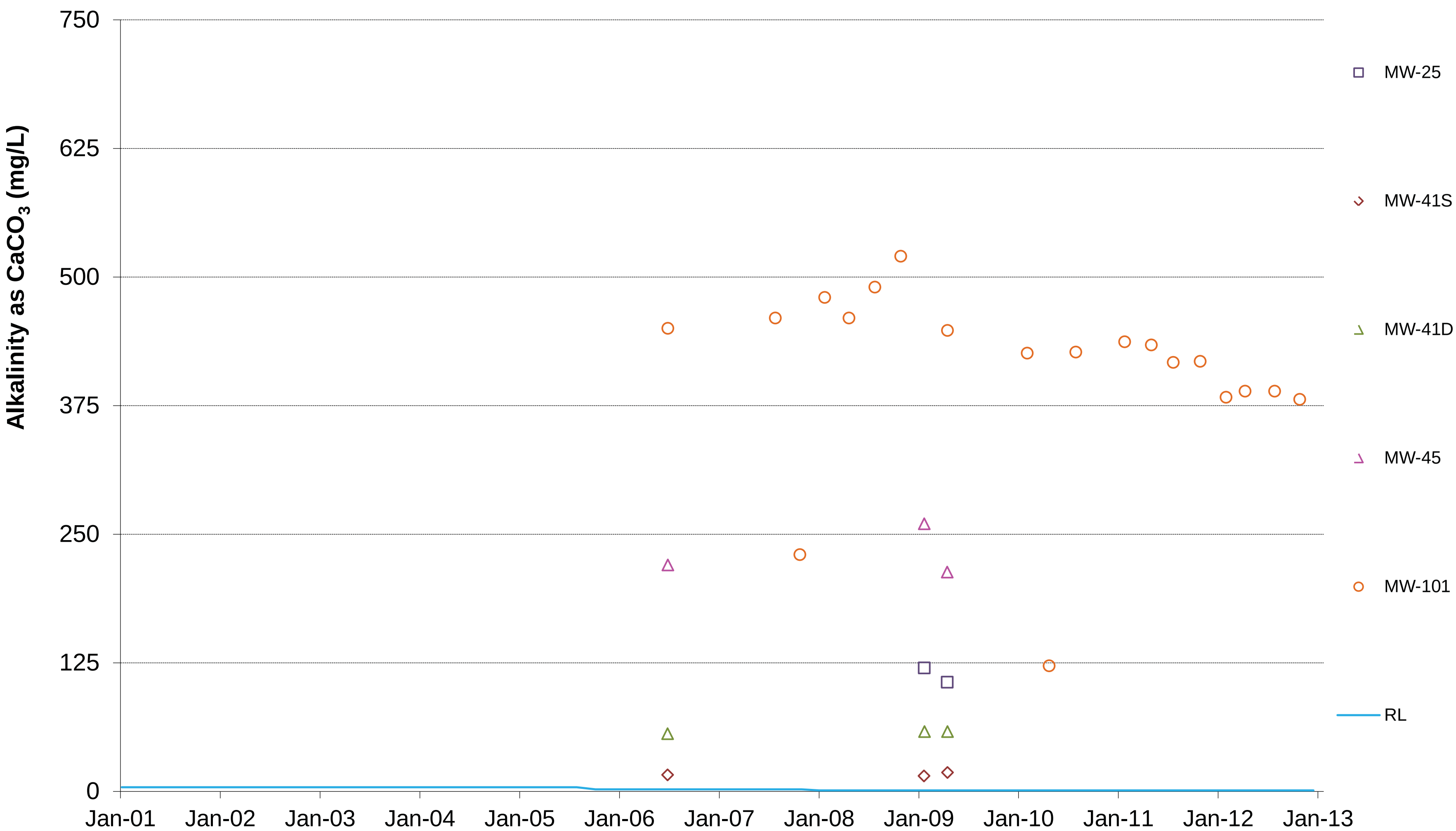

Field pH (Standard Units)
9
8
7
6
5
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
South Solid Waste Area Wells
MW-25
MW-41S
MW-41D
MW-45
MW-101



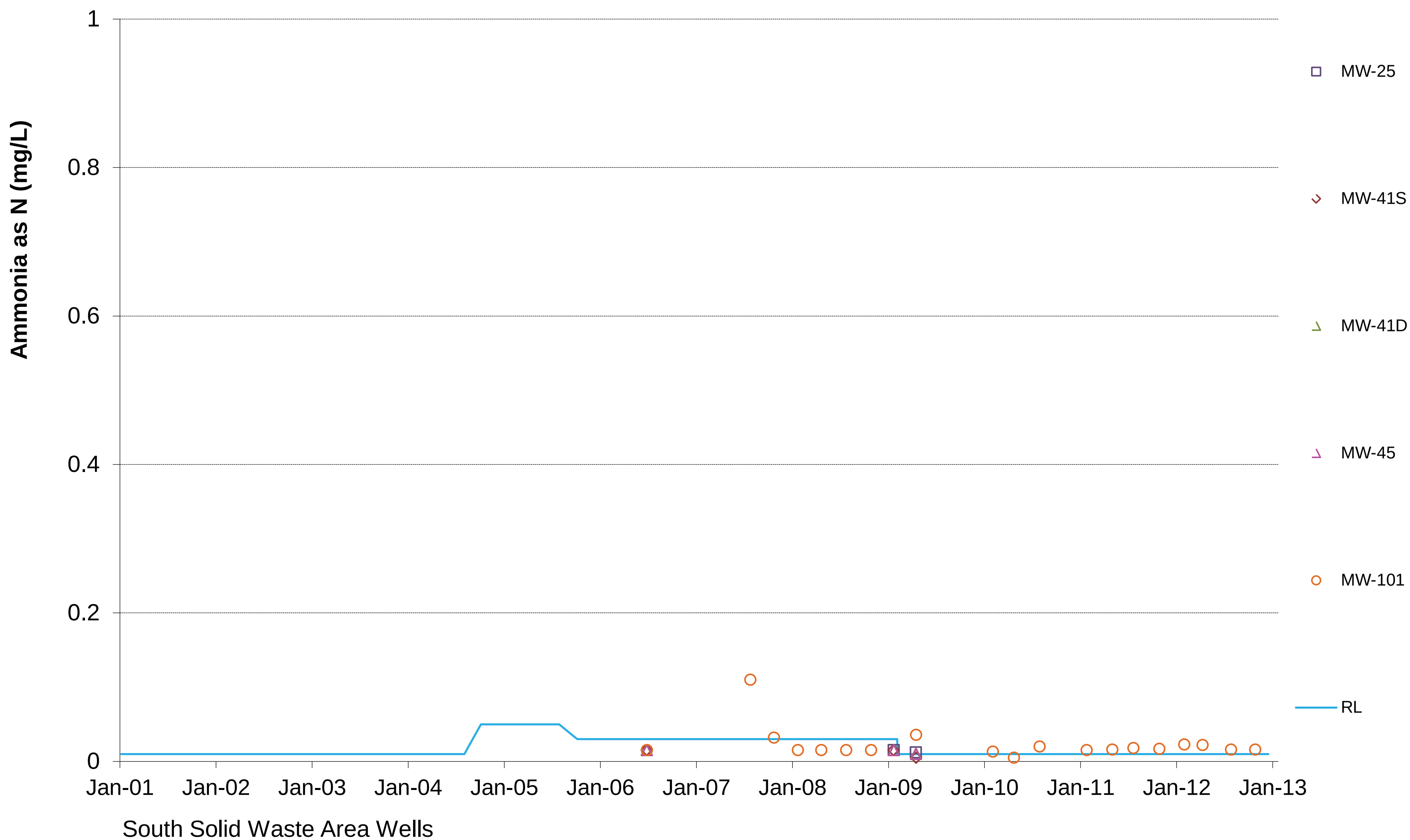
Conductance (uS/cm)
750
625
500
375
250
125
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
South Solid Waste Area Wells
MW-25
MW-41S
MW-41D
MW-45
MW-101

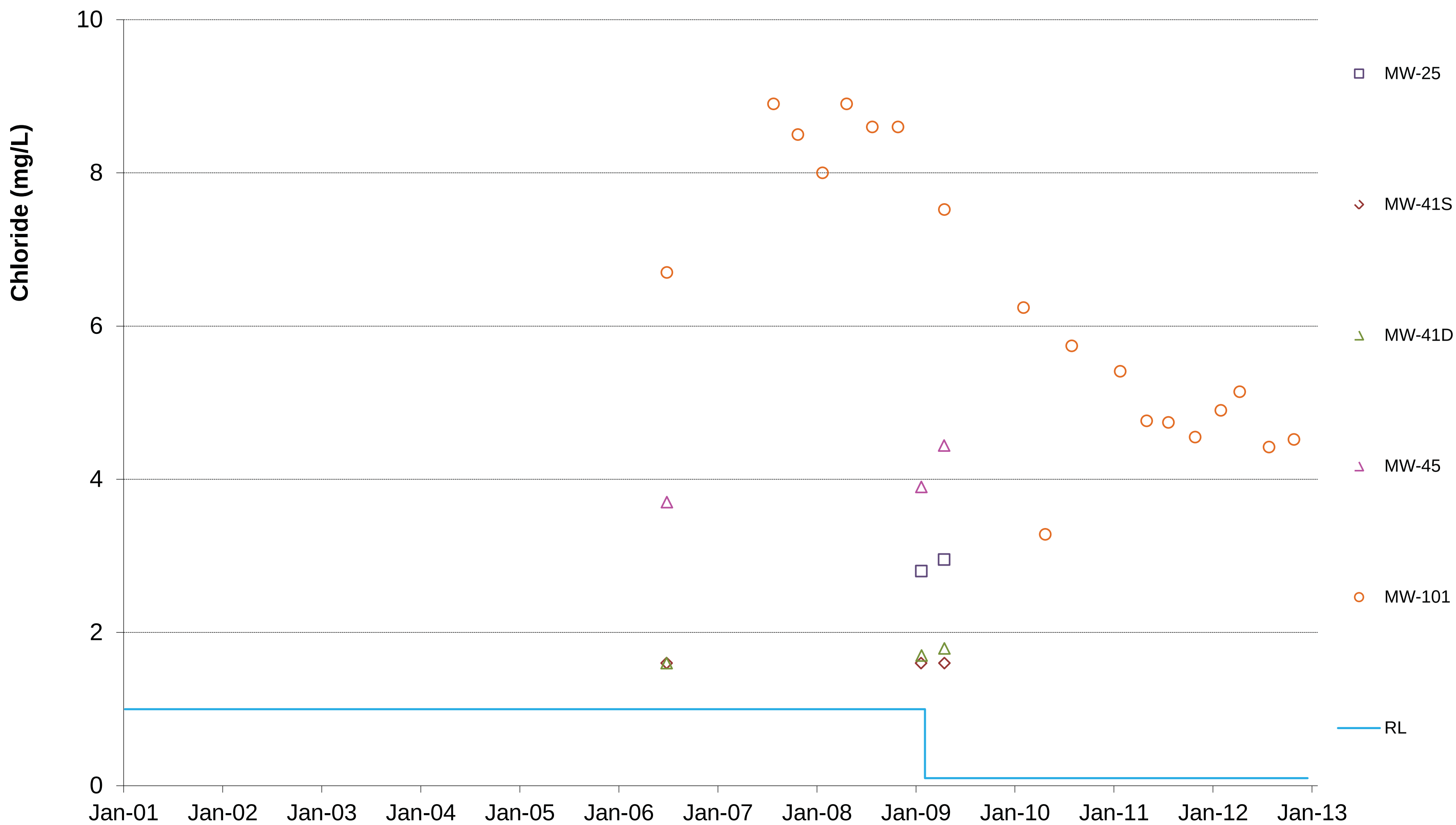


South Solid Waste Area Wells

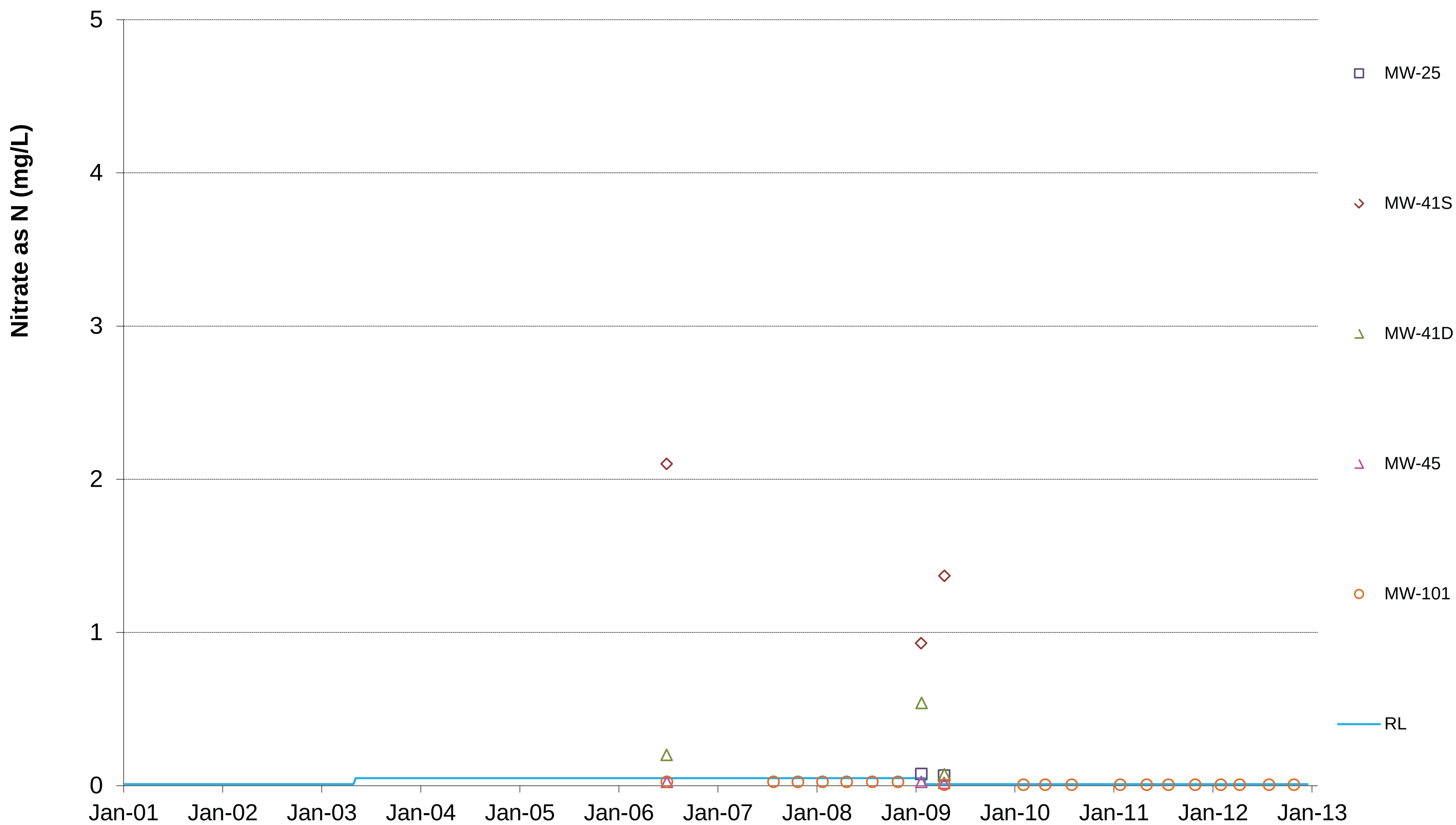


South Solid Waste Area Wells

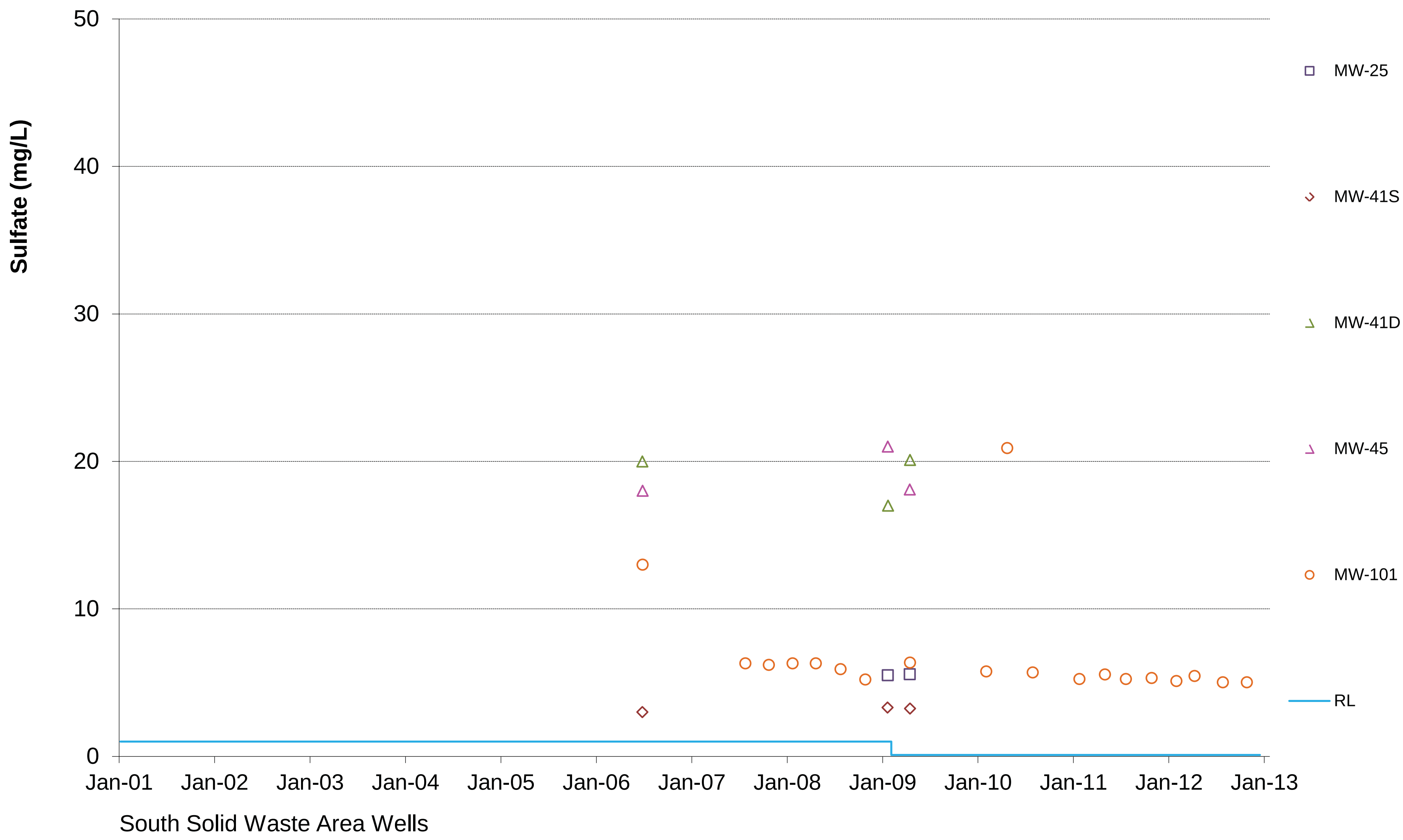

Ammonia as N (mg/L)
1
0.8
0.6
0.4
0.2
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
South Solid Waste Area Wells
MW-25
MW-41S
MW-41D
MW-45
MW-101
RL



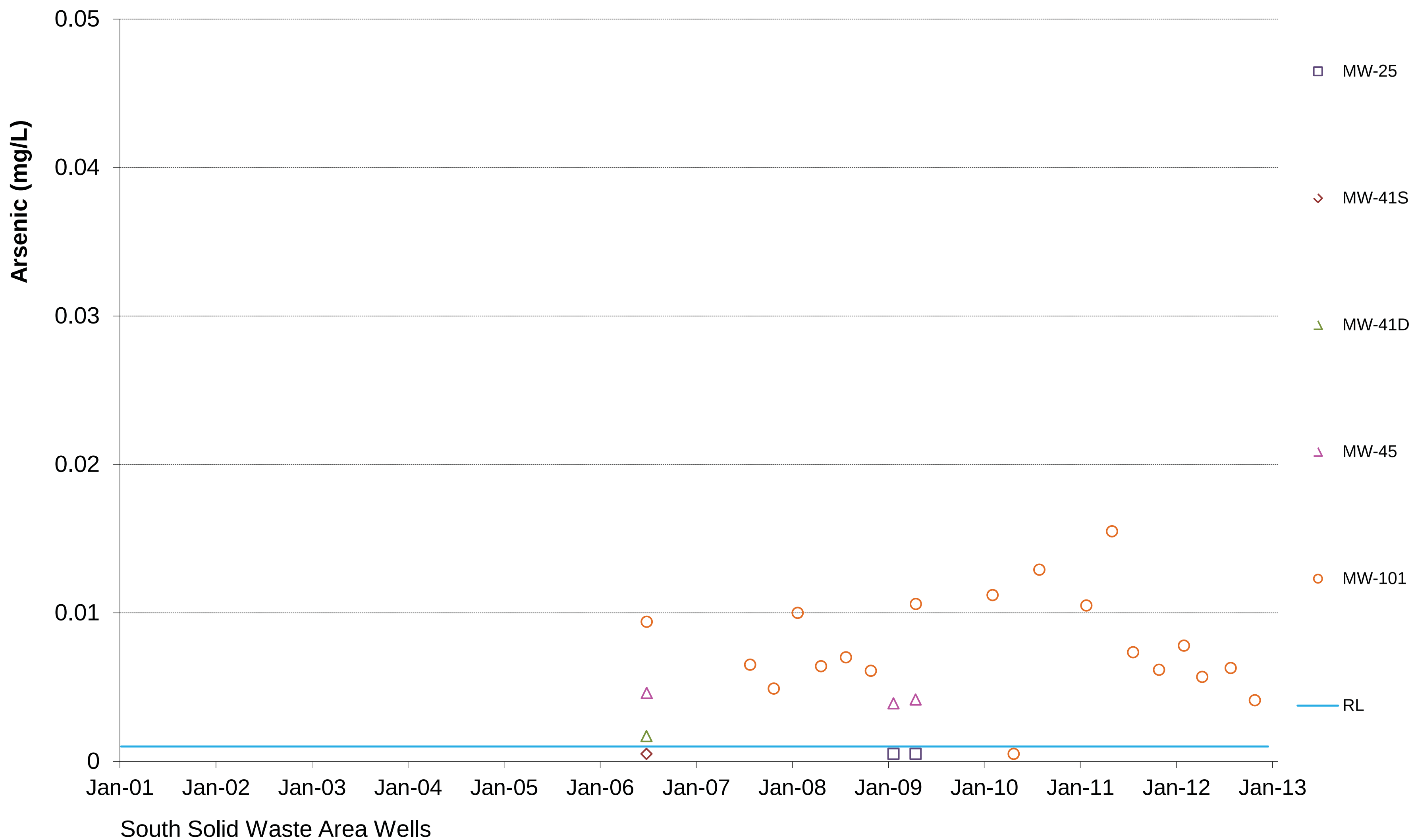
South Solid Waste Area Wells



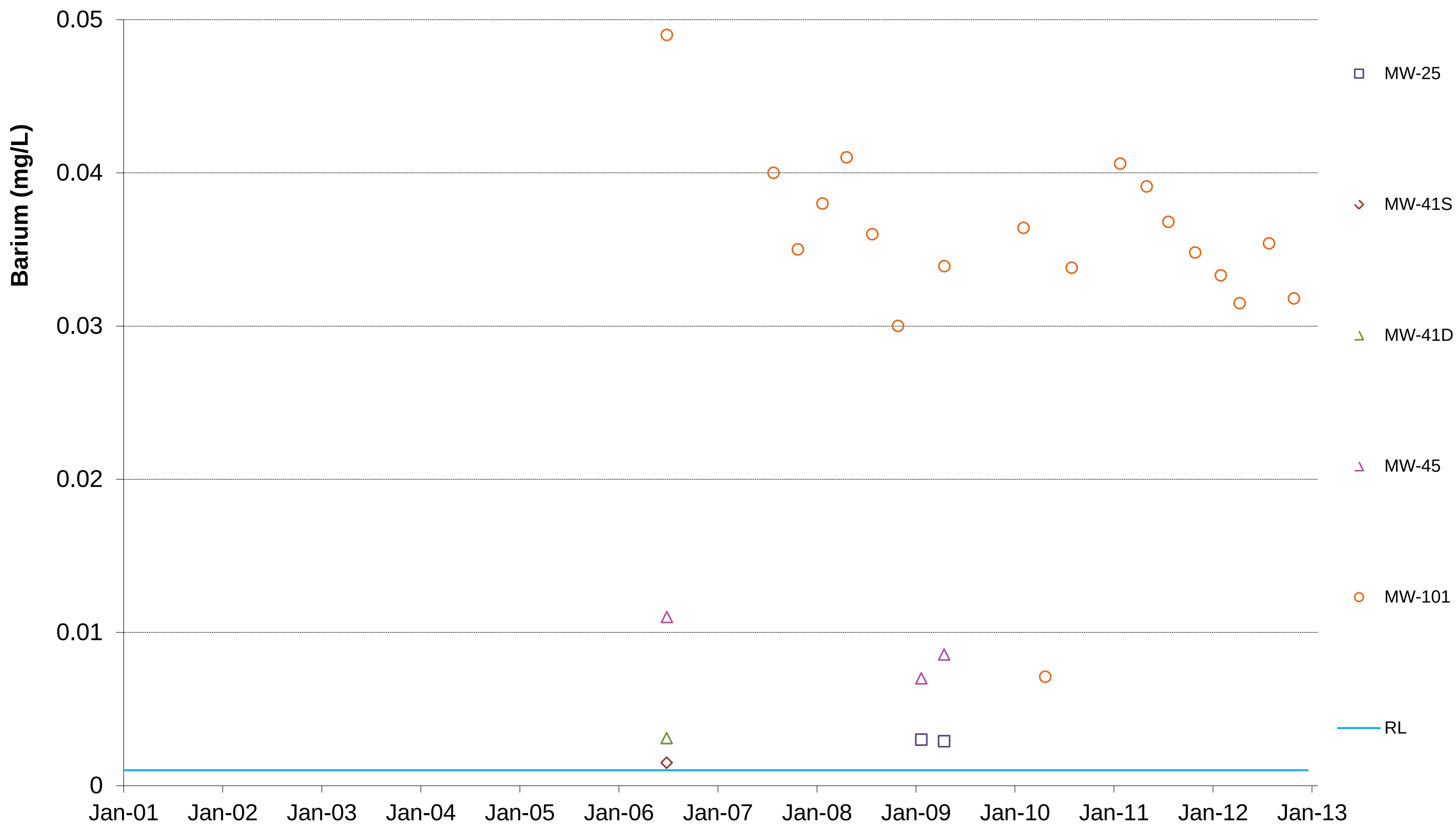
South Solid Waste Area Wells



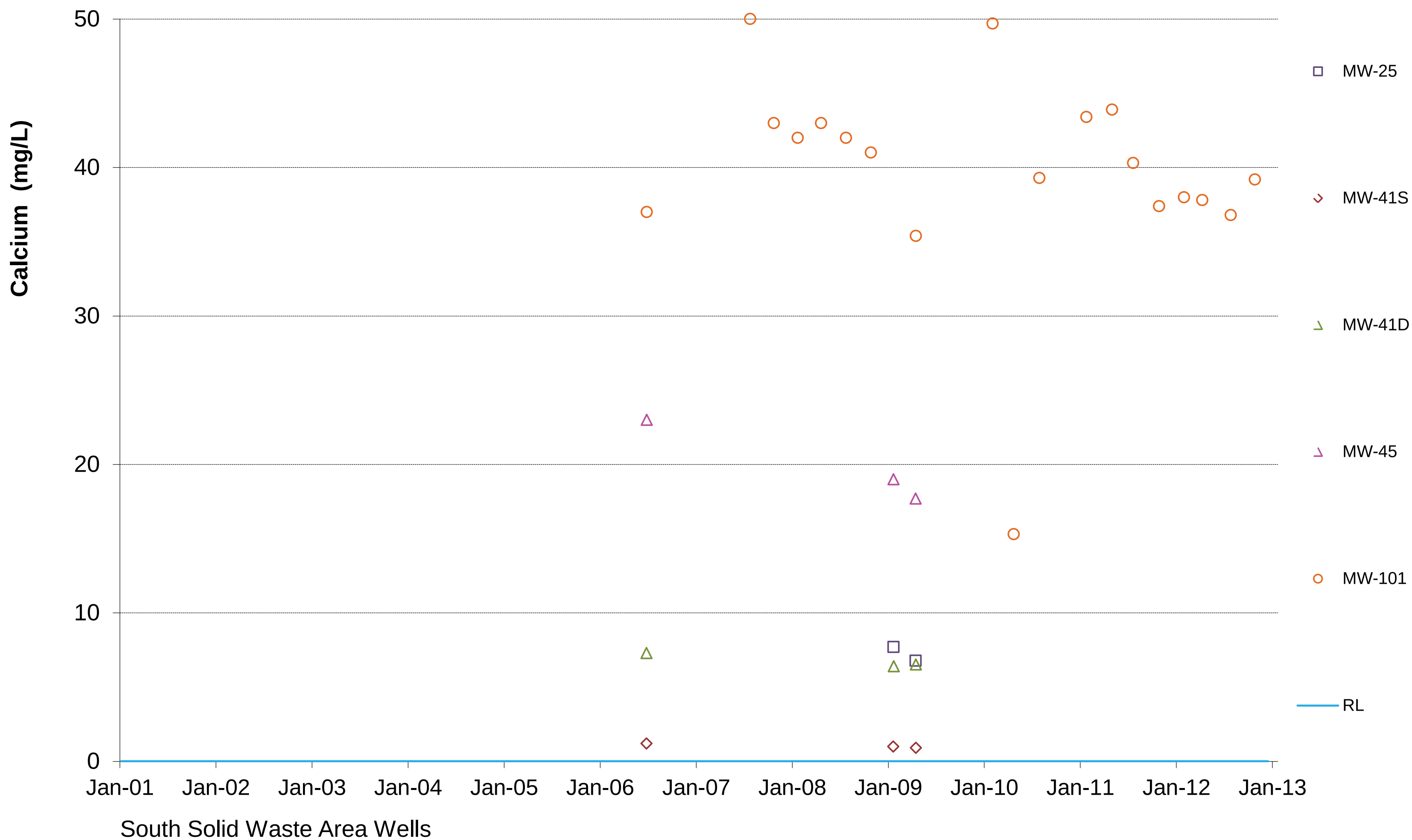
Sulfate (mg/L)
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
South Solid Waste Area Wells
MW-25
MW-41S
MW-41D
MW-45
MW-101
RL



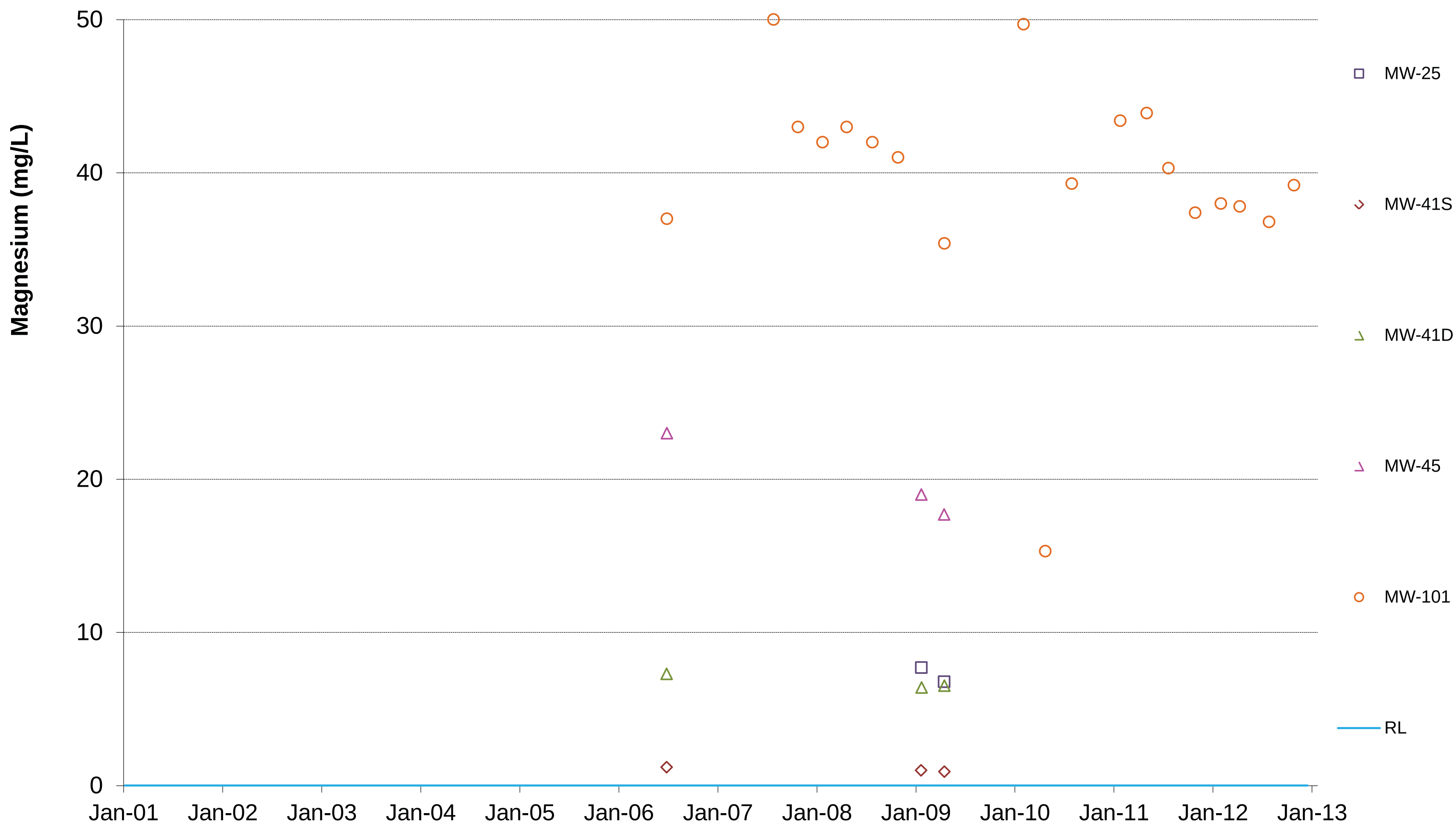
Arsenic (mg/L)
0.05
0.04
0.03
0.02
0.01
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
South Solid Waste Area Wells
MW-25
MW-41S
MW-41D
MW-45
MW-101
RL



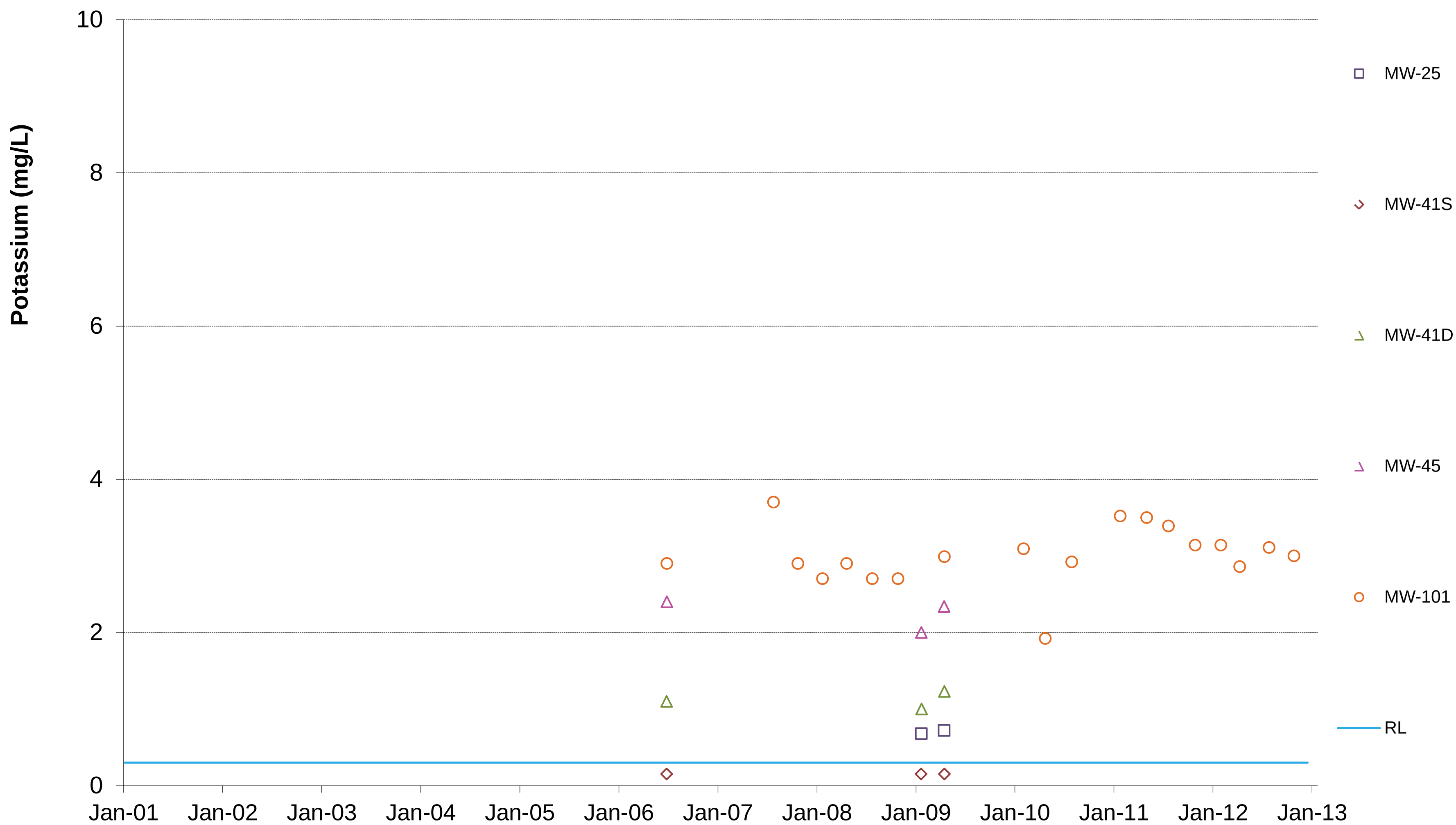
South Solid Waste Area Wells



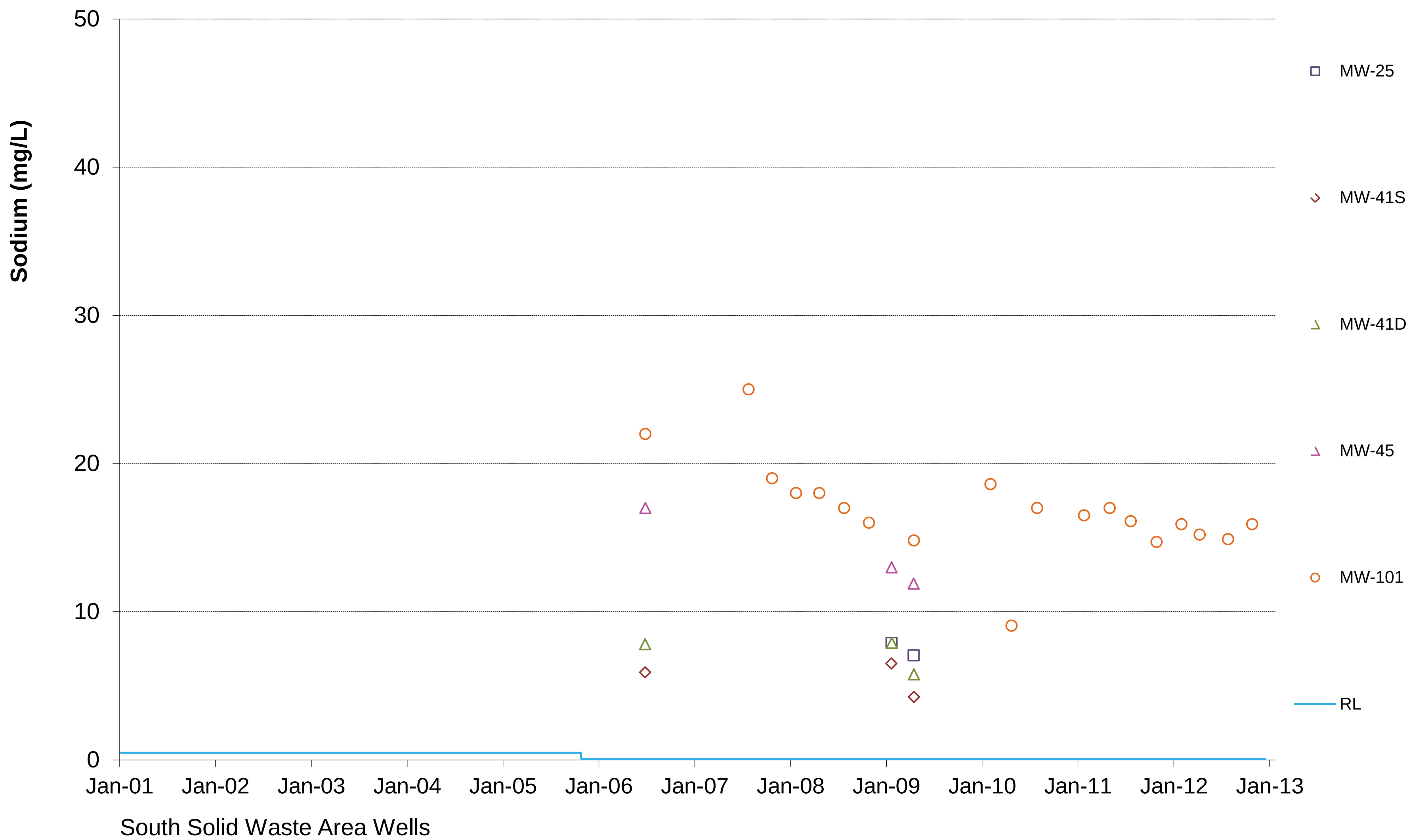
Calcium (mg/L)
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
South Solid Waste Area Wells
MW-25
MW-41S
MW-41D
MW-45
MW-101
RL



