

November 17, 2020

Project No. 20141048

Grand Haven Board of Light and Power
Attn: Erik Booth, P.E., Manager of Operations & Power Supply
1700 Eaton Drive
Grand Haven, Michigan 48417

**PRELIMINARY GROUNDWATER DATA SUMMARY THROUGH OCTOBER 2020
INACTIVE J.B. SIMS GENERATING STATION
1231 N 3RD ST, GRAND HAVEN, MI 49417**

Dear, Mr. Booth.

Per your request, Golder Associates Inc. (Golder) has prepared this correspondence to provide a summary of the groundwater elevation data that has been collected to date, groundwater elevation contour maps (first, second, and third quarter 2020), and historical analytical data from site monitoring wells that has been collected through October 2020. Additionally, it is our understanding that you wanted this data to include the results of the recent surface water sampling conducted over the last four months so that this information can be made available to the public.

The Grand Haven Board of Light and Power (GHBLP) and Golder are currently working collaboratively with both the United States Environmental Protection Agency (USEPA) and Michigan Department of Environment, Great Lakes, and Energy (EGLE) to develop a comprehensive compliance strategy for the recently retired J.B. Sims Power Plant (JB Sims) and associated Coal Combustion Residuals (CCR) units in:

- Reviewing drilling records to understand the composition of JB Sims.
- Addressing CCR for the surface impoundments using in place or removal methods, where feasible.
- Testing for applicable constituents in groundwater near the surface impoundments, water within the surface impoundments, and along the water's edge at the Grand River.
- Compare groundwater and surface water analytical results to State and Federal water quality screening levels

Since 2017, Golder has examined geologic and groundwater quality data for the JB Sims site. Historical records show that this part of the island, where JB Sims was operated, was formed from deposition of various fill materials over many decades. Since the site was previously used as a city dump and other industrial activities, this adds to the complexity of developing a comprehensive environmental strategy. Additionally, the CCR generated from Units 1 & 2 in the 1960's and 1970's was used as fill to make more

land to form the JB Sims site. The current USEPA and EGLE coal combustion residual rules were not written to include a complex environmental and historical situation such as the JB Sims site. Test borings throughout the area encountered ash and other waste materials that are not part of the site's CCR surface impoundments. The JB Sims surface impoundments were constructed into/on top of these other fill materials:

- Units 1 & 2 impoundment is unlined and was formed from ash fill materials, making segregation and removal of JB Sims ash from historical fill material difficult.
- Unit 3 A and Unit 3 B were constructed with an engineered and documented low permeability compacted clay liner on top of historical fill materials; these impoundments have been closed by removal of all CCR and closure certification is pending.

Groundwater Elevation Data

Groundwater elevation data has been recorded at the site by Golder since March 13, 2017 and is ongoing. The historical groundwater elevations are summarized in Table 1, Groundwater Elevation Summary. The depth to groundwater recorded at site monitoring wells ranges from five to ten feet below ground surface and represents a surficial groundwater aquifer in direct hydraulic connection with the adjacent Grand River and influenced by local recharge from stormwater.

Time series plots (Attachment A) have been prepared to show the seasonal variability in groundwater elevations influenced by the Grand River.

Variability in observed groundwater elevations across the site may be influenced by the following:

- Shallow groundwater influenced by stormwater
- Raising Grand River elevations (flooding)

Groundwater Flow Maps

The elevation data from March 27, 2020, June 17, 2020, and September 25, 2020 were used to develop groundwater elevation contour maps (Figure 1 Groundwater Contour Map – March 2020, Figure 2 Groundwater Contour Map – June 2020, and Figure 3 Groundwater Contour Map – September 2020). As shown on Figures 1-3, with the high-water levels in the Grand River (flooding conditions) the direction of groundwater flow tends to be radially inward around the perimeter of the JB Sims site and radially outward around Units 1 & 2 surface impoundment. The groundwater flow direction for the September 25, 2020 event, still shows a radial flow that is inward on the western and southwestern portions of the JB Sims site and radially outward around Units 1 & 2 surface impoundment. The northern and eastern portions of the island show an outward groundwater flow direction towards the Grand River and associated channels during the September 25, 2020 event.

Analytical Data Summary

Groundwater, surface water, and surface impoundment samples have been collected for analysis of applicable CCR monitoring constituents (Appendix III and IV) pursuant to 40 CFR §257.90 through 257.98 and Michigan Part 115 amendment. The Part 115 Amendment was enacted December 2018 and includes additional monitoring constituents. Time series plots for each of the monitored constituents are provided in Attachment B. As shown in Attachments A and B, there does not appear to be a direct

correlation between groundwater and surface water constituent concentrations, fluctuations in groundwater and surface water elevations, and the resultant changes in groundwater flow direction. Golder interprets that the apparent lack of correlation is due to typically low hydraulic gradients and corresponding low flow velocities. Therefore, even when the Grand River is high (flooding conditions), the rate at which groundwater may be displaced by surface water from the Grand River is low, such that constituent concentrations still tend to reflect long-term conditions, regardless of the direction of the gradient. In relation to groundwater surface water interface (GSI) criteria, the results from the surface water locations do not appear to be affected by the Units 1 & 2 impoundment, due to the extremely high ratio of flow in the Grand River to groundwater flux across the GSI. For this reason, surface water sample results are always well below the GSI criteria.

Monitoring well MW-1 was replaced with MW-1R in May 2020 as the location of MW-1 obstructed the construction of the new electrical substation. The replacement monitoring well MW-1R was installed approximately 25 feet west. Time series plots of the original monitoring well MW-1 and the replacement monitoring well MW-1R are provided in Attachment C. As shown in Attachment C, although the distance between these wells is approximately only 25 feet, the initial samples from the replacement well were not statistically similar. MW-1R was installed as the foundations for the new electrical substation were also installed. The timing of the foundation placement and the levels of constituents measured in MW-1R indicate that the disturbances associated with the construction of the foundations appear to have an effect on the groundwater chemistry at this location. Earthwork around the substation, in the vicinity of MW-1R, is complete and the analytical data from the replacement well is starting to resemble the original monitoring well.

The data collected between MW-1 and its replacement MW-1R indicate that disturbing the ash materials using the method of closure by removal could lead to a release of in-place ash materials and downstream migration of contaminants. The conclusion was drawn given the constituent levels reported in MW-1R being statically different from the original location of MW-1, which was 25 feet west of the new location. For this reason, Golder initiated a sampling program over the past four months that consisted of drawing two samples per week in the waters surrounding the island to determine the concentrations of constituents of concern. Also, although sediment curtains and other temporary barriers may be installed in the Grand River to slow the transport of sediments into the Grand River, these measures are temporary and only slow the process of sedimentation, they do not prevent it.

Samples were also collected and analyzed for supplemental constituents for the purposes of developing Stiff and Piper diagrams for geochemical fingerprinting during the June and September 2020 monitoring events, included as Attachment D. As shown in Attachment D, the groundwater, surface water and impoundment samples each hold a distinctly different geochemical signature; the data are not statistically similar. These plots show that the constituents with statistical exceedances have a geochemical fingerprint that is more closely related to the historical fill and not the Unit 3 A and Unit 3 B surface impoundments.

Conclusion

Based on the sampling program described above, the data demonstrates that the material in the Impoundment for Units 1 & 2 is not materially influencing the Grand River which supports the conclusion that a mixing zone and long term monitoring is an appropriate course of action and is an acceptable part

of the environmental strategy for the JB Sims site for the protection of human health and the environment. Additionally, Golder has recommended to the board that an evaluation be conducted regarding an additional feasibility study that includes an in-situ material stabilization program as a potential low impact low risk mitigation approach that could serve as an additional level of mitigation if determined viable and necessary. The material stabilization would involve using a mix design to stabilize the waste materials in-place and would be used in conjunction with a traditional cap system. Golder also understands that long-term monitoring will be a part of the remedial measures implemented for this site.

As described above, the results are encouraging to our strategy and indicate that the integrity of the clay liner for Unit 3 A and B surface impoundments were intact up to the retirement of the JB Sims and keeping the clay liner adds additional protection from stormwater passing through to the underlying historical Island fill.

Given the historic uses of the JB Sims site, Golder is concerned that disturbing materials (both ash and municipal solid waste) that have been relative stable in the ground for over 40 years and were deposited over many decades in the past century would be more harmful to the environment and human health than using in-place measures.

Golder is actively collecting and reviewing the necessary data to assist Grand Haven in developing a comprehensive environmental strategy to effectively mitigate the historical uses over the previous century on the retired JB Sims site. This data is being shared and discussions will continue with both the USEPA and EGLE as a long-term mitigation strategy is developed for this site.

Please contact the undersigned if you need additional information or have questions regarding the attached content.

Sincerely,

Golder Associates Inc.



Carolyn E. Powrozek, C.P.G.
Senior Geologist



Tiffany D. Johnson, P.E.
Principal

CEP/TDJ

CC: Paul Cederquist – GHBLP
David Walters – GHBLP
Arthur Siegal – Jaffe, Raitt Heuer & Weiss, P.C.
David Regalbuto, C.P.G. - Golder

Attachments: Table 1, Historical Groundwater Elevations
Figures 1 through 3, Groundwater Contour Map (March, June, and September)
Attachment A – Hydrographs
Attachment B – Analytical Results Time Series Plots
Attachment C – Monitoring Well MW-1(R) Time Series Plots
Attachment D – Stiff and Piper Diagrams

Tables

TABLE 1.
HISTORICAL GROUNDWATER ELEVATIONS
Grand Haven Board of Light and Power
JB Sims Generating Station

Well Identification	Top of Casing (Staff Gauge) Elevation (feet MSL)	3/13/2017	4/5/2017	4/24/2017	5/15/2017	6/5/2017	6/26/2017	7/17/2017	8/7/2017	6/27/2018	7/30/2018	8/27/2018	9/26/2018	10/22/2018	11/12/2018	11/28/2018	12/7/2018	3/27/2019	9/9/2019	9/27/2019	9/30/2019	11/1/2019	11/15/2019	12/2/2019	12/16/2019	
Monitoring Wells																										
MW-01	587.29	581.63	582.62	581.96	581.64	581.39	581.49	581.79	581.41	NM	NM	582.49	581.99	582.37	NM	NM	NM	582.29	582.05	582.39	NM	583.21	582.96	583.27	582.62	
MW-01R	588.45	Not yet installed																								
MW-02	595.64	580.02	580.24	581.96	580.79	580.70	580.80	581.24	580.79	NM	NM	581.34	581.01	580.94	NM	NM	NM	581.37	582.09	581.94	NM	582.06	579.67	582.47	581.78	
MW-03	593.08	579.99	580.17	580.51	580.74	580.93	581.04	581.30	581.52	NM	NM	581.13	580.91	580.63	NM	NM	NM	580.98	582.13	NM	582.43	582.26	581.89	582.87	582.23	
MW-04	591.49	580.32	580.49	580.84	580.85	580.74	580.98	581.44	581.49	NM	NM	580.99	580.79	581.04	NM	NM	NM	581.14	582.14	NM	581.24	582.49	581.95	582.92	582.05	
MW-05	587.67	Not yet installed									581.67	581.07	581.67	582.02	582.22	582.14	581.97	581.99	582.22	582.08	582.42	NM	583.18	583.02	583.20	582.96
MW-06	590.40	Not yet installed									581.72	581.04	581.80	581.75	582.02	581.87	581.90	581.90	582.18	582.03	582.40	NM	583.18	582.83	583.29	582.84
MW-07	586.49	Not yet installed									581.62	581.29	581.31	581.06	580.94	580.99	580.69	580.79	580.94	582.17	582.09	NM	582.24	581.91	582.72	582.11
MW-08	585.40	Not yet installed									581.63	581.30	581.00	580.95	581.00	581.00	580.70	580.72	580.96	582.18	NM	582.50	582.27	581.94	582.67	582.17
MW-09	589.65	Not yet installed																	582.12	NM	582.25	582.28	582.09	582.68	582.31	
MW-10	586.73	Not yet installed																	582.14	NM	581.93	582.21	581.90	582.17	582.19	
Staff Gauges																										
SG-01	585.10	Not yet installed																	582.20	NM	582.48	582.10	581.97	582.67	582.28	
SG-02	583.43	Not yet installed																	582.11	NM	581.67	582.90	582.81	583.14	582.81	
SG-03	584.37	Not yet installed																	582.13	NM	583.55	582.90	582.85	583.15	582.83	
SG-04	584.53	Not yet installed																	582.11	NM	582.73	584.23	583.10	583.19	583.08	
SG-04R	585.04	Not yet installed																								
SG-05	584.83	Not yet installed																	582.21	NM	582.54	582.19	582.06	582.79	582.17	
SG-06	584.88	Not yet installed																	582.16	NM	582.54	582.18	582.07	582.44	581.77	

Notes:
MSL = mean sea level.
NM = Not Measured

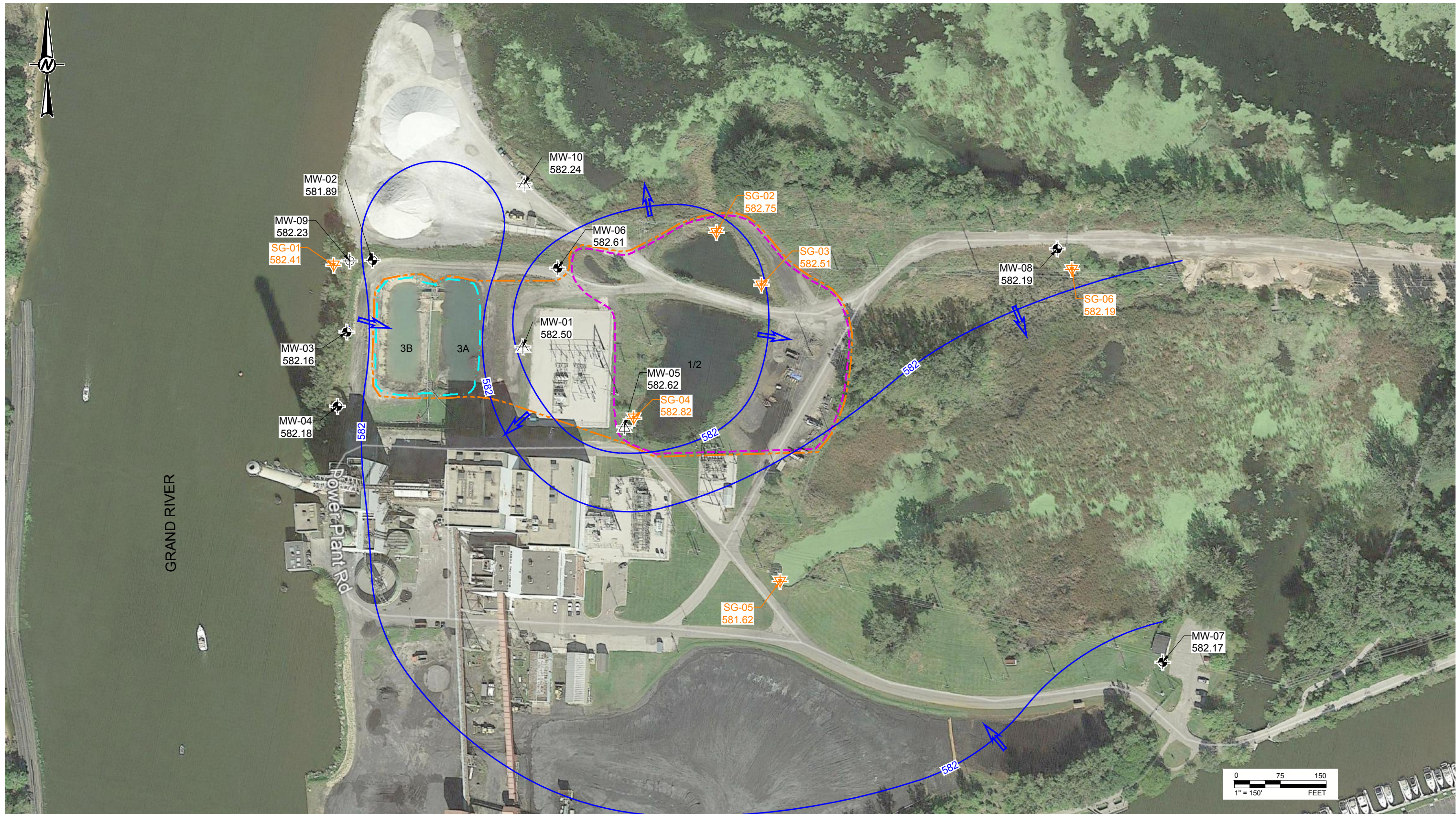
TABLE 1.
HISTORICAL GROUNDWATER ELEVATIONS
Grand Haven Board of Light and Power
JB Sims Generating Station

Well Identification	Top of Casing (Staff Gauge) Elevation (feet MSL)	1/3/2020	1/17/2020	2/3/2020	2/19/2020	3/4/2020	3/27/2020	4/10/2020	4/27/2020	5/6/2020	5/28/2020	6/5/2020	6/17/2020	7/22/2020	7/24/2020	7/31/2020	8/7/2020	8/14/2020	8/21/2020	8/31/2020	9/18/2020	9/25/2020
Monitoring Wells																						
MW-01	587.29	583.13	582.84	583.11	582.72	582.70	582.50	582.84	582.32	Monitoring Well MW-01 was replace by MW-01R on May 1, 2020												
MW-01R	588.45	Not yet installed								582.94	583.17	582.67	582.83	582.49	582.40	582.36	582.32	582.24	582.28	582.20	582.24	582.01
MW-02	595.64	581.28	581.29	581.78	581.82	581.46	581.89	582.09	582.10	581.92	582.77	582.74	582.87	NM	582.77	582.86	582.70	582.42	582.26	582.13	582.50	581.60
MW-03	593.08	581.99	582.20	582.19	582.81	581.88	582.16	582.26	581.70	581.17	582.96	582.71	582.83	NM	582.83	582.78	582.70	582.77	582.69	582.64	582.67	582.31
MW-04	591.49	582.43	582.30	582.33	582.45	581.99	582.18	582.33	582.39	581.97	583.21	582.82	582.85	NM	582.60	582.77	582.66	582.76	582.60	582.66	582.58	582.32
MW-05	587.67	582.26	583.06	583.06	582.85	582.71	582.62	582.87	582.62	582.54	583.20	582.94	582.85	NM	582.48	582.38	582.21	582.06	581.90	582.04	582.24	582.16
MW-06	590.40	583.18	582.97	583.08	582.54	582.57	582.61	582.86	582.65	582.44	583.19	582.95	582.82	NM	582.48	582.42	582.99	582.85	582.73	582.85	582.24	582.13
MW-07	586.49	582.21	582.17	582.26	582.01	581.92	582.17	582.16	582.29	582.08	582.91	582.78	582.77	NM	582.81	582.82	582.67	582.55	582.51	582.66	582.76	582.37
MW-08	585.40	582.12	582.20	582.23	581.83	581.96	582.19	582.15	582.33	582.24	582.93	582.89	582.76	NM	583.08	582.85	582.80	582.69	582.72	582.89	582.76	582.37
MW-09	589.65	582.29	582.24	582.33	582.01	581.99	582.23	582.21	581.78	581.62	582.95	582.83	582.91	582.94	582.83	583.35	583.22	583.06	583.10	583.16	583.04	582.27
MW-10	586.73	582.20	582.21	582.21	582.07	581.98	582.24	582.15	582.26	582.10	582.91	582.91	582.91	582.95	582.85	582.83	582.63	582.97	582.89	583.01	582.54	582.32
Staff Gauges																						
SG-01	585.10	582.18	581.90	583.22	582.09	582.08	582.41	582.20	582.35	582.24	582.98	583.04	582.98	583.20	582.97	583.01	582.83	582.87	582.79	582.83	582.82	582.33
SG-02	583.43	582.94	582.95	Frozen	Frozen	582.81	582.75	582.93	583.22	583.35	583.32	583.37	583.09	582.90	582.88	582.85	582.87	582.74	582.80	582.94	582.53	582.49
SG-03	584.37	582.89	582.91	Frozen	Frozen	582.58	582.51	582.75	582.59	582.96	583.13	583.02	583.03	582.75	582.80	582.72	582.75	582.70	582.67	582.81	582.51	582.48
SG-04	584.53	583.19	583.18	583.20	Frozen	582.82	582.82	583.01	582.78	583.18	Damaged	Damaged	Staff Gauge SG-04 was replaced by SG-04R on June 17, 2020									
SG-04R	585.04	Not yet installed											582.94	582.60	582.58	582.45	582.55	582.51	582.59	582.71	582.36	582.30
SG-05	584.83	582.21	582.19	582.22	581.96	581.61	581.62	581.82	582.02	582.14	582.61	582.61	582.67	582.78	582.59	582.70	582.75	582.80	582.95	583.06	582.57	582.03
SG-06	584.88	581.87	581.30	581.76	Frozen	582.14	582.19	582.13	582.21	582.35	583.10	583.24	582.85	583.36	583.15	583.06	582.14	582.12	582.19	582.25	582.77	582.42

Notes:
MSL = mean sea level.
NM = Not Measured

Figures

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NOTE(S)
1. HORIZONTAL COORDINATE SYSTEM BASED ON MICHIGAN STATE PLANE SOUTH, INTERNATIONAL FEET. VERTICAL DATUM IS NAVD 1988.

LEGEND

DETECTION MONITORING WELL

ASSESSMENT MONITORING WELL

PIEZOMETER

STAFF GAUGE

582 — GROUNDWATER CONTOURS

LIMIT OF UNITS 1/2 ASH PLACEMENT AFTER 1981

UNIT 3 LIMITS OF ASH PLACEMENT

MULTIUNIT NETWORK BOUNDARY

GROUNDWATER FLOW DIRECTION

CLIENT
GRAND HAVEN BOARD OF LIGHT AND POWER
GRAND HAVEN, MICHIGAN

CONSULTANT	YYYY-MM-DD	2020-09-28
DESIGNED	CEP	
PREPARED	DJC	
REVIEWED	CEP	
APPROVED	TPJ	

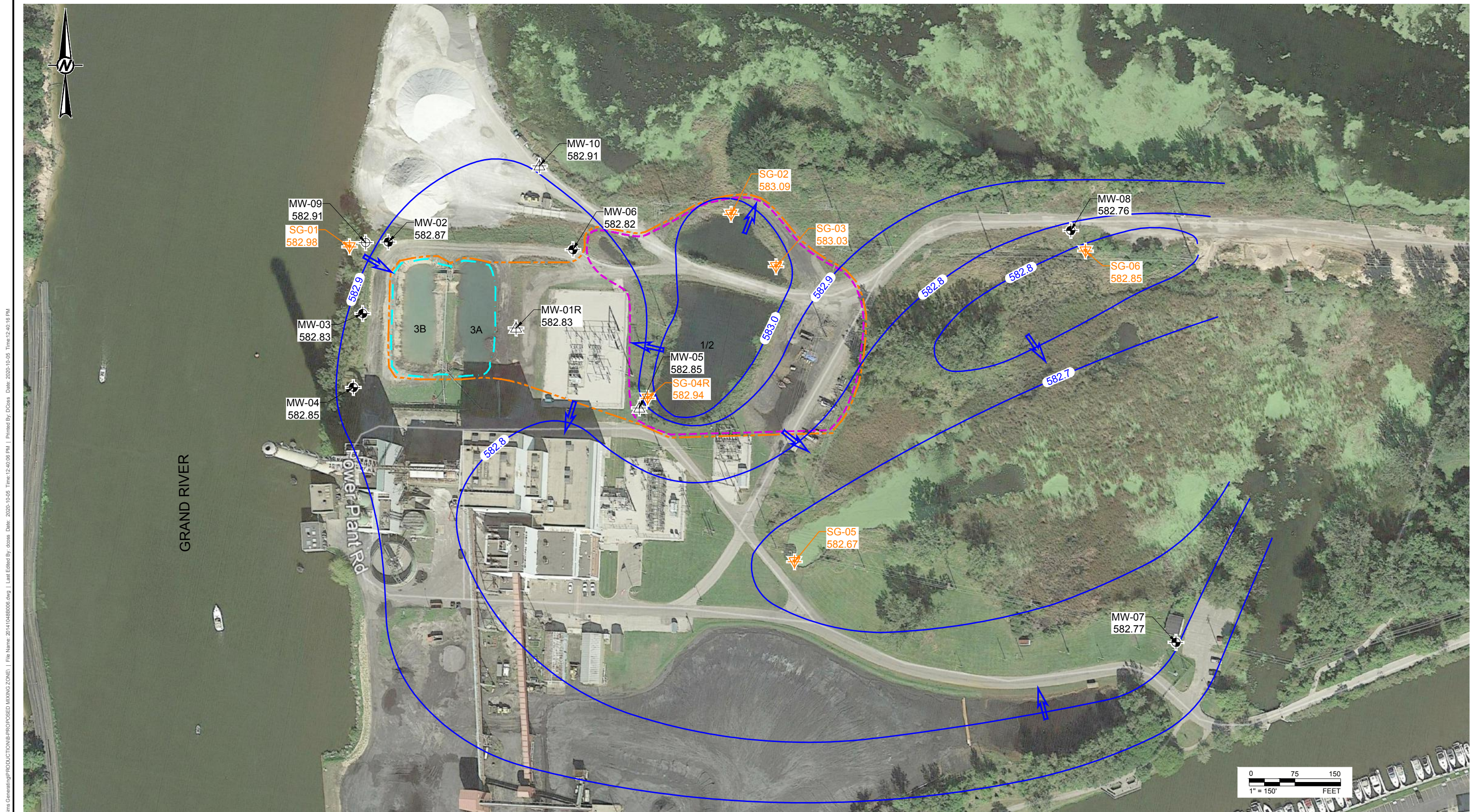


PROJECT
JB SIMS GENERATING STATION

TITLE
GROUNDWATER CONTOUR MAP
MARCH 27, 2020

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REFERENCE
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NOTE(S)
1. HORIZONTAL COORDINATE SYSTEM BASED ON MICHIGAN STATE PLANE SOUTH, INTERNATIONAL FEET. VERTICAL DATUM IS NAVD 1988.

- LEGEND**
- DETECTION MONITORING WELL
 - ASSESSMENT MONITORING WELL
 - PIEZOMETER
 - STAFF GAUGE
 - 582 — GROUNDWATER CONTOURS
 - LIMIT OF UNITS 1/2 ASH PLACEMENT AFTER 1981
 - UNIT 3 LIMITS OF ASH PLACEMENT
 - MULTIUNIT NETWORK BOUNDARY
 - GROUNDWATER FLOW DIRECTION

CLIENT
GRAND HAVEN BOARD OF LIGHT AND POWER
GRAND HAVEN, MICHIGAN

CONSULTANT	YYYY-MM-DD	2020-10-05
	DESIGNED	CEP
	PREPARED	DJC
	REVIEWED	CEP
	APPROVED	TPJ



PROJECT
JB SIMS GENERATING STATION

TITLE
GROUNDWATER CONTOUR MAP
JUNE 17, 2020

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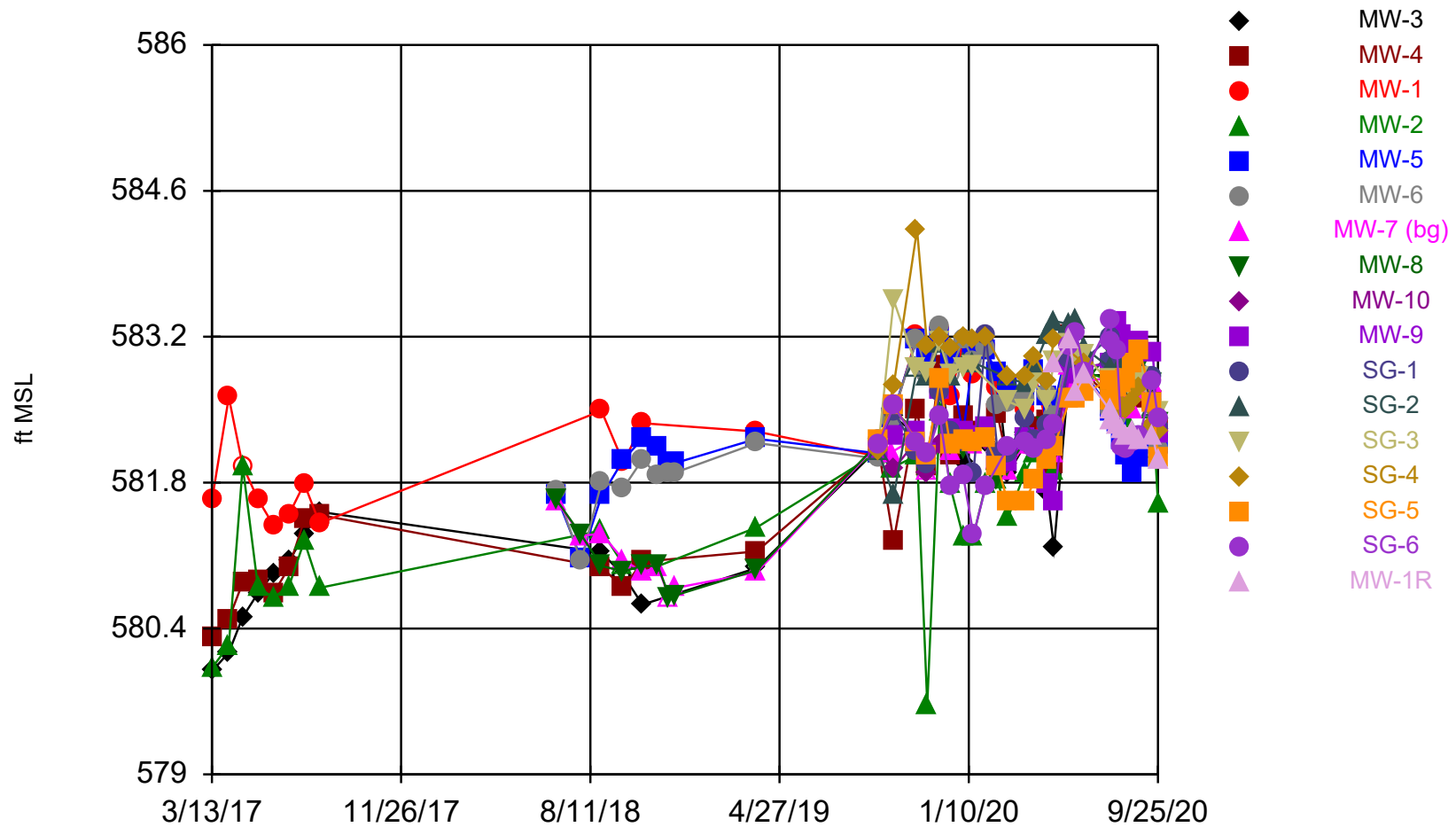
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ATTACHMENT A

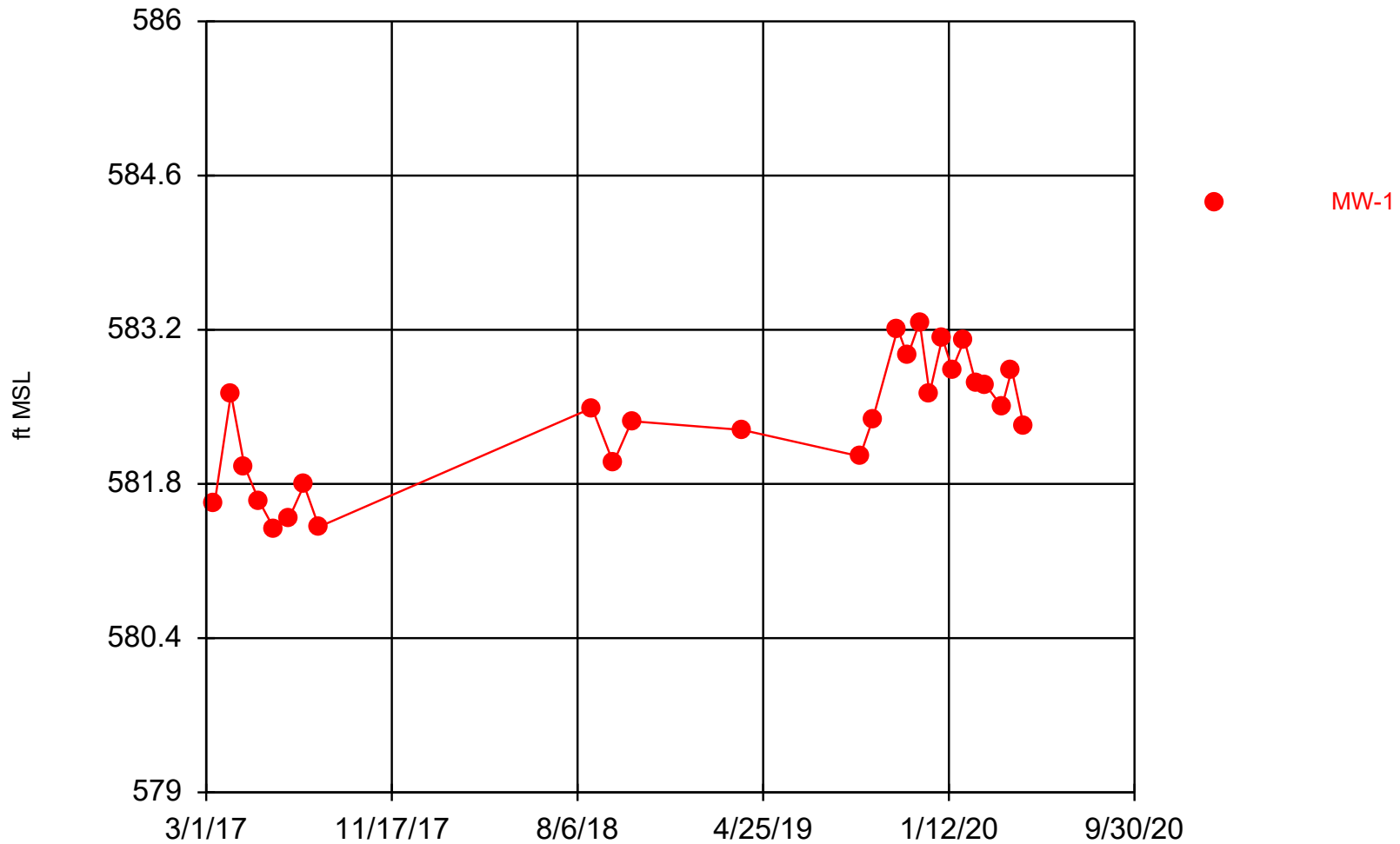
Hydrographs

Time Series

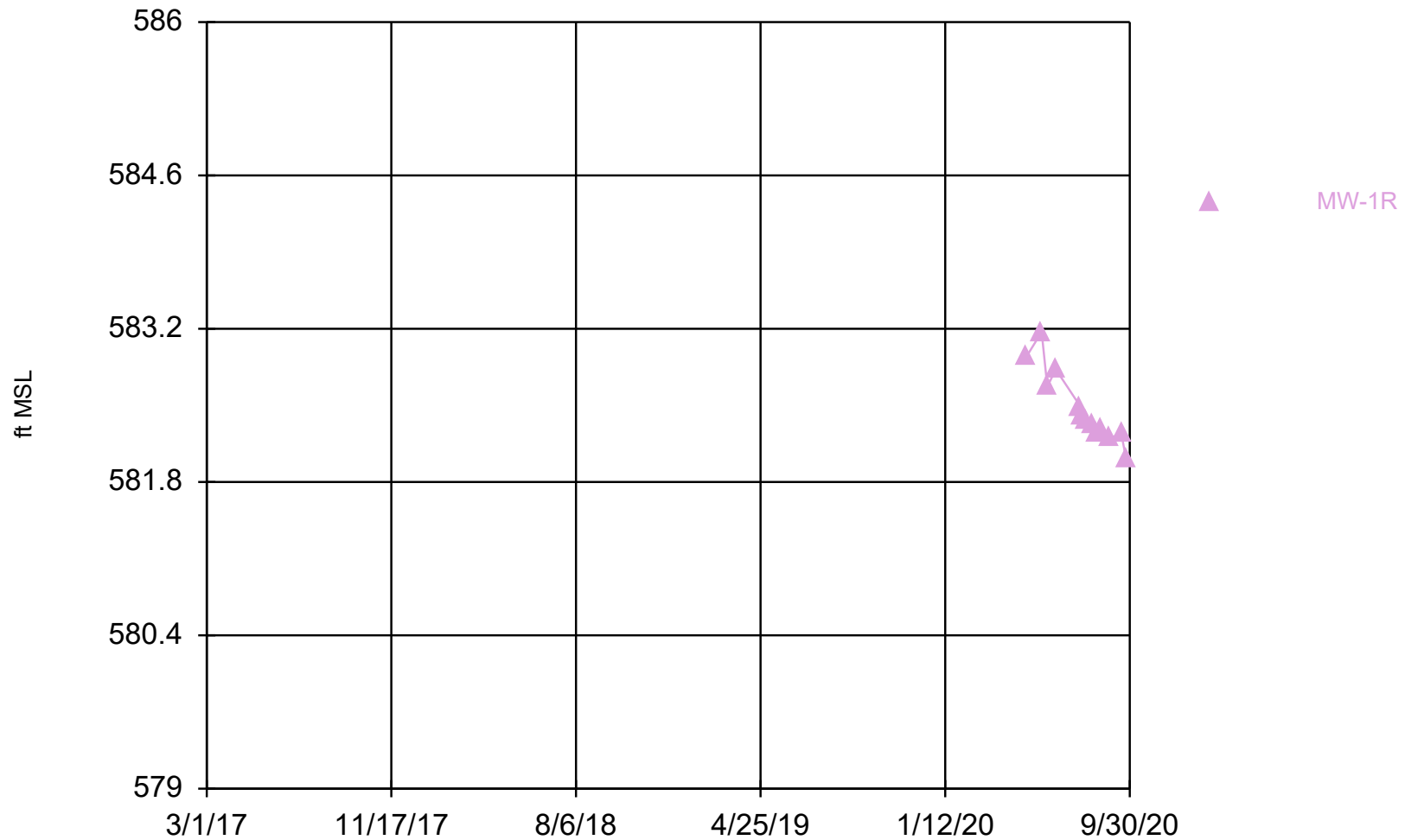


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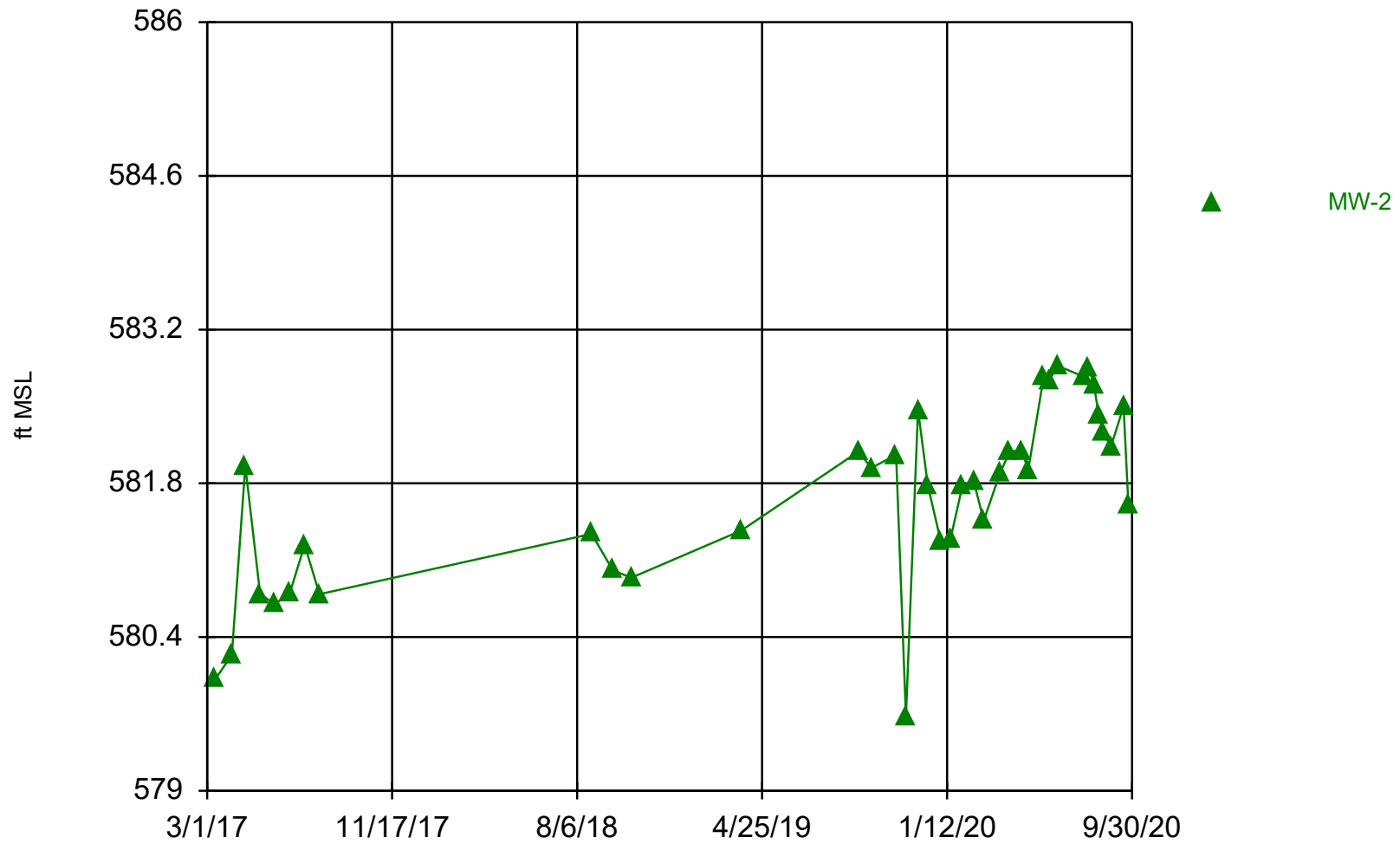


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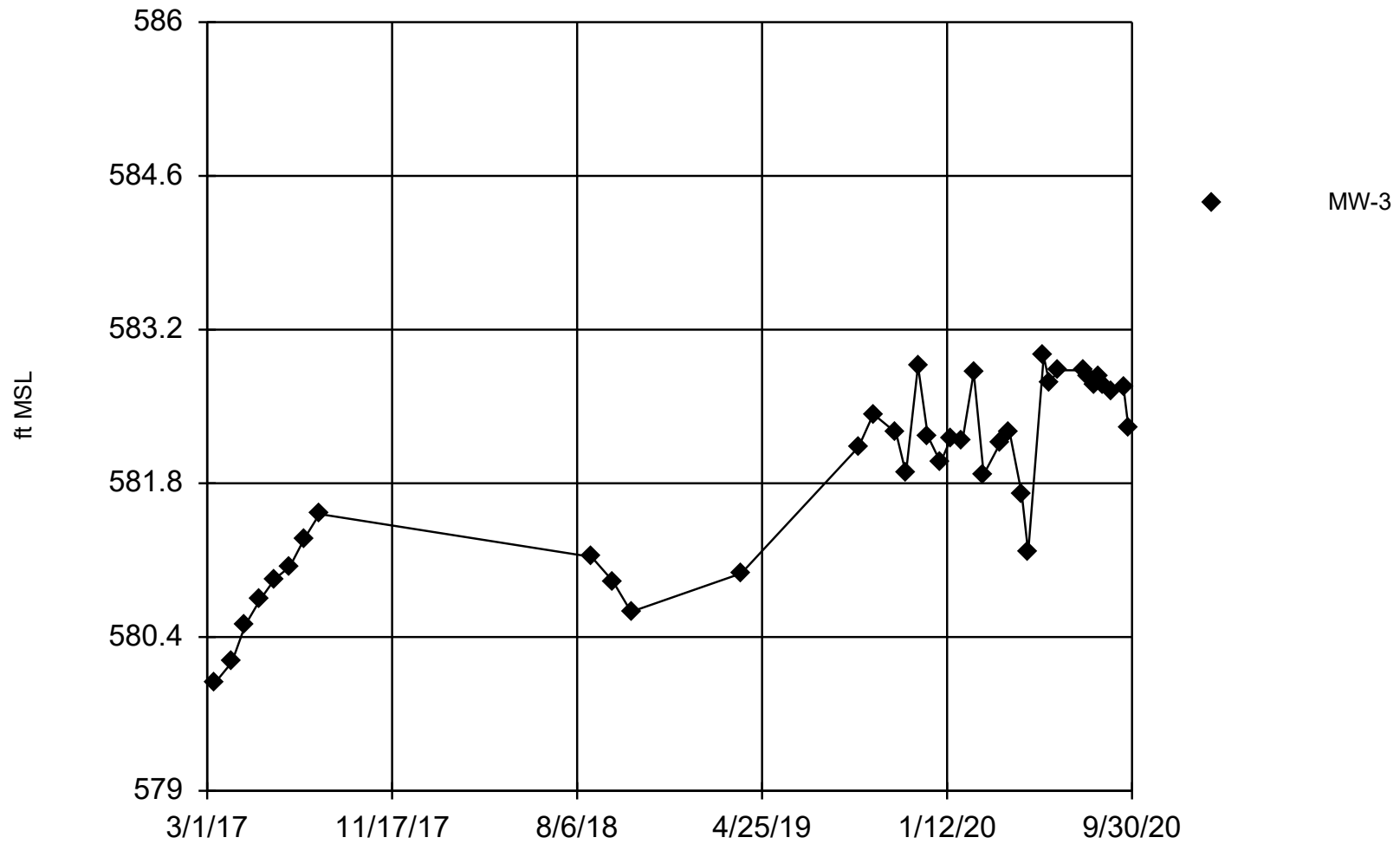
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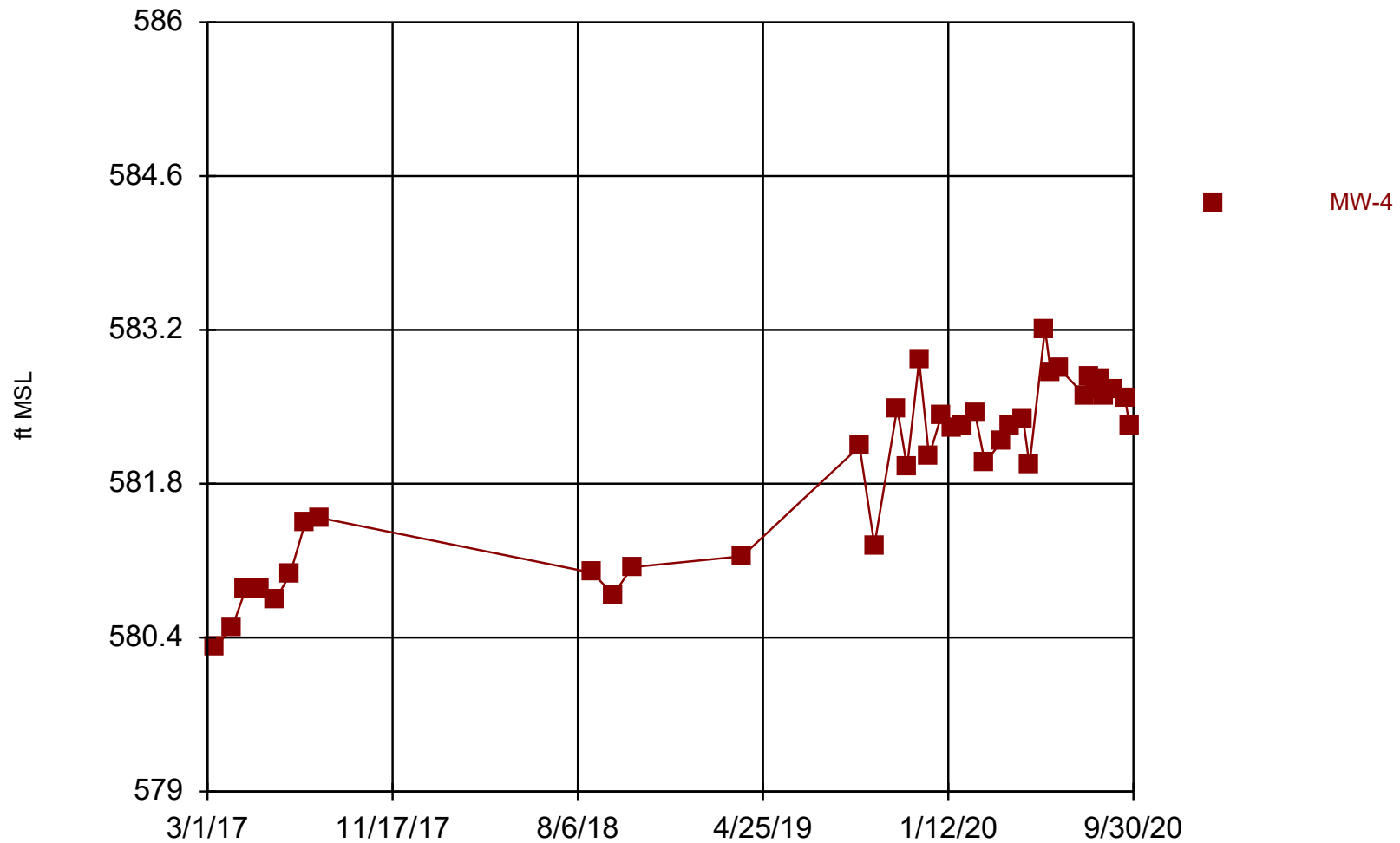


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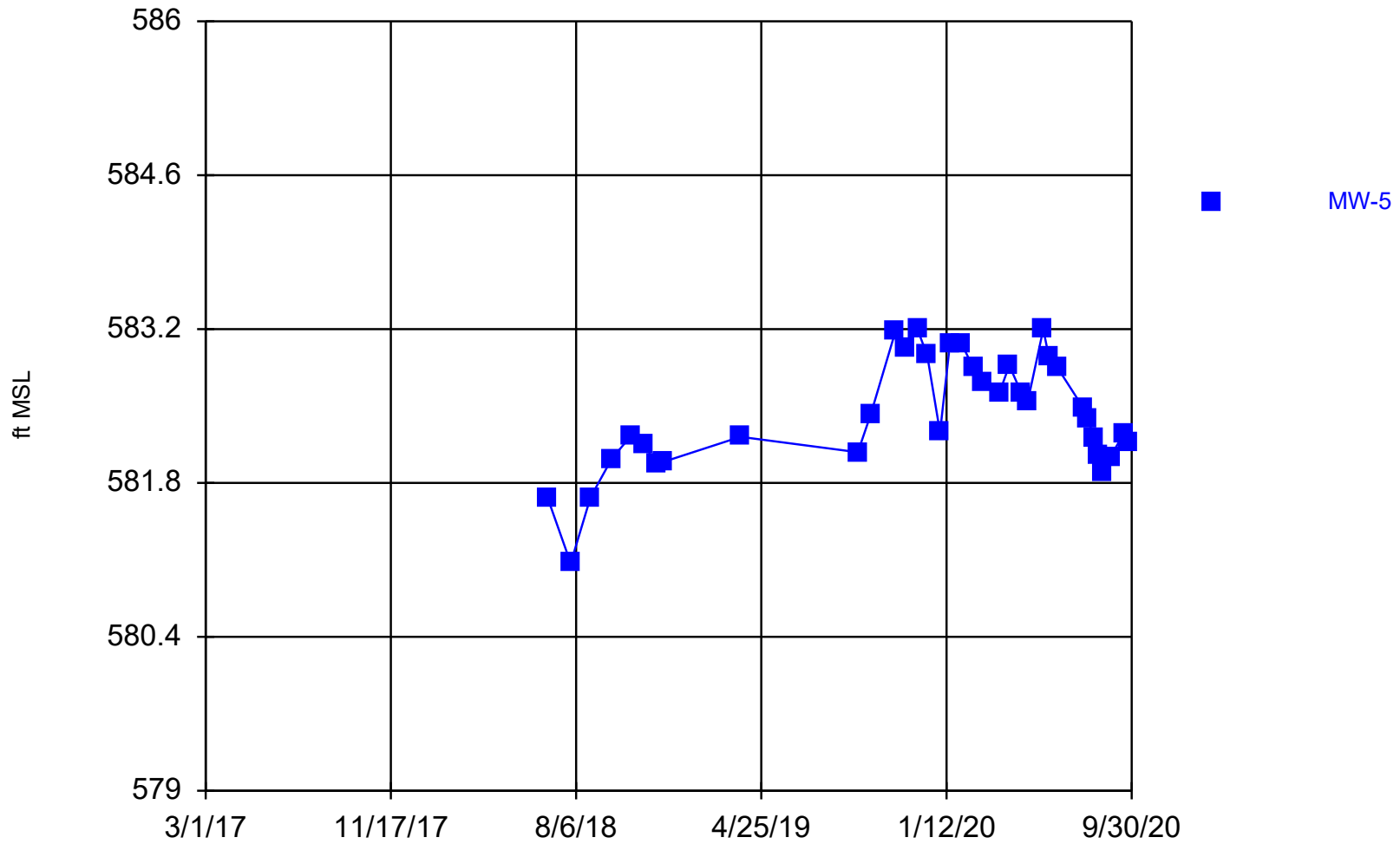
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Time Series

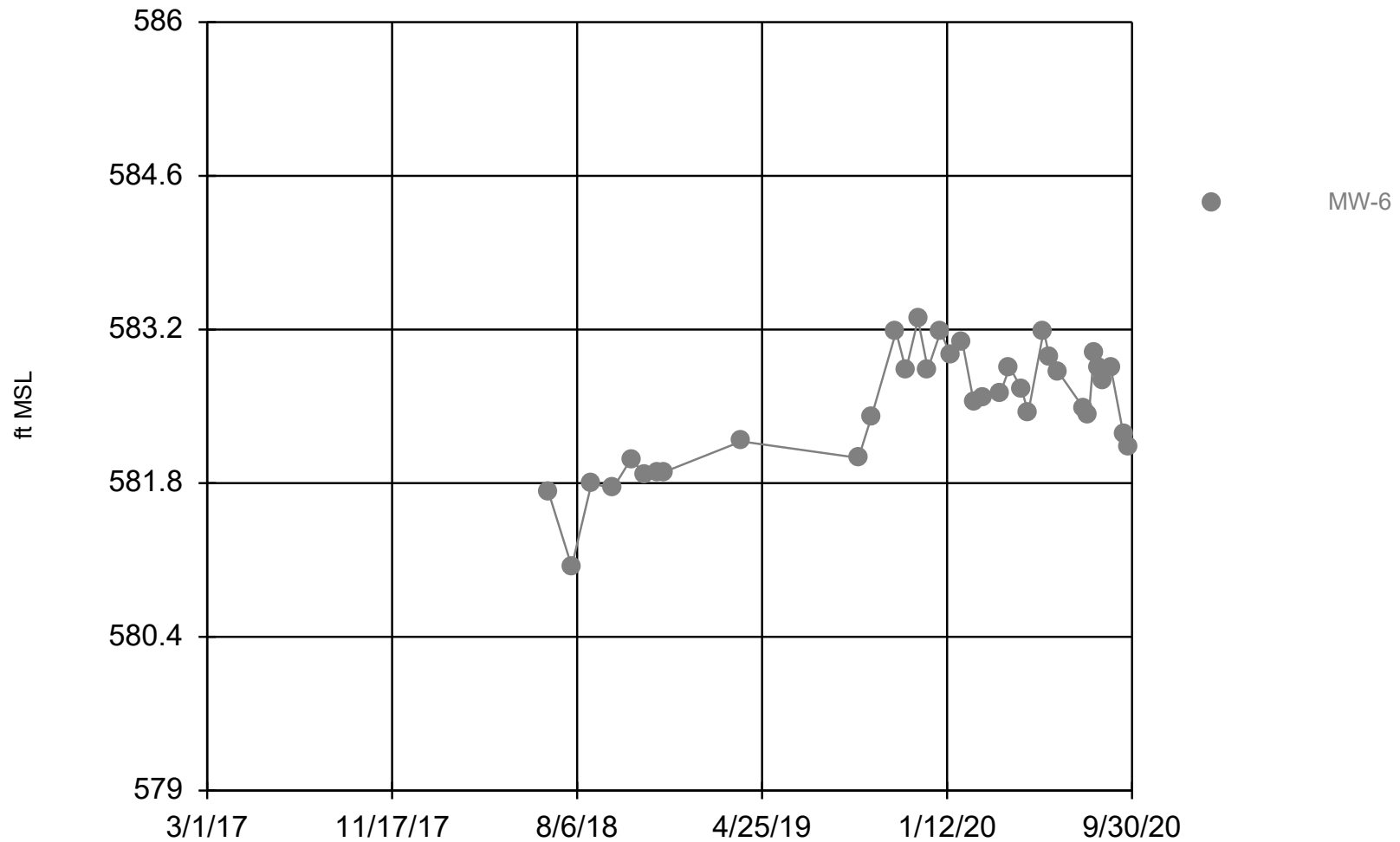


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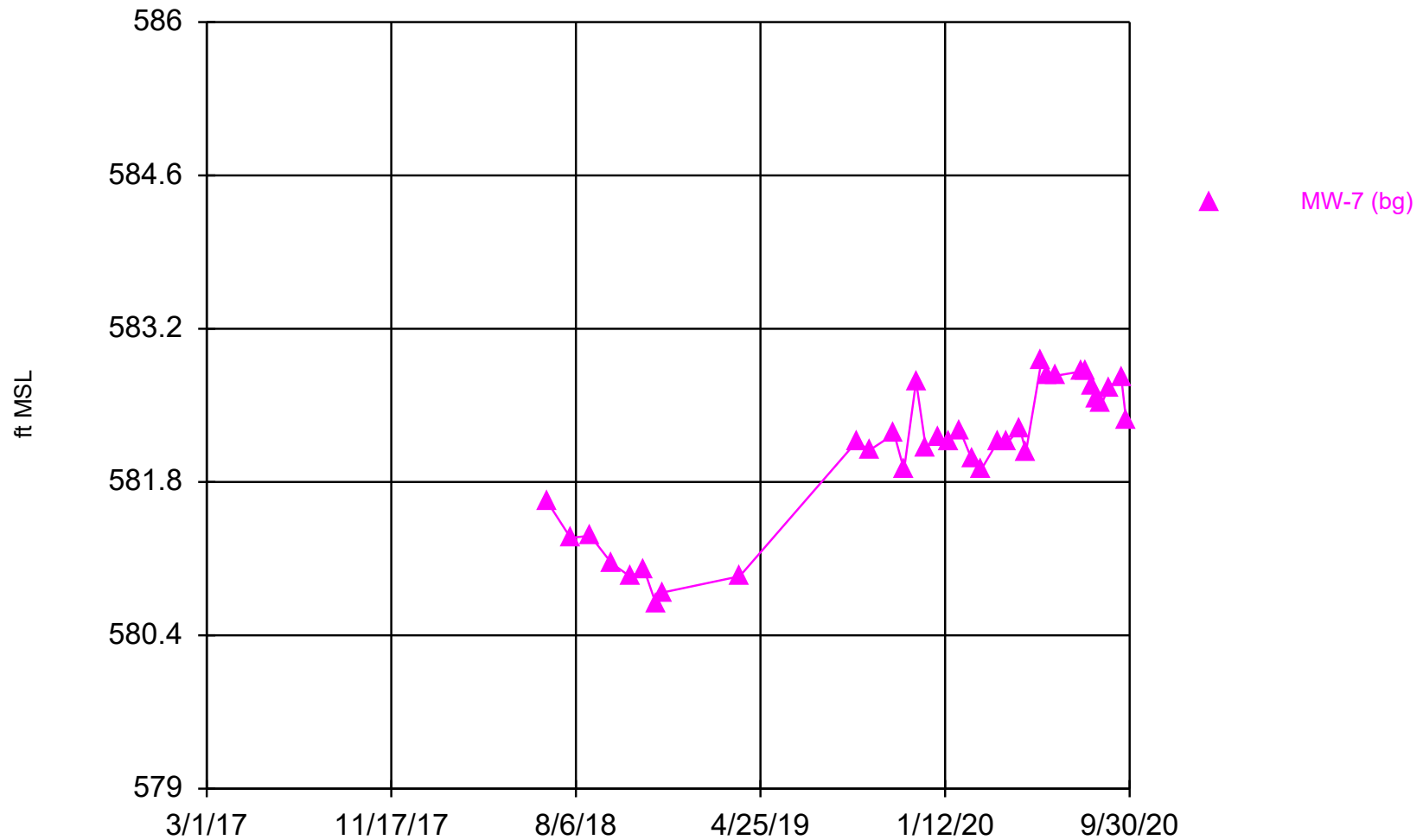


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Time Series



Time Series

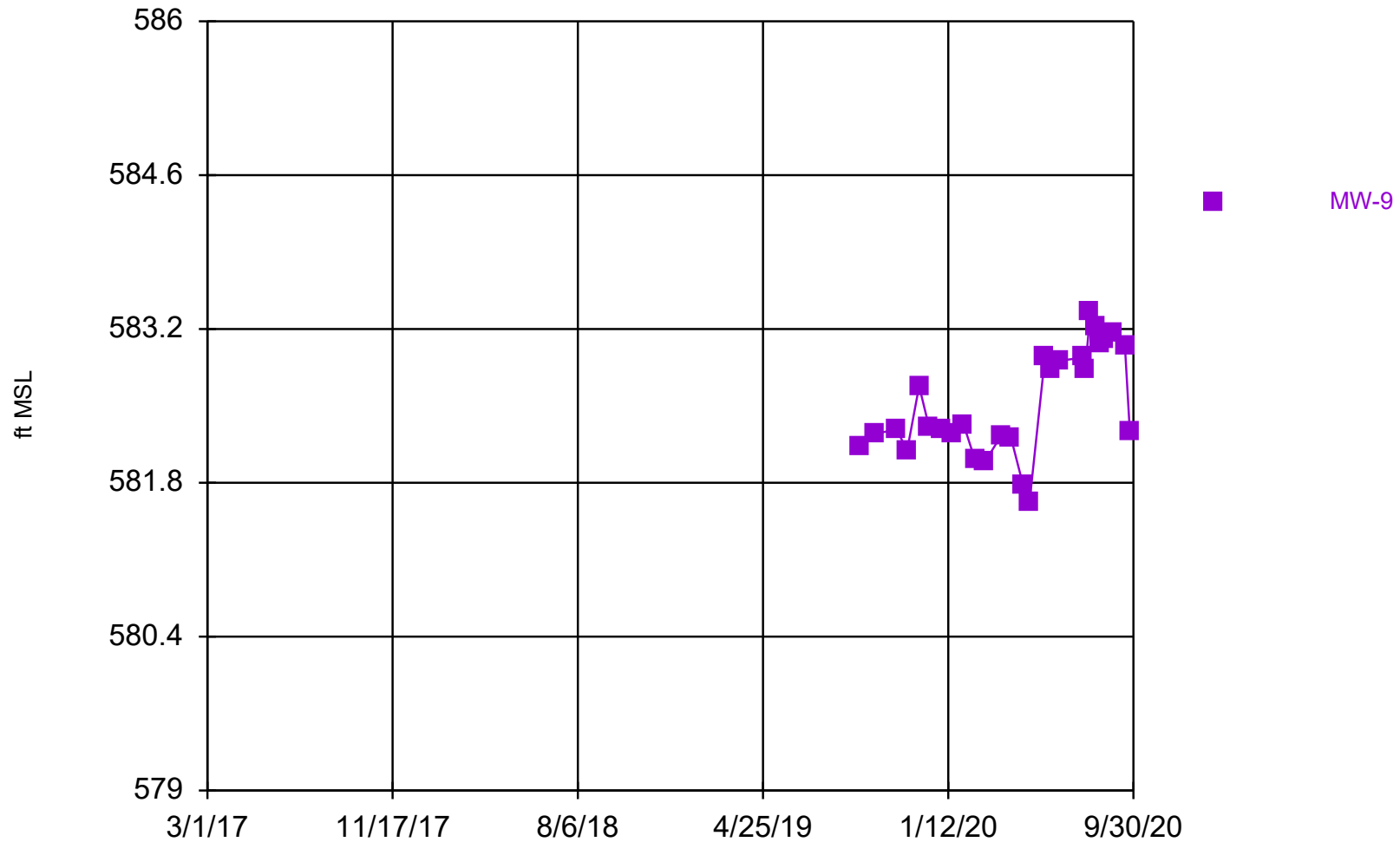


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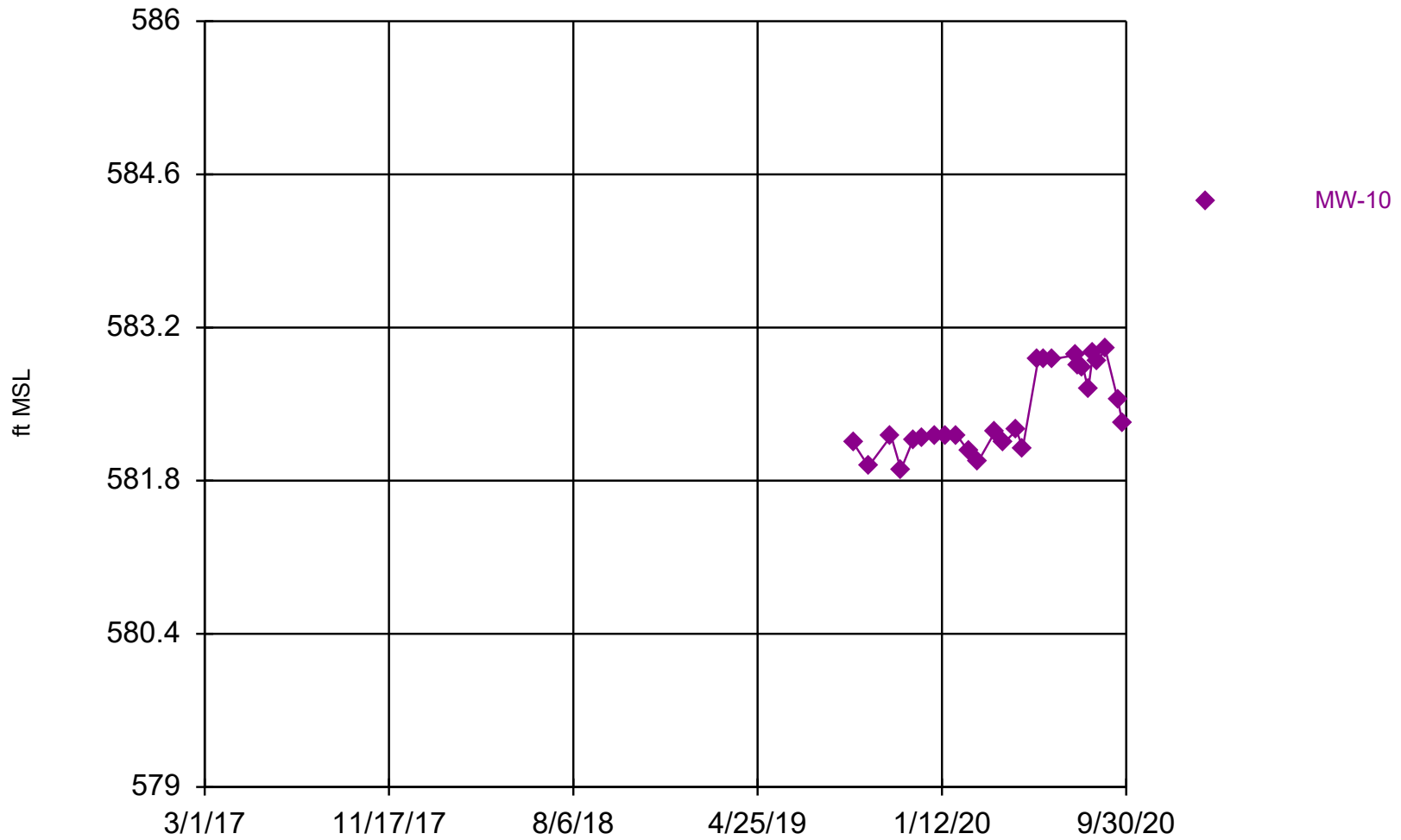


