



Water and Waste
Eaux et déchets

Environmental Standards Division

BRADY ROAD RESOURCE MANAGEMENT FACILITY ANNUAL REPORT - 2021



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BRADY ROAD RESOURCE MANAGEMENT FACILITY ANNUAL REPORT – 2021

EXECUTIVE SUMMARY

The Brady Road Resource Management Facility (BRRMF) is the City of Winnipeg's only active landfill. The site is bordered by the Perimeter Highway on the North, Waverley Street on the East, Brady Road and the R.M. of Macdonald on the West, and Rue des Trappistes on the South. The landfill has been in operation since 1973 and is estimated to have sufficient capacity for over 100 years, assuming current waste diversion practices are continued.

Environment Act Licence No. 3081 R, issued on April 23, 2014, requires the City of Winnipeg to submit an annual report on or before April 15th, detailing activities conducted at BRRMF in the previous year. This report provides a summary of major expenditures and construction, major incidents, waste diversion operations, ground water management, surface water management, leachate management, landfill gas management, and nuisance management for 2021.

Major construction in 2021 included the construction and commissioning of a new waste cell and the installation of a new air compressor system in the flaring compound. In 2021, there were no disruptions or failures of waste management practices due to equipment breakdown, no major spills occurred, and no alarms were activated.

In 2021, approximately 35% of the 486,447 metric tonnes of material received at the BRRMF were beneficially re-used, composted, or removed from the site for further processing or beneficial re-use. In addition, 40,669 kL of leachate was hauled to the North End Sewage Treatment Plant for treatment.

Monitoring programs for leachate, ground water, surface water, and subsurface gas migration followed the sampling and analysis plans in 2021 and contingency plans were not activated.

Statistical analyses of analytical results obtained for leachate, ground water, and surface water indicate that the BRRMF has not had a negative impact on the ground water and surface water downstream of the site.

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1.0 INTRODUCTION

The Brady Road Resource Management Facility (BRRMF) is located south of the Perimeter Highway, between Brady Road and Waverley Street. Residential land use is present within 500 m of the site to the east and within 120 m north of the site (Waverly West development), other surrounding land use is agricultural. Opened in 1973, the 790-hectare, Class 1 Solid Waste Disposal facility currently holds approximately 12 million metric tonnes of waste, with over 300,000 metric tonnes of waste materials landfilled on an annual basis. The site has capacity for over 100 additional years of waste disposal, assuming current waste diversion practices are continued.

The BRRMF operates in accordance with Environment Act Licence No. 3081 R, which was issued on April 23, 2014. Clause 127 of the license requires the City of Winnipeg to prepare and submit an Annual Report on the activities undertaken at the site during the previous year on or before April 15th of each year. This report contains results and/or comments for each of the clauses of Licence No. 3081 R under which the BRRMF has generated pertinent information during 2021. The report also provides information on the BRRMF proposed activities for 2022.

The layouts of the primary components of the BRRMF are shown on Figure 1. Surface water flows are managed by perimeter ditching and retention ponds. The ground water monitoring network consists of wells in the bedrock, till, and clay layers. The leachate collection system is a network of manholes/risers, drains, and sumps around the perimeter of the landfill cells, which feed into a centralized collection tank/truck fill station. The landfill gas (LFG) management system includes extraction wells, collection piping, and a blower/enclosed flare station.

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2.0 MAJOR ACTIVITIES AND CONSTRUCTION

Major activities and construction undertaken in 2021 included:

- construction and commissioning of a new waste cell (Cell 33)
- installation of a new air compressor system in the flaring compound to power the dual-purpose gas wells installed in 2020

Major activities and construction planned for 2022 include:

- completion of landscaping around the administration building (1777 Brady Road)
- paving the cell access road (North-South road off the main road past Cells 30- 33)
- composting organic waste for the Residential Food Waste Collection Pilot Project

3.0 MAJOR INCIDENTS

In 2021, there were no disruptions or failures of waste management practices due to equipment breakdown, no major spills occurred, and no alarms were activated.

4.0 WASTE DIVERSION OPERATIONS

In 2021, the BRRMF received 486,447 metric tonnes of material from a variety of sources including residential waste collection, residential food waste collection (pilot project), commercial wastes, wastes from City operations, and materials dropped off at the 4R depot. Composting programs, on-site re-use of materials, and removal of materials from the site for re-use or further processing allowed 170,936 metric tonnes of material to be diverted from the landfill. The remaining 315,511 metric tonnes of material was landfilled. The 35% diversion rate in 2021 is a slight decrease from the previous year due to the overall decrease in the amount of material received at the BRRMF because the amount of biosolids sent to the land application program and soil fabrication program at Summit Landfill increased in 2021.

The 2-year Residential Food Waste Collection Pilot Project continued in 2021; the feasibility of a city-wide program will be determined by the pilot project, which involves weekly curbside collection of residential food waste from approximately 4,000 households across five pilot areas. In 2021, 411 metric tonnes of food waste was composted at the BRRMF; the resulting material was used onsite. Phase 3 of the project will commence in the summer of 2022. It will include a waste audit, cart inspections, a participant survey, and a City-wide scientific survey.

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In 2021, 8,793 metric tonnes of biosolids were mixed with woodchips and clay to create a fabricated soil that will be used as final cover at the BRRMF. The remaining 1,066 metric tonnes of biosolids were composted at the biosolids composting facility, the final product will be also used as final cover at the BRRMF.

In 2022, we will continue the biosolids soil fabrication project, composting biosolids, composting organic materials, and diverting re-useable wastes from the landfill.

A summary of the BRRMF Waste Diversion Operations is provided in Table 1.

	Table 1. 2021 BRRMF Waste Diversion Summary					
	2016	2017	2018	2019	2020	2021
Materials Landfilled	metric tonnes					
Commercial Wastes	96,834	93,851	88,813	93,621	90,755	100,965
Residential Wastes	174,280	172,209	172,041	174,050	194,570	184,930
Wastes from City Operations	81,403	78,798	66,068	52,571	60,957	29,617
Wastes from Other Municipalities	4,729	3,505	20	0	0	0
Total Materials Landfilled	357,246	348,364	326,942	320,242	346,282	315,511
Materials Diverted from Landfill	metric tonnes					
Batteries	24	33	49	74	79	84
Bicycles	13	11	6	9	14	15
Biosolids	1,899	4,942	1,541	1,916	1,219	9,859
Ceramic	164	245	296	331	281	290
Clean Fill	6,198	247,852	281,546	252,113	136,675	104,728
Compostable Materials	42,250	37,494	40,232	36,694	43,835	35,232
Concrete	1,338	2,801	5,187	6,565	10,145	8,170
Electronics	375	530	570	665	713	607
Glass	11,534	11,181	12,338	10,965	8,942	8,626
Household Hazardous Waste	303	341	594	686	826	660
Lumber	187	185	202	192	91	12
Mattresses	n/a	n/a	n/a	233	316	395
Oil	22	32	60	90	124	121
Oversized Plastics	15	22	52	43	22	15
Ozone-Containing Appliances	66	111	180	166	190	201
Recyclables	156	274	471	278	283	232
Residential Food Waste Collection	n/a	n/a	n/a	n/a	115	411
Scrap Metal	532	619	607	635	726	685
Sweepings (sand)	11,620	398	259	223	995	0
Tires	57	146	165	166	277	593
Total Materials Diverted from Landfill	76,754	307,221	344,354	312,046	205,869	170,936
Total Materials Received	434,000	655,585	671,296	632,288	552,151	486,447
Diversion Rate	18%	47%	51%	49%	37%	35%

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5.0 GROUND WATER, SURFACE WATER, LEACHATE, AND LANDFILL GAS MONITORING

5.1 GROUND WATER

The land beneath the BRRMF consists of three layers: the uppermost layer is clay (averaging 12 m in thickness), the second layer is till (averaging 6 m in thickness), and the lowest layer is bedrock. Ground water flows downwards through the clay and till layers into the bedrock aquifer, which flows in a north-east direction. The ground water in all three layers is saline and non-potable. The major ions in the ground water from the clay layer are calcium, magnesium, sulfate and bicarbonate. Sodium and chloride are the major ions in the bedrock aquifer. Ground water in the till layer is generally intermediate in brackishness and shows a gradual change with depth. The ground water monitoring system includes 34 nested wells: 13 bedrock wells, 13 till wells, and 8 clay wells. The locations of the ground water monitoring wells are shown on Figure 2.