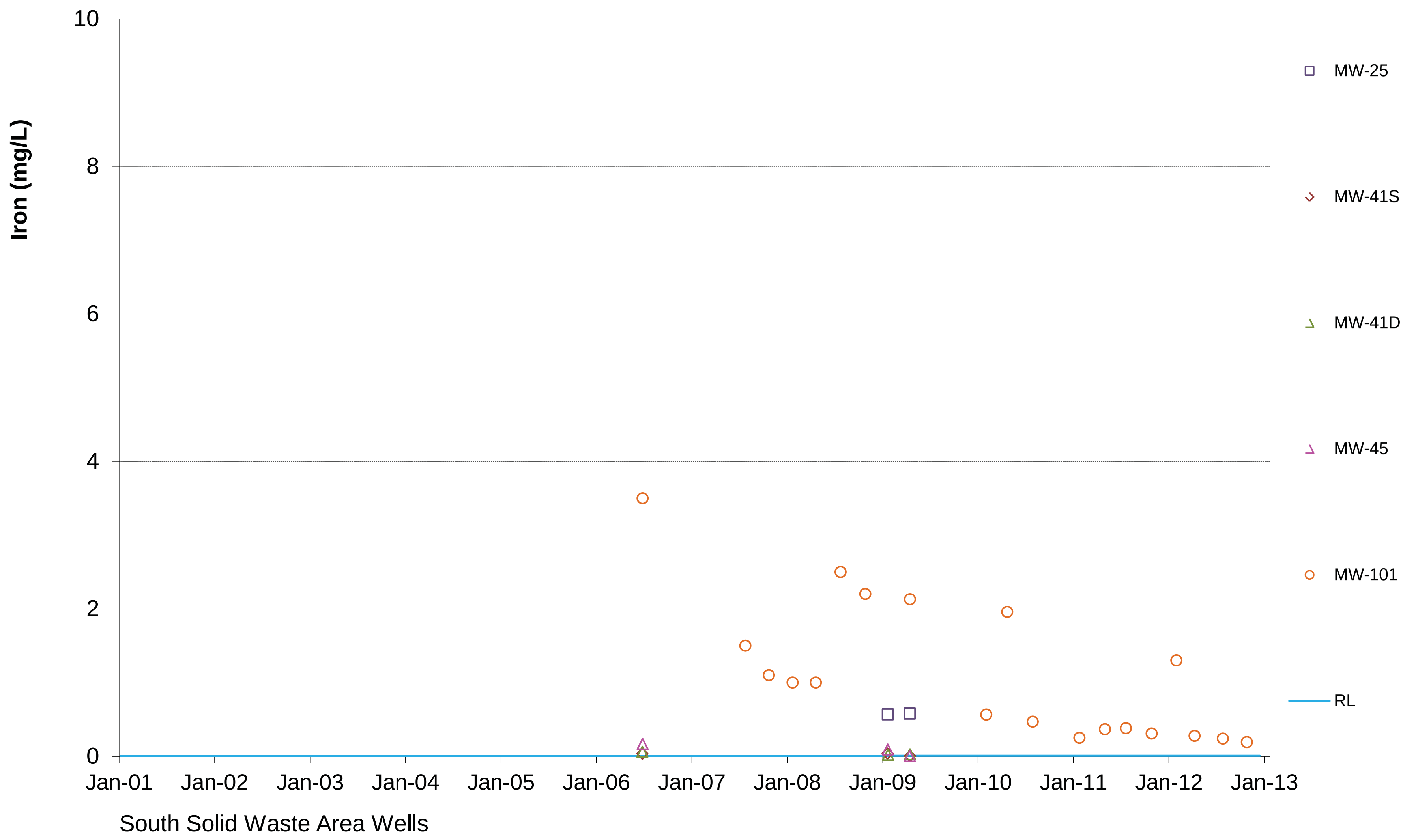
South Solid Waste Area Wells

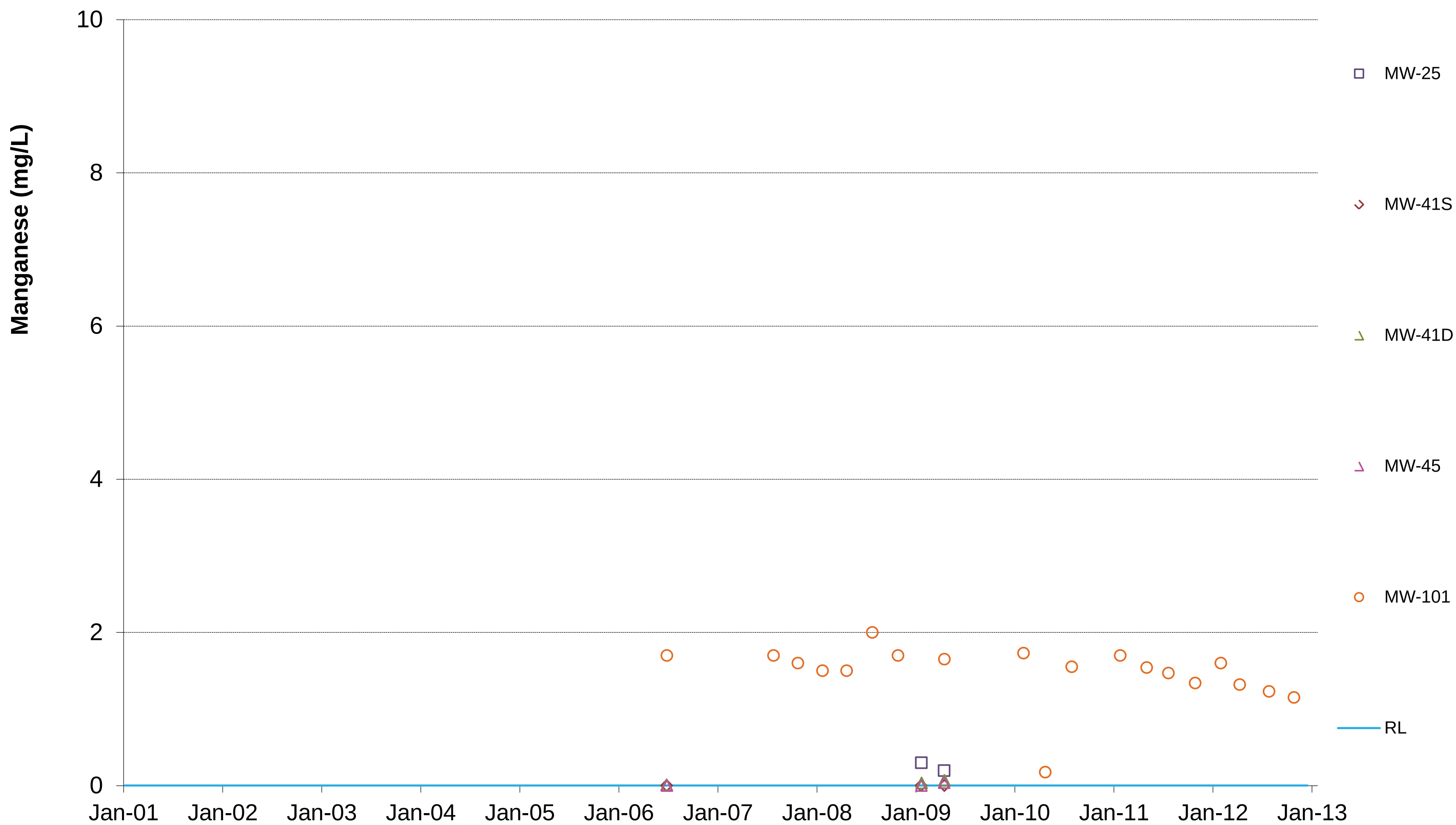


South Solid Waste Area Wells

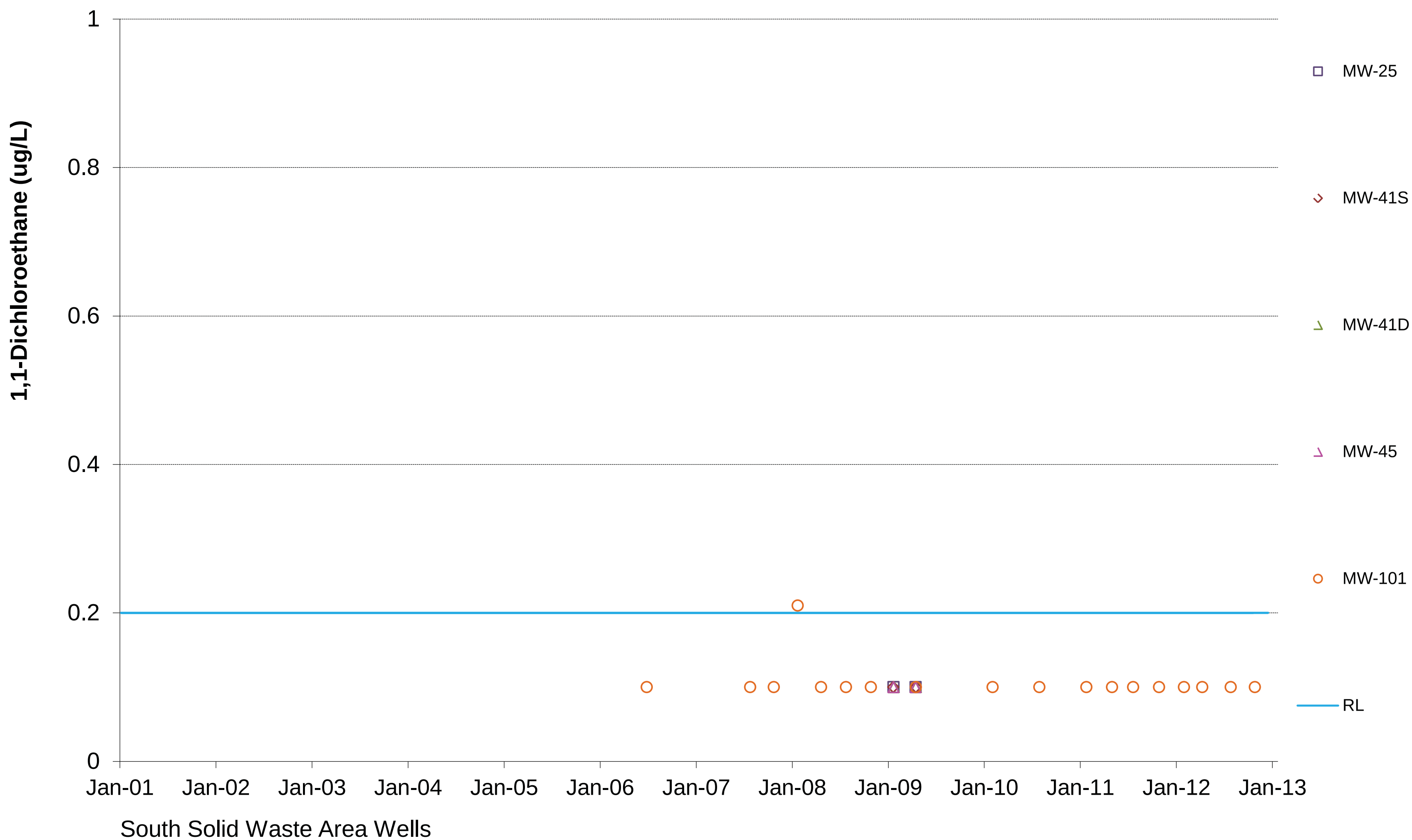


Sodium (mg/L)
50
40
30
20
10
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
South Solid Waste Area Wells
MW-25
MW-41S
MW-41D
MW-45
MW-101
RL

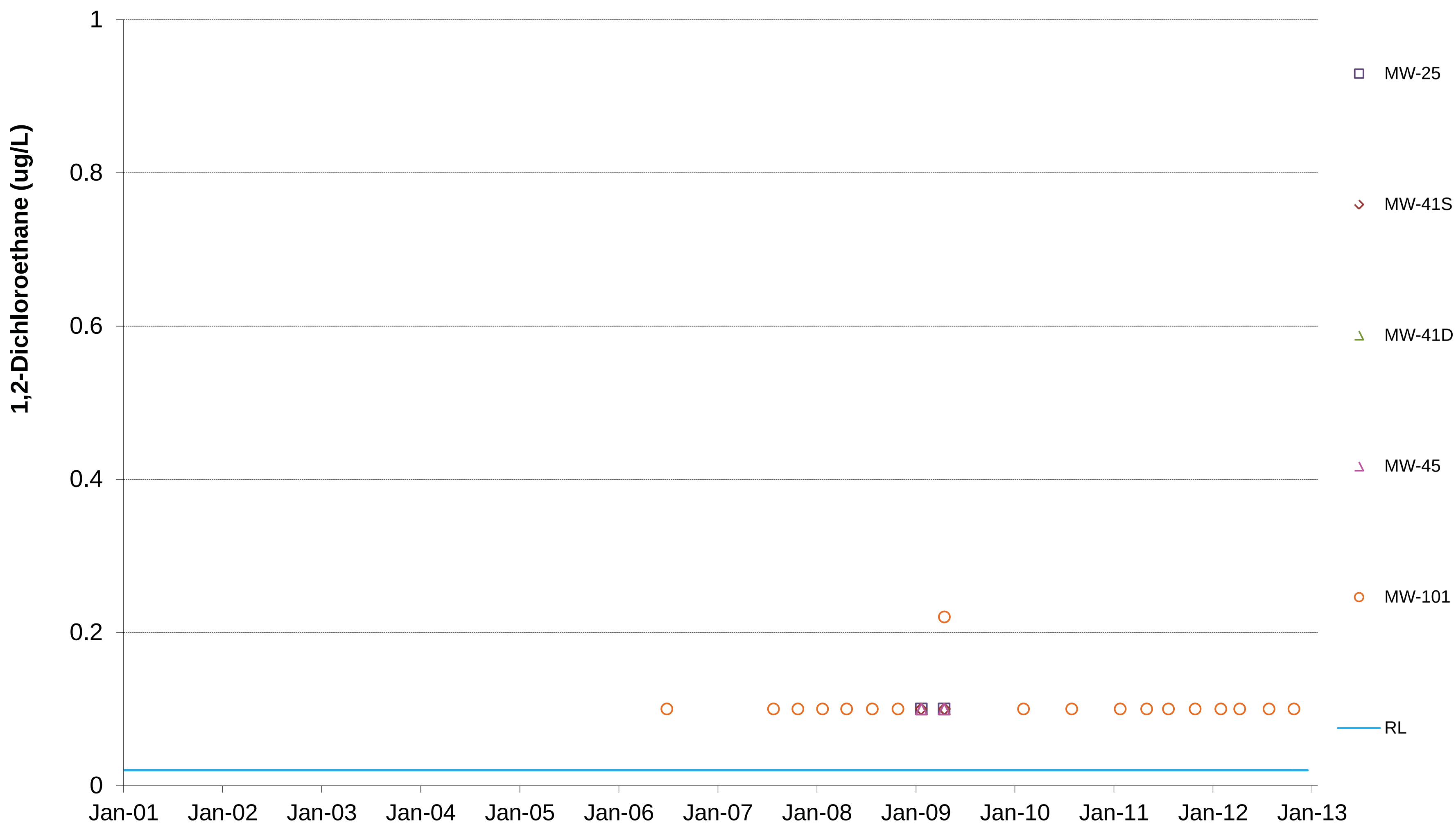

Iron (mg/L)
10
8
6
4
2
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
South Solid Waste Area Wells
MW-25
MW-41S
MW-41D
MW-45
MW-101
RL



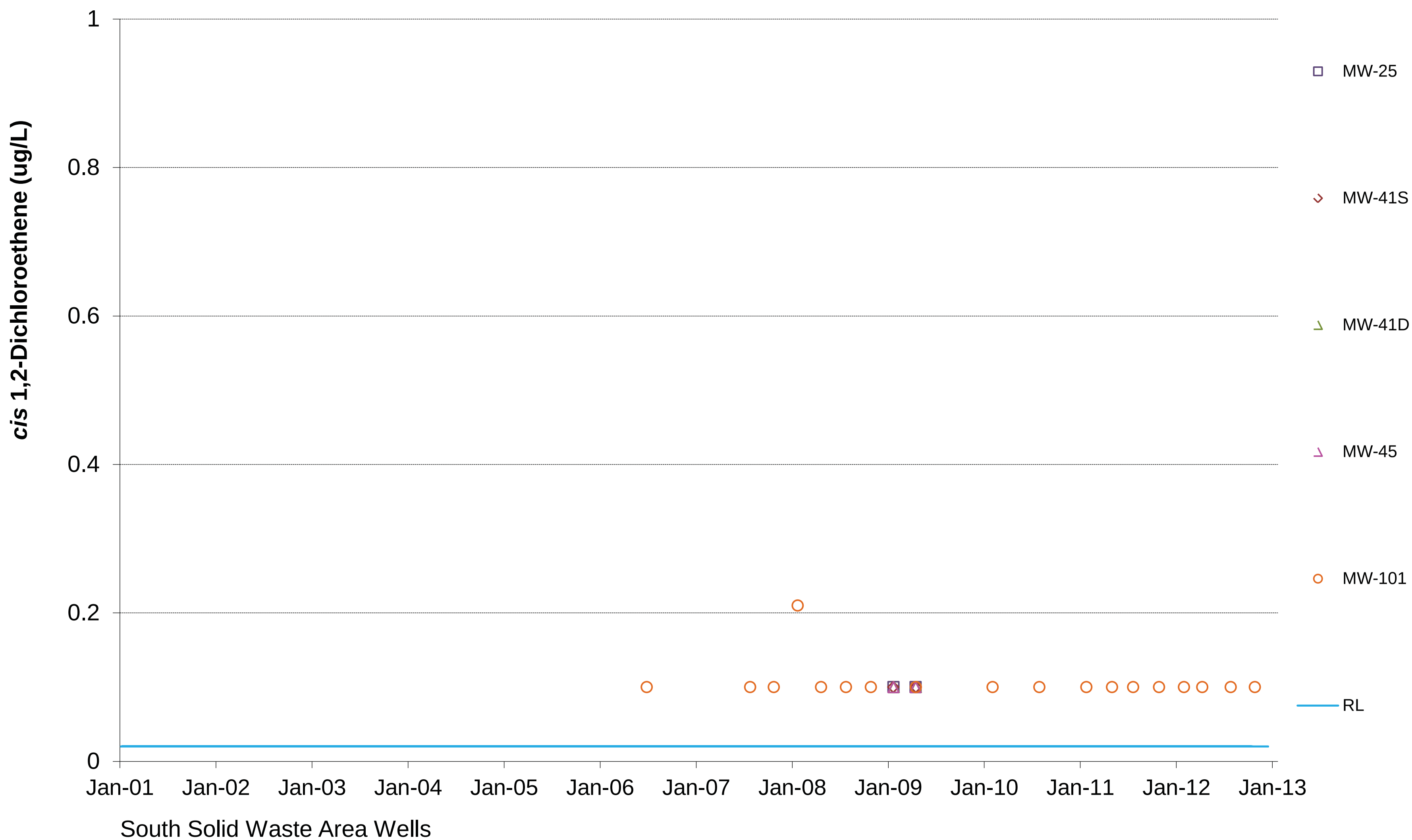
South Solid Waste Area Wells



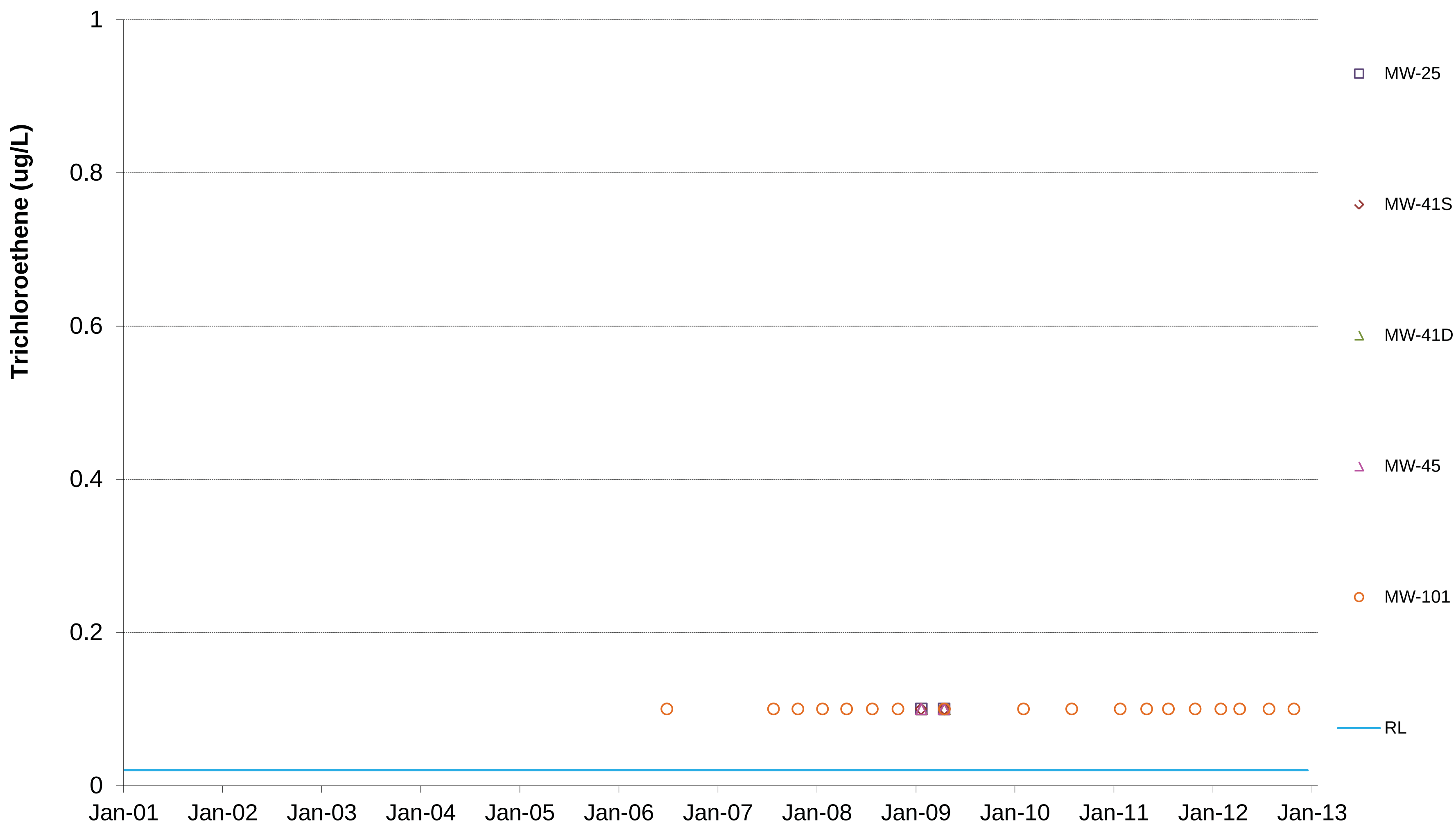
1,1-Dichloroethane (ug/L)
1
0.8
0.6
0.4
0.2
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
South Solid Waste Area Wells
MW-25
MW-41S
MW-41D
MW-45
MW-101
RL



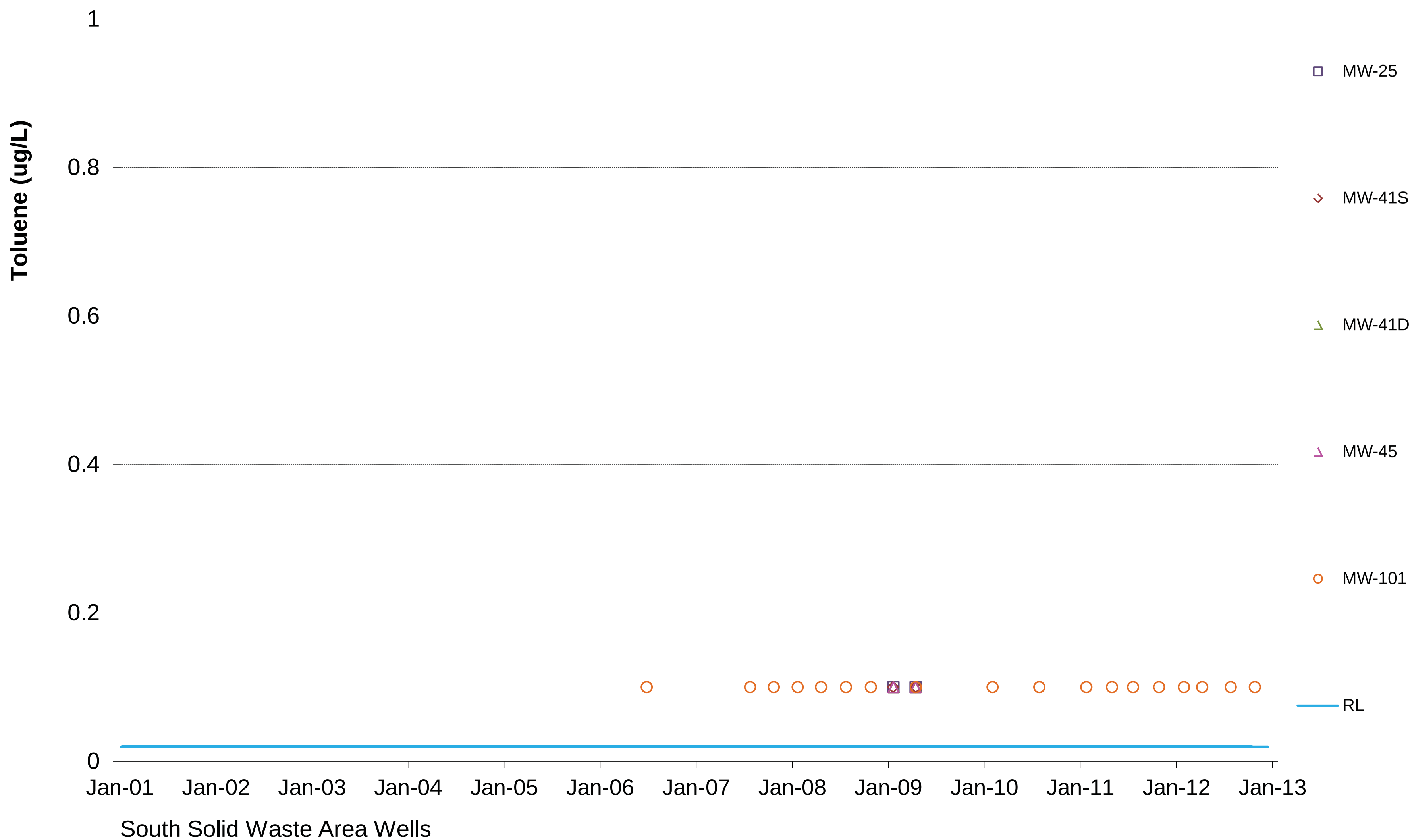
South Solid Waste Area Wells

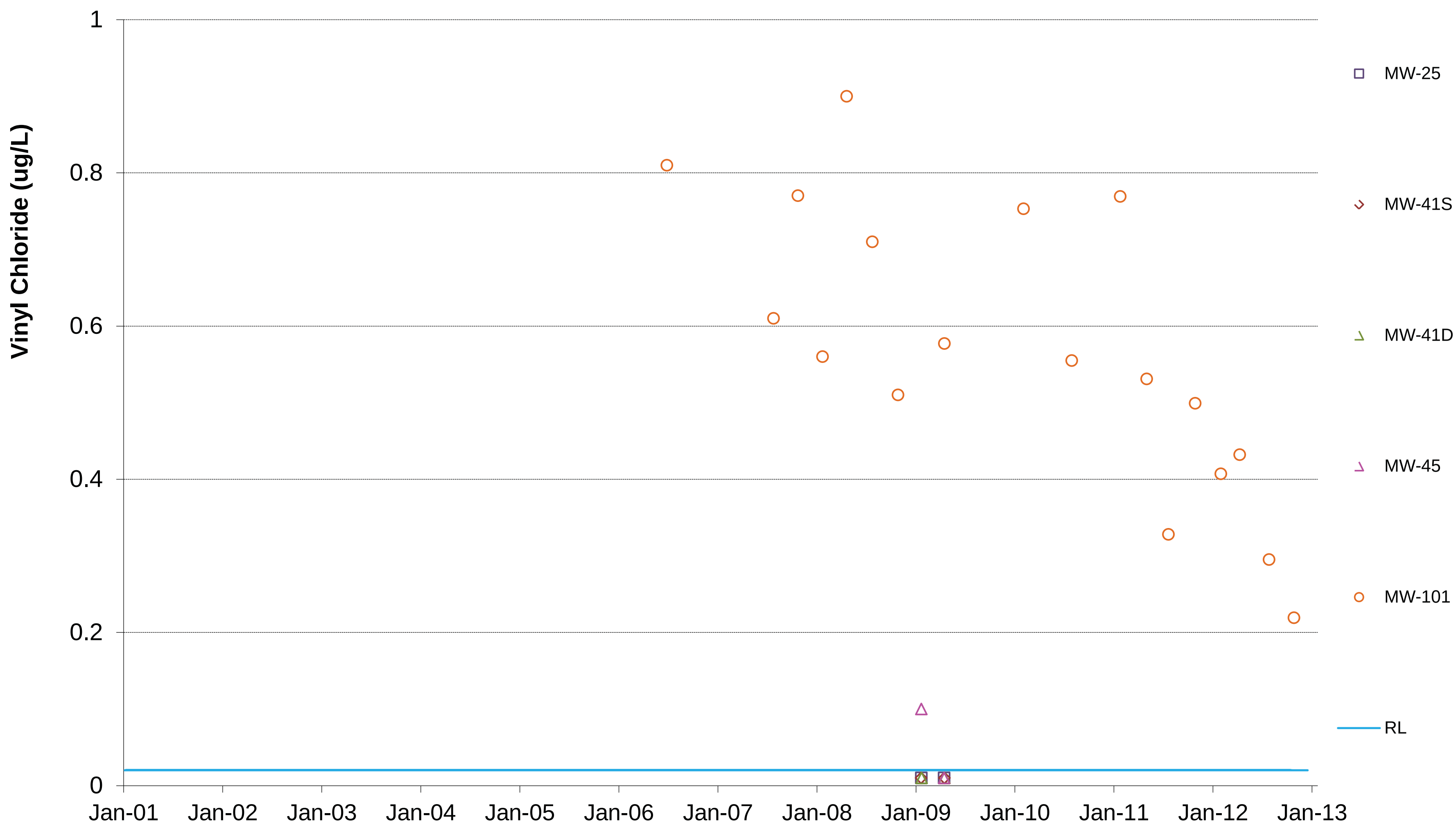


cis 1,2-Dichloroethene (ug/L)
1
0.8
0.6
0.4
0.2
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
South Solid Waste Area Wells
MW-25
MW-41S
MW-41D
MW-45
MW-101
RL



South Solid Waste Area Wells


Toluene (ug/L)
1
0.8
0.6
0.4
0.2
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
South Solid Waste Area Wells
MW-25
MW-41S
MW-41D
MW-45
MW-101
RL



South Solid Waste Area Wells

APPENDIX III

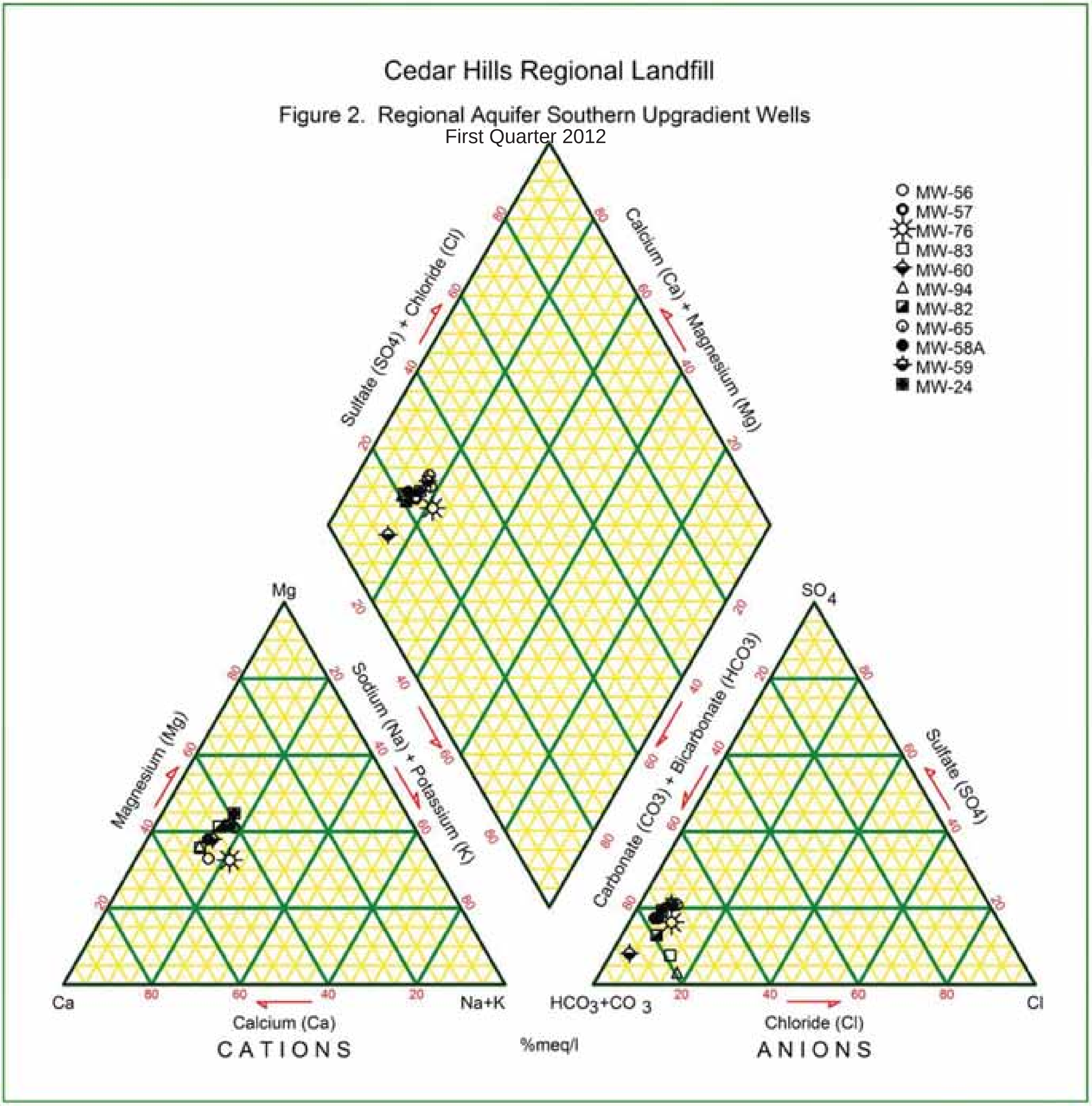
Trilinear Diagrams and Ion Balance Calculations