Constituent: Groundwater Elevation Analysis Run 10/28/2020 3:12 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

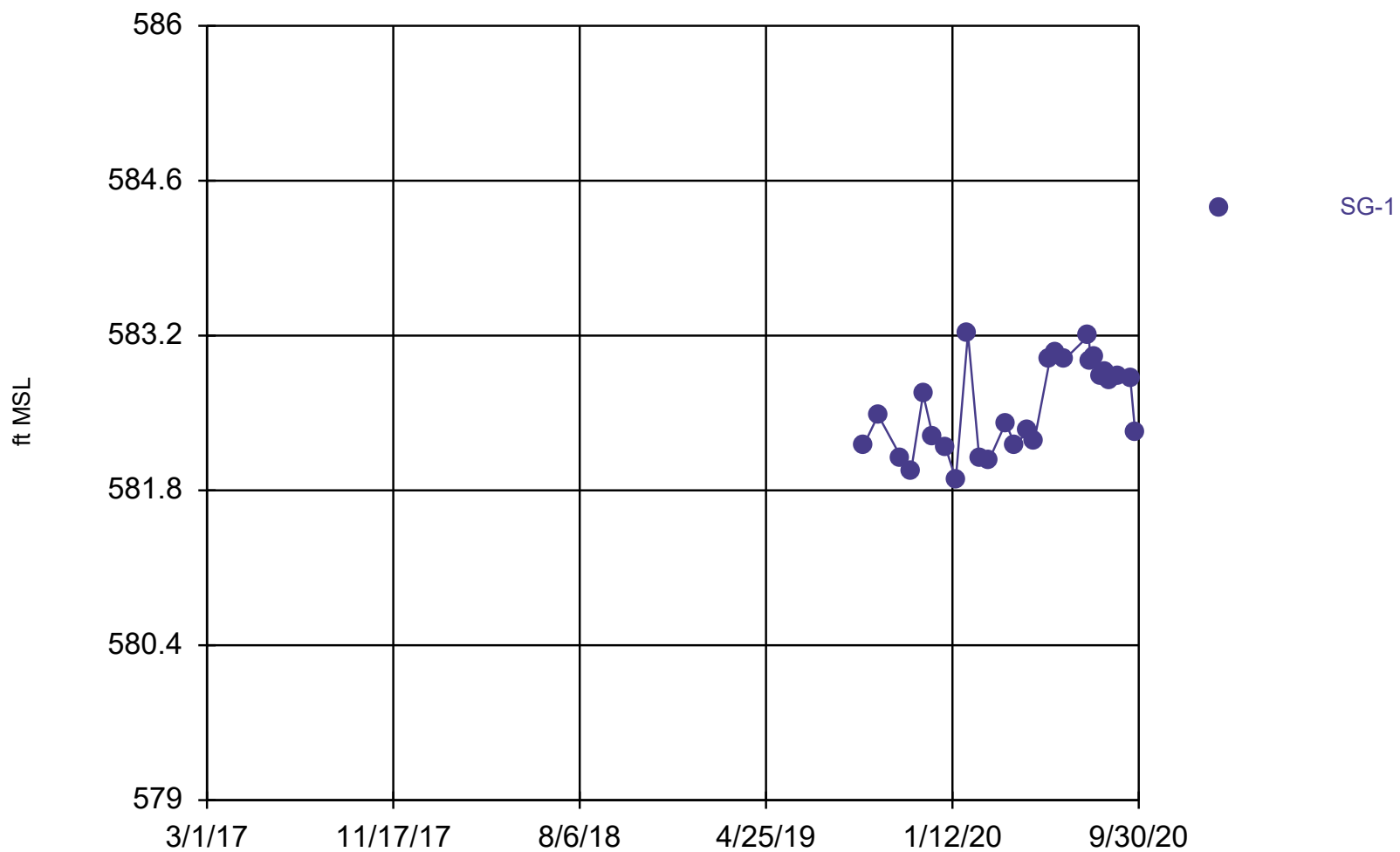
Time Series



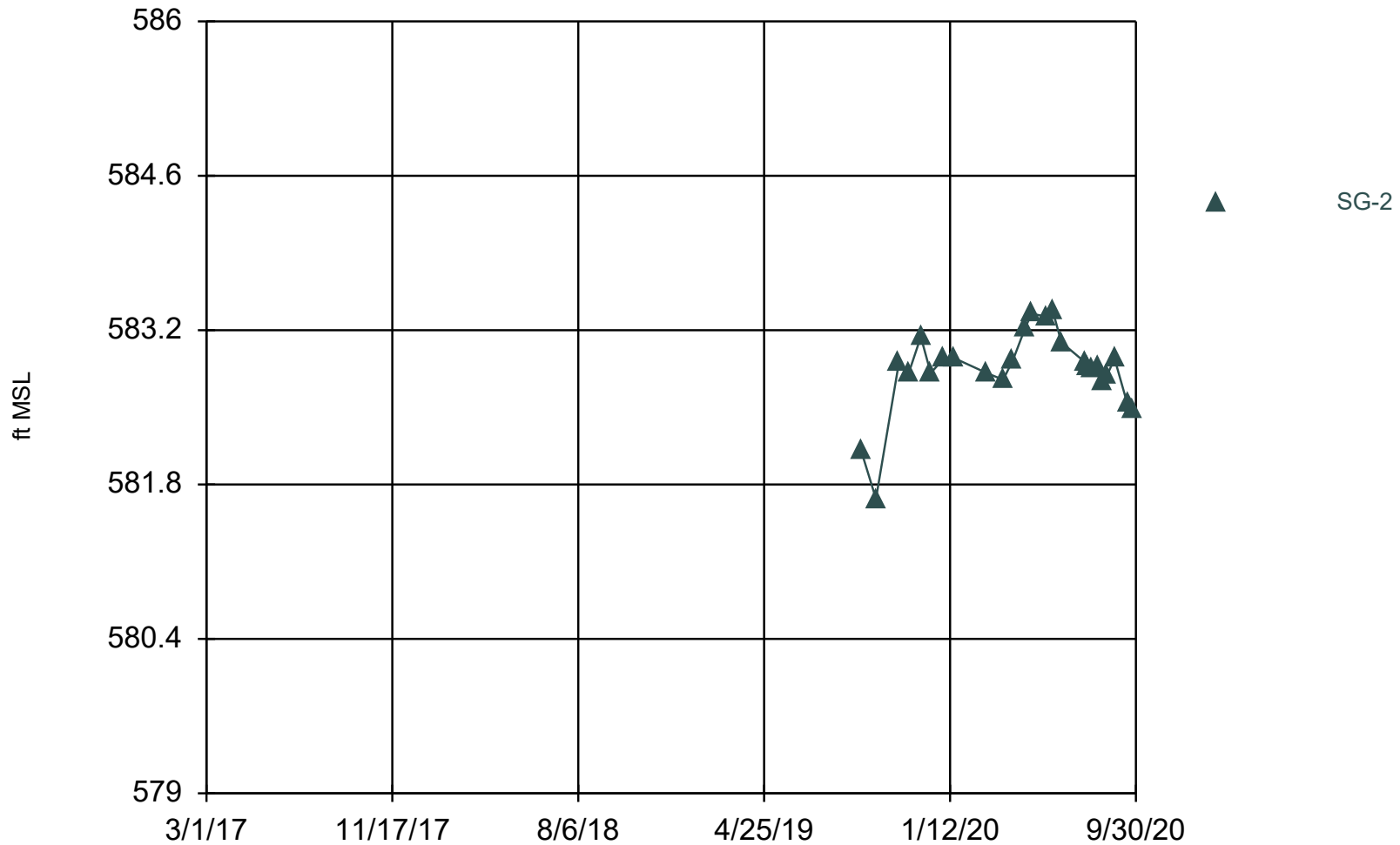
Time Series



Time Series

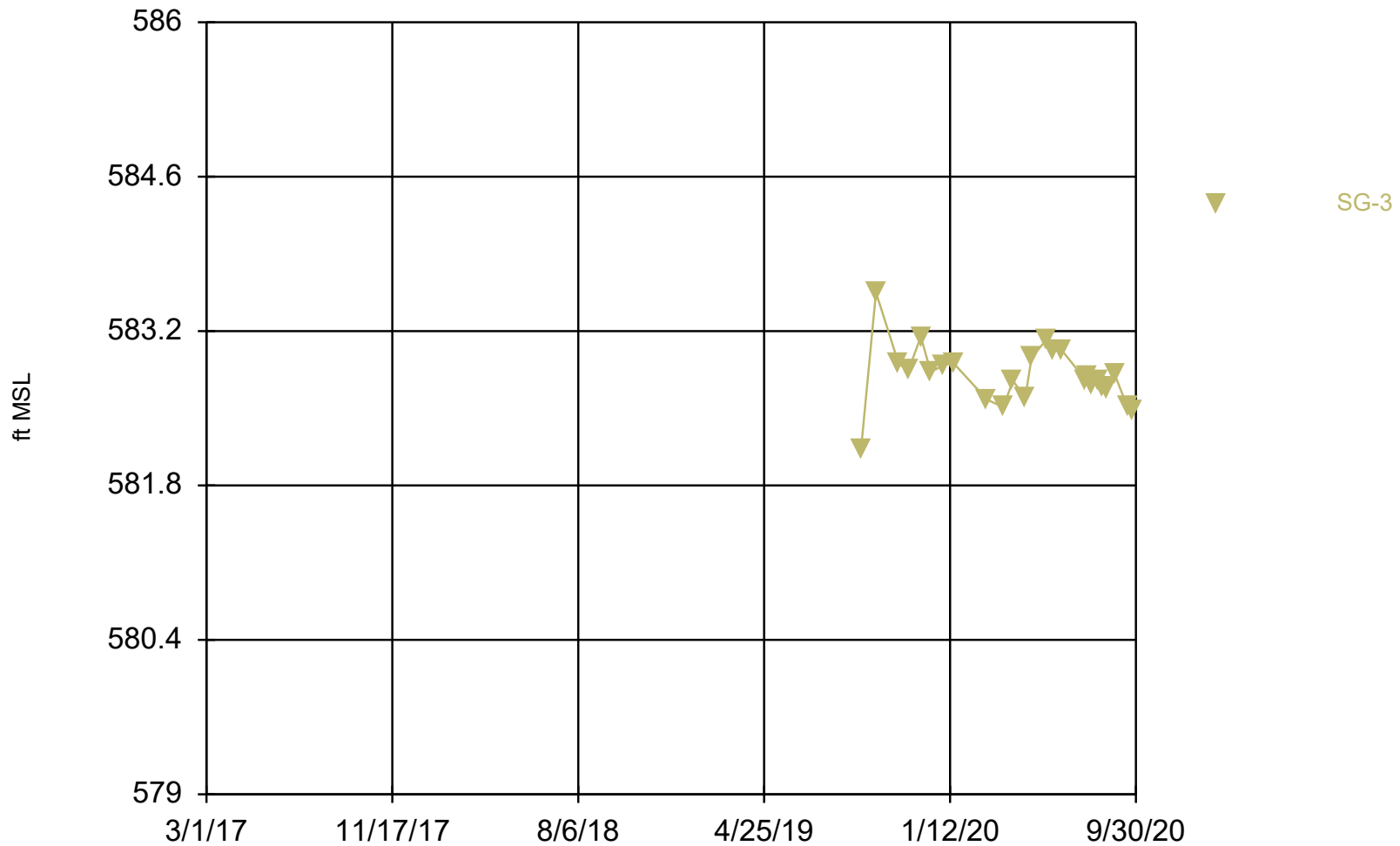


Time Series



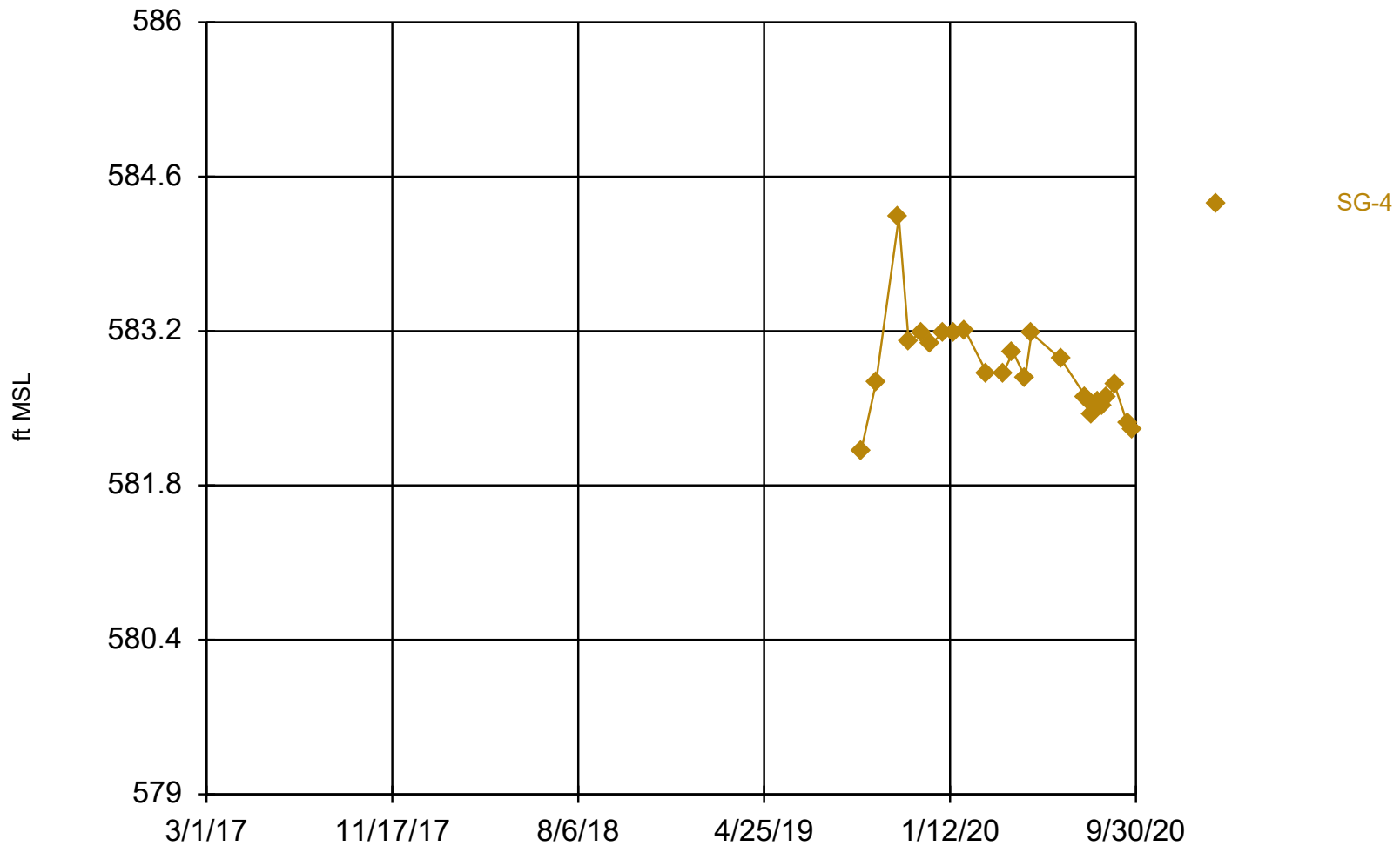
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



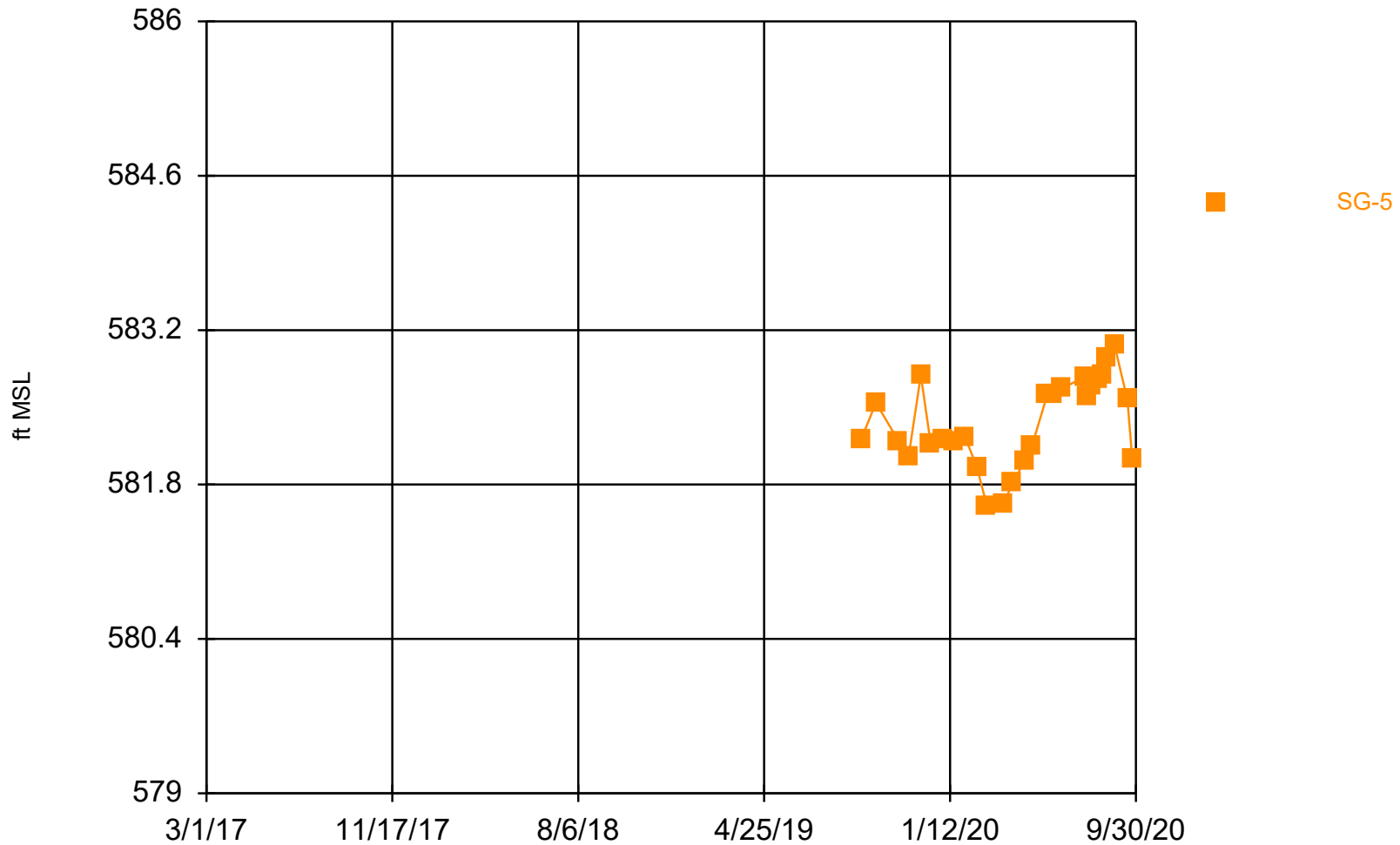
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



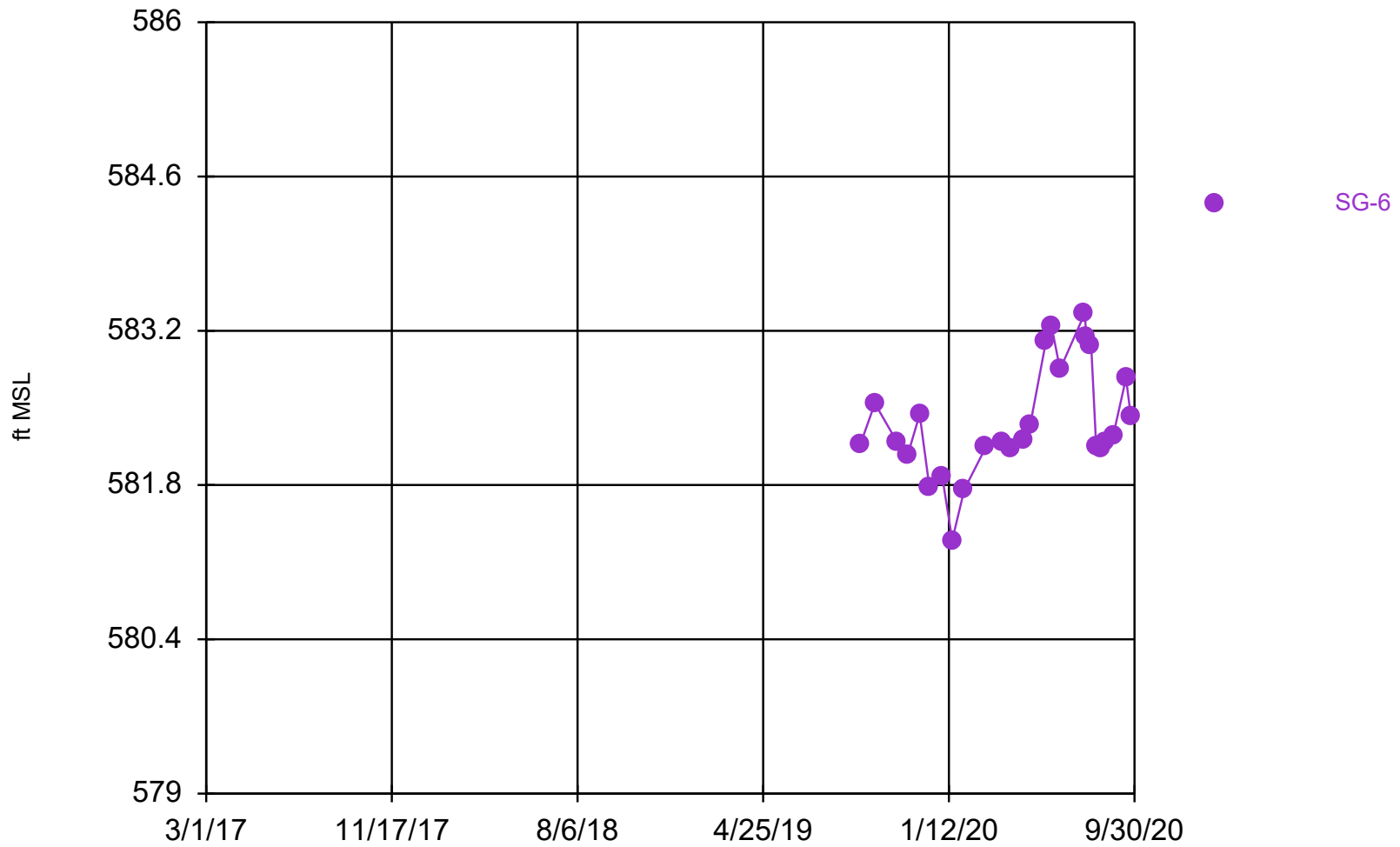
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Groundwater Elevation Analysis Run 10/28/2020 3:13 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

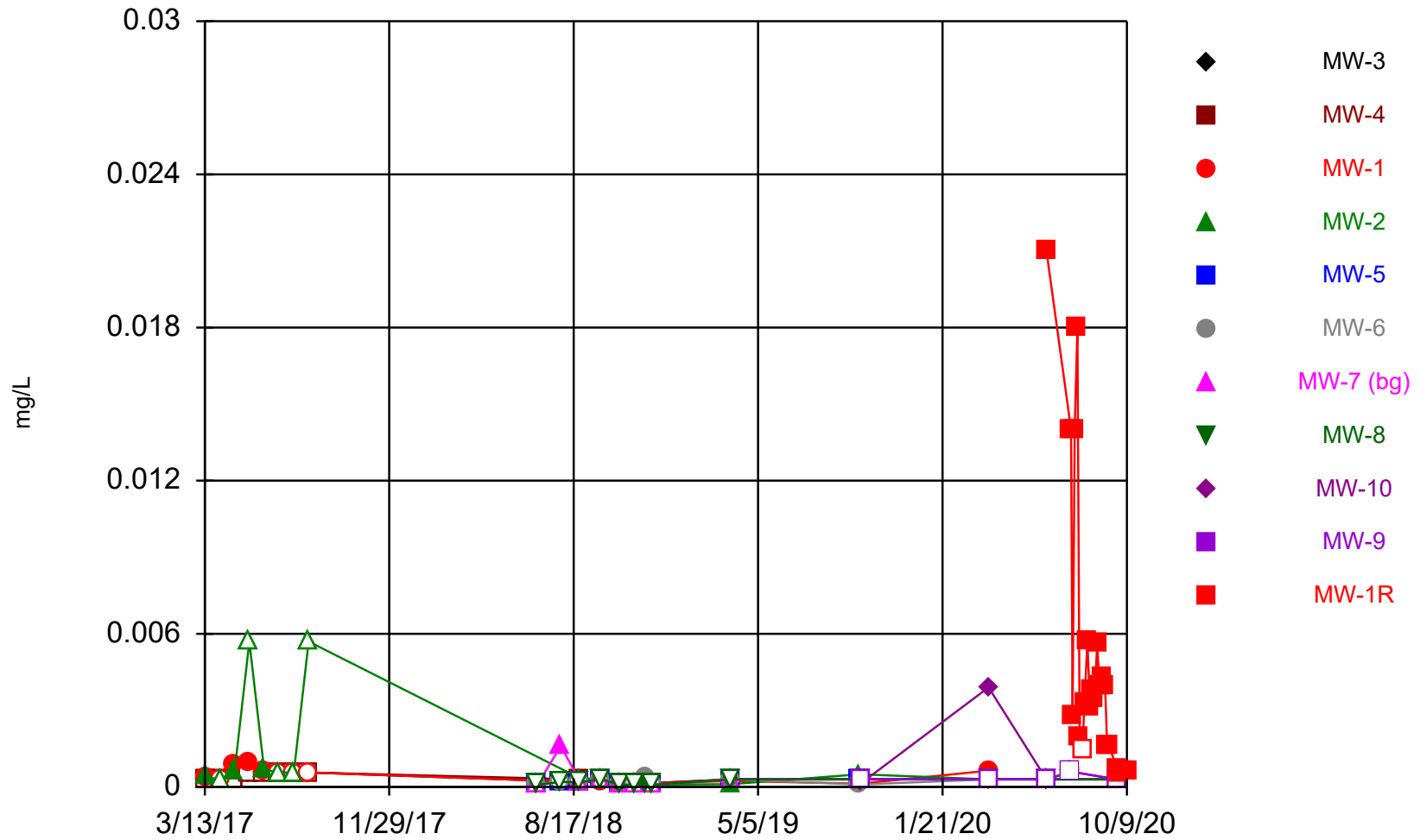
Time Series



ATTACHMENT B

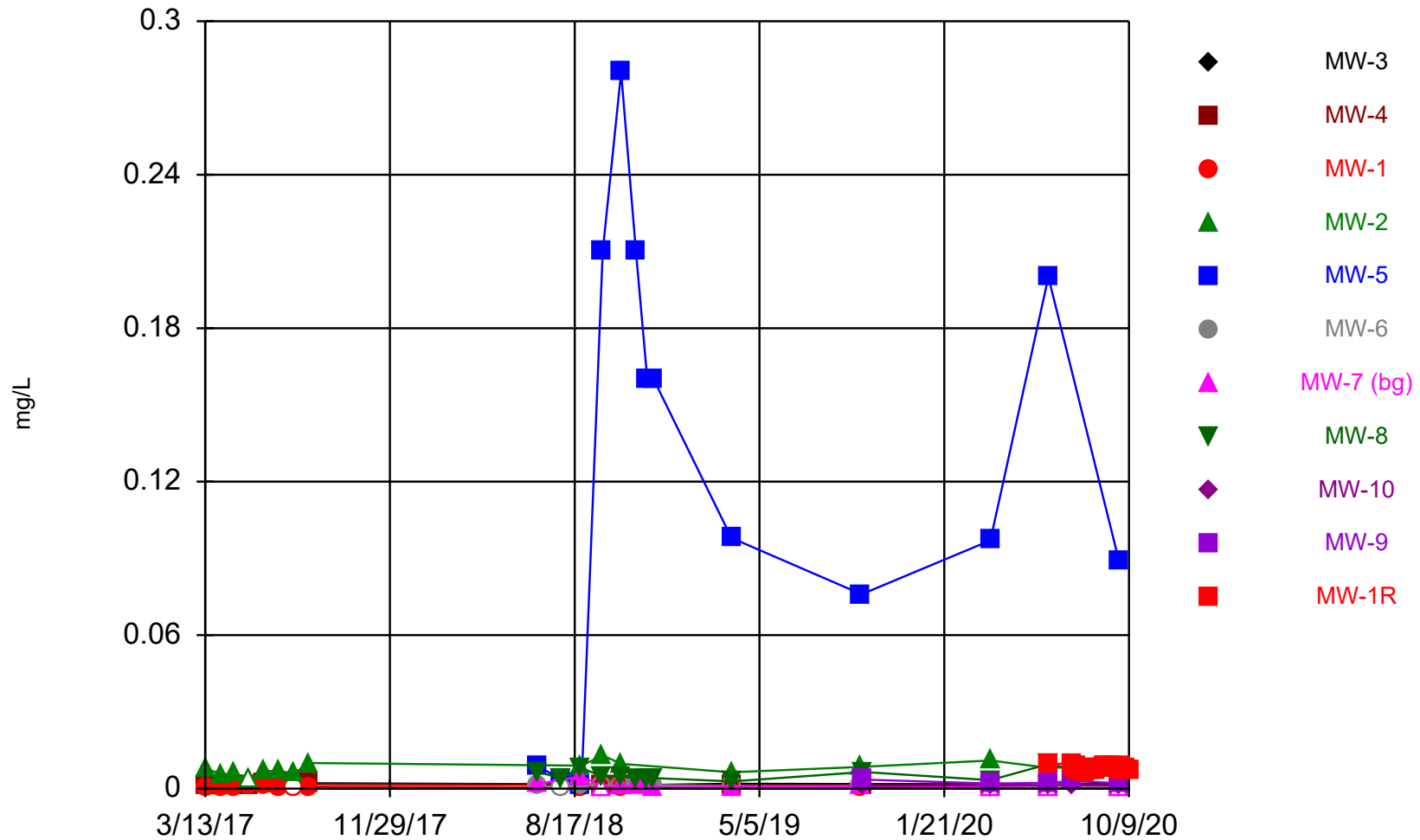
Analytical Results Time Series Plots

Time Series



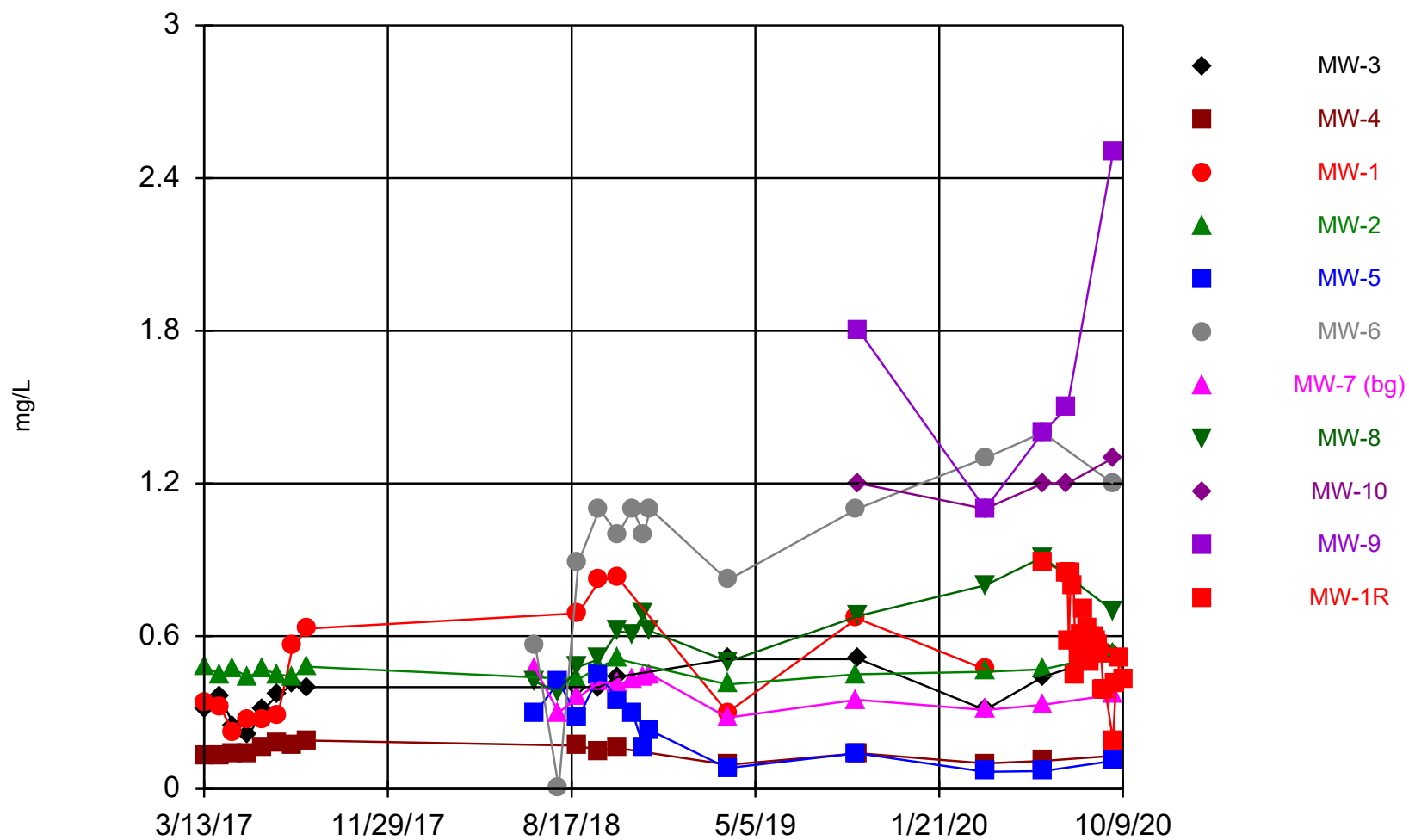
Constituent: Antimony Analysis Run 10/27/2020 12:40 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



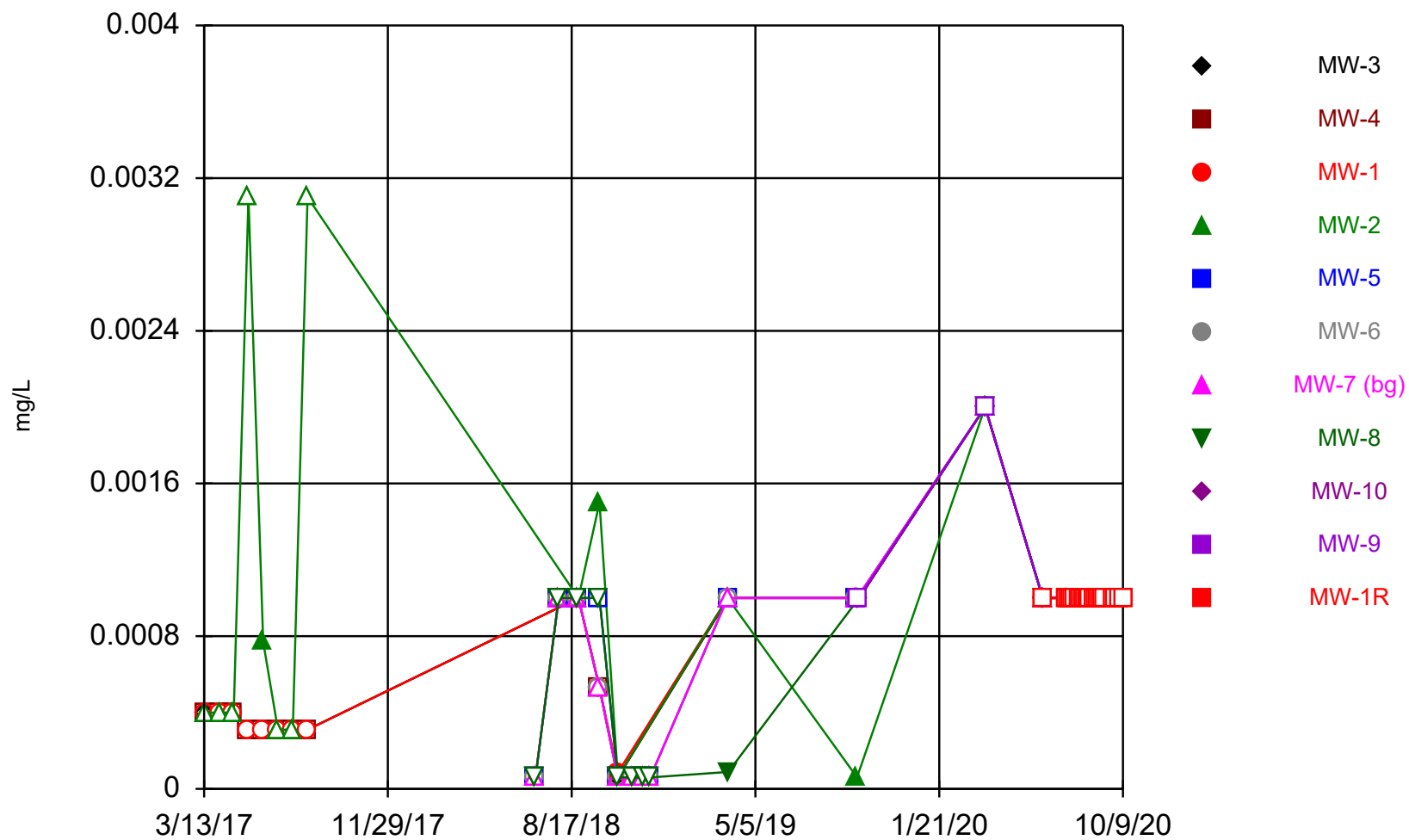
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



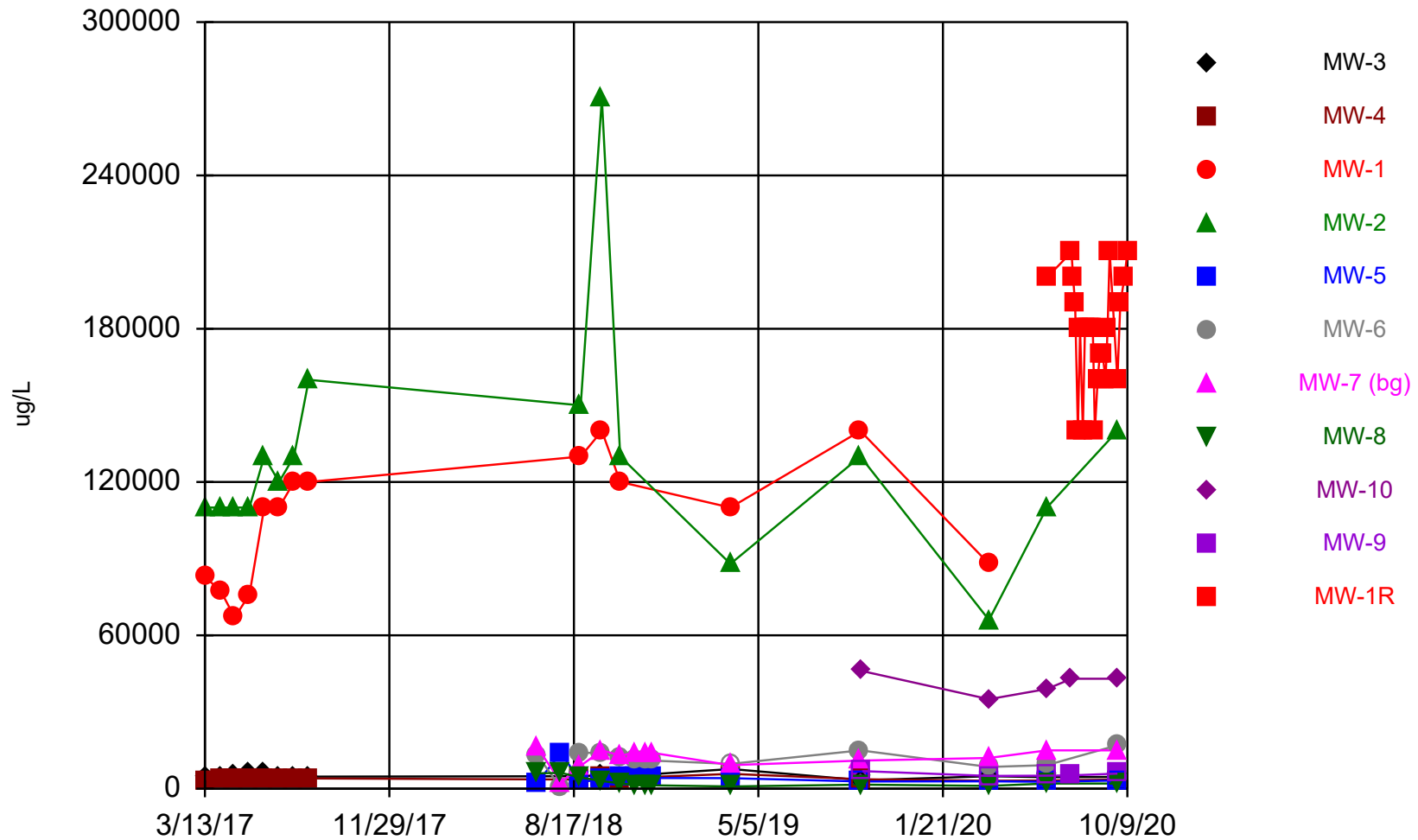
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



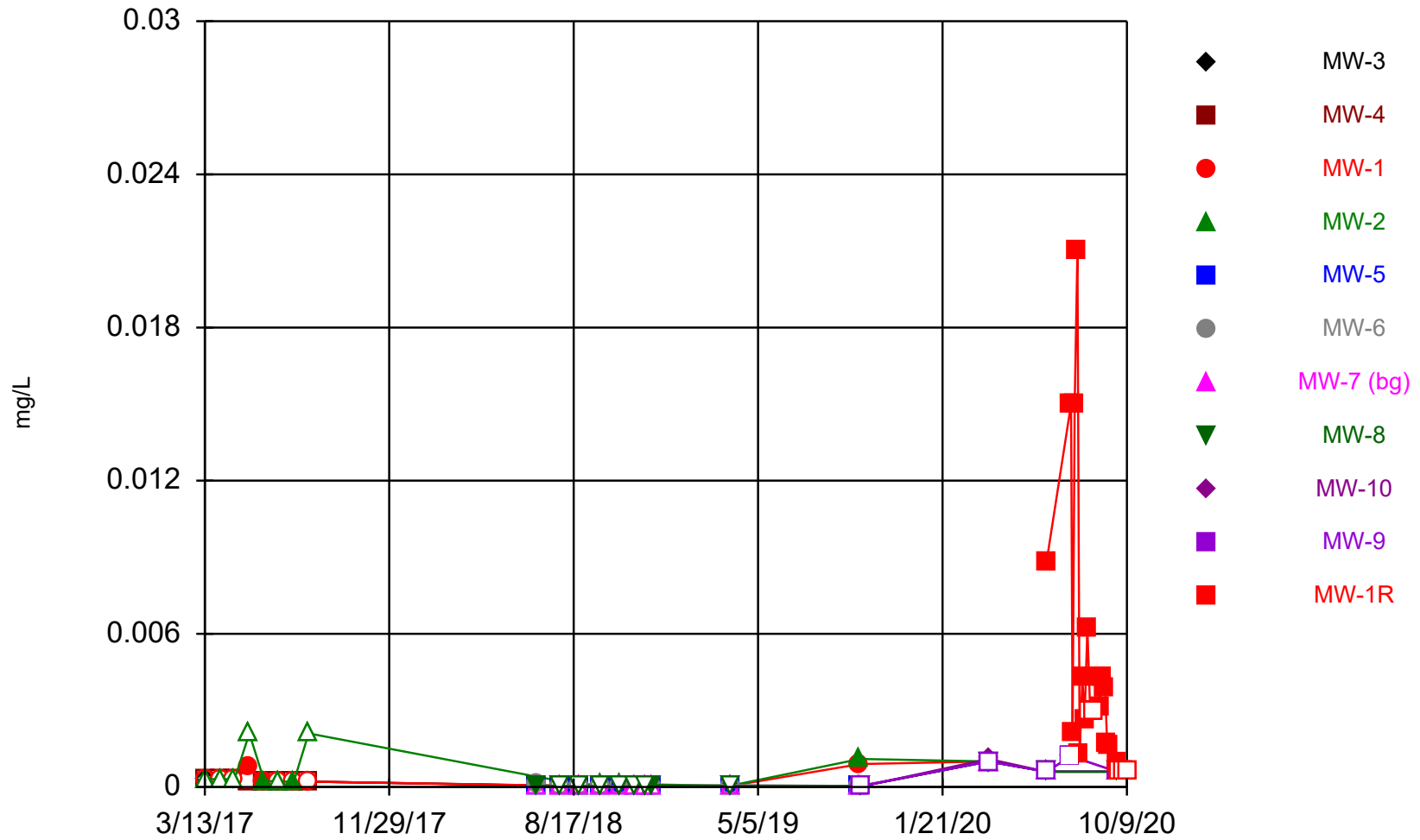
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



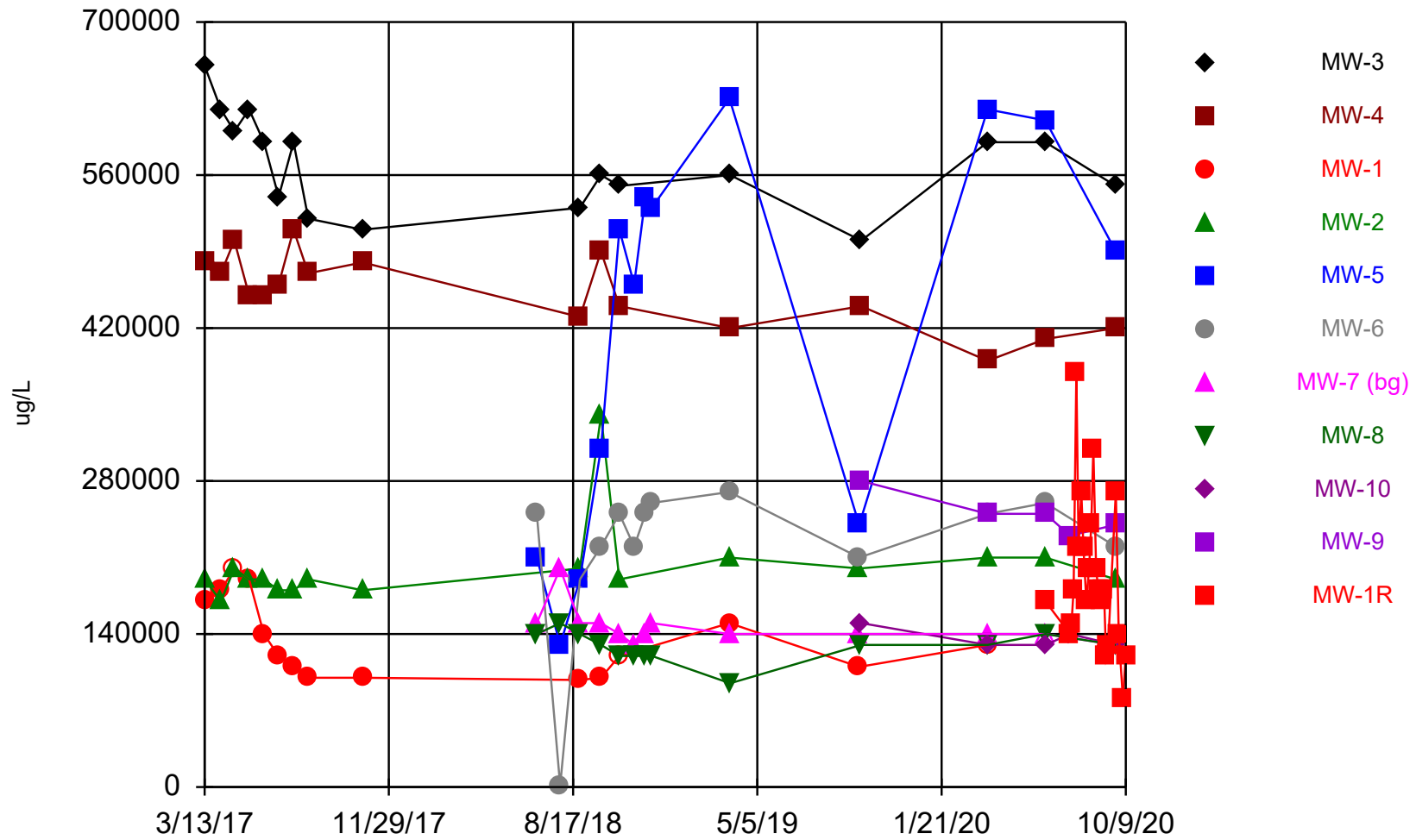
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



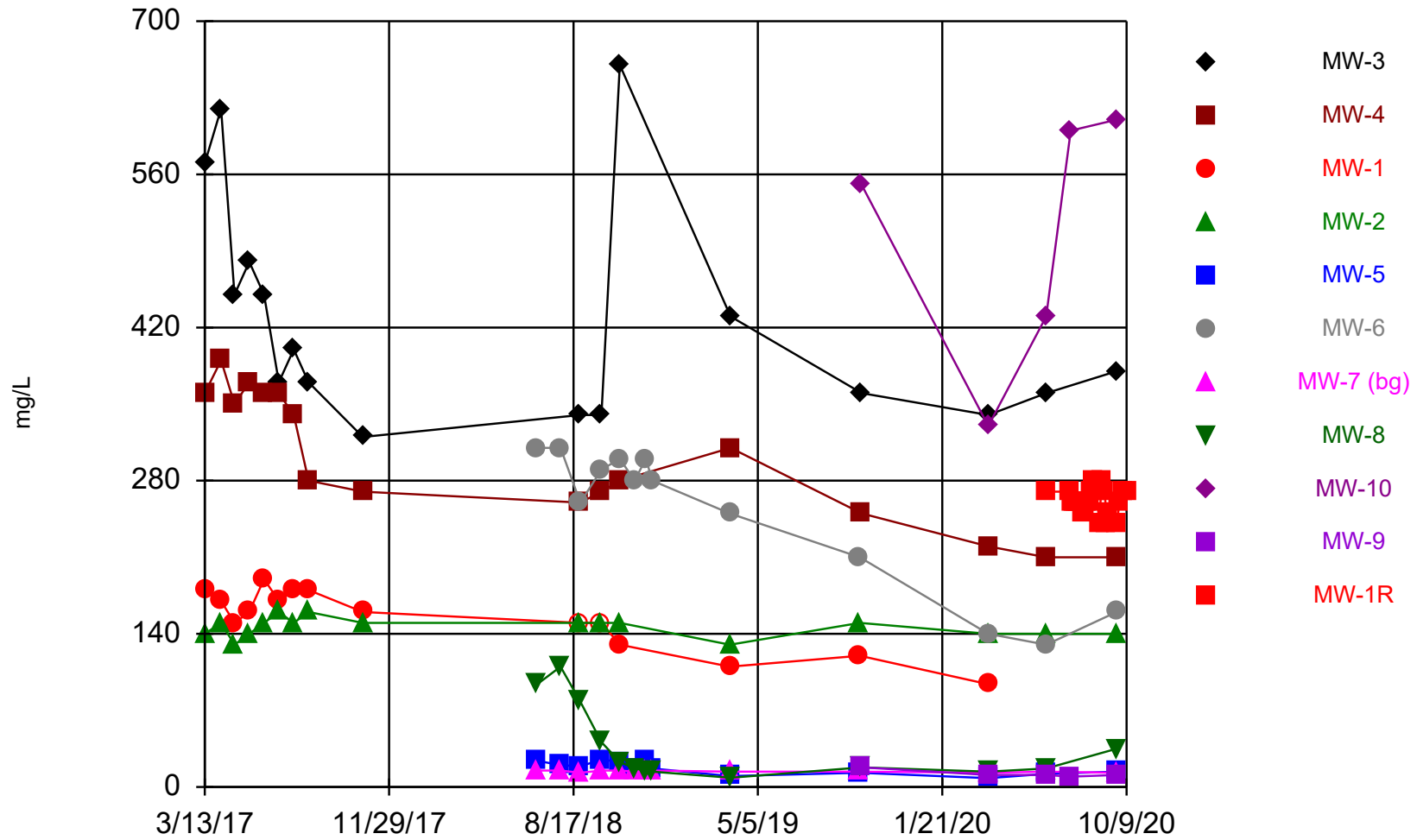
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



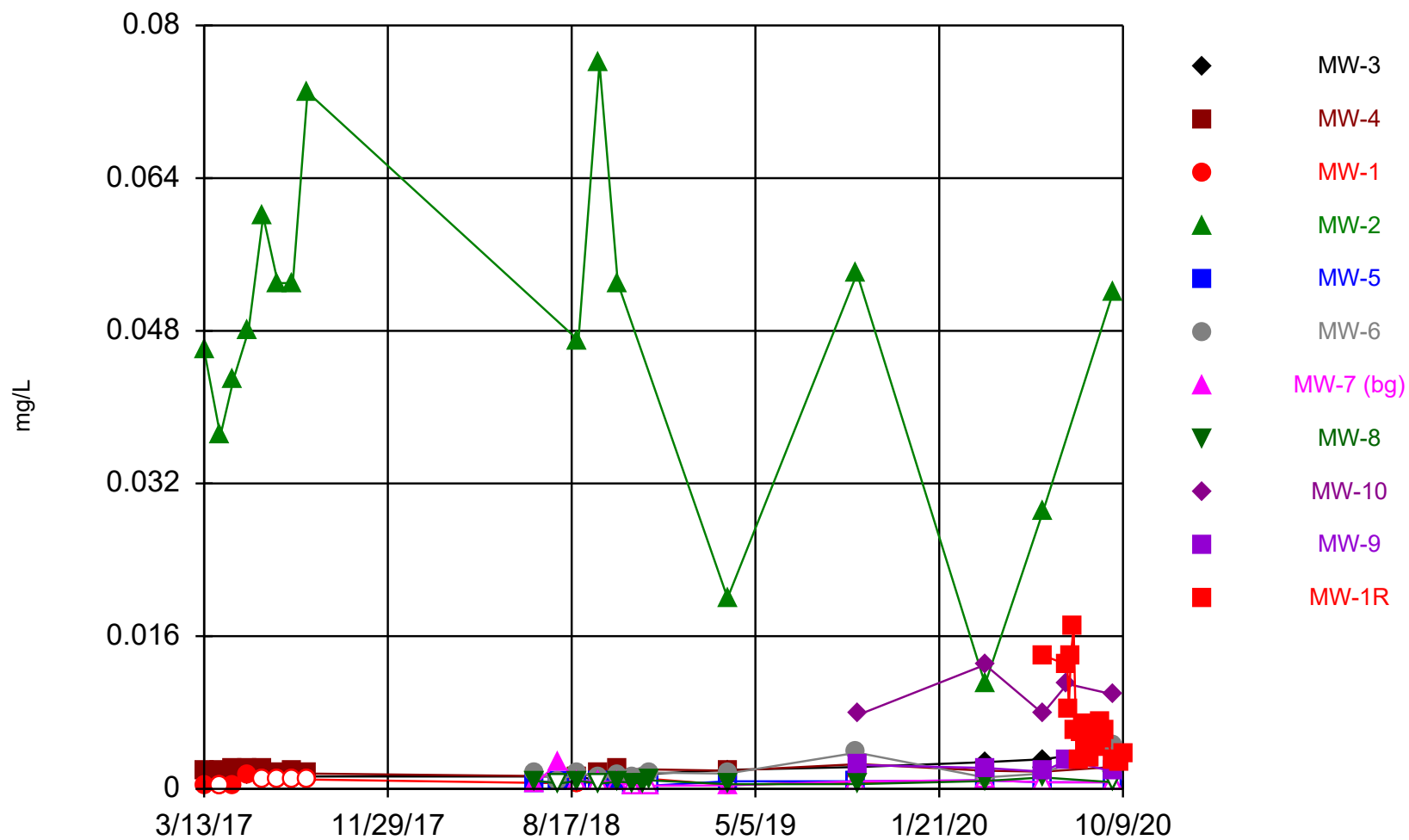
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



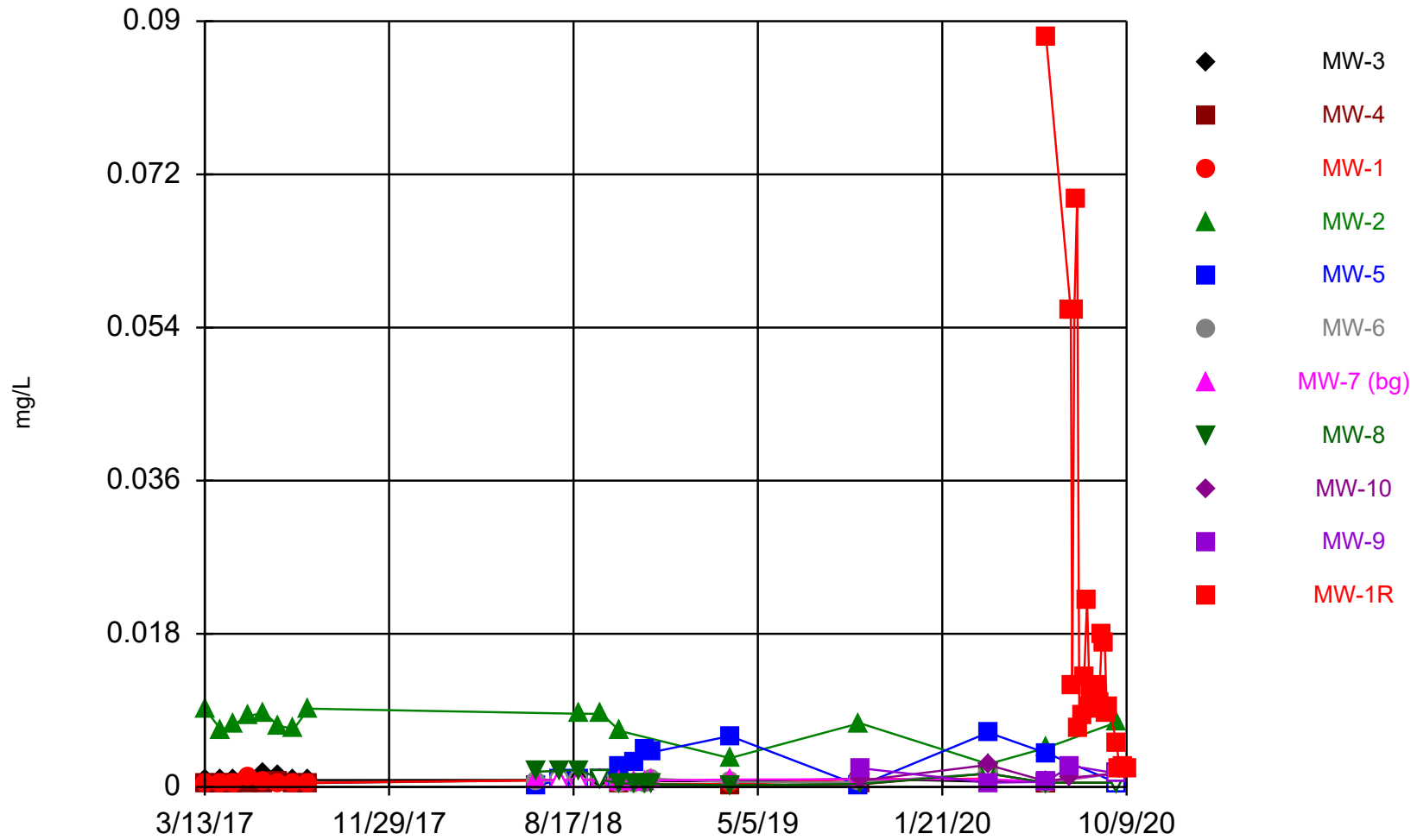
Constituent: Chloride Analysis Run 10/27/2020 12:41 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