As per the BRRMF Operating Plan, ground water is monitored in accordance with the Ground Water Sampling and Analysis Plan (SAP), as specified under Clause 123. Sampling frequency is twice per year for bedrock wells and downgradient till wells, and once per year for clay wells and other till wells distant from the waste areas. As neither Federal nor Manitoba Provincial Governments regulate non-potable ground water quality, the Ontario Ministry of Environment (MOE) guidelines for non-potable groundwater quality are used as the regulatory guideline (MOE, 2011).

In 2021, a total of 49 ground water samples were analyzed – 5 samples from wells upgradient of the site (background water quality), and 44 samples from wells cross gradient and downgradient of the site. There were no deviations from the Ground Water SAP or from normal sample collection and preservation practices. Results for several parameters were variable between different wells of the same type, and also between spring and autumn results at the same well. The results met the guidelines with the exception of chloride in some clay and till wells and most of the bedrock wells. Hydrocarbons were detected in the upstream bedrock well, but were below guideline limits. The 2021 ground water results are provided in Tables 2.1-2.3.

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Table 2.1 2021 Ground Water Monitoring - Clay Wells

			Downgradient and Crossgradient						
			Upgradient						
			GWQ25-6N60DR	GWQ25-5N62D	GWQ25-6N63E	GWQ25-6N57DR	GWQ25-6N67E	GWQ25-4N34B	GWQ25-4N34C
	Units	Criteria*	Spring	Spring	Spring	Spring	Spring	Spring	Spring
Inorganic Parameters									
Alkalinity - Bicarbonate	mg/L		519	479	517	501	462	577	515
Alkalinity - Carbonate	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Hydroxide	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Total	mg/L		519	479	517	501	462	577	515
Dissolved Hardness (CaCO3)	mg/L		1,360	2,180	1,810	1,690	1,430	1,830	1,340
pH	units		6.87	6.84	6.74	6.77	6.99	6.98	6.89
Specific Conductivity	(µS/cm)		4,680	8,810	7,130	6,210	4,770	6,570	5,680
Turbidity	(ntu)		26.8	23.4	48.3	9.33	12.2	24.5	193
Total Dissolved Solids	mg/L		3,900	7,040	5,290	4,880	3,640	5,510	2,580
Total Suspended Solids	mg/L		175	529	607	266	263	466	15,380
Total Solids	mg/L		4,070	7,570	5,900	5,140	3,900	5,980	18,000
Dissolved Chloride (Cl)	mg/L	2,300	765	3,320	2,360	1,360	1,160	1,480	1,670
Dissolved Sulphate (SO4)	mg/L		1,730	2,260	1,960	2,200	1,560	2,510	1,820
Nutrients									
Ammonia - Dissolved	mg/L N		0.098	0.838	0.807	0.652	0.730	<0.003	0.598
Nitrate - Dissolved	mg/L N		0.654	0.064	0.049	0.110	0.055	0.557	0.366
Total Kjeldahl Nitrogen	mg/L N		1.18	2.34	1.55	0.90	0.90	0.50	3.60
Phosphorus - Dissolved	mg/L P		<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013
Other									
Cyanide - Total (CN)	mg/L	0.066	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic Indicators									
Carbonaceous Oxygen Demand	mg/L		37	125	84	58	46	63	101
Total Organic Carbon	mg/L		8.7	21.5	13.1	11.3	8.4	10.8	40.7
Metals									
Arsenic (As)- Dissolved	mg/L	1.9	0.00050	0.00115	0.00060	0.00053	0.00075	0.00058	0.00072
Barium (Ba)- Dissolved	mg/L	29	0.0087	0.0136	0.0153	0.0094	0.0104	0.0112	0.0095
Beryllium (Be)- Dissolved	mg/L	0.067	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cadmium (Cd)- Dissolved	mg/L	0.0027	0.000050	0.000112	0.000114	0.000102	0.000094	0.000148	0.000149
Calcium (Ca)- Dissolved	mg/L		531	882	675	537	526	678	613
Chromium (Cr)- Dissolved	mg/L	0.81	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010
Copper (Cu)- Dissolved	mg/L	0.087	0.00313	0.00188	0.00393	0.00568	0.00219	0.00405	0.00202
Iron (Fe)- Dissolved	mg/L		0.0130	<0.0100	0.0240	0.0120	<0.0100	<0.0100	0.0210
Lead (Pb)- Dissolved	mg/L	0.025	0.000106	0.000243	0.000124	0.000124	<0.000050	<0.000050	<0.000050
Magnesium (Mg)- Dissolved	mg/L		202	386	288	219	220	407	248
Manganese (Mn)- Dissolved	mg/L		1.42	2.68	2.27	1.88	1.00	0.153	2.02
Mercury (Hg)- Total	mg/L	0.0028	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0002120	0.000289
Nickel (Ni)- Dissolved	mg/L	0.49	0.00696	0.01290	0.01080	0.00892	0.00634	0.01970	0.00849
Potassium (K)- Dissolved	mg/L		9.69	14.2	11.5	11.2	9.47	11.5	10.4
Selenium (Se)- Dissolved	mg/L	0.063	0.000114	0.000132	0.000191	0.000241	0.000124	0.000380	0.000209
Silver (Ag)- Dissolved	mg/L	0.0015	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)- Dissolved	mg/L	2,300	309	863	553	462	299	448	429
Zinc (Zn)- Dissolved	mg/L	1.1	0.0053	0.0063	0.0067	0.0084	0.0041	0.0055	0.0054
Field Parameters									
pH	units		7.24	7.17	7.17	7.21	7.18	7.31	7.51
Specific Conductivity	(µS/cm)		4,310	8,180	5,790	5,170	4,290	5,950	4,780
Polycyclic Aromatic Hydrocarbons									
Naphthalene	mg/L	6.4	<0.000050						
Benzo(a)pyrene	mg/L	0.00081	<0.0000050						
Anthracene	mg/L	0.0024	<0.000010						
Petroleum Hydrocarbons									
F1 (C6-C10 Hydrocarbons)	mg/L	0.75	<0.10						
F2 (C10-C16 Hydrocarbons)	mg/L	0.15	<0.10						
F3 (C16-C34 Hydrocarbons)	mg/L	0.50	<0.250						
F4 (C34-C50 Hydrocarbons)	mg/L	0.50	<0.250						
Benzene	mg/L	0.43	<0.00050						
EthylBenzene	mg/L	2.3	<0.00050						
Toluene	mg/L	18	<0.00050						
Xylene (Total)	mg/L	4.2	<0.00064						
Volatile Organic Carbons									
Vinyl chloride	mg/L	0.0017	<0.0005						
Pesticides									
Diazinon	µg/L		<0.10						
Herbicides									
2,4-D	mg/L		<0.0001						