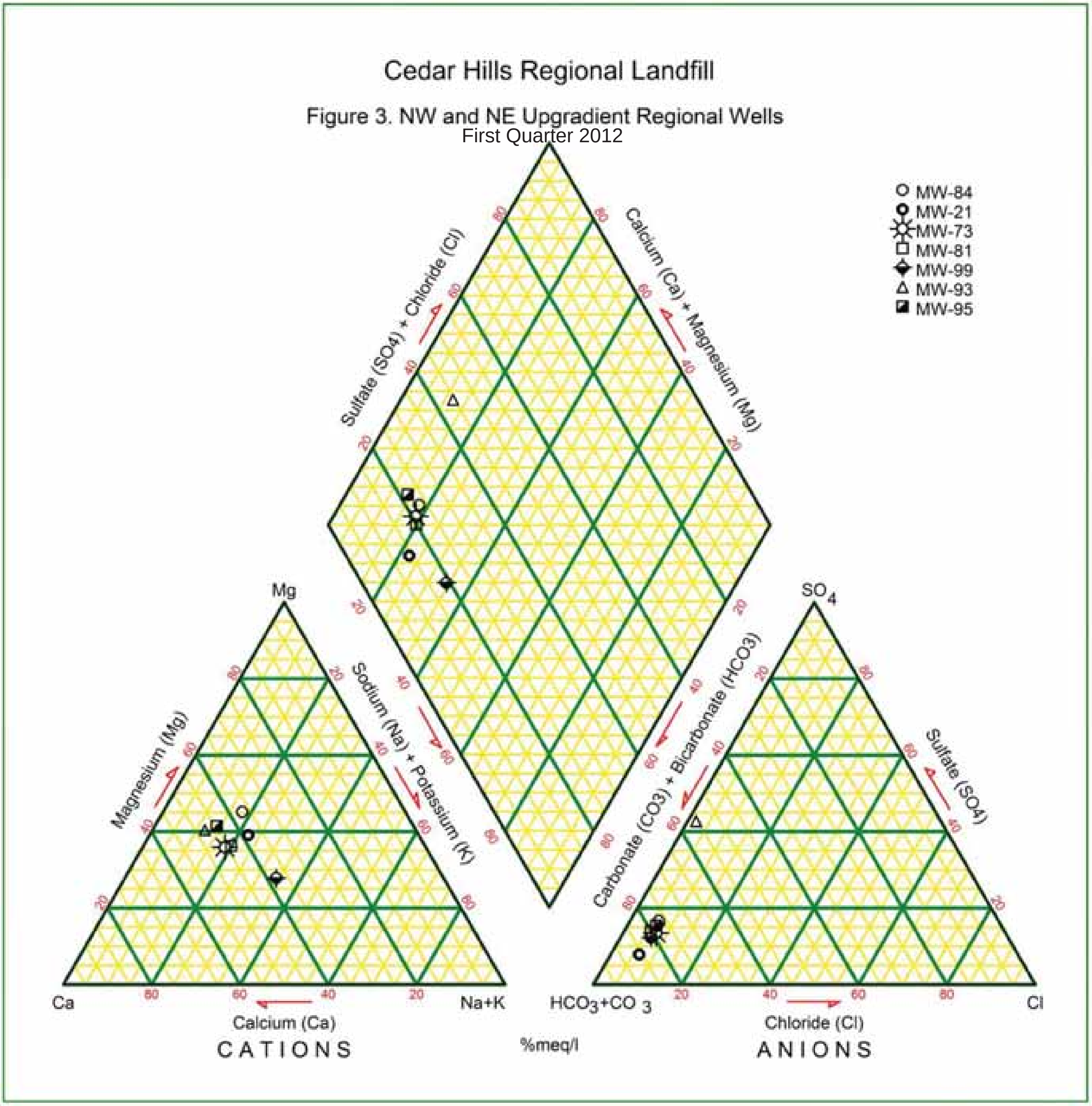
Regional Aquifer

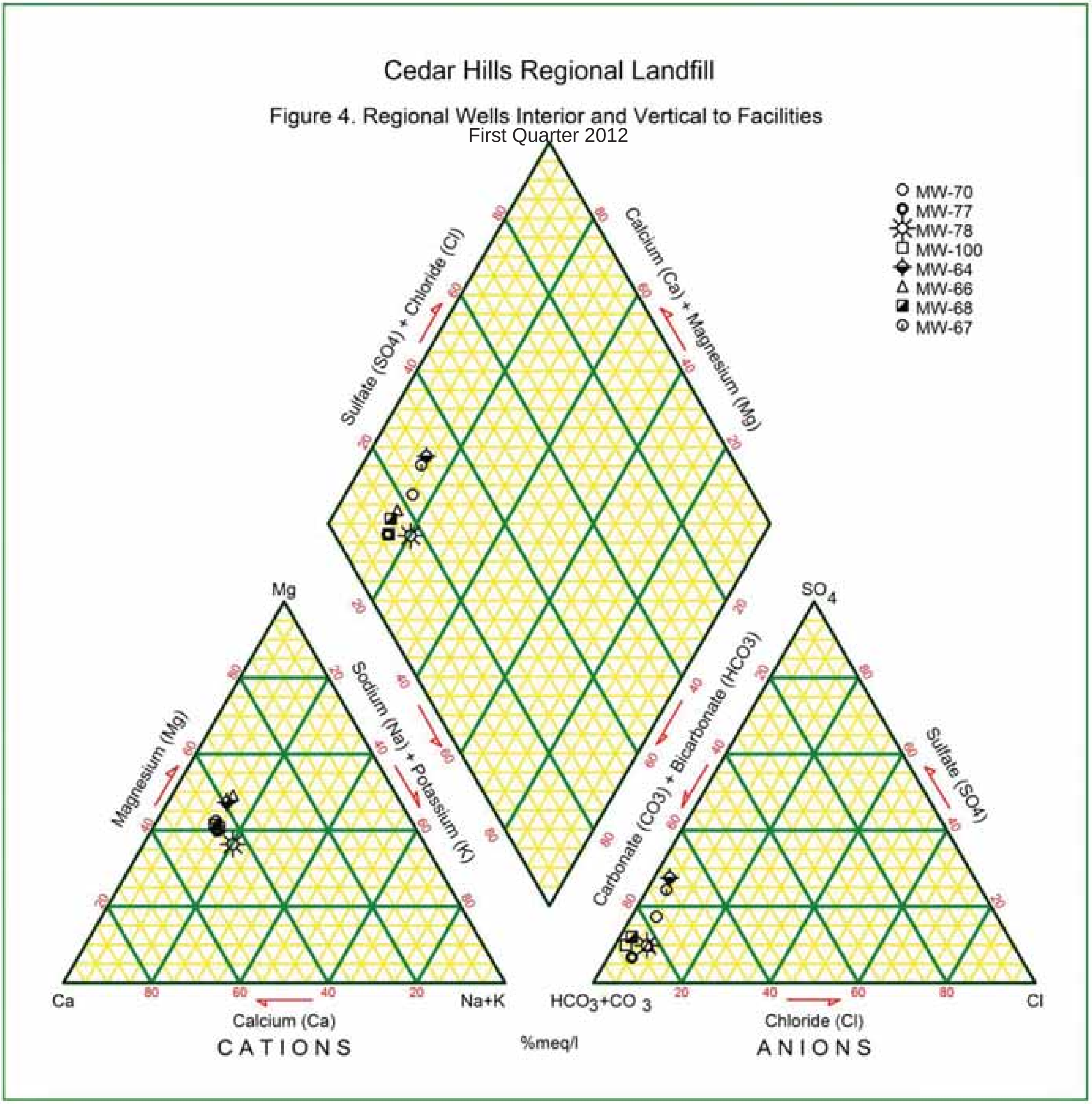
North and West Perched Wells

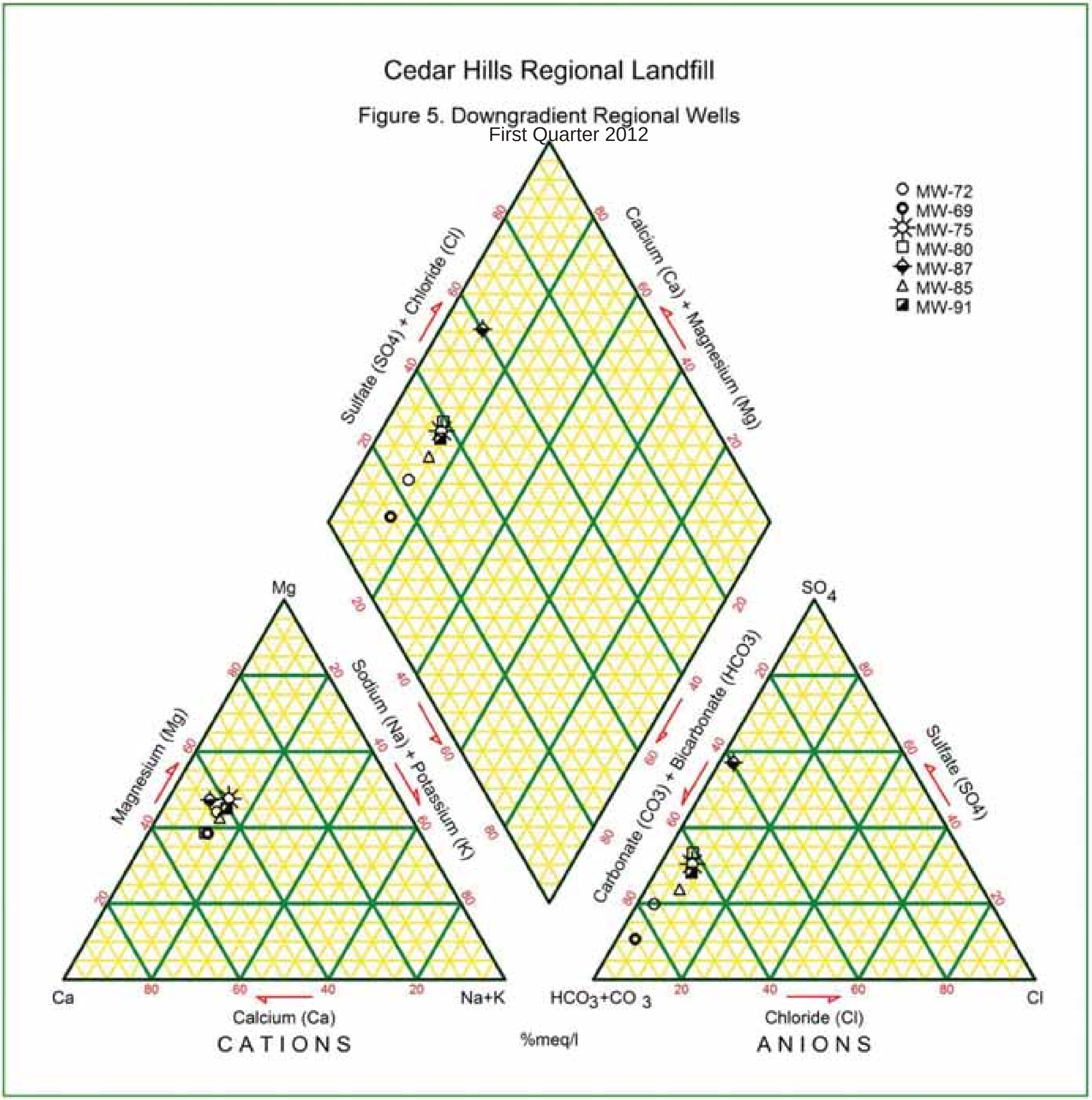
East Main Hill Perched Zone

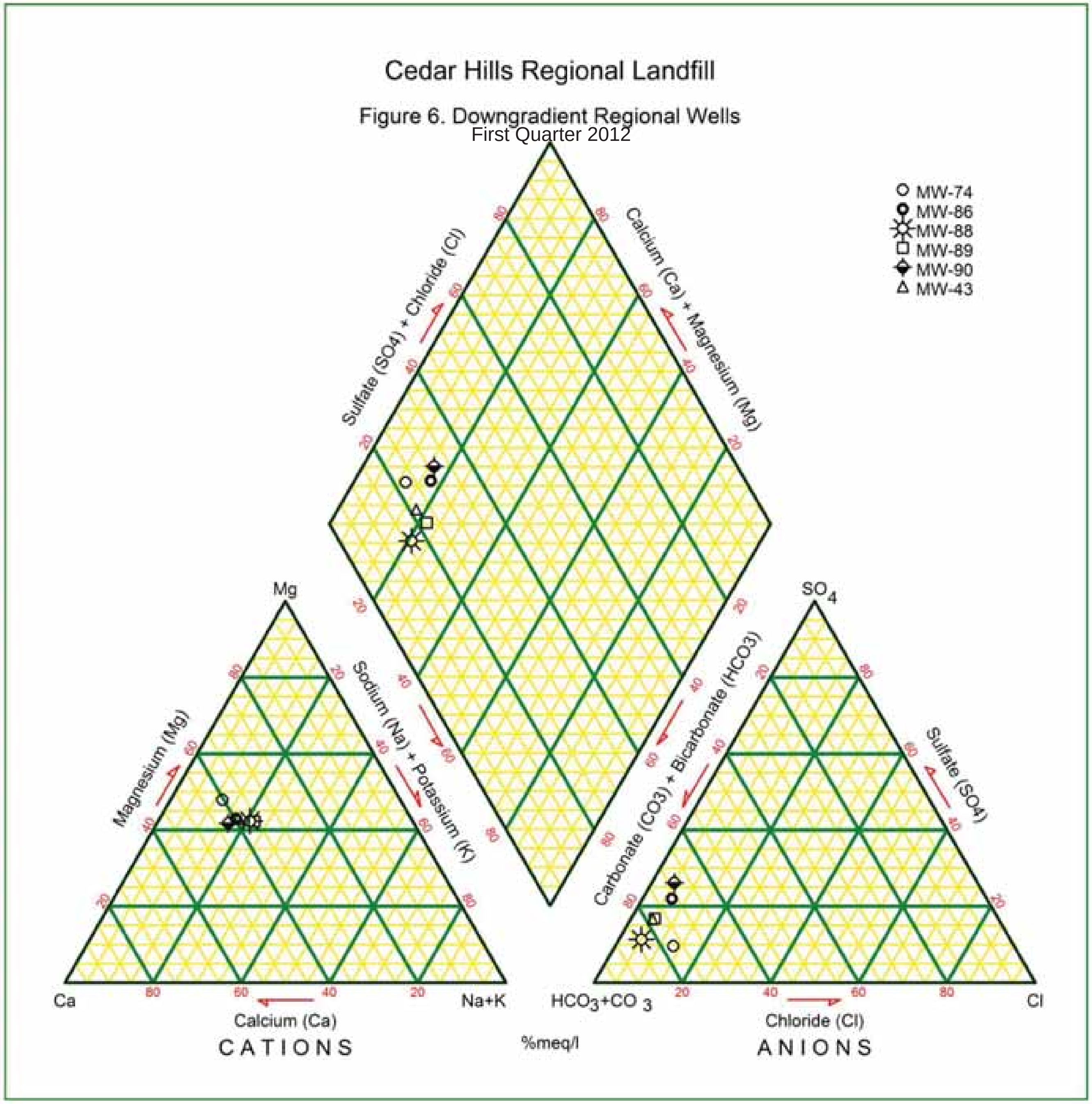
South Solid Waste Area Perched Wells

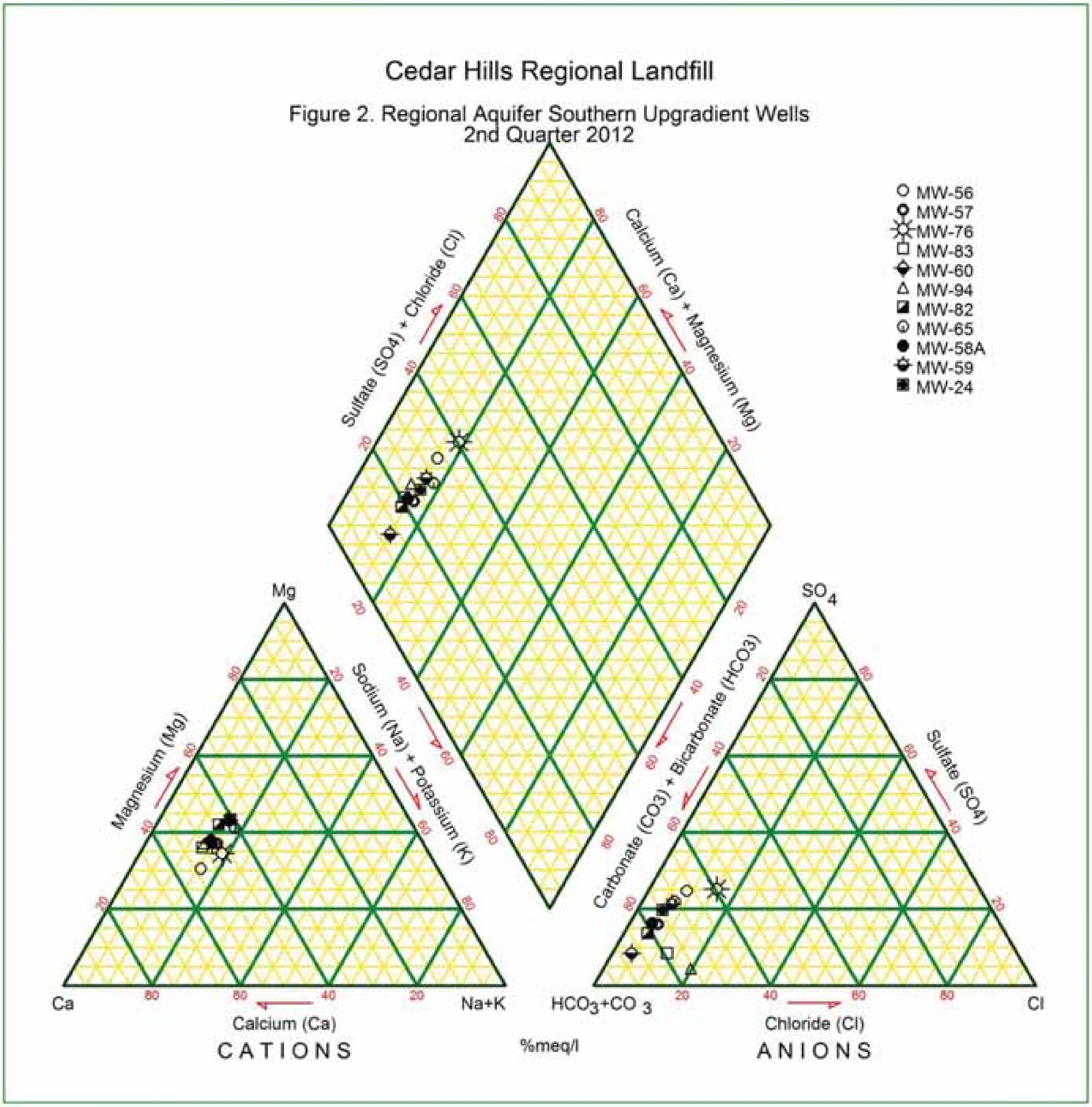

Cedar Hills Regional Landfill
Figure 2. Regional Aquifer Southern Upgradient Wells
First Quarter 2012
MW-56
MW-57
MW-76
MW-83
MW-60
MW-94
MW-82
MW-65
MW-58A
MW-59
MW-24
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

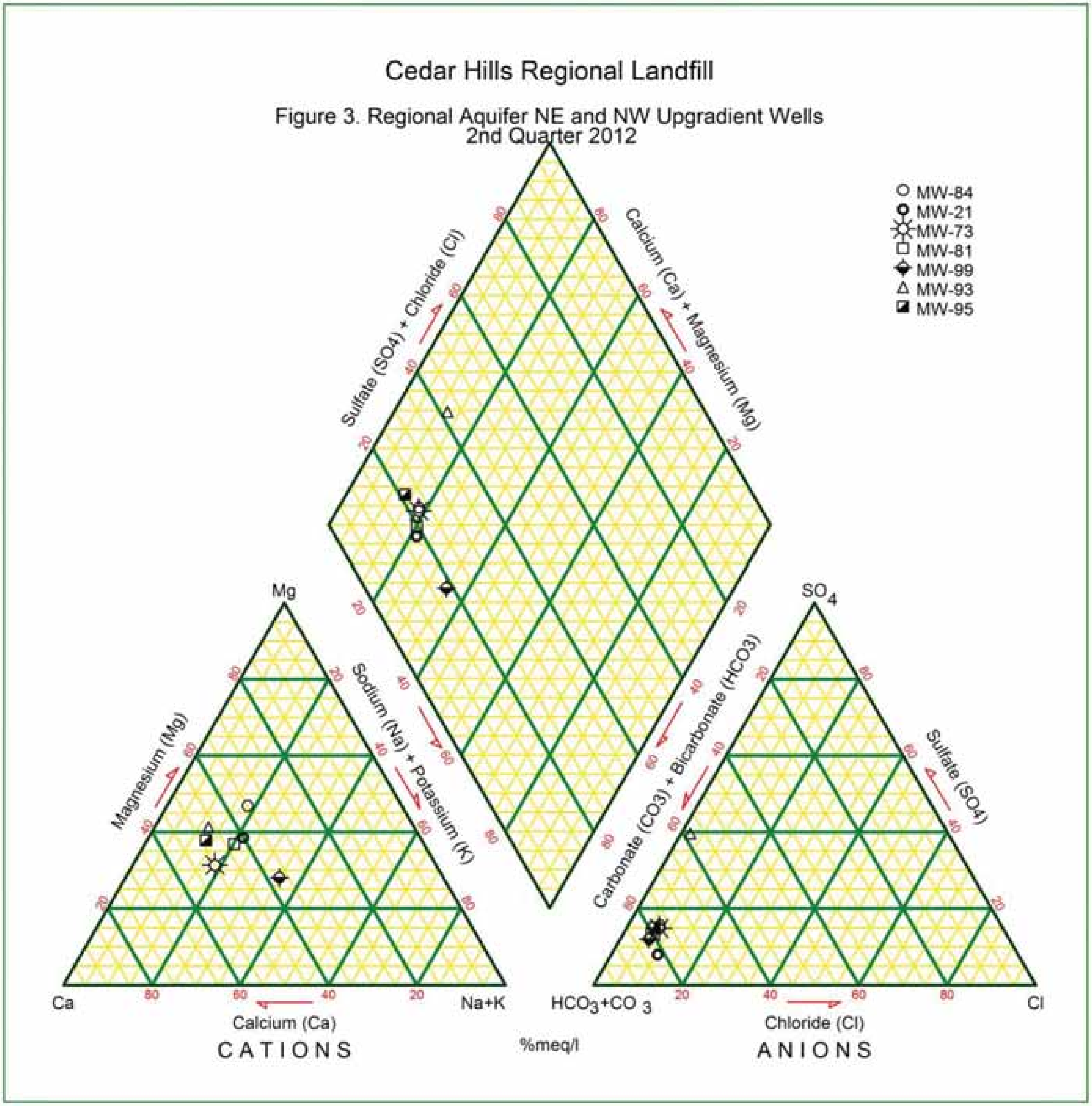

Cedar Hills Regional Landfill
Figure 3. NW and NE Upgradient Regional Wells
First Quarter 2012
MW-84
MW-21
MW-73
MW-81
MW-99
MW-93
MW-95
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Mg
Magnesium (Mg)
Sodium (Na) + Potassium (K)
Ca
Calcium (Ca)
Na+K
CATIONS
SO4
Carbonate (CO3) + Bicarbonate (HCO3)
Sulfate (SO4)
HCO3+CO 3
Chloride (Cl)
Cl
ANIONS
%meq/l


Cedar Hills Regional Landfill
Figure 4. Regional Wells Interior and Vertical to Facilities
First Quarter 2012
MW-70
MW-77
MW-78
MW-100
MW-64
MW-66
MW-68
MW-67
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO_4
Ca
Na+K
HCO_3+CO_3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

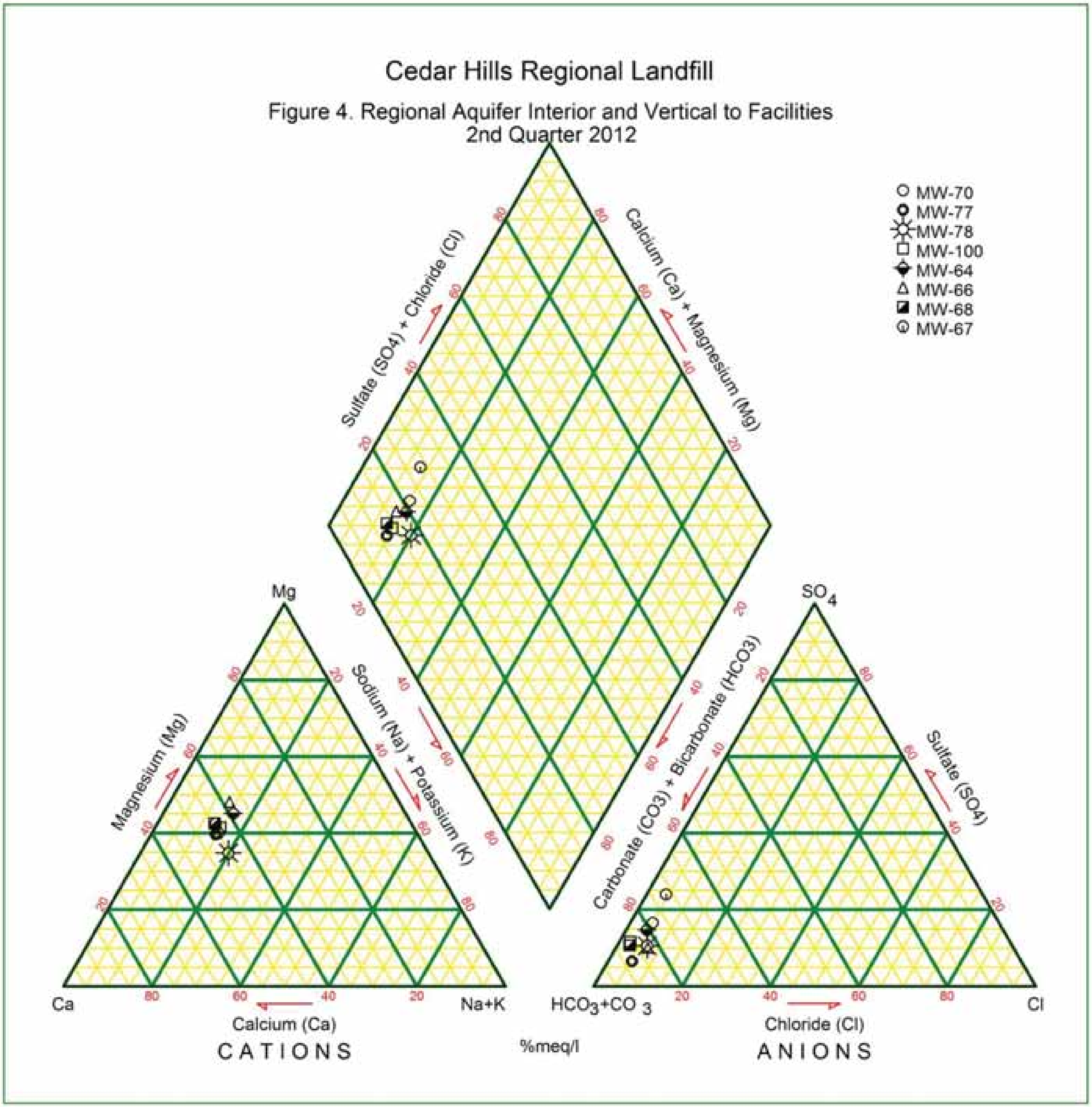

Cedar Hills Regional Landfill
Figure 5. Downgradient Regional Wells
First Quarter 2012
MW-72
MW-69
MW-75
MW-80
MW-87
MW-85
MW-91
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO 3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

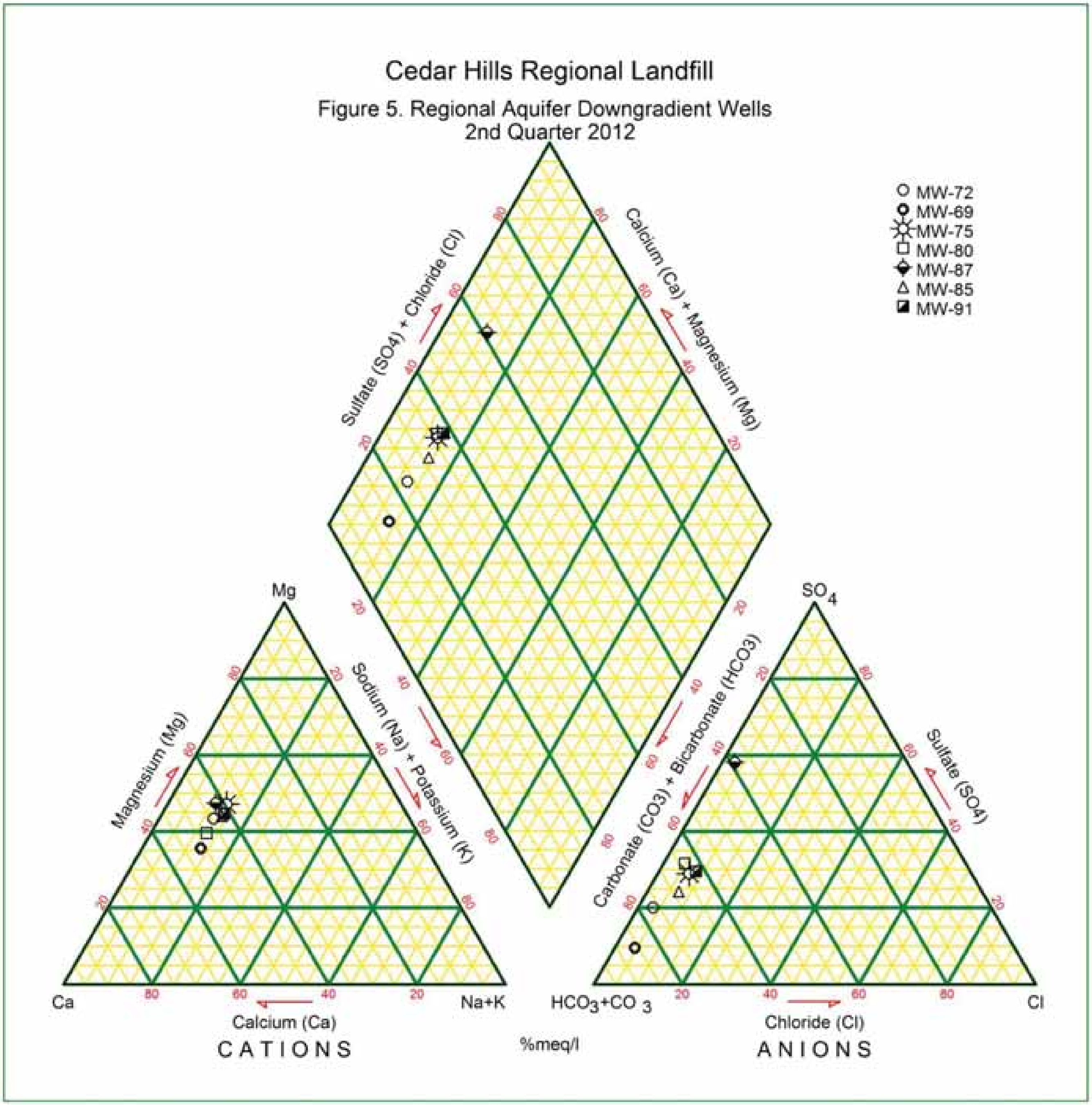

Cedar Hills Regional Landfill
Figure 6. Downgradient Regional Wells
First Quarter 2012
MW-74
MW-86
MW-88
MW-89
MW-90
MW-43
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Carbonate (CO3) + Bicarbonate (HCO3)
Sodium (Na) + Potassium (K)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

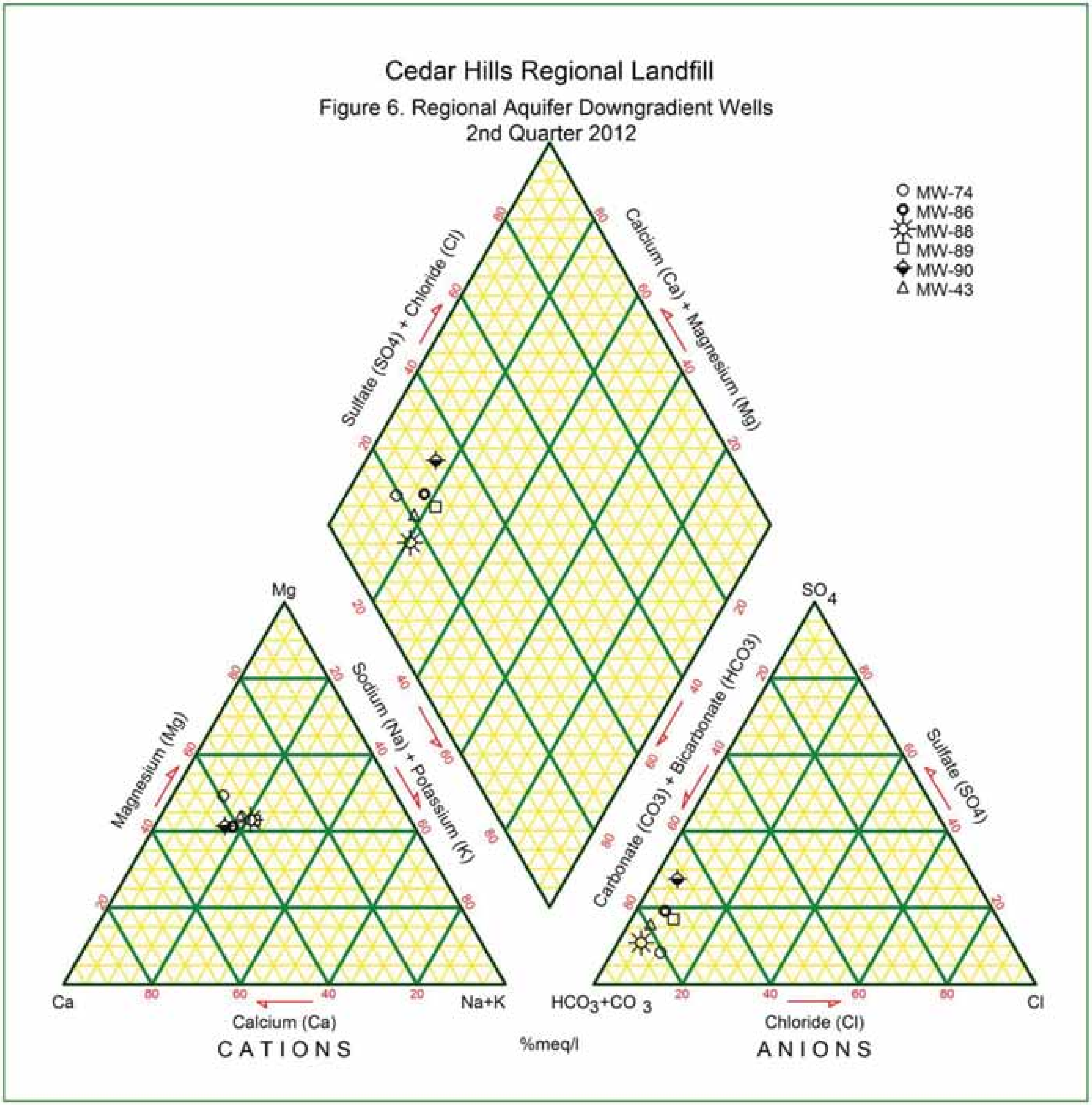

Cedar Hills Regional Landfill
Figure 2. Regional Aquifer Southern Upgradient Wells
2nd Quarter 2012
MW-56
MW-57
MW-76
MW-83
MW-60
MW-94
MW-82
MW-65
MW-58A
MW-59
MW-24
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO 3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

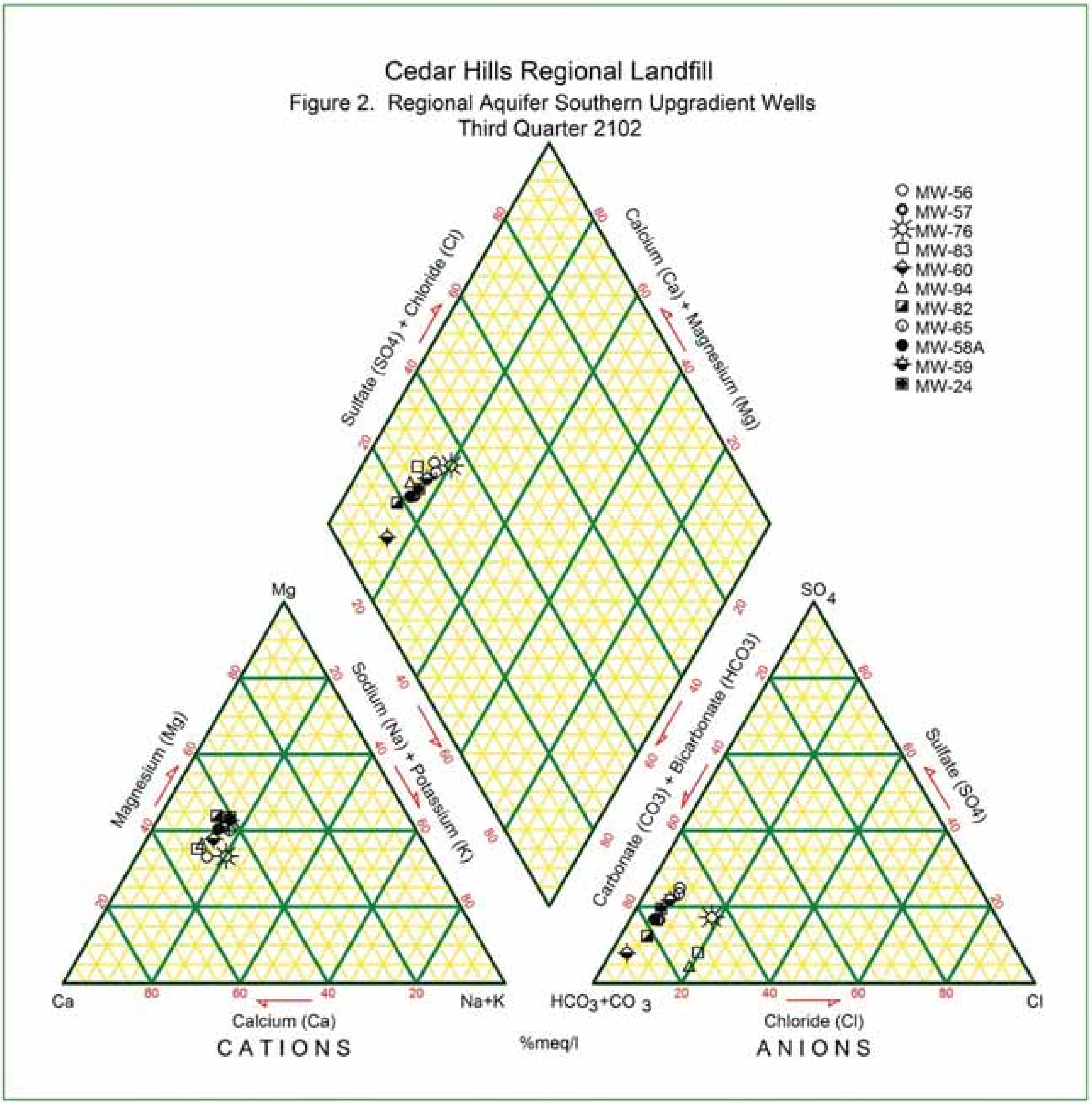


Cedar Hills Regional Landfill
Figure 3. Regional Aquifer NE and NW Upgradient Wells
2nd Quarter 2012
MW-84
MW-21
MW-73
MW-81
MW-99
MW-93
MW-95
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Mg
Magnesium (Mg)
Sodium (Na) + Potassium (K)
Ca
Na+K
Calcium (Ca)
CATIONS
%meq/l
SO4
Carbonate (CO3) + Bicarbonate (HCO3)
Sulfate (SO4)
HCO3+CO3
Cl
Chloride (Cl)
ANIONS

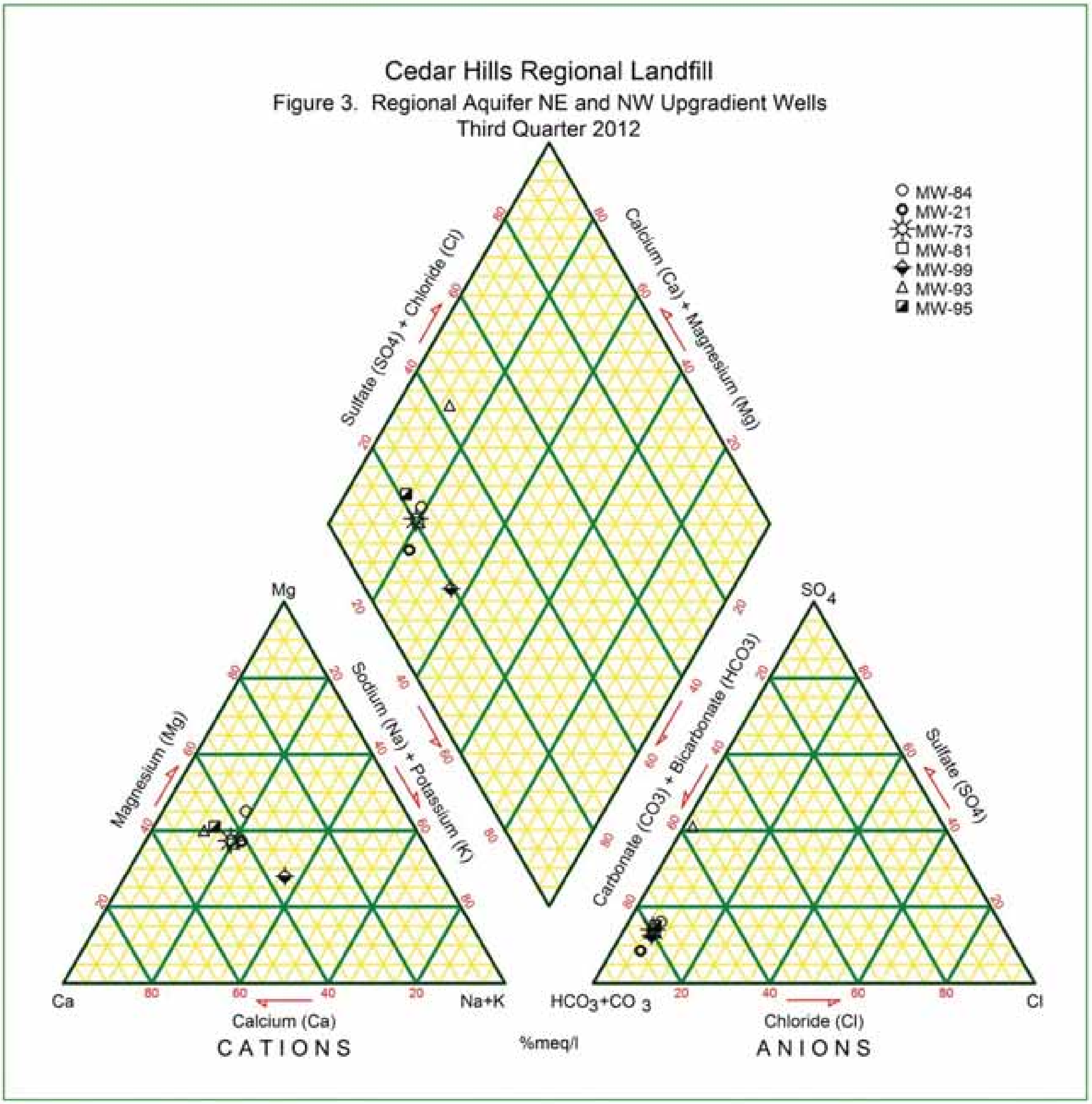

Cedar Hills Regional Landfill
Figure 4. Regional Aquifer Interior and Vertical to Facilities
2nd Quarter 2012
MW-70
MW-77
MW-78
MW-100
MW-64
MW-66
MW-68
MW-67
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

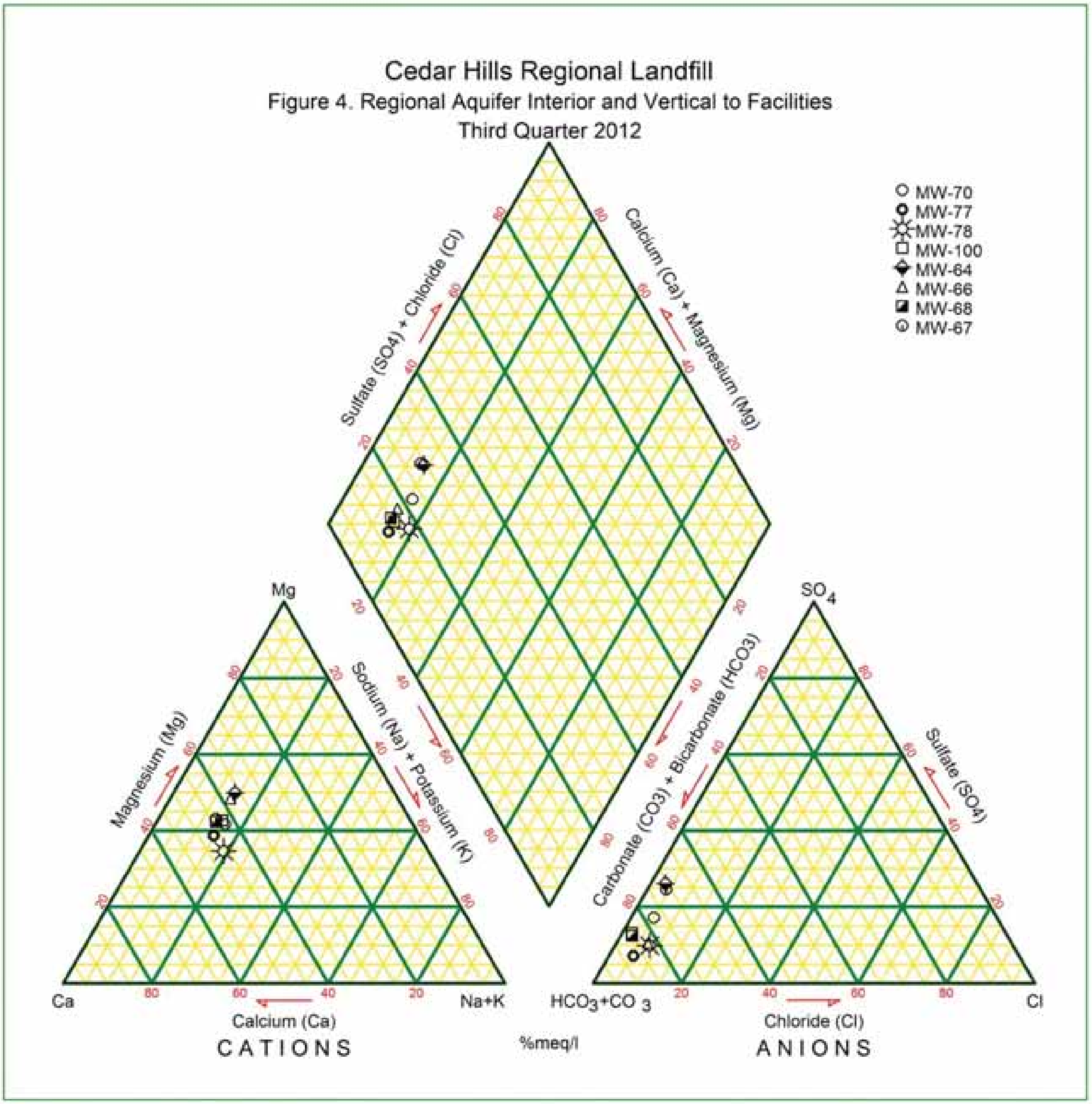

Cedar Hills Regional Landfill
Figure 5. Regional Aquifer Downgradient Wells
2nd Quarter 2012
MW-72
MW-69
MW-75
MW-80
MW-87
MW-85
MW-91
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO_4
Ca
Na+K
HCO_3+CO_3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