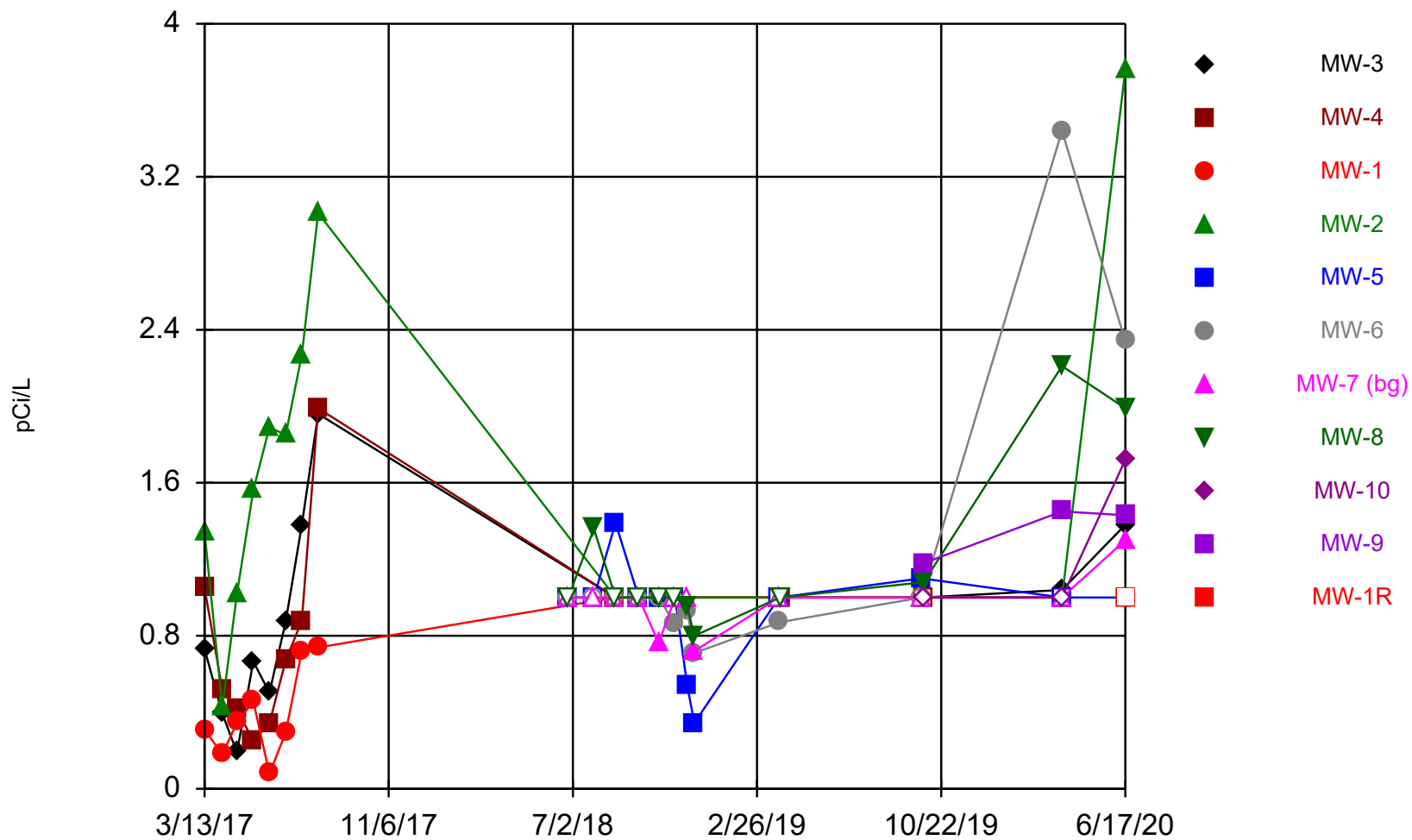
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Cobalt Analysis Run 10/27/2020 12:41 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

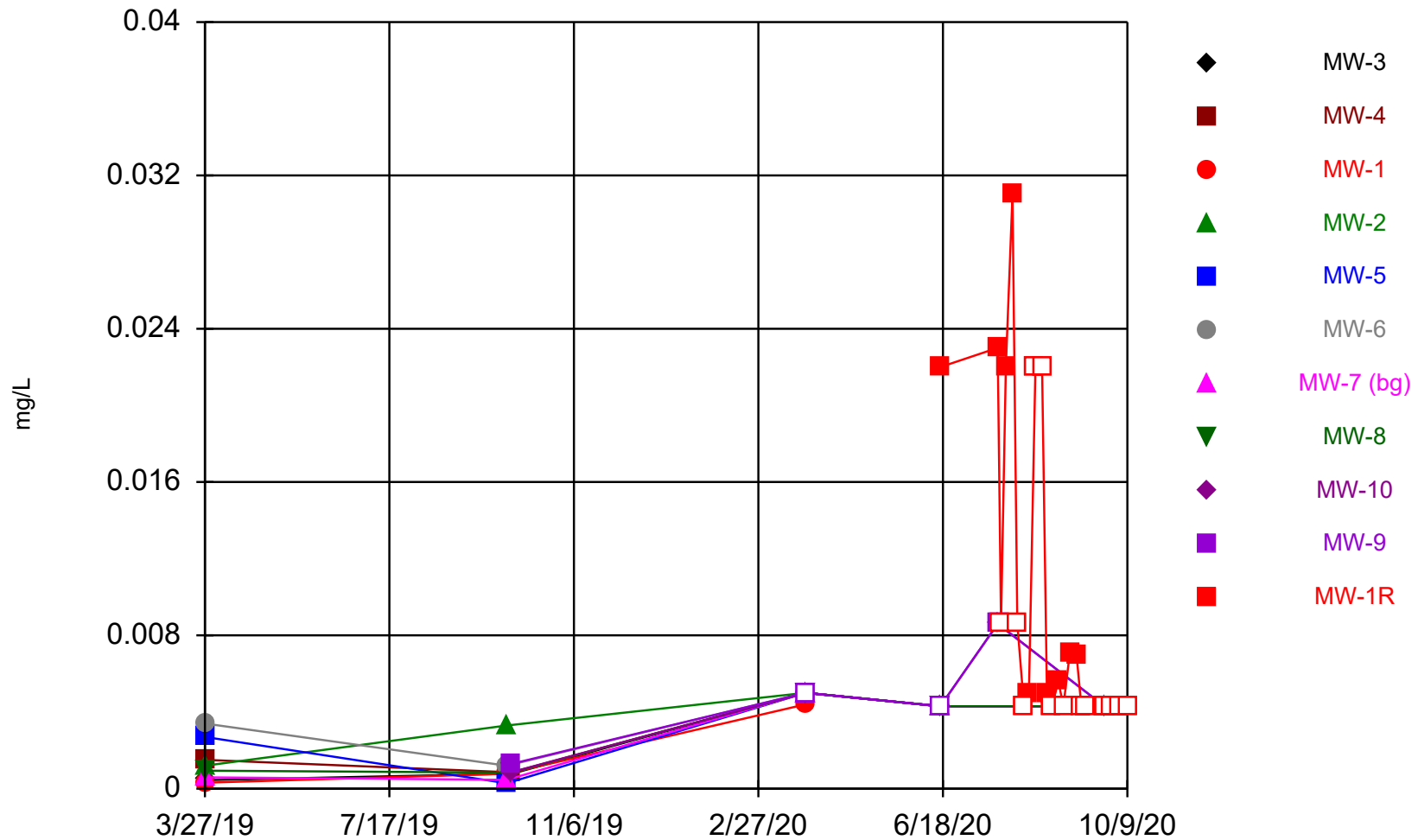
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 10/27/2020 12:41 PM

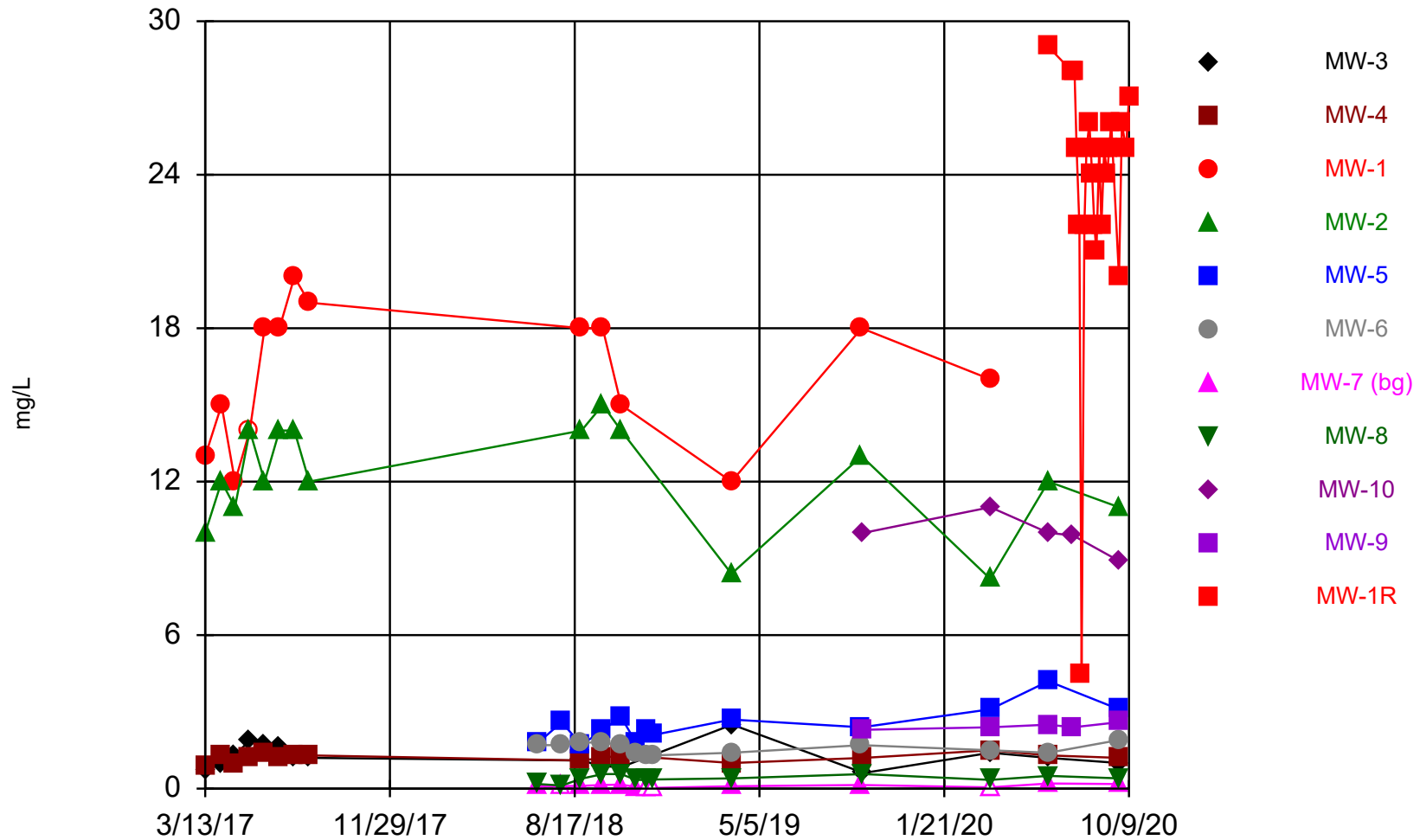
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



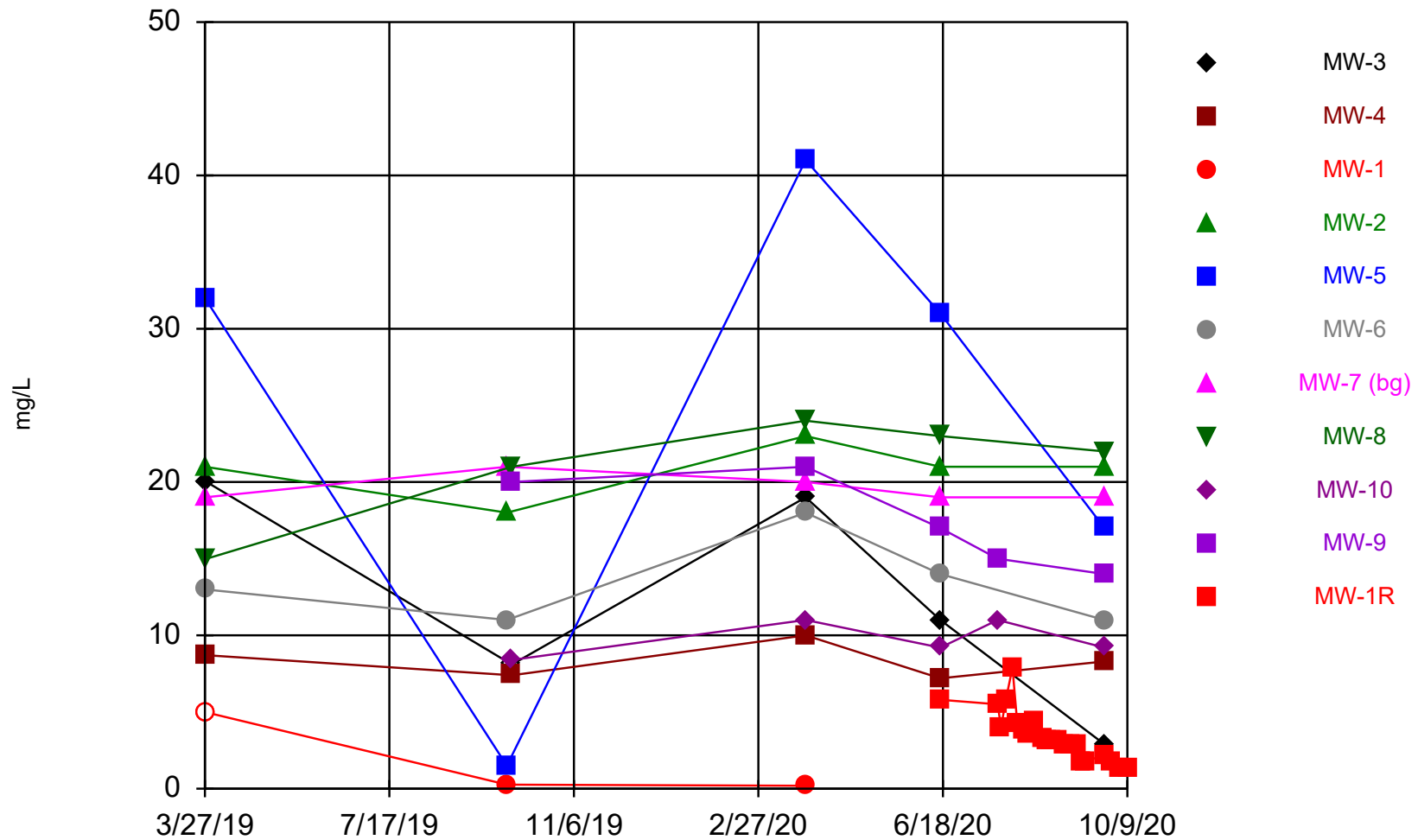
Constituent: Copper Analysis Run 10/27/2020 12:41 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



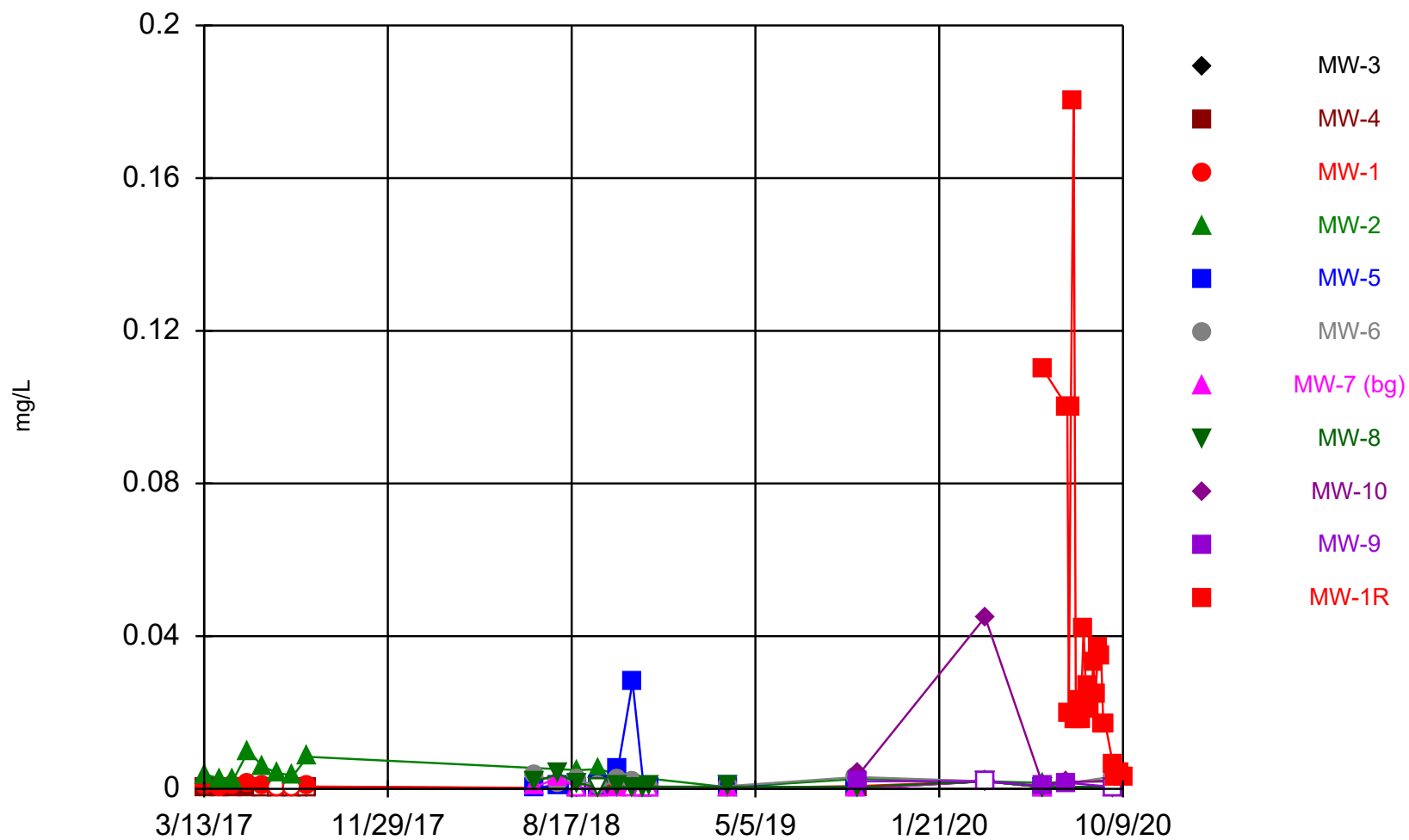
Constituent: Fluoride Analysis Run 10/27/2020 12:41 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Iron Analysis Run 10/27/2020 12:41 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

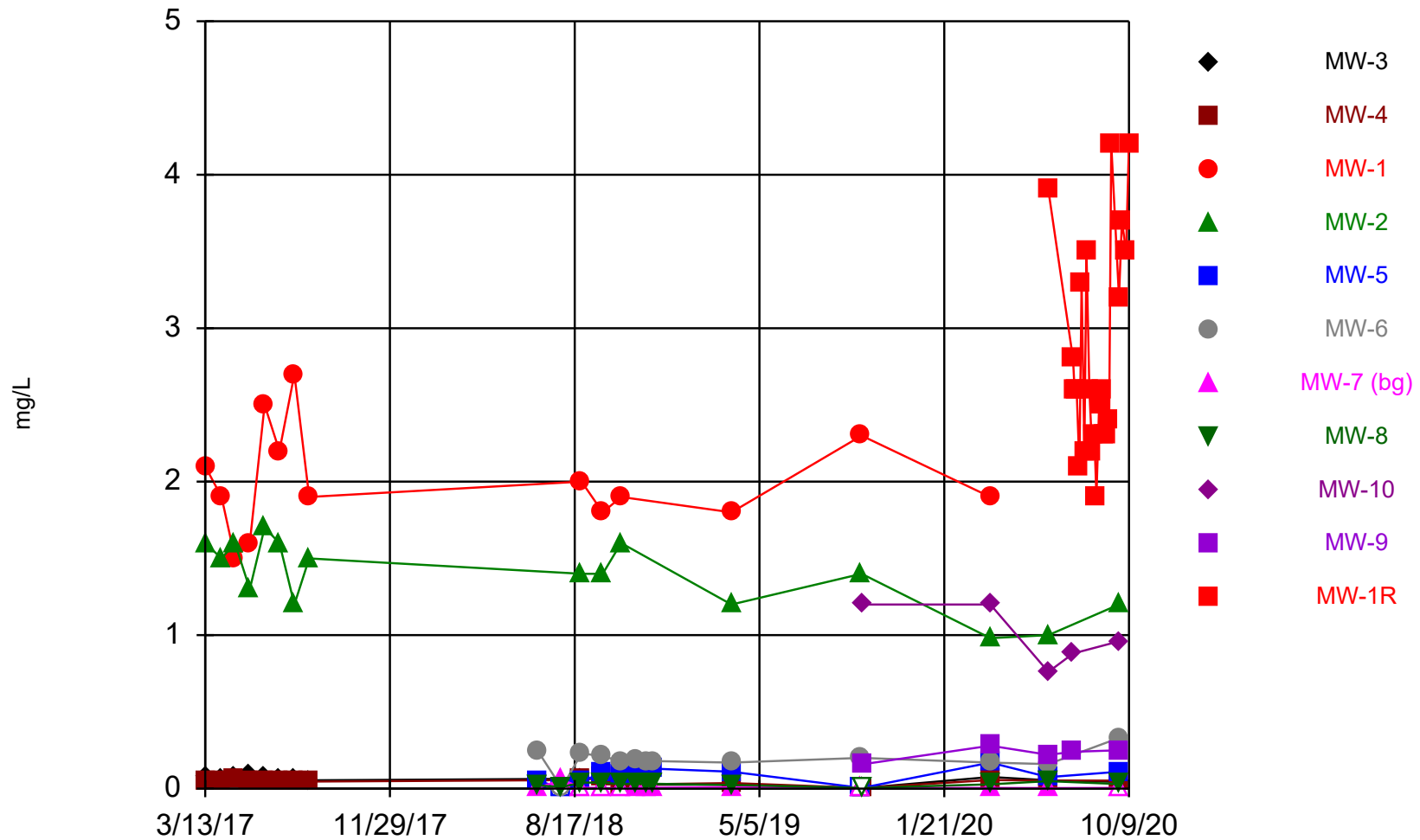
Time Series



Constituent: Lead Analysis Run 10/27/2020 12:41 PM

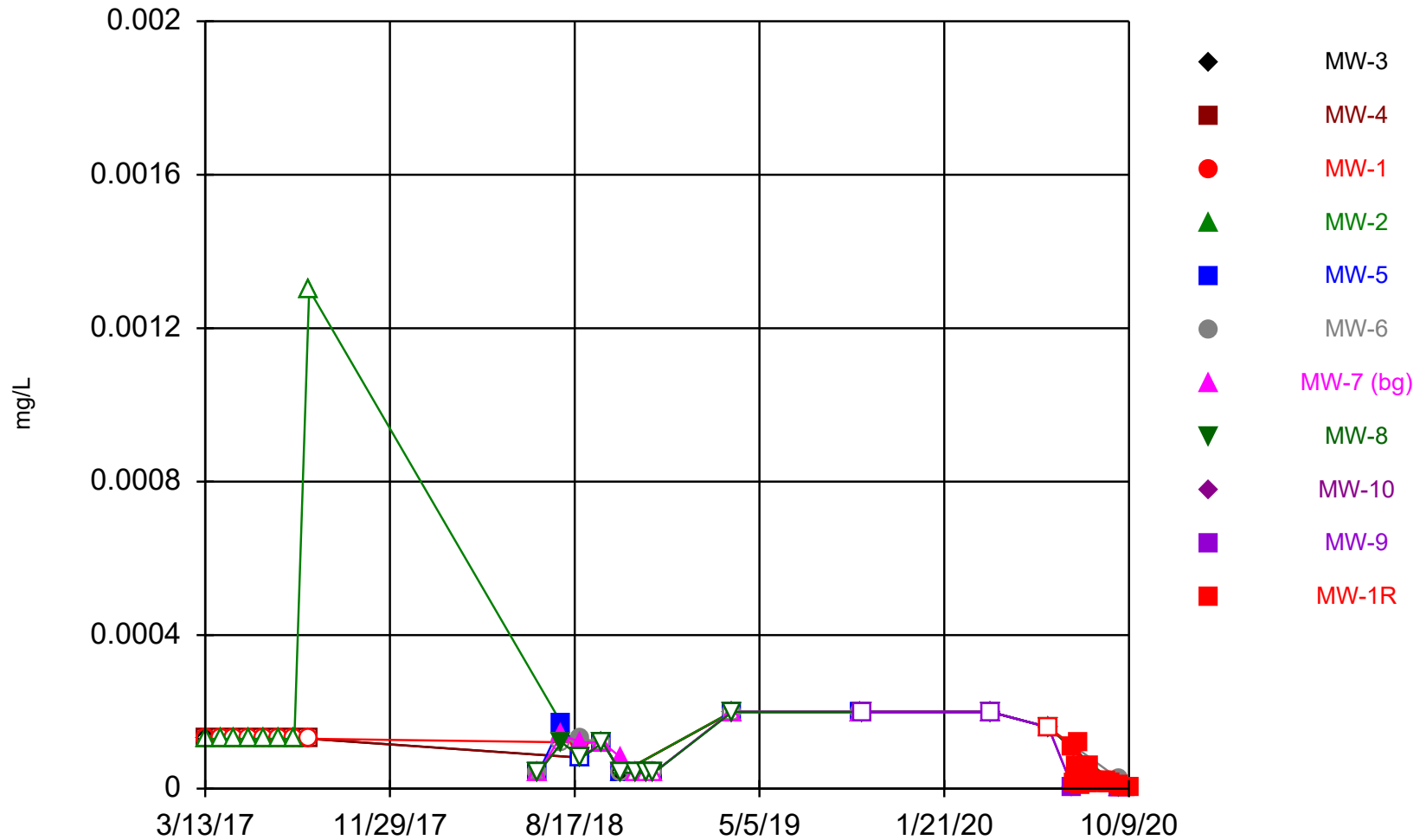
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



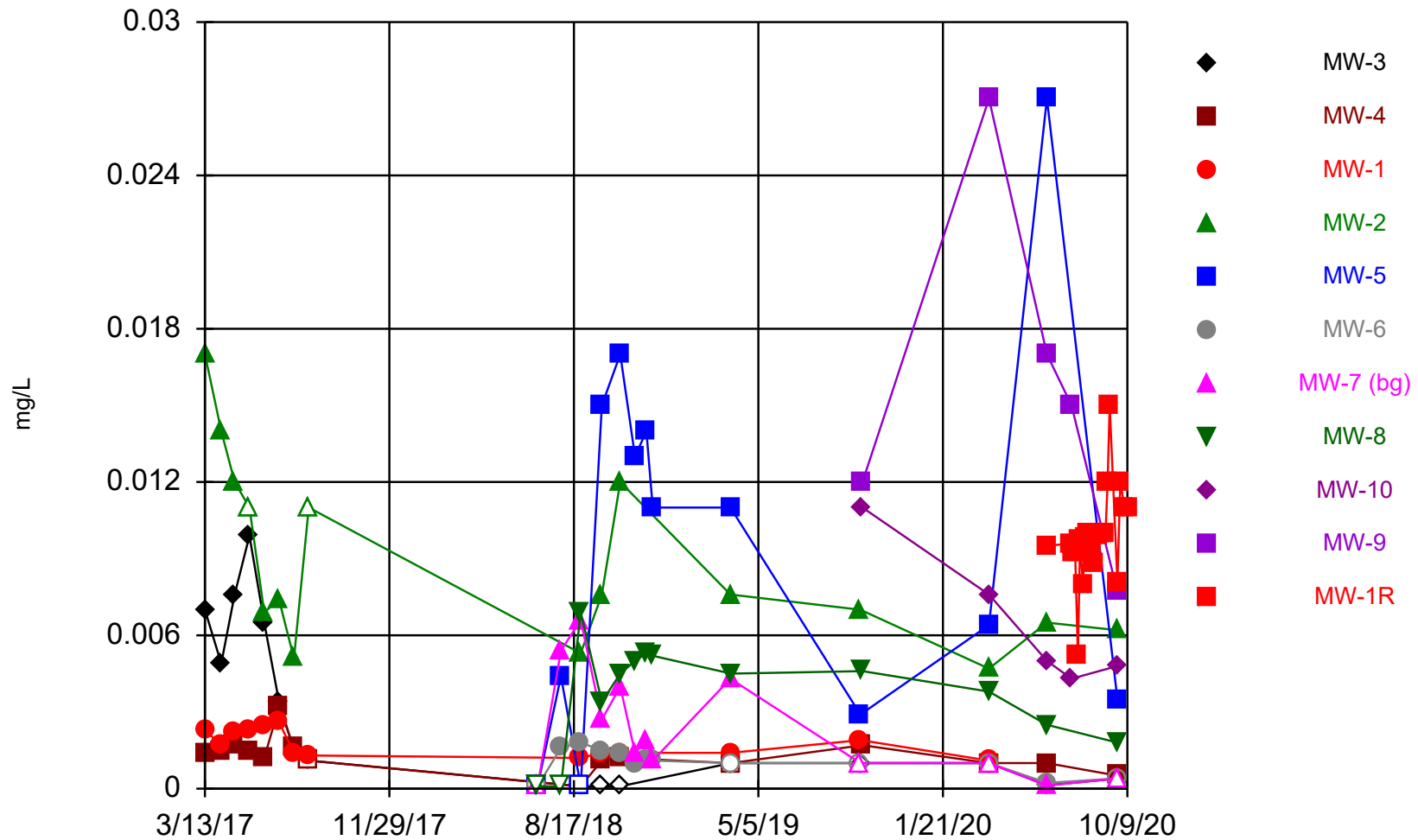
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



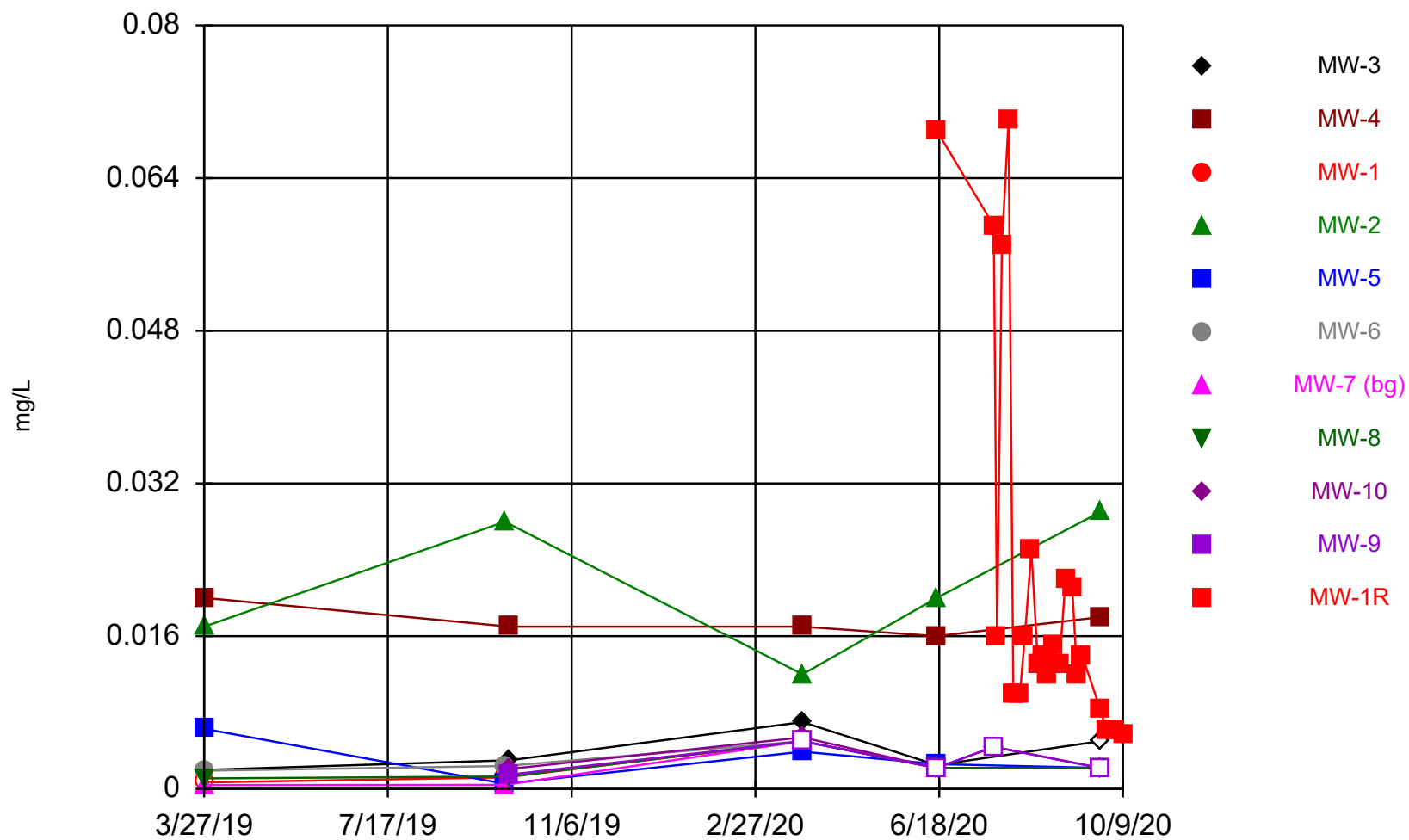
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



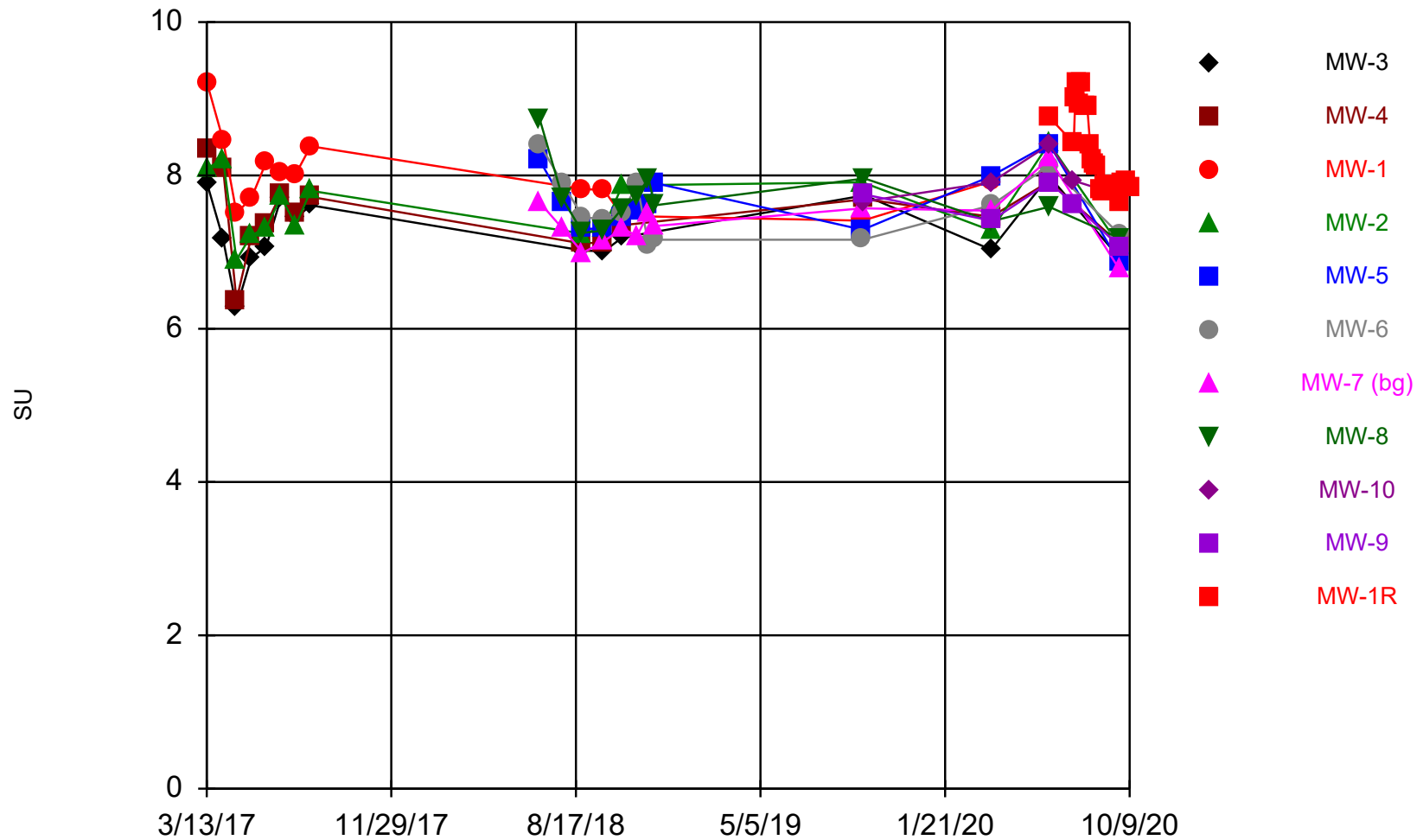
Constituent: Molybdenum Analysis Run 10/27/2020 12:41 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Nickel Analysis Run 10/27/2020 12:41 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

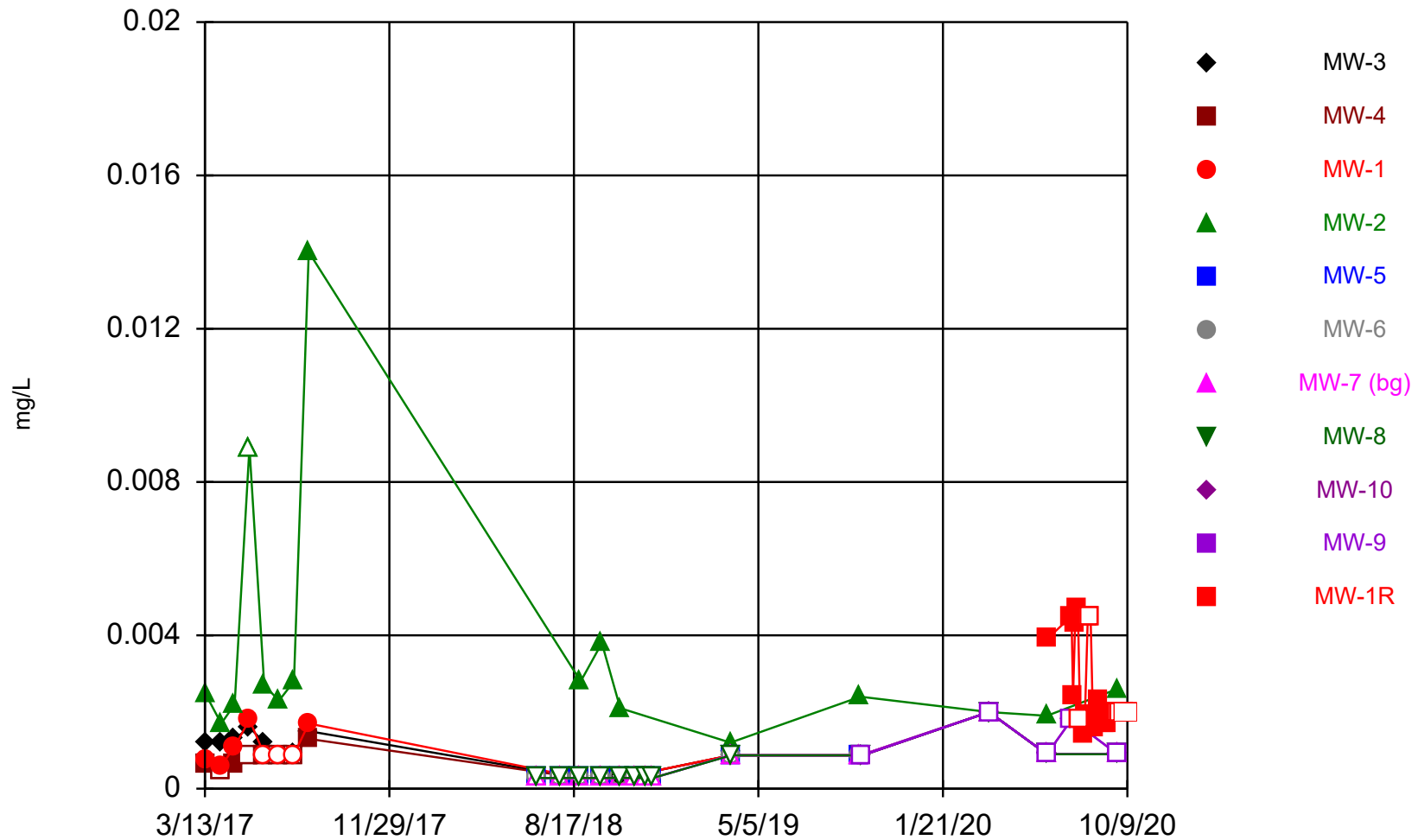
Time Series



Constituent: pH Analysis Run 10/27/2020 12:41 PM

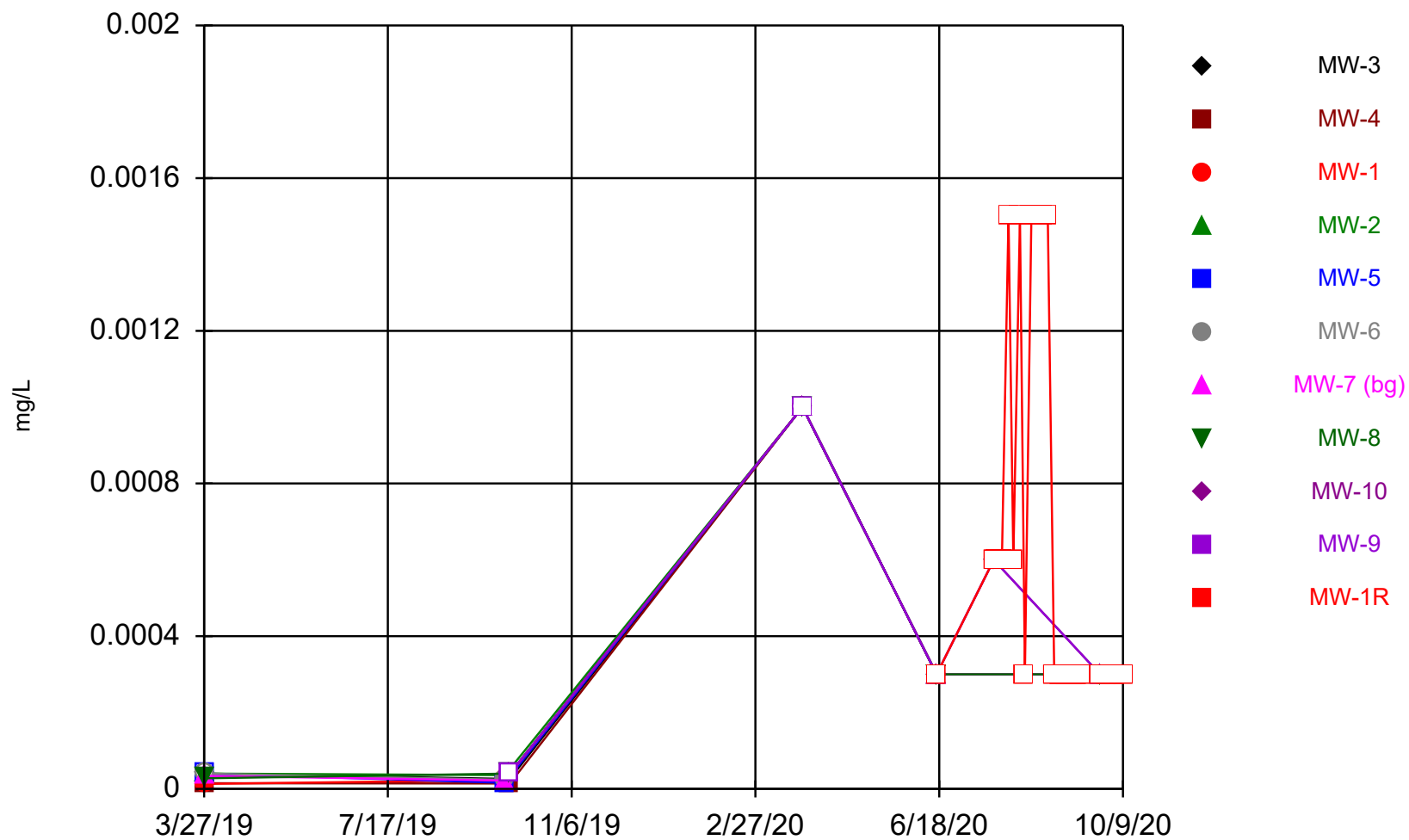
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Selenium Analysis Run 10/27/2020 12:41 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

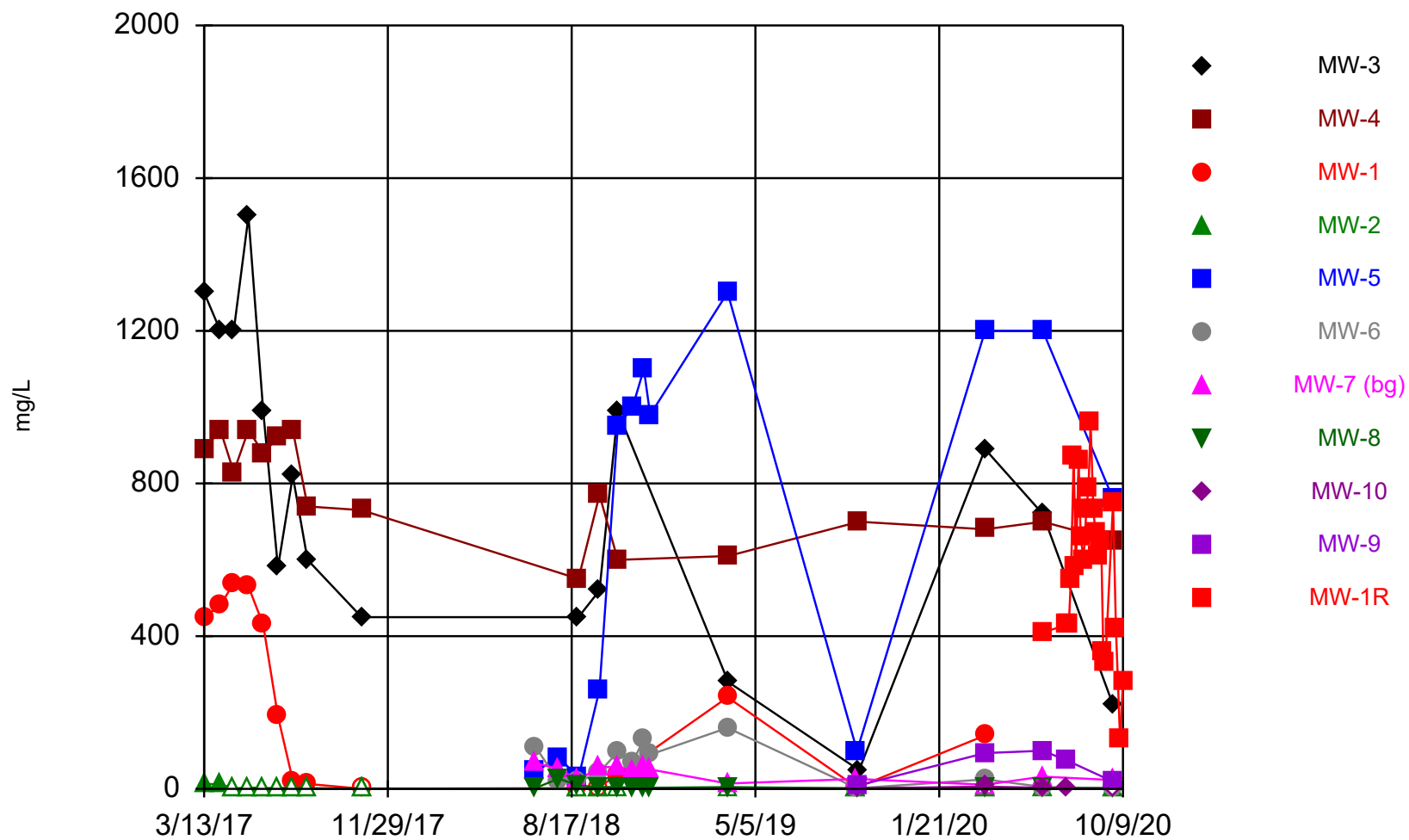
Time Series



Constituent: Silver Analysis Run 10/27/2020 12:41 PM

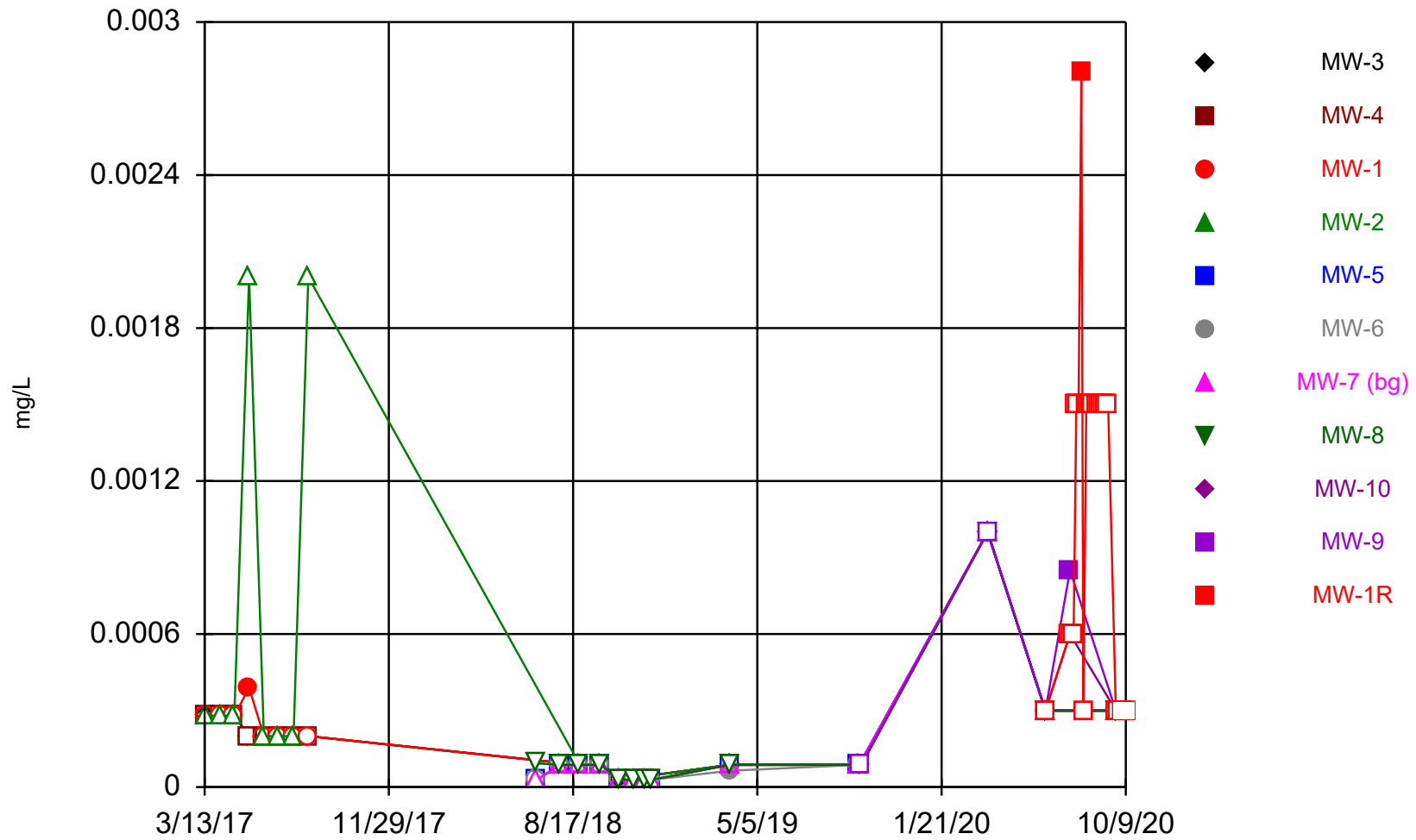
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



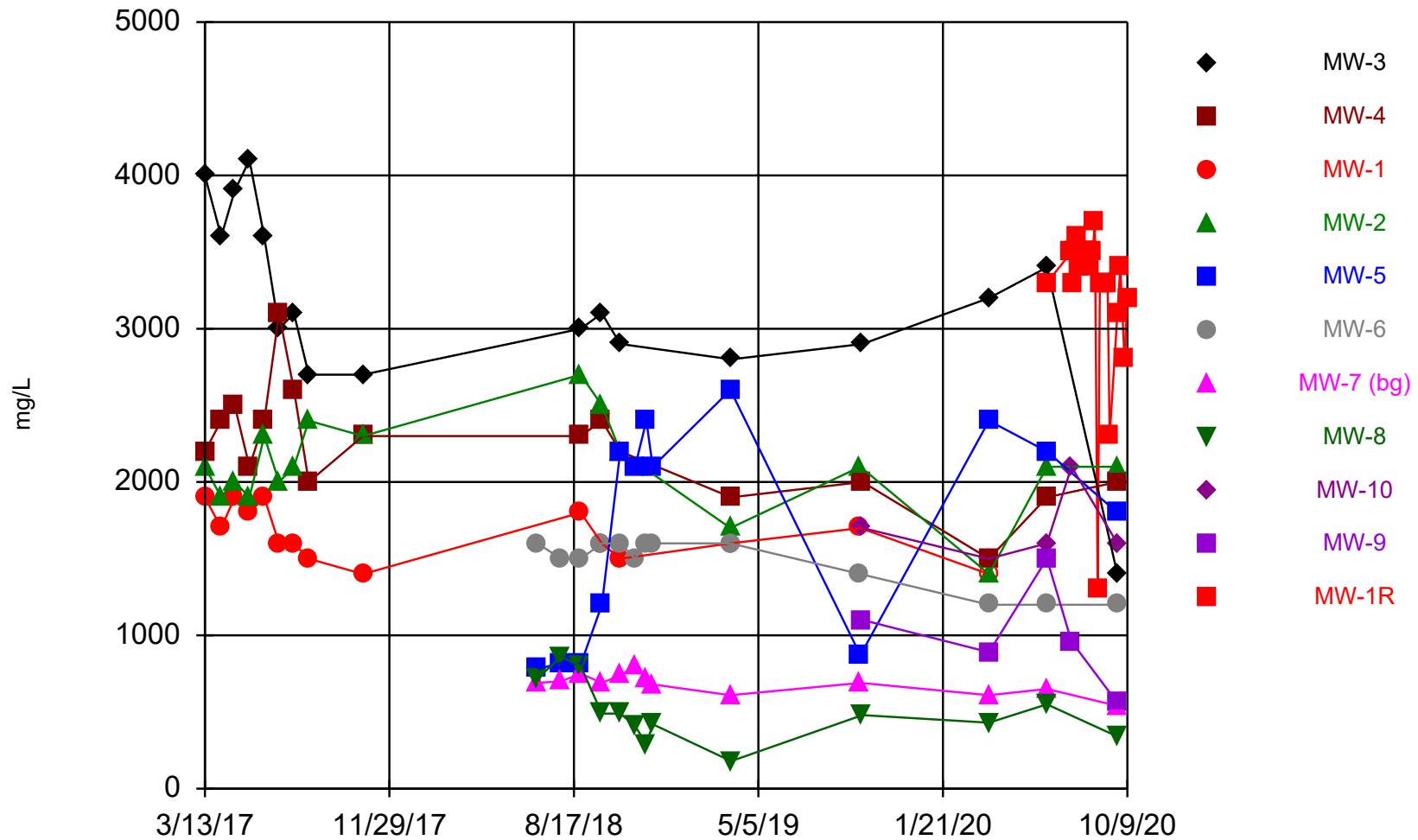
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



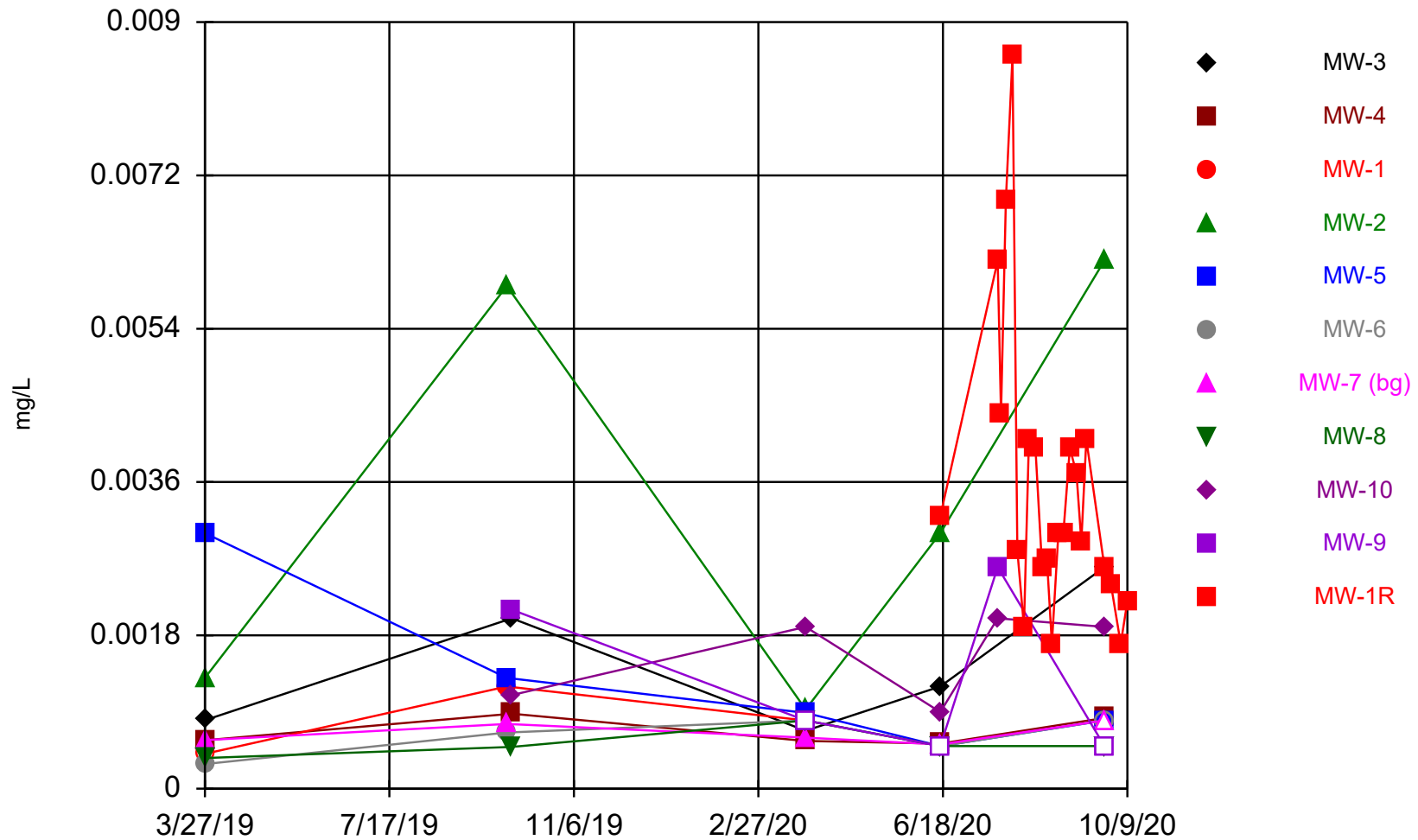
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



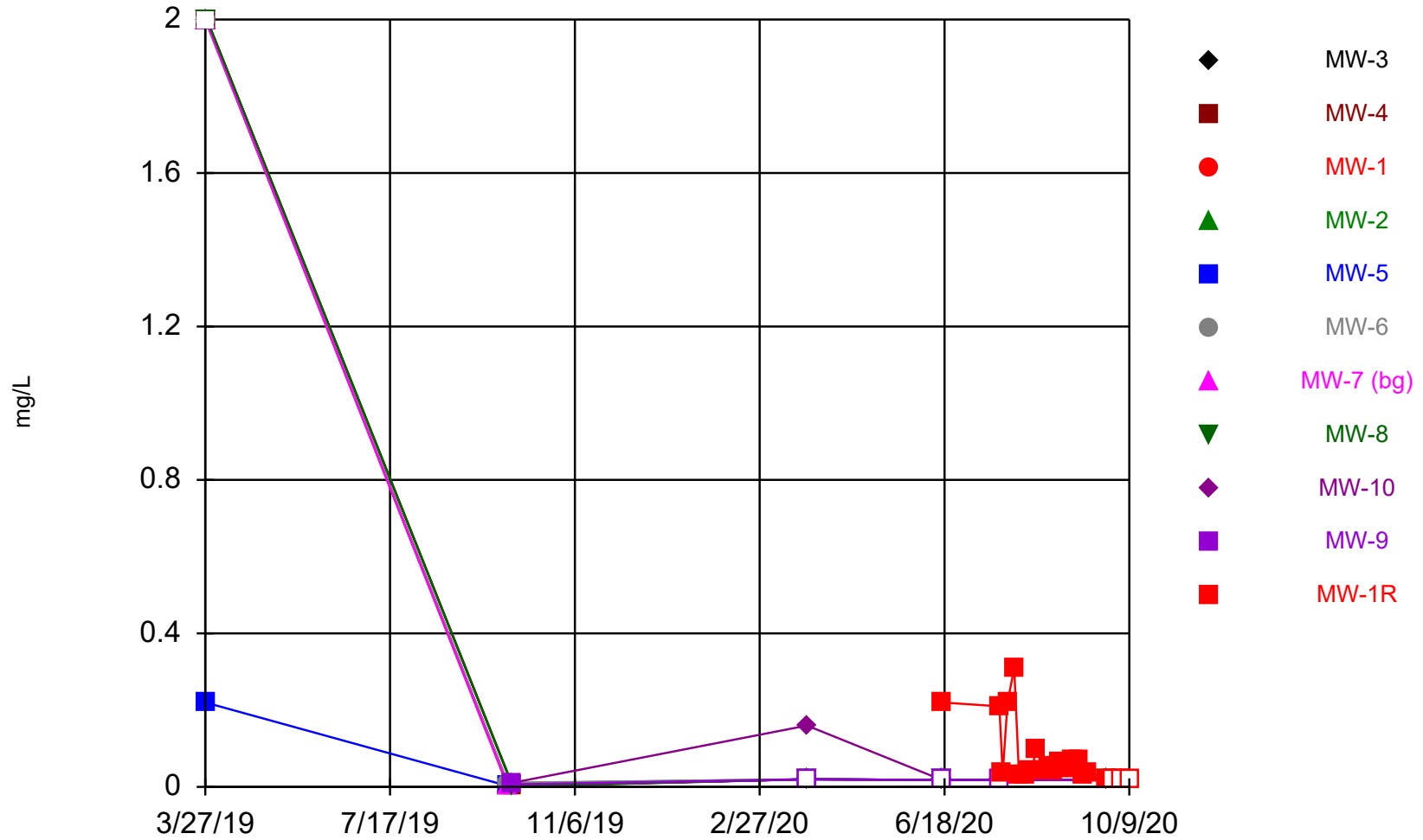
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



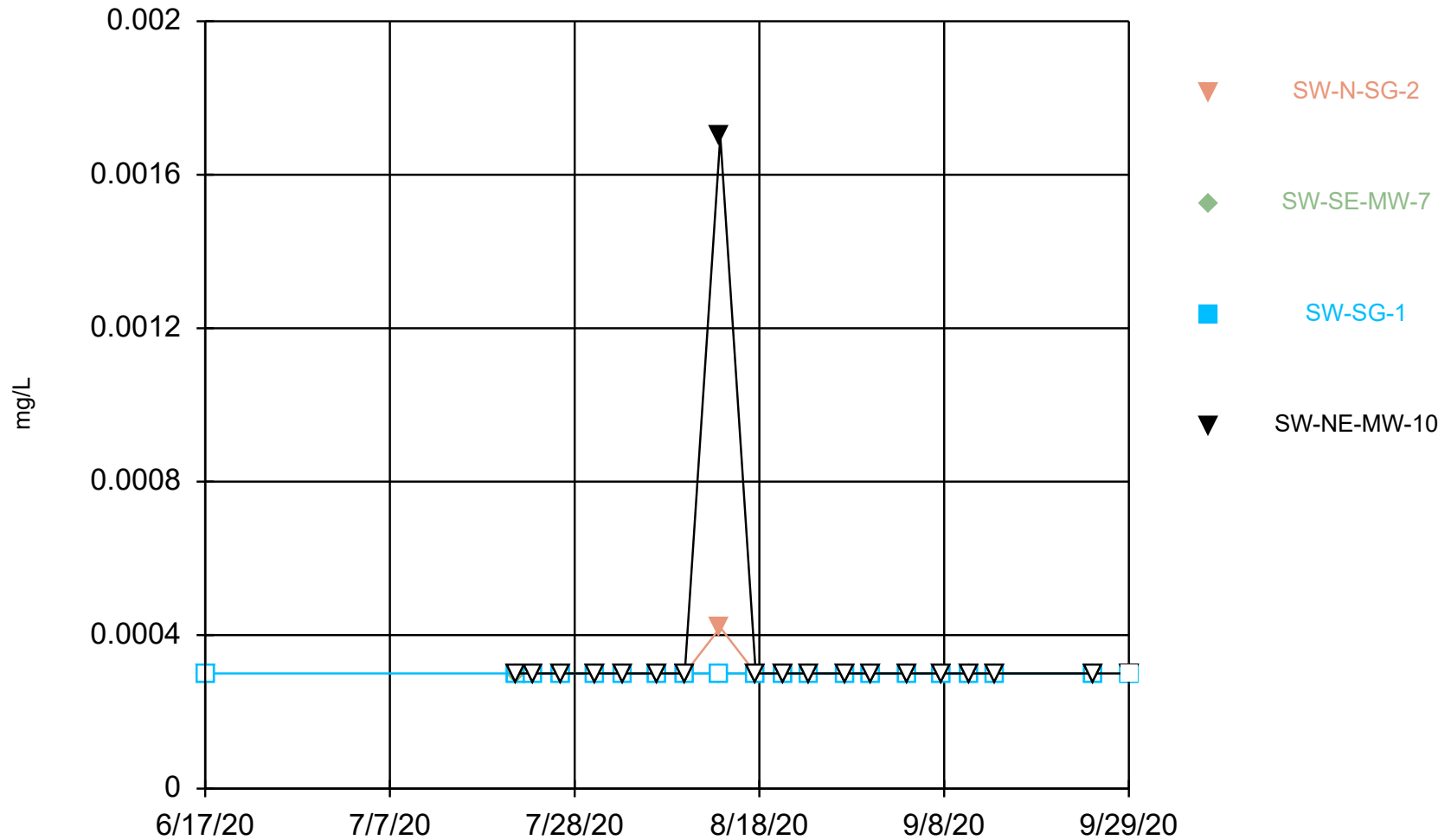
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