Note: Criteria from Ontario Ministry of the Environment. (2011, July 1). Soil, Ground Water and Sediment Standards for Use Under Part XV.I of the *Environmental Protection Act* Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground
 Note: Criteria exceedances are highlighted in red.
 * Criteria for total chloride and total metals

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Table 2.2 2021 Ground Water Monitoring - Till Wells

	Units	Criteria*	Upgradient		Downgradient and Crossgradient							
			GWQ25-6N60ER		GWQ25-5N62E		GWQ25-W13A		GWQ25-W14A		GWQ25-W15A	
			Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
Inorganic Parameters												
Alkalinity - Bicarbonate	mg/L		590	562	392	265	385	154	351	331	441	417
Alkalinity - Carbonate	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Hydroxide	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Total	mg/L		590	562	392	265	385	154	351	331	441	417
Dissolved Hardness (CaCO3)	mg/L		1,060	1,280	1,160	1,160	5,390	7,830	2,090	5,400	5,090	4,960
pH	units		6.95	6.85	7.37	7.09	6.92	7.47	7.48	6.86	6.79	
Specific Conductivity	(µS/cm)		4,120	4,250	8,400	8,520	7,290	7,530	8,360	8,400	6,680	6,950
Turbidity	(ntu)		183	116	746	255	>4,800	>4,800	>4,800	>4,800	>4,800	>4,800
Total Dissolved Solids	mg/L		3,310	3,260	5,360	4,980	3,260	11,200	4,940	8,010	2,800	3,740
Total Suspended Solids	mg/L		458	192	1,400	549	17,620	19,670	5,880	24,400	21,520	23,550
Total Solids	mg/L		3,770	3,460	6,760	5,530	20,900	30,900	10,800	32,400	24,300	27,300
Dissolved Chloride (Cl)	mg/L	2,300	>6,000	400	935	2,440	4,200	2,120	2,550	2,470	2,000	1,410
Dissolved Sulphate (SO4)	mg/L		1,400	726	846	766	1,090	1,140	880	818	1,940	1,880
Nutrients												
Ammonia - Dissolved	mg/L N		0.254	0.969	1.02	0.473	0.733	9.840	1.15	>2.0	1.07	1.040
Nitrate - Dissolved	mg/L N		0.488	0.516	0.063	<0.003	0.088	<0.003	0.006	4.65	0.012	0.239
Total Kjeldahl Nitrogen	mg/L N		1.1	0.3	1.5	1.2	2.0	1.4	2.4	<0.2	3.0	2.4
Phosphorus - Dissolved	mg/L P		<0.013	0.155	<0.013	0.846	<0.013	16.3	<0.013	5.92	<0.013	0.015
Other												
Cyanide - Total (CN)	mg/L	0.066	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010		<0.0010	
Organic Indicators												
Carbonaceous Oxygen Demand	mg/L		43	40	138	105	534	407	243	270	758	678
Total Organic Carbon	mg/L		8.4	7.7	3.4	2.0	23.8	1.0	13.3	42.4	30.1	83.9
Metals												
Arsenic (As)- Dissolved	mg/L	1.9	0.00086	0.00087	0.00354	0.00221	0.00106	0.00056	0.00652	0.00354	0.00091	0.00182
Barium (Ba)- Dissolved	mg/L	29	0.0079	0.0081	0.0111	0.0117	0.0185	0.0144	0.0123	0.0145	0.0132	0.0151
Beryllium (Be)- Dissolved	mg/L	0.067	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cadmium (Cd)- Dissolved	mg/L	0.0027	0.000034	0.000010	0.000008	0.000008	0.000040	0.000039	0.000007	0.000020	0.000043	0.000043
Calcium (Ca)- Dissolved	mg/L		413	425	309	320	402	454	311	354	625	703
Chromium (Cr)- Dissolved	mg/L	0.81	<0.00010	<0.00010	<0.00010	<0.00010	0.00100	<0.00010	<0.00010	<0.00010	0.00025	0.00046
Copper (Cu)- Dissolved	mg/L	0.087	0.00338	0.00153	0.00126	<0.00020	0.00400	0.00354	<0.00020	0.00245	0.00098	0.00165
Iron (Fe)- Dissolved	mg/L		0.017	0.011	0.355	0.238	0.745	0.019	0.680	0.613	1.04	1.620
Lead (Pb)- Dissolved	mg/L	0.025	0.000084	<0.000050	<0.000050	<0.000050	0.000940	0.000100	<0.000050	0.000116	0.000127	0.000373
Magnesium (Mg)- Dissolved	mg/L		180	167	155	148	232	228	173	158	241	248
Manganese (Mn)- Dissolved	mg/L		1.28	1.28	0.057	0.058	0.338	0.451	0.191	0.295	1.98	1.90
Mercury (Hg)- Total	mg/L	0.0028	0.0000063	0.0000117	0.0000115	<0.0000050	0.0002390	0.0000196	0.0001560	0.0000062	0.0001940	<0.0000050
Nickel (Ni)- Dissolved	mg/L	0.49	0.00779	0.00756	0.00115	0.00112	0.00489	0.00421	0.00159	0.00199	0.00880	0.00915
Potassium (K)- Dissolved	mg/L		7.84	7.74	30.1	30.2	17.0	15.6	30.2	26.2	13.2	12.9
Selenium (Se)- Dissolved	mg/L	0.063	0.000066	0.000093	<0.000050	<0.000050	0.000141	0.000283	<0.000050	<0.000050	0.000109	0.000088
Silver (Ag)- Dissolved	mg/L	0.0015	<0.000010	<0.000010	<0.000010	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	0.000010	0.000010
Sodium (Na)- Dissolved	mg/L	2,300	329	292	1,230	1,190	793	792	1,140	1,110	509	544
Zinc (Zn)- Dissolved	mg/L	1.1	0.0044	0.0038	0.0024	0.0020	0.0061	0.0038	<0.0010	0.0030	0.0057	0.0060
Field Parameters												
pH	units		7.22	7.55	7.55	8.05	7.53	7.33	7.97	7.86	7.59	7.11
Specific Conductivity	(µS/cm)		3,350	3,890	9,710	7,390	6,260	6,320	7,370	6,730	5,940	5,860
Polycyclic Aromatic Hydrocarbons												
Naphthalene	mg/L	6.4	<0.000050		<0.000050		<0.000050		<0.000050		<0.000050	
Benzo(a)pyrene	mg/L	0.00081	<0.0000050		<0.0000050		<0.0000050		<0.0000050		<0.0000050	
Anthracene	mg/L	0.0024	<0.000010		<0.000010		<0.000010		<0.000010		<0.000010	
Petroleum Hydrocarbons												
F1 (C6-C10 Hydrocarbons)	mg/L	0.75	<0.10		<0.10		<0.10		<0.10		<0.10	
F2 (C10-C16 Hydrocarbons)	mg/L	0.15	<0.10		<0.10		<0.10		<0.10		<0.10	
F3 (C16-C34 Hydrocarbons)	mg/L	0.50	<0.250		<0.250		<0.250		<0.250		<0.250	
F4 (C34-C50 Hydrocarbons)	mg/L	0.50	<0.250		<0.250		<0.250		<0.250		<0.250	
Benzene	mg/L	0.43	<0.00050		<0.00050		<0.00050		<0.00050		<0.00050	
EthylBenzene	mg/L	2.3	<0.00050		<0.00050		<0.00050		<0.00050		<0.00050	
Toluene	mg/L	18	<0.00050		<0.00050		<0.00050		<0.00050		<0.00050	
Xylene (Total)	mg/L	4.2	<0.00064		<0.00064		<0.00064		<0.00064		<0.00064	
Volatile Organic Carbons												
Vinyl chloride	mg/L	0.0017	<0.0005		<0.0005		<0.0005		<0.0005		<0.0005	
Pesticides												
Diazinon	µg/L		<0.10		<0.10		<0.10		<0.10		<0.10	
Herbicides												
2,4-D	mg/L		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001	