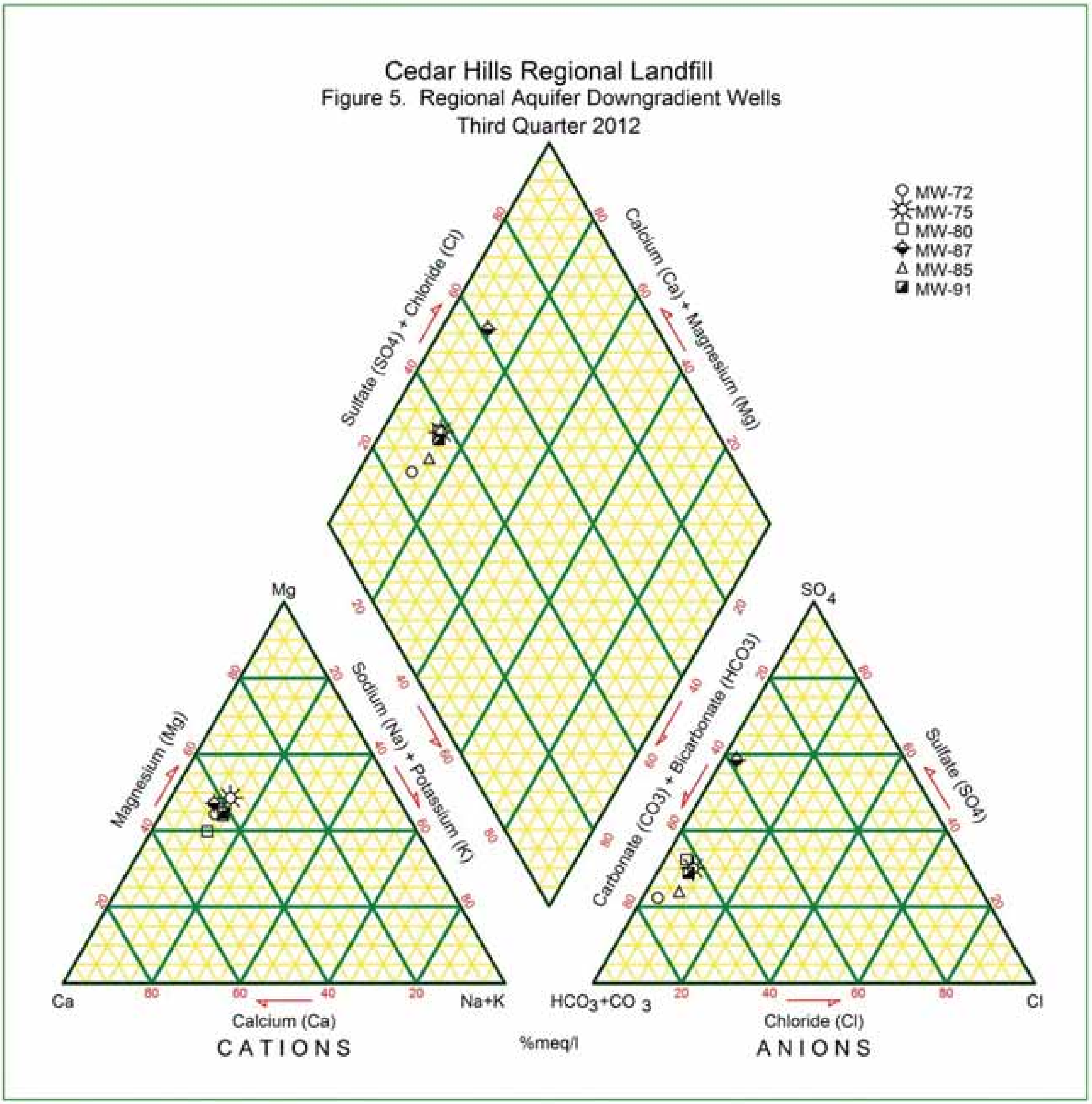

Cedar Hills Regional Landfill
Figure 6. Regional Aquifer Downgradient Wells
2nd Quarter 2012
MW-74
MW-86
MW-88
MW-89
MW-90
MW-43
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO_4
Ca
Na+K
HCO_3+CO 3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

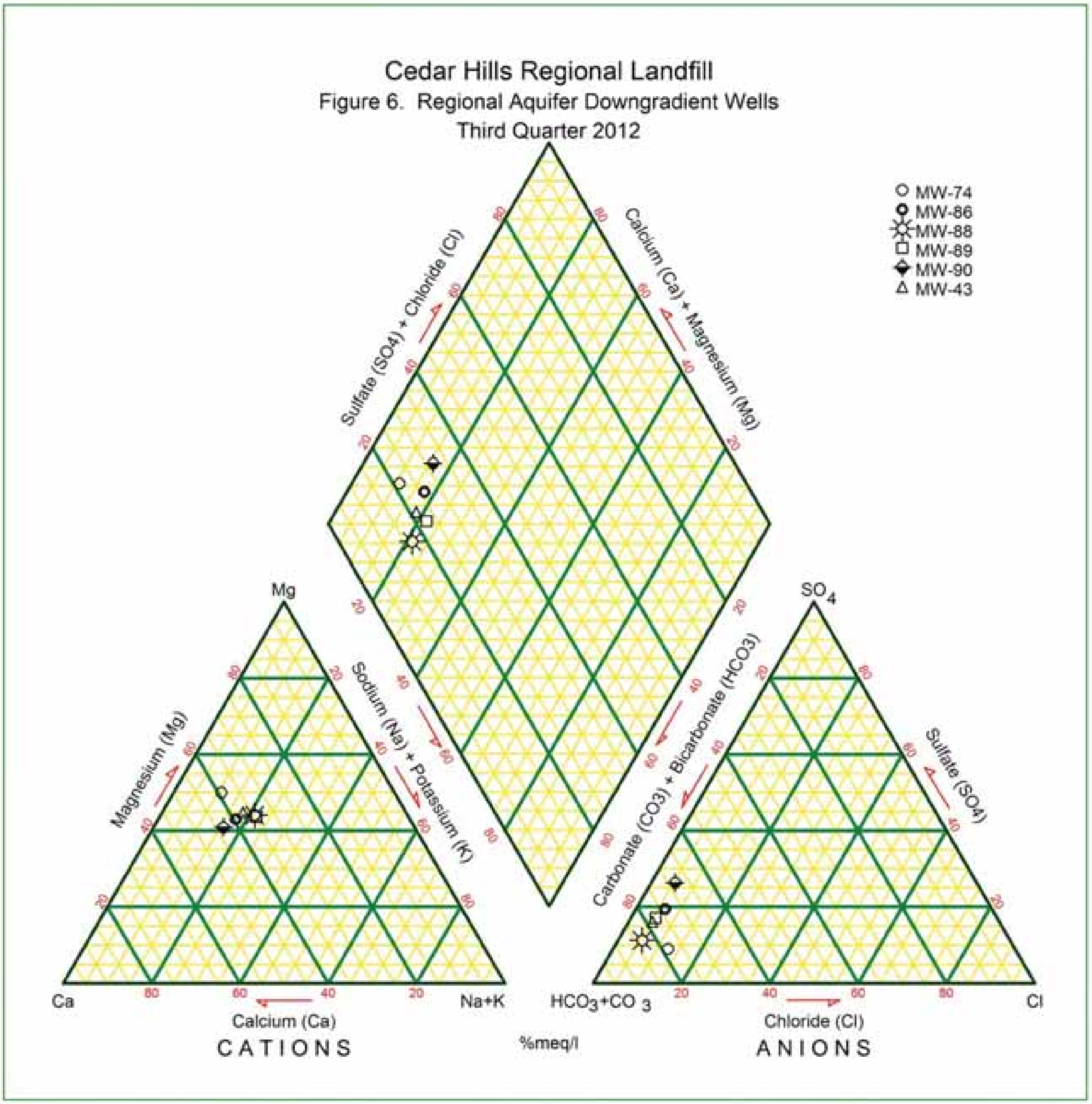


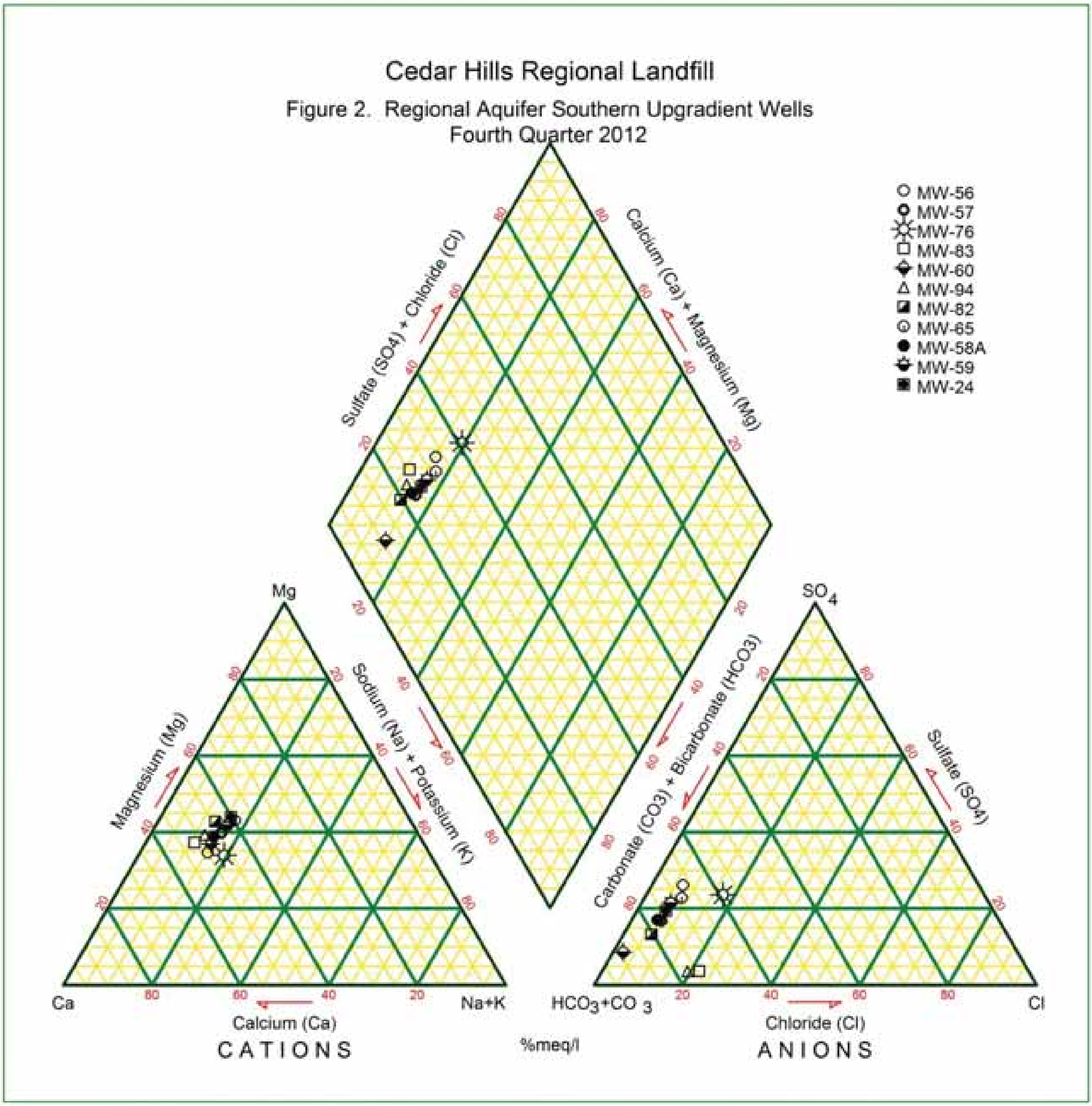
Cedar Hills Regional Landfill
Figure 2. Regional Aquifer Southern Upgradient Wells
Third Quarter 2102
MW-56
MW-57
MW-76
MW-83
MW-60
MW-94
MW-82
MW-65
MW-58A
MW-59
MW-24
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

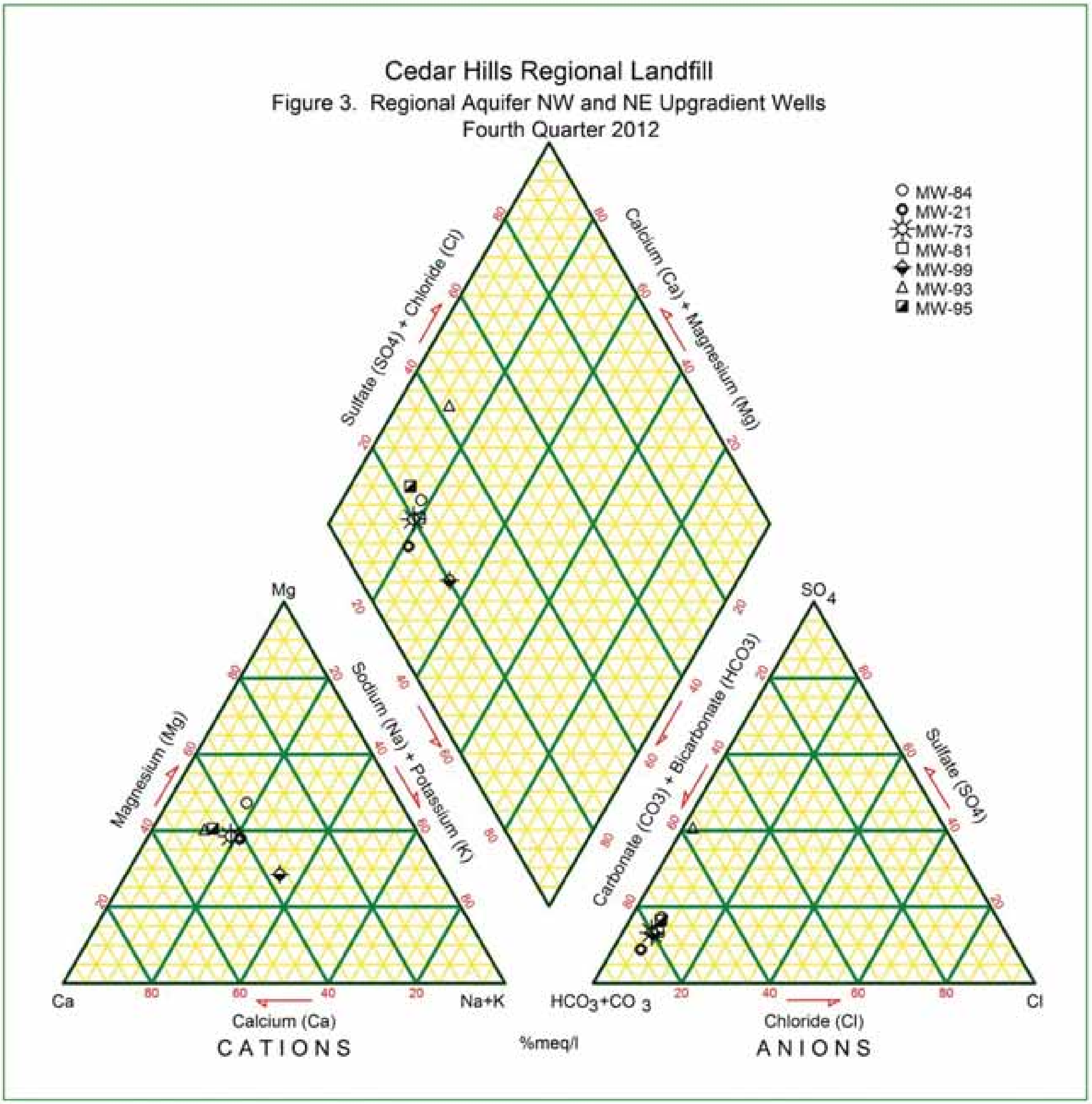

Cedar Hills Regional Landfill
Figure 3. Regional Aquifer NE and NW Upgradient Wells
Third Quarter 2012
MW-84
MW-21
MW-73
MW-81
MW-99
MW-93
MW-95
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Mg
Magnesium (Mg)
Ca
Na+K
Calcium (Ca)
CATIONS
SO_4
Sulfate (SO4)
HCO_3+CO_3
Cl
Chloride (Cl)
ANIONS
%meq/l

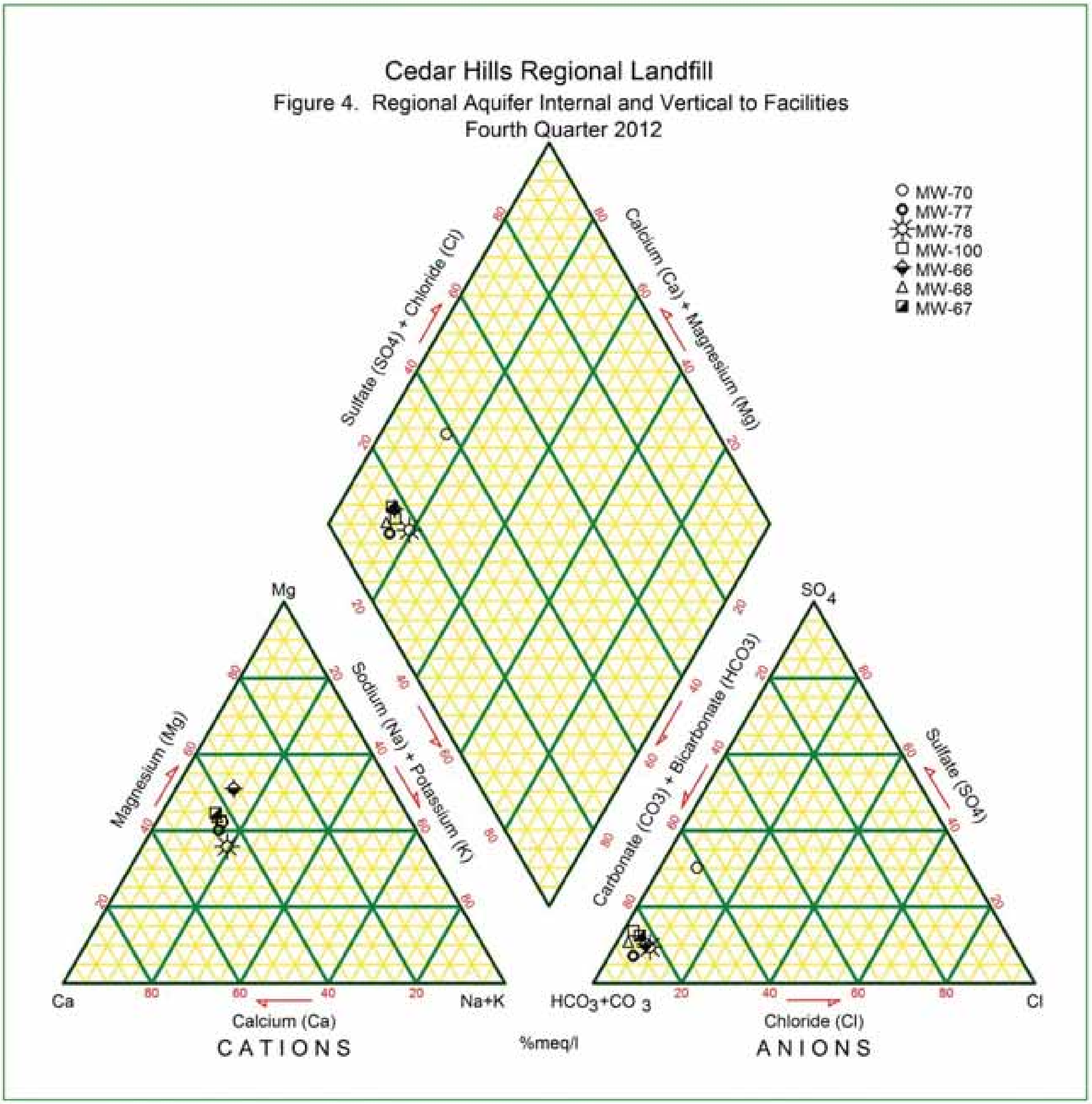

Cedar Hills Regional Landfill
Figure 4. Regional Aquifer Interior and Vertical to Facilities
Third Quarter 2012
MW-70
MW-77
MW-78
MW-100
MW-64
MW-66
MW-68
MW-67
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

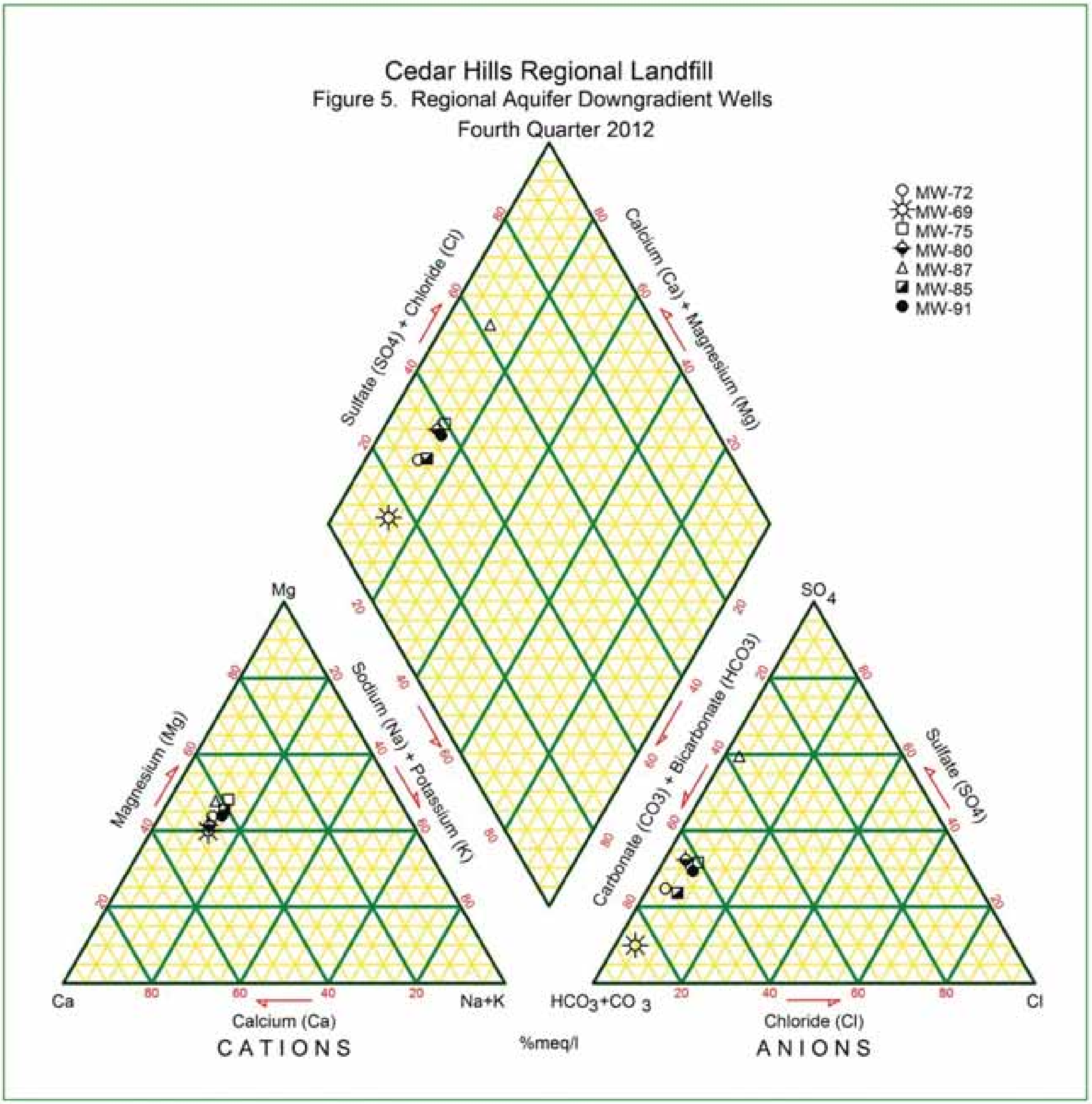

Cedar Hills Regional Landfill
Figure 5. Regional Aquifer Downgradient Wells
Third Quarter 2012
MW-72
MW-75
MW-80
MW-87
MW-85
MW-91
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Mg
Magnesium (Mg)
Ca
Calcium (Ca)
Na+K
CATIONS
%meq/l
SO_4
Sulfate (SO4)
HCO_3+CO_3
Chloride (Cl)
Cl
ANIONS

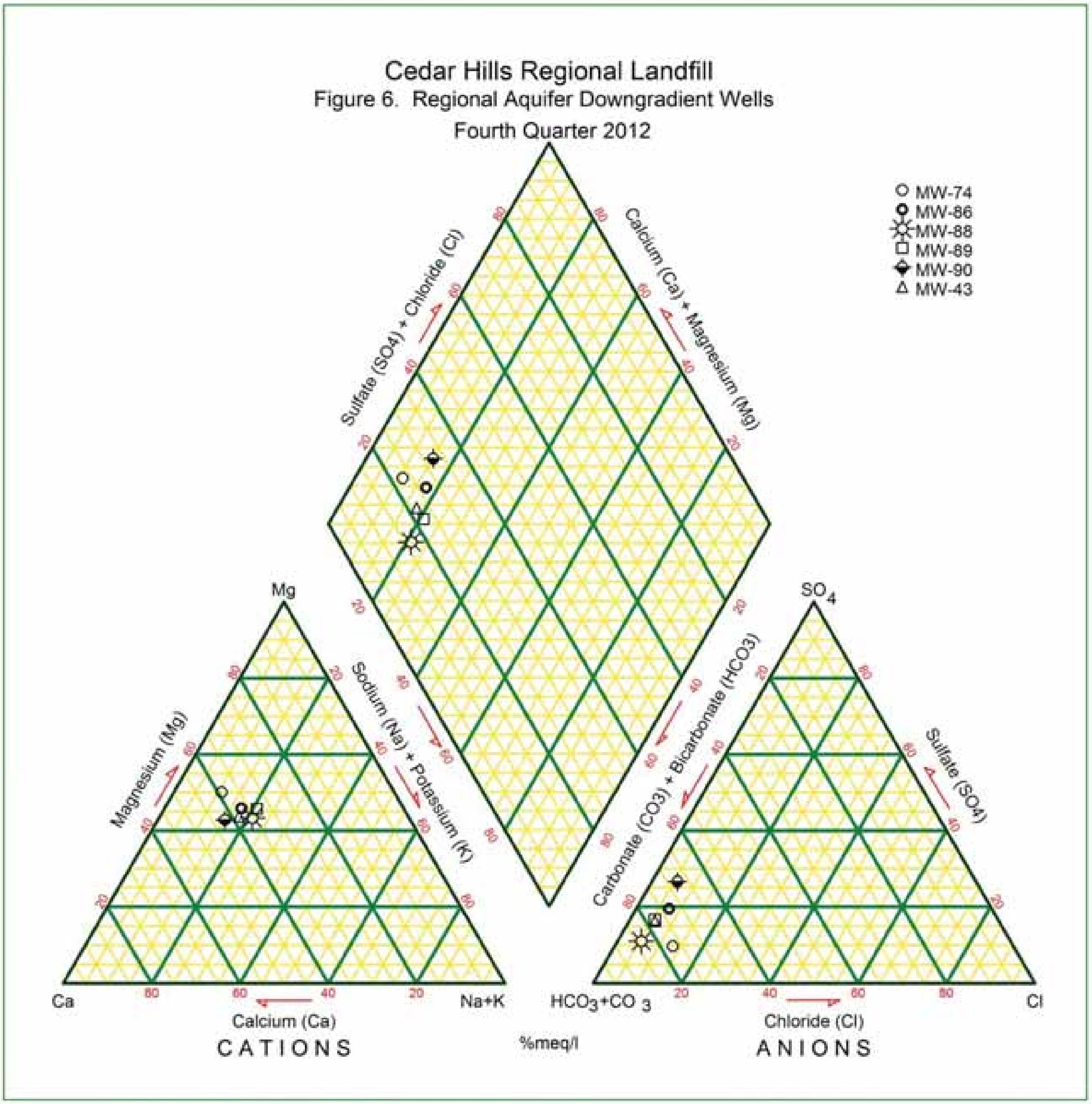

Cedar Hills Regional Landfill
Figure 6. Regional Aquifer Downgradient Wells
Third Quarter 2012
MW-74
MW-86
MW-88
MW-89
MW-90
MW-43
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS


Cedar Hills Regional Landfill
Figure 2. Regional Aquifer Southern Upgradient Wells
Fourth Quarter 2012
MW-56
MW-57
MW-76
MW-83
MW-60
MW-94
MW-82
MW-65
MW-58A
MW-59
MW-24
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS


Cedar Hills Regional Landfill
Figure 3. Regional Aquifer NW and NE Upgradient Wells
Fourth Quarter 2012
MW-84
MW-21
MW-73
MW-81
MW-99
MW-93
MW-95
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Mg
Magnesium (Mg)
Ca
Na+K
Calcium (Ca)
CATIONS
%meq/l
SO_4
Sulfate (SO4)
HCO_3+CO_3
Cl
Chloride (Cl)
ANIONS


Cedar Hills Regional Landfill
Figure 4. Regional Aquifer Internal and Vertical to Facilities
Fourth Quarter 2012
MW-70
MW-77
MW-78
MW-100
MW-66
MW-68
MW-67
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Mg
Magnesium (Mg)
Sodium (Na) + Potassium (K)
Ca
Na+K
Calcium (Ca)
CATIONS
%meq/l
SO4
Carbonate (CO3) + Bicarbonate (HCO3)
Sulfate (SO4)
HCO3+CO3
Cl
Chloride (Cl)
ANIONS


Cedar Hills Regional Landfill
Figure 5. Regional Aquifer Downgradient Wells
Fourth Quarter 2012
MW-72
MW-69
MW-75
MW-80
MW-87
MW-85
MW-91
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Mg
Magnesium (Mg)
Ca
Calcium (Ca)
Na+K
CATIONS
%meq/l
SO4
Sulfate (SO4)
HCO3+CO3
Chloride (Cl)
Cl
ANIONS


Cedar Hills Regional Landfill
Figure 6. Regional Aquifer Downgradient Wells
Fourth Quarter 2012
MW-74
MW-86
MW-88
MW-89
MW-90
MW-43
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Mg
Magnesium (Mg)
Sodium (Na) + Potassium (K)
Ca
Na+K
Calcium (Ca)
CATIONS
%meq/l
SO4
Carbonate (CO3) + Bicarbonate (HCO3)
Sulfate (SO4)
HCO3+CO3
Cl
Chloride (Cl)
ANIONS

Site ID			Upgradient South																	
			MW-24			**MW-56**			**MW-57**			**MW-58A**			**MW-59**			**MW-60**		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	12.6	0.62874	36.2	13.9	0.69361	50.5	16.6	0.82834	35.8	19.3	0.96307	47.0	13.5	0.67365	38.0	18.6	0.92814	47.1
Magnesium	24.3	2	8.8	0.72495	41.7	5.5	0.45094	32.8	10.0	0.81876	35.3	9.2	0.7554	36.8	8.3	0.68052	38.4	9.1	0.74882	38.0
Potassium	39.1	1	0.8	0.0211	1.2	0.9	0.02353	1.7	0.9	0.02292	1.0	1.0	0.02634	1.3	1.0	0.02547	1.4	1.2	0.03069	1.6
Sodium	23.0	1	5.6	0.24315	14.0	4.6	0.20096	14.6	6.9	0.2997	12.9	5.7	0.24794	12.1	5.7	0.24663	13.9	6.0	0.26012	13.2
Iron	55.8	2	3.17	0.11352	6.5	0.02	0.00068	0.0	9.35	0.33484	14.5	1.10	0.03939	1.9	4.00	0.14325	8.1	0.01	0.00043	0.0
Manganese	54.9	2	0.12	0.00433	0.2	0.09	0.00316	0.2	0.26	0.00954	0.4	0.38	0.01365	0.7	0.10	0.00371	0.2	0.00	4E-05	0.0
Ammonia-N	14.0	1	0.04	0.0032	0.2	0.01	0.00071	0.1	0.03	0.00206	0.1	0.07	0.0053	0.3	0.01	0.00071	0.0	0.01	0.00071	0.0
Total Cations (meq/L)				**1.7**			**1.4**			**2.3**			**2.1**			**1.8**			**2.0**	
Anions																				
Alkalinity, Total			65			47			81			77			61			86		
Carbonate	60.0	2	0.0489	0.00163	0.1	0.0169	0.00057	0.0	0.0217	0.00072	0.0	0.1494	0.00498	0.3	0.0249	0.00083	0.0	0.0606	0.00202	0.1
Bicarbonate	61.0	1	78.71	1.29018	74.6	57.06	0.93529	65.2	98.65	1.61703	76.6	93.64	1.53479	77.3	74.74	1.22498	71.7	104.67	1.71572	83.9
Chloride	35.5	1	3.6	0.1007	5.8	4.0	0.11311	7.9	4.5	0.12636	6.0	3.6	0.10211	5.1	4.3	0.12016	7.0	2.9	0.08039	3.9
Nitrate-N	14.0	1	0.01	0.00071	0.0	1.52	0.10852	7.6	0.01	0.00071	0.0	0.01	0.00071	0.0	0.01	0.00071	0.0	1.22	0.0871	4.3
Sulfate	96.1	2	16.1	0.33522	19.4	13.3	0.27692	19.3	17.6	0.36645	17.4	16.5	0.34354	17.3	17.4	0.36228	21.2	7.6	0.15907	7.8
Total Anions (meq/L)				**1.7**			**1.4**			**2.1**			**2.0**			**1.7**			**2.0**	
Total Ions (meq/L)				**3.5**			**2.8**			**4.4**			**4.0**			**3.5**			**4.0**	
Cation/Anion Ratio				**1.01**			**0.96**			**1.10**			**1.03**			**1.04**			**0.96**	
Percent Difference				**0.3**			**-2.2**			**4.6**			**1.6**			**1.9**			**-1.9**	
TRILINEAR DIAGRAM DATA																				
sum (Ca, Mg, Na+K)				1.62			1.37			1.97			1.99			1.63			1.97	
Calcium					38.86			50.66			42.05			48.33			41.42			47.17
Magnesium					44.81			32.94			41.57			37.91			41.85			38.05
Sodium + Potassium					16.33			16.40			16.38			13.76			16.73			14.78
sum (SO_4, Cl, HCO_3+CO_3)				1.73			1.33			2.11			1.99			1.71			1.96	
Sulfate					19.402			20.885			17.362			17.303			21.208			8.127
Chloride					5.828			8.531			5.987			5.143			7.034			4.107
Bicarbonate + Carbonate					74.769			70.584			76.650			77.554			71.758			87.765

Site ID			Upgradient South														
			MW-65			MW-76			MW-82			MW-83			MW-94		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	12.0	0.5988	36.8	11.8	0.58882	46.0	16.8	0.83832	44.1	26.7	1.33234	51.1	25.6	1.27745	51.0
Magnesium	24.3	2	7.3	0.60399	37.1	5.1	0.41638	32.5	9.5	0.78502	41.3	11.3	0.92985	35.7	11.0	0.90516	36.2
Potassium	39.1	1	0.9	0.02394	1.5	1.0	0.02478	1.9	1.4	0.03478	1.8	2.0	0.05218	2.0	1.9	0.04885	2.0
Sodium	23.0	1	5.6	0.24402	15.0	5.7	0.24881	19.4	5.5	0.24098	12.7	6.7	0.28926	11.1	6.2	0.27056	10.8
Iron	55.8	2	4.16	0.14898	9.2	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0
Manganese	54.9	2	0.20	0.00728	0.4	0.00	3.6E-05	0.0	0.00	3.6E-05	0.0	0.00	9.2E-05	0.0	0.00	3.6E-05	0.0
Ammonia-N	14.0	1	0.01	0.00071	0.0	0.01	0.00071	0.1	0.01	0.00071	0.0	0.01	0.00071	0.0	0.01	0.00071	0.0
Total Cations (meq/L)				**1.6**			**1.3**			**1.9**			**2.6**			**2.5**	
Anions																	
Alkalinity, Total			54			53			86			114			113		
Carbonate	60.0	2	0.0229	0.00076	0.1	0.0155	0.00052	0.0	0.0427	0.00142	0.1	0.0485	0.00162	0.1	0.0527	0.00176	0.1
Bicarbonate	61.0	1	65.71	1.07707	71.7	64.26	1.05332	70.7	104.22	1.70832	77.0	138.98	2.27804	78.6	137.75	2.2579	79.2
Chloride	35.5	1	4.0	0.11339	7.5	4.8	0.13567	9.1	6.0	0.16783	7.6	13.9	0.39207	13.5	17.5	0.49361	17.3
Nitrate-N	14.0	1	0.01	0.00071	0.0	0.98	0.06989	4.7	0.85	0.0609	2.7	0.06	0.00451	0.2	0.13	0.00957	0.3
Sulfate	96.1	2	14.9	0.31023	20.7	11.1	0.23111	15.5	13.4	0.279	12.6	10.6	0.2207	7.6	4.3	0.0887	3.1
Total Anions (meq/L)				**1.5**			**1.5**			**2.2**			**2.9**			**2.9**	
Total Ions (meq/L)				**3.1**			**2.8**			**4.1**			**5.5**			**5.4**	
Cation/Anion Ratio				**1.08**			**0.86**			**0.86**			**0.90**			**0.88**	
Percent Difference				**4.0**			**-7.6**			**-7.7**			**-5.3**			**-6.5**	
TRILINEAR DIAGRAM DAT																	
sum (Ca, Mg, Na+K)				1.47			1.28			1.90			2.60			2.50	
Calcium					40.71			46.05			44.14			51.17			51.06
Magnesium					41.07			32.56			41.34			35.71			36.18
Sodium + Potassium					18.22			21.39			14.52			13.11			12.77
sum (SO_4, Cl, HCO_3+CO_3)				1.50			1.42			2.16			2.89			2.84	
Sulfate					20.662			16.268			12.937			7.630			3.121
Chloride					7.552			9.550			7.782			13.555			17.369
Bicarbonate + Carbonate					71.786			74.182			79.281			78.815			79.510

Site ID			MW-21			MW-73			MW-84			MW-81			MW-99		
			Upgradient Northwest									Upgradient Northeast					
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	9.4	0.46806	36.6	12.4	0.61876	45.4	11.0	0.5489	36.9	10.5	0.52395	43.8	8.7	0.43513	37.6
Magnesium	24.3	2	5.8	0.4748	37.1	5.9	0.48879	35.9	8.2	0.67229	45.1	5.3	0.43366	36.3	3.9	0.3201	27.6
Potassium	39.1	1	1.1	0.02916	2.3	0.8	0.02044	1.5	1.0	0.02453	1.6	0.7	0.01854	1.6	0.8	0.02156	1.9
Sodium	23.0	1	5.6	0.24185	18.9	5.4	0.23315	17.1	5.6	0.24228	16.3	5.0	0.21879	18.3	8.6	0.37234	32.2
Iron	55.8	2	1.76	0.06303	4.9	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.03	0.001	0.1
Manganese	54.9	2	0.07	0.00261	0.2	0.00	3.6E-05	0.0	0.00	9.8E-05	0.0	0.00	3.6E-05	0.0	0.08	0.00285	0.2
Ammonia-N	14.0	1	0.01	0.00071	0.1	0.01	0.00071	0.1	0.01	0.00071	0.0	0.01	0.00071	0.1	0.07	0.00482	0.4
Total Cations (meq/L)				**1.3**			**1.4**			**1.5**			**1.2**			**1.2**	
Anions																	
Alkalinity, Total			53			54			61			52			53		
Carbonate	60.0	2	0.0399	0.00133	0.1	0.022	0.00073	0.0	0.0231	0.00077	0.0	0.0452	0.00151	0.1	0.1813	0.00604	0.5
Bicarbonate	61.0	1	64.21	1.05251	85.5	65.96	1.0811	72.2	74.25	1.21705	74.7	63.47	1.04034	73.9	63.93	1.0478	80.1
Chloride	35.5	1	2.8	0.07898	6.4	3.6	0.10182	6.8	3.7	0.10295	6.3	2.8	0.0787	5.6	3.2	0.09026	6.9
Nitrate-N	14.0	1	0.01	0.00071	0.1	1.82	0.12994	8.7	0.61	0.04348	2.7	1.50	0.10709	7.6	0.04	0.00316	0.2
Sulfate	96.1	2	4.7	0.09703	7.9	8.9	0.18426	12.3	12.7	0.26442	16.2	8.7	0.18093	12.8	7.7	0.16011	12.2
Total Anions (meq/L)				**1.2**			**1.5**			**1.6**			**1.4**			**1.3**	
Total Ions (meq/L)				**2.5**			**2.9**			**3.1**			**2.6**			**2.5**	
Cation/Anion Ratio				**1.04**			**0.91**			**0.91**			**0.85**			**0.89**	
Percent Difference				**2.0**			**-4.7**			**-4.5**			**-8.2**			**-6.1**	
TRILINEAR DIAGRAM DAT																	
sum (Ca, Mg, Na+K)				1.21			1.36			1.49			1.19			1.15	
Calcium					38.56			45.46			36.89			43.85			37.87
Magnesium					39.11			35.91			45.18			36.29			27.86
Sodium + Potassium					22.33			18.63			17.93			19.86			34.28
					100.0			100.0			100.0						
sum (SO_4, Cl, HCO_3+CO_3)				1.23			1.37			1.59			1.30			1.30	
Sulfate					7.889			13.470			16.681			13.902			12.277
Chloride					6.422			7.444			6.495			6.047			6.921
Bicarbonate + Carbonate					85.689			79.086			76.824			80.051			80.803

Site ID			Cross Gradient						Interior											
			MW-93			MW-95			MW-70			MW-77			MW-78			MW-100		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	34.7	1.73154	47.6	18.6	0.92814	44.4	18.5	0.92315	44.6	21.9	1.09281	45.2	13.6	0.67864	43.4	23.9	1.19261	43.4
Magnesium	24.3	2	17.8	1.46472	40.2	10.5	0.86402	41.3	10.1	0.8311	40.1	11.7	0.96276	39.8	6.9	0.56696	36.3	13.3	1.09443	39.8
Potassium	39.1	1	1.6	0.04067	1.1	1.1	0.02916	1.4	1.5	0.0376	1.8	1.4	0.03504	1.5	2.1	0.05269	3.4	1.9	0.0486	1.8
Sodium	23.0	1	8.9	0.38887	10.7	6.0	0.26273	12.6	6.4	0.27838	13.4	7.5	0.32406	13.4	6.0	0.26273	16.8	8.2	0.35494	12.9
Iron	55.8	2	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	1.39	0.04978	1.8
Manganese	54.9	2	0.28	0.01023	0.3	0.14	0.00502	0.2	0.00	3.6E-05	0.0	0.02	0.00064	0.0	0.00	3.6E-05	0.0	0.22	0.00797	0.3
Ammonia-N	14.0	1	0.06	0.00458	0.1	0.03	0.00191	0.1	0.01	0.00071	0.0	0.01	0.00071	0.0	0.01	0.00071	0.0	0.01	0.00071	0.0
Total Cations (meq/L)				**3.6**			**2.1**			**2.1**			**2.4**			**1.6**			**2.7**	
Anions																				
Alkalinity, Total			112			87			80			117			69			130		
Carbonate	60.0	2	0.1042	0.00347	0.1	0.1346	0.00449	0.2	0.0959	0.0032	0.2	0.0753	0.00251	0.1	0.0172	0.00057	0.0	0.0374	0.00125	0.0
Bicarbonate	61.0	1	136.43	2.23619	55.3	106.23	1.74125	77.9	97.53	1.59856	76.8	142.59	2.33714	85.8	83.66	1.37122	80.0	158.52	2.59836	87.6
Chloride	35.5	1	2.7	0.07588	1.9	5.1	0.14413	6.4	4.1	0.11621	5.6	5.1	0.14272	5.2	4.2	0.11931	7.0	2.6	0.07277	2.5
Nitrate-N	14.0	1	0.01	0.00071	0.0	0.01	0.00071	0.0	0.04	0.00306	0.1	0.89	0.06383	2.3	0.84	0.06018	3.5	0.01	0.00071	0.0
Sulfate	96.1	2	82.9	1.72605	42.7	16.6	0.34563	15.5	17.3	0.3602	17.3	8.6	0.17802	6.5	7.8	0.16261	9.5	14.0	0.29149	9.8
Total Anions (meq/L)				**4.0**			**2.2**			**2.1**			**2.7**			**1.7**			**3.0**	
Total Ions (meq/L)				**7.7**			**4.3**			**4.2**			**5.1**			**3.3**			**5.7**	
Cation/Anion Ratio				**0.90**			**0.94**			**1.00**			**0.89**			**0.91**			**0.93**	
Percent Difference				**-5.2**			**-3.3**			**-0.2**			**-6.0**			**-4.6**			**-3.8**	
TRILINEAR DIAGRAM DAT																				
sum (Ca, Mg, Na+K)				3.63			2.08			2.07			2.41			1.56			2.69	
Calcium					47.76			44.54			44.59			45.26			43.47			44.33
Magnesium					40.40			41.46			40.15			39.87			36.32			40.68
Sodium + Potassium					11.85			14.01			15.26			14.87			20.21			15.00
sum (SO_4, Cl, HCO_3+CO_3)				4.04			2.24			2.08			2.66			1.65			2.96	
Sulfate					42.707			15.461			17.333			6.691			9.833			9.835
Chloride					1.877			6.448			5.592			5.365			7.215			2.455
Bicarbonate + Carbonate					55.415			78.092			77.075			87.944			82.952			87.710