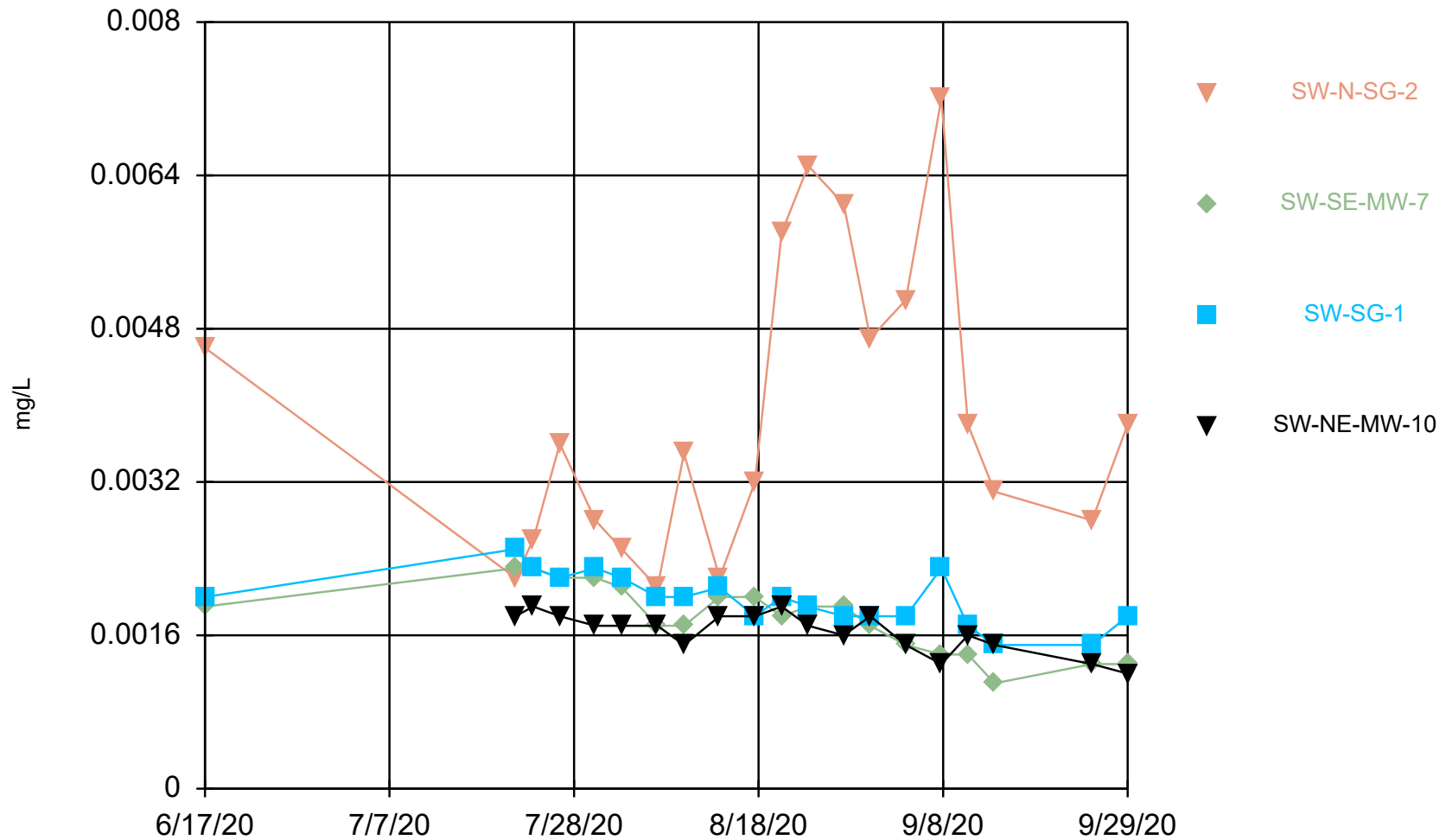
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



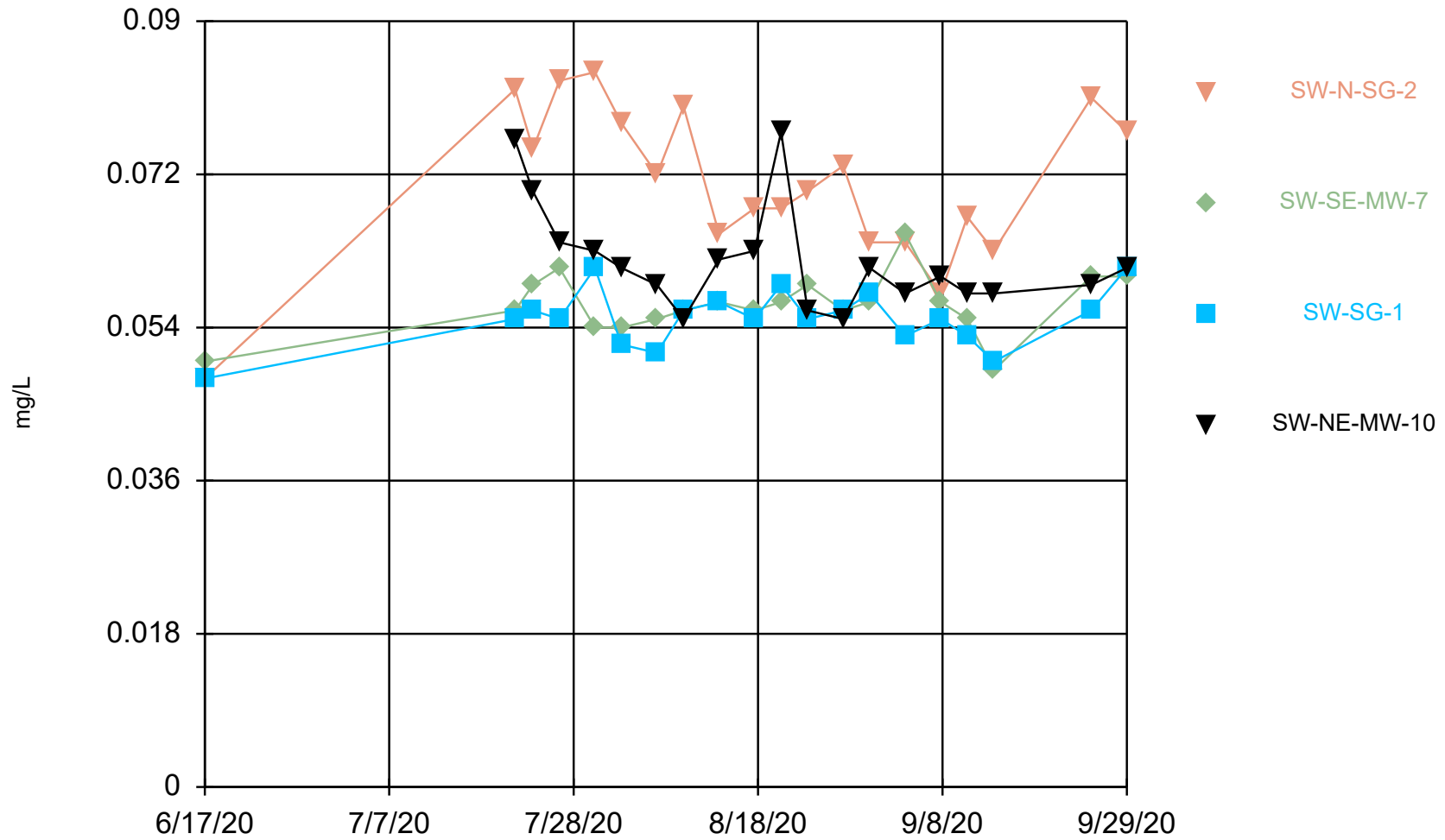
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



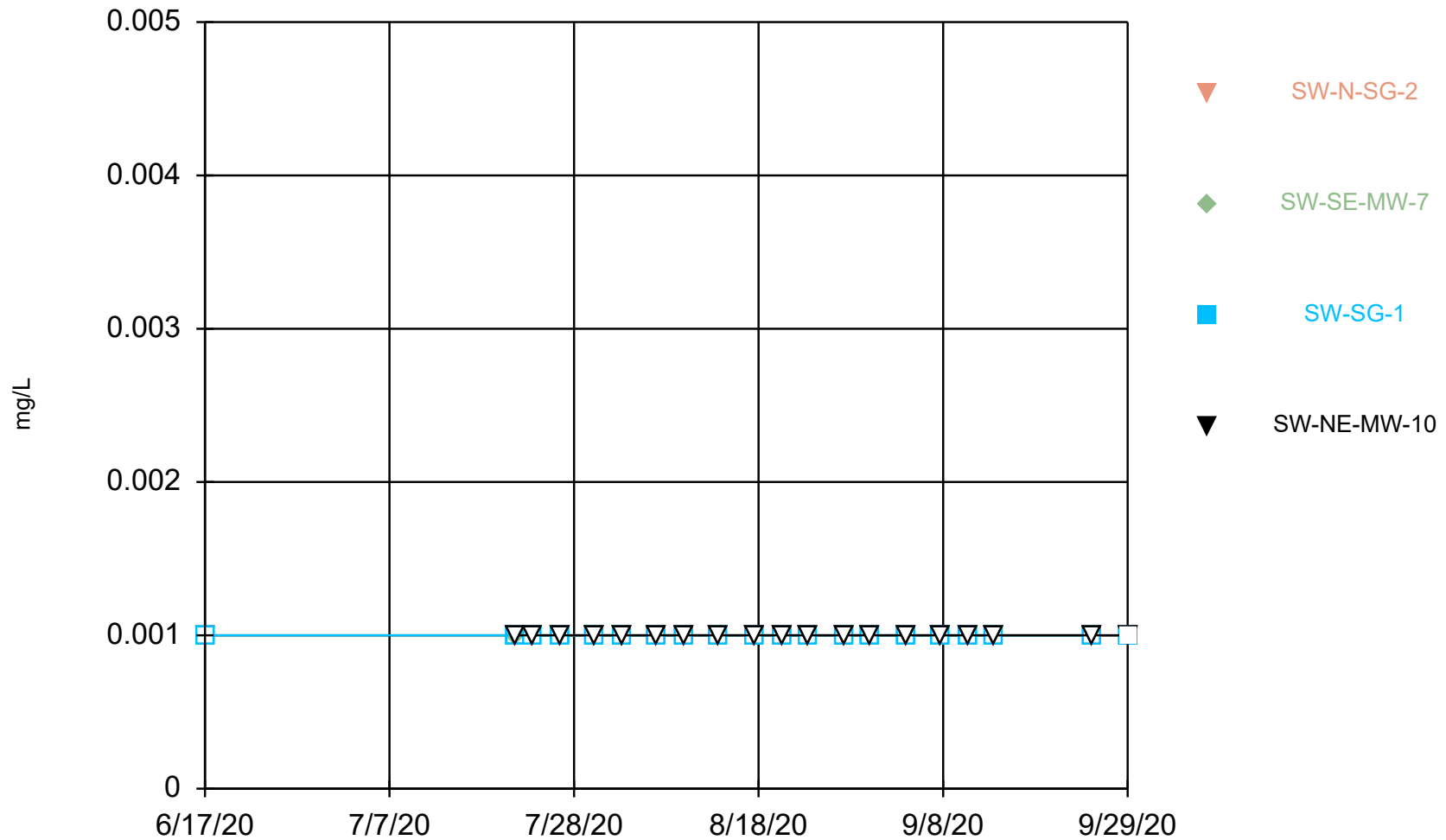
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



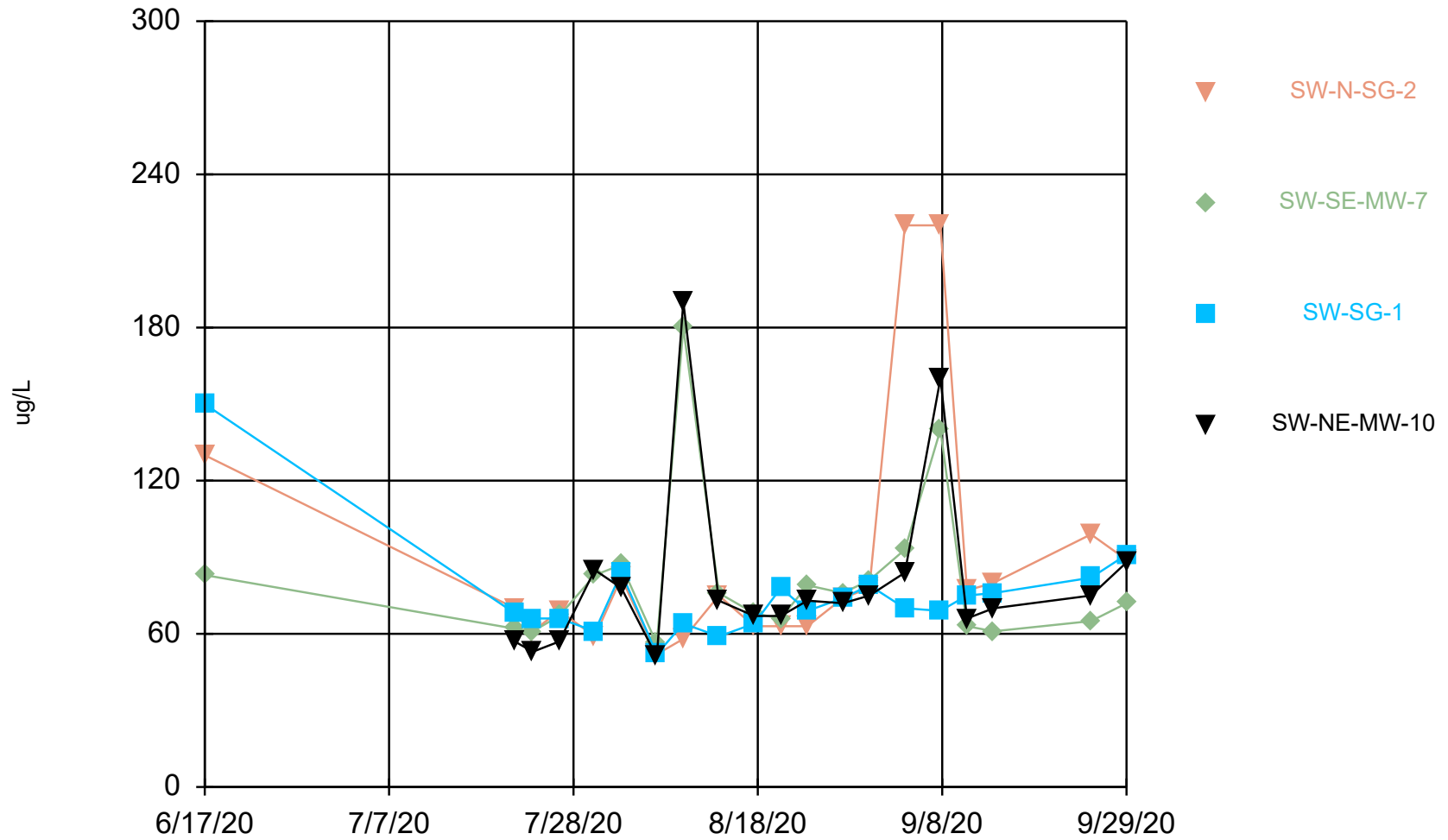
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



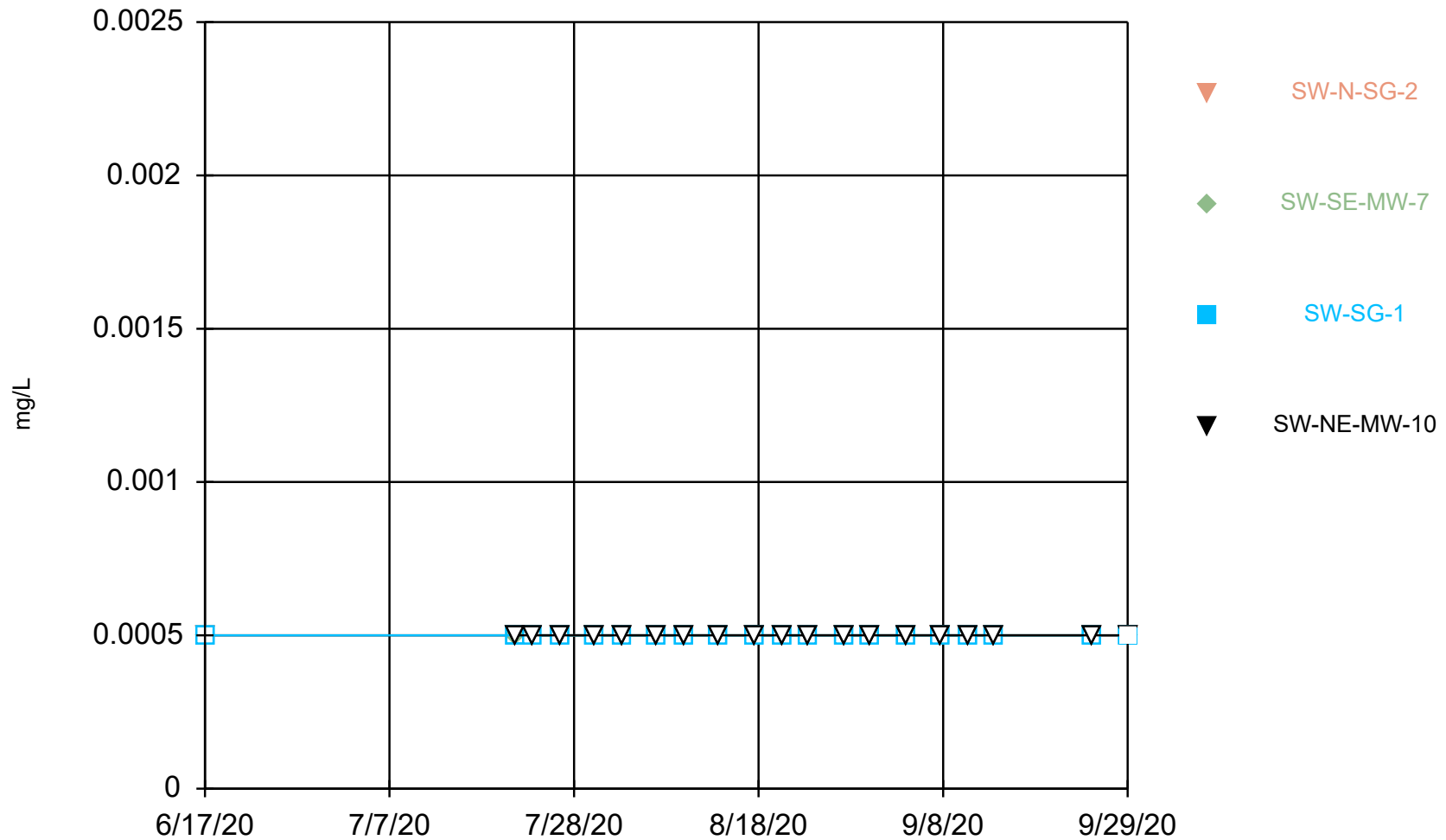
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



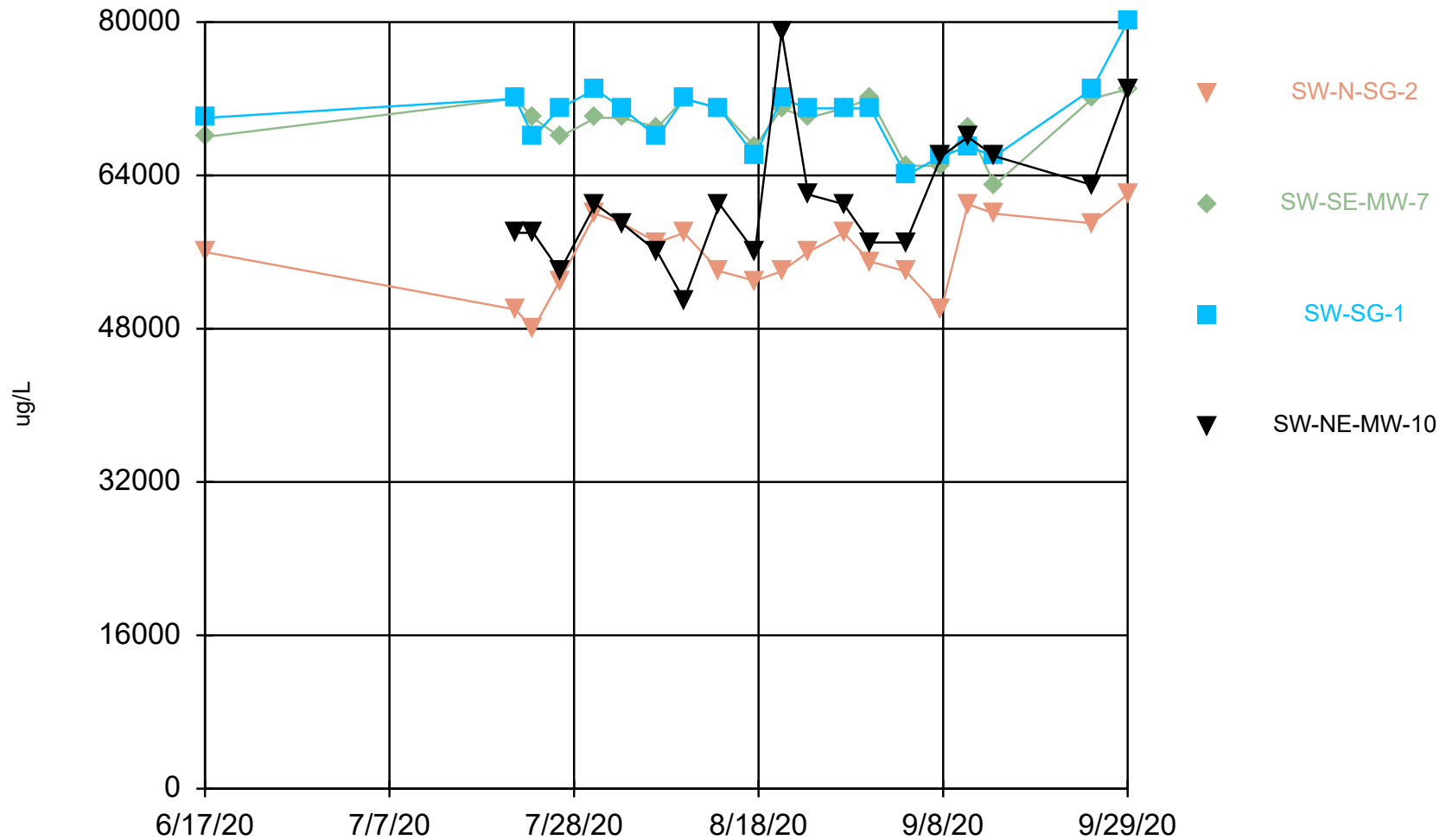
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



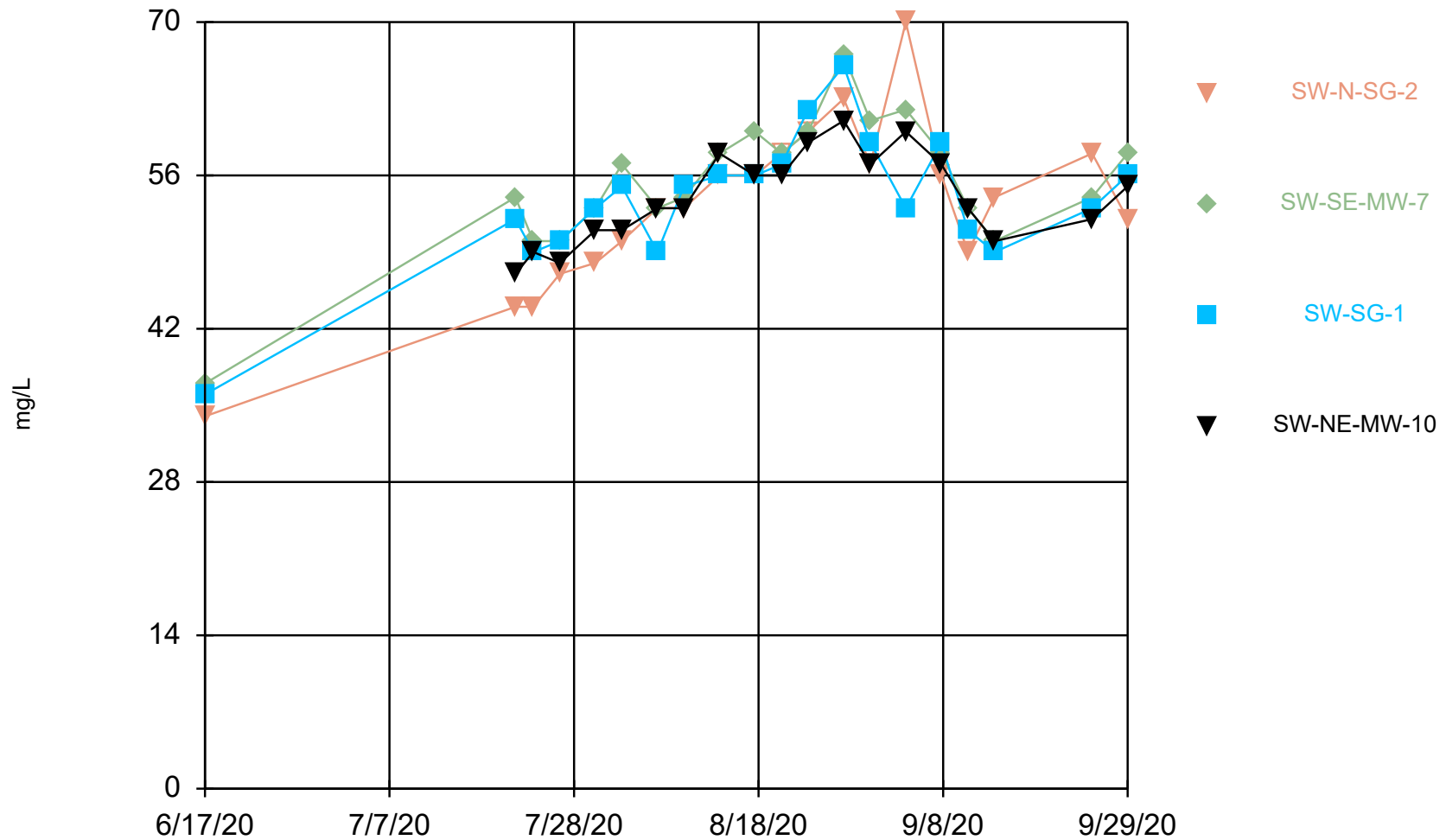
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



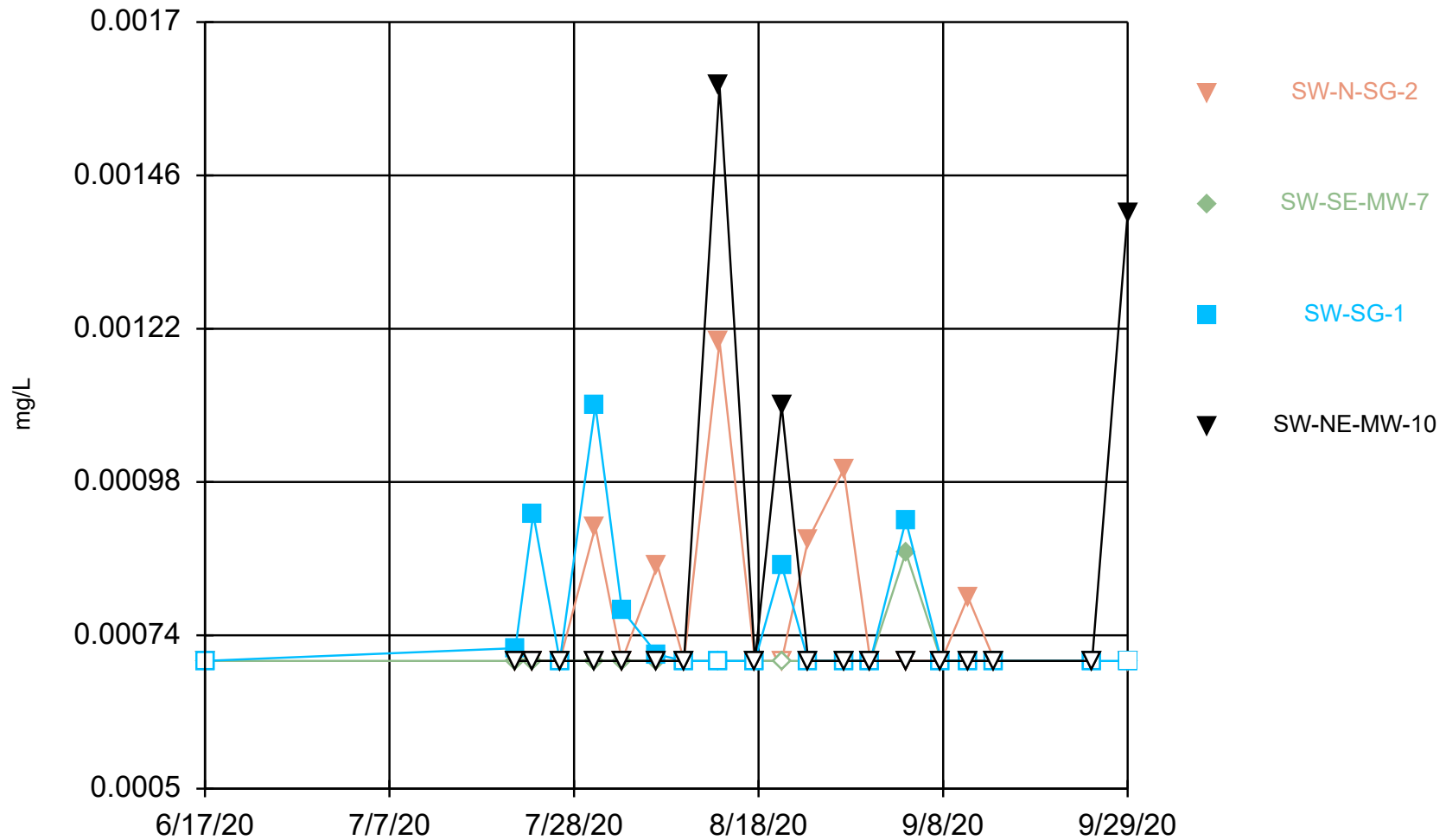
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



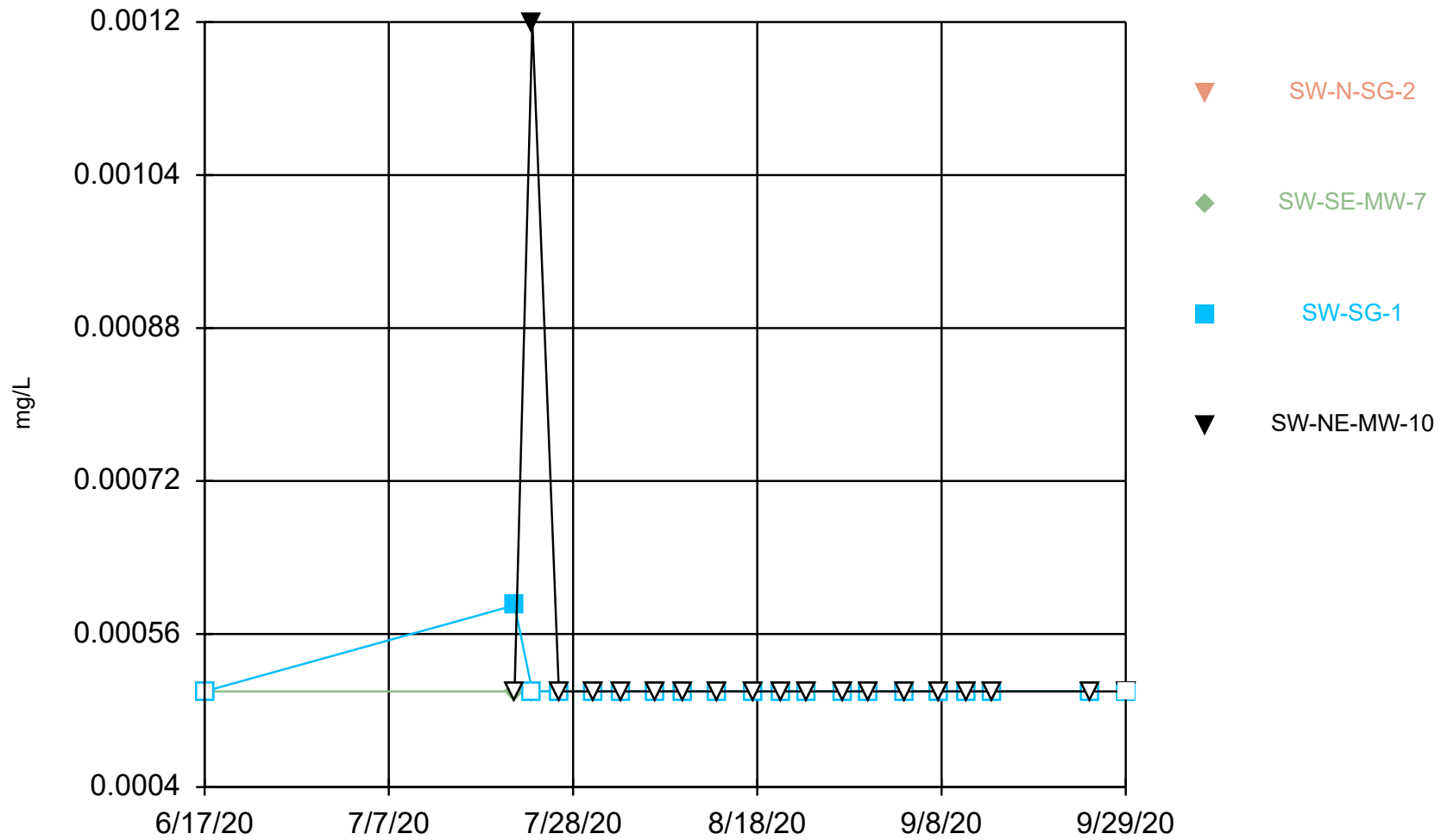
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



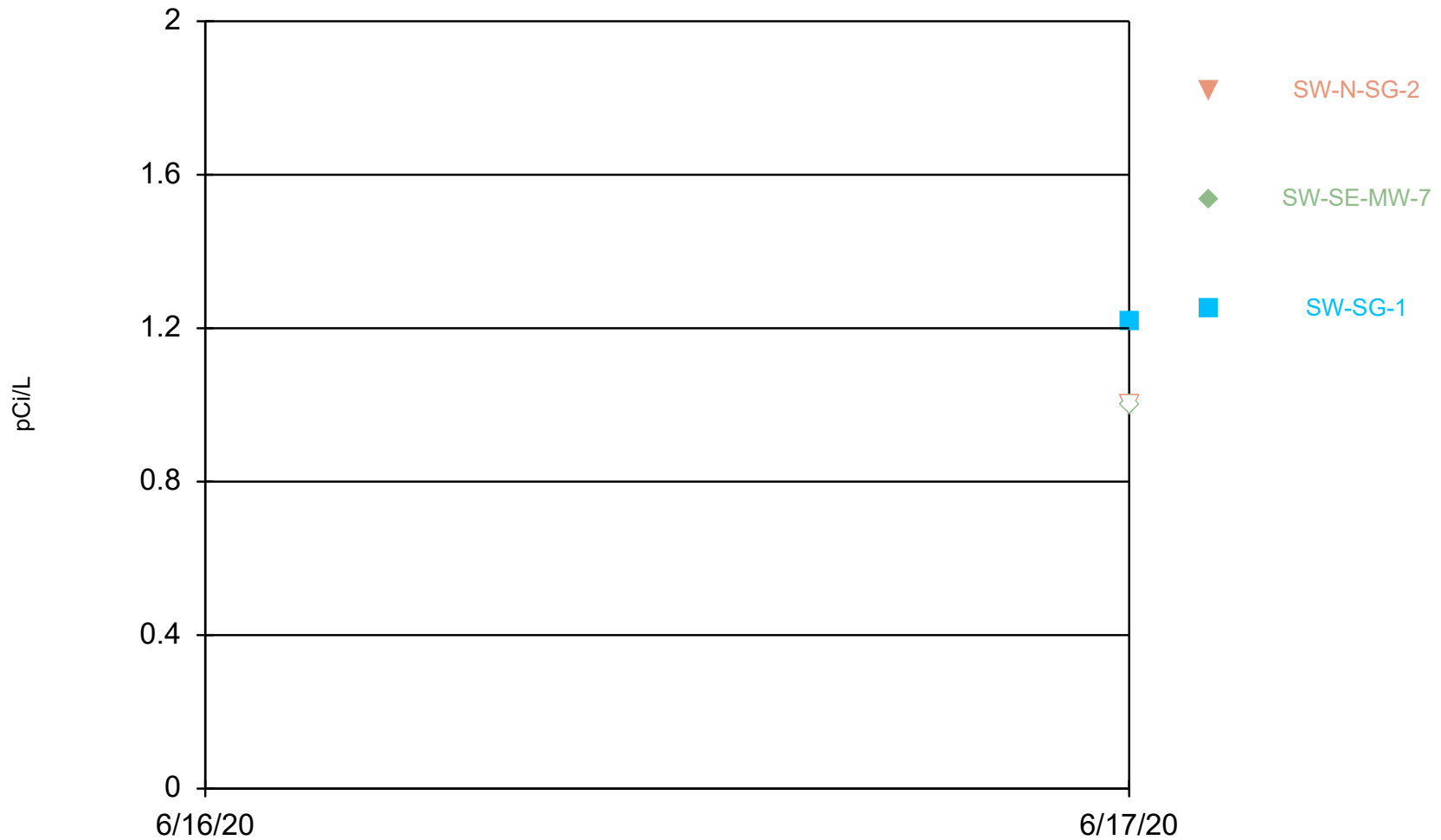
Constituent: Chromium Analysis Run 10/27/2020 12:51 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Cobalt Analysis Run 10/27/2020 12:51 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

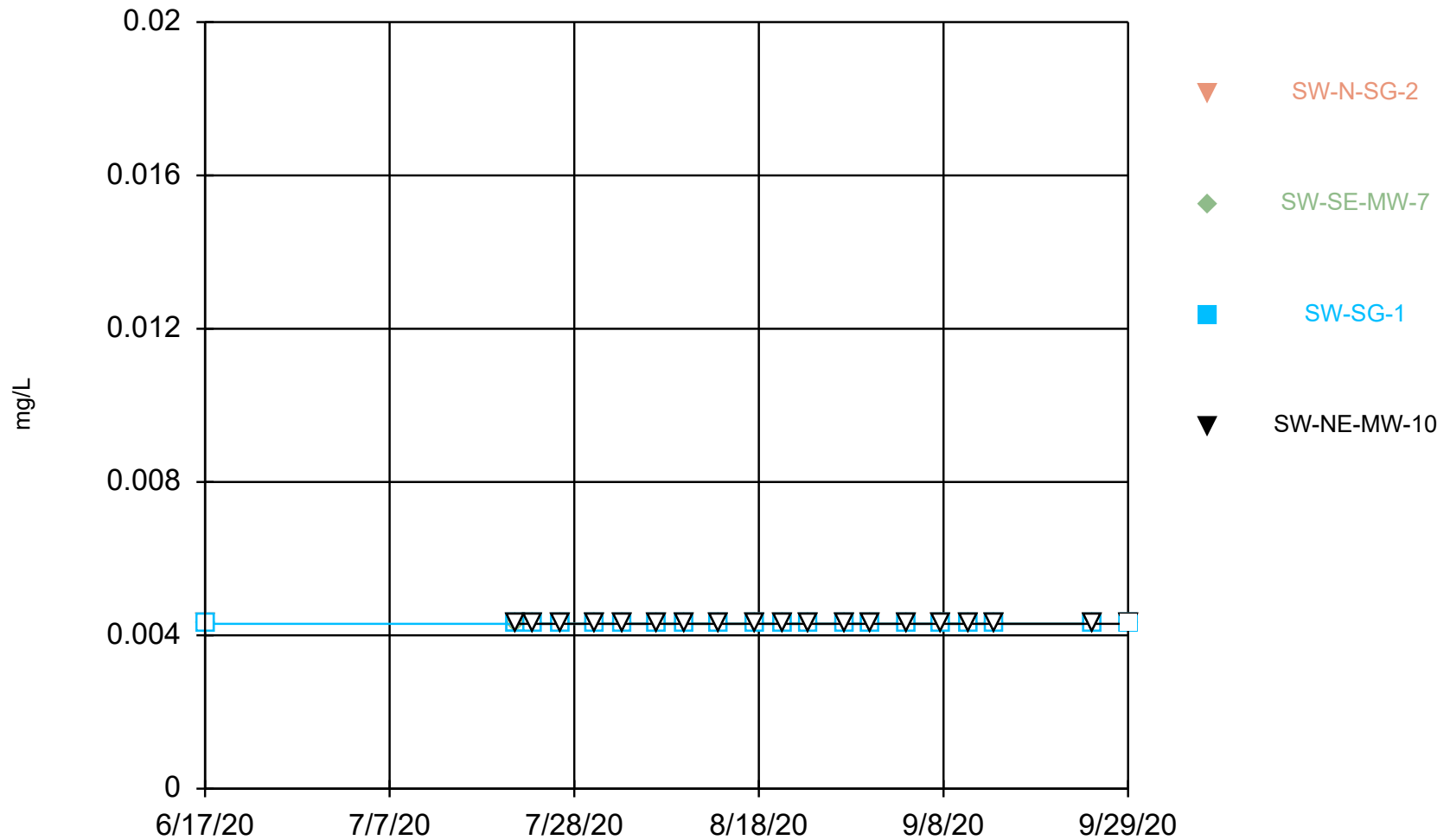
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 10/27/2020 12:51 PM

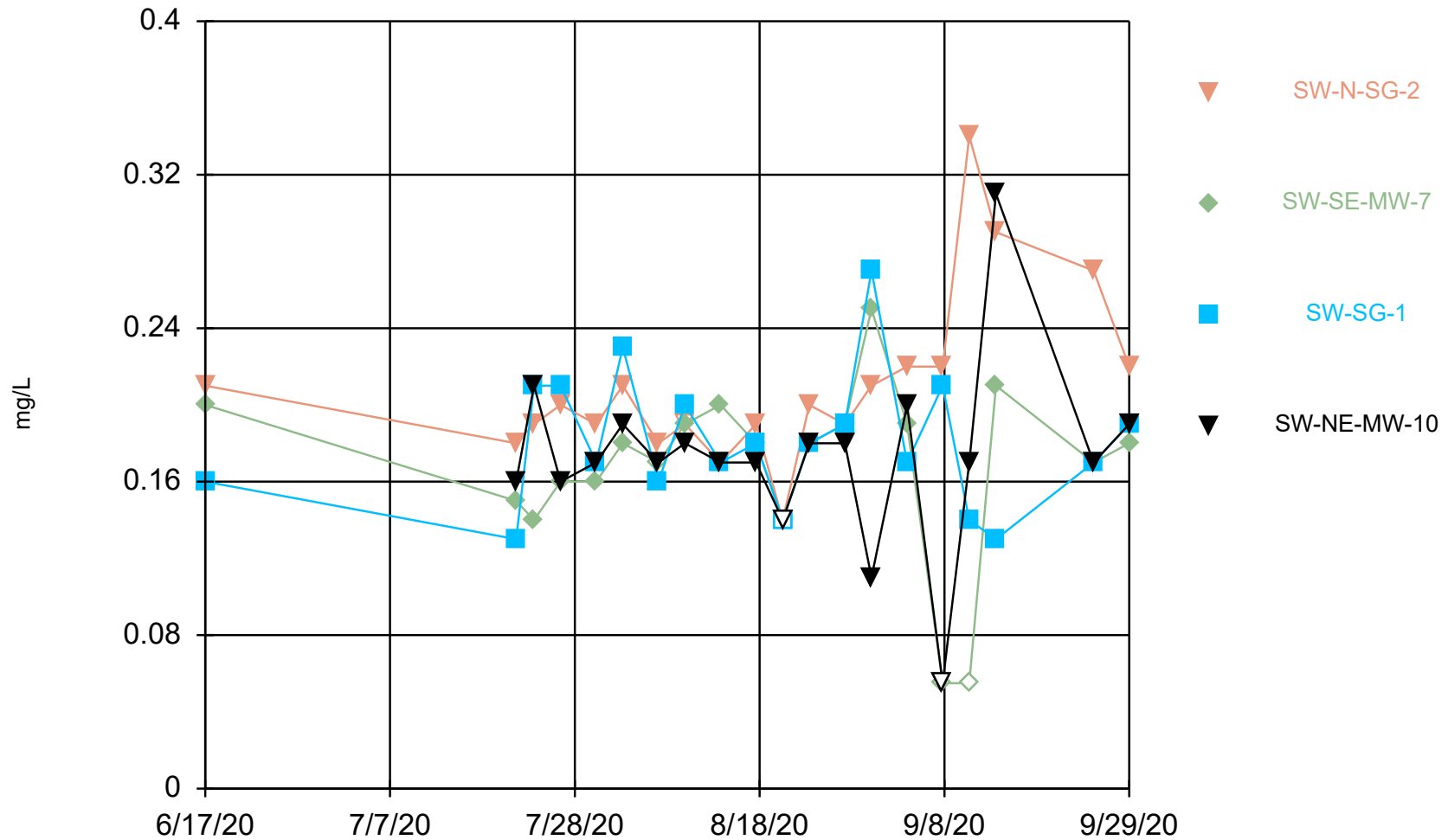
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



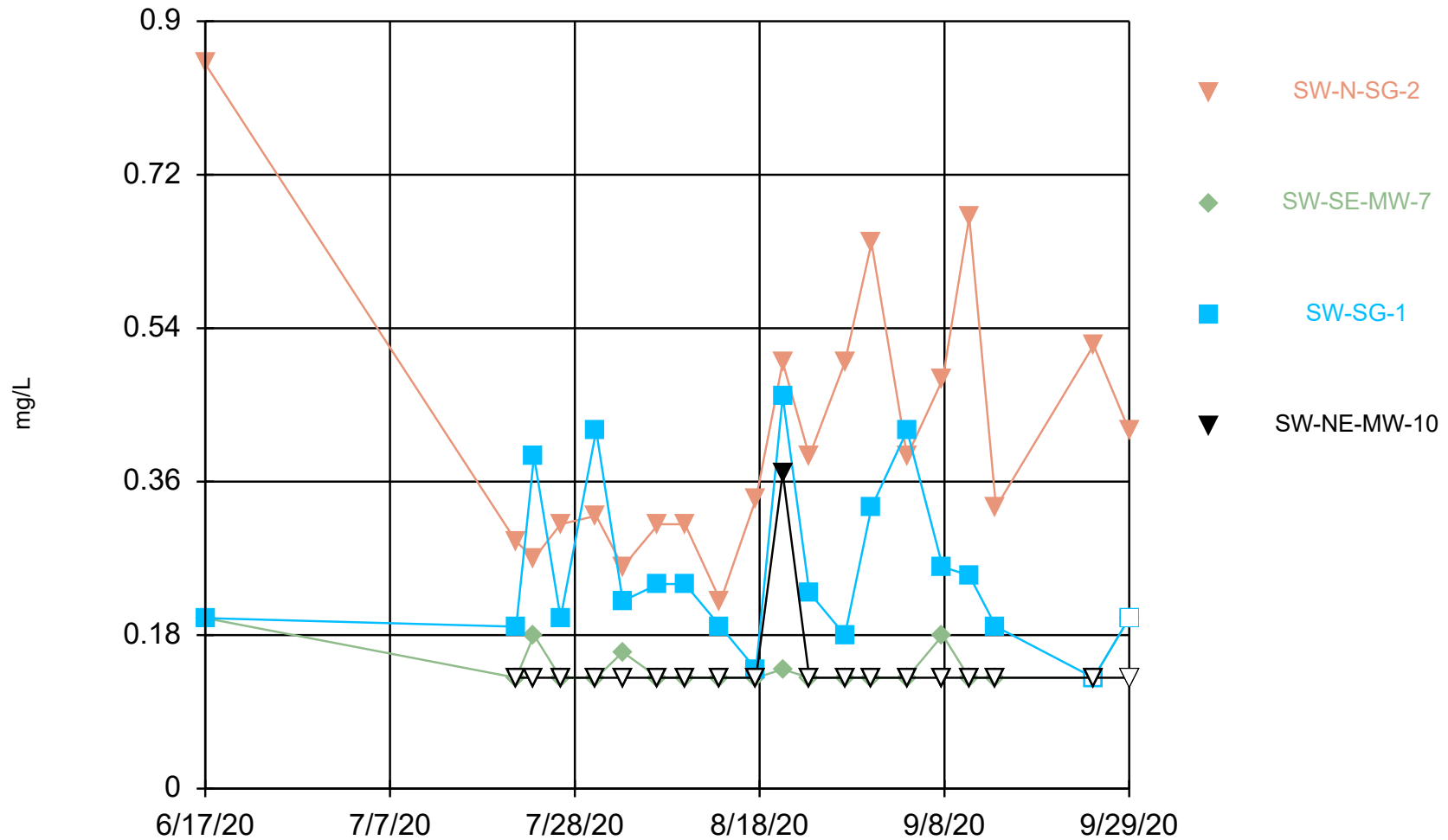
Constituent: Copper Analysis Run 10/27/2020 12:51 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



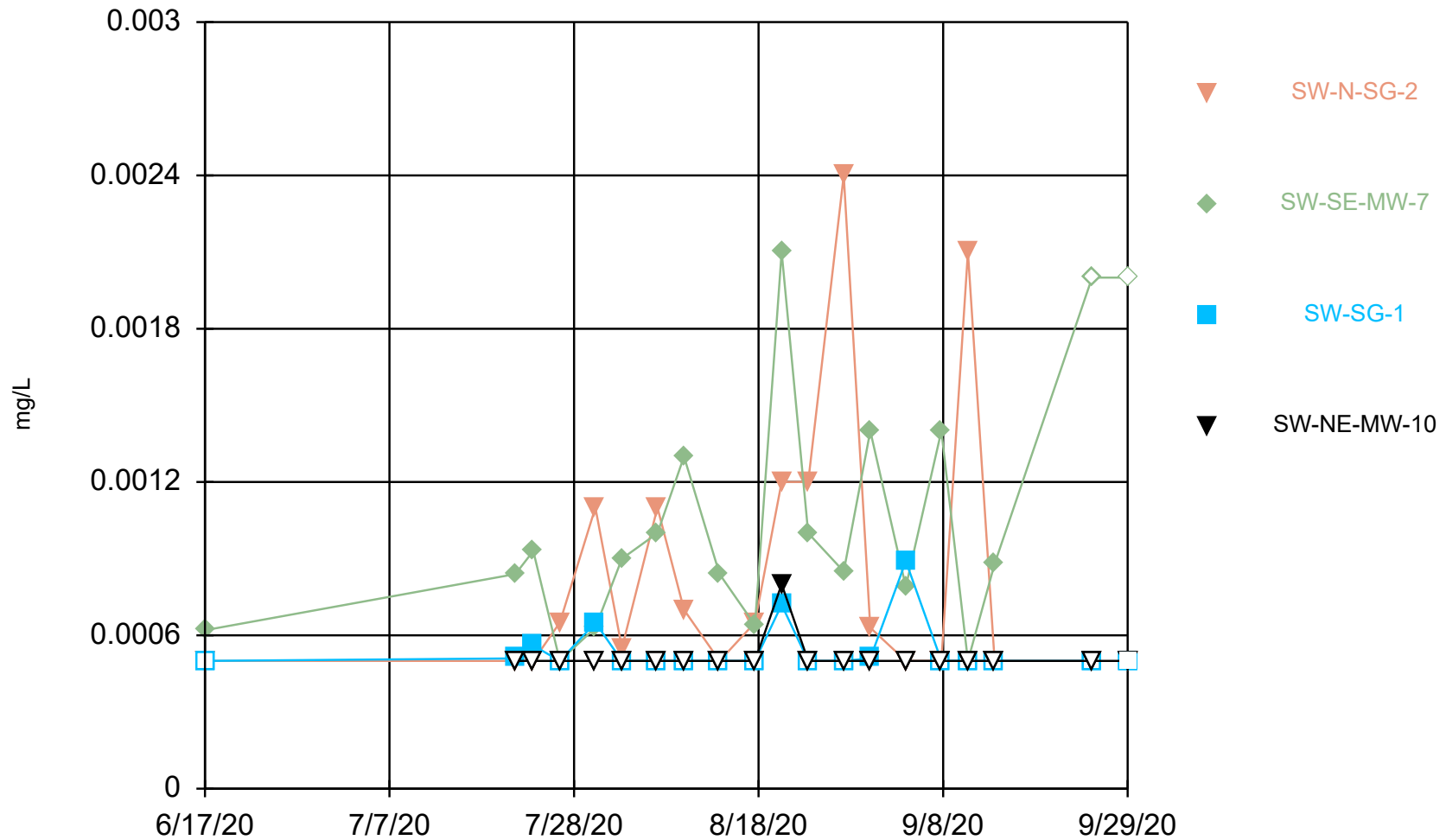
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



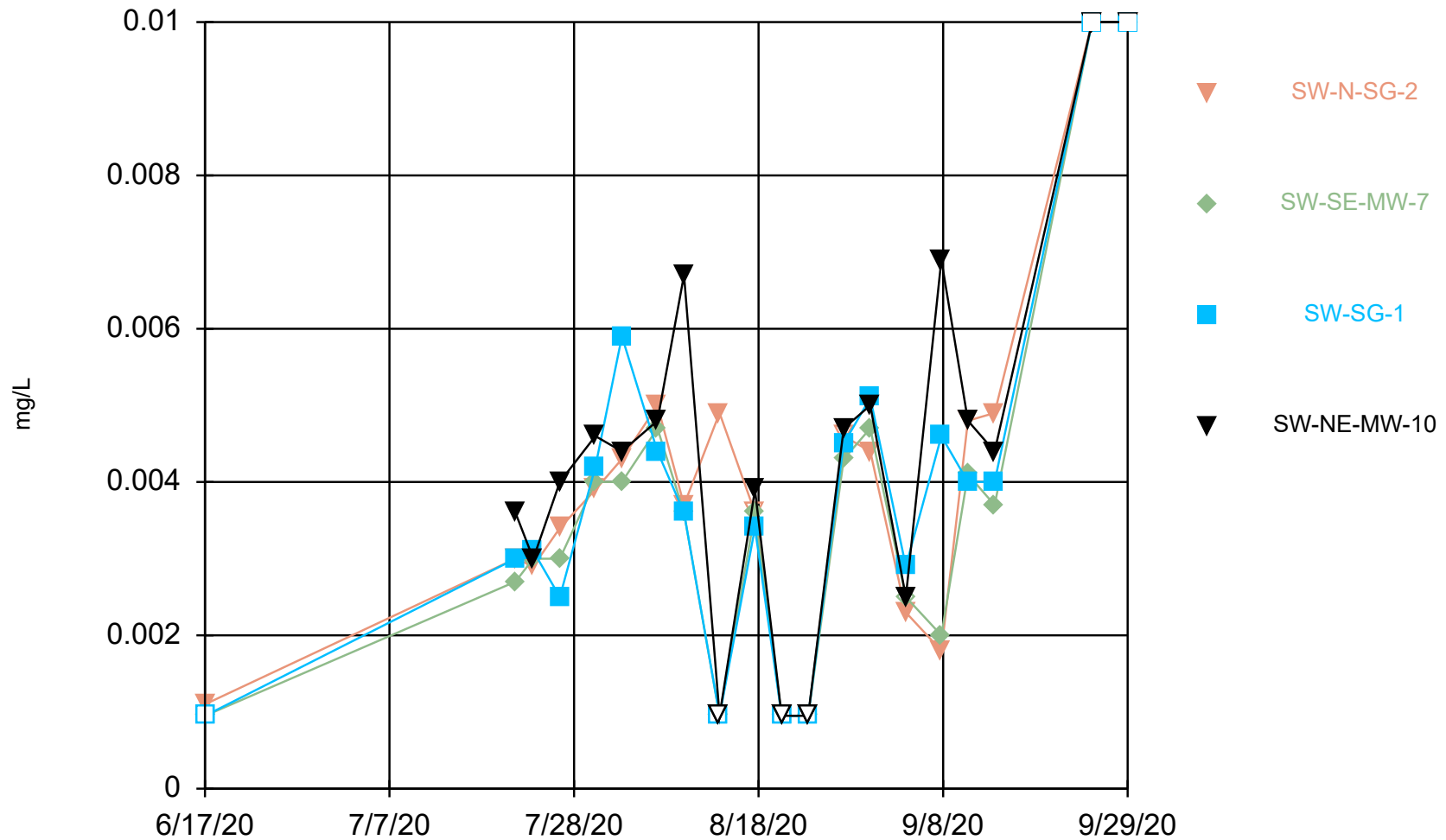
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



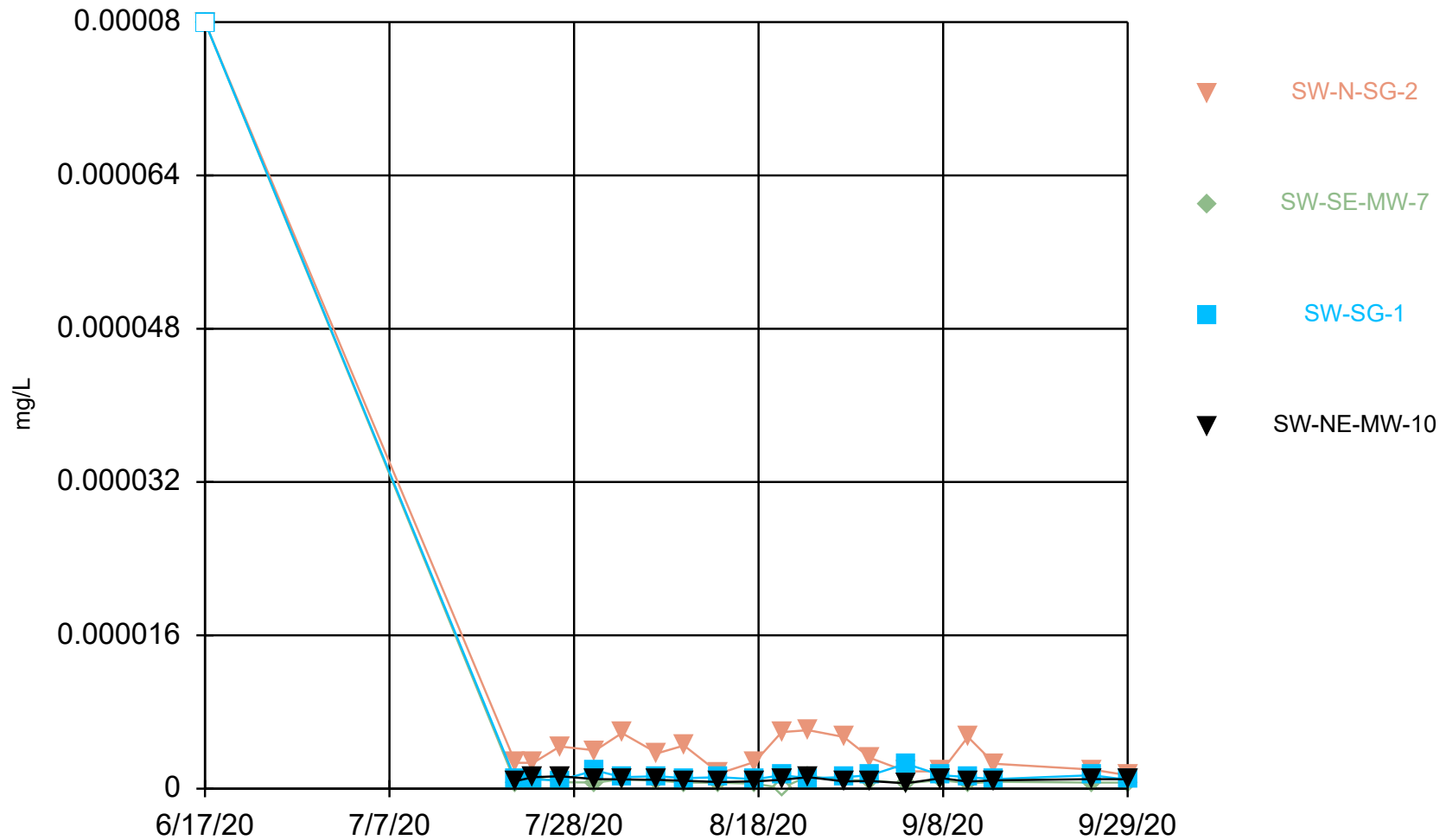
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



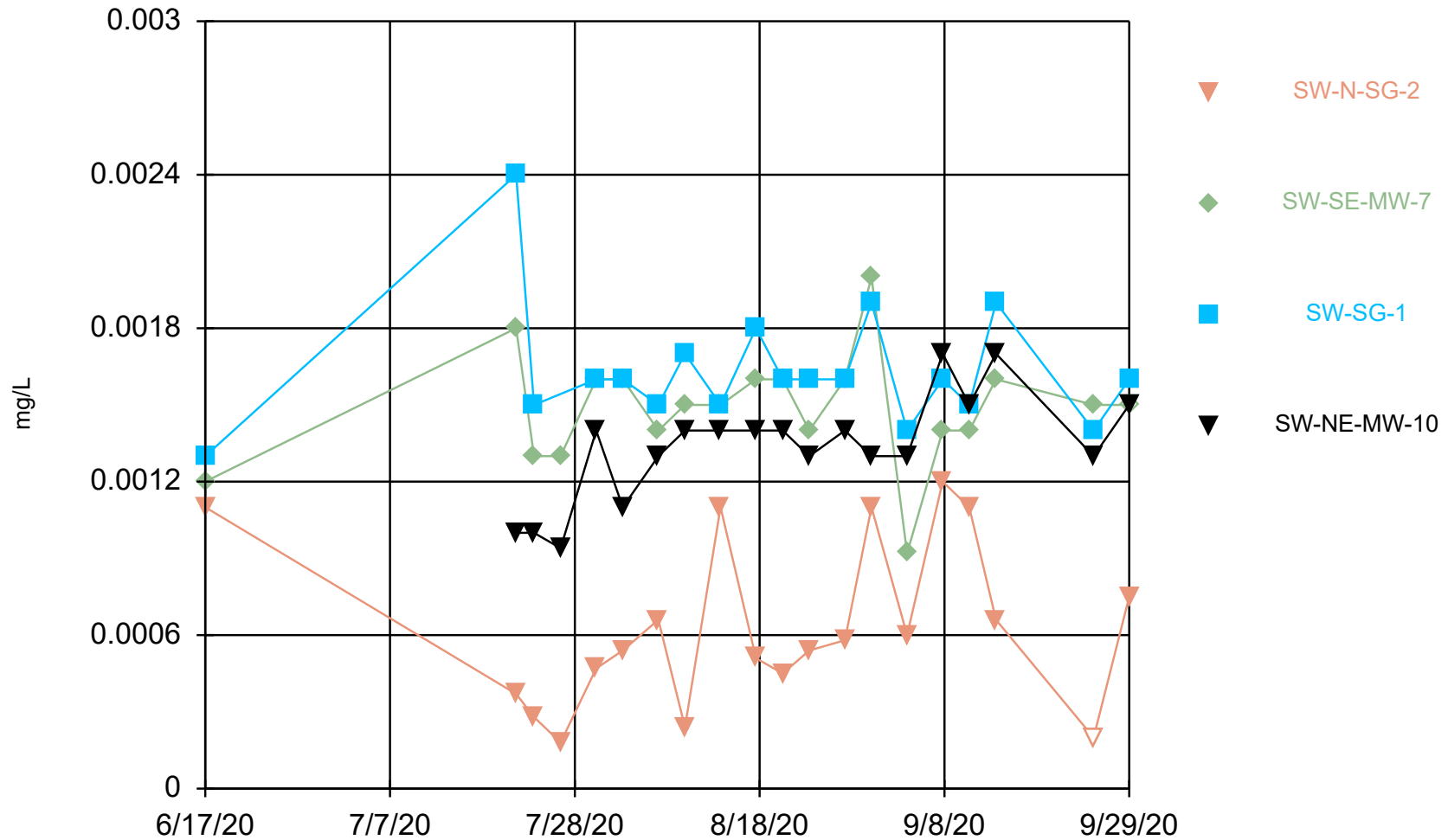
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