Note: Criteria from Ontario Ministry of the Environment. (2011, July 1). Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition
 Note: Criteria exceedences are highlighted in red.
 * Criteria for total chloride and total metals

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 Water and Waste Eaux et déchets			Table 2.2 2021 Ground Water Monitoring - Till Wells									
			Downgradient and Crossgradient									
			GWQ25-W16A		GWQ25-6N63F		GWQ25-6N57F		GWQ25-6N67F		GWQ25-4N34DR	
	Units	Criteria*	Spring	Autumn	Spring	Spring	Spring	Spring	Spring	Spring	Spring	
Inorganic Parameters												
Alkalinity - Bicarbonate	mg/L		2,240	419	610	399	437	706				
Alkalinity - Carbonate	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0				
Alkalinity - Hydroxide	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0				
Alkalinity - Total	mg/L		2,240	419	610	399	437	706				
Dissolved Hardness (CaCO3)	mg/L		4,050	1,290	1,890	1,480	1,110	2,130				
pH	units		7.09	6.88	6.96	7.27	7.00	7.13				
Specific Conductivity	(µS/cm)		5,350	5,370	6,680	6,040	4,520	6,140				
Turbidity	(ntu)		>4,800	161	1,159	274	186	2,077				
Total Dissolved Solids	mg/L		2,400	4,180	4,450	2,460	3,200	5,300				
Total Suspended Solids	mg/L		13,840	720	2,520	22,320	2,360	3,220				
Total Solids	mg/L		16,200	4,900	6,970	24,800	5,560	8,520				
Dissolved Chloride (Cl)	mg/L	2,300	2,110	1,160	1,210	2,110	840	1,020				
Dissolved Sulphate (SO4)	mg/L		1,200	1,120	1,290	1,530	1,240	3,020				
Nutrients												
Ammonia - Dissolved	mg/L N		0.071	0.614	0.893	1.04	0.692	0.806				
Nitrate - Dissolved	mg/L N		0.016	0.373	0.010	0.009	0.033	0.259				
Total Kjeldahl Nitrogen	mg/L N		1.4	0.7	1.3	1.6	1.2	1.8				
Phosphorus - Dissolved	mg/L P		0.013	0.197	<0.013	<0.013	<0.013	<0.013				
Other												
Cyanide - Total (CN)	mg/L	0.066	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010				
Organic Indicators												
Carbonaceous Oxygen Demand	mg/L		626	80	122	86	60	84				
Total Organic Carbon	mg/L		22.4	10.6	7.0	9.6	4.4	10.9				
Metals												
Arsenic (As)- Dissolved	mg/L	1.9	0.00096	0.00118	0.00057	0.00532	0.00146	0.00141				
Barium (Ba)- Dissolved	mg/L	29	0.0102	0.0106	0.0110	0.0097	0.0100	0.0118				
Beryllium (Be)- Dissolved	mg/L	0.067	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010				
Cadmium (Cd)- Dissolved	mg/L	0.0027	0.000035	0.000033	0.000038	0.000035	0.000006	0.000021				
Calcium (Ca)- Dissolved	mg/L		428	474	455	459	416	442				
Chromium (Cr)- Dissolved	mg/L	0.81	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010				
Copper (Cu)- Dissolved	mg/L	0.087	0.00104	0.00048	0.00144	0.00059	0.00084	0.00341				
Iron (Fe)- Dissolved	mg/L		0.011	0.112	0.016	1.27	0.048	0.065				
Lead (Pb)- Dissolved	mg/L	0.025	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000135				
Magnesium (Mg)- Dissolved	mg/L		192	199	290	211	234	432				
Manganese (Mn)- Dissolved	mg/L		0.894	0.905	0.201	0.531	0.185	0.068				
Mercury (Hg)- Total	mg/L	0.0028	<0.0000050	0.0000274	0.0000220	0.0000249	0.0000182	0.0000248				
Nickel (Ni)- Dissolved	mg/L	0.49	0.00543	0.00531	0.00371	0.00516	0.00344	0.00631				
Potassium (K)- Dissolved	mg/L		10.2	10.3	11.8	13.4	8.92	16.5				
Selenium (Se)- Dissolved	mg/L	0.063	0.000054	0.000065	0.000066	0.000091	<0.000050	0.000121				
Silver (Ag)- Dissolved	mg/L	0.0015	<0.000010	0.000010	<0.000010	<0.000010	<0.000010	<0.000010				
Sodium (Na)- Dissolved	mg/L	2,300	392	457	500	547	287	541				
Zinc (Zn)- Dissolved	mg/L	1.1	0.0046	0.0041	0.0029	0.0029	0.0015	0.0038				
Field Parameters												
pH	units		7.34	7.31	7.40	7.98	7.60	7.83				
Specific Conductivity	(µS/cm)		4,770	4,720	6,370	5,400	4,040	5,660				
Polycyclic Aromatic Hydrocarbons												
Naphthalene	mg/L	6.4	<0.000050					<0.000050				
Benzo(a)pyrene	mg/L	0.00081	<0.0000050					<0.0000050				
Anthracene	mg/L	0.0024	<0.000010					<0.000010				
Petroleum Hydrocarbons												
F1 (C6-C10 Hydrocarbons)	mg/L	0.75	<0.10					<0.10				
F2 (C10-C16 Hydrocarbons)	mg/L	0.15	<0.10					<0.10				
F3 (C16-C34 Hydrocarbons)	mg/L	0.50	<0.250					<0.250				
F4 (C34-C50 Hydrocarbons)	mg/L	0.50	<0.250					<0.250				
Benzene	mg/L	0.43	<0.00050					<0.00050				
EthylBenzene	mg/L	2.3	<0.00050					<0.00050				
Toluene	mg/L	18	<0.00050					<0.00050				
Xylene (Total)	mg/L	4.2	<0.00064					<0.00064				
Volatile Organic Carbons												
Vinyl chloride	mg/L	0.0017	<0.0005					<0.0005				
Pesticides												
Diazinon	µg/L		<0.10					<0.10				
Herbicides												
2,4-D	mg/L		<0.0001					<0.0001				

Note: Criteria from Ontario Ministry of the Environment. (2011, July 1). Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act Table 3: Full Depth Generic Site
 Note: Criteria exceedences are highlighted in red.
 * Criteria for total chloride and total metals

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Table 2.3 2021 Ground Water Monitoring - Bedrock Wells