Site ID			Vertical to Facilites												Downgradient Northwest					
			MW-64			MW-66			MW-67			MW-68			MW-69			MW-72		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	18.9	0.94311	38.3	21.7	1.08283	37.0	28.0	1.39721	44.1	28.2	1.40719	44.2	27.8	1.38723	47.3	25.5	1.27246	42.1
Magnesium	24.3	2	13.8	1.13557	46.1	17.5	1.44003	49.2	16.3	1.34129	42.4	15.8	1.30014	40.9	13.5	1.11088	37.9	15.8	1.30014	43.0
Potassium	39.1	1	1.5	0.03862	1.6	1.3	0.03325	1.1	1.6	0.04041	1.3	1.7	0.04374	1.4	1.6	0.04195	1.4	1.8	0.04476	1.5
Sodium	23.0	1	6.5	0.28186	11.5	8.6	0.3719	12.7	8.8	0.38191	12.1	8.7	0.37843	11.9	8.0	0.34581	11.8	7.5	0.3271	10.8
Iron	55.8	2	0.76	0.02722	1.1	0.01	0.00036	0.0	0.06	0.00197	0.1	1.20	0.04297	1.4	1.03	0.03689	1.3	1.9	0.06697	2.2
Manganese	54.9	2	0.85	0.03083	1.3	0.00	3.6E-05	0.0	0.06	0.00212	0.1	0.21	0.00746	0.2	0.19	0.00706	0.2	0.3	0.00939	0.3
Ammonia-N	14.0	1	0.06	0.00411	0.2	0.01	0.00071	0.0	0.01	0.00071	0.0	0.01	0.00071	0.0	0.01	0.00093	0.0	0.0	0.00093	0.0
Total Cations (meq/L)				**2.5**			**2.9**			**3.2**			**3.2**			**2.9**			**3.0**	
Anions																				
Alkalinity, Total			91			117			115			130			123			115		
Carbonate	60.0	2	0.0787	0.00262	0.1	0.0885	0.00295	0.1	0.0932	0.00311	0.1	0.0876	0.00292	0.1	0.2676	0.00892	0.3	0.087	0.0029	0.1
Bicarbonate	61.0	1	110.49	1.8111	68.8	142.56	2.3367	81.3	140.11	2.29655	70.3	158.42	2.59669	85.1	149.52	2.45071	84.9	140.12	2.29675	76.2
Chloride	35.5	1	3.2	0.09139	3.5	7.6	0.2155	7.5	5.0	0.14103	4.3	2.9	0.08293	2.7	4.2	0.11959	4.1	4.1	0.11536	3.8
Nitrate-N	14.0	1	0.02	0.00107	0.0	0.60	0.04312	1.5	0.56	0.03984	1.2	0.04	0.00308	0.1	0.01	0.00071	0.0	0.0	0.00071	0.0
Sulfate	96.1	2	34.8	0.72457	27.5	13.3	0.27692	9.6	37.8	0.78703	24.1	17.6	0.36645	12.0	14.8	0.30815	10.7	28.8	0.59964	19.9
Total Anions (meq/L)				**2.6**			**2.9**			**3.3**			**3.1**			**2.9**			**3.0**	
Total Ions (meq/L)				**5.1**			**5.8**			**6.4**			**6.2**			**5.8**			**6.0**	
Cation/Anion Ratio				**0.94**			**1.02**			**0.97**			**1.04**			**1.01**			**1.00**	
Percent Difference				**-3.3**			**0.9**			**-1.6**			**2.1**			**0.7**			**0.1**	
TRILINEAR DIAGRAM DAT																				
sum (Ca, Mg, Na+K)				2.40			2.93			3.16			3.13			2.89			2.94	
Calcium					39.31			36.98			44.20			44.97			48.07			43.22
Magnesium					47.33			49.18			42.43			41.54			38.49			44.16
Sodium + Potassium					13.36			13.84			13.36			13.49			13.44			12.63
sum (SO_4, Cl, HCO_3+CO_3)				2.63			2.83			3.23			3.05			2.89			3.01	
Sulfate					27.553			9.778			24.383			12.019			10.672			19.891
Chloride					3.475			7.609			4.369			2.720			4.142			3.827
Bicarbonate + Carbonate					68.971			82.613			71.247			85.262			85.186			76.282

Site ID			Downgradient																	
			MW-74			MW-75			MW-80			MW-85			MW-86			MW-87		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	34.9	1.74152	39.9	22.0	1.0978	37.9	23.6	1.17764	47.4	20.3	1.01297	43.3	11.5	0.57385	39.2	34.5	1.72156	41.4
Magnesium	24.3	2	25.2	2.07365	47.5	16.4	1.34952	46.6	11.4	0.93808	37.8	12.1	0.99568	42.5	7.6	0.62209	42.5	22.9	1.88439	45.3
Potassium	39.1	1	1.9	0.0486	1.1	1.7	0.04348	1.5	1.5	0.03785	1.5	1.2	0.03146	1.3	1.0	0.02583	1.8	2.1	0.05473	1.3
Sodium	23.0	1	10.6	0.46107	10.6	7.9	0.34407	11.9	6.3	0.27316	11.0	6.9	0.30013	12.8	5.2	0.22445	15.3	8.7	0.37973	9.1
Iron	55.8	2	1.2	0.04118	0.9	1.5	0.05479	1.9	1.3	0.04763	1.9	0.0	0.00036	0.0	0.5	0.01629	1.1	3.0	0.10708	2.6
Manganese	54.9	2	0.1	0.00249	0.1	0.1	0.00422	0.1	0.2	0.00899	0.4	0.0	3.6E-05	0.0	0.0	0.00095	0.1	0.4	0.01329	0.3
Ammonia-N	14.0	1	0.0	0.00071	0.0	0.0	0.00071	0.0	0.0	0.001	0.0	0.0	0.00071	0.0	0.0	0.00071	0.0	0.0	0.00086	0.0
Total Cations (meq/L)				**4.4**			**2.9**			**2.5**			**2.3**			**1.5**			**4.2**	
Anions																				
Alkalinity, Total			185			97.5			78.1			93.5			63.8			89.1		
Carbonate	60.0	2	0.1276	0.00425	0.1	0.0572	0.00191	0.1	0.0663	0.00221	0.1	0.063	0.0021	0.1	0.0366	0.00122	0.1	0.0406	0.00135	0.0
Bicarbonate	61.0	1	225.44	3.69519	76.7	118.83	1.9478	62.3	95.15	1.55956	60.7	113.94	1.86762	68.3	77.76	1.27459	71.0	108.62	1.78038	39.7
Chloride	35.5	1	22.3	0.629	13.1	8.0	0.22509	7.2	5.3	0.15062	5.9	7.4	0.20732	7.6	4.19	0.11818	6.6	5.0	0.14047	3.1
Nitrate-N	14.0	1	0.4	0.02727	0.6	0.0	0.00071	0.0	0.0	0.00071	0.0	0.1	0.00871	0.3	0.106	0.00757	0.4	0.0	0.00071	0.0
Sulfate	96.1	2	22.1	0.46014	9.6	45.6	0.94943	30.4	41.2	0.85782	33.4	31.1	0.64753	23.7	18.9	0.39351	21.9	123.0	2.56096	57.1
Total Anions (meq/L)				**4.8**			**3.1**			**2.6**			**2.7**			**1.8**			**4.5**	
Total Ions (meq/L)				**9.2**			**6.0**			**5.1**			**5.1**			**3.3**			**8.6**	
Cation/Anion Ratio				**0.91**			**0.93**			**0.97**			**0.86**			**0.82**			**0.93**	
Percent Difference				**-4.9**			**-3.8**			**-1.7**			**-7.7**			**-10.2**			**-3.7**	
TRILINEAR DIAGRAM DAT																				
sum (Ca, Mg, Na+K)				4.32			2.83			2.43			2.34			1.45			4.04	
Calcium					40.27			38.73			48.53			43.28			39.68			42.61
Magnesium					47.95			47.60			38.66			42.55			43.01			46.64
Sodium + Potassium					11.78			13.67			12.82			14.17			17.31			10.75
sum (SO_4, Cl, HCO_3+CO_3)				4.79			3.12			2.57			2.72			1.79			4.48	
Sulfate					9.609			30.389			33.375			23.766			22.015			57.124
Chloride					13.135			7.205			5.860			7.609			6.612			3.133
Bicarbonate + Carbonate					77.255			62.406			60.764			68.625			71.374			39.743

Site ID			Downgradient														
			MW-88			MW-89			MW-90			MW-91			MW-43		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	8.5	0.42365	36.8	13.0	0.6487	35.2	16.3	0.81337	41.0	21.1	1.05289	39.9	12.4	0.61876	38.2
Magnesium	24.3	2	5.9	0.48632	42.3	9.3	0.76363	41.4	9.8	0.80724	40.7	14.2	1.16848	44.3	8.2	0.67723	41.8
Potassium	39.1	1	0.8	0.02113	1.8	1.4	0.03478	1.9	1.3	0.03376	1.7	1.6	0.04143	1.6	1.3	0.03299	2.0
Sodium	23.0	1	5.0	0.21792	18.9	8.3	0.3606	19.6	6.4	0.27882	14.1	7.6	0.33232	12.6	5.7	0.24707	15.3
Iron	55.8	2	0.0	0.00036	0.0	0.7	0.02493	1.4	1.1	0.03796	1.9	0.9	0.03302	1.3	0.9	0.03356	2.1
Manganese	54.9	2	0.0	3.6E-05	0.0	0.3	0.00932	0.5	0.3	0.00965	0.5	0.2	0.00866	0.3	0.2	0.00848	0.5
Ammonia-N	14.0	1	0.0	0.00071	0.1	0.0	0.00136	0.1	0.0	0.00107	0.1	0.0	0.003	0.1	0.0	0.00161	0.1
Total Cations (meq/L)				**1.2**			**1.8**			**2.0**			**2.6**			**1.6**	
Anions																	
Alkalinity, Total			53.1			76.2			70			85.3			67.8		
Carbonate	60.0	2	0.04302	0.00143	0.1	0.08518	0.00284	0.1	0.05417	0.00181	0.1	0.0575	0.00192	0.1	0.06756	0.00225	0.1
Bicarbonate	61.0	1	64.69	1.06041	81.4	92.79	1.52093	77.7	85.29	1.39798	68.6	103.95	1.70383	63.6	82.58	1.35354	78.3
Chloride	35.5	1	2.3	0.06431	4.9	3.7	0.10521	5.4	3.7	0.10408	5.1	7.7	0.21719	8.1	3.0	0.08518	4.9
Nitrate-N	14.0	1	0.5	0.03298	2.5	0.0	0.00071	0.0	0.0	0.00071	0.0	0.0	0.00171	0.1	0.0	0.00071	0.0
Sulfate	96.1	2	6.9	0.14346	11.0	15.8	0.32897	16.8	25.6	0.53301	26.2	36.3	0.7558	28.2	13.8	0.28733	16.6
Total Anions (meq/L)				**1.3**			**2.0**			**2.0**			**2.7**			**1.7**	
Total Ions (meq/L)				**2.5**			**3.8**			**4.0**			**5.3**			**3.3**	
Cation/Anion Ratio				**0.88**			**0.94**			**0.97**			**0.98**			**0.94**	
Percent Difference				**-6.2**			**-3.0**			**-1.4**			**-0.8**			**-3.3**	
TRILINEAR DIAGRAM DAT																	
sum (Ca, Mg, Na+K)				1.15			1.81			1.93			2.60			1.58	
Calcium					36.87			35.89			42.07			40.57			39.26
Magnesium					42.32			42.24			41.76			45.03			42.97
Sodium + Potassium					20.80			21.87			16.17			14.40			17.77
sum (SO_4, Cl, HCO_3+CO_3)				1.27			1.96			2.04			2.68			1.73	
Sulfate					11.299			16.802			26.168			28.215			16.625
Chloride					5.065			5.373			5.110			8.108			4.929
Bicarbonate + Carbonate					83.635			77.825			68.722			63.677			78.446

Site ID			Upgradient South																	
			MW-56			**MW-57**			**MW-76**			**MW-83**			**MW-60**			**MW-94**		
			4/10/12			4/30/12			4/16/12			4/18/12			4/12/12			4/24/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	14.6	0.72854	53.5	16.2	0.80838	39.7	19.4	0.96806	46.8	25.2	1.25749	50.6	17.2	0.85828	47.7	24.8	1.23752	49.7
Magnesium	24.3	2	5.0	0.41473	30.5	7.8	0.64267	31.6	8.7	0.71426	34.6	10.9	0.89693	36.1	8.1	0.669	37.2	11.2	0.92162	37.0
Potassium	39.1	1	0.8	0.02023	1.5	0.9	0.0234	1.1	1.4	0.03453	1.7	1.8	0.04629	1.9	1.0	0.0266	1.5	2.0	0.05218	2.1
Sodium	23.0	1	4.5	0.194	14.3	5.9	0.25533	12.5	8.0	0.34972	16.9	6.6	0.28578	11.5	5.6	0.24359	13.5	6.4	0.27621	11.1
Iron	55.8	2	0.03	0.00107	0.1	8.25	0.29545	14.5	0.01	0.00018	0.0	0.01	0.00018	0.0	0.01	0.00018	0.0	0.01	0.00018	0.0
Manganese	54.9	2	0.05	0.00182	0.1	0.24	0.00866	0.4	0.00	1.8E-05	0.0	0.00	8.3E-05	0.0	0.00	5.9E-05	0.0	0.00	1.8E-05	0.0
Ammonia-N	14.0	1	0.01	0.00036	0.0	0.03	0.00221	0.1	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0
Total Cations (meq/L)				**1.4**			**2.0**			**2.1**			**2.5**			**1.8**			**2.5**	
Anions																				
Alkalinity, Total			47			88			60			105			83			108		
Carbonate	60.0	2	0.023	0.00077	0.1	0.0235	0.00079	0.0	0.0089	0.0003	0.0	0.0513	0.00171	0.1	0.0508	0.00169	0.1	0.0504	0.00168	0.1
Bicarbonate	61.0	1	57.29	0.93909	63.0	106.95	1.75295	77.5	73.43	1.20352	57.2	128.00	2.09797	78.7	100.67	1.65006	83.3	131.66	2.158	73.5
Chloride	35.5	1	4.3	0.12213	8.2	5.2	0.14639	6.5	10.9	0.30745	14.6	11.6	0.32719	12.3	2.9	0.0818	4.1	19.9	0.56131	19.1
Nitrate-N	14.0	1	1.12	0.07996	5.4	0.01	0.00036	0.0	1.17	0.08353	4.0	0.20	0.01406	0.5	1.22	0.0871	4.4	1.26	0.08996	3.1
Sulfate	96.1	2	16.8	0.34979	23.4	17.4	0.36228	16.0	24.5	0.51011	24.2	10.8	0.22487	8.4	7.7	0.16011	8.1	6.0	0.12576	4.3
Total Anions (meq/L)				**1.5**			**2.3**			**2.1**			**2.7**			**2.0**			**2.9**	
Total Ions (meq/L)				**2.9**			**4.3**			**4.2**			**5.2**			**3.8**			**5.4**	
Cation/Anion Ratio				**0.91**			**0.90**			**0.98**			**0.93**			**0.91**			**0.85**	
Percent Difference				**-4.6**			**-5.3**			**-0.9**			**-3.5**			**-4.8**			**-8.3**	
Trilinear Diagram Data																				
sum (Ca, Mg, Na+K)				1.36			1.73			2.07			2.49			1.80			2.49	
Calcium					53.67			46.73			46.84			50.57			47.75			49.75
Magnesium					30.55			37.15			34.56			36.07			37.22			37.05
Sodium + Potassium					15.78			16.11			18.59			13.36			15.03			13.20
sum (SO_4, Cl, HCO_3+CO_3)				1.41			2.26			2.02			2.65			1.89			2.85	
Sulfate					24.776			16.013			25.236			8.480			8.455			4.418
Chloride					8.651			6.471			15.210			12.339			4.320			19.718
Bicarbonate + Carbonate					66.572			77.516			59.554			79.181			87.225			75.865

Site ID			Upgradient South														
			MW-82			**MW-65**			**MW-58A**			**MW-59**			**MW-24**		
			4/18/12			4/16/12			4/19/12			4/24/12			4/3/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	20.6	1.02794	43.8	11.7	0.58383	36.6	17.2	0.85828	46.2	12.4	0.61876	37.5	12.5	0.62375	37.7
Magnesium	24.3	2	12.0	0.98745	42.1	7.2	0.59247	37.1	8.3	0.68628	36.9	7.9	0.65089	39.4	8.1	0.669	40.5
Potassium	39.1	1	1.6	0.04169	1.8	0.9	0.02246	1.4	1.0	0.02558	1.4	1.0	0.02583	1.6	0.8	0.02138	1.3
Sodium	23.0	1	6.6	0.28752	12.3	5.5	0.2388	15.0	5.4	0.23358	12.6	4.9	0.21401	13.0	5.2	0.22619	13.7
Iron	55.8	2	0.01	0.00018	0.0	4.24	0.15184	9.5	1.05	0.0376	2.0	3.82	0.1368	8.3	2.94	0.10529	6.4
Manganese	54.9	2	0.00	1.8E-05	0.0	0.17	0.00623	0.4	0.36	0.01318	0.7	0.09	0.00336	0.2	0.11	0.00386	0.2
Ammonia-N	14.0	1	0.01	0.00036	0.0	0.01	0.00036	0.0	0.07	0.00521	0.3	0.01	0.00036	0.0	0.04	0.00286	0.2
Total Cations (meq/L)				**2.3**			**1.6**			**1.9**			**1.7**			**1.7**	
Anions																	
Alkalinity, Total			96			54			75			63			63		
Carbonate	60.0	2	0.0456	0.00152	0.1	0.0148	0.00049	0.0	0.1428	0.00476	0.2	0.0293	0.00098	0.1	0.0521	0.00174	0.1
Bicarbonate	61.0	1	116.54	1.91019	78.9	65.48	1.07335	70.6	91.58	1.50102	78.4	76.68	1.25683	71.6	76.51	1.25408	74.4
Chloride	35.5	1	4.5	0.12608	5.2	3.9	0.11085	7.3	3.4	0.09703	5.1	4.4	0.12354	7.0	3.4	0.09562	5.7
Nitrate-N	14.0	1	0.84	0.05983	2.5	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0
Sulfate	96.1	2	15.5	0.32272	13.3	16.1	0.33522	22.0	15.0	0.31231	16.3	17.9	0.37269	21.2	16.0	0.33313	19.8
Total Anions (meq/L)				**2.4**			**1.5**			**1.9**			**1.8**			**1.7**	
Total Ions (meq/L)				**4.8**			**3.1**			**3.8**			**3.4**			**3.3**	
Cation/Anion Ratio				**0.97**			**1.05**			**0.97**			**0.94**			**0.98**	
Percent Difference				**-1.6**			**2.4**			**-1.5**			**-3.1**			**-1.0**	
Trilinear Diagram Data																	
sum (Ca, Mg, Na+K)				2.34			1.44			1.80			1.51			1.54	
Calcium					43.84			40.61			47.58			40.99			40.49
Magnesium					42.12			41.21			38.05			43.12			43.43
Sodium + Potassium					14.04			18.17			14.37			15.89			16.07
sum (SO_4, Cl, HCO_3+CO_3)				2.36			1.52			1.92			1.75			1.68	
Sulfate					13.672			22.055			16.308			21.248			19.776
Chloride					5.341			7.293			5.067			7.043			5.676
Bicarbonate + Carbonate					80.987			70.652			78.626			71.709			74.548

			Upgradient Northwest									Upgradient Northeast					
Site ID			**MW-84**			**MW-21**			**MW-73**			**MW-81**			**MW-99**		
			4/24/12			4/5/12			4/18/12			4/20/12			4/20/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	8.9	0.44361	34.9	9.4	0.46856	38.0	13.0	0.6487	50.0	11.0	0.5489	42.9	9.1	0.45409	36.8
Magnesium	24.3	2	7.3	0.59659	46.9	5.5	0.45094	36.6	4.9	0.4065	31.3	5.7	0.47151	36.9	4.2	0.34396	27.9
Potassium	39.1	1	0.9	0.02297	1.8	0.9	0.02399	1.9	0.8	0.01982	1.5	0.7	0.019	1.5	0.8	0.02156	1.7
Sodium	23.0	1	4.8	0.20835	16.4	5.2	0.22619	18.4	5.1	0.2214	17.1	5.5	0.23837	18.6	9.3	0.40496	32.8
Iron	55.8	2	0.01	0.00018	0.0	1.63	0.05837	4.7	0.01	0.00018	0.0	0.01	0.00018	0.0	0.04	0.00133	0.1
Manganese	54.9	2	0.00	1.8E-05	0.0	0.07	0.0024	0.2	0.00	1.8E-05	0.0	0.00	1.8E-05	0.0	0.07	0.00245	0.2
Ammonia-N	14.0	1	0.01	0.00036	0.0	0.02	0.00136	0.1	0.01	0.00036	0.0	0.01	0.00036	0.0	0.06	0.0045	0.4
Total Cations (meq/L)				**1.3**			**1.2**			**1.3**			**1.3**			**1.2**	
Anions																	
Alkalinity, Total			58			55			48			49			52		
Carbonate	60.0	2	0.0237	0.00079	0.1	0.0561	0.00187	0.1	0.0143	0.00048	0.0	0.039	0.0013	0.1	0.1913	0.00638	0.5
Bicarbonate	61.0	1	71.08	1.16503	75.7	66.99	1.09797	81.4	57.92	0.94938	70.5	60.07	0.98455	73.7	62.93	1.03147	80.9
Chloride	35.5	1	3.8	0.10747	7.0	5.0	0.14131	10.5	3.2	0.09082	6.7	2.7	0.07729	5.8	2.9	0.08264	6.5
Nitrate-N	14.0	1	0.43	0.0307	2.0	0.01	0.00036	0.0	1.74	0.12422	9.2	1.50	0.10709	8.0	0.02	0.00136	0.1
Sulfate	96.1	2	11.3	0.23528	15.3	5.1	0.10681	7.9	8.7	0.18093	13.4	8.0	0.16553	12.4	7.3	0.15282	12.0
Total Anions (meq/L)				**1.5**			**1.3**			**1.3**			**1.3**			**1.3**	
Total Ions (meq/L)				**2.8**			**2.6**			**2.6**			**2.6**			**2.5**	
Cation/Anion Ratio				**0.83**			**0.91**			**0.96**			**0.96**			**0.97**	
Percent Difference				**-9.5**			**-4.5**			**-1.8**			**-2.2**			**-1.7**	
Trilinear Diagram Data																	
sum (Ca, Mg, Na+K)				1.27			1.17			1.30			1.28			1.22	
Calcium					34.89			40.06			50.04			42.96			37.08
Magnesium					46.92			38.55			31.36			36.90			28.09
Sodium + Potassium					18.19			21.39			18.61			20.14			34.83
					100.0			100.0			100.0						
sum (SO_4, Cl, HCO_3+CO_3)				1.51			1.35			1.22			1.23			1.27	
Sulfate					15.596			7.924			14.811			13.472			12.002
Chloride					7.124			10.484			7.435			6.290			6.491
Bicarbonate + Carbonate					77.280			81.593			77.754			80.238			81.507

			Cross Gradient						Interior											
Site ID			**MW-93**			**MW-95**			**MW-70**			**MW-77**			**MW-78**			**MW-100**		
			4/24/12			4/30/12			4/6/12			4/23/12			4/6/12			4/17/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	28.6	1.42715	46.4	17.4	0.86826	48.7	17.8	0.88822	44.8	23.7	1.18263	45.7	13.2	0.65868	45.2	25.8	1.28743	42.8
Magnesium	24.3	2	15.4	1.26723	41.2	8.2	0.67229	37.7	9.7	0.79408	40.1	12.5	1.02859	39.7	6.2	0.50689	34.8	14.9	1.22609	40.8
Potassium	39.1	1	1.4	0.03683	1.2	1.1	0.02737	1.5	1.3	0.03427	1.7	1.5	0.03785	1.5	1.8	0.04655	3.2	1.9	0.04936	1.6
Sodium	23.0	1	7.7	0.3345	10.9	4.8	0.20879	11.7	6.1	0.26534	13.4	7.8	0.33798	13.1	5.6	0.24359	16.7	8.9	0.38539	12.8
Iron	55.8	2	0.01	0.00018	0.0	0.01	0.00018	0.0	0.01	0.00018	0.0	0.01	0.00018	0.0	0.01	0.00018	0.0	1.41	0.0505	1.7
Manganese	54.9	2	0.21	0.00775	0.3	0.12	0.00433	0.2	0.00	1.8E-05	0.0	0.02	0.00064	0.0	0.00	1.8E-05	0.0	0.22	0.00797	0.3
Ammonia-N	14.0	1	0.05	0.00381	0.1	0.02	0.00163	0.1	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0
Total Cations (meq/L)				**3.1**			**1.8**			**2.0**			**2.6**			**1.5**			**3.0**	
Anions																				
Alkalinity, Total			113			86			84			116			65			129		
Carbonate	60.0	2	0.11	0.00367	0.1	0.1259	0.0042	0.2	0.1319	0.0044	0.2	0.0764	0.00255	0.1	0.0148	0.00049	0.0	0.0478	0.00159	0.1
Bicarbonate	61.0	1	137.64	2.25599	58.2	104.05	1.70555	78.5	101.72	1.66735	78.1	141.36	2.3171	85.9	79.15	1.29731	79.8	157.28	2.57802	85.9
Chloride	35.5	1	2.8	0.08011	2.1	4.8	0.13652	6.3	3.8	0.1069	5.0	5.0	0.14103	5.2	3.8	0.10718	6.6	2.6	0.07305	2.4
Nitrate-N	14.0	1	0.01	0.00086	0.0	0.01	0.00036	0.0	0.04	0.00318	0.1	0.89	0.06361	2.4	0.77	0.0549	3.4	0.01	0.00036	0.0
Sulfate	96.1	2	73.7	1.5345	39.6	15.6	0.32481	15.0	17.0	0.35395	16.6	8.3	0.1724	6.4	8.0	0.16615	10.2	16.8	0.34979	11.6
Total Anions (meq/L)				**3.9**			**2.2**			**2.1**			**2.7**			**1.6**			**3.0**	
Total Ions (meq/L)				**7.0**			**4.0**			**4.1**			**5.3**			**3.1**			**6.0**	
Cation/Anion Ratio				**0.79**			**0.82**			**0.93**			**0.96**			**0.90**			**1.00**	
Percent Difference				**-11.5**			**-9.8**			**-3.7**			**-2.1**			**-5.5**			**0.1**	
Trilinear Diagram Data																				
sum (Ca, Mg, Na+K)				3.07			1.78			1.98			2.59			1.46			2.95	
Calcium					46.55			48.87			44.82			45.71			45.25			43.67
Magnesium					41.34			37.84			40.07			39.76			34.82			41.59
Sodium + Potassium					12.11			13.29			15.12			14.53			19.93			14.75
sum (SO_4, Cl, HCO_3+CO_3)				3.87			2.17			2.13			2.63			1.57			3.00	
Sulfate					39.607			14.961			16.597			6.547			10.575			11.650
Chloride					2.068			6.288			5.013			5.356			6.822			2.433
Bicarbonate + Carbonate					58.325			78.751			78.390			88.097			82.603			85.917

			Vertical to Facilites												Downgradient Northwest					
Site ID			**MW-64**			**MW-66**			**MW-68**			**MW-67**			**MW-72**			**MW-69**		
			4/27/12			4/23/12			4/26/12			4/6/2012			4/17/2012			4/25/2012		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	12.5	0.62375	38.3	21.8	1.08782	38.4	24.0	1.1976	43.9	27.1	1.3523	44.2	25.8	1.28743	43.3	22.6	1.12774	50.4
Magnesium	24.3	2	8.8	0.72331	44.5	16.6	1.36597	48.2	13.9	1.1438	41.9	15.8	1.30014	42.5	15.3	1.259	42.3	9.6	0.78585	35.1
Potassium	39.1	1	1.2	0.0312	1.9	1.3	0.03351	1.2	1.6	0.03964	1.5	1.5	0.0376	1.2	1.8	0.04501	1.5	1.4	0.03632	1.6
Sodium	23.0	1	5.1	0.22184	13.6	8.0	0.34711	12.2	7.1	0.30666	11.2	8.3	0.36277	11.9	7.1	0.30927	10.4	5.9	0.25577	11.4
Iron	55.8	2	0.35	0.01243	0.8	0.01	0.00018	0.0	0.99	0.03553	1.3	0.08	0.00283	0.1	1.73	0.06195	2.1	0.70	0.02518	1.1
Manganese	54.9	2	0.34	0.01227	0.8	0.00	1.8E-05	0.0	0.19	0.00703	0.3	0.06	0.00218	0.1	0.27	0.00968	0.3	0.15	0.00535	0.2
Ammonia-N	14.0	1	0.03	0.00178	0.1	0.01	0.00036	0.0	0.01	0.00086	0.0	0.01	0.00036	0.0	0.02	0.00107	0.0	0.01	0.001	0.0
Total Cations (meq/L)				**1.6**			**2.8**			**2.7**			**3.1**			**3.0**			**2.2**	
Anions																				
Alkalinity, Total			86			122			136			118			114			126		
Carbonate	60.0	2	0.0662	0.00221	0.1	0.0785	0.00262	0.1	0.0875	0.00292	0.1	0.0795	0.00265	0.1	0.0768	0.00256	0.1	0.2335	0.00778	0.3
Bicarbonate	61.0	1	104.30	1.70953	80.5	148.68	2.43701	81.5	165.74	2.71667	86.4	143.80	2.35699	70.7	138.92	2.2771	76.4	153.25	2.51184	85.6
Chloride	35.5	1	3.5	0.09957	4.7	7.5	0.21183	7.1	3.1	0.088	2.8	5.1	0.14385	4.3	3.5	0.09957	3.3	4.7	0.13172	4.5
Nitrate-N	14.0	1	0.01	0.00086	0.0	0.62	0.04426	1.5	0.01	0.00036	0.0	0.56	0.03969	1.2	0.01	0.00036	0.0	0.01	0.00036	0.0
Sulfate	96.1	2	15.0	0.31231	14.7	14.2	0.29566	9.9	16.1	0.33522	10.7	38.0	0.79119	23.7	28.8	0.59964	20.1	13.5	0.28108	9.6
Total Anions (meq/L)				**2.1**			**3.0**			**3.1**			**3.3**			**3.0**			**2.9**	
Total Ions (meq/L)				**3.8**			**5.8**			**5.9**			**6.4**			**6.0**			**5.2**	
Cation/Anion Ratio				**0.77**			**0.95**			**0.87**			**0.92**			**1.00**			**0.76**	
Percent Difference				**-13.3**			**-2.7**			**-7.0**			**-4.3**			**-0.1**			**-13.5**	
Trilinear Diagram Data																				
sum (Ca, Mg, Na+K)				1.60			2.83			2.69			3.05			2.90			2.21	
Calcium					38.98			38.38			44.56			44.30			44.38			51.13
Magnesium					45.20			48.19			42.56			42.59			43.40			35.63
Sodium + Potassium					15.81			13.43			12.88			13.11			12.21			13.24
sum (SO_4, Cl, HCO_3+CO_3)				2.12			2.95			3.14			3.29			2.98			2.93	
Sulfate					14.707			10.032			10.666			24.014			20.130			9.585
Chloride					4.689			7.188			2.800			4.366			3.342			4.492
Bicarbonate + Carbonate					80.605			82.780			86.534			71.620			76.528			85.923

Site ID			Downgradient																	
			MW-75			MW-80			MW-87			MW-85			MW-91			MW-74		
			4/20/2012			4/23/2012			4/20/2012			4/30/2012			4/10/2012			4/20/2012		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	22.8	1.13772	38.8	25.9	1.29242	46.6	36.5	1.82136	40.6	21.1	1.05289	42.1	20.6	1.02794	39.6	39.8	1.98603	39.2
Magnesium	24.3	2	16.5	1.35775	46.3	13.0	1.06974	38.6	25.1	2.06542	46.1	13.4	1.10265	44.1	13.5	1.11088	42.8	30.4	2.50154	49.3
Potassium	39.1	1	1.7	0.04425	1.5	1.6	0.04016	1.4	2.2	0.05525	1.2	1.5	0.03709	1.5	1.5	0.03913	1.5	2.0	0.05141	1.0
Sodium	23.0	1	7.8	0.33841	11.5	6.9	0.30057	10.8	9.4	0.41018	9.1	7.1	0.3097	12.4	7.1	0.30883	11.9	12.2	0.53067	10.5
Iron	55.8	2	1.35	0.04835	1.6	1.68	0.06016	2.2	3.25	0.11639	2.6	0.01	0.00018	0.0	2.70	0.09669	3.7	0.01	0.00018	0.0
Manganese	54.9	2	0.12	0.00444	0.2	0.27	0.00994	0.4	0.37	0.01354	0.3	0.00	1.8E-05	0.0	0.27	0.00997	0.4	0.00	1.8E-05	0.0
Ammonia-N	14.0	1	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.001	0.0	0.01	0.00036	0.0	0.05	0.00351	0.1	0.01	0.00036	0.0
Total Cations (meq/L)				**2.9**			**2.8**			**4.5**			**2.5**			**2.6**			**5.1**	
Anions																				
Alkalinity, Total			98			89			87			92			88			213		
Carbonate	60.0	2	0.0644	0.00215	0.1	0.0824	0.00275	0.1	0.0324	0.00108	0.0	0.0637	0.00212	0.1	0.0374	0.00125	0.0	0.3947	0.01316	0.2
Bicarbonate	61.0	1	119.06	1.95156	63.8	107.92	1.76899	63.5	106.44	1.74466	39.0	112.60	1.8456	68.3	107.16	1.75649	62.0	259.06	4.2462	80.0
Chloride	35.5	1	7.7	0.21634	7.1	4.7	0.13313	4.8	4.5	0.12777	2.9	6.8	0.19152	7.1	8.4	0.23609	8.3	20.5	0.57823	10.9
Nitrate-N	14.0	1	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.12	0.00878	0.3	0.03	0.00243	0.1	0.48	0.03448	0.6
Sulfate	96.1	2	42.6	0.88697	29.0	42.3	0.88072	31.6	125.0	2.60261	58.1	31.4	0.65377	24.2	40.2	0.837	29.5	20.9	0.43516	8.2
Total Anions (meq/L)				**3.1**			**2.8**			**4.5**			**2.7**			**2.8**			**5.3**	
Total Ions (meq/L)				**6.0**			**5.6**			**9.0**			**5.2**			**5.4**			**10.4**	
Cation/Anion Ratio				**0.96**			**1.00**			**1.00**			**0.93**			**0.92**			**0.96**	
Percent Difference				**-2.1**			**-0.2**			**0.1**			**-3.8**			**-4.4**			**-2.3**	
Trilinear Diagram Data																				
sum (Ca, Mg, Na+K)				2.88			2.70			4.35			2.50			2.49			5.07	
Calcium					39.53			47.82			41.85			42.08			41.34			39.17
Magnesium					47.17			39.58			47.46			44.06			44.67			49.34
Sodium + Potassium					13.30			12.61			10.69			13.86			13.99			11.48
sum (SO_4, Cl, HCO_3+CO_3)				3.06			2.79			4.48			2.69			2.83			5.27	
Sulfate					29.014			31.617			58.144			24.277			29.567			8.253
Chloride					7.077			4.779			2.855			7.112			8.340			10.966
Bicarbonate + Carbonate					63.909			63.604			39.001			68.612			62.093			80.781

Site ID			Downgradient														
			MW-86			**MW-88**			**MW-89**			**MW-90**			**MW-43**		
			4/30/2012			4/17/2012			4/10/2012			4/9/2012			4/6/2012		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	11.8	0.58882	40.8	9.0	0.44711	36.2	12.7	0.63373	34.5	15.6	0.77844	41.6	12.2	0.60878	37.2
Magnesium	24.3	2	7.2	0.59165	41.0	6.5	0.53158	43.0	9.4	0.77186	42.0	9.2	0.75293	40.3	8.5	0.70109	42.8
Potassium	39.1	1	1.1	0.02737	1.9	0.8	0.02108	1.7	1.3	0.03402	1.9	1.2	0.03069	1.6	1.2	0.03069	1.9
Sodium	23.0	1	5.2	0.22532	15.6	5.4	0.23619	19.1	8.2	0.35842	19.5	5.9	0.25707	13.8	5.9	0.25751	15.7
Iron	55.8	2	0.28	0.01003	0.7	0.01	0.00018	0.0	0.81	0.02897	1.6	1.10	0.03939	2.1	0.87	0.03126	1.9
Manganese	54.9	2	0.01	0.00022	0.0	0.00	1.8E-05	0.0	0.24	0.00877	0.5	0.27	0.00968	0.5	0.21	0.00764	0.5
Ammonia-N	14.0	1	0.01	0.00036	0.0	0.01	0.00036	0.0	0.02	0.00121	0.1	0.01	0.001	0.1	0.02	0.00166	0.1
Total Cations (meq/L)				**1.4**			**1.2**			**1.8**			**1.9**			**1.6**	
Anions																	
Alkalinity, Total			65			53			76			69			71		
Carbonate	60.0	2	0.02645	0.00088	0.0	0.05947	0.00198	0.2	0.09713	0.00324	0.2	0.0544	0.00181	0.1	0.05998	0.002	0.1
Bicarbonate	61.0	1	79.37	1.30092	73.3	64.78	1.06186	81.5	92.16	1.51053	73.3	83.70	1.37198	67.2	86.13	1.41179	79.2
Chloride	35.5	1	4.1	0.11508	6.5	2.4	0.06713	5.2	7.0	0.19716	9.6	3.7	0.10521	5.2	3.1	0.08772	4.9
Nitrate-N	14.0	1	0.32	0.02299	1.3	0.48	0.03398	2.6	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0
Sulfate	96.1	2	16.1	0.33522	18.9	6.6	0.13783	10.6	16.8	0.34979	17.0	27.0	0.56216	27.5	13.5	0.28108	15.8
Total Anions (meq/L)				**1.8**			**1.3**			**2.1**			**2.0**			**1.8**	
Total Ions (meq/L)				**3.2**			**2.5**			**3.9**			**3.9**			**3.4**	
Cation/Anion Ratio				**0.81**			**0.95**			**0.89**			**0.92**			**0.92**	
Percent Difference				**-10.3**			**-2.6**			**-5.7**			**-4.4**			**-4.2**	
Trilinear Diagram Data																	
sum (Ca, Mg, Na+K)				1.43			1.24			1.80			1.82			1.60	
Calcium					41.09			36.18			35.25			42.79			38.09
Magnesium					41.28			43.01			42.93			41.39			43.87
Sodium + Potassium					17.63			20.82			21.83			15.82			18.03
sum (SO_4, Cl, HCO_3+CO_3)				1.75			1.27			2.06			2.04			1.78	
Sulfate					19.132			10.863			16.974			27.541			15.768
Chloride					6.568			5.291			9.568			5.154			4.921
Bicarbonate + Carbonate					74.300			83.846			73.458			67.304			79.311

Table 4
Ion Balance Calculations
Cedar Hills Landfill Regional Aquifer Groundwater Monitoring Wells

Data Collected from July 1, 2012 September 30, 2012

			Upgradient South								
Site ID			**MW-56** 7/13/12			**MW-57** 7/9/12			**MW-76** 7/17/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	15.3	0.76347	50.8	17.1	0.85329	36.3	15.5	0.77345	46.5
Magnesium	24.3	2	6.1	0.49784	33.1	9.9	0.81465	34.6	6.7	0.5538	33.3
Potassium	39.1	1	1.0	0.02509	1.7	1.0	0.02453	1.0	1.2	0.03018	1.8
Sodium	23.0	1	4.9	0.21357	14.2	6.7	0.29013	12.3	7.0	0.30492	18.3
Iron	55.8	2	0.01	0.00036	0.0	10.00	0.35812	15.2	0.01	0.00036	0.0
Manganese	54.9	2	0.07	0.00265	0.2	0.30	0.01074	0.5	0.00	3.6E-05	0.0
Ammonia-N	14.0	1	0.01	0.00071	0.0	0.03	0.00238	0.1	0.01	0.00071	0.0
Total Cations (meq/L)				**1.5**			**2.4**			**1.7**	
Anions											
Alkalinity, Total			53			87			56		
Carbonate	60.0	2	0.0399	0.00133	0.1	0.0218	0.00073	0.0	0.0091	0.0003	0.0
Bicarbonate	61.0	1	64.21	1.05251	66.8	106.10	1.73901	76.7	68.79	1.12753	63.5
Chloride	35.5	1	3.92	0.11057	7.0	5.32	0.15006	6.6	11.30	0.31873	18.0
Nitrate-N	14.0	1	0.33	0.02349	1.5	0.01	0.00071	0.0	0.38	0.02684	1.5
Sulfate	96.1	2	18.6	0.38727	24.6	18.1	0.37686	16.6	14.5	0.3019	17.0
Total Anions (meq/L)				**1.6**			**2.3**			**1.8**	
Total Ions (meq/L)				**3.1**			**4.6**			**3.4**	
Cation/Anion Ratio				**0.95**			**1.04**			**0.94**	
Percent Difference				**-2.3**			**1.9**			**-3.3**	
Trilinear Diagram Data											
sum (Ca, Mg, Na+K)				1.50			1.98			1.66	
Calcium					50.90			43.04			46.53
Magnesium					33.19			41.09			33.31
Sodium + Potassium					15.91			15.87			20.16
sum (SO_4, Cl, HCO_3+CO_3)				1.55			2.27			1.75	
Sulfate					24.958			16.626			17.267
Chloride					7.126			6.620			18.229
Bicarbonate + Carbonate					67.916			76.754			64.504