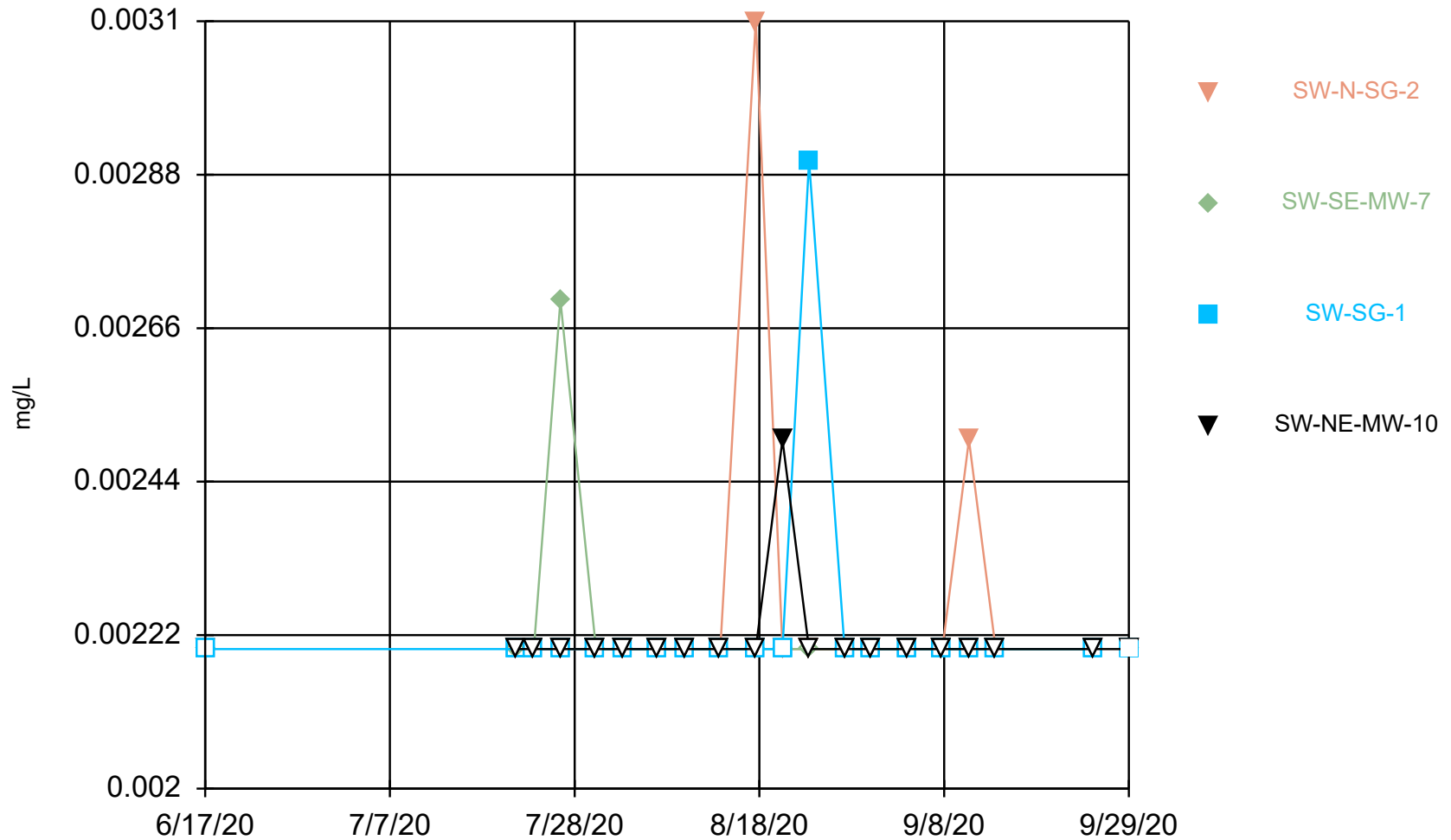
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



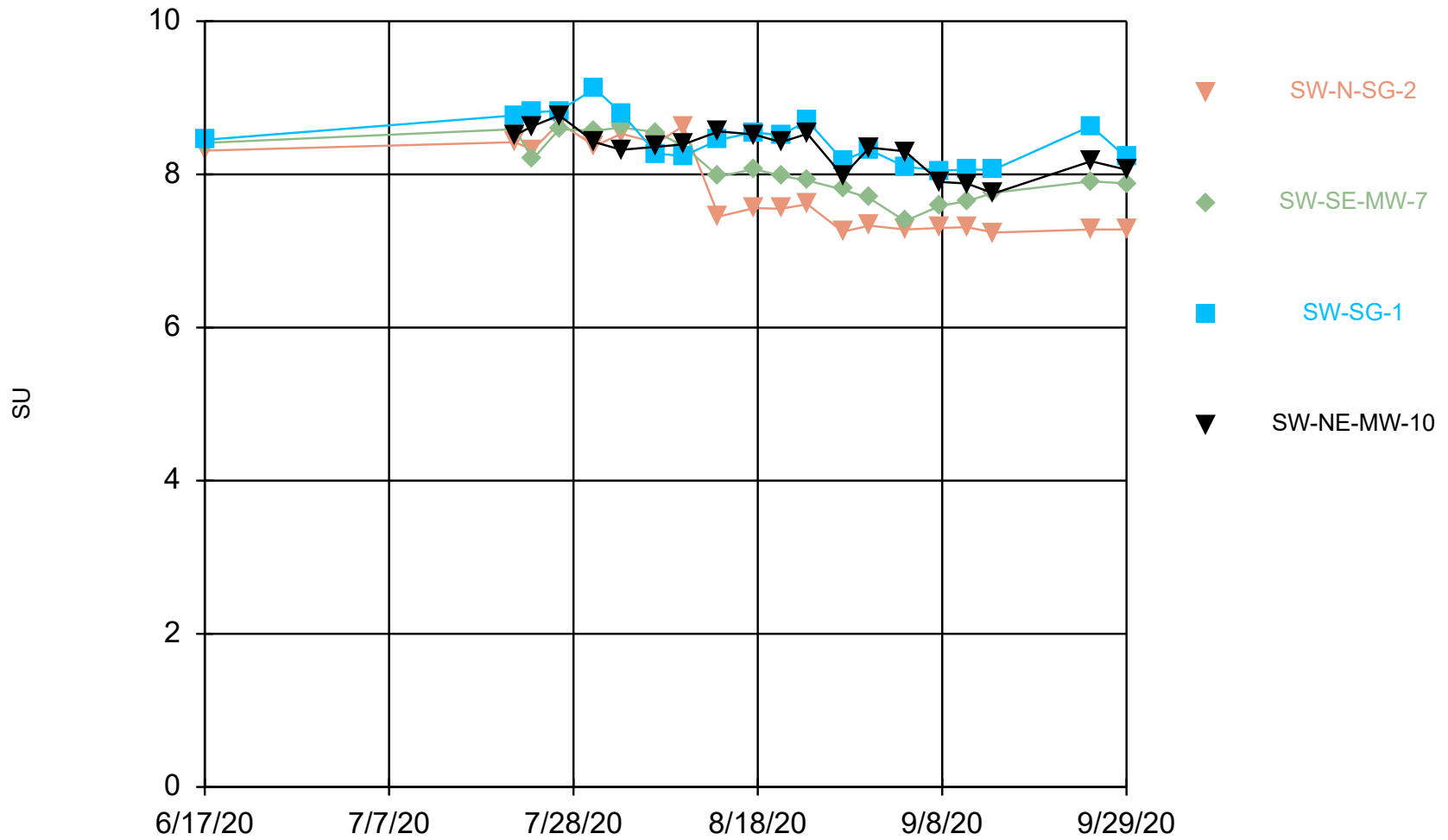
Constituent: Molybdenum Analysis Run 10/27/2020 12:51 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Nickel Analysis Run 10/27/2020 12:51 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

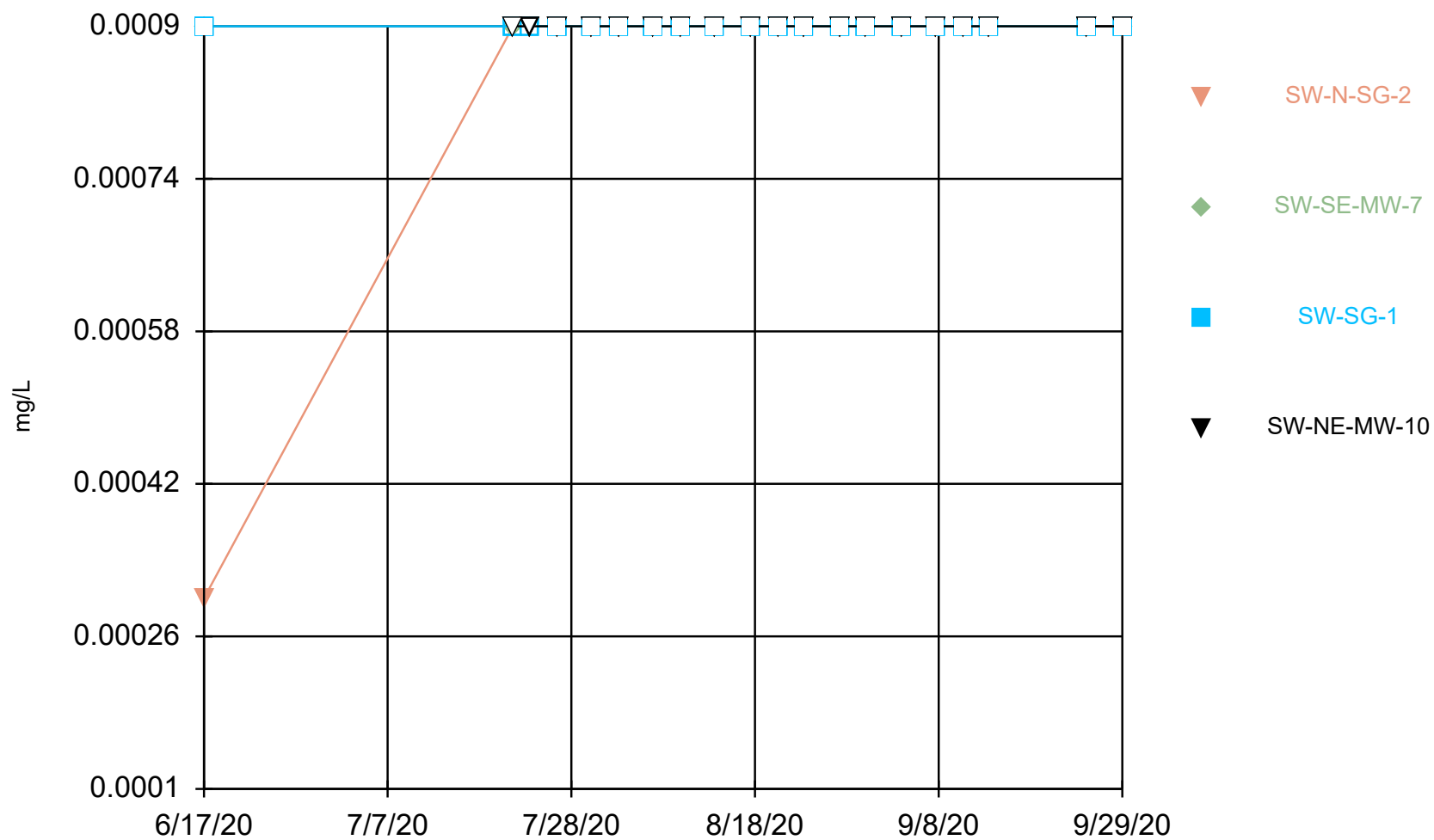
Time Series



Constituent: pH Analysis Run 10/27/2020 12:51 PM

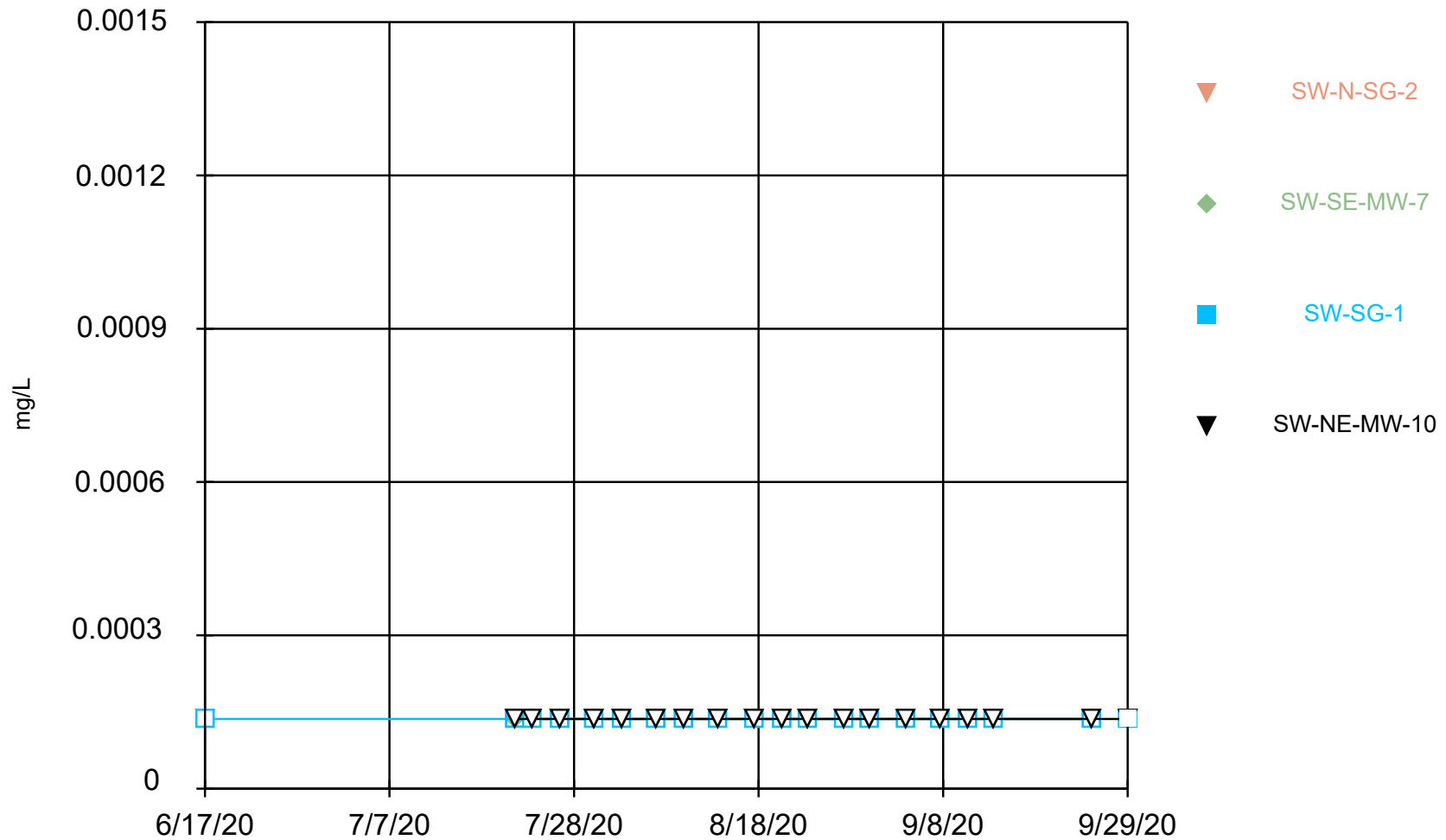
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Time Series



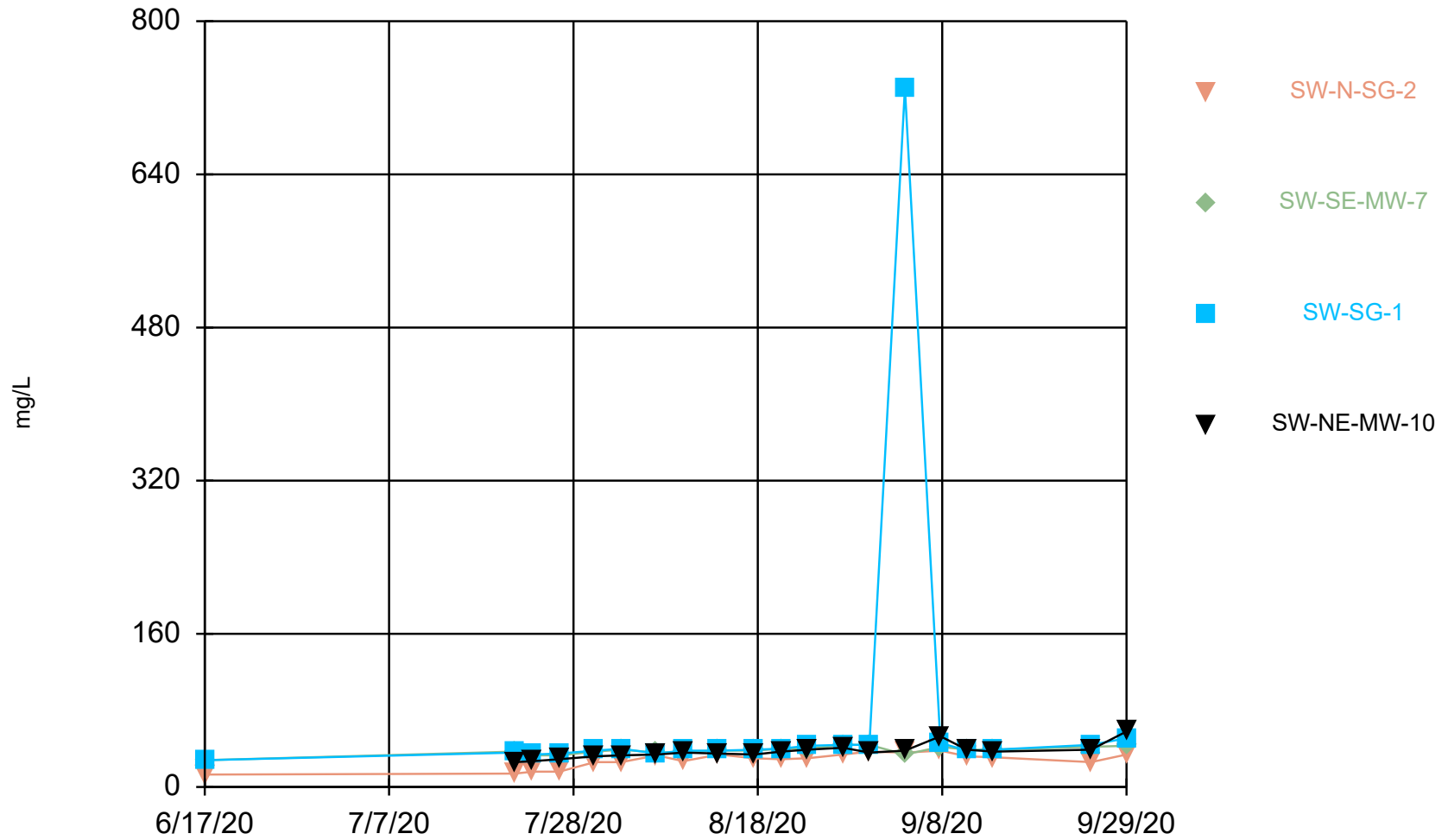
Constituent: Selenite Analysis Run 10/27/2020 12:51 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



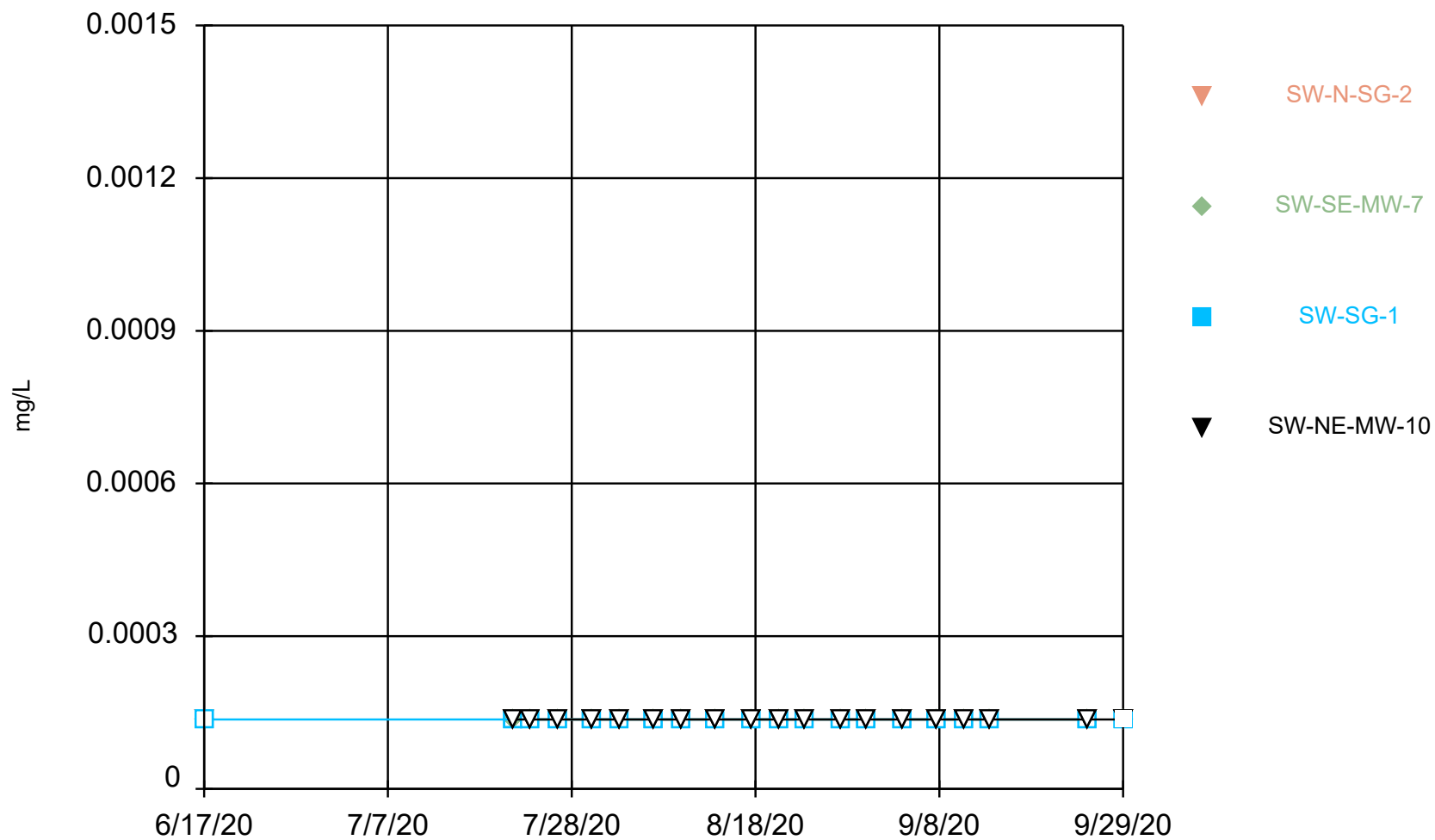
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



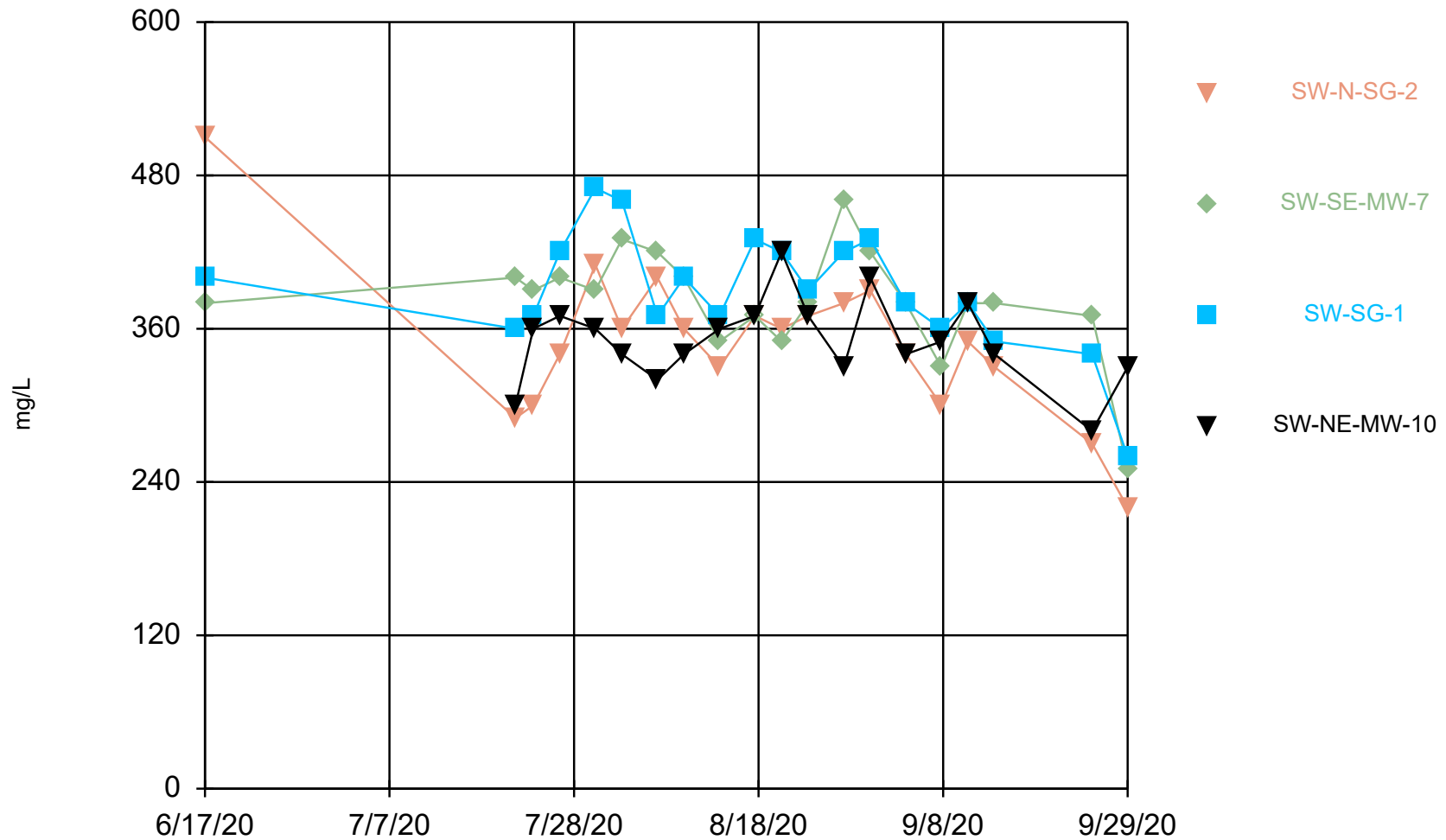
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



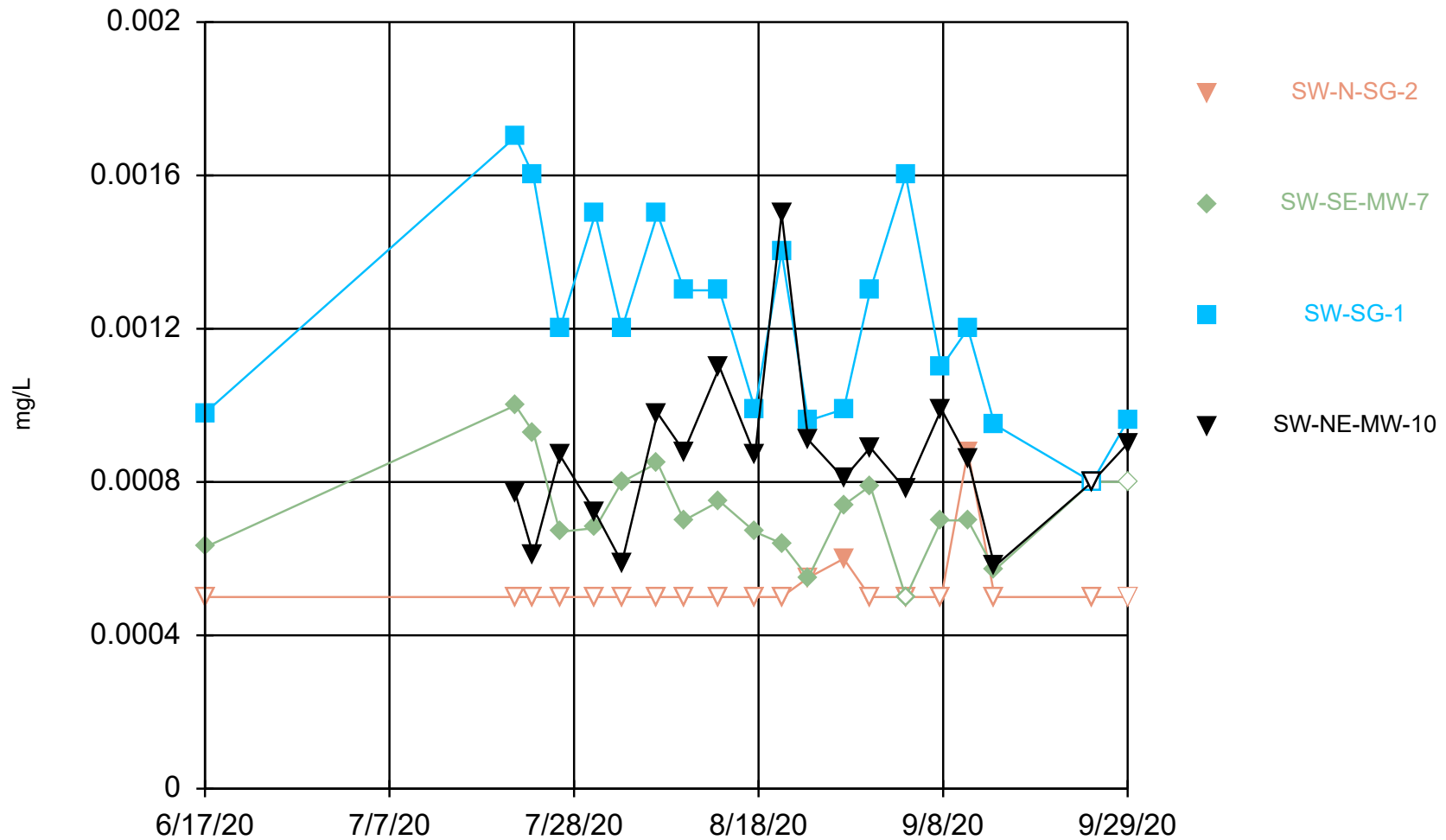
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



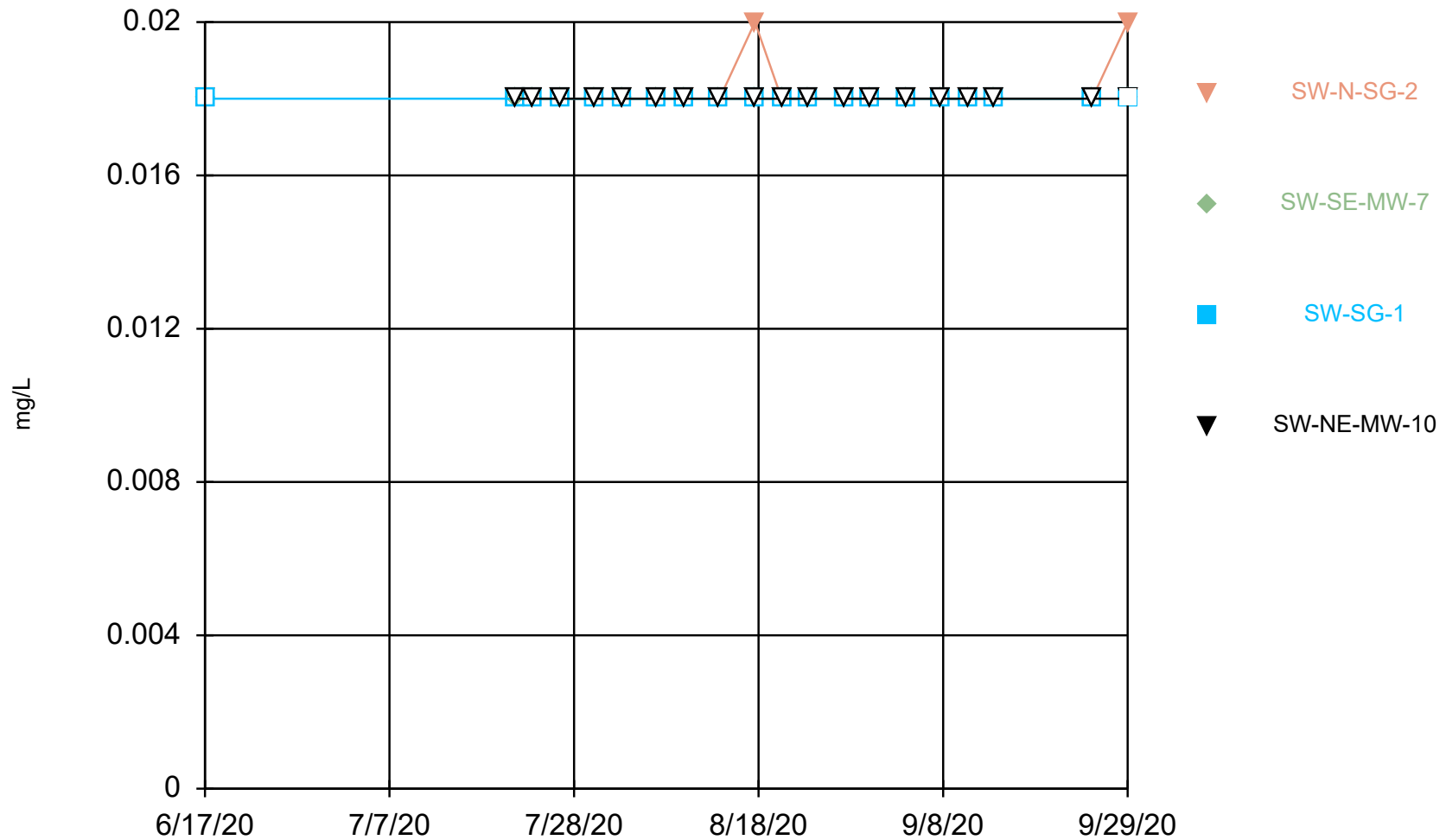
Constituent: Total Dissolved Solids Analysis Run 10/27/2020 12:51 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Vanadium Analysis Run 10/27/2020 12:51 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

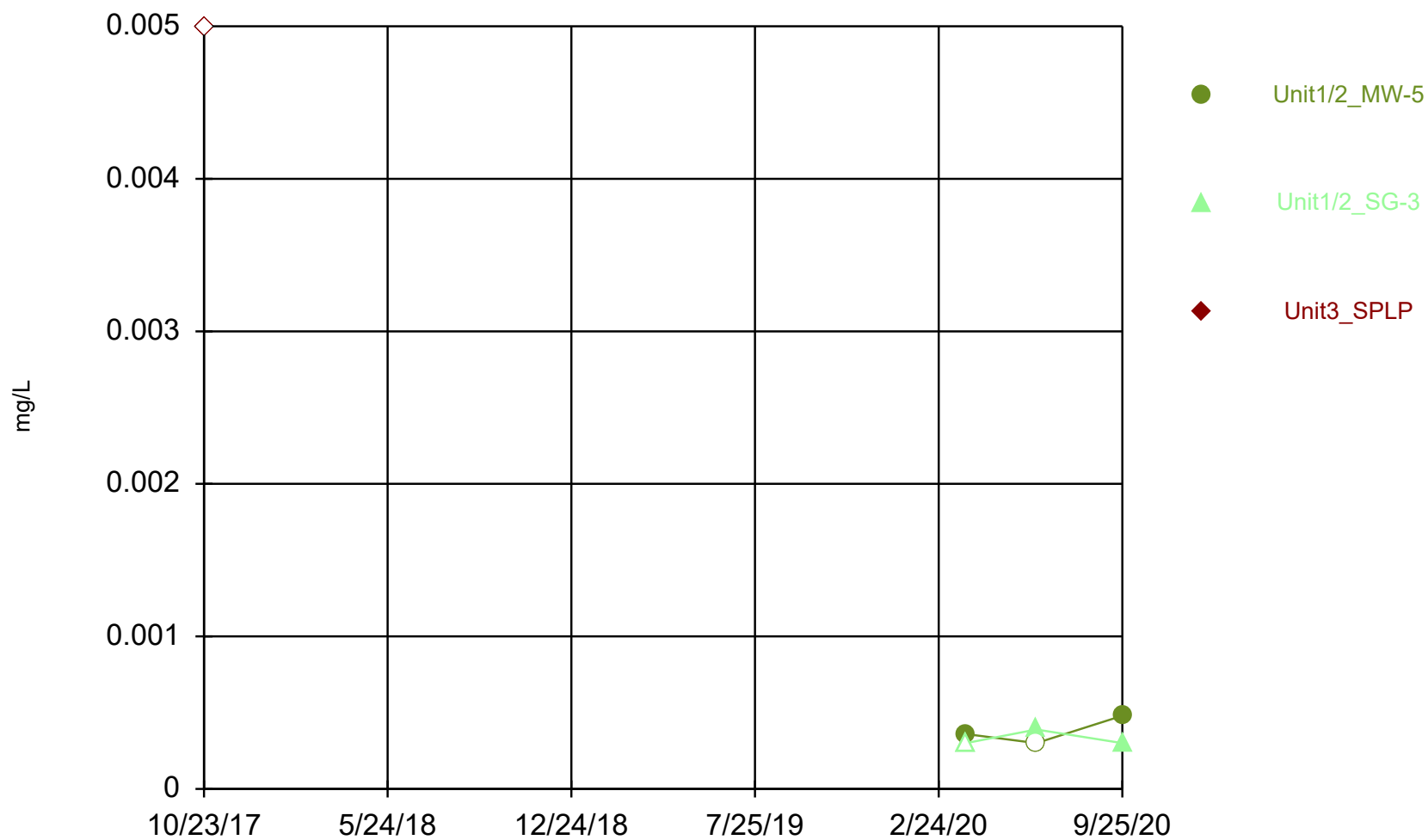
Time Series



Constituent: Zinc Analysis Run 10/27/2020 12:51 PM

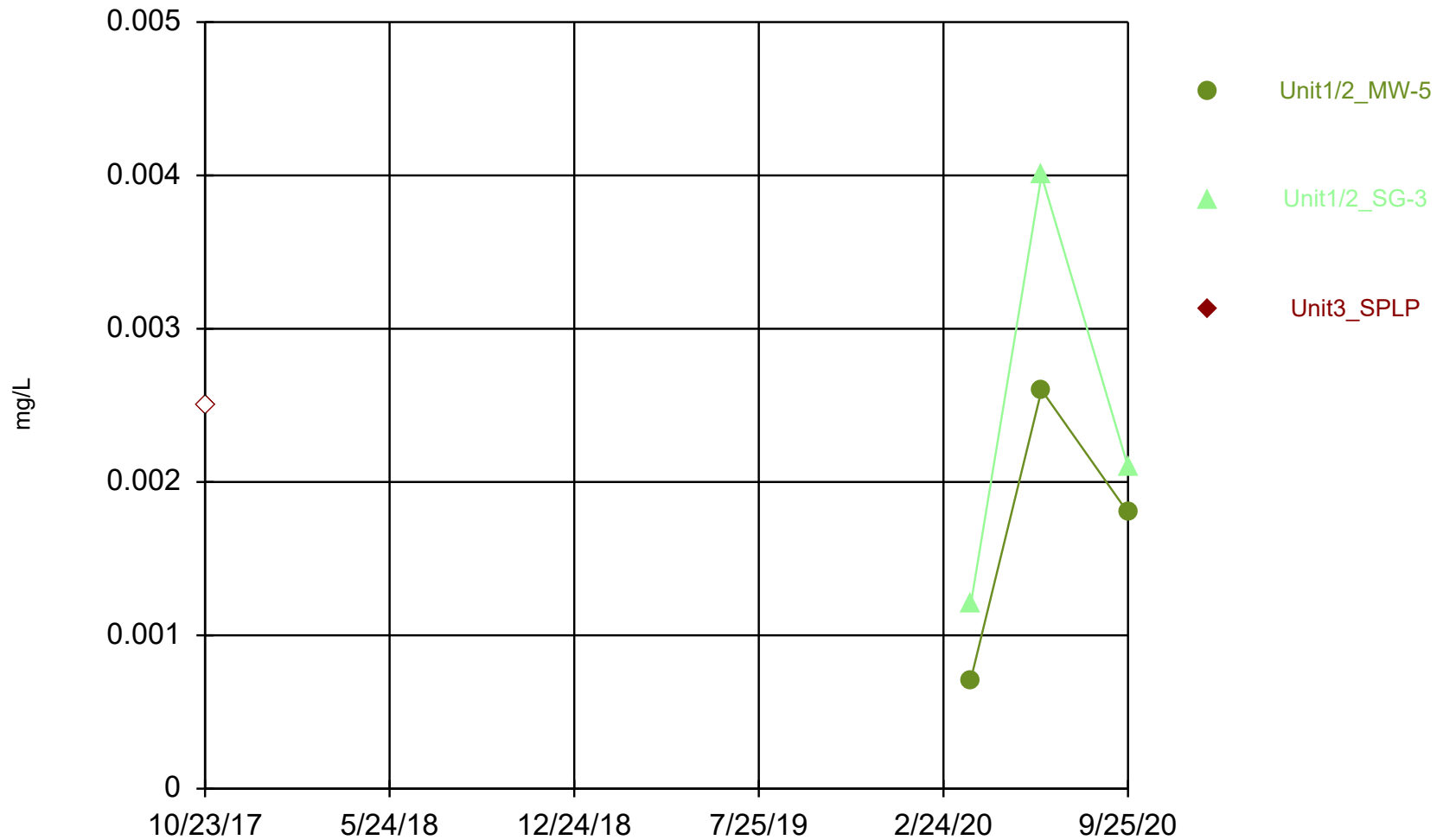
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series

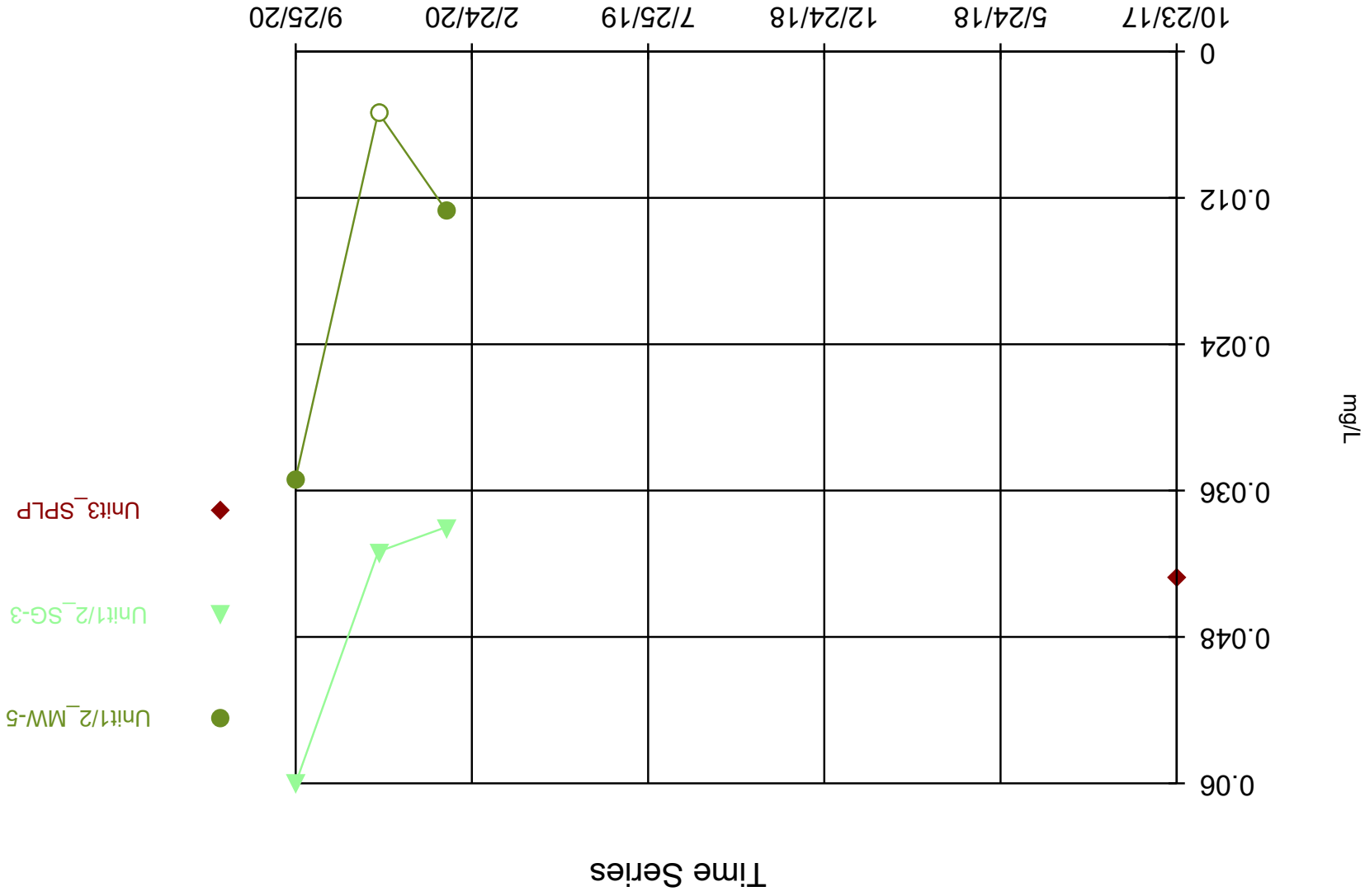


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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series

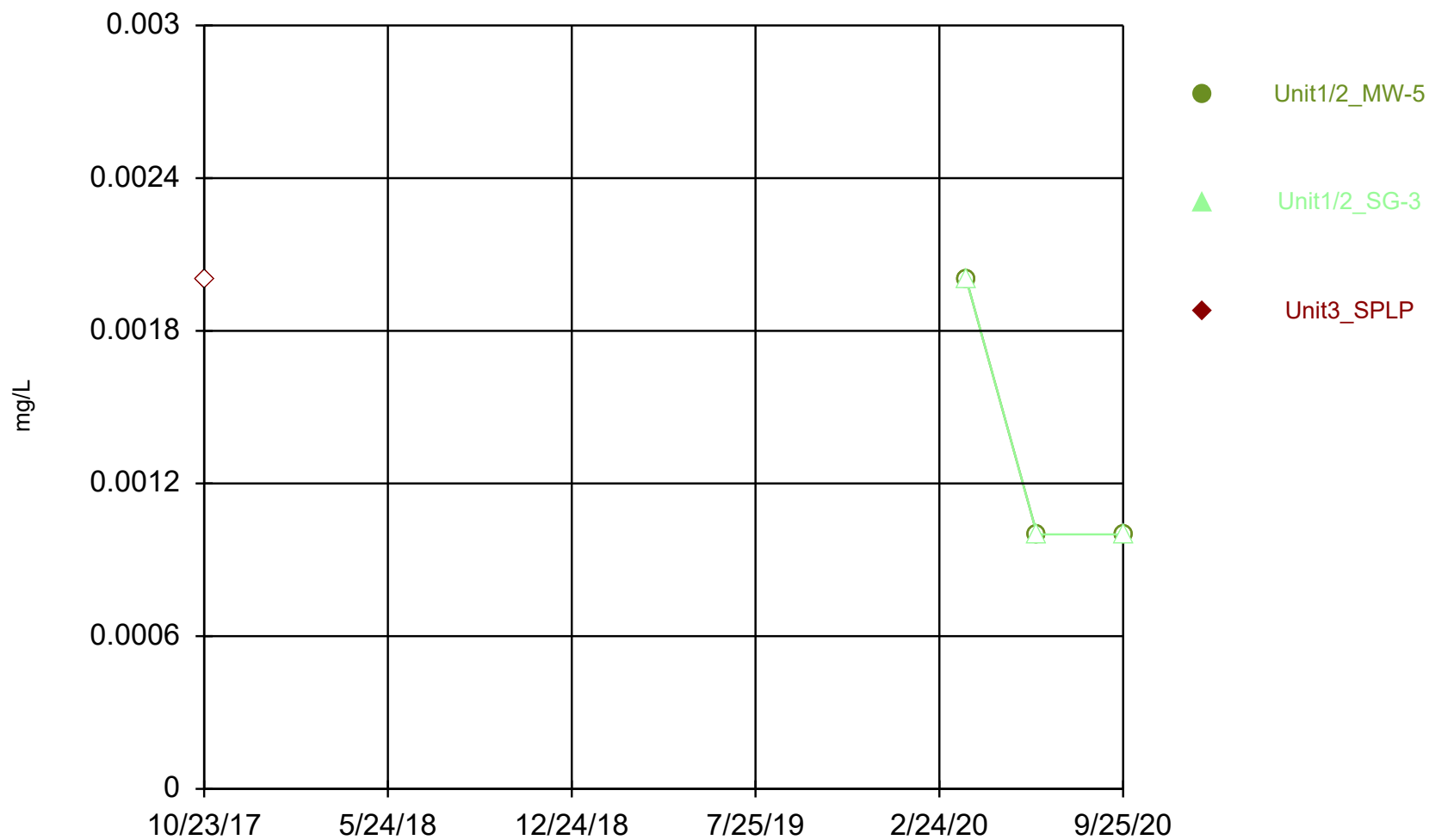


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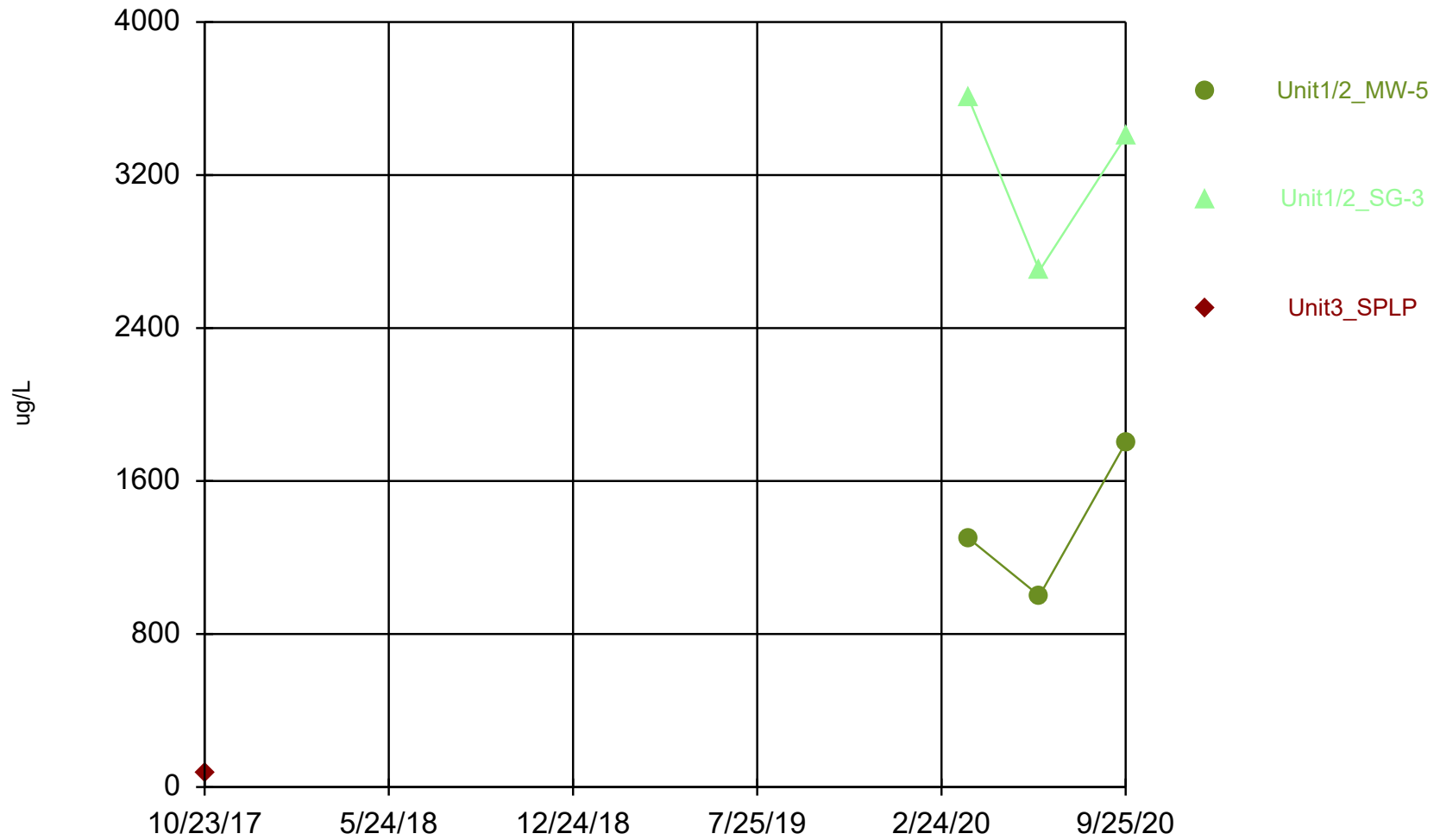
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Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Beryllium Analysis Run 10/27/2020 12:48 PM
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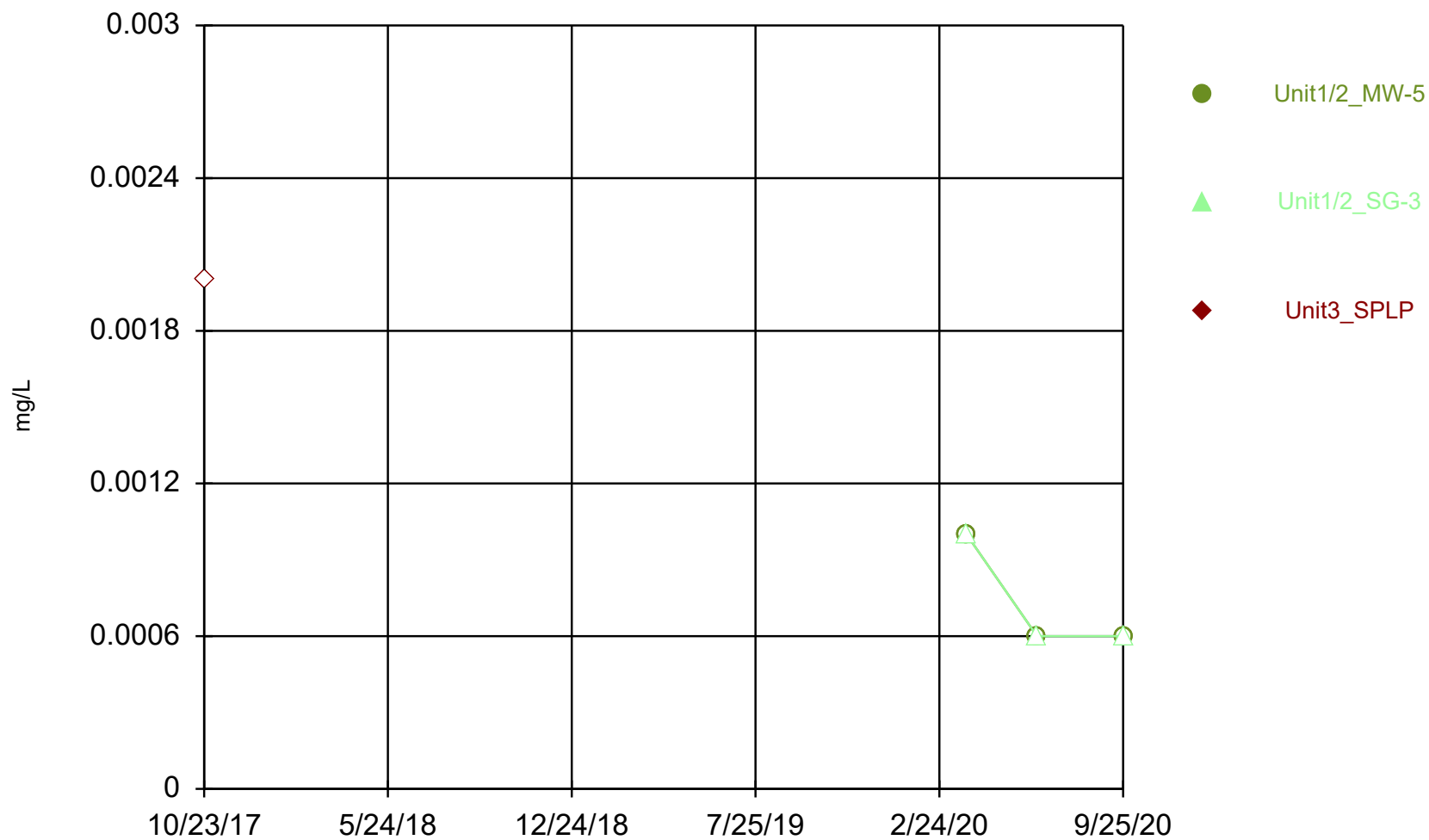
Time Series



Constituent: Boron Analysis Run 10/27/2020 12:48 PM

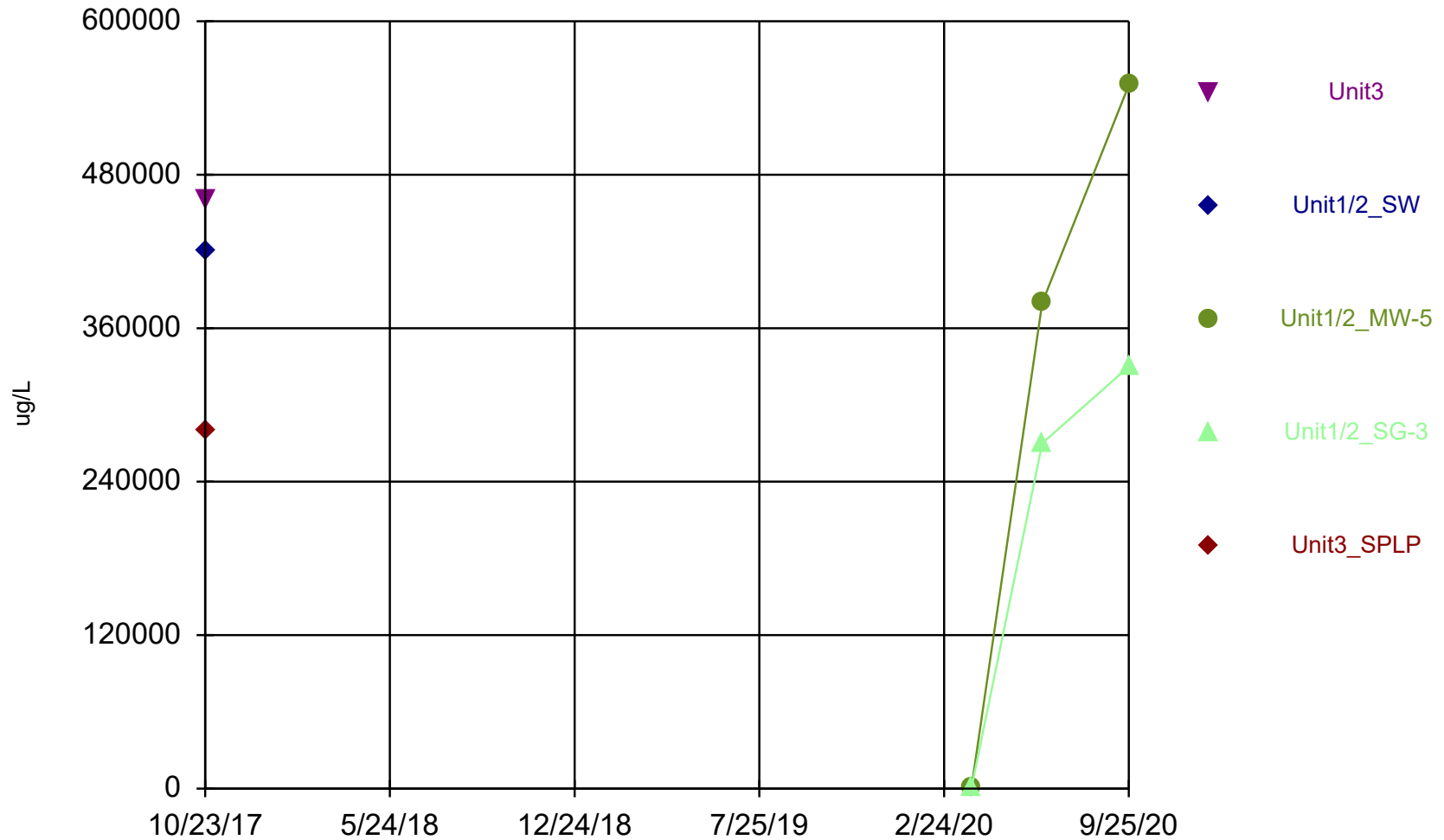
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Cadmium Analysis Run 10/27/2020 12:48 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