			Downgradient and Crossgradient											
			GWQ25-W9		GWQ25-W10		GWQ25-W7		GWQ25-W12		GWQ25-W4		GWQ25-W5	
	Units	Criteria*	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
Inorganic Parameters														
Alkalinity - Bicarbonate	mg/L		146	134	189	166	133	120	138	136	49.8	46	138	134
Alkalinity - Carbonate	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Hydroxide	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Total	mg/L		146	134	189	166	133	120	138	136	49.8	46	138	134
Dissolved Hardness (CaCO ₃)	mg/L		955	891	976	868	702	652	884	812	449	448	844	822
pH	units		7.76	7.41	7.24	7.35	7.52	7.52	7.40	7.44	7.98	8.12	7.50	7.45
Specific Conductivity	(µS/cm)		9,600	9,730	9,090	9,330	6,790	6,980	8,690	8,970	7,230	7,260	8,230	8,370
Turbidity	(ntu)		20.8	6.14	6.48	13.6	5.96	11.40	6.82	9.11	15.7	12	5.15	2.5
Total Dissolved Solids	mg/L		6,090	6,270	5,770	5,950	4,260	4,190	5,550	5,620	4,330	4,260	5,300	5,260
Total Suspended Solids	mg/L		212	286	169	198	41	347	145	139	29	208	15	334
Total Solids	mg/L		6,310	6,560	5,940	6,140	4,300	4,540	5,700	5,760	4,350	4,470	5,320	5,590
Dissolved Chloride (Cl)	mg/L	2,300	3,010	3,040	2,480	2,700	4,620	1,970	2,620	2,430	4,140	2,720	4,860	3,370
Dissolved Sulphate (SO ₄)	mg/L		942	950	900	87	640	620	854	117	846	403	580	97
Nutrients														
Ammonia - Dissolved	mg/L N		1.39	1.42	1.34	1.31	0.480	1.93	1.15	1.12	0.818	0.826	0.868	0.968
Nitrate - Dissolved	mg/L N		0.009	0.127	0.006	<0.003	0.004	0.035	<0.003	0.022	<0.003	0.119	<0.003	<0.003
Total Kjeldahl Nitrogen	mg/L N		1.8	1.3	1.8	1.0	2.8	2.0	1.5	0.8	1.1	0.2	1.6	0.8
Phosphorus - Dissolved	mg/L P		0.033	0.014	0.032	0.021	<0.013	<0.013	0.015	0.021	<0.013	<0.013	<0.013	<0.013
Other														
Cyanide - Total (CN)	mg/L	0.066	<0.0010	<0.0010	<0.0010		<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	
Organic Indicators														
Carbonaceous Oxygen Demand	mg/L		139	202	155	121	87	81	123	119	98	93	113	122
Total Organic Carbon	mg/L		1.5	0.8	1.7	1.4	1.4	0.7	1.2	0.9	0.7	0.2	1.3	1.1
Metals														
Arsenic (As)- Dissolved	mg/L	1.9	0.00692	0.00692	0.00532	0.00500	0.00258	0.00272	0.00447	0.00450	0.00502	0.00016	0.00020	0.00477
Barium (Ba)- Dissolved	mg/L	29	0.0114	0.0117	0.0142	0.0139	0.0116	0.0127	0.0123	0.0122	0.0139	0.0093	0.0094	0.0142
Beryllium (Be)- Dissolved	mg/L	0.067	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cadmium (Cd)- Dissolved	mg/L	0.0027	<0.000005	<0.000005	<0.000005	<0.000050	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Calcium (Ca)- Dissolved	mg/L		336	317	336	304	245	239	299	283	320	181	177	320
Chromium (Cr)- Dissolved	mg/L	0.81	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)- Dissolved	mg/L	0.087	<0.00020	<0.00020	<0.00020	<0.0020	<0.00020	0.00233	<0.00020	<0.00020	0.00025	0.00085	0.00077	0.00140
Iron (Fe)- Dissolved	mg/L		0.901	0.872	1.42	1.280	0.839	0.796	0.589	0.540	0.657	1.12	1.25	0.647
Lead (Pb)- Dissolved	mg/L	0.025	<0.000050	<0.000050	<0.000050	<0.00050	<0.000050	0.000096	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000060
Magnesium (Mg)- Dissolved	mg/L		169	154	167	155	127	115	159	148	166	105	102	171
Manganese (Mn)- Dissolved	mg/L		0.0220	0.0218	0.0613	0.0444	0.0096	0.0094	0.0242	0.0206	0.0258	0.0345	0.0397	0.0229
Mercury (Hg)- Total	mg/L	0.0028	<0.0000050	<0.0000050	<0.0000050	<0.000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Nickel (Ni)- Dissolved	mg/L	0.49	0.00146	0.00149	0.00193	<0.0050	<0.00050	<0.00050	0.00129	<0.0050	0.00113	<0.00050	<0.00050	0.00118
Potassium (K)- Dissolved	mg/L		39.3	38.7	40.0	40.0	30.7	29.0	36.9	36.2	34.8	30.8	30.0	36.2
Selenium (Se)- Dissolved	mg/L	0.063	<0.000050	<0.000050	<0.000050	0.00119	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silver (Ag)- Dissolved	mg/L	0.0015	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000012	<0.000010	0.000015
Sodium (Na)- Dissolved	mg/L	2,300	1,580	1,450	1,570	1,450	1,080	984	1,390	1,350	1,340	1,200	1,250	1,240
Zinc (Zn)- Dissolved	mg/L	1.1	<0.0010	<0.0010	0.0017	<0.010	<0.0010	0.0023	0.0010	<0.010	0.0153	0.0015	0.0011	0.0335
Bacteria														
Total Coliforms (MTF)	MPN/100mL		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fecal Coliforms (MTF)	MPN/100mL		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
E. coli (MTF)	MPN/100mL		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Field Parameters														
pH	units		7.94	8.13	7.69	7.93	7.62	7.94	8.09	8.13	8.13	9.28	8.81	8.20
Specific Conductivity	(µS/cm)		8,620	8,530	8,040	8,010	5,480	5,800	7,990	7,860	7,320	6,310	6,490	7,250
Polycyclic Aromatic Hydrocarbons														
Naphthalene	mg/L	6.4	<0.000050	<0.000050	<0.000050		<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050
Benzo(a)pyrene	mg/L	0.00081	<0.0000050	<0.0000050	<0.0000050		<0.0000050		<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Anthracene	mg/L	0.0024	<0.000010	<0.000010	<0.000010		<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Petroleum Hydrocarbons														
F1 (C6-C10 Hydrocarbons)	mg/L	0.75	<0.10	<0.10	<0.10		<0.10		<0.10		<0.10	<0.10	<0.10	<0.10
F2 (C10-C16 Hydrocarbons)	mg/L	0.15	<0.10	<0.10	<0.10		<0.10		<0.10		<0.10	<0.10	<0.10	<0.10
F3 (C16-C34 Hydrocarbons)	mg/L	0.50	<0.250	<0.250	<0.250		<0.250		<0.250		<0.250	<0.250	<0.250	<0.250
F4 (C34-C50 Hydrocarbons)	mg/L	0.50	<0.250	<0.250	<0.250		<0.250		<0.250		<0.250	<0.250	<0.250	<0.250
Benzene	mg/L	0.43	<0.00050	<0.00050	<0.00050		<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050
EthylBenzene	mg/L	2.3	<0.00050	<0.00050	<0.00050		<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050
Toluene	mg/L	18	<0.00050	<0.00050	<0.00050		<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050
Xylene (Total)	mg/L	4.2	<0.00064	<0.00064	<0.00064		<0.00064		<0.00064		<0.00064	<0.00064	<0.00064	<0.00064
Volatile Organic Carbons														
Vinyl chloride	mg/L	0.0017	<0.0005	<0.0005	<0.0005		<0.0005		<0.0005		<0.0005	<0.0005	<0.0005	<0.0005
Pesticides														
Diazinon	µg/L		<0.10	<0.10	<0.10		<0.10		<0.10		<0.10	<0.10	<0.10	<0.10
Herbicides														
2,4-D	mg/L		<0.0001	<0.0001	<0.0001		<0.0001		<0.0001		<0.0001	<0.0001	<0.0001	<0.0001