			Upgradient South								
Site ID			**MW-83** 7/17/12			**MW-60** 7/25/12			**MW-94** 7/19/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	29.7	1.48204	52.1	17.3	0.86327	47.0	27.9	1.39222	50.3
Magnesium	24.3	2	12.2	1.00391	35.3	8.4	0.69368	37.8	12.3	1.01214	36.6
Potassium	39.1	1	2.1	0.05397	1.9	1.1	0.02839	1.5	2.1	0.05422	2.0
Sodium	23.0	1	7.0	0.30579	10.7	5.7	0.24837	13.5	7.0	0.30579	11.1
Iron	55.8	2	0.01	0.00036	0.0	0.02	0.00064	0.0	0.01	0.00036	0.0
Manganese	54.9	2	0.00	5.1E-05	0.0	0.00	3.6E-05	0.0	0.00	3.6E-05	0.0
Ammonia-N	14.0	1	0.01	0.00071	0.0	0.01	0.00071	0.0	0.01	0.00071	0.0
Total Cations (meq/L)				**2.8**			**1.8**			**2.8**	
Anions											
Alkalinity, Total			107			86			108		
Carbonate	60.0	2	0.0499	0.00166	0.1	0.0576	0.00192	0.1	0.0528	0.00176	0.1
Bicarbonate	61.0	1	130.44	2.13801	71.4	104.19	1.70782	84.4	131.65	2.15792	73.7
Chloride	35.5	1	20.70	0.58387	19.5	2.51	0.0708	3.5	19.60	0.55284	18.9
Nitrate-N	14.0	1	0.45	0.03234	1.1	1.25	0.08924	4.4	1.18	0.08424	2.9
Sulfate	96.1	2	11.40	0.23736	7.9	7.39	0.15387	7.6	6.26	0.13034	4.5
Total Anions (meq/L)				**3.0**			**2.0**			**2.9**	
Total Ions (meq/L)				**5.8**			**3.9**			**5.7**	
Cation/Anion Ratio				**0.95**			**0.91**			**0.94**	
Percent Difference				**-2.5**			**-4.9**			**-2.8**	
Trilinear Diagram Data											
sum (Ca, Mg, Na+K)				2.85			1.83			2.76	
Calcium					52.08			47.08			50.36
Magnesium					35.28			37.83			36.61
Sodium + Potassium					12.64			15.09			13.02
sum (SO_4, Cl, HCO_3+CO_3)				2.96			1.93			2.84	
Sulfate					8.016			7.954			4.585
Chloride					19.719			3.660			19.447
Bicarbonate + Carbonate					72.264			88.386			75.968

Table 4
Ion Balance Calculations
Cedar Hills Landfill Regional Aquifer Groundwater Monitoring Wells

Data Collected from July 1, 2012 September 30, 2012

			Upgradient South														
Site ID			**MW-82**			**MW-65**			**MW-58A**			**MW-59**			**MW-24**		
			7/3/12			7/17/12			7/10/12			7/3/12			7/18/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	24.3	1.21257	43.3	11.9	0.59381	37.7	16.4	0.81836	43.3	13.1	0.65369	37.2	13.3	0.66367	37.7
Magnesium	24.3	2	14.9	1.22609	43.8	6.8	0.5612	35.7	9.0	0.74141	39.2	8.3	0.68299	38.9	8.7	0.71179	40.4
Potassium	39.1	1	1.8	0.04476	1.6	0.9	0.02409	1.5	1.0	0.02583	1.4	1.0	0.02634	1.5	0.9	0.02279	1.3
Sodium	23.0	1	7.2	0.31275	11.2	5.1	0.22314	14.2	5.7	0.24794	13.1	5.4	0.23663	13.5	5.5	0.23706	13.5
Iron	55.8	2	0.01	0.00036	0.0	4.58	0.16402	10.4	1.04	0.03724	2.0	4.25	0.1522	8.7	3.30	0.11818	6.7
Manganese	54.9	2	0.00	3.6E-05	0.0	0.18	0.00652	0.4	0.37	0.01343	0.7	0.11	0.00397	0.2	0.11	0.00382	0.2
Ammonia-N	14.0	1	0.01	0.00071	0.0	0.01	0.00071	0.0	0.07	0.00485	0.3	0.01	0.00093	0.1	0.04	0.00268	0.2
Total Cations (meq/L)				**2.8**			**1.6**			**1.9**			**1.8**			**1.8**	
Anions																	
Alkalinity, Total			122			53			76			62			64		
Carbonate	60.0	2	0.0556	0.00185	0.1	0.035	0.00117	0.1	0.1017	0.00339	0.2	0.0444	0.00148	0.1	0.0455	0.00152	0.1
Bicarbonate	61.0	1	148.73	2.43778	80.4	64.71	1.06067	68.7	92.15	1.51038	77.6	74.94	1.22833	71.6	78.48	1.28629	74.7
Chloride	35.5	1	6.40	0.18052	6.0	4.24	0.11959	7.7	3.71	0.10465	5.4	3.91	0.11029	6.4	3.42	0.09647	5.6
Nitrate-N	14.0	1	0.62	0.04419	1.5	0.01	0.00071	0.0	0.01	0.00071	0.0	0.01	0.00071	0.0	0.01	0.00071	0.0
Sulfate	96.1	2	17.70	0.36853	12.2	17.40	0.36228	23.5	15.70	0.32689	16.8	18.00	0.37478	21.8	16.20	0.3373	19.6
Total Anions (meq/L)				**3.0**			**1.5**			**1.9**			**1.7**			**1.7**	
Total Ions (meq/L)				**5.8**			**3.1**			**3.8**			**3.5**			**3.5**	
Cation/Anion Ratio				**0.92**			**1.02**			**0.97**			**1.02**			**1.02**	
Percent Difference				**-4.0**			**0.9**			**-1.5**			**1.2**			**1.1**	
Trilinear Diagram Data																	
sum (Ca, Mg, Na+K)				2.80			1.40			1.83			1.60			1.64	
Calcium					43.37			42.35			44.63			40.86			40.58
Magnesium					43.85			40.02			40.44			42.70			43.53
Sodium + Potassium					12.79			17.63			14.93			16.44			15.89
sum (SO_4, Cl, HCO_3+CO_3)				2.99			1.54			1.95			1.71			1.72	
Sulfate					12.331			23.468			16.804			21.854			19.592
Chloride					6.040			7.747			5.379			6.431			5.603
Bicarbonate + Carbonate					81.629			68.785			77.817			71.714			74.804

Table 4
Ion Balance Calculations
Cedar Hills Landfill Regional Aquifer Groundwater Monitoring Wells

Data Collected from July 1, 2012 September 30, 2012

			Upgradient Northwest									Upgradient Northeast					
Site ID				**MW-84**			**MW-21**			**MW-73**			**MW-81**			**MW-99**	
				7/18/12			7/31/12			7/23/12			7/17/12			7/20/12	
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	10.4	0.51896	36.1	10.2	0.50898	39.0	11.9	0.59381	43.4	10.7	0.53393	43.2	8.5	0.42365	35.6
Magnesium	24.3	2	7.9	0.6476	45.0	5.6	0.46081	35.3	6.2	0.51183	37.4	5.5	0.45258	36.6	4.0	0.33162	27.9
Potassium	39.1	1	1.0	0.02494	1.7	1.0	0.02527	1.9	0.8	0.02018	1.5	0.7	0.01872	1.5	0.8	0.02108	1.8
Sodium	23.0	1	5.7	0.24576	17.1	5.6	0.24402	18.7	5.6	0.24228	17.7	5.3	0.23054	18.6	9.3	0.40627	34.1
Iron	55.8	2	0.01	0.00036	0.0	1.78	0.06375	4.9	0.01	0.00036	0.0	0.01	0.00036	0.0	0.04	0.00133	0.1
Manganese	54.9	2	0.00	3.6E-05	0.0	0.07	0.0026	0.2	0.00	3.6E-05	0.0	0.00	3.6E-05	0.0	0.06	0.00219	0.2
Ammonia-N	14.0	1	0.01	0.00071	0.0	0.01	0.00071	0.1	0.01	0.00071	0.1	0.01	0.00071	0.1	0.06	0.00455	0.4
Total Cations (meq/L)				**1.4**			**1.3**			**1.4**			**1.2**			**1.2**	
Anions																	
Alkalinity, Total			57			53			54			51			52		
Carbonate	60.0	2	0.0299	0.001	0.1	0.1257	0.00419	0.3	0.0489	0.00163	0.1	0.0356	0.00119	0.1	0.2136	0.00712	0.6
Bicarbonate	61.0	1	69.72	1.14283	75.2	64.04	1.04965	84.6	65.54	1.07421	72.7	61.54	1.00866	73.1	62.64	1.02672	79.9
Chloride	35.5	1	3.85	0.10859	7.1	2.83	0.07982	6.4	3.11	0.08772	5.9	3.23	0.09111	6.6	3.16	0.08913	6.9
Nitrate-N	14.0	1	0.40	0.02834	1.9	0.01	0.00071	0.1	1.74	0.12422	8.4	1.52	0.10852	7.9	0.03	0.00186	0.1
Sulfate	96.1	2	11.50	0.23944	15.8	5.08	0.10577	8.5	9.15	0.19051	12.9	8.15	0.16969	12.3	7.69	0.16011	12.5
Total Anions (meq/L)				**1.5**			**1.2**			**1.5**			**1.4**			**1.3**	
Total Ions (meq/L)				**3.0**			**2.5**			**2.8**			**2.6**			**2.5**	
Cation/Anion Ratio				**0.95**			**1.05**			**0.93**			**0.90**			**0.93**	
Percent Difference				**-2.8**			**2.6**			**-3.8**			**-5.4**			**-3.8**	
Trilinear Diagram Data																	
sum (Ca, Mg, Na+K)				1.44			1.24			1.37			1.24			1.18	
Calcium					36.11			41.08			43.40			43.21			35.82
Magnesium					45.06			37.19			37.41			36.62			28.04
Sodium + Potassium					18.83			21.73			19.18			20.17			36.14
					100.0			100.0			100.0						
sum (SO_4, Cl, HCO_3+CO_3)				1.49			1.24			1.35			1.27			1.28	
Sulfate					16.050			8.534			14.069			13.355			12.479
Chloride					7.279			6.440			6.478			7.170			6.947
Bicarbonate + Carbonate					76.671			85.026			79.452			79.475			80.575

Table 4
Ion Balance Calculations
Cedar Hills Landfill Regional Aquifer Groundwater Monitoring Wells

Data Collected from July 1, 2012 September 30, 2012

			Cross Gradient						Interior												
Site ID			**MW-93**			**MW-95**			**MW-70**			**MW-77**			**MW-78**			**MW-100**		
			7/19/12			7/27/12			7/13/12			8/30/12			8/30/12			7/27/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	35.5	1.77146	47.9	18.5	0.92315	45.0	16.8	0.83832	42.5	22.6	1.12774	46.5	15.1	0.75349	46.4	25.9	1.29242	41.8
Magnesium	24.3	2	17.9	1.47295	39.9	10.2	0.83933	41.0	10.0	0.82288	41.7	11.4	0.93808	38.7	6.8	0.56202	34.6	15.7	1.29192	41.8
Potassium	39.1	1	1.6	0.0399	1.1	1.1	0.02865	1.4	1.4	0.03657	1.9	1.5	0.03734	1.5	2.1	0.05346	3.3	1.9	0.04732	1.5
Sodium	23.0	1	9.1	0.3967	10.7	5.8	0.25098	12.2	6.3	0.27447	13.9	7.3	0.3184	13.1	5.9	0.25533	15.7	9.1	0.3967	12.8
Iron	55.8	2	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	1.53	0.05479	1.8
Manganese	54.9	2	0.25	0.00917	0.2	0.13	0.00473	0.2	0.00	3.6E-05	0.0	0.02	0.00058	0.0	0.00	3.6E-05	0.0	0.22	0.00808	0.3
Ammonia-N	14.0	1	0.07	0.00476	0.1	0.03	0.00226	0.1	0.01	0.00071	0.0	0.01	0.00071	0.0	0.01	0.00071	0.0	0.01	0.00071	0.0
Total Cations (meq/L)				**3.7**			**2.0**			**2.0**			**2.4**			**1.6**			**3.1**	
Anions																				
Alkalinity, Total			112			85			80			109			69			132		
Carbonate	60.0	2	0.1116	0.00372	0.1	0.1018	0.00339	0.2	0.0962	0.00321	0.2	0.0475	0.00158	0.1	0.0093	0.00031	0.0	0.0501	0.00167	0.1
Bicarbonate	61.0	1	136.41	2.23594	56.8	103.49	1.69635	78.3	97.77	1.60255	77.4	132.88	2.17809	85.1	84.16	1.37948	79.1	160.94	2.63793	84.6
Chloride	35.5	1	2.76	0.07785	2.0	5.05	0.14244	6.6	3.73	0.10521	5.1	4.86	0.13708	5.4	4.68	0.13201	7.6	2.36	0.06657	2.1
Nitrate-N	14.0	1	0.02	0.00107	0.0	0.01	0.00071	0.0	0.03	0.00236	0.1	0.88	0.06297	2.5	0.93	0.06647	3.8	0.01	0.00071	0.0
Sulfate	96.1	2	77.60	1.6157	41.1	15.60	0.32481	15.0	17.10	0.35604	17.2	8.61	0.17927	7.0	7.94	0.16532	9.5	19.70	0.41017	13.2
Total Anions (meq/L)				**3.9**			**2.2**			**2.1**			**2.6**			**1.7**			**3.1**	
Total Ions (meq/L)				**7.6**			**4.2**			**4.0**			**5.0**			**3.4**			**6.2**	
Cation/Anion Ratio				**0.94**			**0.95**			**0.95**			**0.95**			**0.93**			**0.99**	
Percent Difference				**-3.1**			**-2.8**			**-2.4**			**-2.7**			**-3.5**			**-0.4**	
Trilinear Diagram Data																				
sum (Ca, Mg, Na+K)				3.68			2.04			1.97			2.42			1.62			3.03	
Calcium					48.12			45.21			42.51			46.57			46.39			42.68
Magnesium					40.01			41.10			41.72			38.74			34.60			42.66
Sodium + Potassium					11.86			13.69			15.77			14.69			19.01			14.66
sum (SO_4, Cl, HCO_3+CO_3)				3.93			2.17			2.07			2.50			1.68			3.12	
Sulfate					41.078			14.989			17.225			7.182			9.857			13.162
Chloride					1.979			6.573			5.090			5.492			7.871			2.136
Bicarbonate + Carbonate					56.942			78.438			77.685			87.326			82.272			84.702

Table 4
Ion Balance Calculations
Cedar Hills Landfill Regional Aquifer Groundwater Monitoring Wells

Data Collected from July 1, 2012 September 30, 2012

			Vertical to Facilites												**Downgradient Northwest**					
Site ID			**MW-64**			**MW-66**			**MW-68**			**MW-67**			**MW-72**			**MW-69**		
			7/19/12			7/18/12			7/25/12			7/24/2012			7/26/2012			No Sample		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	17.4	0.86826	35.5	21.2	1.05788	37.9	26.0	1.29741	43.6	27.7	1.38224	43.8	25.2	1.25749	42.2			
Magnesium	24.3	2	14.6	1.2014	49.2	16.4	1.34952	48.4	15.1	1.24254	41.7	16.5	1.35775	43.0	15.6	1.28369	43.1			
Potassium	39.1	1	1.5	0.03888	1.6	1.3	0.03299	1.2	1.6	0.04016	1.3	1.5	0.03785	1.2	1.7	0.04246	1.4			
Sodium	23.0	1	6.8	0.29578	12.1	8.0	0.34624	12.4	8.1	0.3532	11.9	8.5	0.36929	11.7	7.1	0.30796	10.3			
Iron	55.8	2	0.59	0.02109	0.9	0.01	0.00036	0.0	0.99	0.0356	1.2	0.08	0.00295	0.1	2.15	0.077	2.6			
Manganese	54.9	2	0.43	0.01551	0.6	0.00	3.6E-05	0.0	0.21	0.00757	0.3	0.09	0.00336	0.1	0.28	0.01001	0.3			
Ammonia-N	14.0	1	0.03	0.00192	0.1	0.01	0.00071	0.0	0.02	0.00114	0.0	0.01	0.00071	0.0	0.02	0.00143	0.0			
Total Cations (meq/L)				**2.4**			**2.8**			**3.0**			**3.2**			**3.0**				
Anions																				
Alkalinity, Total			90			119			133			117			114					
Carbonate	60.0	2	0.0568	0.00189	0.1	0.0637	0.00212	0.1	0.0696	0.00232	0.1	0.0612	0.00204	0.1	0.0924	0.00308	0.1			
Bicarbonate	61.0	1	110.05	1.80383	70.5	145.05	2.37752	80.9	162.12	2.65728	84.9	142.62	2.33761	70.3	138.89	2.27658	74.1			
Chloride	35.5	1	2.99	0.08434	3.3	7.35	0.20732	7.1	2.87	0.08095	2.6	4.92	0.13878	4.2	3.71	0.10465	3.4			
Nitrate-N	14.0	1	0.03	0.00178	0.1	0.65	0.04612	1.6	0.01	0.00071	0.0	0.52	0.03727	1.1	0.01	0.00071	0.0			
Sulfate	96.1	2	32.10	0.66835	26.1	14.60	0.30398	10.3	18.70	0.38935	12.4	38.80	0.80785	24.3	33.00	0.68709	22.4			
Total Anions (meq/L)				**2.6**			**2.9**			**3.1**			**3.3**			**3.1**				
Total Ions (meq/L)				**5.0**			**5.7**			**6.1**			**6.5**			**6.1**				
Cation/Anion Ratio				**0.95**			**0.95**			**0.95**			**0.95**			**0.97**				
Percent Difference				**-2.3**			**-2.6**			**-2.5**			**-2.6**			**-1.5**				
Trilinear Diagram Data																				
sum (Ca, Mg, Na+K)				2.40			2.79			2.93			3.15			2.89				
Calcium					36.11			37.96			44.23			43.92			43.49			
Magnesium					49.97			48.43			42.36			43.14			44.39			
Sodium + Potassium					13.92			13.61			13.41			12.94			12.12			
sum (SO_4, Cl, HCO_3+CO_3)				2.56			2.89			3.13			3.29			3.07				
Sulfate					26.124			10.515			12.440			24.583			22.371			
Chloride					3.296			7.171			2.586			4.223			3.407			
Bicarbonate + Carbonate					70.580			82.314			84.974			71.195			74.222			

Table 4
Ion Balance Calculations
Cedar Hills Landfill Regional Aquifer Groundwater Monitoring Wells

Data Collected from July 1, 2012 September 30, 2012

			Downgradient																	
Site ID			**MW-75**			**MW-80**			**MW-87**			**MW-85**			**MW-91**			**MW-74**		
			7/23/2012			7/16/2012			7/20/2012			7/27/2012			7/16/2012			7/23/2012		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	21.7	1.08283	37.0	25.2	1.25749	46.4	35.1	1.7515	40.9	21.5	1.07285	41.8	21.6	1.07784	39.9	39.6	1.97605	39.2
Magnesium	24.3	2	16.9	1.39066	47.6	12.8	1.05328	38.8	23.8	1.95844	45.8	13.7	1.12734	43.9	14.1	1.16026	42.9	30.6	2.518	50.0
Potassium	39.1	1	1.6	0.04169	1.4	1.5	0.03862	1.4	2.0	0.05166	1.2	1.3	0.03402	1.3	1.6	0.04195	1.6	1.9	0.0486	1.0
Sodium	23.0	1	7.9	0.34537	11.8	6.9	0.29796	11.0	8.9	0.38669	9.0	7.6	0.33015	12.9	7.4	0.32101	11.9	11.4	0.49587	9.8
Iron	55.8	2	1.64	0.05873	2.0	1.53	0.05479	2.0	3.26	0.11675	2.7	0.01	0.00036	0.0	2.51	0.08989	3.3	0.01	0.00036	0.0
Manganese	54.9	2	0.12	0.00448	0.2	0.24	0.00856	0.3	0.35	0.01285	0.3	0.00	3.6E-05	0.0	0.28	0.01001	0.4	0.00	3.6E-05	0.0
Ammonia-N	14.0	1	0.01	0.00071	0.0	0.01	0.00071	0.0	0.02	0.00107	0.0	0.01	0.00071	0.0	0.03	0.00206	0.1	0.01	0.00071	0.0
Total Cations (meq/L)				**2.9**			**2.7**			**4.3**			**2.6**			**2.7**			**5.0**	
Anions																				
Alkalinity, Total			96			89			87			93			92			207		
Carbonate	60.0	2	0.0592	0.00197	0.1	0.0945	0.00315	0.1	0.0385	0.00128	0.0	0.0641	0.00214	0.1	0.0621	0.00207	0.1	0.1756	0.00585	0.1
Bicarbonate	61.0	1	117.37	1.92374	62.2	107.78	1.76658	62.5	105.45	1.72845	38.2	113.33	1.85758	68.3	112.36	1.84165	63.8	252.18	4.13352	77.9
Chloride	35.5	1	8.28	0.23355	7.6	4.89	0.13793	4.9	5.14	0.14498	3.2	7.14	0.20139	7.4	7.30	0.20591	7.1	23.20	0.65439	12.3
Nitrate-N	14.0	1	0.01	0.00071	0.0	0.01	0.00071	0.0	0.02	0.00107	0.0	0.12	0.00871	0.3	0.02	0.00129	0.0	0.49	0.03477	0.7
Sulfate	96.1	2	44.70	0.93069	30.1	44.00	0.91612	32.4	127.00	2.64425	58.5	31.30	0.65169	23.9	40.20	0.837	29.0	22.80	0.47472	9.0
Total Anions (meq/L)				**3.1**			**2.8**			**4.5**			**2.7**			**2.9**			**5.3**	
Total Ions (meq/L)				**6.0**			**5.5**			**8.8**			**5.3**			**5.6**			**10.3**	
Cation/Anion Ratio				**0.95**			**0.96**			**0.95**			**0.94**			**0.94**			**0.95**	
Percent Difference				**-2.8**			**-2.0**			**-2.7**			**-3.0**			**-3.3**			**-2.5**	
Trilinear Diagram Data																				
sum (Ca, Mg, Na+K)				2.86			2.65			4.15			2.56			2.60			5.04	
Calcium					37.85			47.50			42.22			41.84			41.44			39.22
Magnesium					48.62			39.79			47.21			43.96			44.61			49.98
Sodium + Potassium					13.53			12.71			10.57			14.20			13.95			10.81
sum (SO_4, Cl, HCO_3+CO_3)				3.09			2.82			4.52			2.71			2.89			5.27	
Sulfate					30.120			32.443			58.514			24.023			28.996			9.010
Chloride					7.558			4.885			3.208			7.424			7.133			12.421
Bicarbonate + Carbonate					62.322			62.673			38.277			68.553			63.871			78.569

Table 4
Ion Balance Calculations
Cedar Hills Landfill Regional Aquifer Groundwater Monitoring Wells

Data Collected from July 1, 2012 September 30, 2012

			Downgradient														
Site ID			**MW-86**			**MW-88**			**MW-89**			**MW-90**			**MW-43**		
			7/16/2012			7/25/2012			7/13/2012			7/16/2012			7/3/2012		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	12.9	0.64371	39.2	8.3	0.41367	34.6	12.5	0.62375	33.6	16.2	0.80838	42.1	12.1	0.60379	35.9
Magnesium	24.3	2	8.5	0.70191	42.7	6.4	0.52582	44.0	9.6	0.79325	42.7	9.3	0.76445	39.9	8.9	0.73318	43.6
Potassium	39.1	1	1.1	0.02762	1.7	0.8	0.02018	1.7	1.4	0.03683	2.0	1.3	0.03402	1.8	1.3	0.03351	2.0
Sodium	23.0	1	6.0	0.25881	15.8	5.4	0.23402	19.6	8.3	0.36103	19.5	6.0	0.26055	13.6	6.1	0.26621	15.8
Iron	55.8	2	0.29	0.01024	0.6	0.01	0.00036	0.0	0.85	0.03055	1.6	1.14	0.04083	2.1	0.94	0.03366	2.0
Manganese	54.9	2	0.01	0.0002	0.0	0.00	3.6E-05	0.0	0.25	0.00917	0.5	0.25	0.00892	0.5	0.23	0.00841	0.5
Ammonia-N	14.0	1	0.01	0.00071	0.0	0.01	0.00071	0.1	0.02	0.00143	0.1	0.02	0.00107	0.1	0.02	0.00166	0.1
Total Cations (meq/L)				**1.6**			**1.2**			**1.9**			**1.9**			**1.7**	
Anions																	
Alkalinity, Total			65			52			75			69			70		
Carbonate	60.0	2	0.03893	0.0013	0.1	0.02801	0.00093	0.1	0.08946	0.00298	0.2	0.067	0.00223	0.1	0.06807	0.00227	0.1
Bicarbonate	61.0	1	78.98	1.29451	72.8	63.75	1.04491	80.7	90.95	1.49079	77.2	83.80	1.37356	68.1	85.14	1.39552	78.4
Chloride	35.5	1	4.05	0.11424	6.4	2.43	0.06854	5.3	3.78	0.10662	5.5	3.84	0.10831	5.4	3.37	0.09506	5.3
Nitrate-N	14.0	1	0.38	0.02741	1.5	0.55	0.03912	3.0	0.01	0.00071	0.0	0.01	0.00071	0.0	0.01	0.00071	0.0
Sulfate	96.1	2	16.40	0.34146	19.2	6.78	0.14117	10.9	15.90	0.33105	17.1	25.50	0.53093	26.3	13.80	0.28733	16.1
Total Anions (meq/L)				**1.8**			**1.3**			**1.9**			**2.0**			**1.8**	
Total Ions (meq/L)				**3.4**			**2.5**			**3.8**			**3.9**			**3.5**	
Cation/Anion Ratio				**0.92**			**0.92**			**0.96**			**0.95**			**0.94**	
Percent Difference				**-4.0**			**-4.0**			**-2.0**			**-2.5**			**-2.9**	
Trilinear Diagram Data																	
sum (Ca, Mg, Na+K)				1.63			1.19			1.81			1.87			1.64	
Calcium					39.44			34.66			34.37			43.29			36.89
Magnesium					43.01			44.05			43.71			40.94			44.80
Sodium + Potassium					17.55			21.30			21.92			15.77			18.31
sum (SO_4, Cl, HCO_3+CO_3)				1.75			1.26			1.93			2.02			1.78	
Sulfate					19.495			11.243			17.140			26.348			16.140
Chloride					6.522			5.459			5.520			5.375			5.340
Bicarbonate + Carbonate					73.982			83.298			77.340			68.276			78.520

Site ID			Upgradient South																	
			MW-56			MW-57			MW-76			MW-83			MW-60			MW-94		
			10/2/12			10/8/12			10/26/12			10/18/12			10/9/12			10/18/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	15.1	0.75349	50.0	16.0	0.7984	37.6	16.6	0.82834	46.7	41.4	2.06587	51.7	16.0	0.7984	48.2	30.9	1.54192	48.4
Magnesium	24.3	2	6.3	0.5217	34.6	8.7	0.7159	33.7	7.3	0.60235	33.9	18.1	1.48941	37.3	7.4	0.61222	36.9	15.2	1.25077	39.3
Potassium	39.1	1	1.0	0.02481	1.6	0.9	0.02235	1.1	1.2	0.02992	1.7	2.8	0.07213	1.8	1.0	0.02634	1.6	2.3	0.05934	1.9
Sodium	23.0	1	4.7	0.20487	13.6	6.0	0.26142	12.3	7.2	0.31318	17.7	8.4	0.36625	9.2	5.1	0.2201	13.3	7.6	0.33145	10.4
Iron	55.8	2	0.01	0.00018	0.0	8.83	0.31622	14.9	0.01	0.00018	0.0	0.01	0.00018	0.0	0.01	0.00036	0.0	0.01	0.00018	0.0
Manganese	54.9	2	0.08	0.003	0.2	0.24	0.0087	0.4	0.00	1.8E-05	0.0	0.00	1.8E-05	0.0	0.00	1.8E-05	0.0	0.00	1.8E-05	0.0
Ammonia-N	14.0	1	0.01	0.00036	0.0	0.02	0.00144	0.1	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0
Total Cations (meq/L)				**1.5**			**2.1**			**1.8**			**4.0**			**1.7**			**3.2**	
Anions																				
Alkalinity, Total			57			88			56			145			83			120		
Carbonate	60.0	2	0.0342	0.00114	0.1	0.0357	0.00119	0.1	0.0066	0.00022	0.0	0.0891	0.00297	0.1	0.0314	0.00105	0.1	0.0887	0.00296	0.1
Bicarbonate	61.0	1	69.47	1.13869	66.8	107.17	1.75654	76.3	68.67	1.12561	57.7	176.72	2.89659	73.4	101.07	1.6567	85.3	146.22	2.39668	75.4
Chloride	35.5	1	4.2	0.11903	7.0	5.5	0.15598	6.8	11.7	0.33001	16.9	30.2	0.85183	21.6	1.5	0.04118	2.1	21.3	0.6008	18.9
Nitrate-N	14.0	1	0.01	0.00036	0.0	0.01	0.00036	0.0	0.65	0.04619	2.4	0.75	0.05319	1.3	1.17	0.08353	4.3	0.95	0.06754	2.1
Sulfate	96.1	2	21.4	0.44557	26.1	18.6	0.38727	16.8	21.6	0.44973	23.0	6.9	0.14325	3.6	7.7	0.16032	8.3	5.4	0.11264	3.5
Total Anions (meq/L)				**1.7**			**2.3**			**2.0**			**3.9**			**1.9**			**3.2**	
Total Ions (meq/L)				**3.2**			**4.4**			**3.7**			**7.9**			**3.6**			**6.4**	
Cation/Anion Ratio				**0.88**			**0.92**			**0.91**			**1.01**			**0.85**			**1.00**	
Percent Difference				**-6.1**			**-4.0**			**-4.8**			**0.6**			**-7.9**			**0.1**	
Trilinear Diagram Data																				
sum (Ca, Mg, Na+K)				1.50			1.80			1.77			3.99			1.66			3.18	
Calcium					50.07			44.40			46.70			51.73			48.18			48.43
Magnesium					34.67			39.81			33.96			37.29			36.95			39.29
Sodium + Potassium					15.26			15.78			19.34			10.98			14.87			12.28
sum (SO_4, Cl, HCO_3+CO_3)				1.70			2.30			1.91			3.89			1.86			3.11	
Sulfate					26.142			16.831			23.601			3.678			8.623			3.618
Chloride					6.984			6.779			17.318			21.872			2.215			19.299
Bicarbonate + Carbonate					66.875			76.391			59.081			74.450			89.162			77.083

Site ID			Upgradient South														
				MW-82			MW-65			MW-58A			MW-59			MW-24	
				10/2/12			10/12/12			10/9/12			10/8/12			10/10/12	
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	21.5	1.07285	44.3	12.2	0.60878	35.5	15.4	0.76846	45.2	12.8	0.63872	38.2	12.3	0.61377	37.3
Magnesium	24.3	2	12.6	1.03682	42.8	8.0	0.66077	38.6	7.8	0.64102	37.7	7.8	0.6402	38.3	8.2	0.67311	40.9
Potassium	39.1	1	1.6	0.0399	1.6	1.0	0.02512	1.5	0.9	0.02335	1.4	1.0	0.02453	1.5	0.8	0.02049	1.2
Sodium	23.0	1	6.3	0.27316	11.3	5.5	0.2388	13.9	5.0	0.21618	12.7	5.1	0.22358	13.4	5.1	0.22227	13.5
Iron	55.8	2	0.01	0.00018	0.0	4.74	0.16975	9.9	0.97	0.0347	2.0	3.98	0.14253	8.5	3.08	0.1103	6.7
Manganese	54.9	2	0.00	1.8E-05	0.0	0.20	0.0071	0.4	0.31	0.01139	0.7	0.10	0.00348	0.2	0.11	0.00386	0.2
Ammonia-N	14.0	1	0.01	0.00036	0.0	0.03	0.00217	0.1	0.07	0.00473	0.3	0.01	0.00036	0.0	0.04	0.00292	0.2
Total Cations (meq/L)				**2.4**			**1.7**			**1.7**			**1.7**			**1.6**	
Anions																	
Alkalinity, Total			113			53			74			65			65		
Carbonate	60.0	2	0.0565	0.00188	0.1	0.0188	0.00063	0.0	0.161	0.00537	0.3	0.0504	0.00168	0.1	0.0643	0.00214	0.1
Bicarbonate	61.0	1	137.75	2.25778	79.1	64.87	1.06321	68.7	89.95	1.47441	76.9	79.32	1.30012	71.8	78.56	1.28766	74.0
Chloride	35.5	1	6.3	0.1777	6.2	4.6	0.1289	8.3	4.0	0.11142	5.8	4.2	0.11903	6.6	4.0	0.11311	6.5
Nitrate-N	14.0	1	0.64	0.04548	1.6	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0
Sulfate	96.1	2	17.9	0.37269	13.1	17.0	0.35395	22.9	15.7	0.32689	17.0	18.7	0.38935	21.5	16.2	0.3373	19.4
Total Anions (meq/L)				**2.9**			**1.5**			**1.9**			**1.8**			**1.7**	
Total Ions (meq/L)				**5.3**			**3.3**			**3.6**			**3.5**			**3.4**	
Cation/Anion Ratio				**0.85**			**1.11**			**0.89**			**0.92**			**0.95**	
Percent Difference				**-8.2**			**5.1**			**-6.0**			**-3.9**			**-2.8**	
Trilinear Diagram Data																	
sum (Ca, Mg, Na+K)				2.42			1.53			1.65			1.53			1.53	
Calcium					44.28			39.70			46.60			41.83			40.13
Magnesium					42.80			43.09			38.87			41.92			44.00
Sodium + Potassium					12.92			17.21			14.53			16.25			15.87
sum (SO_4, Cl, HCO_3+CO_3)				2.81			1.55			1.92			1.81			1.74	
Sulfate					13.263			22.885			17.042			21.509			19.383
Chloride					6.324			8.334			5.809			6.576			6.500
Bicarbonate + Carbonate					80.413			68.781			77.149			71.916			74.118

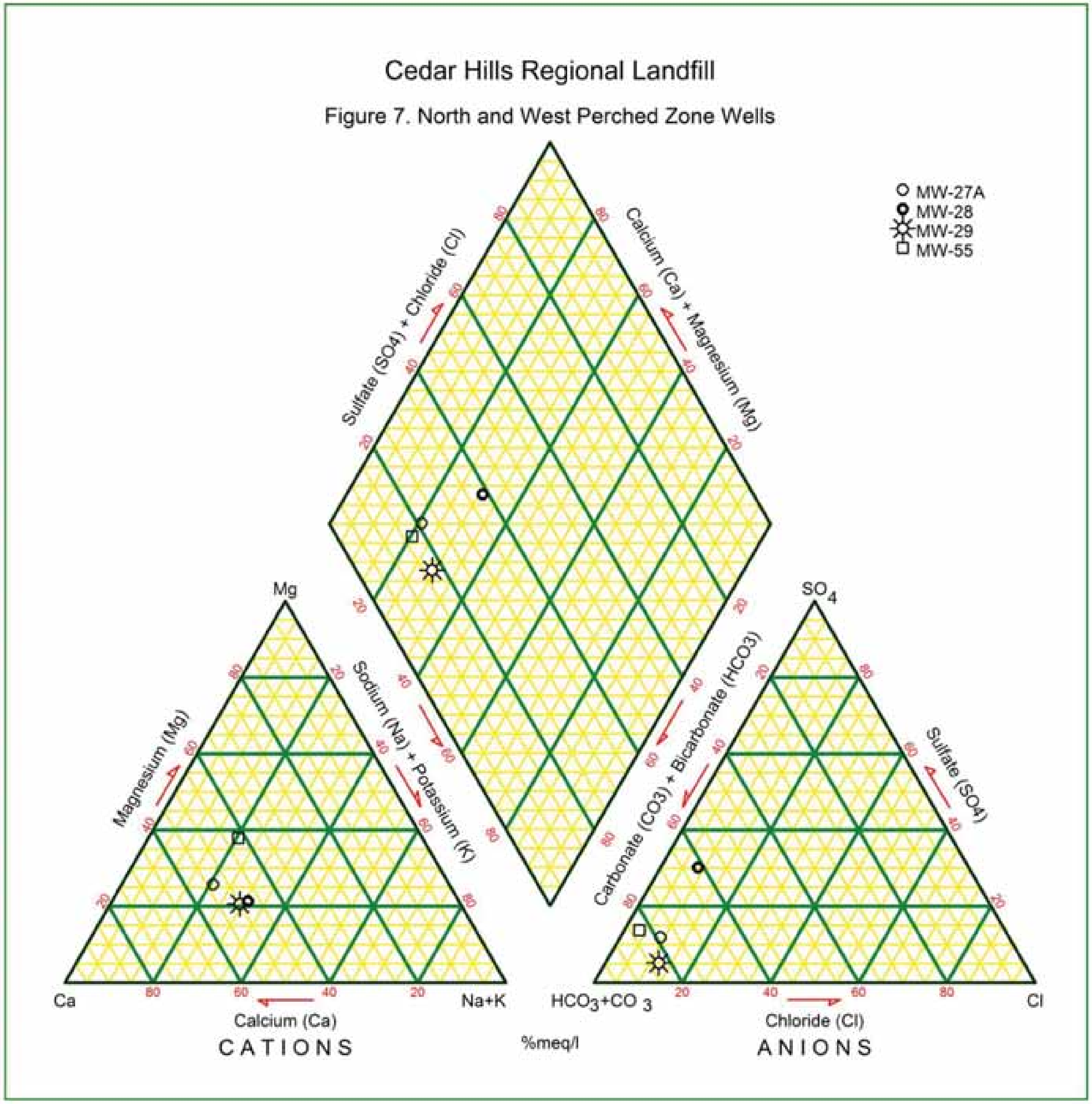
Site ID			Upgradient Northwest									Upgradient Northeast					
			MW-84			MW-21			MW-73			MW-81			MW-99		
			10/22/12			10/2/12			10/22/12			10/22/12			10/5/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	10.9	0.54391	34.8	9.0	0.4496	38.7	11.8	0.58882	42.8	10.7	0.53393	41.4	8.3	0.41617	36.5
Magnesium	24.3	2	9.0	0.73812	47.3	5.1	0.41802	36.0	6.4	0.52993	38.5	6.1	0.49949	38.7	3.9	0.32339	28.4
Potassium	39.1	1	1.0	0.02583	1.7	0.9	0.02422	2.1	0.8	0.02128	1.5	0.7	0.01885	1.5	0.8	0.01975	1.7
Sodium	23.0	1	5.8	0.25316	16.2	4.8	0.20705	17.8	5.4	0.23532	17.1	5.5	0.23793	18.4	8.6	0.37408	32.8
Iron	55.8	2	0.01	0.00018	0.0	1.66	0.05945	5.1	0.01	0.00018	0.0	0.01	0.00018	0.0	0.03	0.00122	0.1
Manganese	54.9	2	0.01	0.00022	0.0	0.07	0.00244	0.2	0.00	1.8E-05	0.0	0.00	1.8E-05	0.0	0.06	0.00201	0.2
Ammonia-N	14.0	1	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.05	0.00368	0.3
Total Cations (meq/L)				**1.6**			**1.2**			**1.4**			**1.3**			**1.1**	
Anions																	
Alkalinity, Total			60			53			55			49			52		
Carbonate	60.0	2	0.0362	0.00121	0.1	0.2675	0.00892	0.7	0.0394	0.00131	0.1	0.0391	0.0013	0.1	0.2531	0.00844	0.6
Bicarbonate	61.0	1	73.49	1.20461	74.0	63.75	1.04493	84.0	66.53	1.09052	73.5	60.19	0.98655	71.8	63.17	1.03541	79.0
Chloride	35.5	1	3.9	0.10944	6.7	2.8	0.07898	6.4	3.2	0.09082	6.1	3.5	0.09985	7.3	3.4	0.09534	7.3
Nitrate-N	14.0	1	0.54	0.03862	2.4	0.01	0.00036	0.0	1.69	0.12065	8.1	1.63	0.11637	8.5	0.04	0.00286	0.2
Sulfate	96.1	2	13.2	0.27484	16.9	5.3	0.11014	8.9	8.7	0.18072	12.2	8.2	0.1699	12.4	8.1	0.16865	12.9
Total Anions (meq/L)				**1.6**			**1.2**			**1.5**			**1.4**			**1.3**	
Total Ions (meq/L)				**3.2**			**2.4**			**2.9**			**2.7**			**2.5**	
Cation/Anion Ratio				**0.96**			**0.93**			**0.93**			**0.94**			**0.87**	
Percent Difference				**-2.1**			**-3.4**			**-3.8**			**-3.1**			**-7.0**	
Trilinear Diagram Data																	
sum (Ca, Mg, Na+K)				1.56			1.10			1.38			1.29			1.13	
Calcium					34.84			40.91			42.81			41.38			36.72
Magnesium					47.28			38.04			38.53			38.71			28.53
Sodium + Potassium					17.87			21.05			18.66			19.90			34.75
					100.0			100.0			100.0						
sum (SO_4, Cl, HCO_3+CO_3)				1.59			1.24			1.36			1.26			1.31	
Sulfate					17.284			8.861			13.256			13.510			12.895
Chloride					6.883			6.354			6.662			7.940			7.290
Bicarbonate + Carbonate					75.833			84.785			80.083			78.551			79.815