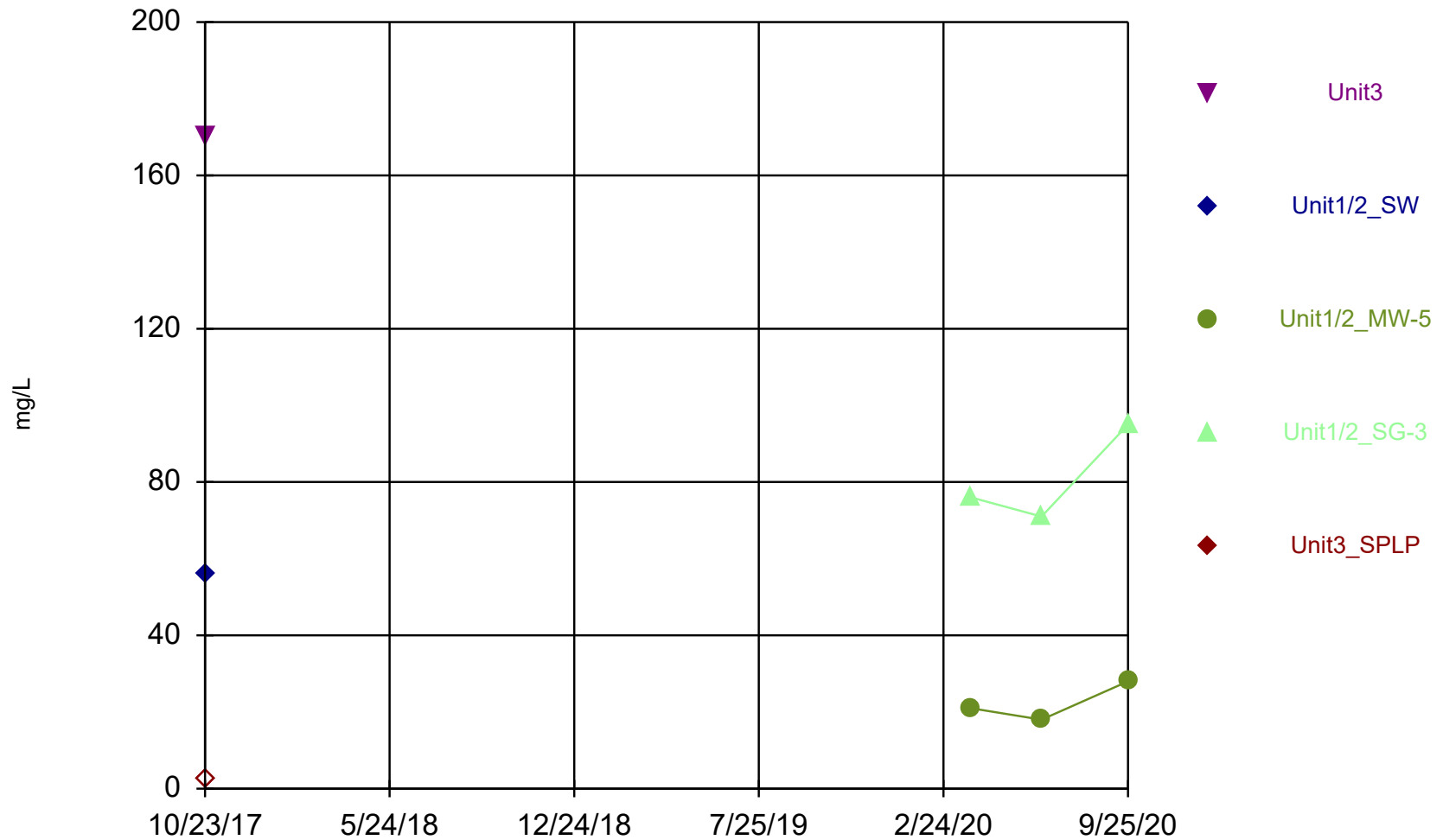
Time Series



Constituent: Calcium Analysis Run 10/27/2020 12:48 PM

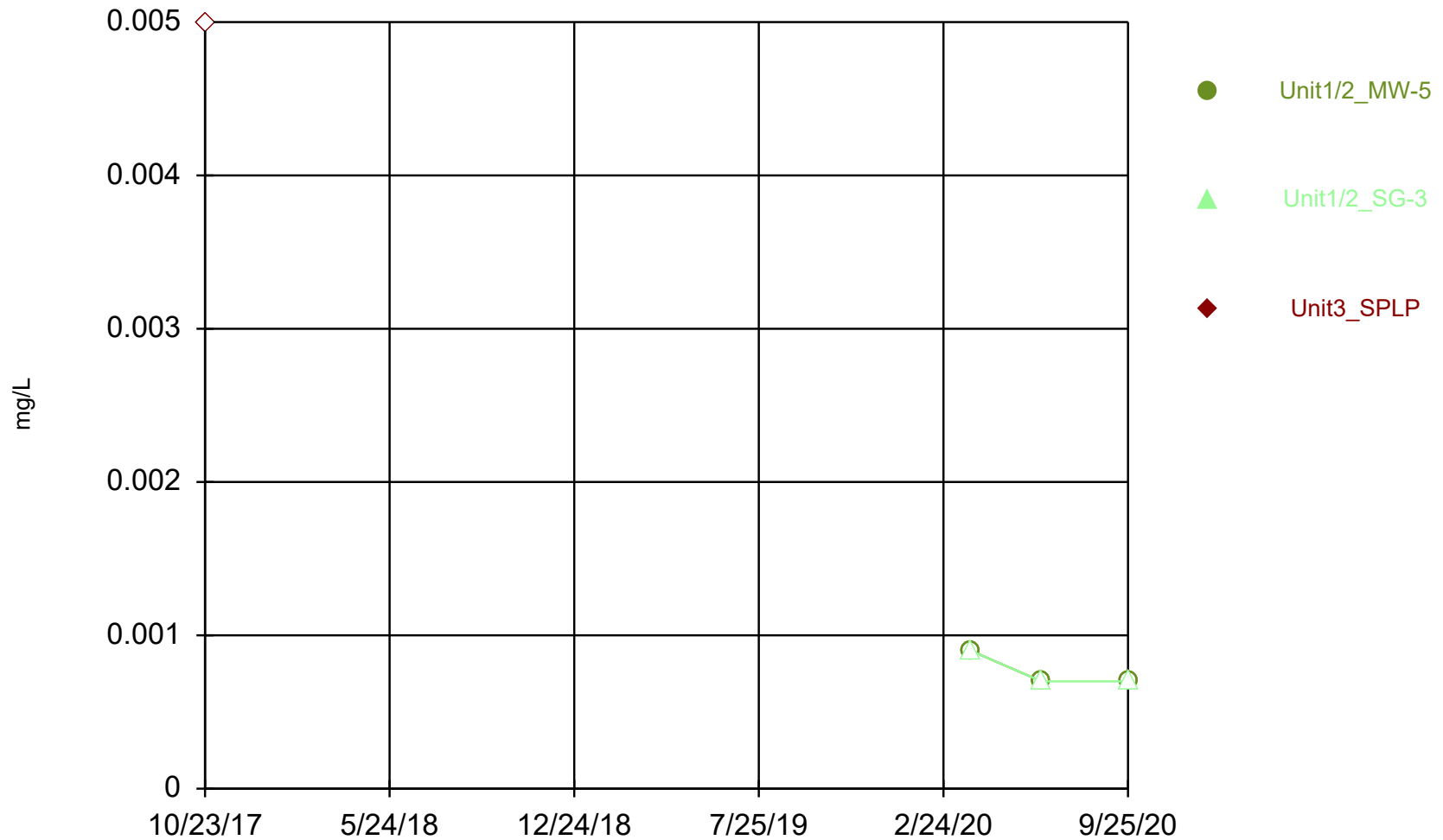
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



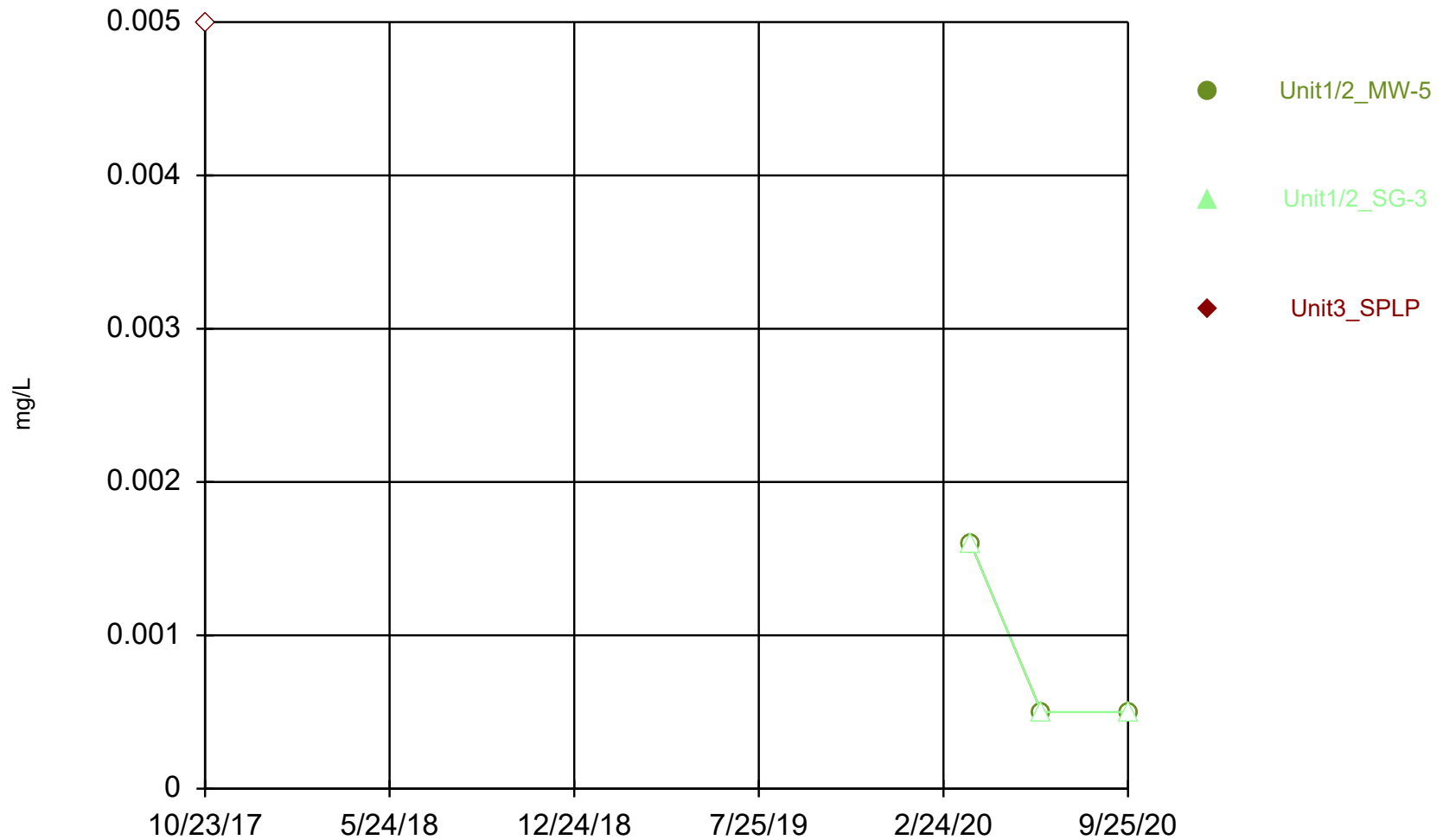
Constituent: Chloride Analysis Run 10/27/2020 12:48 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



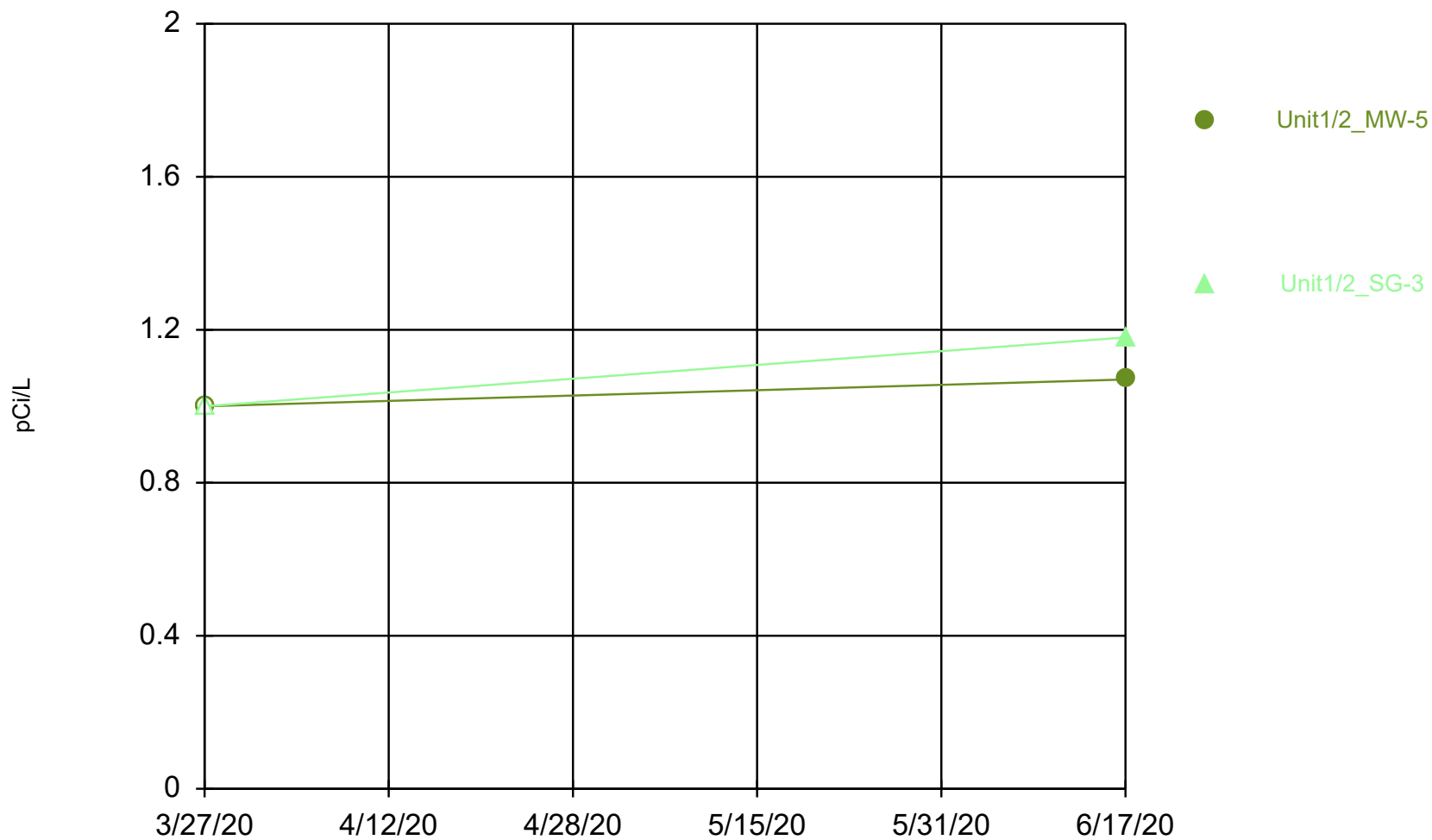
Constituent: Chromium Analysis Run 10/27/2020 12:48 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Cobalt Analysis Run 10/27/2020 12:48 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

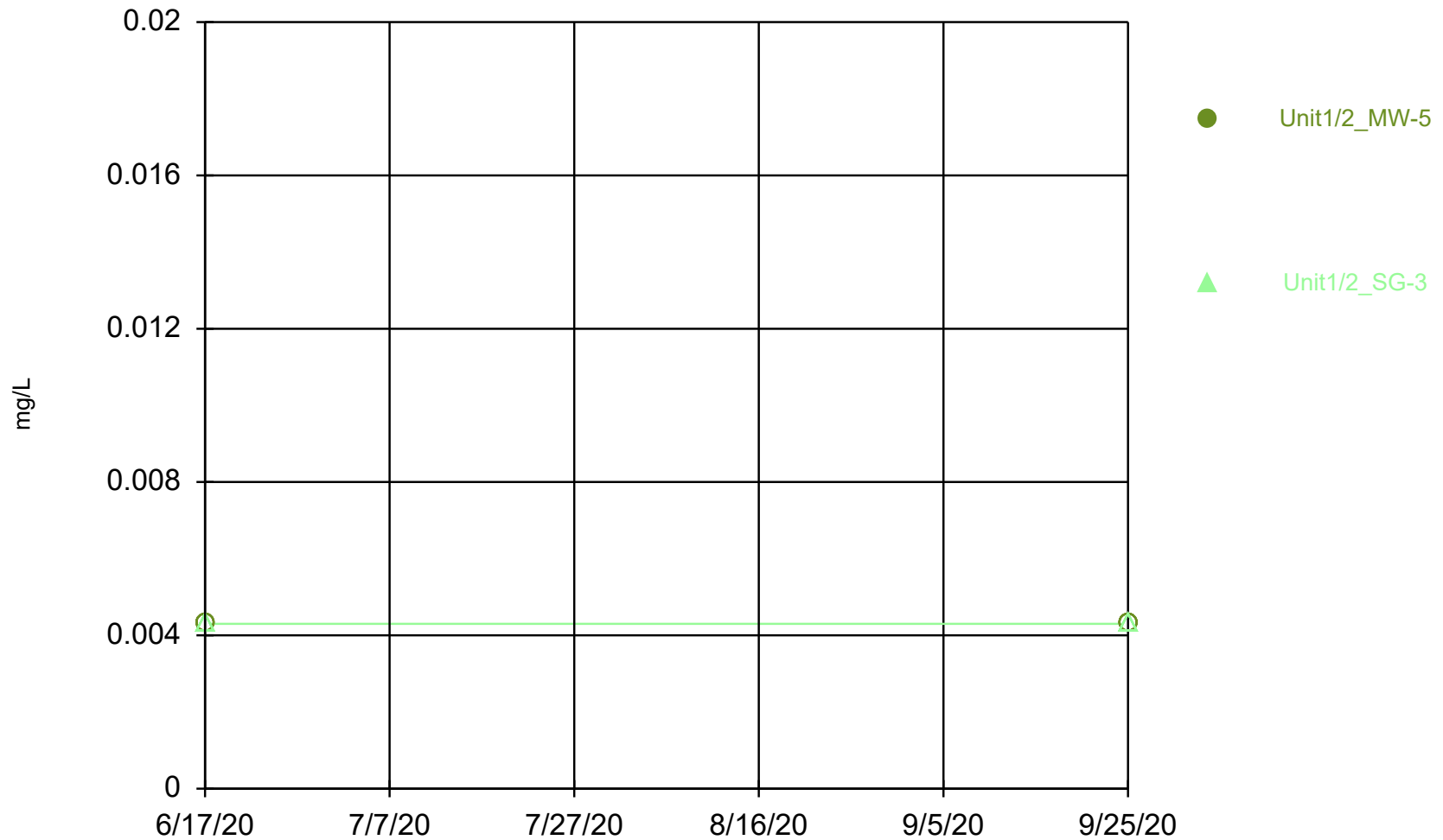
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 10/27/2020 12:48 PM

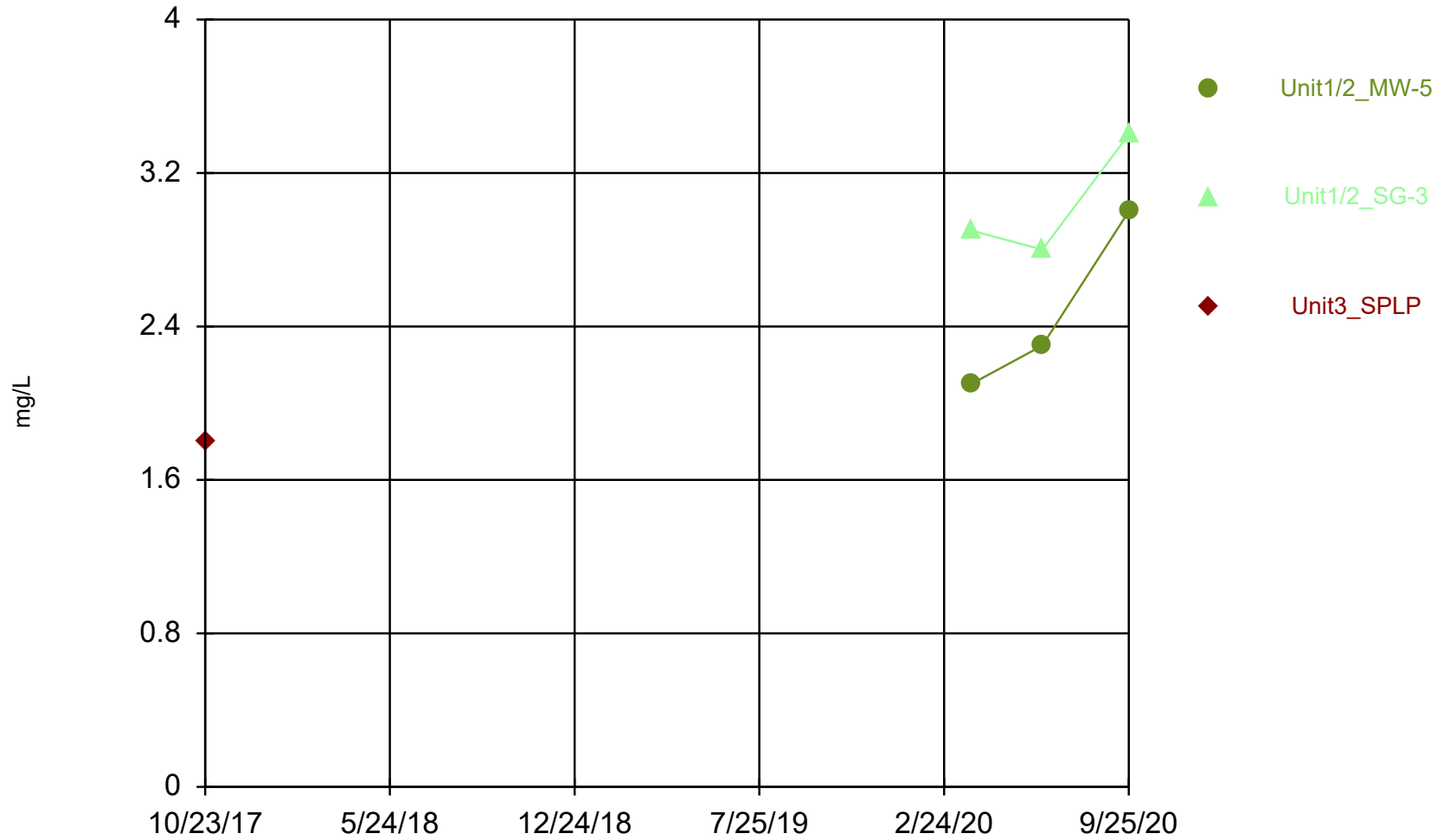
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Copper Analysis Run 10/27/2020 12:49 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

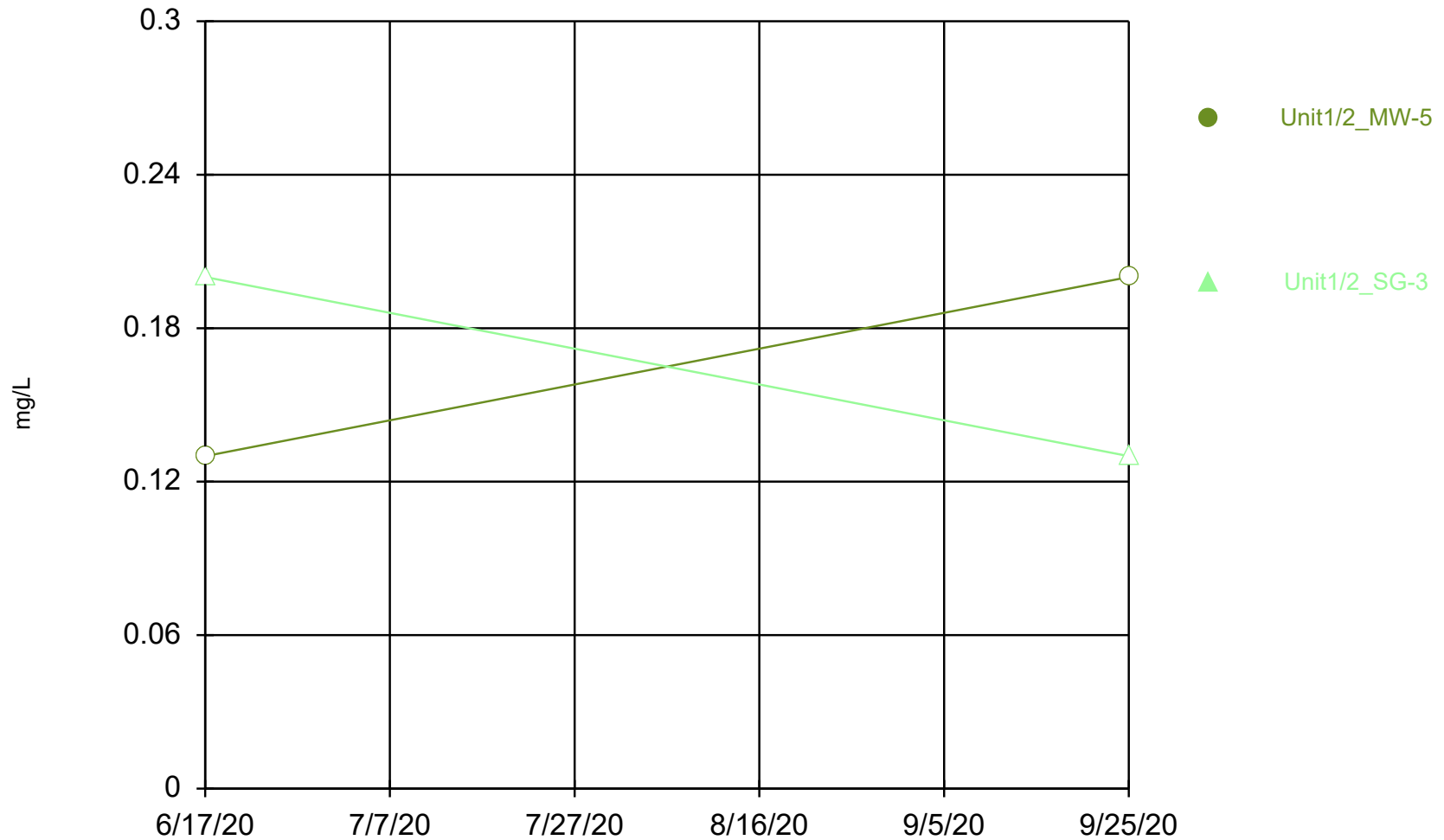
Time Series



Constituent: Fluoride Analysis Run 10/27/2020 12:49 PM

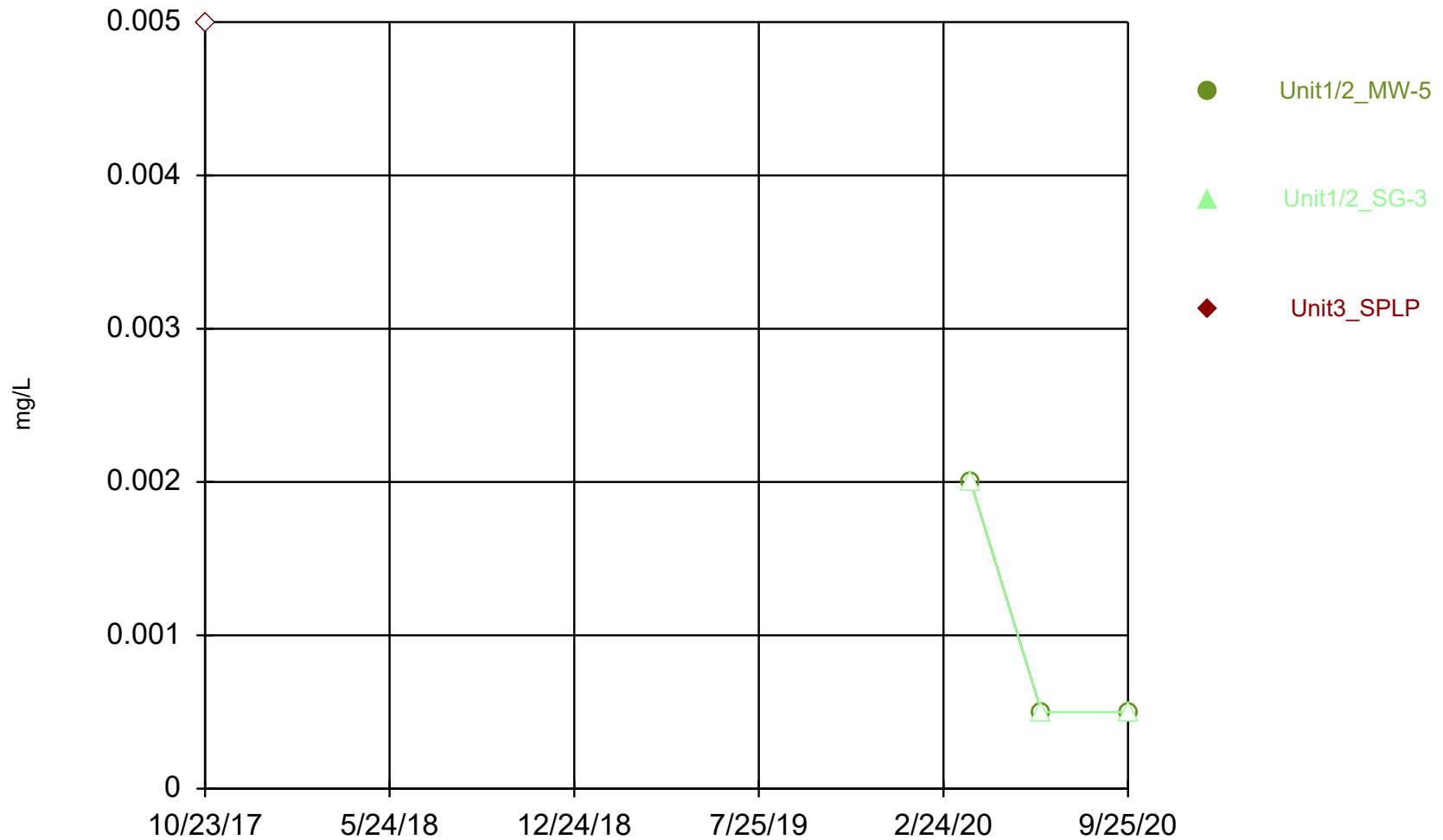
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



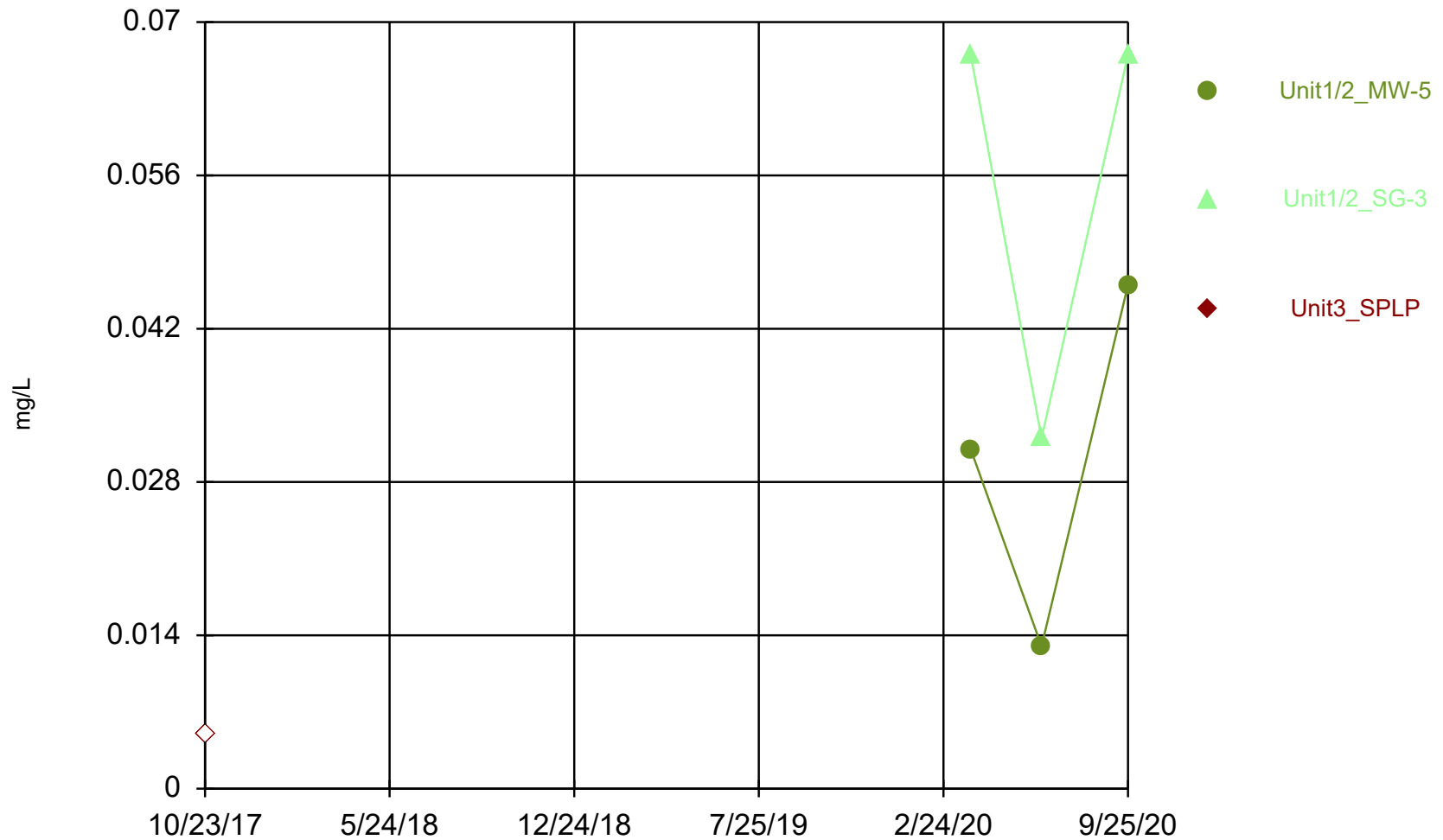
Constituent: Iron Analysis Run 10/27/2020 12:49 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Lead Analysis Run 10/27/2020 12:49 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

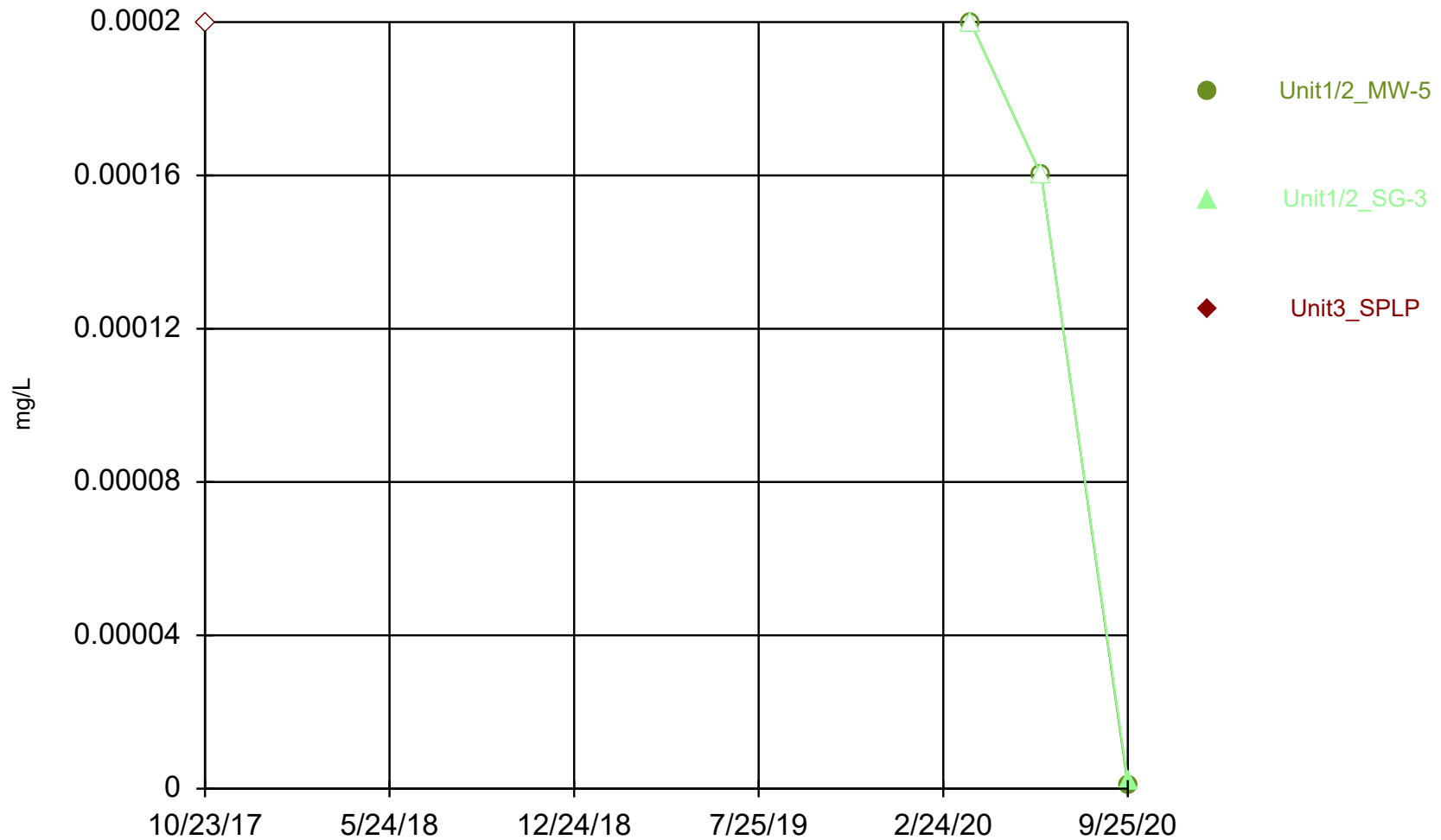
Time Series



Constituent: Lithium Analysis Run 10/27/2020 12:49 PM

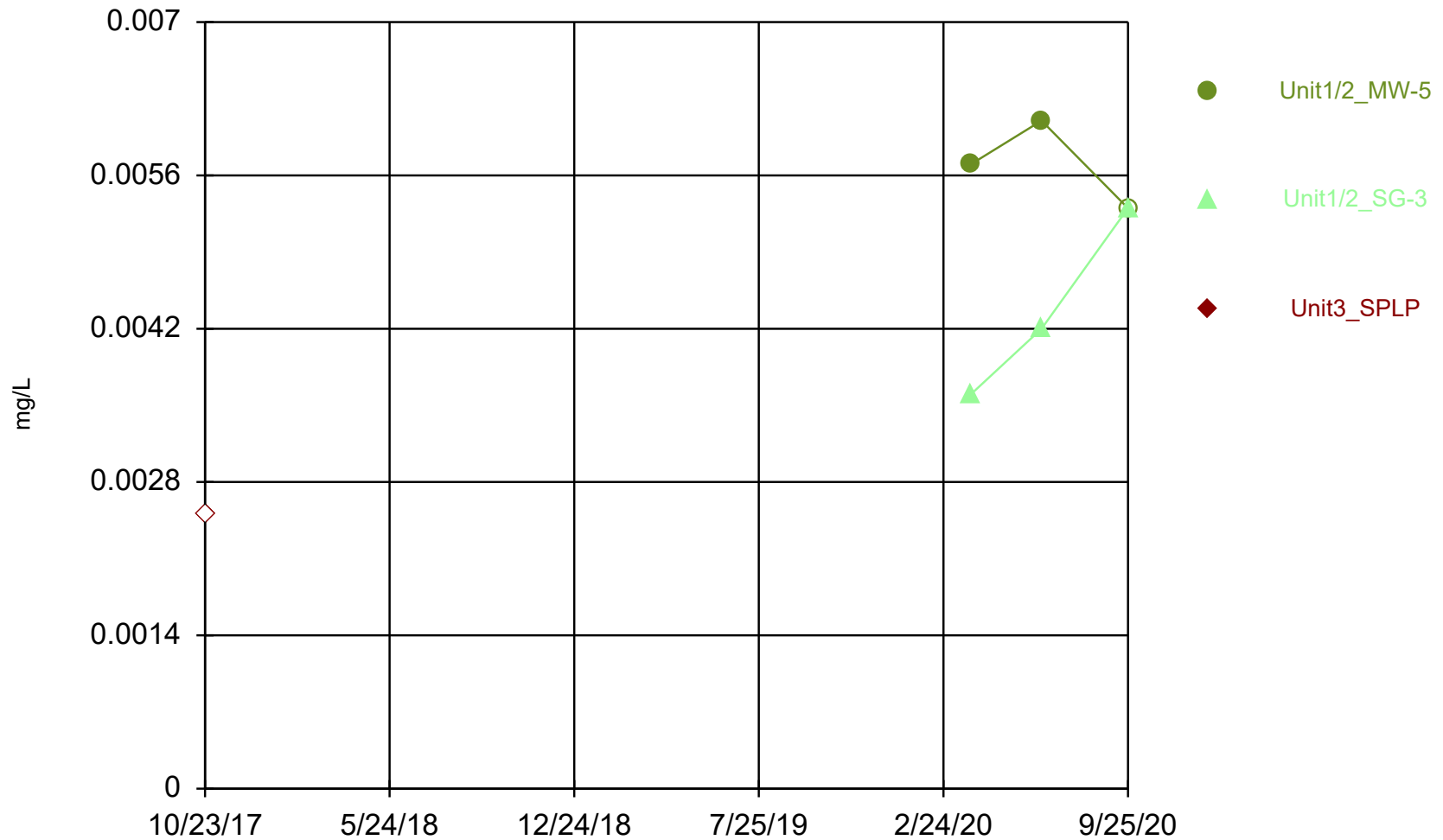
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



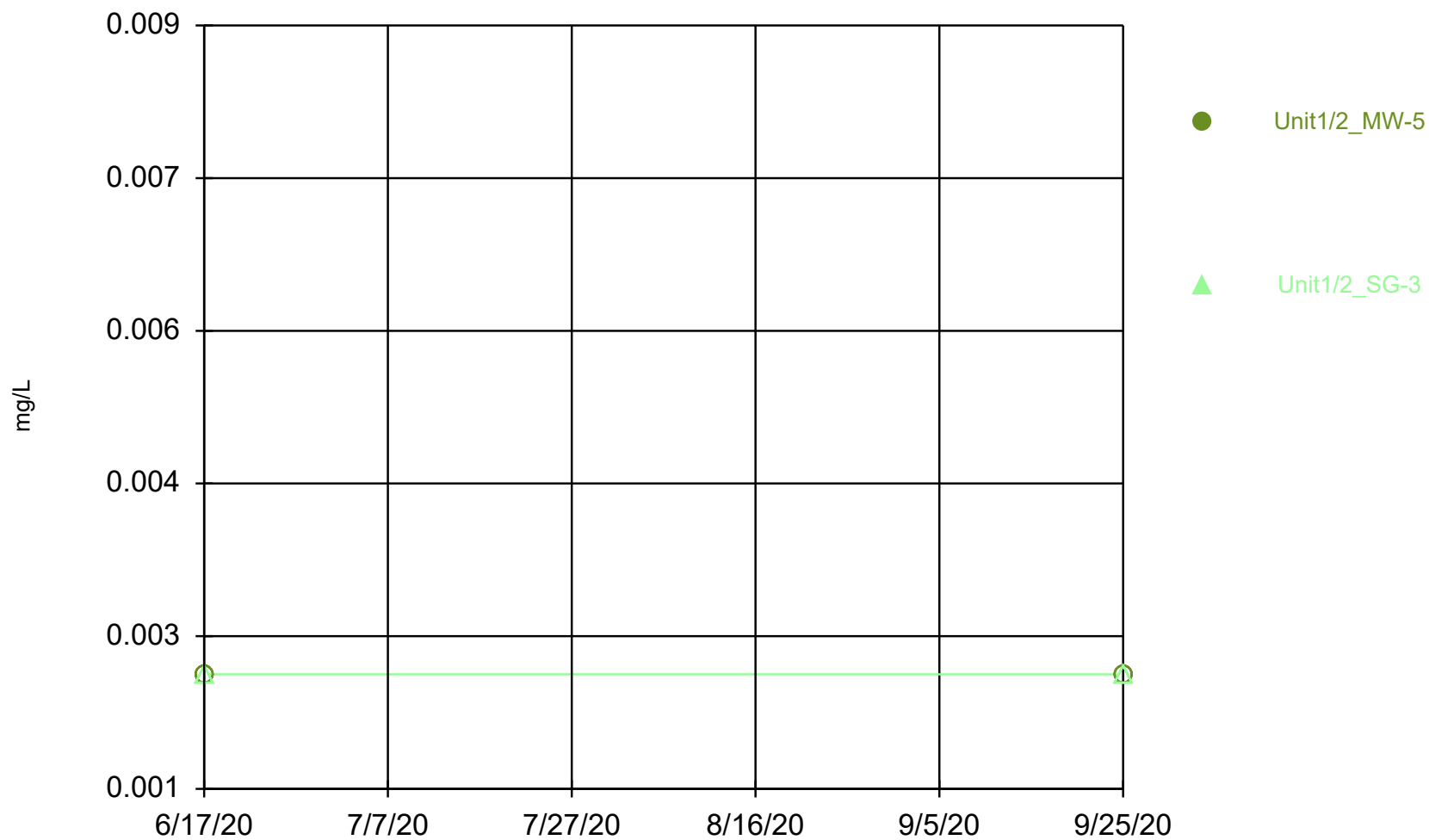
Constituent: Mercury Analysis Run 10/27/2020 12:49 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



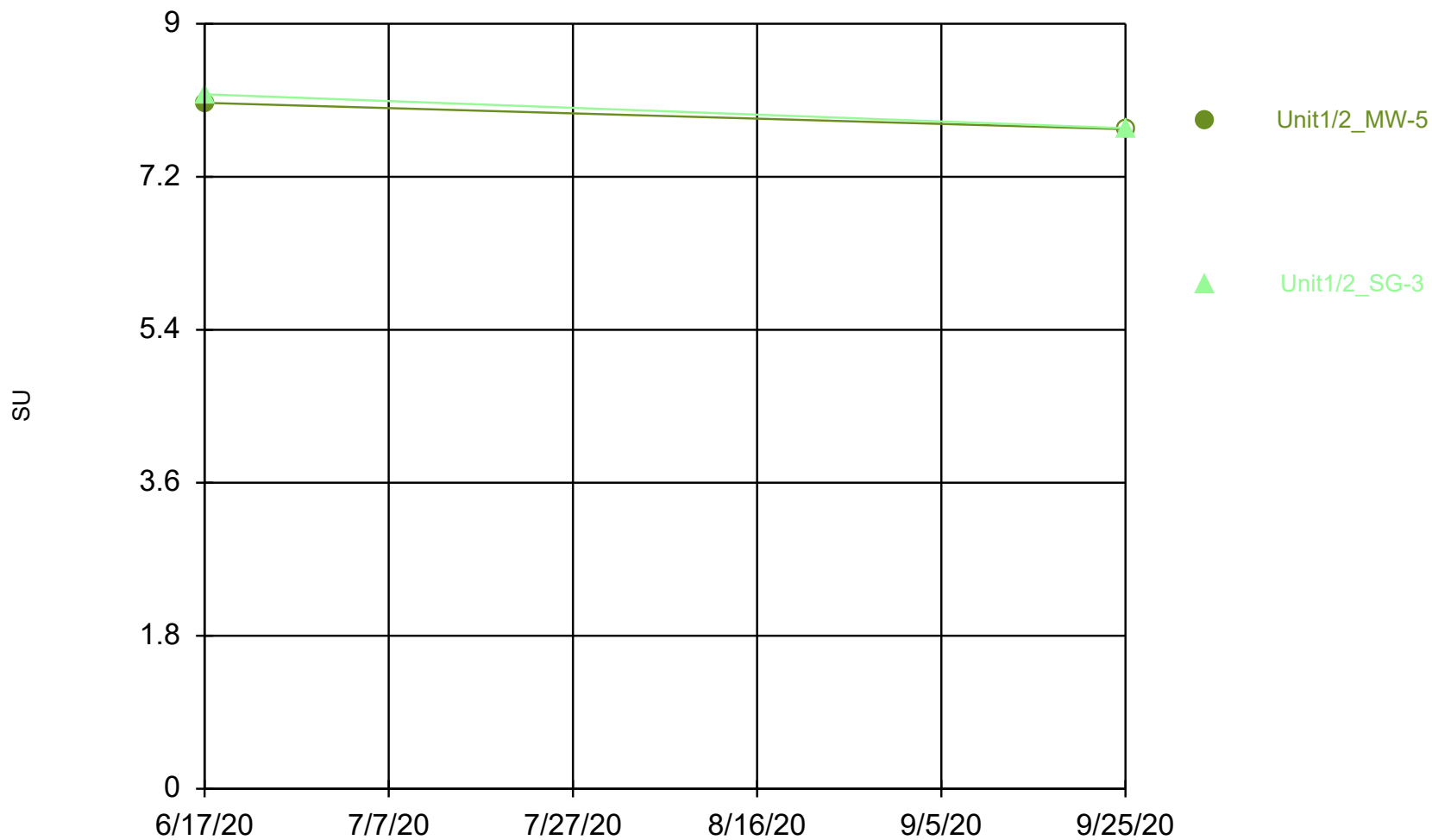
Constituent: Molybdenum Analysis Run 10/27/2020 12:49 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Nickel Analysis Run 10/27/2020 12:49 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

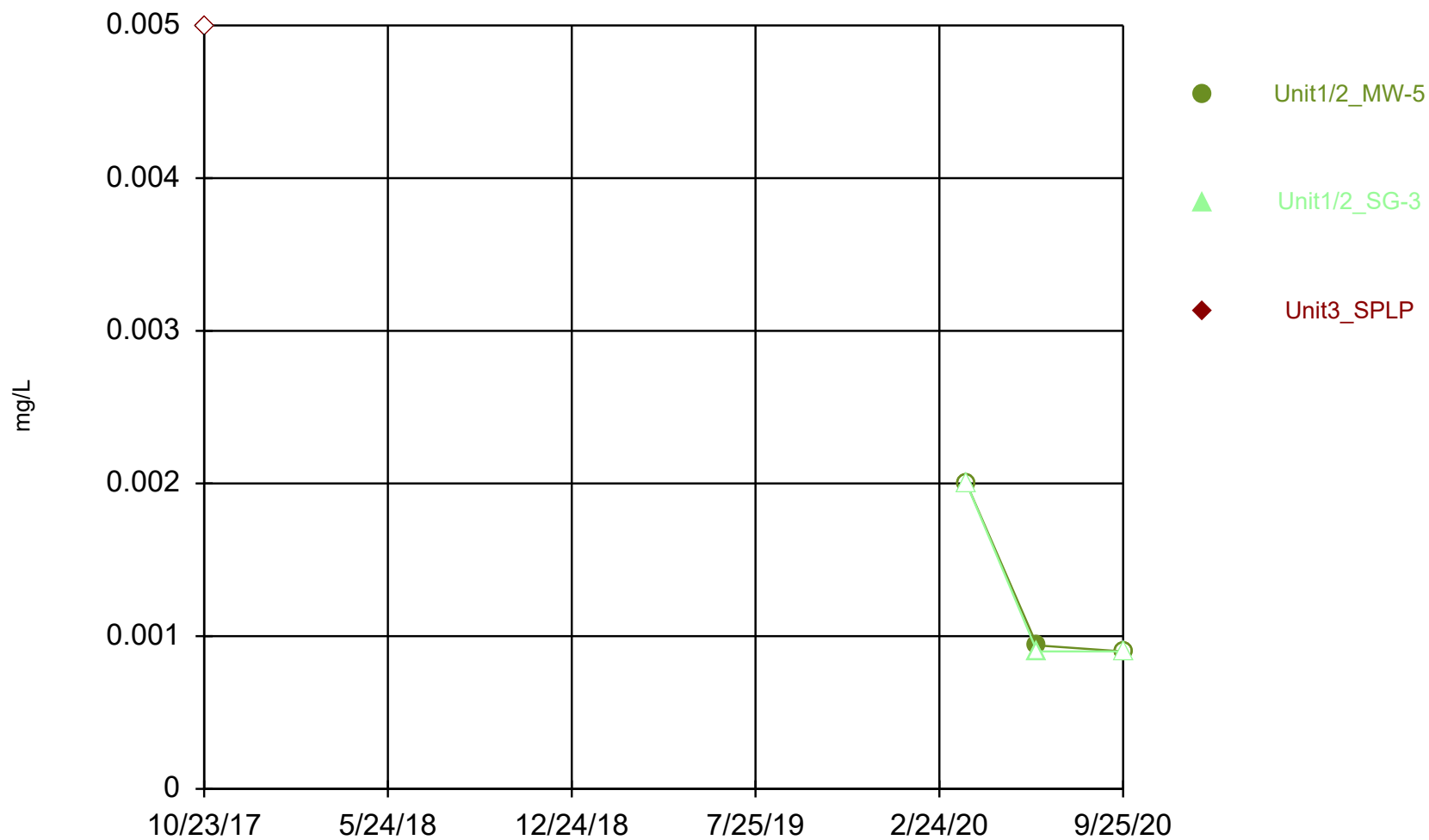
Time Series



Constituent: pH Analysis Run 10/27/2020 12:49 PM

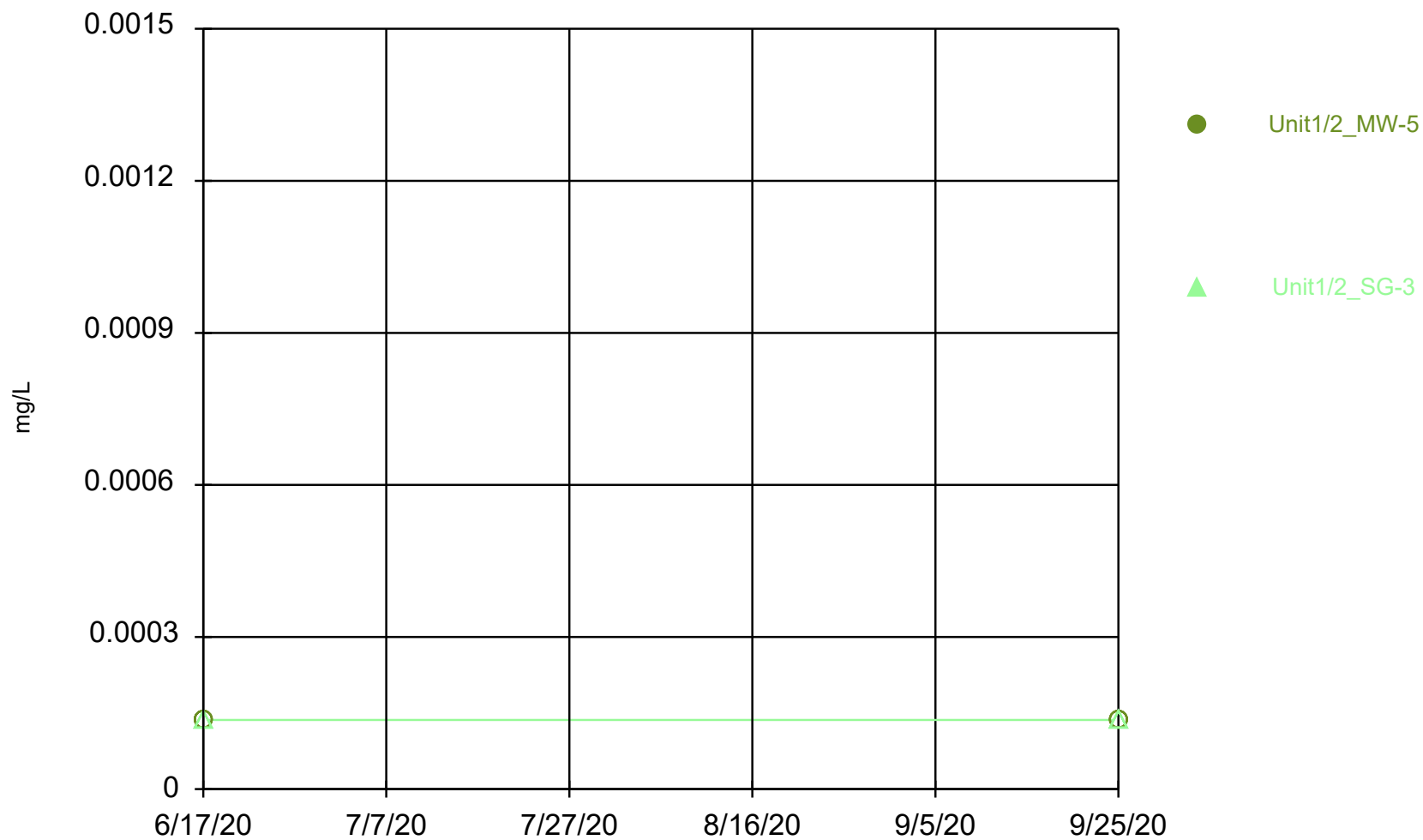
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Selenium Analysis Run 10/27/2020 12:49 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

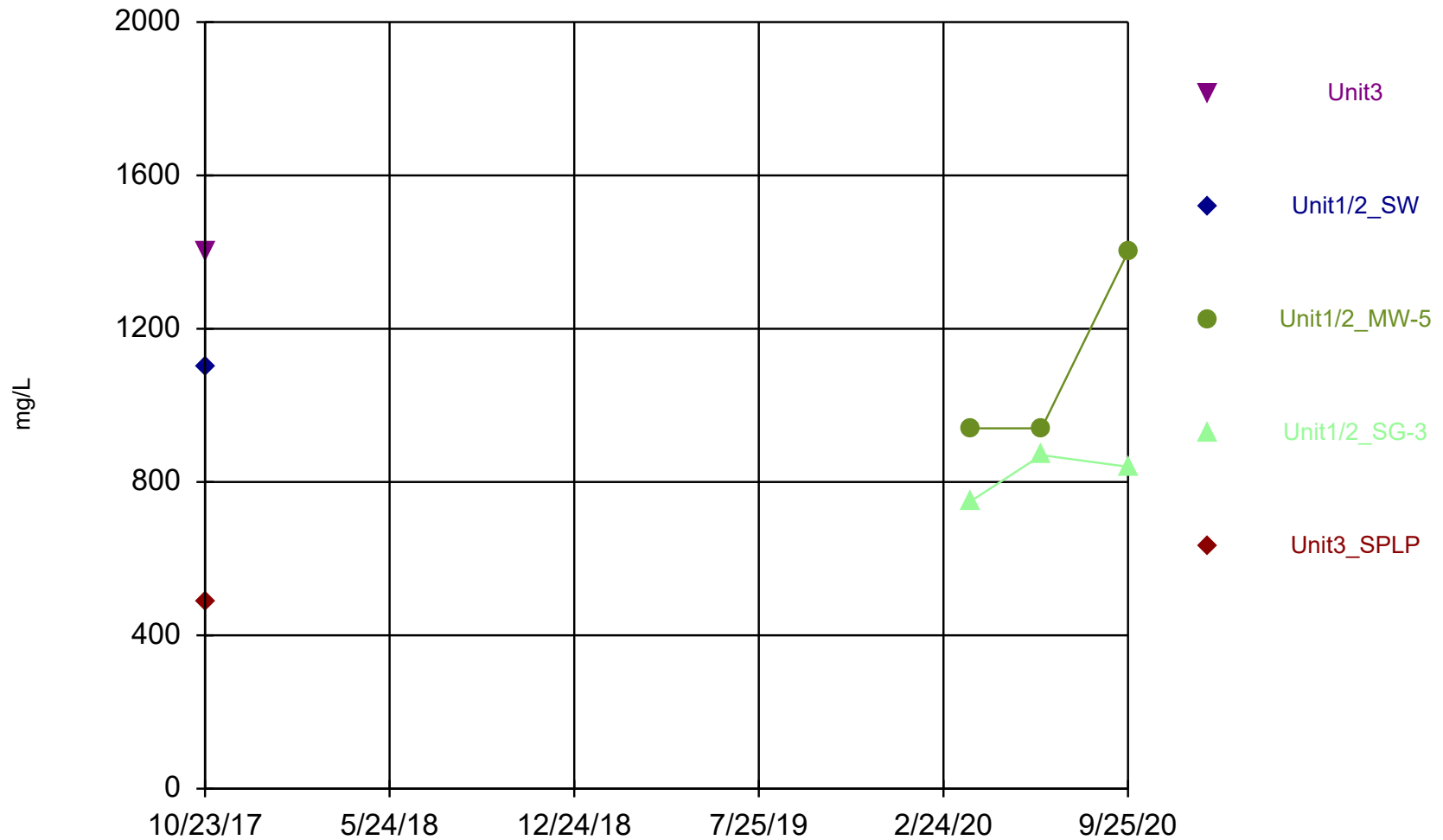
Time Series



Constituent: Silver Analysis Run 10/27/2020 12:49 PM

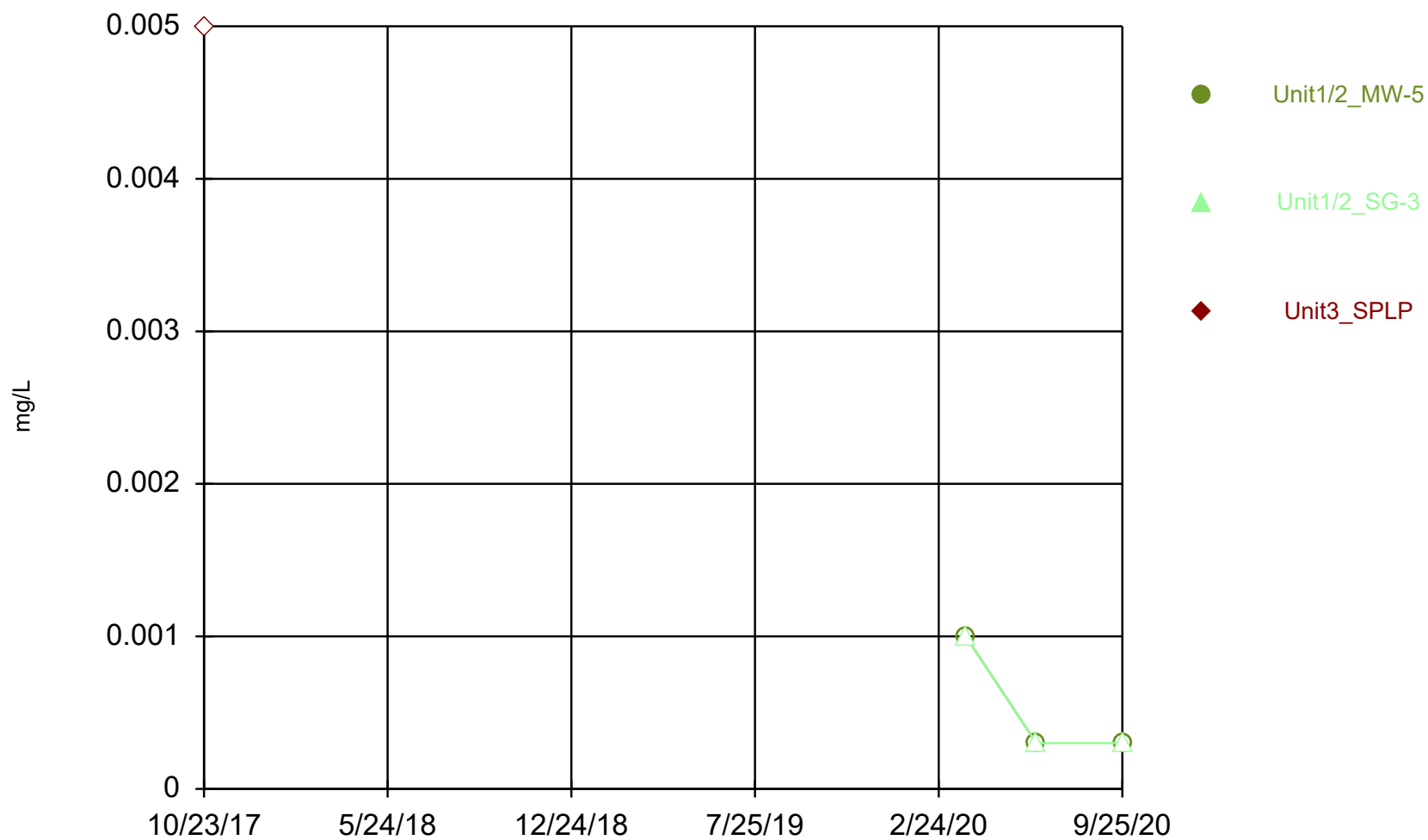
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