Note: Criteria from Ontario Ministry of the Environment. (2011, July 1). Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition
 Note: Criteria exceedences are highlighted in red.
 * Criteria for total chloride and total metals

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The 2016-2021 average results are provided in Tables 3.1-3.3. In clay wells, the average copper concentrations were higher in both upstream and downstream samples in 2020 and 2021 compared to earlier years; in till and bedrock wells, copper levels were similar to previous years. In clay, till, and bedrock wells, dissolved chloride and some metals are consistently higher in the downstream samples than the upstream samples. In clay and till wells, sodium is higher in the upstream samples, but in bedrock wells it is higher in the downstream samples. Several parameters are below detection limits in upstream and downstream samples in all three well types.

The Piper diagrams provided in Appendix A display tight groupings of ground water sampling data, which is indicative of no significant ground water chemical changes.

Time versus concentration graphs provided in Appendix B show the historical relationship of the analytical parameters at each monitoring location. In general, the analytical results for ground water obtained in 2021 were found to be similar to those obtained in 2016-2020, and are consistent with background levels.

The Contingency Action Plan identified under Clause 125 was not implemented in 2021.

At this time, we have no recommendations for changes to the ground water monitoring program.

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Table 3.1 2021 Ground Water Quality Comparison - Clay Wells

	Units	Criteria	2016 Average		2017 Average		2018 Average		2019 Average		2020 Average		2021 Average	
			Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient
Inorganic Parameters														
Alkalinity - Bicarbonate	mg/L		625	642	621	603	539	585	530	546	528	555	519	509
Alkalinity - Carbonate	mg/L		<0.50	<0.50	<0.50	<0.50	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Hydroxide	mg/L		<0.50	<0.50	<0.50	<0.50	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Total	mg/L		512	526	509	495	539	585	530	546	528	555	519	509
Dissolved Hardness (CaCO3)	mg/L		2,260	2,666	2,120	2,558	2,325	3,065	1,720	2,202	1,370	1,777	1,360	1,713
pH	units		6.96	6.97	7.04	6.97	6.81	6.80	6.89	6.98	6.81	6.91	6.87	6.87
Specific Conductivity	(µS/cm)		4,560	5,996	4,780	6,386	4,820	6,463	4,800	6,622	4,820	6,523	4,680	6,528
Turbidity	(ntu)		40.4	504.2	91.8	6462.5	116.0	535.4	24.3	42.2	122.0	329.5	26.8	51.8
Total Dissolved Solids	mg/L		3,960	4,967	3,840	4,720	3,890	5,076	3,880	6,783	3,960	5,376	3,900	4,823
Total Suspended Solids	mg/L		310	1,247	500	8,842	280	1,357	268	970	183	1,143	175	2,919
Total Solids	mg/L		4,270	6,214	4,340	13,562	4,170	6,433	4,150	7,753	4,140	6,516	4,070	7,748
Dissolved Chloride (Cl)	mg/L	2,300 *	450	927	470	990	474	948	570	1,067	369	1,057	765	1,892
Dissolved Sulphate (SO4)	mg/L		2,000	1,959	1,670	1,738	1,750	1,911	1,730	2,160	1,680	2,110	1,730	2,052
Nutrients														
Ammonia - Dissolved	mg/L N		<0.003	0.156	0.175	0.584	0.129	0.646	0.005	0.356	0.012	0.362	0.098	0.604
Nitrate - Dissolved	mg/L N		13.0	0.680	0.630	0.426	0.635	0.337	0.855	0.356	0.923	0.408	0.654	0.200
Total Kjeldahl Nitrogen	mg/L N		2.0	1.6	0.7	1.2	0.4	0.9	0.2	0.9	0.2	1.2	1.2	1.6
Phosphorus - Dissolved	mg/L P		0.180	0.012	<0.010	0.020	<0.010	<0.010	<0.013	0.017	0.027	0.027	<0.013	<0.013
Other														
Cyanide - Total (CN)	mg/L	0.066	NR	NR	NR	NR	NR	NR	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic Indicators														
Chemical Oxygen Demand	mg/L		44	122	50	792	40	69	32	156	47	97	37	80
Total Organic Carbon	mg/L		10.6	22.0	10.8	19.6	29.1	17.7	10.0	23.0	9.9	37.7	8.7	17.6
Metals														
Arsenic (As)- Dissolved	mg/L	1.9*	0.000394	0.000730	0.000360	0.000722	0.000530	0.000796	0.000480	0.000758	0.000480	0.000876	0.000500	0.000722
Barium (Ba)- Dissolved	mg/L	29*	0.00908	0.01252	0.00869	0.01179	0.00870	0.01326	0.00810	0.01083	0.00870	0.01166	0.00870	0.01157
Beryllium (Be)- Dissolved	mg/L	0.067*	0.000015	0.000008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cadmium (Cd)- Dissolved	mg/L	0.0027*	0.000068	0.000181	0.000052	0.000216	0.000215	0.000471	0.000471	0.000155	0.000026	0.000141	0.000050	0.000120
Calcium (Ca)- Dissolved	mg/L		572	646	540	637	575	697	579	713	405	597	531	652
Chromium (Cr)- Dissolved	mg/L	0.81*	<0.00010	0.00008	<0.00010	<0.00010	0.00013	0.00043	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)- Dissolved	mg/L	0.087*	0.0020	0.0027	0.0023	0.0021	0.0086	0.0021	0.0014	0.0021	0.00187	0.00278	0.00313	0.00329
Iron (Fe)- Dissolved	mg/L		0.004	0.014	0.023	0.091	0.115	<0.010	0.058	0.016	0.011	0.013	0.013	0.012
Lead (Pb)- Dissolved	mg/L	0.025*	0.000037	0.000053	0.000103	0.000098	<0.000050	0.000343	<0.000050	<0.000050	<0.000050	<0.000050	0.000106	0.000094
Magnesium (Mg)- Dissolved	mg/L		201	256	187	235	216	312	212	334	160	285	202	295
Manganese (Mn)- Dissolved	mg/L		1.72	1.41	1.59	1.87	1.86	2.03	0.86	1.54	1.10	1.47	1.10	1.42
Mercury (Hg)- Total	mg/L	0.0028	<0.000010	<0.000010	<0.000002	<0.000002	<0.000005	0.0000612	<0.000050	0.0000710	<0.0000050	0.0000680	<0.0000050	0.0000852
Nickel (Ni)- Dissolved	mg/L	0.49*	0.00698	0.00950	0.00643	0.00992	0.00724	0.01277	0.00667	0.00972	0.00640	0.00925	0.00696	0.01119
Potassium (K)- Dissolved	mg/L		9.7	10.9	9.2	10.1	10.9	14.0	10.2	11.4	9.8	10.7	9.7	11.4
Selenium (Se)- Dissolved	mg/L	0.063*	0.00018	0.00027	<0.00040	<0.00040	0.00013	0.00023	0.00014	0.01189	0.00069	0.00048	0.000114	0.00021
Silver (Ag)- Dissolved	mg/L	0.0015*	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.000010	<0.000010	0.000010	0.000020	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)- Dissolved	mg/L	2,300*	336	485	325	534	345	582	332	267	415	309	509	509
Zinc (Zn)- Dissolved	mg/L	1.1*	0.00359	0.00572	0.00550	0.00766	0.00620	0.01546	0.00450	0.00547	0.00640	0.00611	0.00530	0.00607
Field Parameters														
pH	units		7.36	7.38	7.84	7.78	7.02	7.19	7.44	7.67	7.44	7.34	7.24	7.26
Specific Conductivity	(µS/cm)		2,330	3,271	4,010	5,248	4,330	5,986	4,050	5,295	4,050	5,010	4,310	5,693
Polycyclic Aromatic Hydrocarbons														
Naphthalene	mg/L	6.4	<0.000050	NR	NR	NR	<0.000050	<0.000050	<0.000050		<0.000050		<0.000050	
Benzo(a)pyrene	mg/L	0.00081	<0.000010	NR	NR	NR	<0.000050	<0.000050	<0.000050		<0.000050		<0.000050	
Anthracene	mg/L	0.0024	<0.000050	NR	NR	NR	<0.000010	<0.000010	<0.000010		<0.000010		<0.000010	
Petroleum Hydrocarbons														
F1 (C6-C10 Hydrocarbons)	mg/L	0.75	<0.025	NR	<0.025	NR	<0.10	<0.10	<0.10		<0.10		<0.10	
F2 (C10-C16 Hydrocarbons)	mg/L	0.15	<0.10	NR	<0.10	NR	<0.10	<0.10	<0.10		<0.10		<0.10	
F3 (C16-C34 Hydrocarbons)	mg/L	0.50	<0.20	NR	<0.20	NR	<0.25	<0.25	<0.25		<0.25		<0.25	
F4 (C34-C50 Hydrocarbons)	mg/L	0.50	<0.20	NR	<0.20	NR	<0.25	<0.25	<0.25		<0.25		<0.25	
Benzene	mg/L	0.43	<0.00010	NR	<0.00010	NR	<0.00050	<0.00050	<0.00050		<0.00050		<0.00050	
Ethylbenzene	mg/L	2.3	<0.00010	NR	<0.00010	NR	<0.00050	<0.00050	<0.00050		<0.00050		<0.00050	
Toluene	mg/L	18	<0.00020	NR	<0.00020	NR	<0.00050	<0.00050	<0.00050		<0.00050		<0.00050	
Xylene (Total)	mg/L	4.2*	<0.00010	NR	<0.00010	NR	<0.00050	<0.00050	<0.00050		<0.00064		<0.00064	
Volatile Organic Carbons														
Vinyl chloride	mg/L	1.7	<0.0002	NR	<0.0002	NR	<0.0005	<0.0005	<0.0005		<0.0005		<0.0005	
Pesticides														
Diazinon	µg/L		<2.0	NR	<2.0	NR	<0.10	<0.10	<0.10		<0.10		<0.10	
Herbicides														
2,4-D	mg/L		<0.0010	NR	<0.0010	NR	<0.0010	<0.0010	<0.0010		<0.0010		<0.0010	