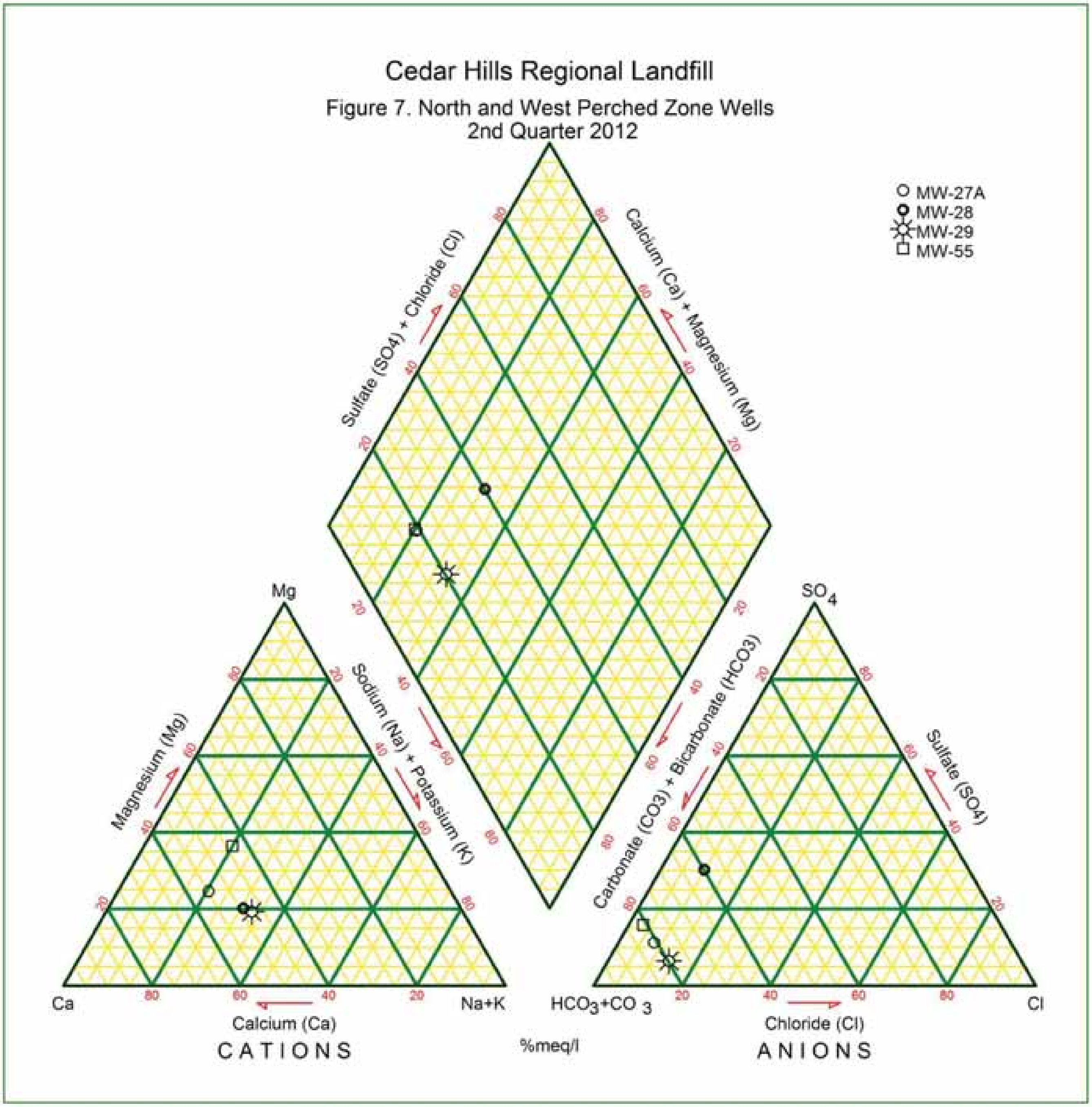
Site ID			Cross Gradient						Interior											
			MW-93			**MW-95**			**MW-70**			**MW-77**			**MW-78**			**MW-100**		
			10/10/12			10/25/12			10/15/12			10/25/12			10/26/12			10/4/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	32.3	1.61178	47.7	18.2	0.90818	45.7	18.0	0.8982	42.7	20.8	1.03792	44.8	14.2	0.70858	44.9	25.8	1.28743	42.2
Magnesium	24.3	2	16.5	1.35775	40.2	9.8	0.8023	40.4	10.8	0.88871	42.3	11.3	0.92985	40.1	6.9	0.56532	35.9	15.5	1.27546	41.8
Potassium	39.1	1	1.4	0.03581	1.1	1.1	0.02762	1.4	1.5	0.03888	1.9	1.3	0.03351	1.4	1.9	0.04885	3.1	1.8	0.04553	1.5
Sodium	23.0	1	8.3	0.36103	10.7	5.6	0.24272	12.2	6.3	0.2749	13.1	7.3	0.31623	13.6	5.8	0.25316	16.1	8.9	0.38626	12.7
Iron	55.8	2	0.01	0.00018	0.0	0.01	0.00018	0.0	0.01	0.00018	0.0	0.01	0.00018	0.0	0.01	0.00018	0.0	1.37	0.04906	1.6
Manganese	54.9	2	0.24	0.00866	0.3	0.13	0.0047	0.2	0.00	1.8E-05	0.0	0.01	0.00039	0.0	0.00	1.8E-05	0.0	0.23	0.00819	0.3
Ammonia-N	14.0	1	0.05	0.00371	0.1	0.03	0.00184	0.1	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0
Total Cations (meq/L)				**3.4**			**2.0**			**2.1**			**2.3**			**1.6**			**3.1**	
Anions																				
Alkalinity, Total			114			85			81			109			70			135		
Carbonate	60.0	2	0.1217	0.00406	0.1	0.1258	0.00419	0.2	0.0942	0.00314	0.1	0.0702	0.00234	0.1	0.0125	0.00042	0.0	0.0588	0.00196	0.1
Bicarbonate	61.0	1	138.83	2.2756	57.0	103.93	1.70355	76.2	98.02	1.60662	61.2	132.84	2.17733	85.2	85.86	1.40737	79.3	164.58	2.69763	84.0
Chloride	35.5	1	3.0	0.0849	2.1	5.6	0.15796	7.1	7.7	0.21691	8.3	4.8	0.13624	5.3	4.9	0.13821	7.8	2.5	0.0708	2.2
Nitrate-N	14.0	1	0.01	0.00086	0.0	0.01	0.00036	0.0	0.03	0.002	0.1	0.86	0.06154	2.4	0.94	0.06682	3.8	0.01	0.00036	0.0
Sulfate	96.1	2	78.3	1.63027	40.8	17.7	0.36853	16.5	38.2	0.79536	30.3	8.6	0.17906	7.0	7.8	0.16199	9.1	21.2	0.4414	13.7
Total Anions (meq/L)				**4.0**			**2.2**			**2.6**			**2.6**			**1.8**			**3.2**	
Total Ions (meq/L)				**7.4**			**4.2**			**4.7**			**4.9**			**3.4**			**6.3**	
Cation/Anion Ratio				**0.85**			**0.89**			**0.80**			**0.91**			**0.89**			**0.95**	
Percent Difference				**-8.4**			**-5.9**			**-11.1**			**-4.9**			**-5.9**			**-2.6**	
Trilinear Diagram Data																				
sum (Ca, Mg, Na+K)				3.37			1.98			2.10			2.32			1.58			2.99	
Calcium					47.88			45.85			42.76			44.79			44.96			42.99
Magnesium					40.33			40.50			42.31			40.12			35.87			42.59
Sodium + Potassium					11.79			13.65			14.94			15.09			19.16			14.42
sum (SO_4, Cl, HCO_3+CO_3)				3.99			2.23			2.62			2.49			1.71			3.21	
Sulfate					40.810			16.495			30.334			7.177			9.484			13.743
Chloride					2.125			7.070			8.273			5.460			8.092			2.204
Bicarbonate + Carbonate					57.065			76.436			61.394			87.363			82.424			84.053

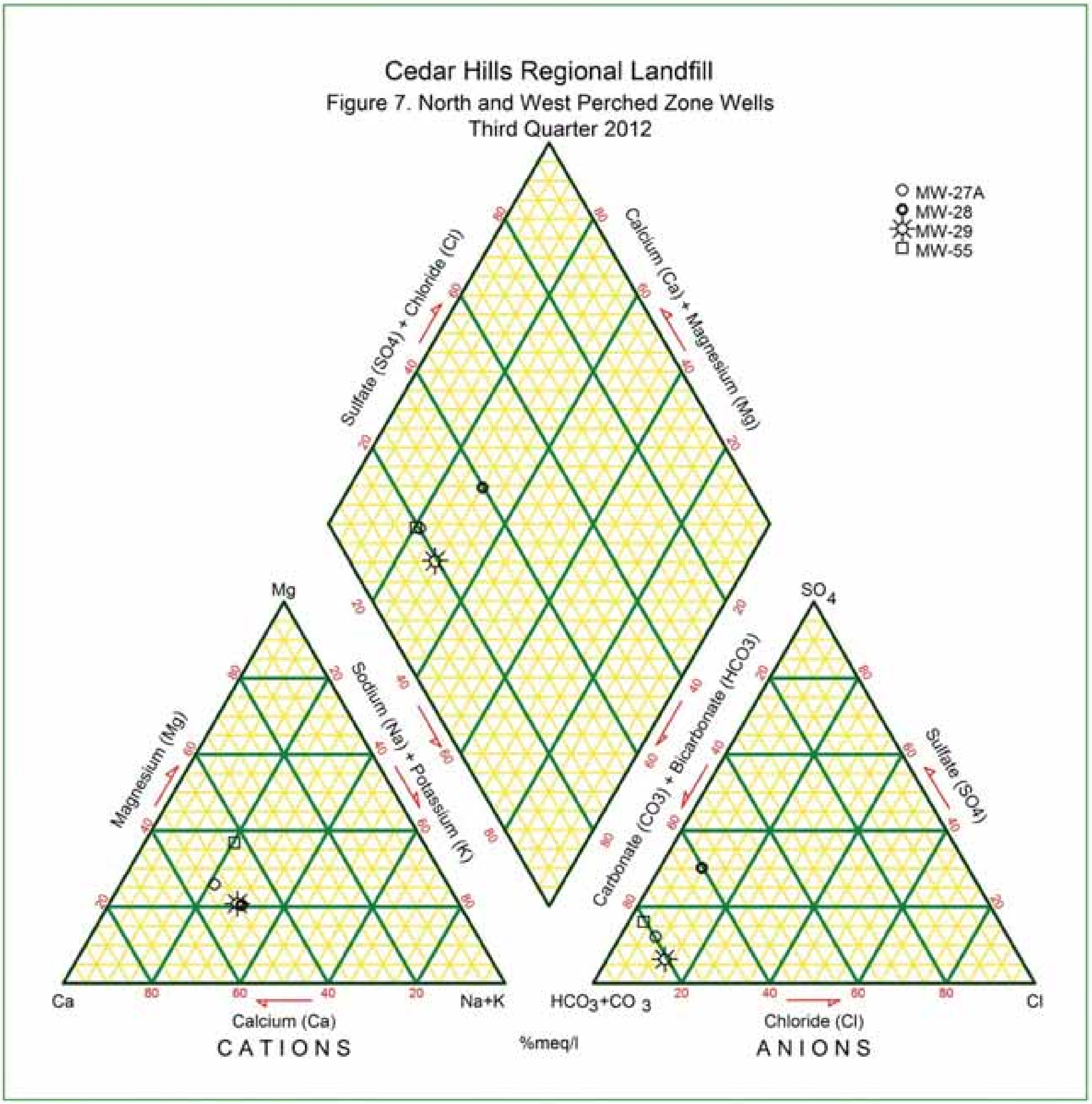
Site ID			Vertical to Facilites												Downgradient Northwest					
			MW-64			**MW-66**			**MW-68**			**MW-67**			**MW-72**			**MW-69**		
			No Sample			10/12/12			10/16/12			12/15/12			10/4/12			10/19/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2				21.8	1.08782	35.9	27.3	1.36228	42.7	30.0	1.49701	43.1	24.5	1.22255	43.0	28.1	1.4022	46.4
Magnesium	24.3	2				18.8	1.54701	51.0	16.7	1.3742	43.0	18.8	1.54701	44.5	14.7	1.20963	42.5	14.4	1.18494	39.2
Potassium	39.1	1				1.3	0.03376	1.1	1.7	0.04399	1.4	1.6	0.04195	1.2	1.6	0.04143	1.5	1.7	0.04348	1.4
Sodium	23.0	1				8.3	0.3619	11.9	8.4	0.36321	11.4	8.8	0.38147	11.0	6.6	0.28752	10.1	7.8	0.33711	11.2
Iron	55.8	2				0.01	0.00018	0.0	1.13	0.04047	1.3	0.13	0.00476	0.1	2.03	0.0727	2.6	1.23	0.04405	1.5
Manganese	54.9	2				0.00	1.8E-05	0.0	0.23	0.00826	0.3	0.09	0.00334	0.1	0.26	0.00939	0.3	0.21	0.0075	0.2
Ammonia-N	14.0	1				0.01	0.00036	0.0	0.01	0.00086	0.0	0.01	0.00036	0.0	0.01	0.001	0.0	0.02	0.00107	0.0
Total Cations (meq/L)							**3.0**			**3.2**			**3.5**			**2.8**			**3.0**	
Anions																				
Alkalinity, Total						119			131			119			115			126		
Carbonate	60.0	2				0.0921	0.00307	0.1	0.1218	0.00406	0.1	0.0942	0.00314	0.1	0.0831	0.00277	0.1	0.2335	0.00778	0.3
Bicarbonate	61.0	1				144.99	2.37657	81.4	159.57	2.61554	86.5	144.99	2.3765	82.1	140.13	2.29689	71.2	153.25	2.51184	85.2
Chloride	35.5	1				6.9	0.19491	6.7	2.8	0.07757	2.6	4.4	0.1227	4.2	4.5	0.12608	3.9	4.8	0.13398	4.5
Nitrate-N	14.0	1				0.76	0.05404	1.9	0.01	0.00036	0.0	0.50	0.0357	1.2	0.01	0.00036	0.0	0.01	0.00036	0.0
Sulfate	96.1	2				14.0	0.29149	10.0	15.7	0.32689	10.8	17.1	0.35604	12.3	38.5	0.8016	24.8	14.1	0.29357	10.0
Total Anions (meq/L)							**2.9**			**3.0**			**2.9**			**3.2**			**2.9**	
Total Ions (meq/L)							**6.0**			**6.2**			**6.4**			**6.1**			**6.0**	
Cation/Anion Ratio							**1.04**			**1.06**			**1.20**			**0.88**			**1.02**	
Percent Difference							**1.9**			**2.7**			**9.1**			**-6.3**			**1.2**	
Trilinear Diagram Data																				
sum (Ca, Mg, Na+K)							3.03			3.14			3.47			2.76			2.97	
Calcium								35.90			43.33			43.17			44.28			47.25
Magnesium								51.05			43.71			44.62			43.81			39.93
Sodium + Potassium								13.06			12.95			12.21			11.91			12.82
sum (SO_4, Cl, HCO_3+CO_3)							2.87			3.02			2.86			3.23			2.95	
Sulfate								10.171			10.810			12.456			24.838			9.961
Chloride								6.801			2.565			4.293			3.907			4.546
Bicarbonate + Carbonate								83.029			86.625			83.252			71.255			85.493

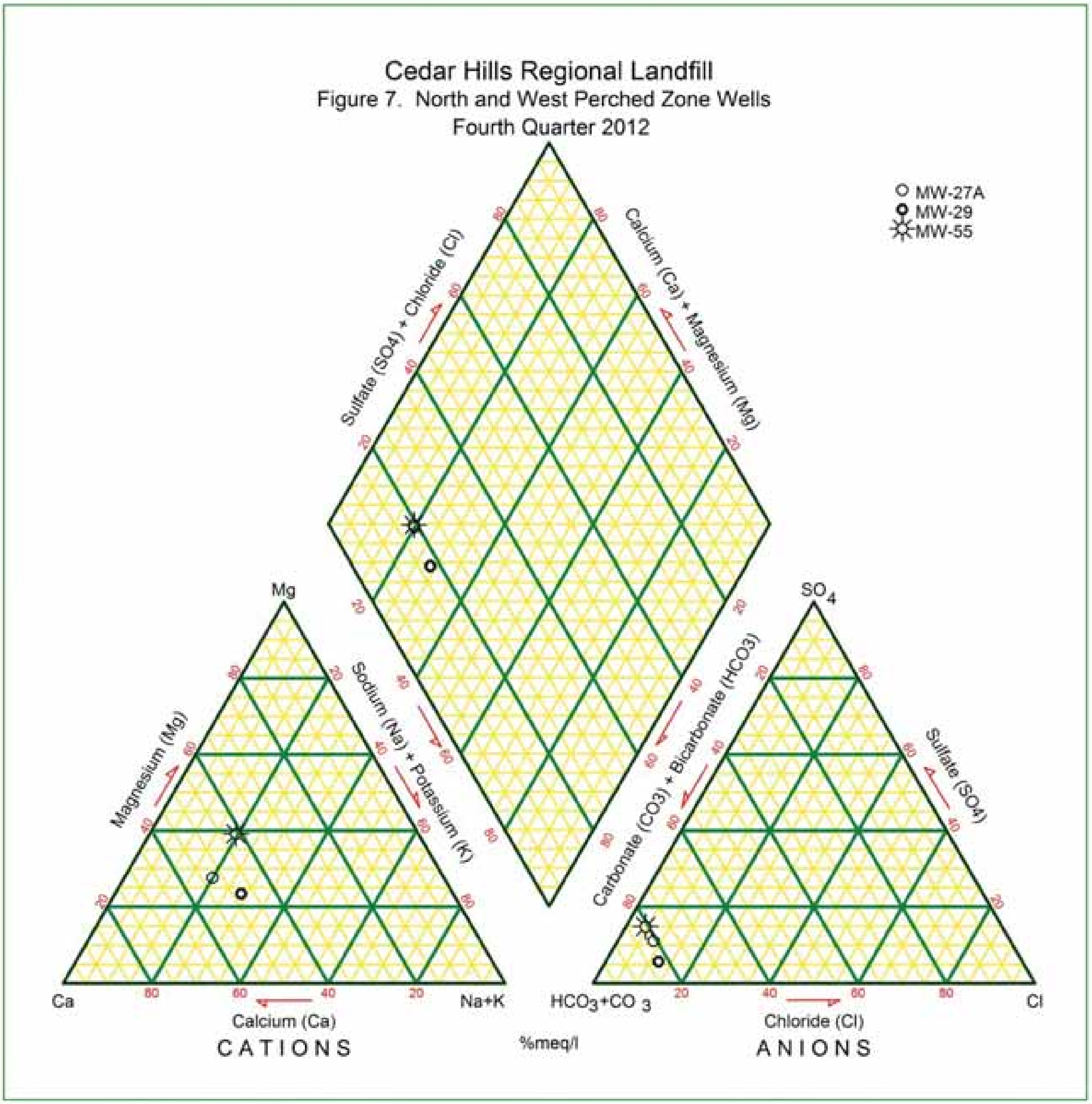
Site ID			MW-75			MW-80			MW-87			MW-85			MW-91			MW-74		
			Downgradient																	
			10/10/12			10/19/12			10/5/12			10/19/12			10/31/12			10/10/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	21.0	1.0479	37.7	25.4	1.26747	45.2	33.6	1.67665	40.4	22.9	1.14271	40.8	20.2	1.00798	40.3	36.8	1.83633	39.1
Magnesium	24.3	2	15.9	1.30837	47.0	13.8	1.13557	40.5	23.4	1.92553	46.3	15.5	1.27546	45.5	12.8	1.05328	42.1	28.6	2.35343	50.1
Potassium	39.1	1	1.5	0.03913	1.4	1.6	0.0399	1.4	1.9	0.04936	1.2	1.5	0.03862	1.4	1.7	0.04271	1.7	1.8	0.04578	1.0
Sodium	23.0	1	7.4	0.32145	11.6	6.8	0.29752	10.6	8.6	0.37538	9.0	8.0	0.34624	12.3	6.7	0.291	11.6	10.6	0.46107	9.8
Iron	55.8	2	1.43	0.05121	1.8	1.55	0.05551	2.0	3.21	0.11496	2.8	0.01	0.00018	0.0	2.45	0.08774	3.5	0.01	0.00018	0.0
Manganese	54.9	2	0.11	0.00404	0.1	0.25	0.00892	0.3	0.34	0.01238	0.3	0.00	1.8E-05	0.0	0.41	0.01474	0.6	0.00	1.8E-05	0.0
Ammonia-N	14.0	1	0.13	0.00914	0.3	0.01	0.00036	0.0	0.01	0.00086	0.0	0.01	0.00036	0.0	0.03	0.00249	0.1	0.01	0.00036	0.0
Total Cations (meq/L)				**2.8**			**2.8**			**4.2**			**2.8**			**2.5**			**4.7**	
Anions																				
Alkalinity, Total			96			90			87			98			86			205		
Carbonate	60.0	2	0.054	0.0018	0.1	0.1072	0.00357	0.1	0.0435	0.00145	0.0	0.0907	0.00302	0.1	0.0636	0.00212	0.1	0.1481	0.00494	0.1
Bicarbonate	61.0	1	117.38	1.92391	60.4	108.97	1.78616	62.8	106.17	1.74029	37.1	118.77	1.94668	68.7	104.91	1.71962	62.6	249.80	4.09445	76.6
Chloride	35.5	1	8.9	0.25132	7.9	4.8	0.13595	4.8	5.5	0.15372	3.3	7.3	0.2045	7.2	7.7	0.21606	7.9	24.8	0.69952	13.1
Nitrate-N	14.0	1	0.01	0.00086	0.0	0.01	0.00036	0.0	0.01	0.00093	0.0	0.13	0.00921	0.3	0.02	0.00143	0.1	0.44	0.03113	0.6
Sulfate	96.1	2	48.4	1.00773	31.6	44.2	0.92028	32.3	134.0	2.78999	59.5	32.1	0.66835	23.6	38.7	0.80577	29.4	24.8	0.51636	9.7
Total Anions (meq/L)				**3.2**			**2.8**			**4.7**			**2.8**			**2.7**			**5.3**	
Total Ions (meq/L)				**6.0**			**5.7**			**8.8**			**5.6**			**5.2**			**10.0**	
Cation/Anion Ratio				**0.87**			**0.99**			**0.89**			**0.99**			**0.91**			**0.88**	
Percent Difference				**-6.8**			**-0.7**			**-6.0**			**-0.5**			**-4.7**			**-6.5**	
Trilinear Diagram Data																				
sum (Ca, Mg, Na+K)				2.72			2.74			4.03			2.80			2.39			4.70	
Calcium					38.57			46.25			41.64			40.77			42.09			39.10
Magnesium					48.16			41.44			47.82			45.50			43.98			50.11
Sodium + Potassium					13.27			12.31			10.55			13.73			13.93			10.79
sum (SO_4, Cl, HCO_3+CO_3)				3.18			2.85			4.69			2.82			2.74			5.32	
Sulfate					31.642			32.336			59.546			23.679			29.369			9.715
Chloride					7.891			4.777			3.281			7.245			7.875			13.161
Bicarbonate + Carbonate					60.466			62.887			37.173			69.076			62.756			77.125

Site ID			Downgradient														
			MW-86			MW-88			MW-89			MW-90			MW-43		
			10/18/12			10/24/12			10/12/12			10/22/12			10/4/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	13.1	0.65369	36.5	8.3	0.41417	35.5	13.1	0.65369	32.7	16.1	0.80339	40.9	11.8	0.58882	37.3
Magnesium	24.3	2	9.9	0.81547	45.6	6.1	0.50525	43.3	10.9	0.89693	44.8	10.0	0.81958	41.8	8.2	0.67229	42.6
Potassium	39.1	1	1.2	0.02967	1.7	0.8	0.01957	1.7	1.5	0.03811	1.9	1.4	0.03453	1.8	1.2	0.03044	1.9
Sodium	23.0	1	6.4	0.27882	15.6	5.2	0.22662	19.4	8.6	0.37277	18.6	5.9	0.25577	13.0	5.6	0.24402	15.5
Iron	55.8	2	0.31	0.01096	0.6	0.01	0.00018	0.0	0.83	0.02955	1.5	1.08	0.03868	2.0	0.97	0.03456	2.2
Manganese	54.9	2	0.01	0.00025	0.0	0.00	4.1E-05	0.0	0.23	0.00837	0.4	0.24	0.00888	0.5	0.20	0.00717	0.5
Ammonia-N	14.0	1	0.01	0.00036	0.0	0.01	0.00036	0.0	0.02	0.00136	0.1	0.02	0.00114	0.1	0.02	0.00153	0.1
Total Cations (meq/L)				**1.8**			**1.2**			**2.0**			**2.0**			**1.6**	
Anions																	
Alkalinity, Total			65			53			75			69			70		
Carbonate	60.0	2	0.02405	0.0008	0.0	0.04911	0.00164	0.1	0.10255	0.00342	0.2	0.08111	0.0027	0.1	0.12694	0.00423	0.2
Bicarbonate	61.0	1	79.13	1.297	72.0	64.32	1.0542	80.9	90.80	1.48836	77.5	84.38	1.38309	67.5	85.26	1.39756	77.6
Chloride	35.5	1	4.7	0.13144	7.3	2.4	0.06826	5.2	3.8	0.10662	5.6	4.2	0.11762	5.7	3.7	0.10493	5.8
Nitrate-N	14.0	1	0.33	0.02327	1.3	0.56	0.03969	3.0	0.01	0.00036	0.0	0.01	0.00036	0.0	0.01	0.00036	0.0
Sulfate	96.1	2	16.7	0.34771	19.3	6.7	0.13908	10.7	15.4	0.32064	16.7	26.2	0.54551	26.6	14.1	0.29357	16.3
Total Anions (meq/L)				**1.8**			**1.3**			**1.9**			**2.0**			**1.8**	
Total Ions (meq/L)				**3.6**			**2.5**			**3.9**			**4.0**			**3.4**	
Cation/Anion Ratio				**0.99**			**0.90**			**1.04**			**0.96**			**0.88**	
Percent Difference				**-0.3**			**-5.5**			**2.1**			**-2.2**			**-6.6**	
Trilinear Diagram Data																	
sum (Ca, Mg, Na+K)				1.78			1.17			1.96			1.91			1.54	
Calcium					36.77			35.53			33.33			41.99			38.35
Magnesium					45.87			43.35			45.73			42.84			43.78
Sodium + Potassium					17.35			21.12			20.95			15.17			17.87
sum (SO_4, Cl, HCO_3+CO_3)				1.78			1.26			1.92			2.05			1.80	
Sulfate					19.568			11.011			16.708			26.624			16.307
Chloride					7.397			5.404			5.556			5.741			5.828
Bicarbonate + Carbonate					73.035			83.586			77.736			67.635			77.865


Cedar Hills Regional Landfill
Figure 7. North and West Perched Zone Wells
MW-27A
MW-28
MW-29
MW-55
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS


Cedar Hills Regional Landfill
Figure 7. North and West Perched Zone Wells
2nd Quarter 2012
MW-27A
MW-28
MW-29
MW-55
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS


Cedar Hills Regional Landfill
Figure 7. North and West Perched Zone Wells
Third Quarter 2012
MW-27A
MW-28
MW-29
MW-55
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Mg
Magnesium (Mg)
Sodium (Na) + Potassium (K)
Ca
Na+K
Calcium (Ca)
CATIONS
%meq/l
SO_4
Carbonate (CO3) + Bicarbonate (HCO3)
Sulfate (SO4)
HCO_3+CO_3
Cl
Chloride (Cl)
ANIONS


Cedar Hills Regional Landfill
Figure 7. North and West Perched Zone Wells
Fourth Quarter 2012
MW-27A
MW-29
MW-55
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Mg
Magnesium (Mg)
Ca
Na+K
Calcium (Ca)
CATIONS
%meq/l
SO4
Sulfate (SO4)
HCO3+CO 3
Cl
Chloride (Cl)
ANIONS

			North and West Perched Wells											
Site ID				**MW-27A**			**MW-28**			**MW-29**			**MW-55**	
Date				1/5/2012			1/5/2012			1/12/2012			1/10/2012	
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	20.8	1.03792	53.1	10.6	0.52894	47.8	7.7	0.38473	49.9	12.6	0.62874	41.2
Magnesium	24.3	2	6.1	0.49949	25.6	2.9	0.23534	21.3	1.9	0.15882	20.6	6.9	0.57108	37.4
Potassium	39.1	1	3.6	0.09105	4.7	1.1	0.02686	2.4	0.5	0.01366	1.8	1.6	0.04118	2.7
Sodium	23.0	1	7.2	0.31144	15.9	7.2	0.31405	28.4	4.9	0.21227	27.5	6.1	0.26534	17.4
Iron	55.8	2	0.0	0.00036	0.0	0.0	0.00036	0.0	0.0	0.00036	0.0	0.3	0.01103	0.7
Manganese	54.9	2	0.1	0.00198	0.1	0.0	3.6E-05	0.0	0.0	3.6E-05	0.0	0.2	0.00619	0.4
Ammonia-N	14.0	1	0.2	0.01092	0.6	0.0	0.00071	0.1	0.0	0.00071	0.1	0.1	0.00435	0.3
Total Cations (meq/L)				**2.0**			**1.1**			**0.8**			**1.5**	
Anions														
Alkalinity, Total			82			34.1			27.4			67.4		
Carbonate	60.0	2	0.28764	0.00959	0.5	0.0008	2.7E-05	0.0	0.00386	0.00013	0.0	0.17218	0.00574	0.4
Bicarbonate	61.0	1	99.09	1.62417	78.2	41.60	0.68187	60.6	33.42	0.54779	66.4	81.88	1.34206	82.5
Chloride	35.5	1	6.7	0.18757	9.0	3.3	0.09421	8.4	2.8	0.08011	9.7	2.0	0.055	3.4
Nitrate-N	14.0	1	0.1	0.01	0.5	0.2	0.01342	1.2	2.3	0.16278	19.7	0.0	0.00071	0.0
Sulfate	96.1	2	11.8	0.24569	11.8	16.1	0.33522	29.8	1.6	0.03415	4.1	10.7	0.22278	13.7
Total Anions (meq/L)				**2.1**			**1.1**			**0.8**			**1.6**	
Total Ions (meq/L)				**4.0**			**2.2**			**1.6**			**3.2**	
Cation/Anion Ratio				**0.94**			**0.98**			**0.93**			**0.94**	
Percent Difference				**-3.1**			**-0.8**			**-3.4**			**-3.1**	
TRILINEAR DIAGRAM DATA														
sum (Ca, Mg, Na+K)				1.94			1.11			0.77			1.51	
Calcium					53.5			47.9			50.0			41.7
Magnesium					25.7			21.3			20.6			37.9
Sodium + Potassium					20.7			30.8			29.4			20.3
sum (SO_4, Cl, HCO_3+CO_3)				2.07			1.11			0.66			1.63	
Sulfate					11.9			30.2			5.2			13.7
Chloride					9.1			8.5			12.1			3.4
Bicarbonate + Carbonate					79.0			61.4			82.7			82.9

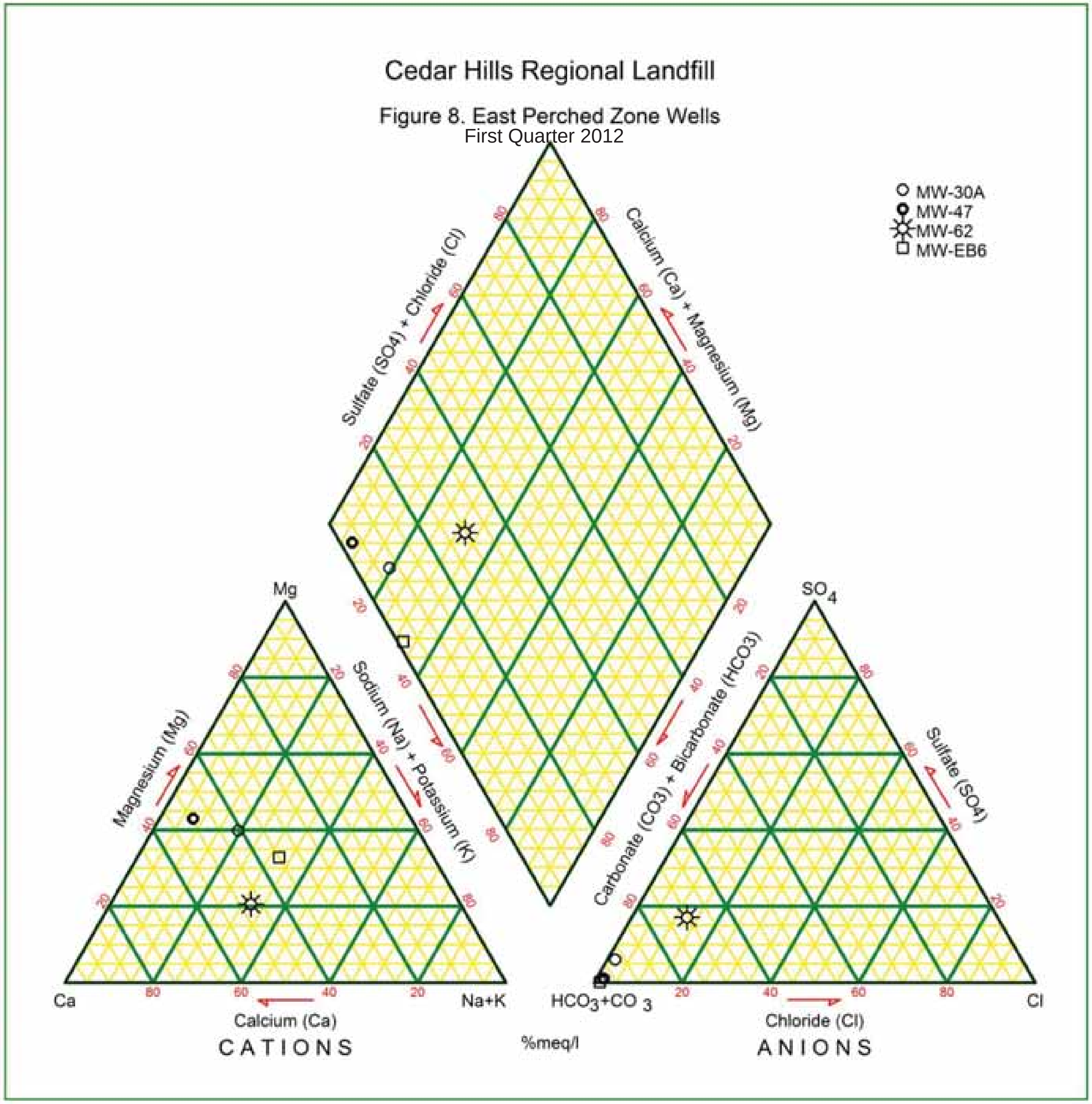
			North and West Perched Wells											
Site ID			**MW-27A**			**MW-28**			**MW-29**			**MW-55**		
Date														
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	19.8	0.98802	54.4	9.0	0.44711	49.2	6.1	0.30339	47.7	26.8	1.33733	40.6
Magnesium	24.3	2	5.4	0.44518	24.5	2.2	0.1835	20.2	1.5	0.12261	19.3	15.0	1.23431	37.5
Potassium	39.1	1	3.5	0.08977	4.9	0.9	0.02202	2.4	0.5	0.01228	1.9	1.7	0.04348	1.3
Sodium	23.0	1	6.5	0.28056	15.4	5.9	0.25577	28.1	4.5	0.19704	31.0	15.5	0.67421	20.5
Iron	55.8	2	0.0	0.00036	0.0	0.0	0.00036	0.0	0.0	0.00036	0.1	0.0	0.00036	0.0
Manganese	54.9	2	0.1	0.0019	0.1	0.0	3.6E-05	0.0	0.0	3.6E-05	0.0	0.0	3.6E-05	0.0
Ammonia-N	14.0	1	0.2	0.01157	0.6	0.0	0.00071	0.1	0.0	0.00071	0.1	0.0	0.00071	0.0
Total Cations (meq/L)				**1.8**			**0.9**			**0.6**			**3.3**	
Anions														
Alkalinity, Total			81			30.7			26.4			175		
Carbonate	60.0	2	0.23655	0.00789	0.4	0.00074	2.5E-05	0.0	0.00302	0.0001	0.0	0.02524	0.00084	0.0
Bicarbonate	61.0	1	97.97	1.60587	79.7	37.45	0.61388	57.8	32.20	0.52782	69.9	213.45	3.49863	93.0
Chloride	35.5	1	5.7	0.16021	8.0	3.6	0.10098	9.5	3.2	0.09139	12.1	1.7	0.04654	1.2
Nitrate-N	14.0	1	0.2	0.01521	0.8	0.5	0.03655	3.4	1.3	0.09281	12.3	0.5	0.03256	0.9
Sulfate	96.1	2	10.8	0.22487	11.2	14.9	0.31023	29.2	2.0	0.04247	5.6	8.8	0.18406	4.9
Total Anions (meq/L)				**2.0**			**1.1**			**0.8**			**3.8**	
Total Ions (meq/L)				**3.8**			**2.0**			**1.4**			**7.1**	
Cation/Anion Ratio				**0.90**			**0.86**			**0.84**			**0.87**	
Percent Difference				**-5.1**			**-7.7**			**-8.5**			**-6.7**	
TRILINEAR DIAGRAM DATA														
sum (Ca, Mg, Na+K)				1.80			0.91			0.64			3.29	
Calcium					54.8			49.2			47.8			40.7
Magnesium					24.7			20.2			19.3			37.5
Sodium + Potassium					20.5			30.6			32.9			21.8
sum (SO_4, Cl, HCO_3+CO_3)				2.00			1.03			0.66			3.73	
Sulfate					11.2			30.3			6.4			4.9
Chloride					8.0			9.9			13.8			1.2
Bicarbonate + Carbonate					80.7			59.9			79.8			93.8

Table 8
Ion Balance Calculations
Cedar Hills Landfill Perched Zones GW Monitoring Wells

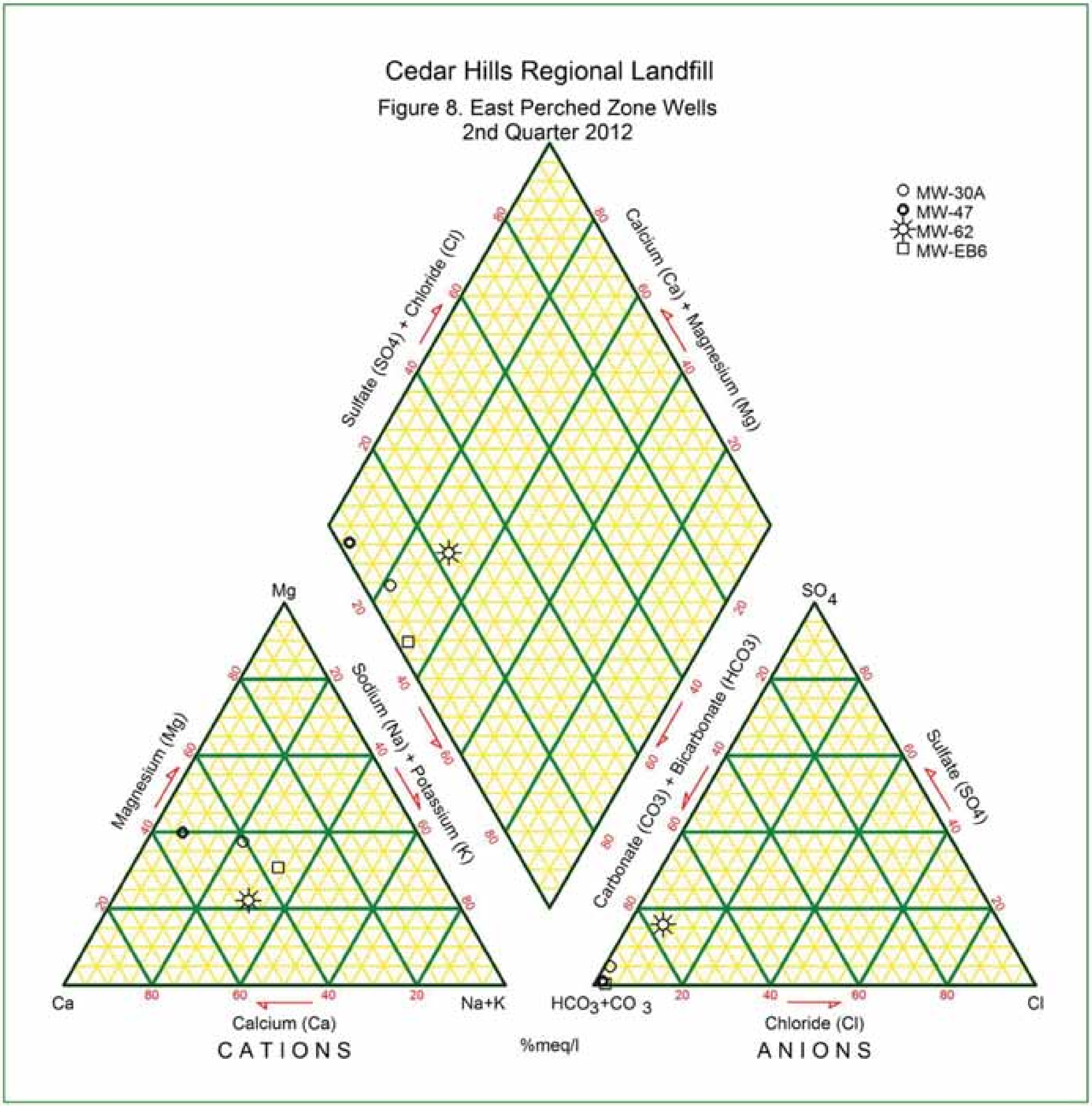
Data Collected from July 1, 2012 to September 30, 2012