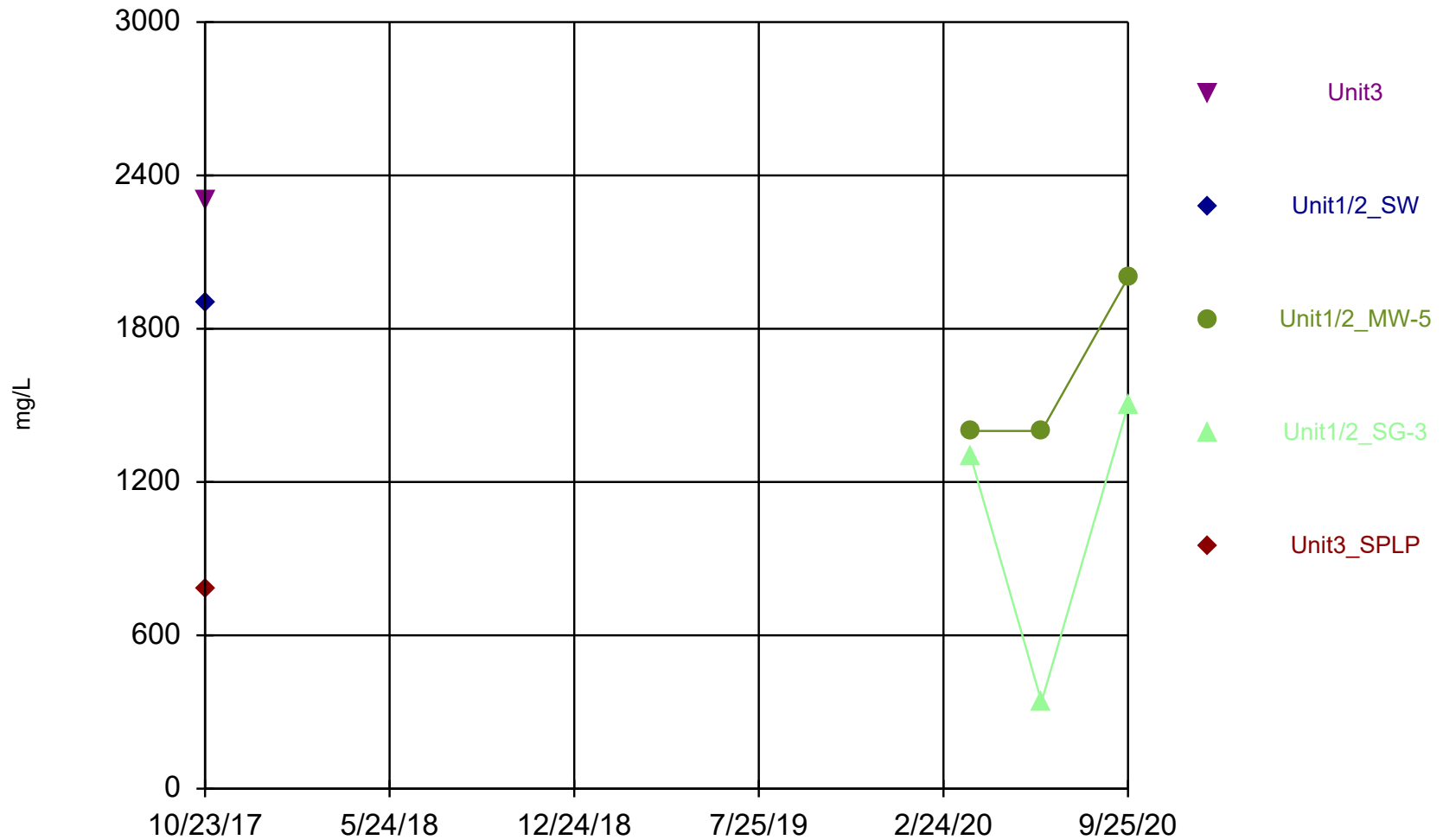
Constituent: Sulfate Analysis Run 10/27/2020 12:49 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



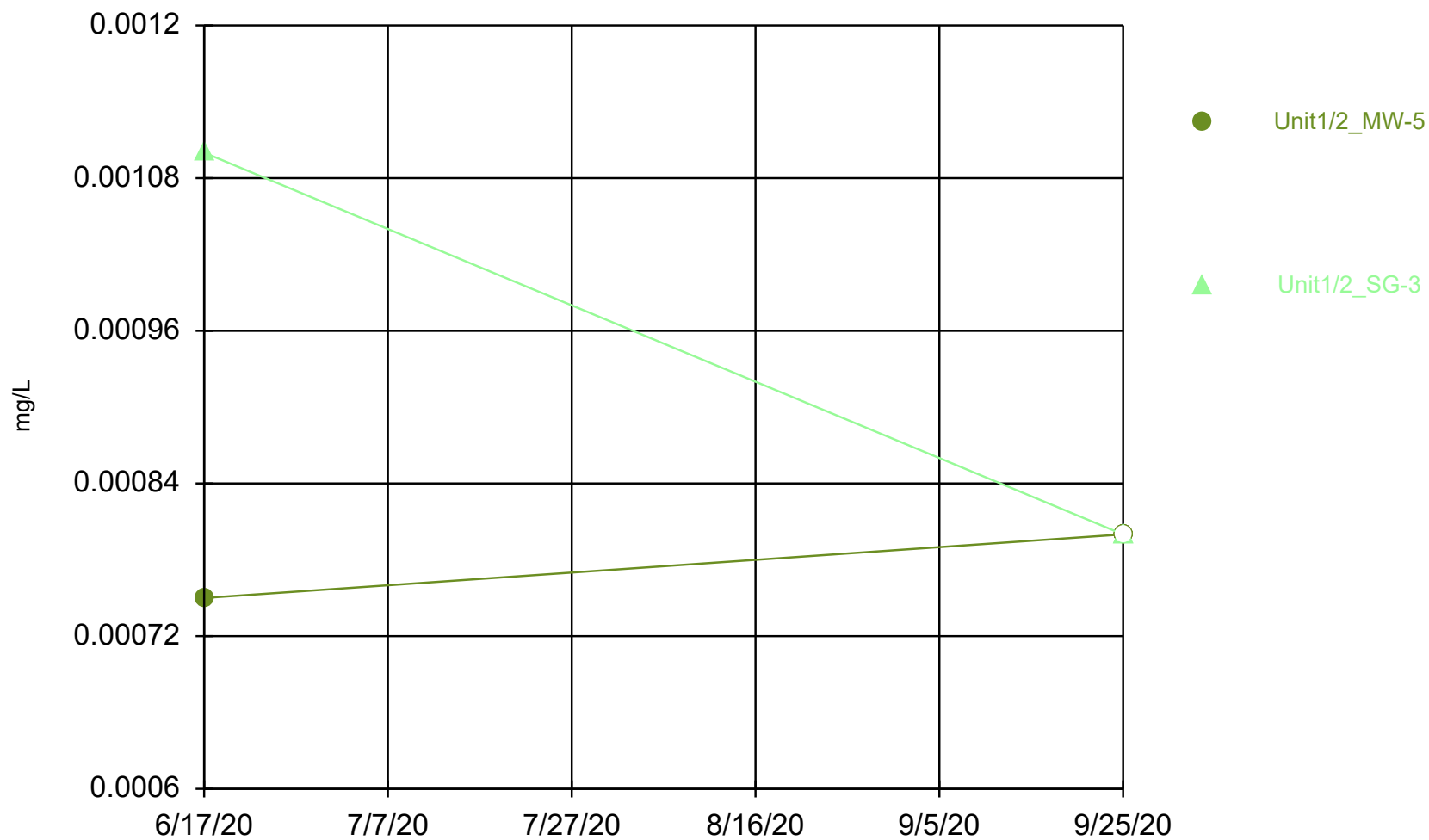
Constituent: Thallium Analysis Run 10/27/2020 12:49 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



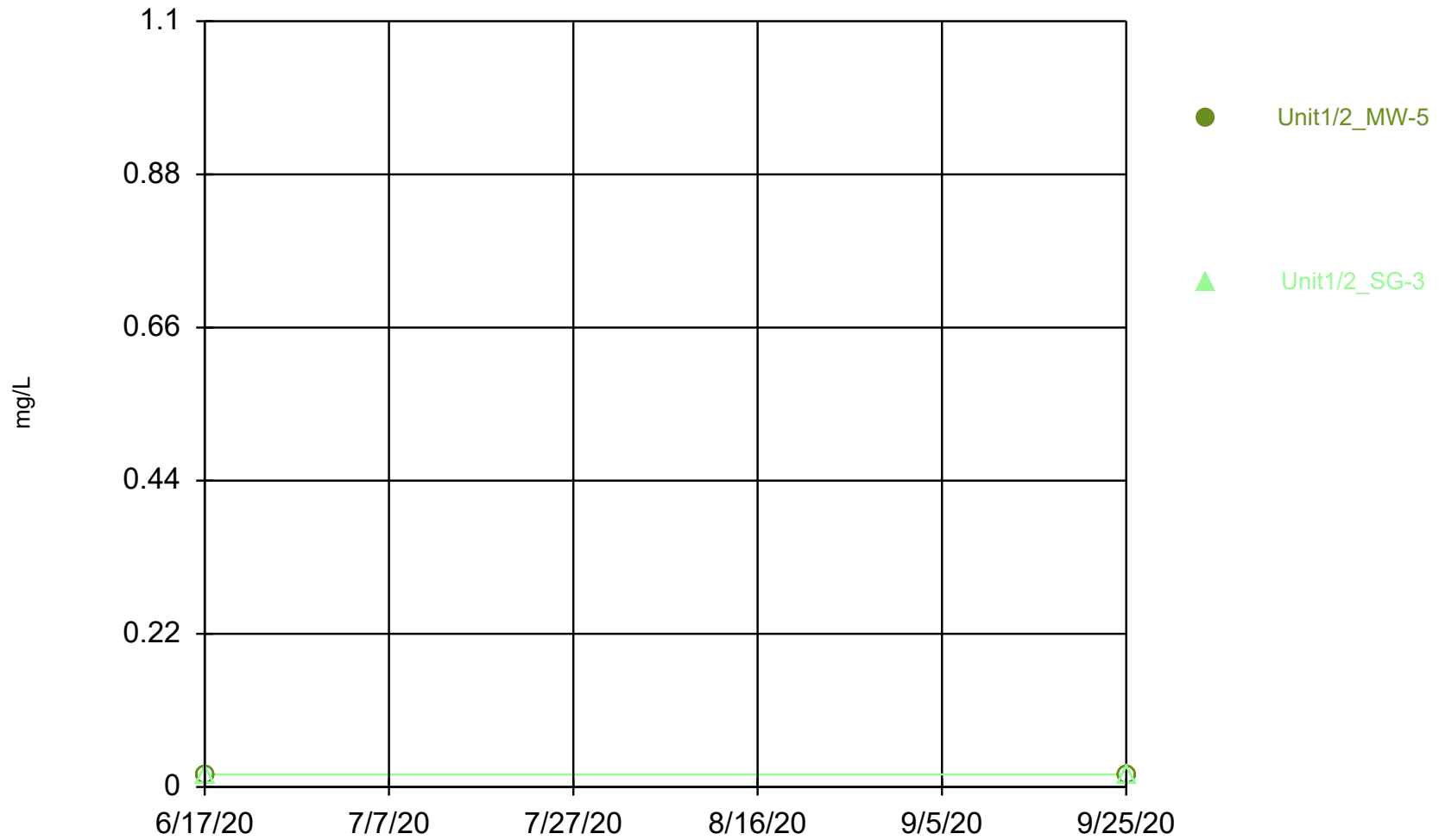
Constituent: Total Dissolved Solids Analysis Run 10/27/2020 12:49 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Vanadium Analysis Run 10/27/2020 12:49 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series

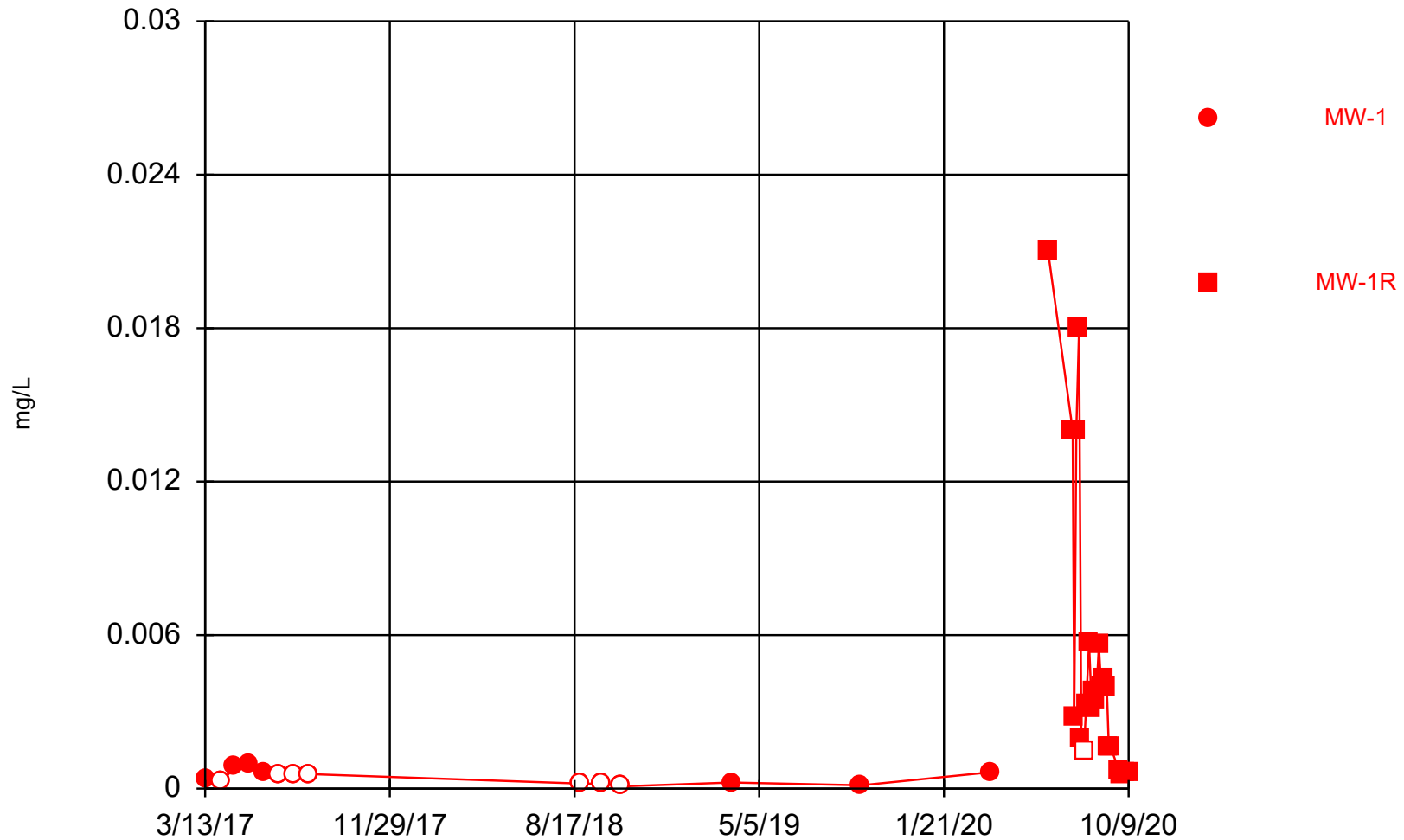


Constituent: Zinc Analysis Run 10/27/2020 12:49 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

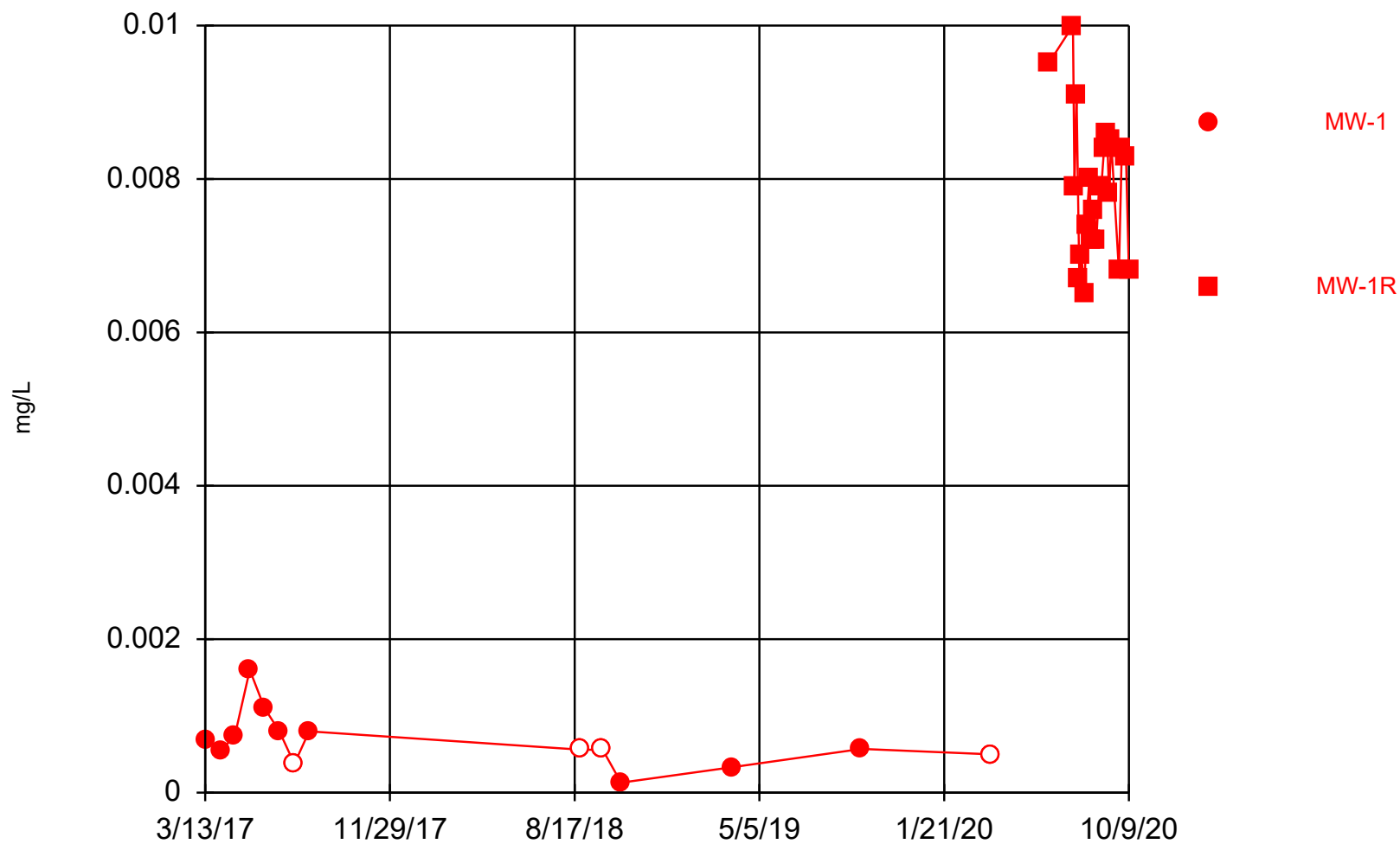
ATTACHMENT C

**Monitoring Well MW-1(R) Time
Series Plots**

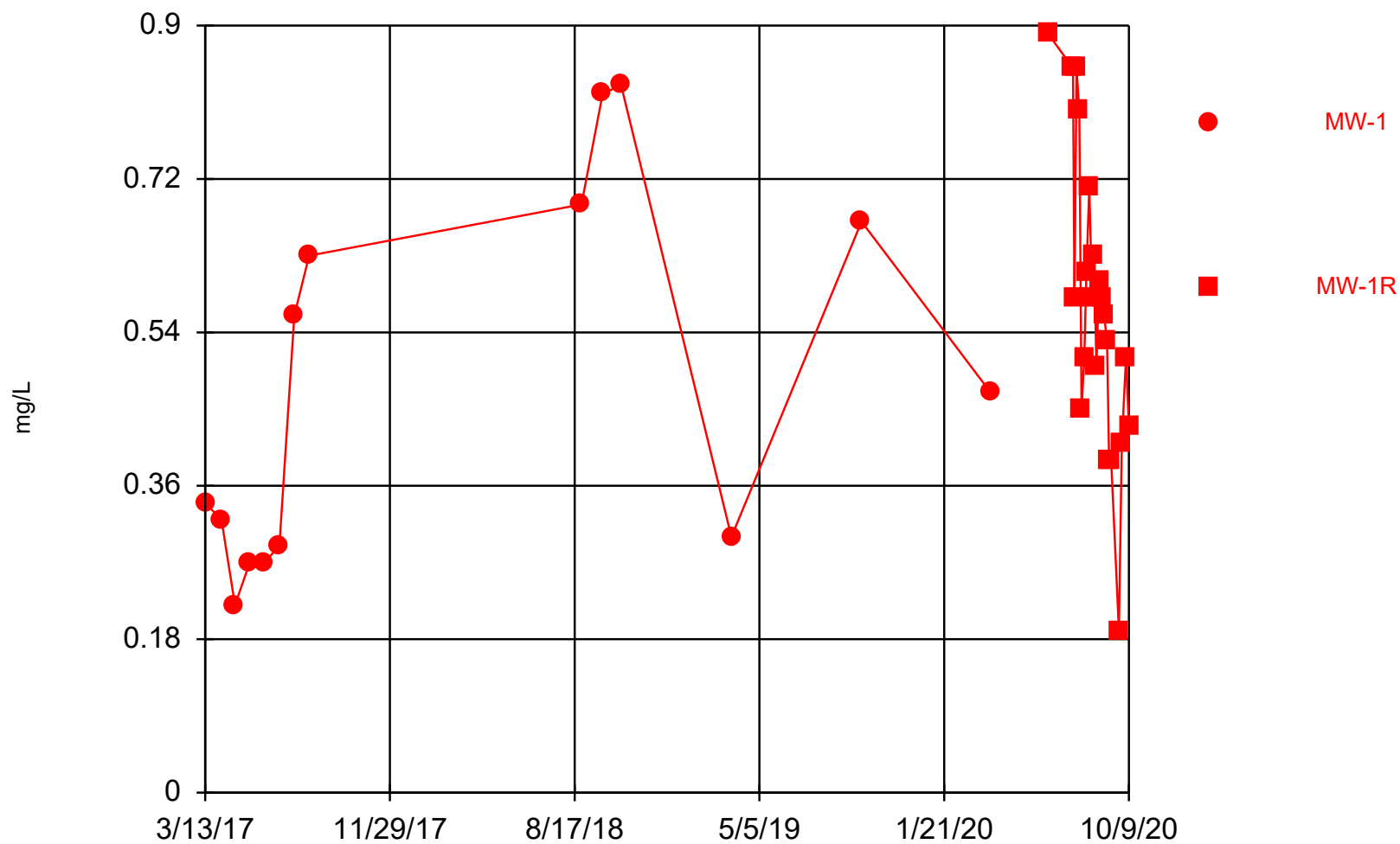
Time Series



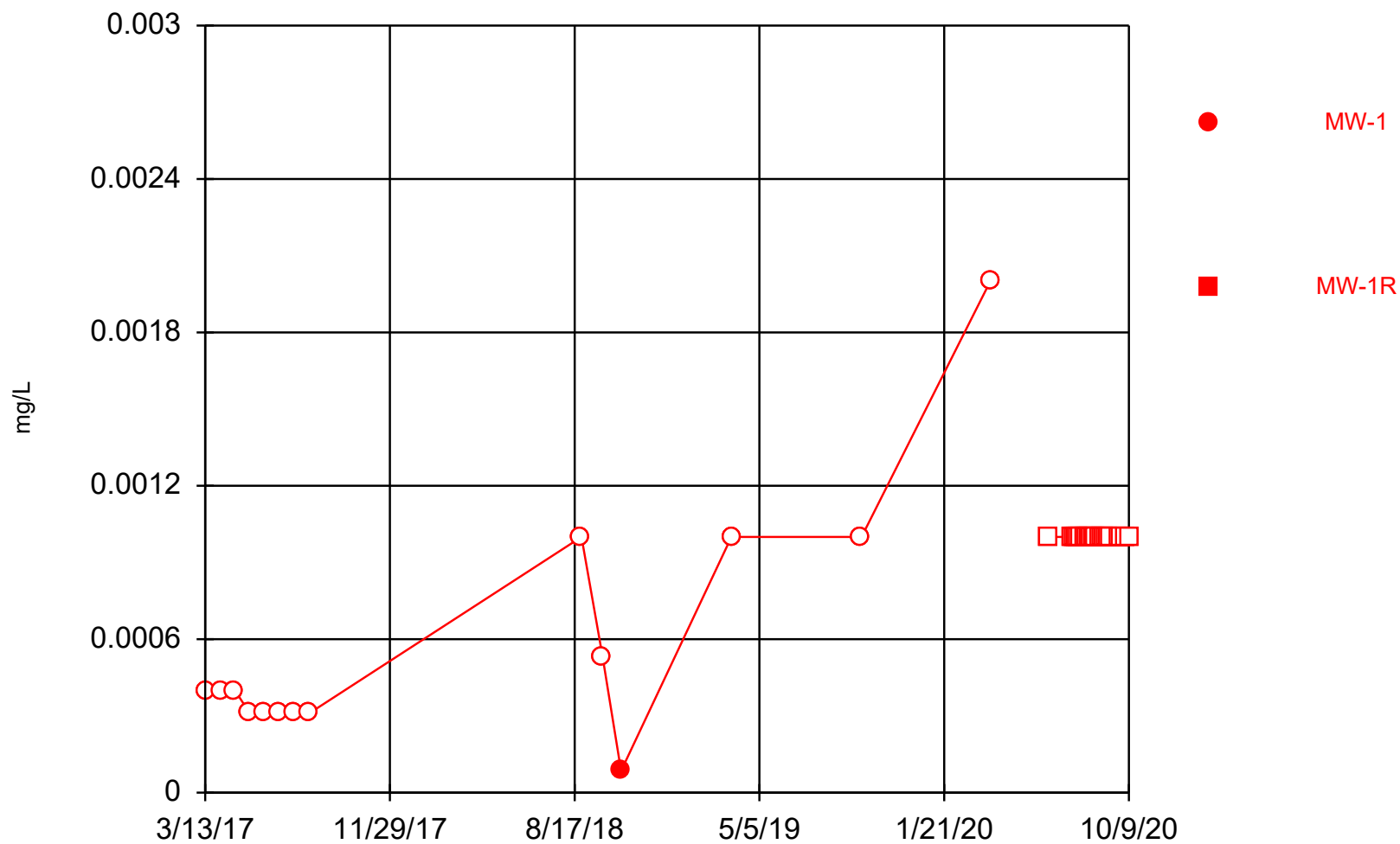
Time Series



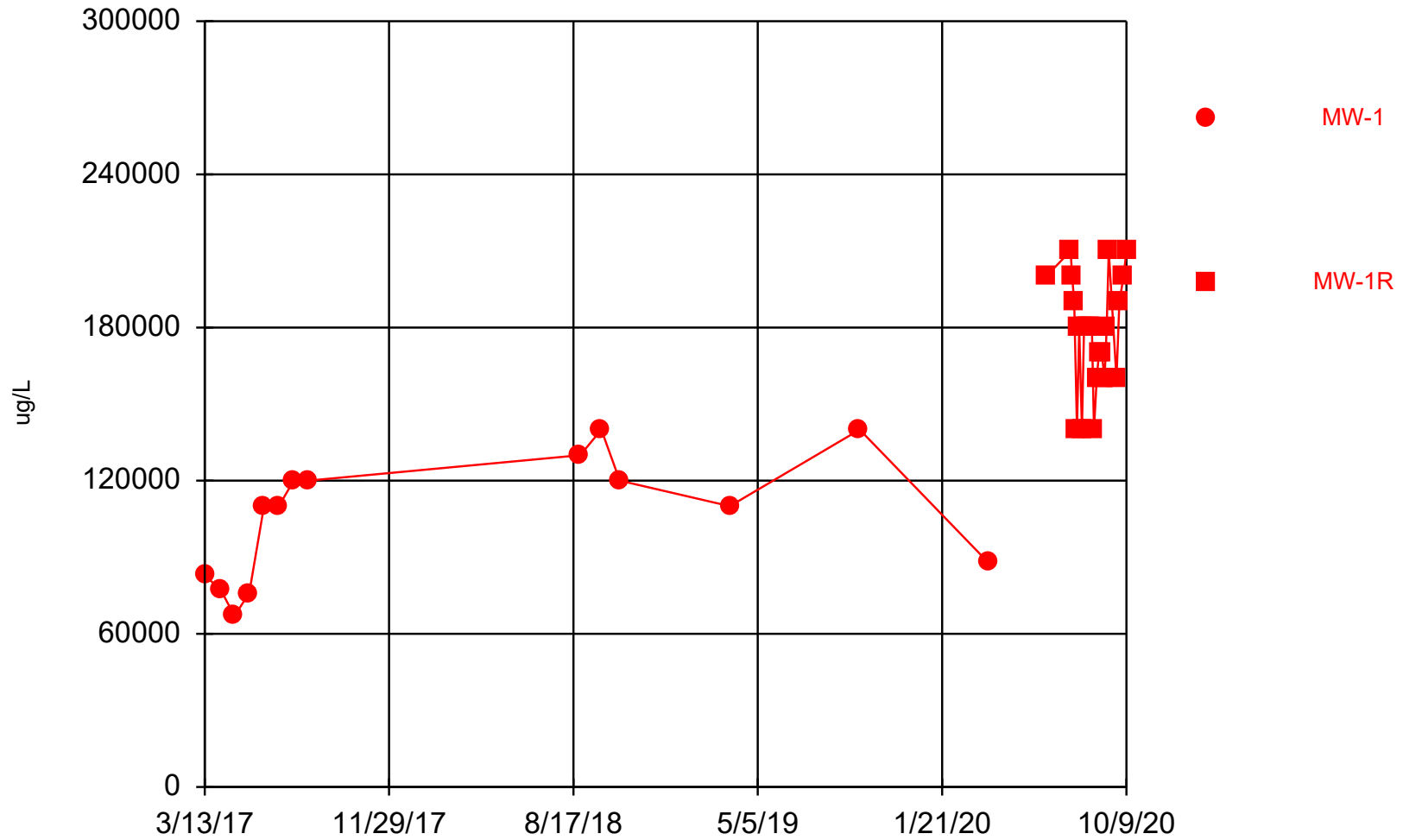
Time Series



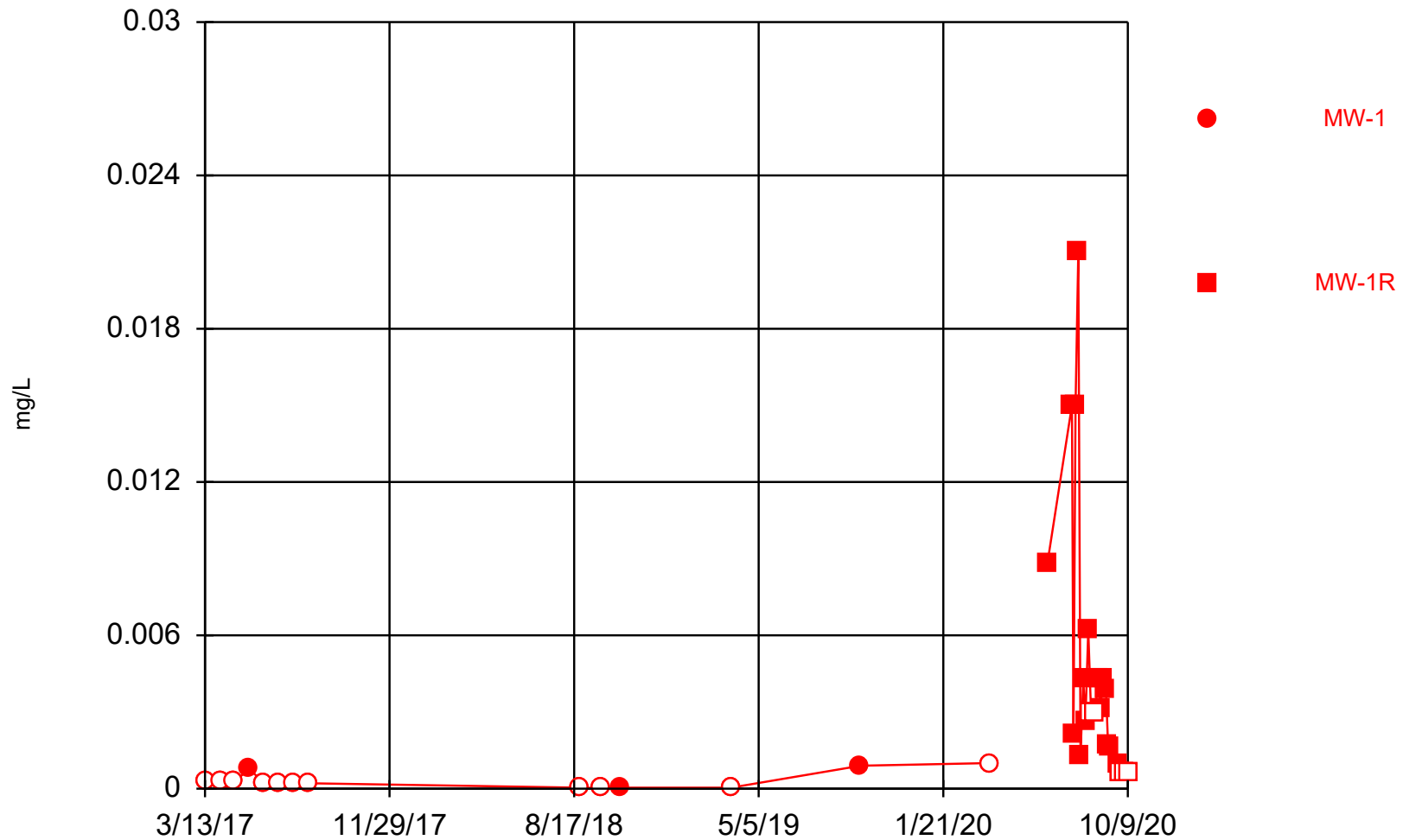
Time Series



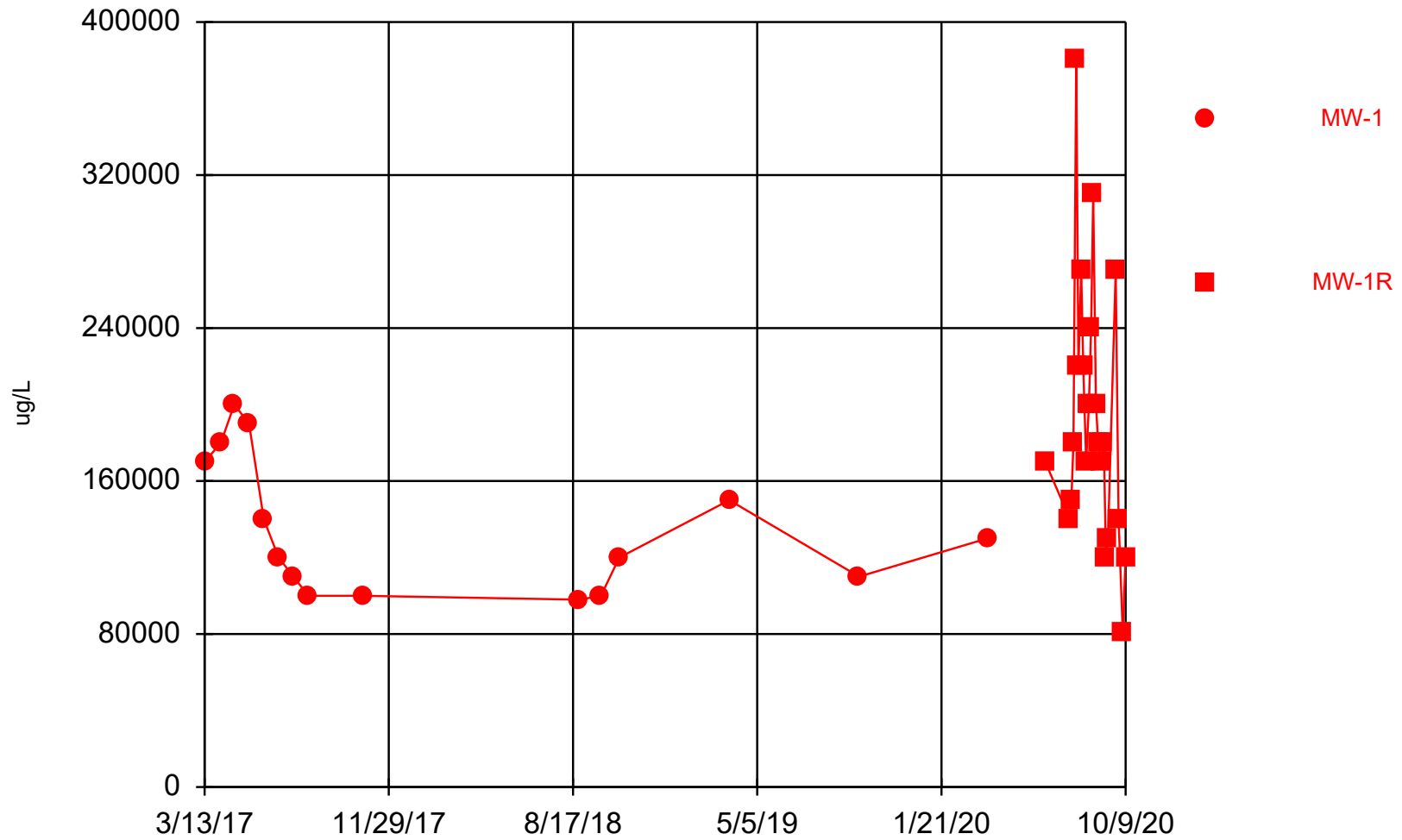
Time Series



Time Series

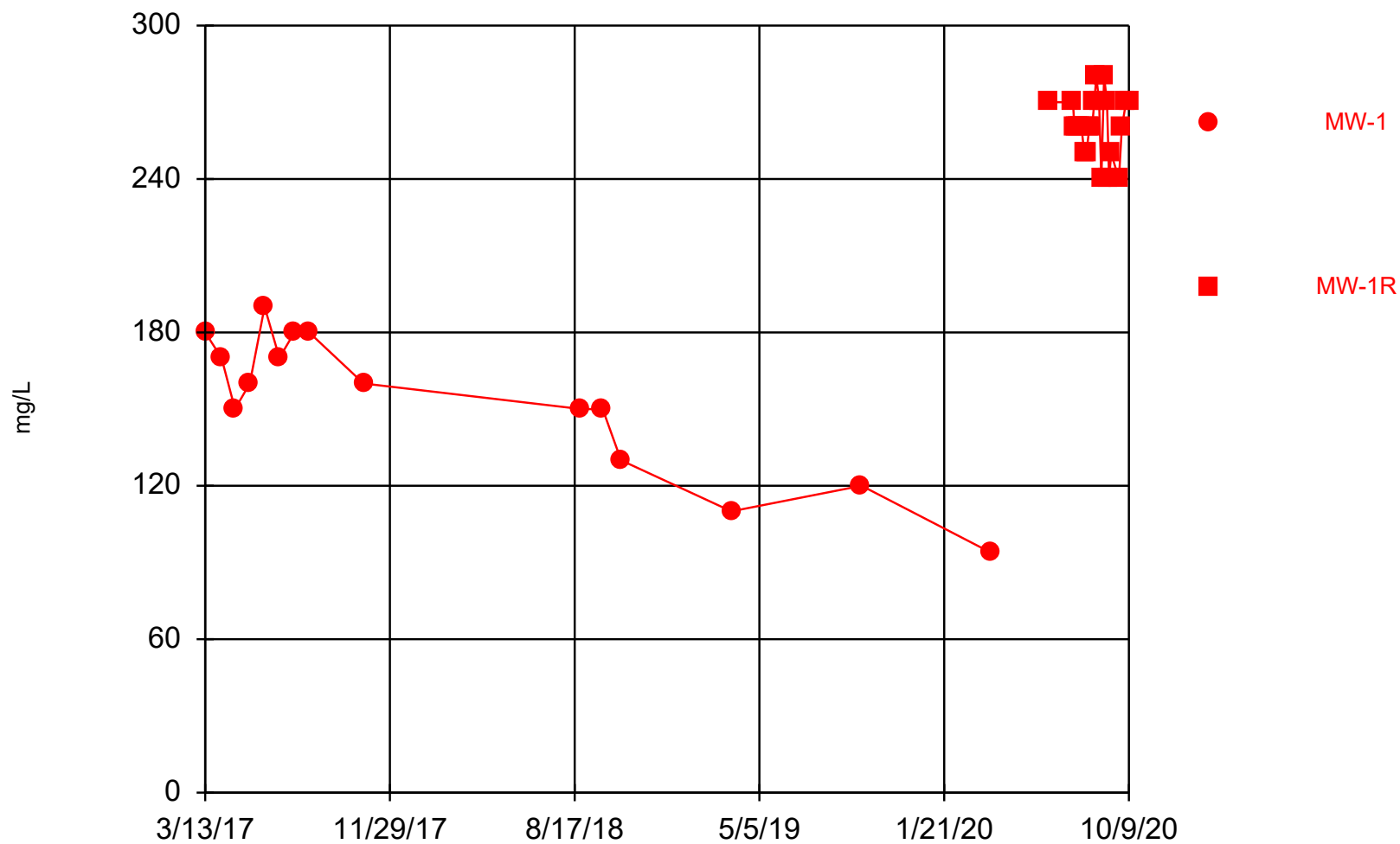


Time Series



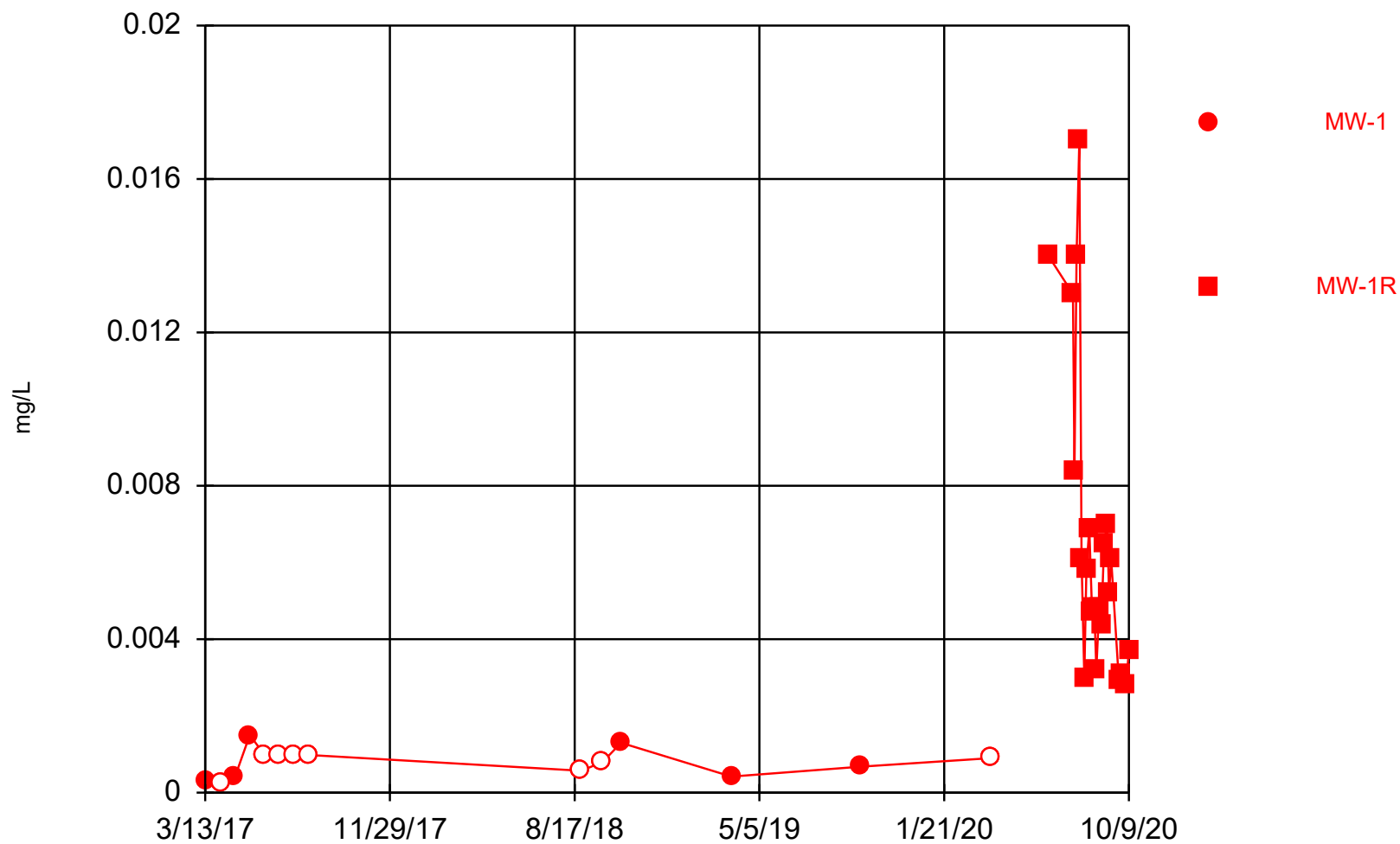
Constituent: Calcium Analysis Run 10/27/2020 12:46 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series

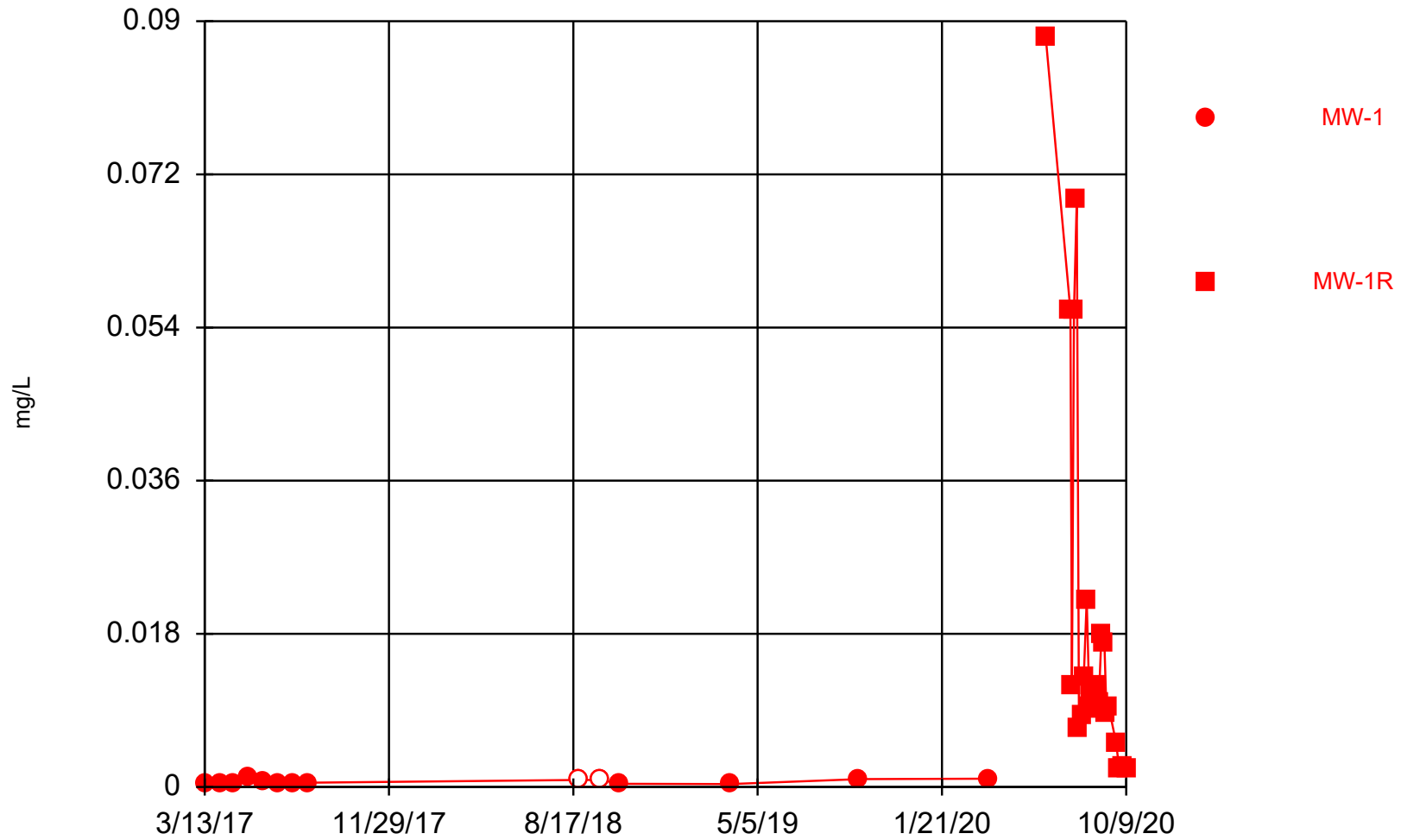


Constituent: Chloride Analysis Run 10/27/2020 12:46 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

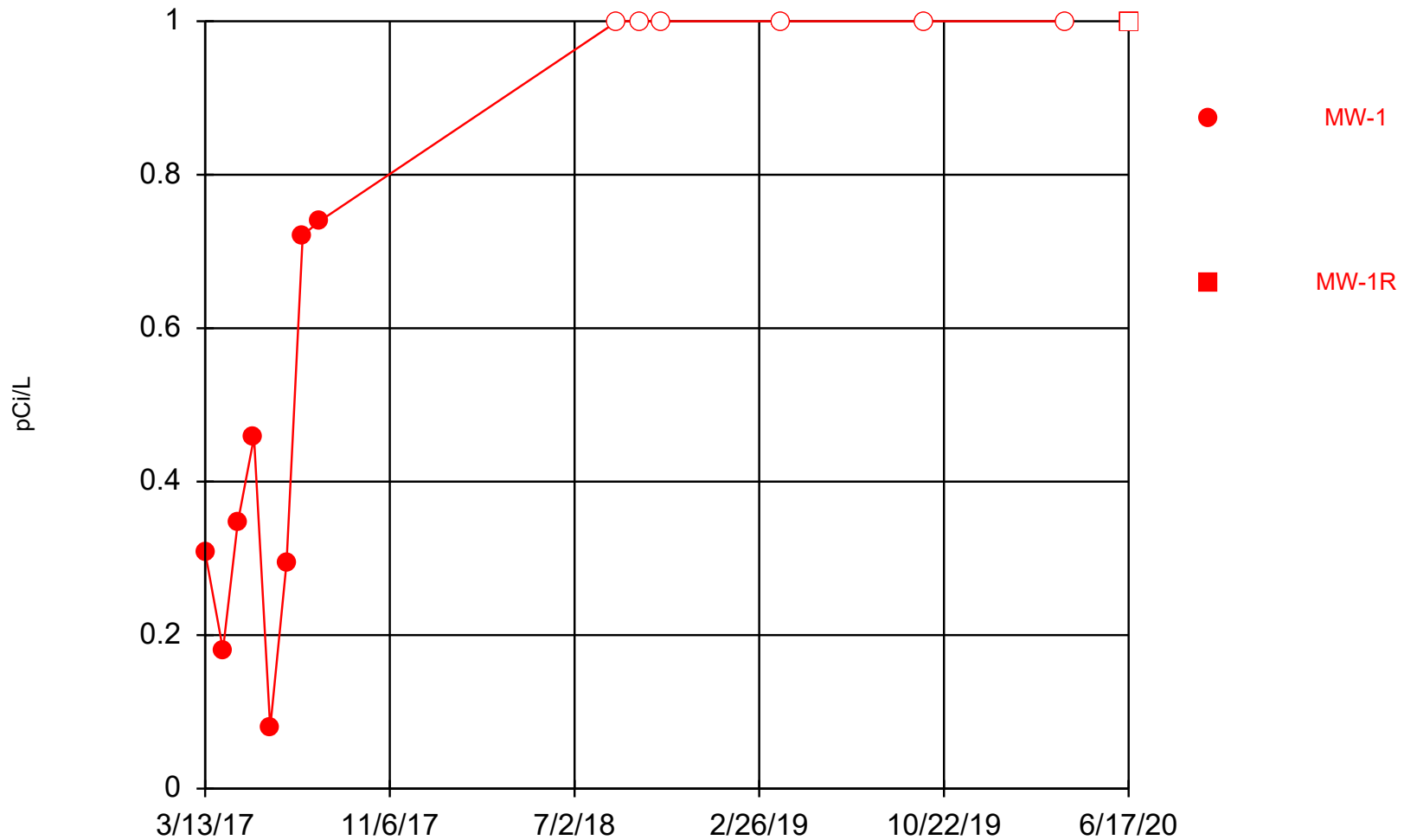
Time Series



Time Series



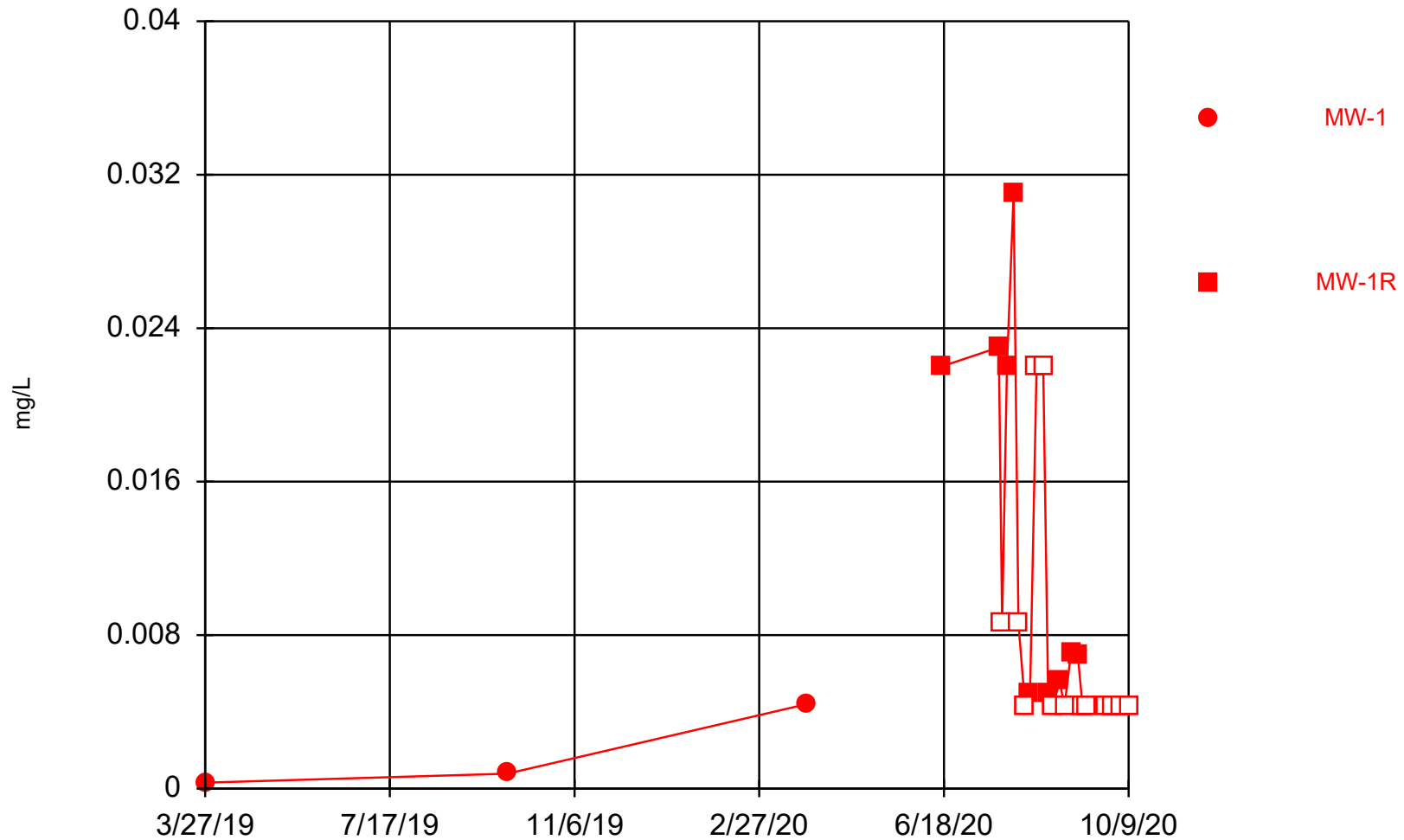
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 10/27/2020 12:46 PM

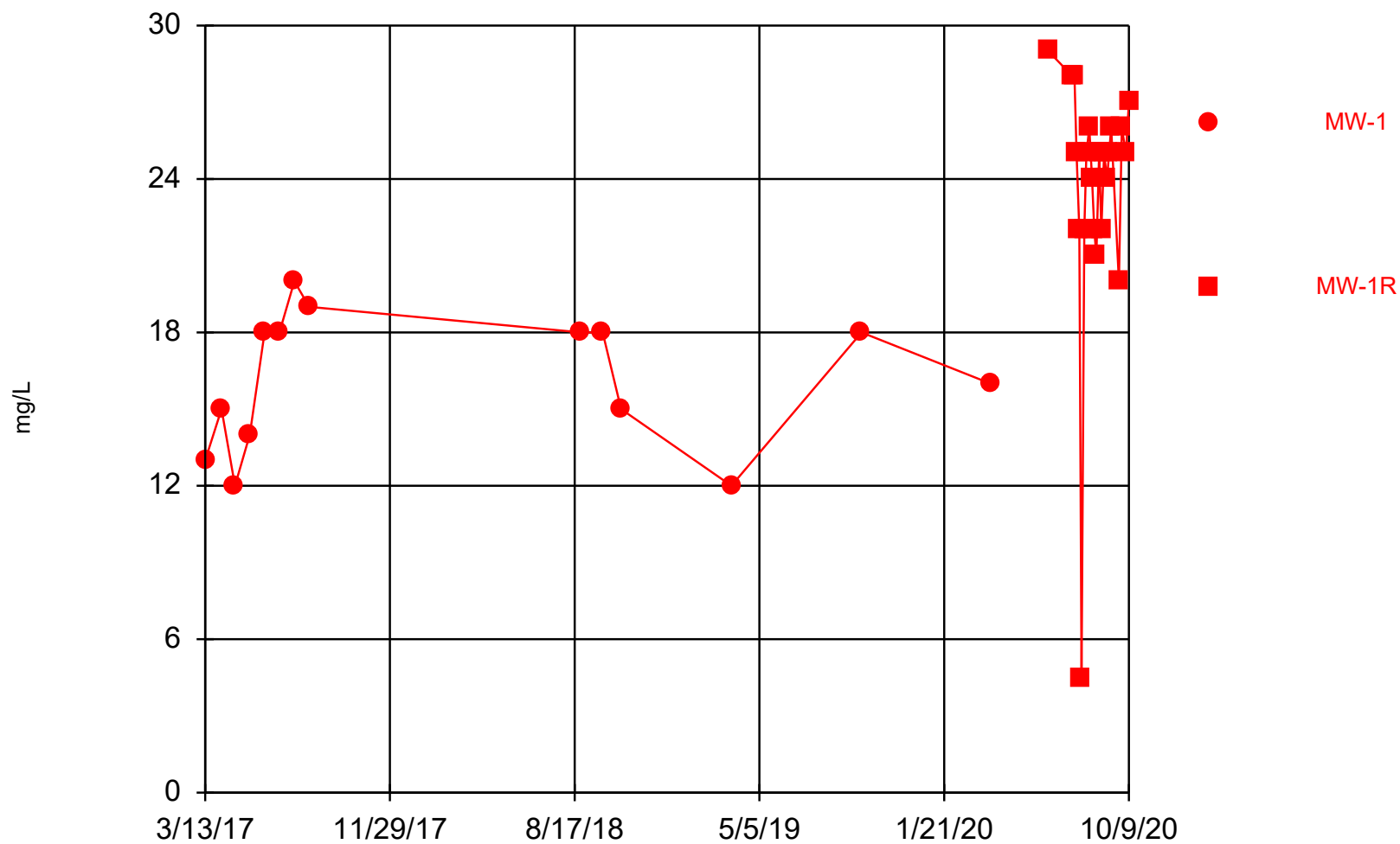
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



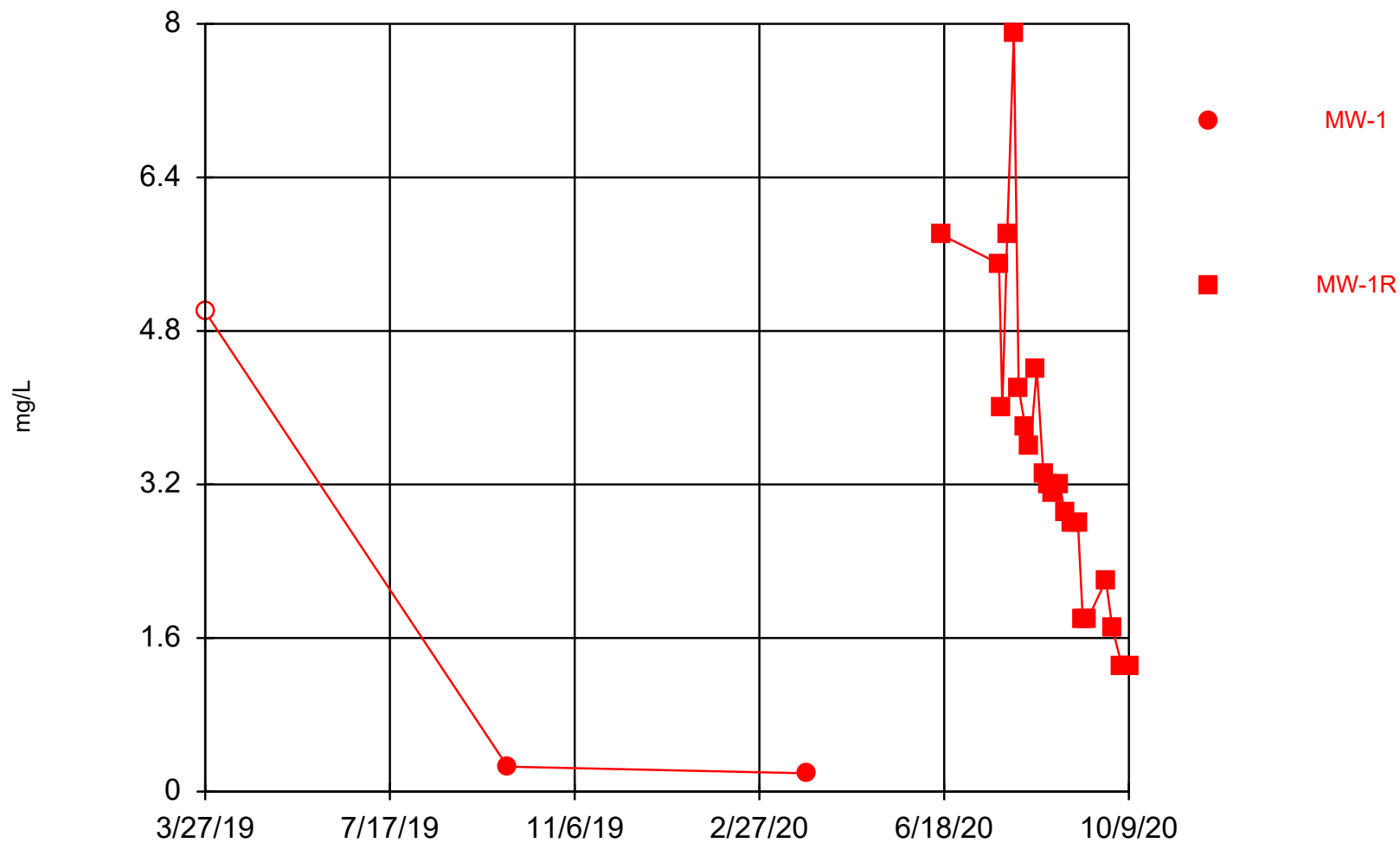
Constituent: Copper Analysis Run 10/27/2020 12:46 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