Note: Criteria from Ontario Ministry of the Environment. (2011, July 1). Soil, Ground Water and Sediment Standards for Use Under Part XVI of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

Note: Where value is expressed as less than (<), the value is halved and used in the calculations, where value is expressed as (>), the value is used in the calculations.

* Criteria for total chloride, total metals and xylene mixture

NR - No result due to lab error.

Client File No. 5556.00

Manitoba Environment Act Licence No. 3081 R

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Table 3.2 2021 Ground Water Quality Comparison - Till Wells

Inorganic Parameters	Units	Criteria	2016		2017		2018		2019		2020		2021	
			Average		Average		Average		Average		Average		Average	
			Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient
Alkalinity - Bicarbonate	mg/L		667	399	663	366	683	536	604	1,007	572	554	576	539
Alkalinity - Carbonate	mg/L		<0.50	<0.50	<0.50	<0.50	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Hydroxide	mg/L		<0.50	<0.50	<0.50	<0.50	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Total	mg/L		547	327	544	300	683	536	604	1,007	572	554	576	539
Dissolved Hardness (CaCO3)	mg/L		1,580	1,977	1,550	2,001	1,853	2,415	1,510	3,436	1,240	2,435	1,170	3,216
pH	units		6.97	7.21	6.92	7.11	6.96	7.11	6.93	7.12	6.95	7.13	6.90	7.12
Specific Conductivity	(µS/cm)		4,380	6,814	4,300	7,027	4,280	6,888	4,270	7,049	4,080	6,694	4,185	6,874
Turbidity	(ntu)		209	3,110	183	4,259	215	5,126	247	3,338	186	1,636	150	2,747
Total Dissolved Solids	mg/L		3,470	4,703	3,260	4,774	3,345	4,715	3,300	4,297	3,285	4,318	3,285	4,734
Total Suspended Solids	mg/L		610	11,186	640	9,840	616	7,528	880	9,199	581	7,044	325	11,398
Total Solids	mg/L		4,080	15,889	3,900	14,614	3,958	12,245	4,180	12,768	3,865	11,355	3,615	16,131
Dissolved Chloride (Cl)	mg/L	2,300 *	380	1,465	390	1,562	398	1,518	436	1,643	405	1,415	3,200	1,898
Dissolved Sulphate (SO4)	mg/L		1,450	1,343	1,430	1,258	1,465	1,308	1,375	1,101	1,405	1,500	1,063	1,340
Nutrients														
Ammonia - Dissolved	mg/L N		0.161	0.709	0.304	0.845	0.496	0.892	0.386	0.859	0.198	0.758	0.612	0.892
Nitrate - Dissolved	mg/L N		0.445	0.257	0.371	0.086	0.231	0.086	0.206	0.048	0.588	0.189	0.502	0.412
Total Kjeldahl Nitrogen	mg/L N		1.0	3.0	0.8	1.6	0.9	1.4	0.7	1.5	0.3	1.3	0.7	1.6
Phosphorus - Dissolved	mg/L P		0.030	0.036	<0.010	0.022	0.012	0.018	<0.013	0.013	0.023	0.030	0.081	1.667
Other														
Cyanide - Total (CN)	mg/L	0.066	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic Indicators														
Chemical Oxygen Demand	mg/L		45	259	40	286	25	504	43	354	43	252	42	299
Total Organic Carbon	mg/L		9.2	39.6	10.0	31.1	19.9	32.3	9.4	18.1	8.4	47.0	8.1	18.9
Metals														
Arsenic (As)- Dissolved	mg/L	1.9*	0.002480	0.001978	0.001210	0.002620	0.001190	0.002578	0.001110	0.003034	0.000975	0.001805	0.000865	0.002219
Barium (Ba)- Dissolved	mg/L	29*	0.00915	0.01146	0.00809	0.01497	0.00827	0.01380	0.00804	0.01161	0.00840	0.01268	0.00800	0.01244
Beryllium (Be)- Dissolved	mg/L	0.067*	0.000014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cadmium (Cd)- Dissolved	mg/L	0.0027*	0.000058	0.000076	<0.000050	0.000070	0.000037	0.000076	0.000057	0.000033	0.000022	0.000050	0.000022	0.000027
Calcium (Ca)- Dissolved	mg/L		376	475	457	461	367	457	495	439	416	439	419	399
Chromium (Cr)- Dissolved	mg/L	0.81*	0.00030	<0.0010	<0.0010	0.00130	<0.0010	0.00051	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	0.00016
Copper (Cu)- Dissolved	mg/L	0.087*	0.00028	0.00019	0.00019	0.00037	0.00019	0.00023	0.00014	0.00002	0.00016	0.00013	0.00025	0.00016
Iron (Fe)- Dissolved	mg/L		0.006	0.166	0.194	0.884	<0.010	0.662	0.022	0.530	0.058	0.318	0.014	0.488
Lead (Pb)- Dissolved	mg/L	0.025*	0.000059	<0.000050	0.000067	0.000050	<0.000050	0.000050	<0.000050	<0.000050	<0.000050	0.000064	0.000055	0.000142
Magnesium (Mg)- Dissolved	mg/L		155	201	154	210	171	257	195	231	166	214	174	224
Manganese (Mn)- Dissolved	mg/L		0.77	0.55	0.87	0.49	1.09	0.88	1.17	0.55	1.25	0.78	1.28	0.58
Mercury (Hg)- Total	mg/L	0.0028	<0.000010	<0.000010	<0.000020	0.0000280	<0.000005	0.0002658	0.0000190	0.0000650	0.000063	0.0001407	0.0000090	0.0000537
Nickel (Ni)- Dissolved	mg/L	0.49*	0.00737	0.00404	0.00759	0.00462	0.00731	0.00545	0.00791	0.00418	0.00763	0.00487	0.00768	0.00445
Potassium (K)- Dissolved	mg/L		8.2	14.8	7.5	17.6	9.0	19.6	8.6	19.6	8.6	16.9	7.8	17.6
Selenium (Se)- Dissolved	mg/L	0.063*	0.00012	<0.00040	<0.00040	<0.00040	0.00010	0.00007	0.00008	0.00025	<0.000050	0.00010	0.000080	0.000082