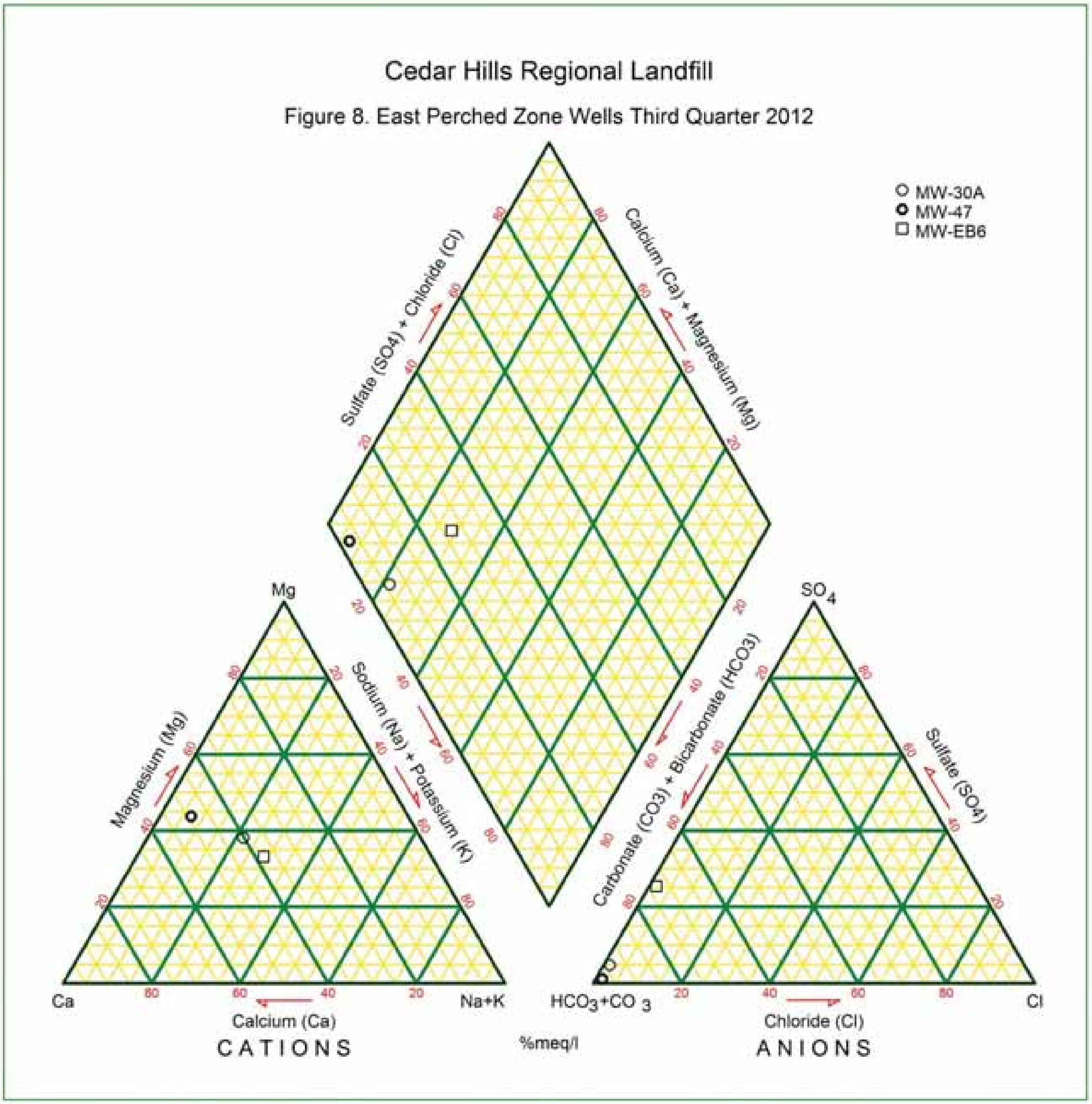
			North and West Perched Wells											
Site ID				**MW-27A**			**MW-28**			**MW-29**			**MW-55**	
Date				7/13/12			7/16/12			7/16/12			7/18/12	
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	19.2	0.95808	52.3	8.9	0.44561	49.3	6.8	0.34032	50.1	12.0	0.5988	42.3
Magnesium	24.3	2	5.7	0.47069	25.7	2.3	0.18515	20.5	1.7	0.14153	20.8	6.3	0.51512	36.4
Potassium	39.1	1	3.5	0.09003	4.9	0.9	0.02381	2.6	0.5	0.01253	1.8	1.7	0.04246	3.0
Sodium	23.0	1	6.8	0.29578	16.2	5.7	0.24794	27.4	4.2	0.18399	27.1	5.6	0.24141	17.0
Iron	55.8	2	0.0	0.00036	0.0	0.0	0.00036	0.0	0.0	0.00036	0.1	0.3	0.0092	0.6
Manganese	54.9	2	0.1	0.00242	0.1	0.0	3.6E-05	0.0	0.0	3.6E-05	0.0	0.1	0.00532	0.4
Ammonia-N	14.0	1	0.2	0.01299	0.7	0.0	0.00071	0.1	0.0	0.00071	0.1	0.1	0.00391	0.3
Total Cations (meq/L)				**1.8**			**0.9**			**0.7**			**1.4**	
Anions														
Alkalinity, Total			80			28.4			23.8			61.4		
Carbonate	60.0	2	0.33653	0.01122	0.6	0.00061	2E-05	0.0	0.00122	4.1E-05	0.0	0.21128	0.00704	0.5
Bicarbonate	61.0	1	96.43	1.58054	79.0	34.65	0.56789	59.0	29.03	0.47589	64.5	74.48	1.22077	80.0
Chloride	35.5	1	5.7	0.15965	8.0	3.2	0.08941	9.3	2.7	0.07729	10.5	1.8	0.05105	3.3
Nitrate-N	14.0	1	0.1	0.00637	0.3	0.3	0.0202	2.1	2.1	0.14707	19.9	0.0	0.00093	0.1
Sulfate	96.1	2	11.7	0.2436	12.2	13.7	0.28525	29.6	1.8	0.03706	5.0	11.8	0.24569	16.1
Total Anions (meq/L)				**2.0**			**1.0**			**0.7**			**1.5**	
Total Ions (meq/L)				**3.8**			**1.9**			**1.4**			**2.9**	
Cation/Anion Ratio				**0.91**			**0.94**			**0.92**			**0.93**	
Percent Difference				**-4.5**			**-3.2**			**-4.1**			**-3.7**	
TRILINEAR DIAGRAM DATA														
sum (Ca, Mg, Na+K)				1.81			0.90			0.68			1.40	
Calcium					52.8			49.4			50.2			42.8
Magnesium					25.9			20.5			20.9			36.9
Sodium + Potassium					21.3			30.1			29.0			20.3
sum (SO_4, Cl, HCO_3+CO_3)				2.00			0.94			0.59			1.52	
Sulfate					12.2			30.3			6.3			16.1
Chloride					8.0			9.5			13.1			3.3
Bicarbonate + Carbonate					79.8			60.3			80.6			80.5

			North and West Perched Wells											
Site ID			**MW-27A**			**MW-28**			**MW-29**			**MW-55**		
Date			**10/11/12**			**No Sample**			**10/15/12**			**10/19/12**		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	20.7	1.03293	52.0				7.5	0.37226	48.0	12.4	0.61876	40.7
Magnesium	24.3	2	6.6	0.54639	27.5				2.2	0.18186	23.4	7.1	0.58671	38.6
Potassium	39.1	1	3.8	0.09642	4.8				0.6	0.01509	1.9	1.7	0.04374	2.9
Sodium	23.0	1	6.9	0.29796	15.0				4.7	0.20618	26.6	5.7	0.24881	16.4
Iron	55.8	2	0.0	0.00018	0.0				0.0	0.00018	0.0	0.3	0.01189	0.8
Manganese	54.9	2	0.1	0.00244	0.1				0.0	1.8E-05	0.0	0.2	0.00575	0.4
Ammonia-N	14.0	1	0.2	0.01199	0.6				0.0	0.00036	0.0	0.1	0.00367	0.2
Total Cations (meq/L)				**2.0**						**0.8**			**1.5**	
Anions														
Alkalinity, Total			80						27.9			66.8		
Carbonate	60.0	2	0.25797	0.0086	0.4				0.00568	0.00019	0.0	0.12664	0.00422	0.3
Bicarbonate	61.0	1	97.44	1.59716	80.2				34.03	0.55773	67.1	81.24	1.33158	80.4
Chloride	35.5	1	5.7	0.16049	8.1				2.9	0.08095	9.7	2.6	0.07362	4.4
Nitrate-N	14.0	1	0.1	0.00373	0.2				2.2	0.15421	18.5	0.0	0.00107	0.1
Sulfate	96.1	2	10.6	0.2207	11.1				1.9	0.03852	4.6	11.8	0.24569	14.8
Total Anions (meq/L)				**2.0**						**0.8**			**1.7**	
Total Ions (meq/L)				**4.0**						**1.6**			**3.2**	
Cation/Anion Ratio				**1.00**						**0.93**			**0.92**	
Percent Difference				**-0.1**						**-3.5**			**-4.3**	
TRILINEAR DIAGRAM DATA														
sum (Ca, Mg, Na+K)				1.97						0.78			1.50	
Calcium					52.3						48.0			41.3
Magnesium					27.7						23.5			39.2
Sodium + Potassium					20.0						28.5			19.5
sum (SO_4, Cl, HCO_3+CO_3)				1.99						0.68			1.66	
Sulfate					11.1						5.7			14.8
Chloride					8.1						12.0			4.4
Bicarbonate + Carbonate					80.8						82.4			80.7

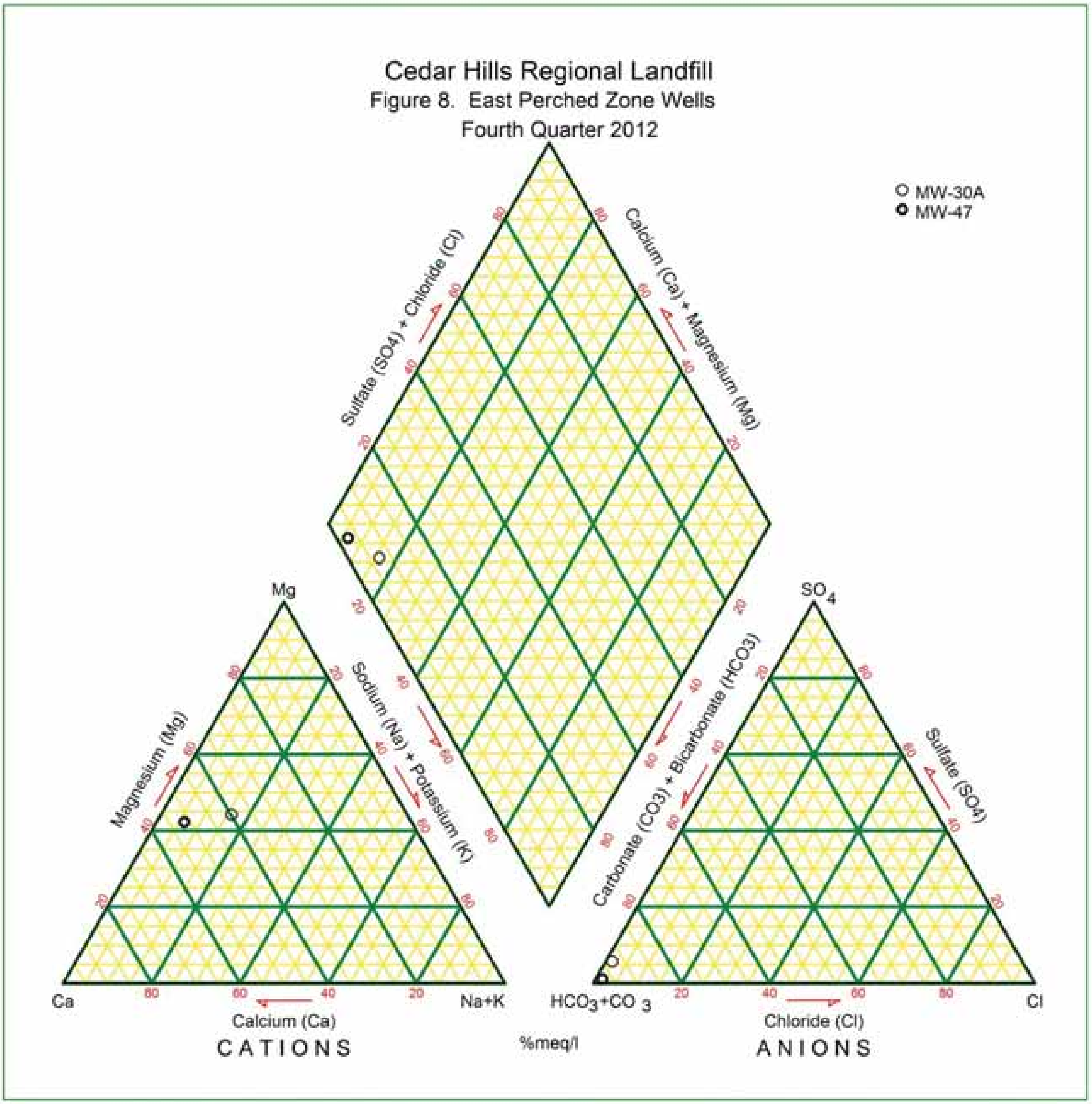


Cedar Hills Regional Landfill
Figure 8. East Perched Zone Wells
First Quarter 2012
MW-30A
MW-47
MW-62
MW-EB6
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

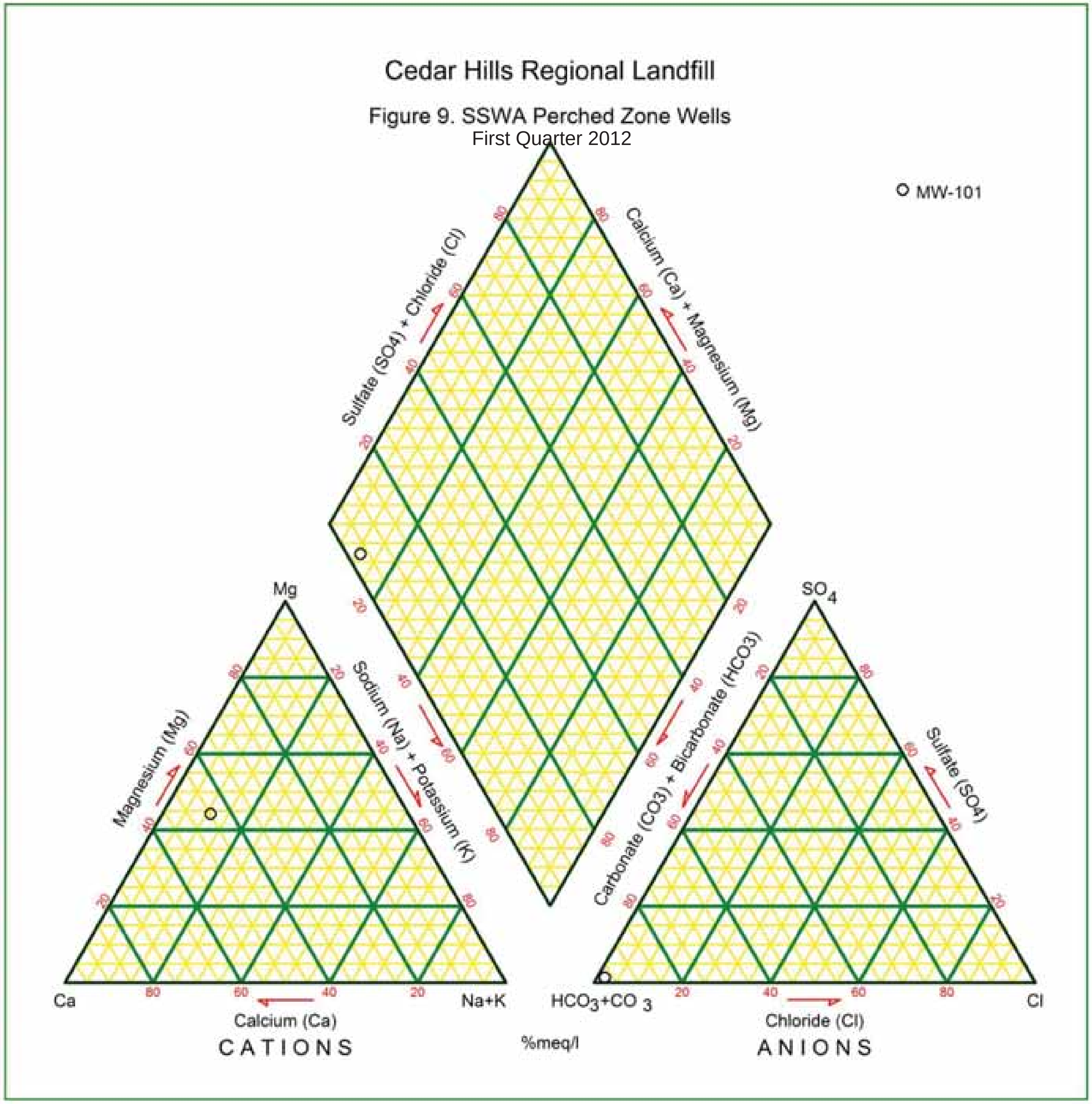

Cedar Hills Regional Landfill
Figure 8. East Perched Zone Wells
2nd Quarter 2012
MW-30A
MW-47
MW-62
MW-EB6
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO_4
Ca
Na+K
HCO_3+CO_3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

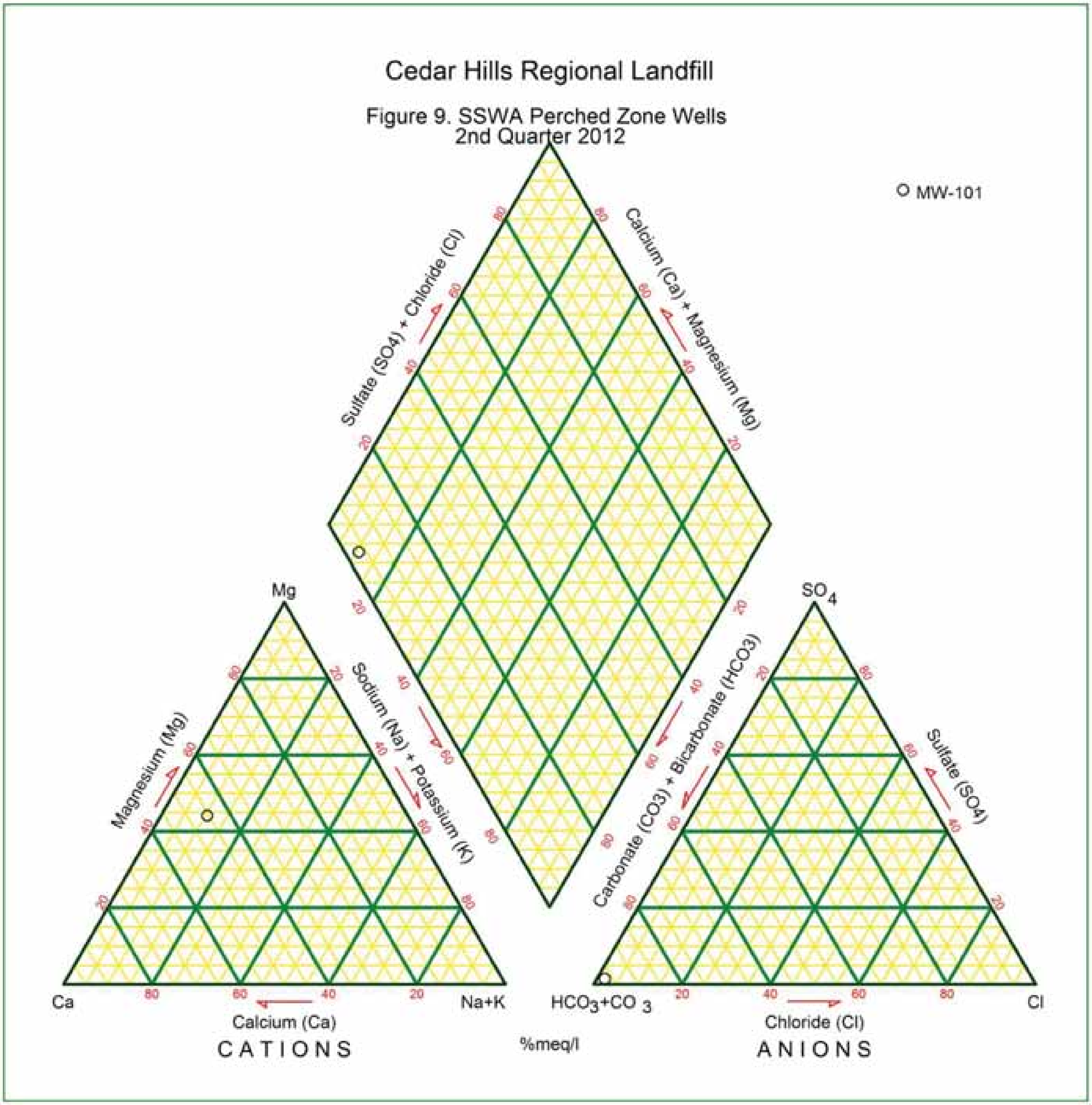


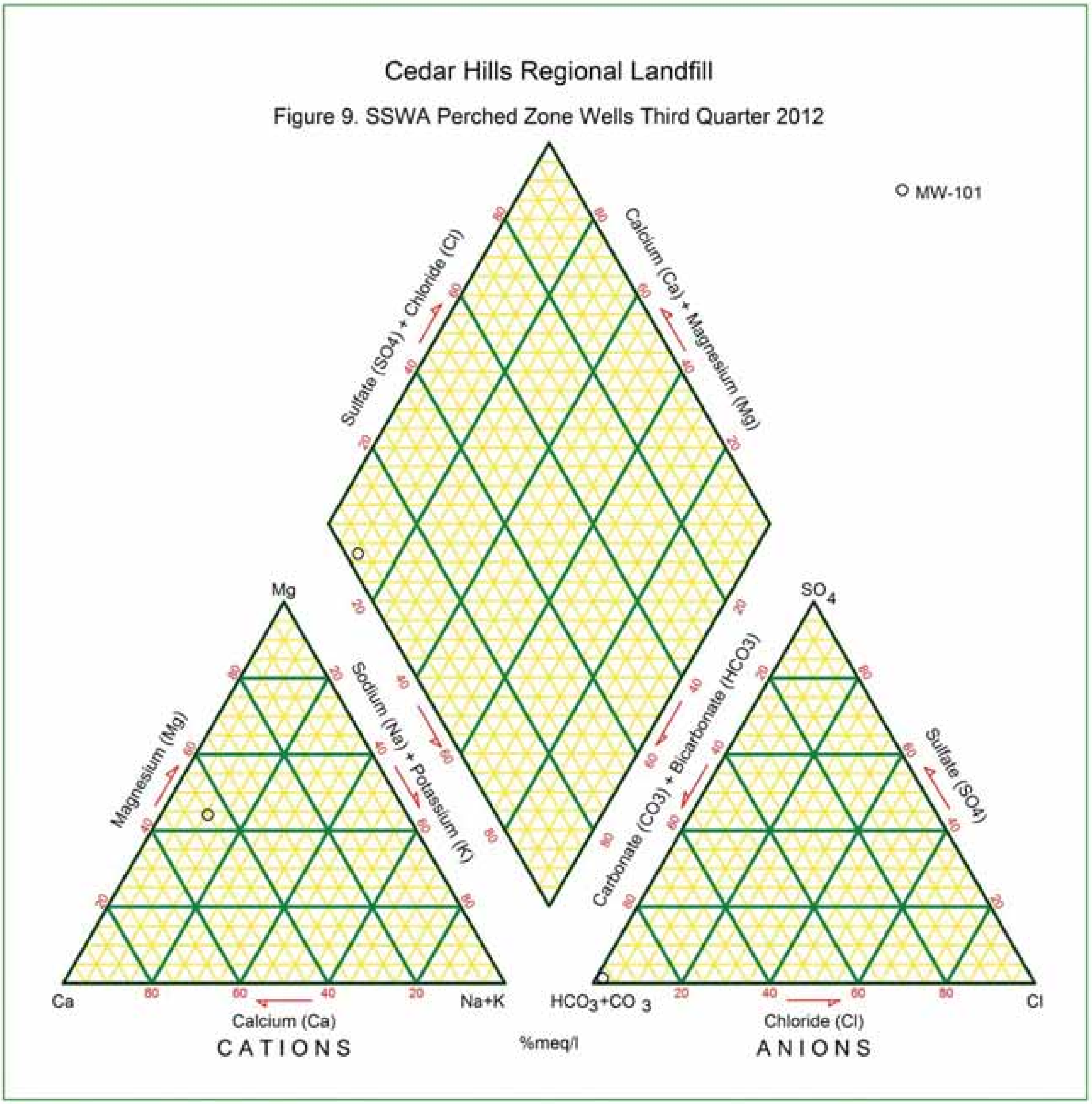
Cedar Hills Regional Landfill
Figure 8. East Perched Zone Wells Third Quarter 2012
MW-30A
MW-47
MW-EB6
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO_4
Ca
Na+K
HCO_3+CO_3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS

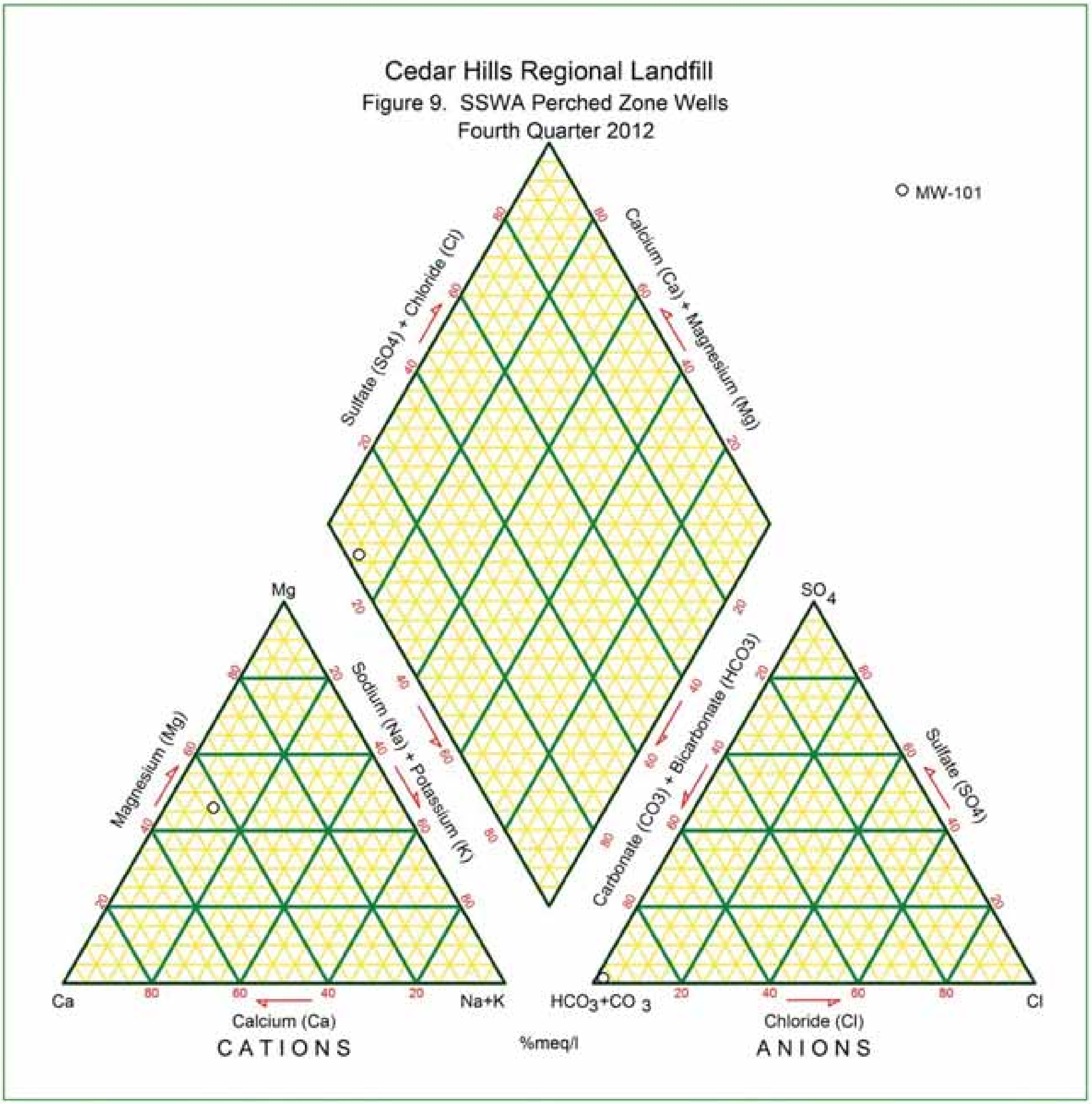


Cedar Hills Regional Landfill
Figure 8. East Perched Zone Wells
Fourth Quarter 2012
MW-30A
MW-47
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS


Cedar Hills Regional Landfill
Figure 9. SSWA Perched Zone Wells
First Quarter 2012
MW-101
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Magnesium (Mg)
Sulfate (SO4)
Mg
SO_4
Ca
Na+K
HCO_3+CO_3
Cl
Calcium (Ca)
Chloride (Cl)
CATIONS
%meq/l
ANIONS


Cedar Hills Regional Landfill
Figure 9. SSWA Perched Zone Wells
2nd Quarter 2012
MW-101
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Mg
Magnesium (Mg)
Ca
Na+K
Calcium (Ca)
CATIONS
%meq/l
SO4
Sulfate (SO4)
HCO3+CO3
Cl
Chloride (Cl)
ANIONS


Cedar Hills Regional Landfill
Figure 9. SSWA Perched Zone Wells Third Quarter 2012
MW-101
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Sodium (Na) + Potassium (K)
Carbonate (CO3) + Bicarbonate (HCO3)
Mg
Magnesium (Mg)
Ca
Calcium (Ca)
Na+K
CATIONS
%meq/l
SO_4
Sulfate (SO4)
HCO_3+CO_3
Chloride (Cl)
Cl
ANIONS


Cedar Hills Regional Landfill
Figure 9. SSWA Perched Zone Wells
Fourth Quarter 2012
MW-101
Sulfate (SO4) + Chloride (Cl)
Calcium (Ca) + Magnesium (Mg)
Mg
Magnesium (Mg)
Sodium (Na) + Potassium (K)
Ca
Na+K
Calcium (Ca)
CATIONS
%meq/l
SO4
Carbonate (CO3) + Bicarbonate (HCO3)
Sulfate (SO4)
HCO3+CO3
Cl
Chloride (Cl)
ANIONS

			East Perched Zone						SSWA		
Site ID				**MW-30A**			**MW-47**			**MW-101**	
Date				1/5/2012			1/5/2012			1/31/2012	
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	31.9	1.59182	40.8	126.0	6.28743	49.1	63.5	3.16866	44.2
Magnesium	24.3	2	18.9	1.55524	39.8	66.5	5.47213	42.7	38.0	3.12693	43.6
Potassium	39.1	1	1.8	0.04706	1.2	5.1	0.12993	1.0	3.1	0.08031	1.1
Sodium	23.0	1	16.3	0.70901	18.2	19.3	0.8395	6.6	15.9	0.69161	9.6
Iron	55.8	2	0.0	0.00036	0.0	0.5	0.01798	0.1	1.3	0.04656	0.6
Manganese	54.9	2	0.0	3.6E-05	0.0	1.4	0.04951	0.4	1.6	0.05825	0.8
Ammonia-N	14.0	1	0.0	0.00071	0.0	0.1	0.00408	0.0	0.0	0.00162	0.0
Total Cations (meq/L)				**3.9**			**12.8**			**7.2**	
Anions											
Alkalinity, Total			188			643			383		
Carbonate	60.0	2	0.02839	0.00095	0.0	0.29313	0.00977	0.1	0.21977	0.00733	0.1
Bicarbonate	61.0	1	229.30	3.75849	91.7	783.86	12.8483	97.2	466.81	7.65152	96.8
Chloride	35.5	1	2.6	0.07334	1.8	7.8	0.22029	1.7	4.9	0.13821	1.7
Nitrate-N	14.0	1	0.3	0.02035	0.5	0.0	0.00071	0.0	0.0	0.00071	0.0
Sulfate	96.1	2	11.8	0.24569	6.0	6.9	0.1445	1.1	5.1	0.10639	1.3
Total Anions (meq/L)				**4.1**			**13.2**			**7.9**	
Total Ions (meq/L)				**8.0**			**26.0**			**15.1**	
Cation/Anion Ratio				**0.95**			**0.97**			**0.91**	
Percent Difference				**-2.4**			**-1.6**			**-5**	
TRILINEAR DIAGRAM DATA											
sum (Ca, Mg, Na+K)				3.90			12.73			7.07	
Calcium					40.8			49.4			44.83
Magnesium					39.8			43.0			44.24
Sodium + Potassium					19.4			7.6			10.92
sum (SO_4, Cl, HCO_3+CO_3)				4.08			13.22			7.90	
Sulfate					6.0			1.1			1.3
Chloride					1.8			1.7			1.7
Bicarbonate + Carbonate					92.2			97.2			96.9

			East Perched Zone												SSWA		
Site ID			**MW-30A**			**MW-47**			**MW-62**			**MW-EB6**			**MW-101**		
Date																	
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	127.0	6.33733	52.8	11.6	0.57884	43.0	18.5	0.92315	47.0	11.4	0.56886	31.0	64.1	3.1986	45.0
Magnesium	24.3	2	57.9	4.76445	39.7	5.9	0.48467	36.0	5.3	0.43448	22.1	5.9	0.48632	26.5	37.8	3.11047	43.8
Potassium	39.1	1	4.6	0.11765	1.0	1.6	0.04016	3.0	1.0	0.02466	1.3	1.6	0.04195	2.3	2.9	0.07315	1.0
Sodium	23.0	1	16.5	0.71771	6.0	5.2	0.22532	16.7	13.3	0.57852	29.5	11.1	0.48282	26.3	15.2	0.66116	9.3
Iron	55.8	2	0.6	0.01988	0.2	0.2	0.00745	0.6	0.0	0.00064	0.0	2.0	0.07055	3.8	0.3	0.00992	0.1
Manganese	54.9	2	1.4	0.05097	0.4	0.1	0.00517	0.4	0.0	3.6E-05	0.0	0.8	0.0285	1.6	1.3	0.04805	0.7
Ammonia-N	14.0	1	0.1	0.00367	0.0	0.1	0.00389	0.3	0.0	0.00071	0.0	2.2	0.15492	8.4	0.0	0.00156	0.0
Total Cations (meq/L)				**12.0**			**1.3**			**2.0**			**1.8**			**7.1**	
Anions																	
Alkalinity, Total			666			62.4			74.3			86.5			389		
Carbonate	60.0	2	0.38216	0.01274	0.1	0.26381	0.00879	0.6	0.00977	0.00033	0.0	0.00752	0.00025	0.0	0.28747	0.00958	0.1
Bicarbonate	61.0	1	811.74	13.3053	97.4	75.59	1.23902	80.3	90.63	1.48545	68.7	105.51	1.72949	97.1	474.00	7.76925	96.7
Chloride	35.5	1	6.8	0.19237	1.4	1.8	0.05049	3.3	5.4	0.1509	7.0	1.5	0.04344	2.4	5.1	0.14498	1.8
Nitrate-N	14.0	1	0.0	0.00071	0.0	0.0	0.00071	0.0	3.0	0.21632	10.0	0.0	0.00257	0.1	0.0	0.00071	0.0
Sulfate	96.1	2	7.2	0.14949	1.1	11.7	0.2436	15.8	14.8	0.30815	14.3	0.3	0.00631	0.4	5.5	0.11347	1.4
Total Anions (meq/L)				**13.7**			**1.5**			**2.2**			**1.8**			**8.0**	
Total Ions (meq/L)				**25.7**			**2.9**			**4.1**			**3.6**			**15.1**	
Cation/Anion Ratio				**0.88**			**0.87**			**0.91**			**1.03**			**0.88**	
Percent Difference				**-6.4**			**-6.8**			**-4.8**			**1.4**			**-6**	
TRILINEAR DIAGRAM DATA																	
sum (Ca, Mg, Na+K)				11.94			1.33			1.96			1.58			7.04	
Calcium					53.1			43.6			47.08			36.01			45.41
Magnesium					39.9			36.5			22.16			30.78			44.16
Sodium + Potassium					7.0			20.0			30.76			33.21			10.43
sum (SO_4, Cl, HCO_3+CO_3)				13.66			1.54			1.94			1.78			8.04	
Sulfate					1.1			15.8			15.8			0.4			1.4
Chloride					1.4			3.3			7.8			2.4			1.8
Bicarbonate + Carbonate					97.5			80.9			76.4			97.2			96.8

Ta□le 8
Ion Balance Calc□lations
Ce□ar □ills Lan□fill Perc□e□ □ones GW Monitorin□Wells

Data Collected from July 1, 2012 to September 30, 2012

			East Perched Zone												SSWA		
Site ID			**MW-30A**			**MW-47**			**MW-62**			**MW-EB6**			**MW-101**		
Date			7/3/12			7/17/12			No Sample			7/18/12			7/26/12		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	26.9	1.34232	40.1	129.0	6.43713	48.9				12.8	0.63872	21.8	62.1	3.0988	44.9
Magnesium	24.3	2	15.5	1.27546	38.1	69.7	5.73545	43.5				6.8	0.55791	19.0	36.8	3.02818	43.8
Potassium	39.1	1	1.7	0.04322	1.3	5.0	0.12788	1.0				1.6	0.03964	1.4	3.1	0.07954	1.2
Sodium	23.0	1	15.7	0.68291	20.4	18.3	0.79601	6.0				10.2	0.44368	15.1	14.9	0.64811	9.4
Iron	55.8	2	0.0	0.00036	0.0	0.3	0.01085	0.1				28.0	1.00274	34.2	0.2	0.00856	0.1
Manganese	54.9	2	0.0	3.6E-05	0.0	1.8	0.06371	0.5				1.1	0.03859	1.3	1.2	0.04478	0.6
Ammonia-N	14.0	1	0.0	0.00071	0.0	0.1	0.00515	0.0				3.0	0.21061	7.2	0.0	0.00114	0.0
Total Cations (meq/L)				**3.3**			**13.2**						**2.9**			**6.9**	
Anions																	
Alkalinity, Total			182			663						75.2			389		
Carbonate	60.0	2	0.01511	0.0005	0.0	0.36333	0.01211	0.1				0.00432	0.00014	0.0	0.34553	0.01152	0.1
Bicarbonate	61.0	1	222.01	3.63895	93.3	808.12	13.2459	97.3				91.74	1.50363	72.9	473.88	7.76731	97.0
Chloride	35.5	1	1.9	0.05303	1.4	7.2	0.20309	1.5				1.2	0.03272	1.6	4.4	0.12467	1.6
Nitrate-N	14.0	1	0.4	0.02563	0.7	0.0	0.00071	0.0				0.0	0.00221	0.1	0.0	0.00071	0.0
Sulfate	96.1	2	8.8	0.18406	4.7	7.3	0.15137	1.1				25.2	0.52469	25.4	5.0	0.10431	1.3
Total Anions (meq/L)				**3.9**			**13.6**						**2.1**			**8.0**	
Total Ions (meq/L)				**7.2**			**26.8**						**5.0**			**14.9**	
Cation/Anion Ratio				**0.86**			**0.97**						**1.42**			**0.86**	
Percent Difference				**-7.7**			**-1.6**						**17.4**			**-7**	
TRILINEAR DIAGRAM DATA																	
sum (Ca, Mg, Na+K)				3.34			13.10						1.68			6.85	
Calcium					40.1			49.2						38.02			45.21
Magnesium					38.1			43.8						33.21			44.18
Sodium + Potassium					21.7			7.1						28.77			10.62
sum (SO_4, Cl, HCO_3+CO_3)				3.88			13.61						2.06			8.01	
Sulfate					4.7			1.1						25.5			1.3
Chloride					1.4			1.5						1.6			1.6
Bicarbonate + Carbonate					93.9			97.4						73.0			97.1

			East Perched Zone												SSWA		
Site ID			**MW-30A**			**MW-47**			**MW-62**			**MW-EB6**			**MW-101**		
Date			**10/12/12**			**10/8/12**			**No Sam□le**			**No Sam□le**			**10/26/12**		
Cations	MW	n	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)	mg/L	meq/L	%(meq)
Calcium	40.1	2	31.9	1.59182	39.8	123.0	6.13772	51.2							60.4	3.01397	42.7
Magnesium	24.3	2	21.5	1.76918	44.2	61.2	5.036	42.0							39.2	3.22567	45.7
Potassium	39.1	1	1.8	0.04655	1.2	4.5	0.11612	1.0							3.0	0.07673	1.1
Sodium	23.0	1	13.6	0.59157	14.8	14.5	0.63072	5.3							15.9	0.69161	9.8
Iron	55.8	2	0.0	0.00018	0.0	0.2	0.00777	0.1							0.2	0.00688	0.1
Manganese	54.9	2	0.0	1.8E-05	0.0	1.4	0.05024	0.4							1.2	0.04187	0.6
Ammonia-N	14.0	1	0.0	0.00036	0.0	0.1	0.00402	0.0							0.0	0.00114	0.0
Total Cations (meq/L)				**4.0**			**12.0**									**7.1**	
Anions																	
Alkalinity, Total			193			676									381		
Carbonate	60.0	2	0.02064	0.00069	0.0	0.30818	0.01027	0.1							0.35435	0.01181	0.2
Bicarbonate	61.0	1	235.42	3.85873	92.3	824.09	13.5077	97.3							464.10	7.60704	96.9
Chloride	35.5	1	2.1	0.06036	1.4	7.7	0.21606	1.6							4.5	0.12749	1.6
Nitrate-N	14.0	1	0.3	0.02342	0.6	0.0	0.00036	0.0							0.0	0.00036	0.0
Sulfate	96.1	2	11.4	0.23736	5.7	7.2	0.1497	1.1							5.0	0.10452	1.3
Total Anions (meq/L)				**4.2**			**13.9**									**7.9**	
Total Ions (meq/L)				**8.2**			**25.9**									**14.9**	
Cation/Anion Ratio				**0.96**			**0.86**									**0.90**	
Percent Difference				**-2.2**			**-7.4**									**-5**	
TRILINEAR DIAGRAM DATA																	
sum (Ca, Mg, Na+K)				4.00			11.92									7.01	
Calcium					39.8			51.5									43.01
Magnesium					44.2			42.2									46.03
Sodium + Potassium					16.0			6.3									10.96
sum (SO_4, Cl, HCO_3+CO_3)				4.16			13.88									7.85	
Sulfate					5.7			1.1									1.3
Chloride					1.5			1.6									1.6
Bicarbonate + Carbonate					92.8			97.4									97.0