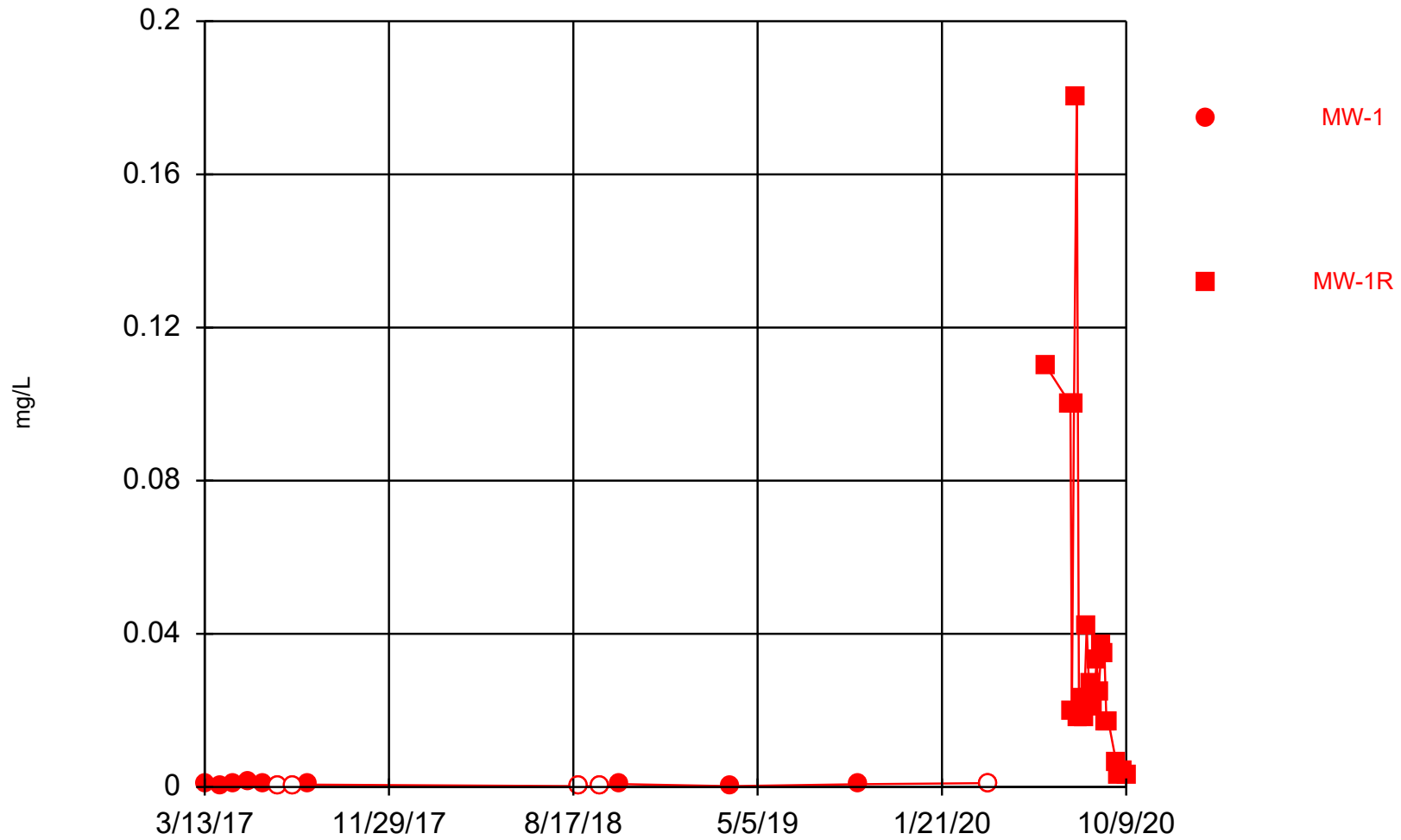
Constituent: Fluoride Analysis Run 10/27/2020 12:46 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



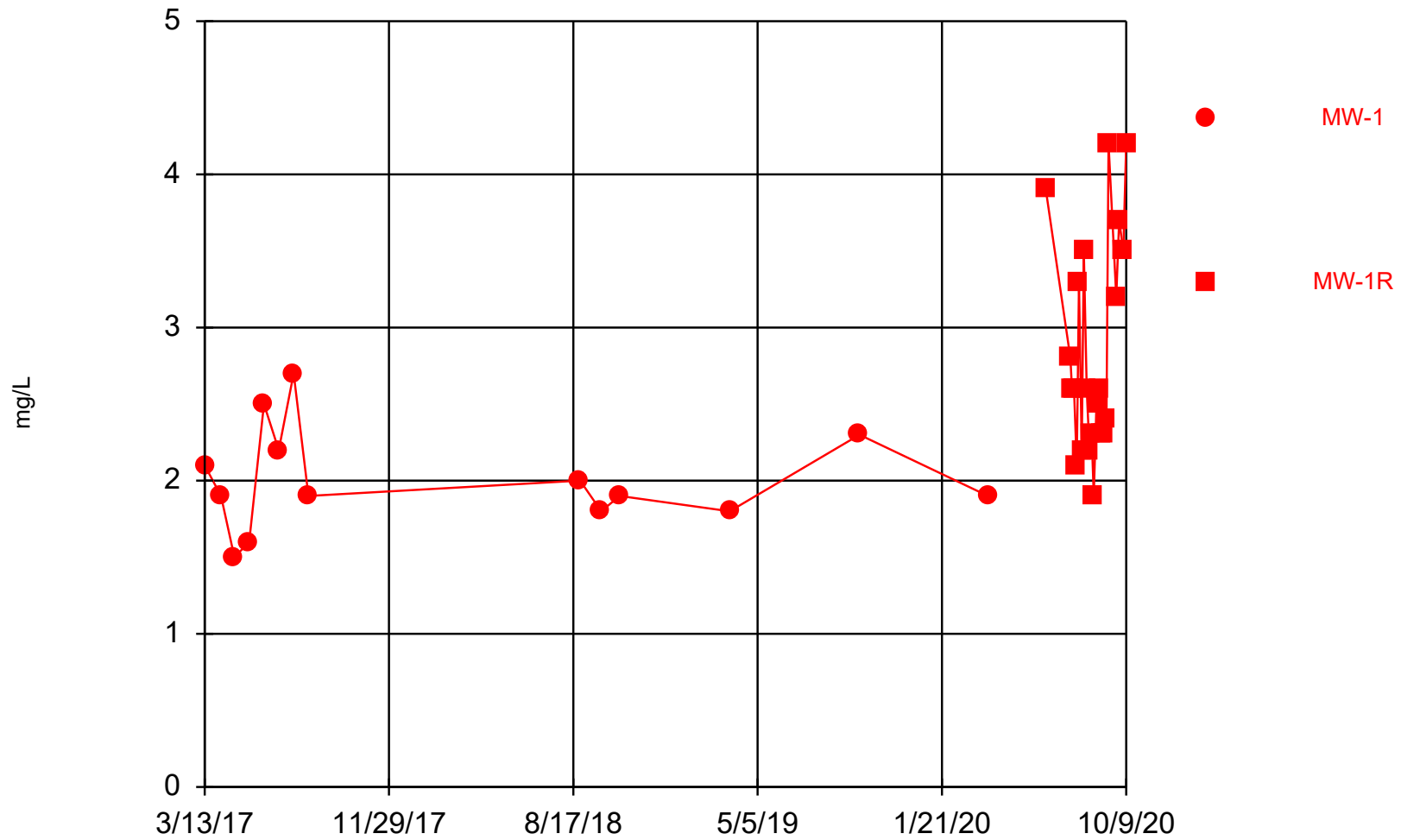
Constituent: Iron Analysis Run 10/27/2020 12:46 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series

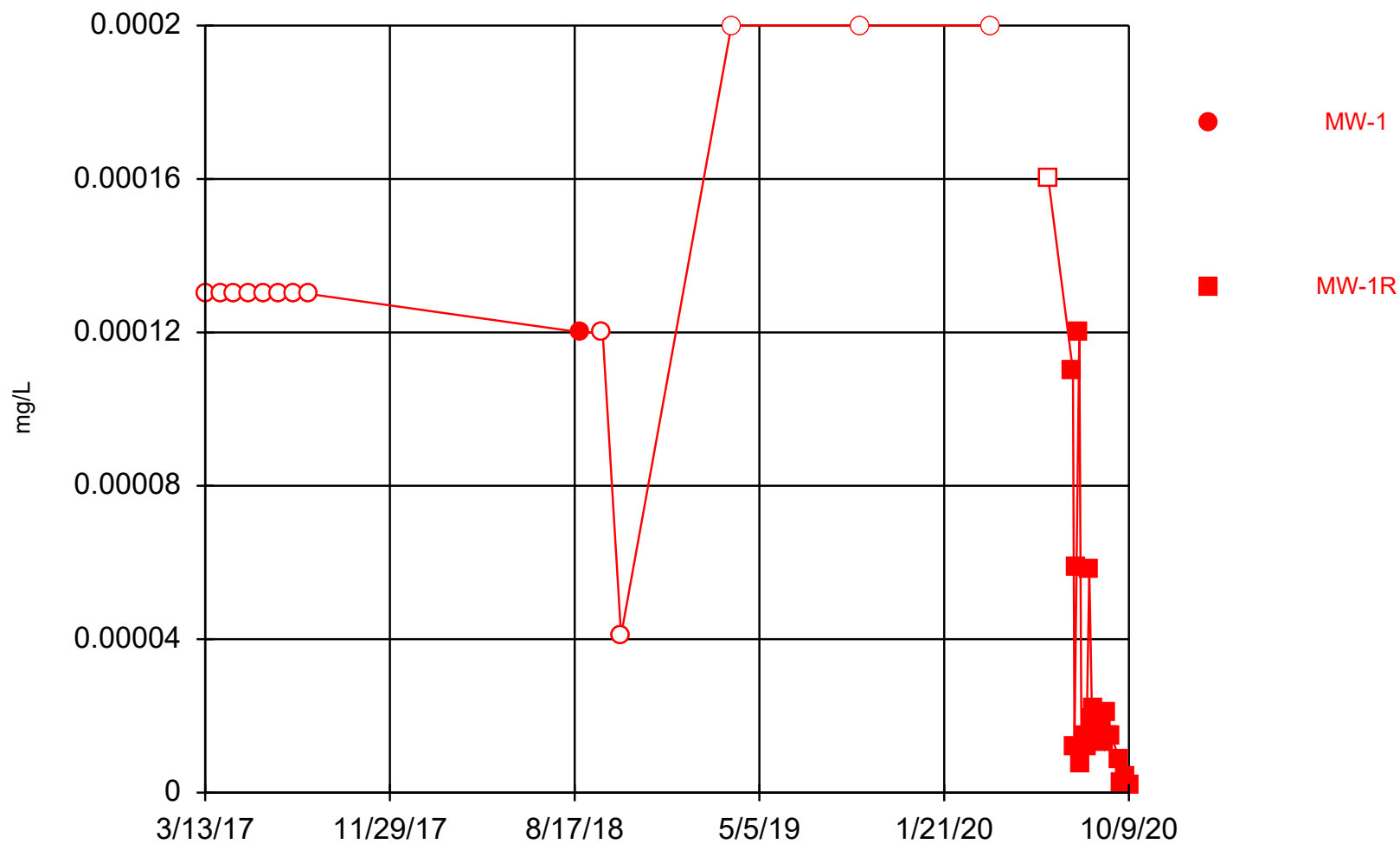


Constituent: Lead Analysis Run 10/27/2020 12:46 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series

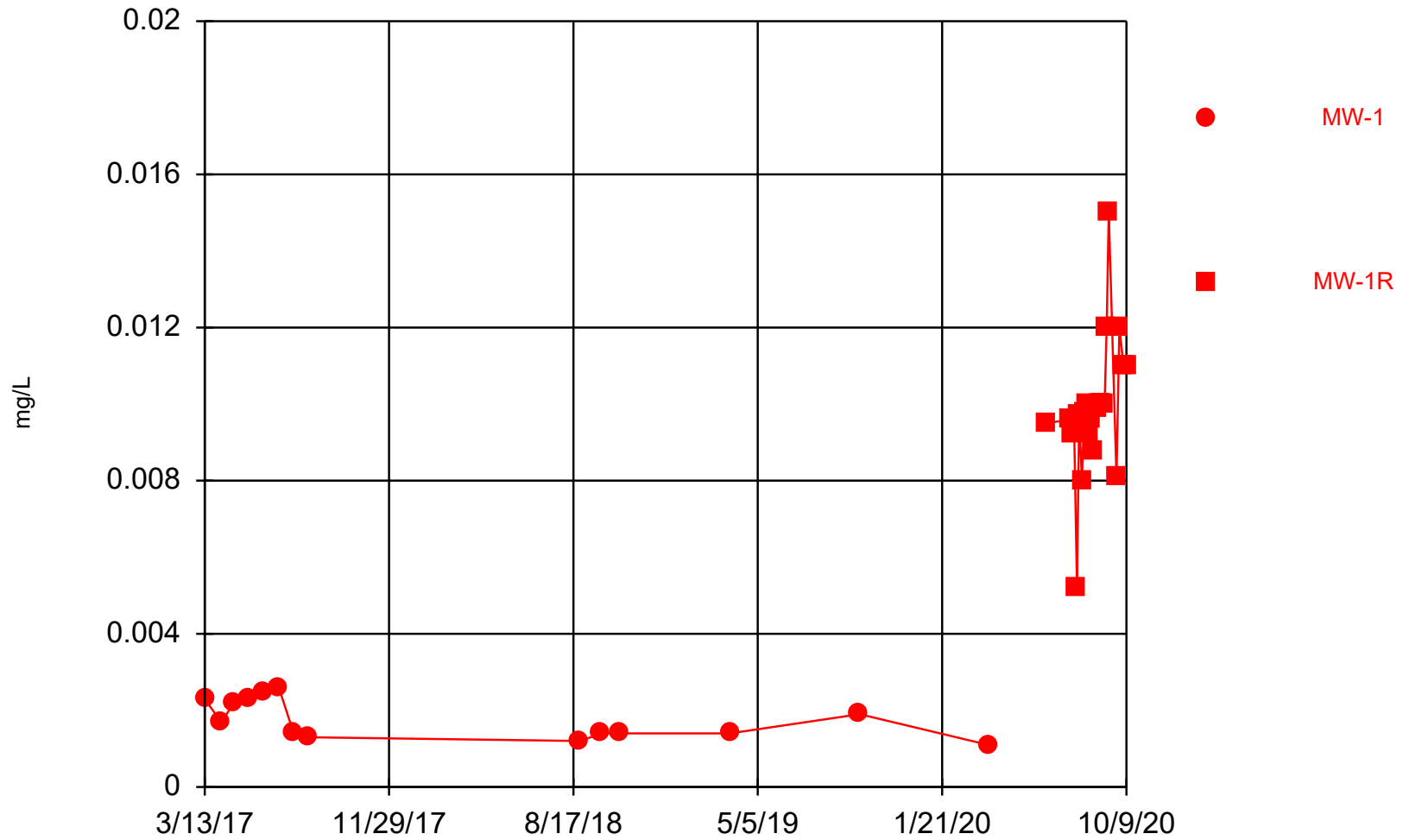


Time Series

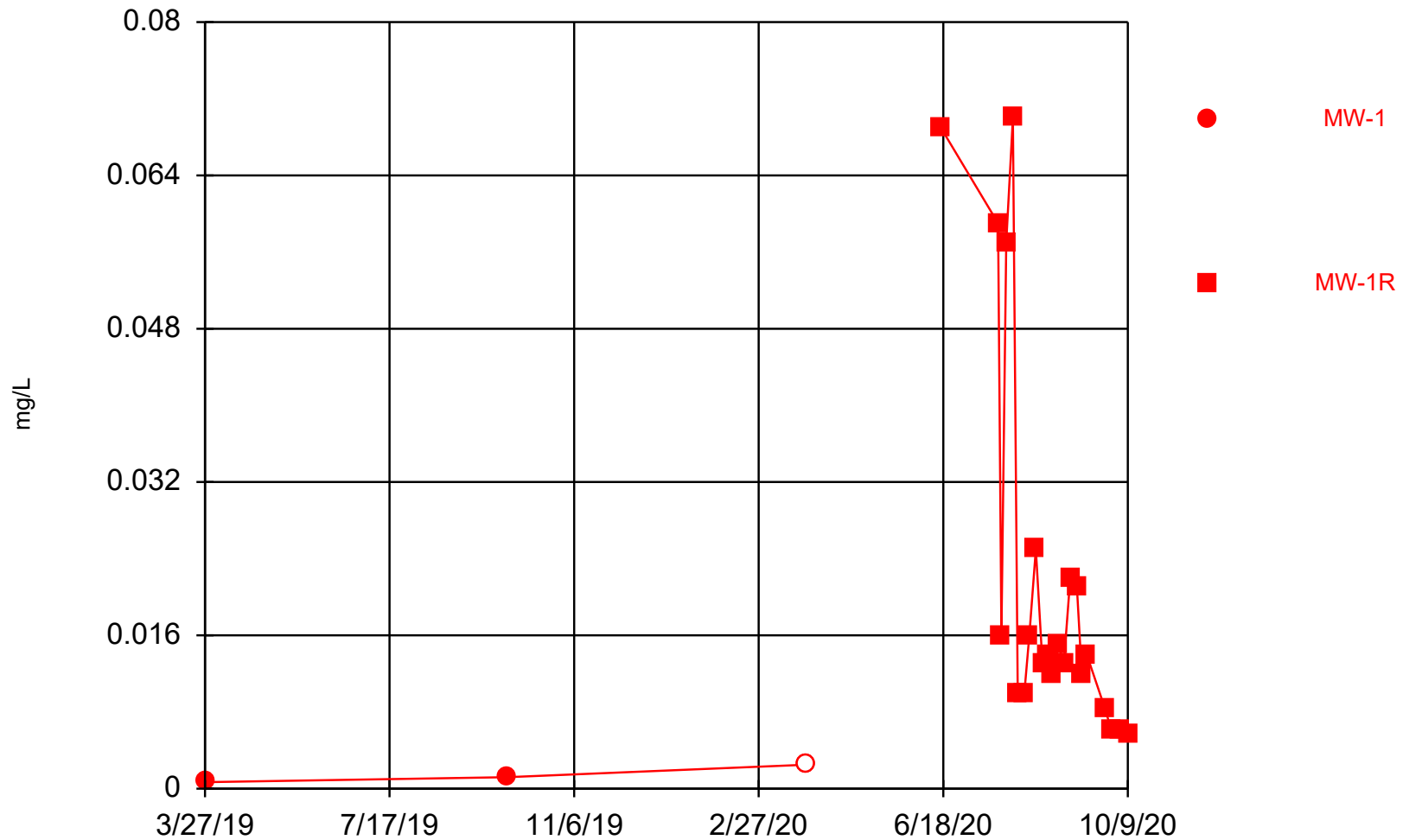


Constituent: Mercury Analysis Run 10/27/2020 12:46 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series

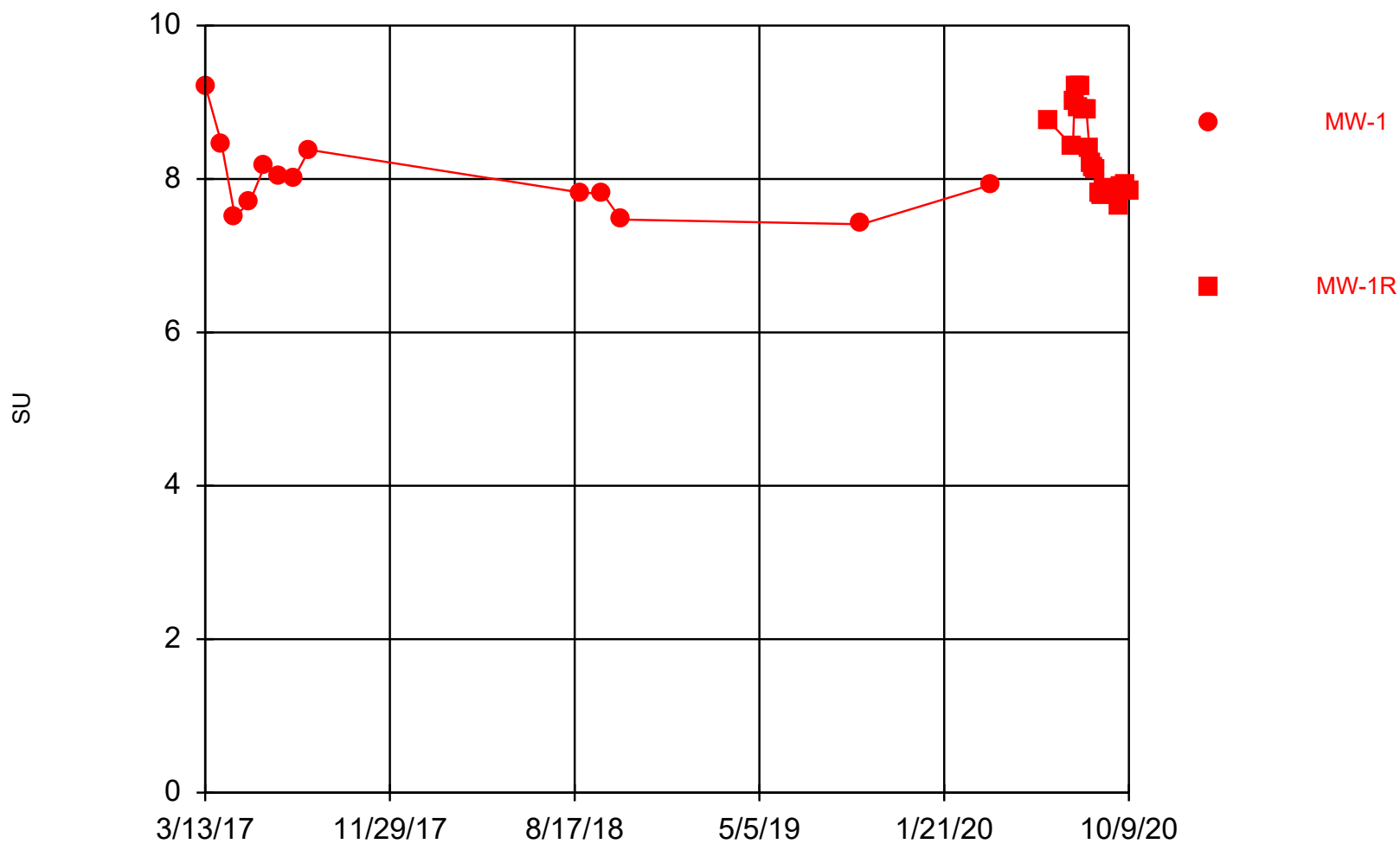


Time Series



Constituent: Nickel Analysis Run 10/27/2020 12:47 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

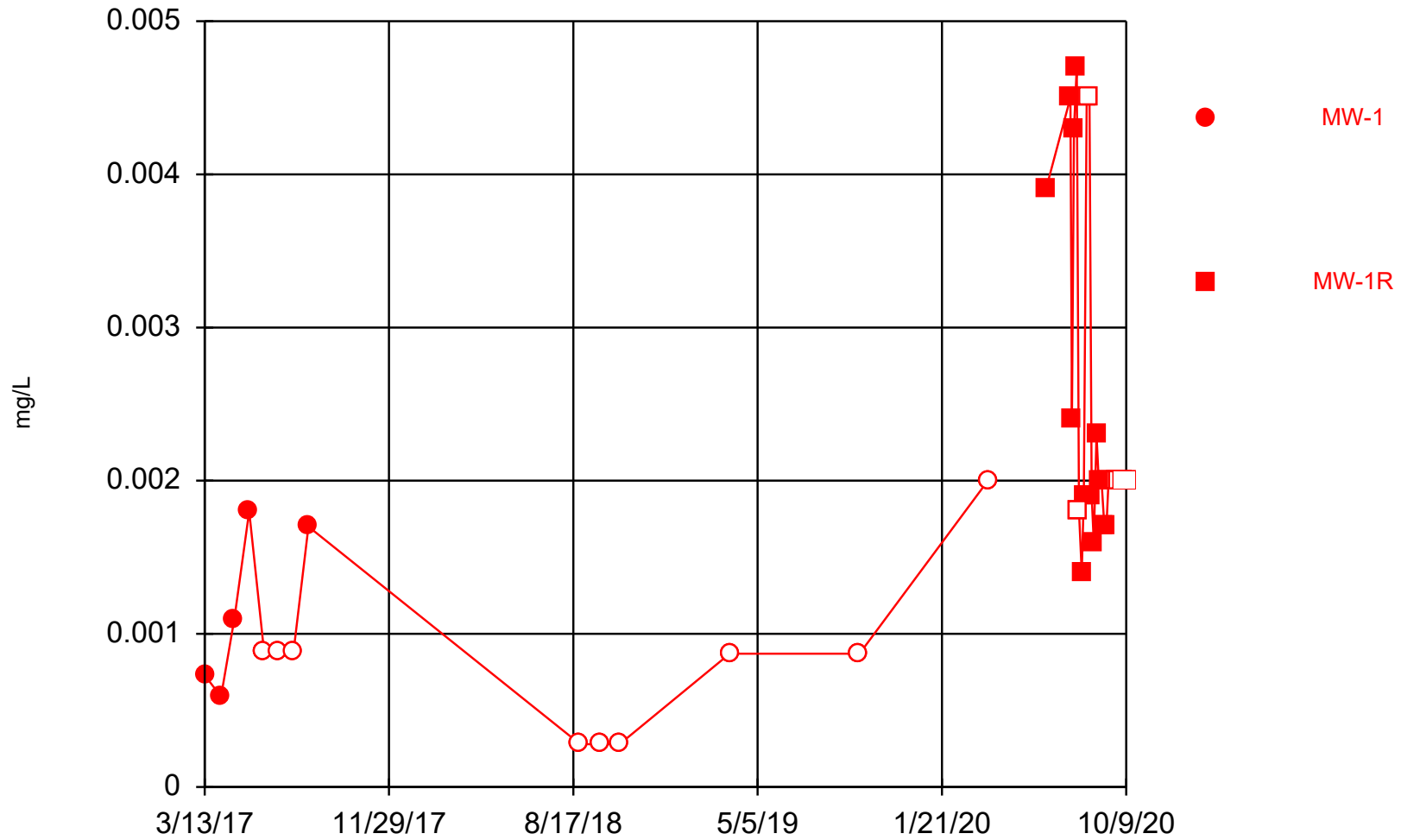
Time Series



Constituent: pH Analysis Run 10/27/2020 12:47 PM

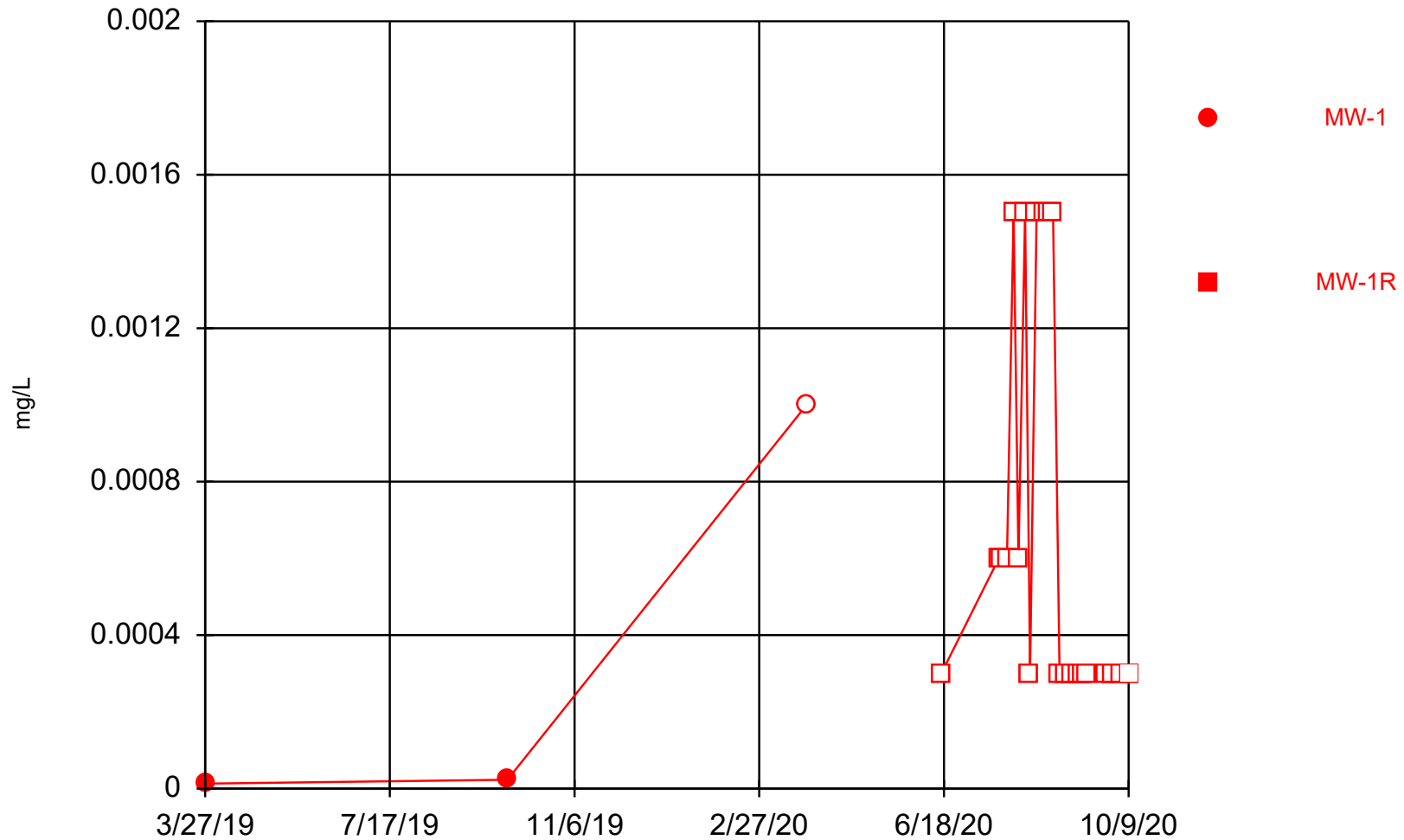
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



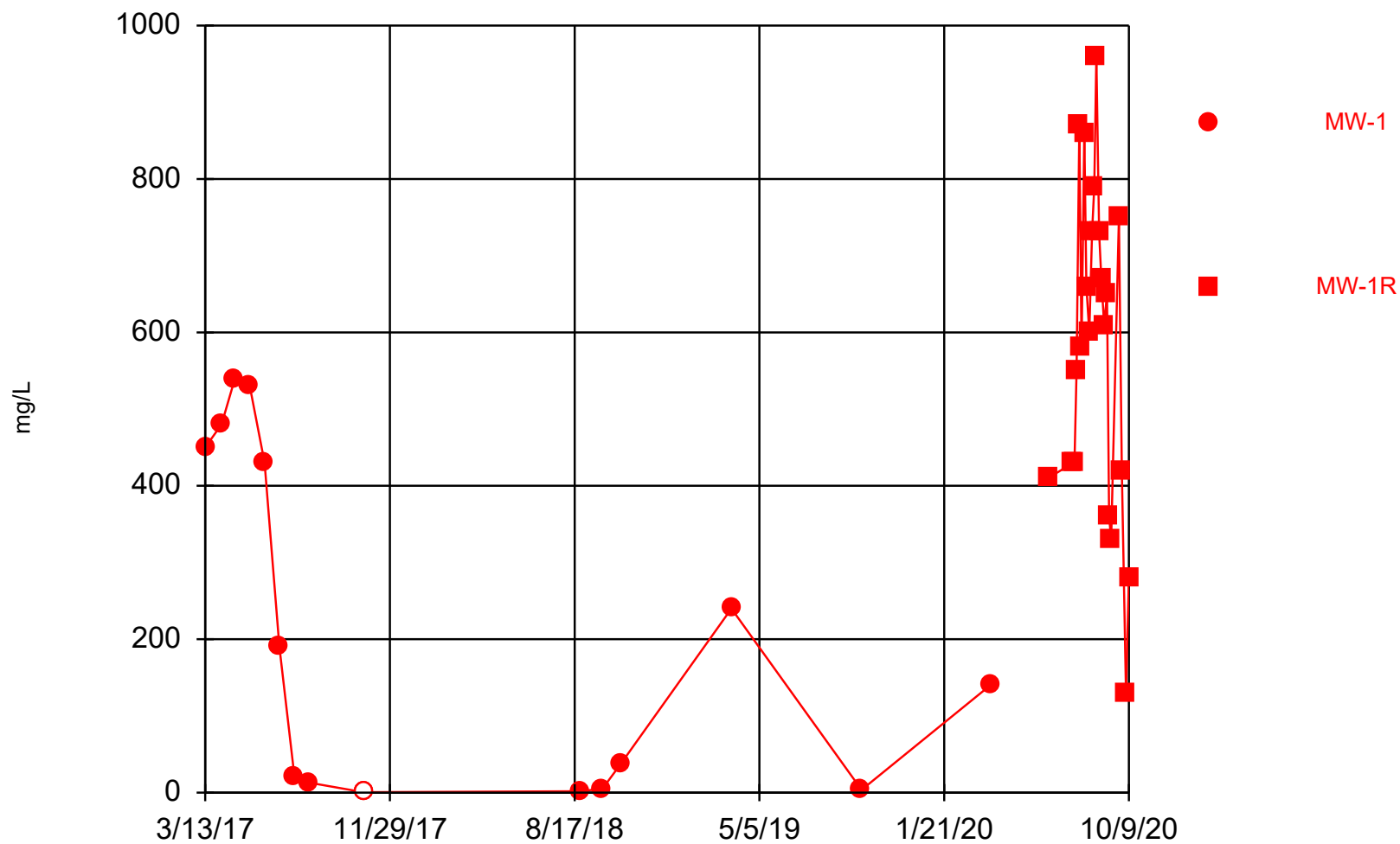
Constituent: Selenium Analysis Run 10/27/2020 12:47 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



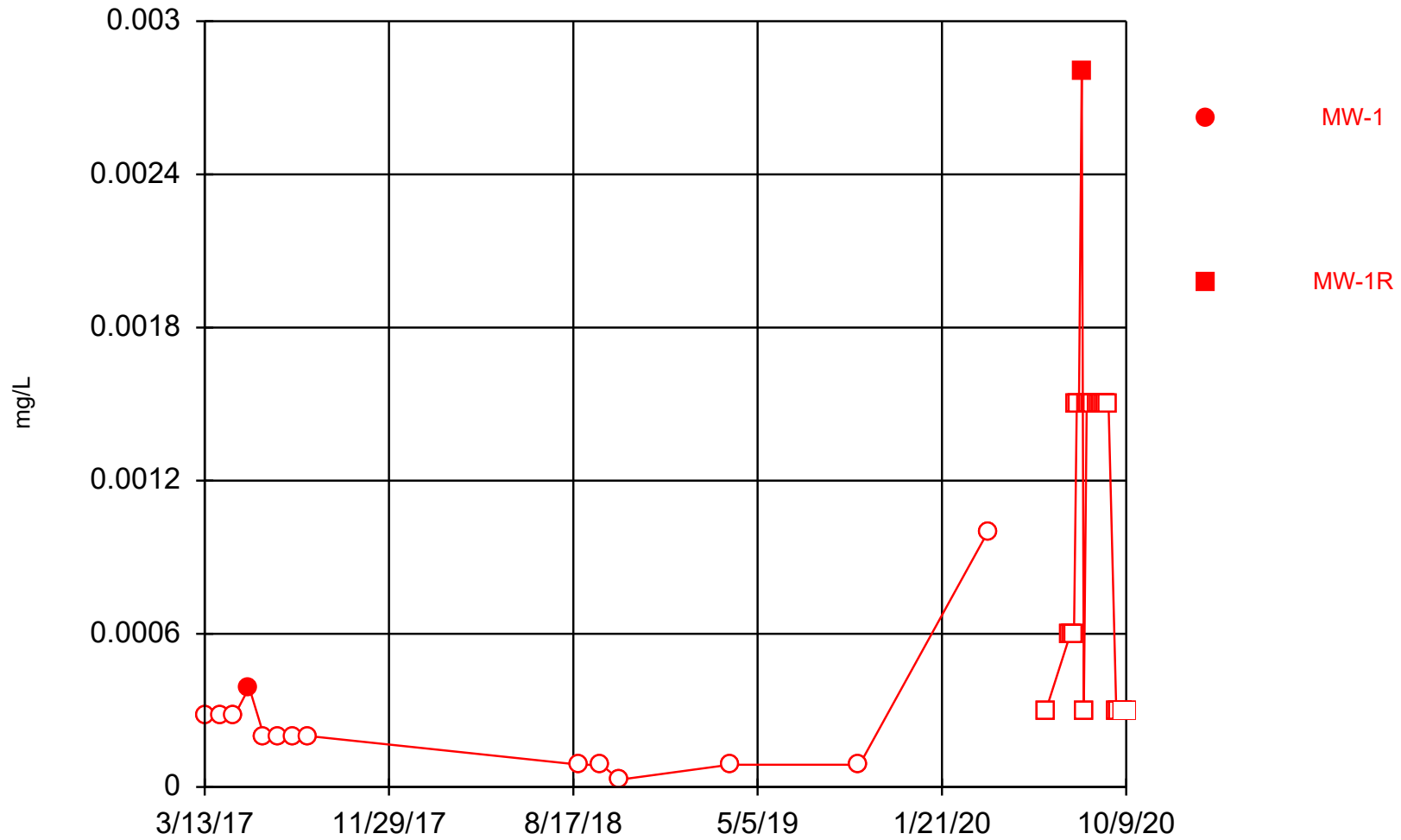
Constituent: Silver Analysis Run 10/27/2020 12:47 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series

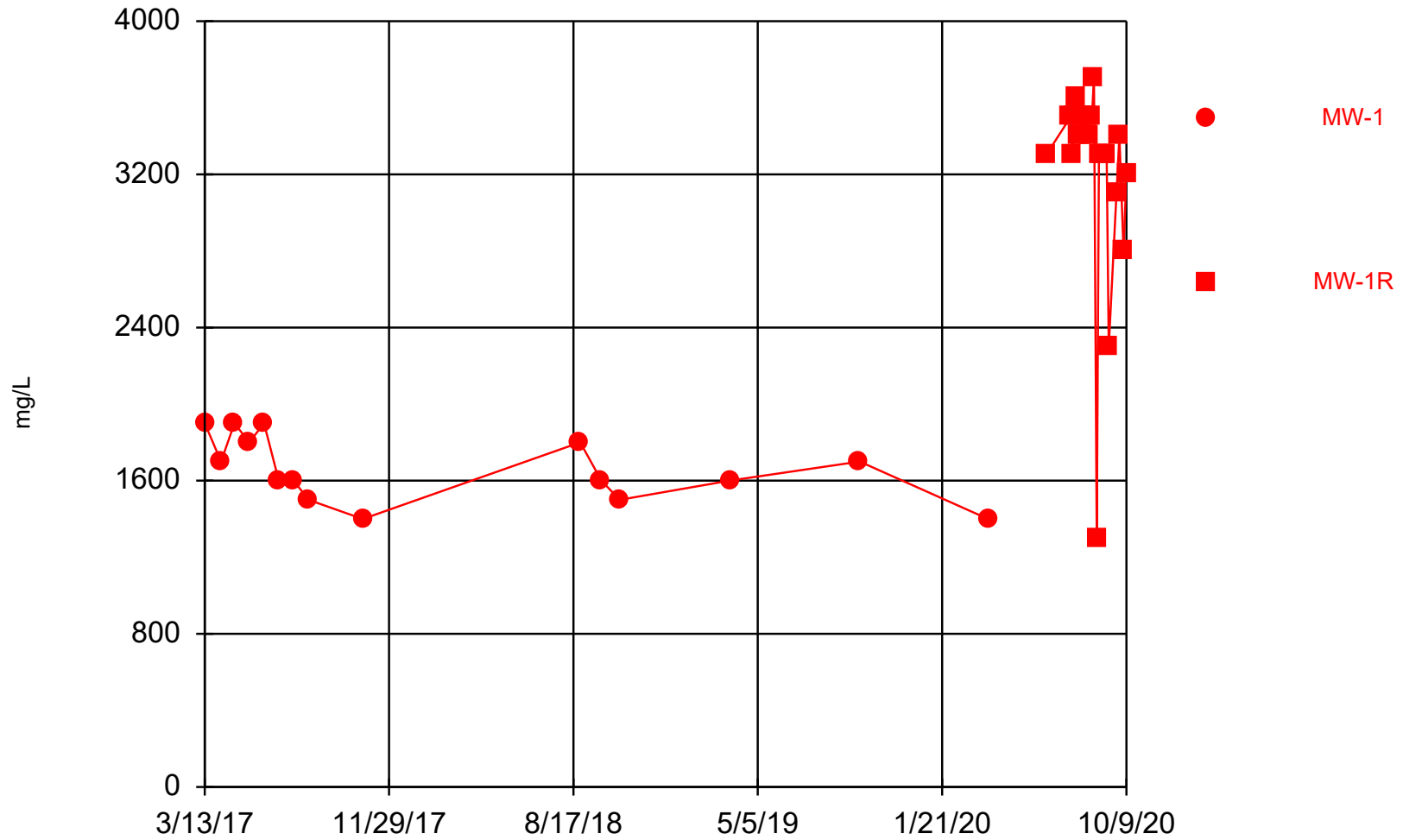


Constituent: Sulfate Analysis Run 10/27/2020 12:47 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

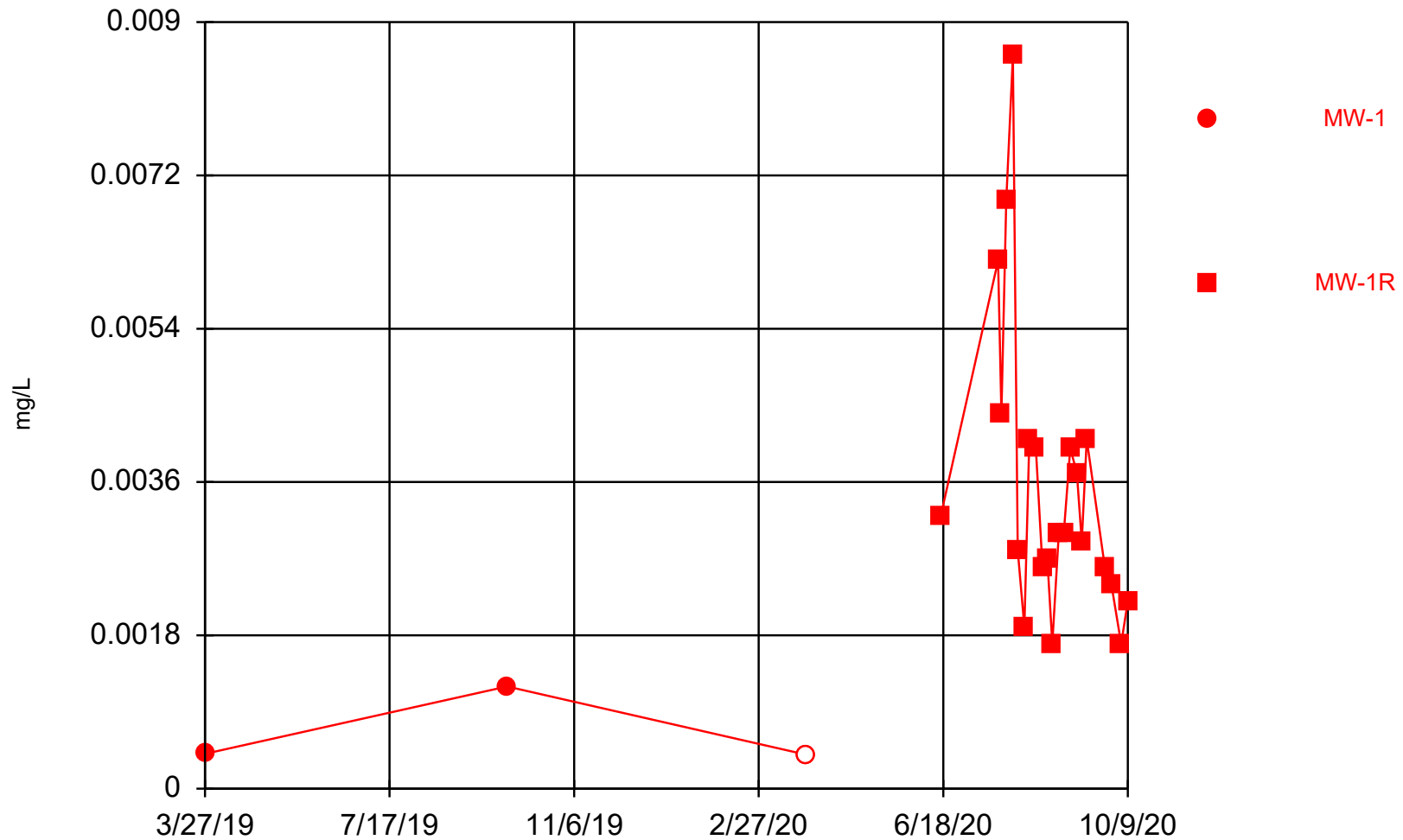
Time Series



Time Series

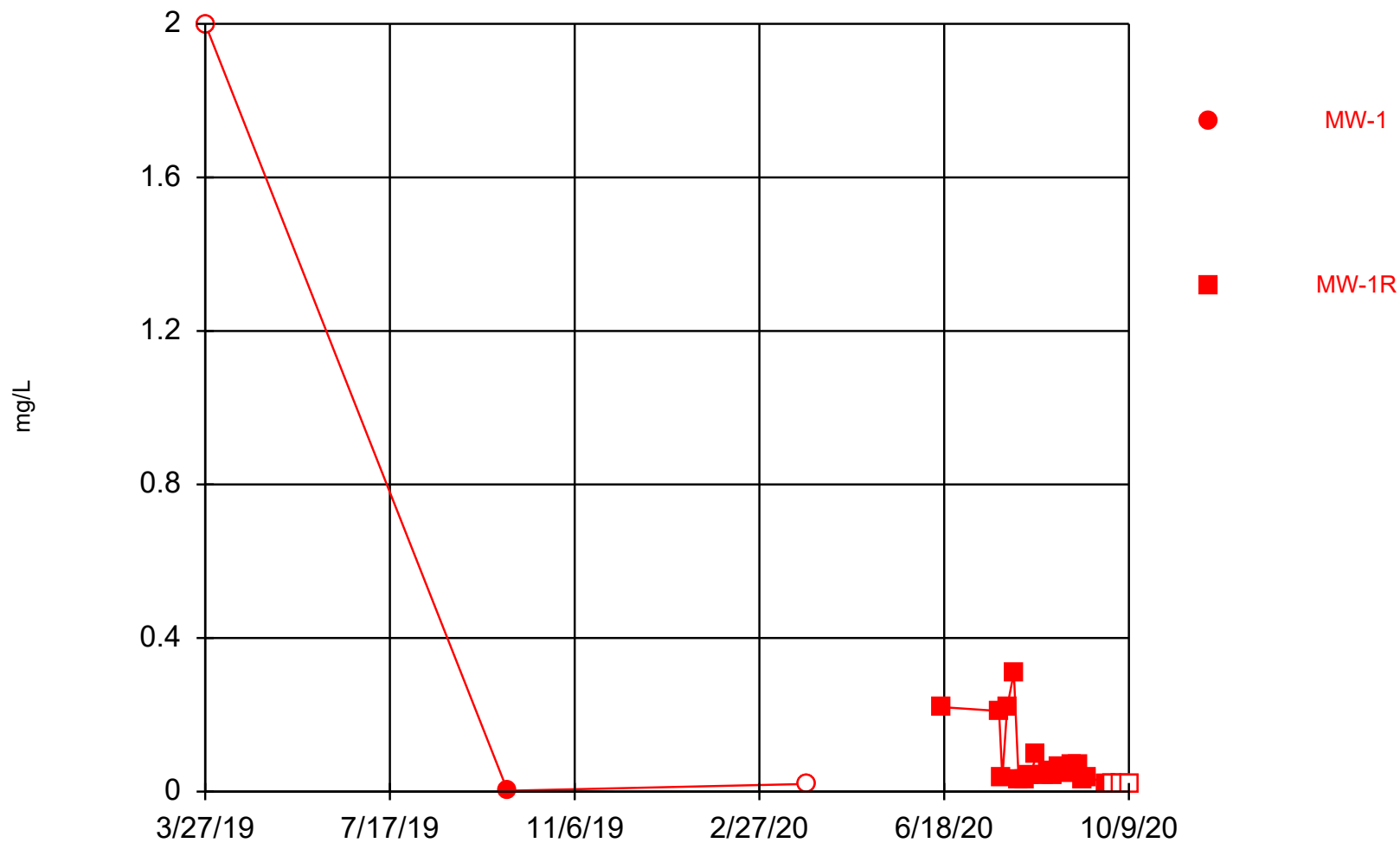


Time Series



Constituent: Vanadium Analysis Run 10/27/2020 12:47 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

Time Series



Constituent: Zinc Analysis Run 10/27/2020 12:47 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP

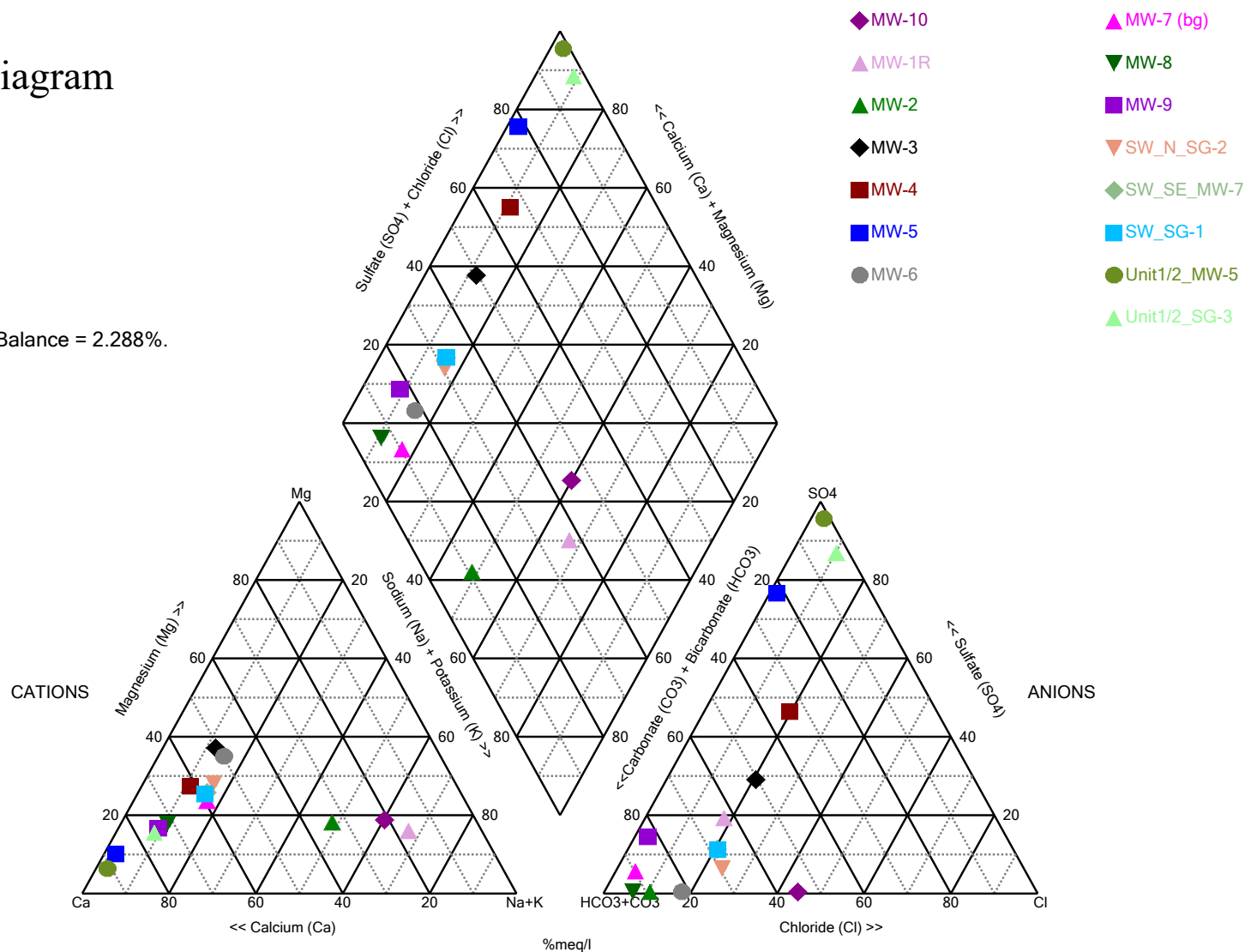
ATTACHMENT D

Stiff and Piper Diagrams

Piper Diagram

6/17/2020

Cation-Anion Balance = 2.288%.



Analysis Run 7/17/2020 11:25 AM

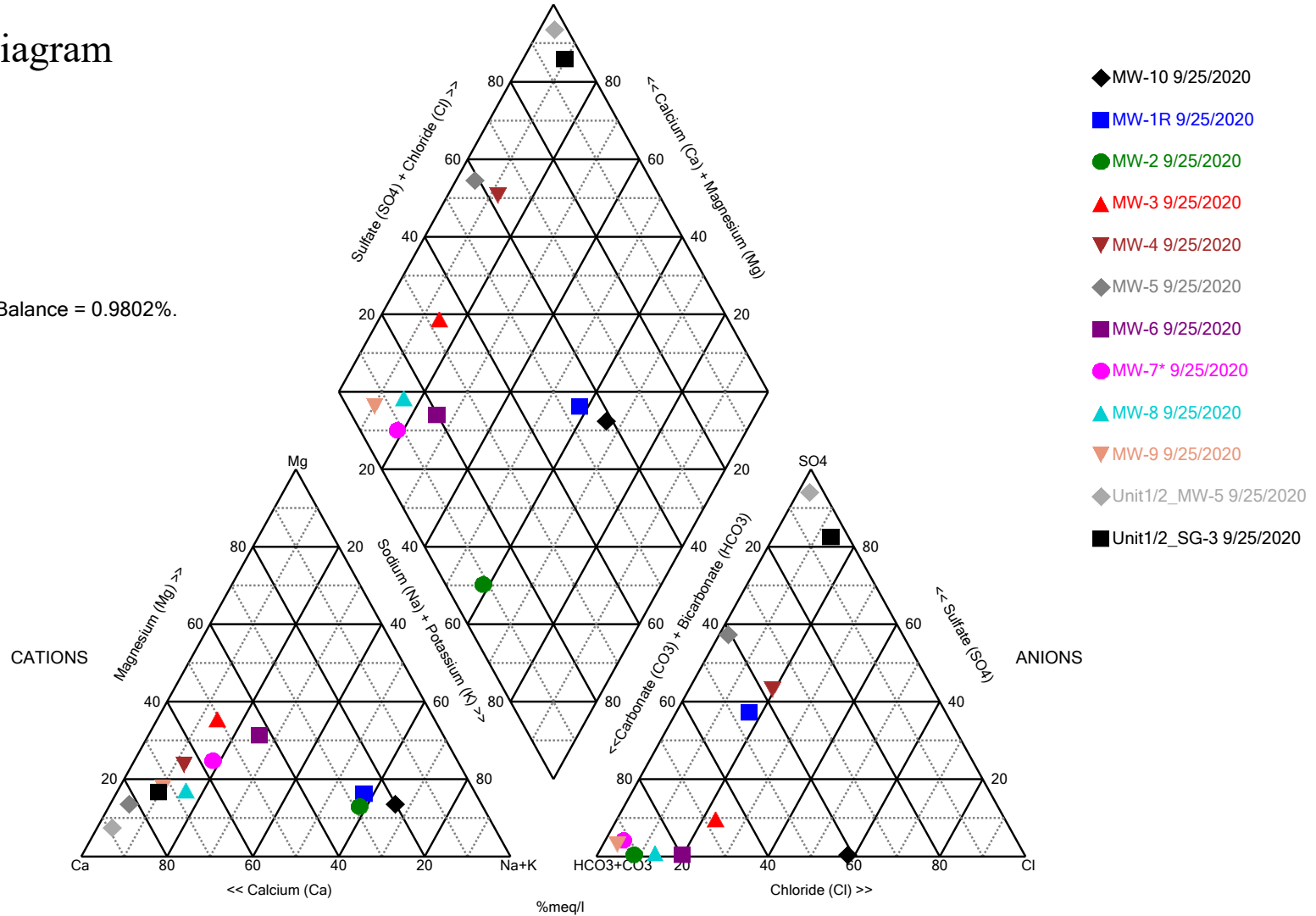
Grand Haven BLP

Client: Golder Associates

Data: DT-Grand Haven BLP

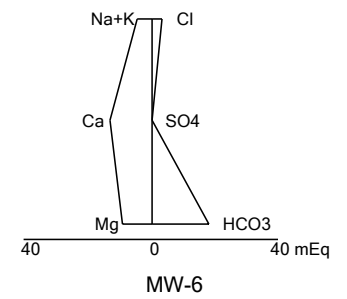
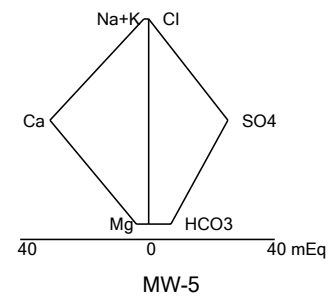
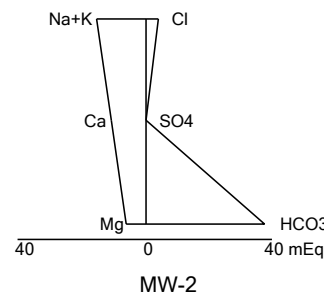
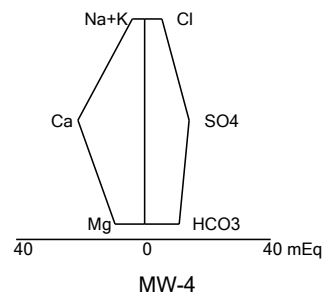
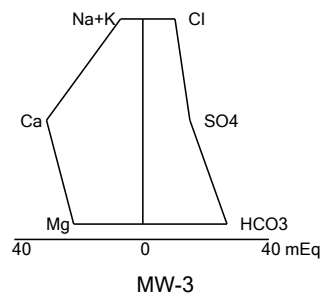
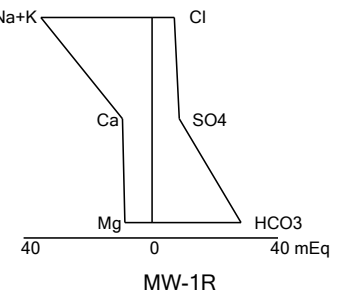
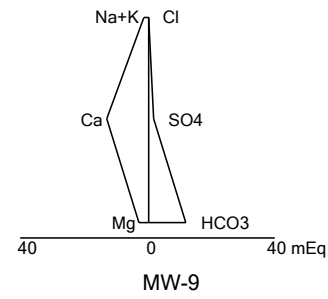
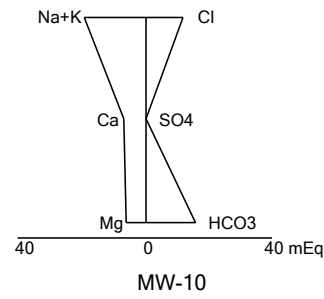
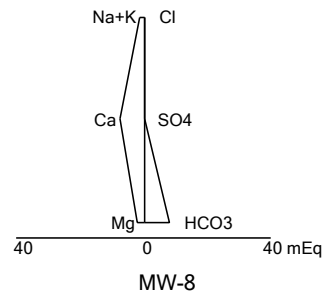
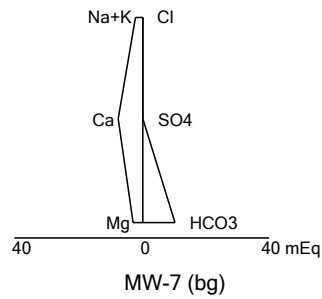
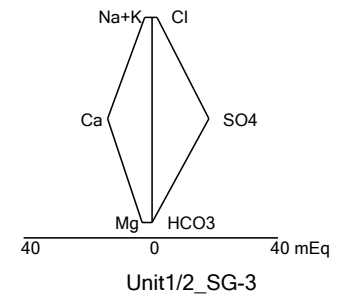
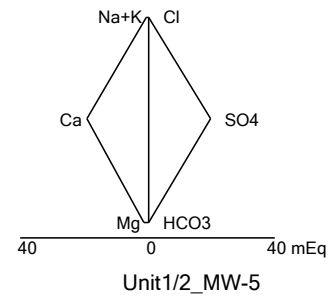
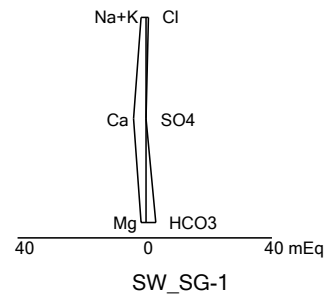
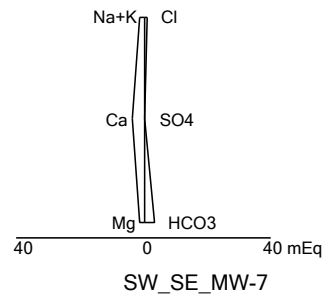
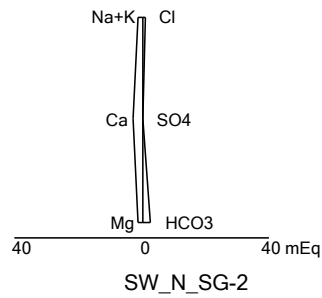
Piper Diagram

Cation-Anion Balance = 0.9802%.

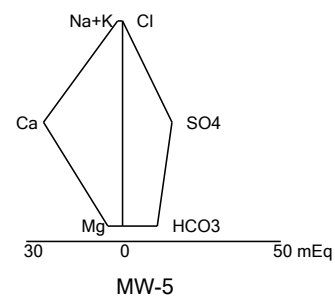
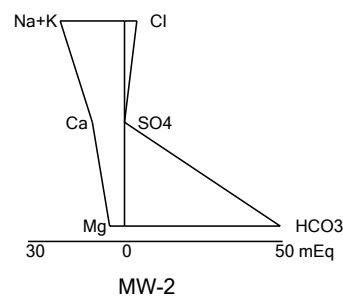
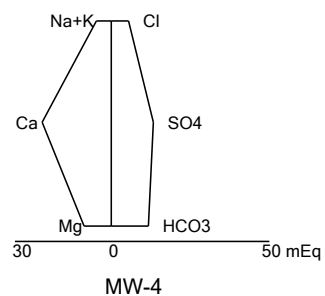
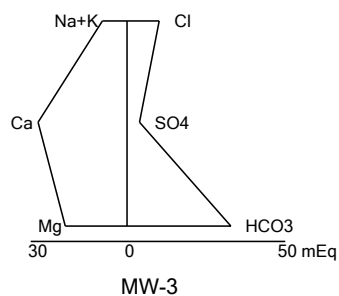
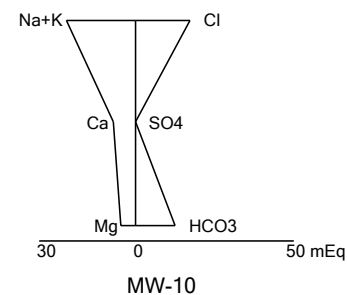
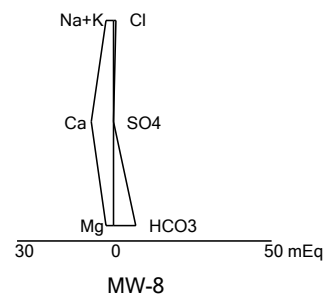
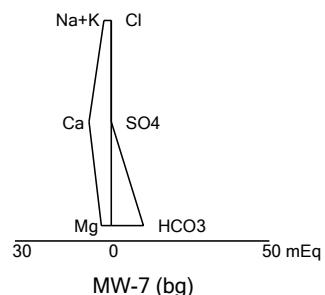
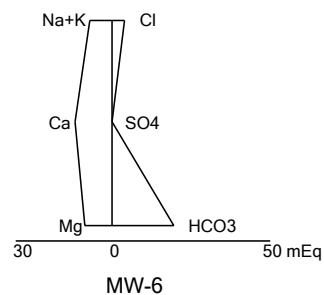
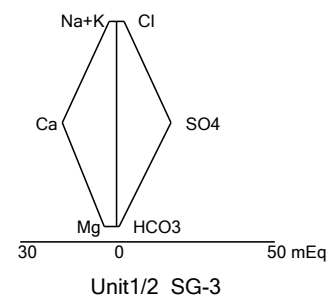
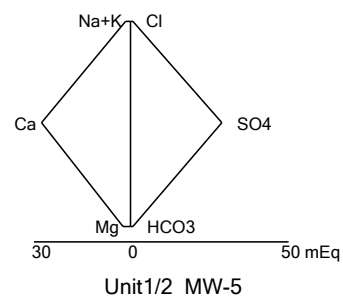
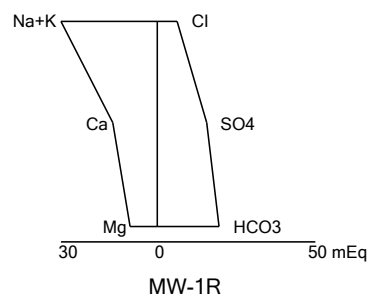
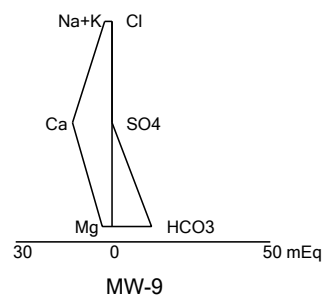


Analysis Run 10/27/2020 1:06 PM

Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP



Stiff Diagram - 6/17/2020 Analysis Run 7/17/2020 11:26 AM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP



Stiff Diagram - 9/25/2020 Analysis Run 10/27/2020 2:57 PM
Grand Haven BLP Client: Golder Associates Data: DT-Grand Haven BLP