Silver (Ag)- Dissolved	mg/L	0.0015*	<0.000005	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010	0.000015	0.000021	0.000013	<0.000010	<0.000010	<0.000010
Sodium (Na)- Dissolved	mg/L	2,300*	521	651	422	772	396	784	371	835	318	676	311	717
Zinc (Zn)- Dissolved	mg/L	1.1*	0.00388	0.00717	0.00550	0.00602	0.00630	0.00795	0.00360	0.00250	0.00340	0.00380	0.00410	0.00350
Field Parameters														
pH	units		7.35	7.50	7.85	7.93	7.26	7.37	7.59	7.80	7.27	7.34	7.39	7.60
Specific Conductivity	(µS/cm)		3,190	3,147	3,790	6,481	3,630	6,295	4,650	5,581	3,875	5,768	3,620	6,181
Polycyclic Aromatic Hydrocarbons														
Naphthalene	mg/L	6.4	<0.000050	<0.000050	NR	NR	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Benzo(a)pyrene	mg/L	0.00081	<0.000010	<0.000010	NR	NR	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Anthracene	mg/L	0.0024	<0.000050	<0.000050	NR	NR	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Petroleum Hydrocarbons														
F1 (C6-C10 Hydrocarbons)	mg/L	0.75	<0.025	<0.025	<0.025	<0.025	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
F2 (C10-C16 Hydrocarbons)	mg/L	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
F3 (C16-C34 Hydrocarbons)	mg/L	0.50	<0.20	<0.20	<0.20	<0.20	<0.25	0.277	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
F4 (C34-C50 Hydrocarbons)	mg/L	0.50	<0.20	<0.20	<0.20	<0.20	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Benzene	mg/L	0.43	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Ethylbenzene	mg/L	2.3	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Toluene	mg/L	18	<0.00020	<0.00020	<0.00020	0.00041	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Xylene (Total)	mg/L	4.2*	<0.00010	<0.00010	<0.00010	0.00037	<0.00050	<0.00050	<0.00050	<0.00050	<0.00064	<0.00064	<0.00064	<0.00064
Volatile Organic Carbons														
Vinyl chloride	mg/L	1.7	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Pesticides														
Diazinon	µg/L		<2.0	<2.0	<2.0	<2.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Herbicides														
2,4-D	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0001	<0.0010	<0.0001	<0.0001

Note: Criteria from Ontario Ministry of the Environment. (2011, July 1). Soil, Ground Water and Sediment Standards for Use Under Part XVI.1 of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

Note: Where value is expressed as less than (<), the value is halved and used in the calculations, where value is expressed as (-), the value is used in the calculations.
* Criteria for total chloride, total metals and xylene mixture
NR - No result due to lab error.

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Table 3.3 2021 Ground Water Quality Comparison - Bedrock Wells

Parameters	Units	Criteria	2016		2017		2018		2019		2020		2021	
			Average		Average		Average		Average		Average		Average	
			Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient
Inorganic Parameters														
Alkalinity - Bicarbonate	mg/L		164	166	164	162	1,454	136	150	154	141	138	137	140
Alkalinity - Carbonate	mg/L		<0.50	<0.50	<0.50	<0.50	<3.0	5.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Hydroxide	mg/L		<0.50	<0.50	<0.50	<0.50	<3.0	17.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Total	mg/L		134	136	134	133	1,454	155	150	154	141	138	137	140
Dissolved Hardness (CaCO3)	mg/L		1,065	1,237	1,390	1,200	1,544	1,523	998	872	819	811	908	809
pH	units		7.56	7.67	7.42	7.49	7.54	7.67	7.58	7.51	7.47	7.57	7.36	7.49
Specific Conductivity	(µS/cm)		10,350	8,484	9,965	8,373	10,035	8,255	10,100	8,433	10,105	8,263	10,050	8,400
Turbidity	(ntu)		15.4	38.9	10.0	26.1	7.6	13.3	6.8	12.4	11.6	8.0	9.6	10.4
Total Dissolved Solids	mg/L		6,265	5,033	6,145	5,020	6,320	5,043	6,220	4,989	6,245	5,032	6,370	5,263
Total Suspended Solids	mg/L		320	426	640	590	383	416	401	475	359	334	144	221
Total Solids	mg/L		6,585	5,458	6,785	5,611	6,703	5,459	6,625	5,463	6,610	5,366	6,515	5,484
Dissolved Chloride (Cl)	mg/L	2,300*	3,000	2,413	2,850	2,208	2,785	2,131	1,855	2,281	2,900	2,393	5,185	3,045
Dissolved Sulphate (SO4)	mg/L		974	759	943	765	941	747	833	680	949	882	512	547
Nutrients														
Ammonia - Dissolved	mg/L N		1.31	1.06	1.36	1.10	0.686	1.09	1.44	1.11	1.43	1.12	1.27	1.06
Nitrate - Dissolved	mg/L N		0.012	0.025	<0.003	0.011	0.631	0.046	<0.003	0.035	0.010	0.005	0.013	0.023
Total Kjeldahl Nitrogen	mg/L N		2.0	1.6	1.6	1.3	1.1	1.2	2.0	1.5	1.7	1.1	1.7	1.3
Phosphorus - Dissolved	mg/L P		<0.018	<0.010	<0.010	<0.010	0.015	<0.010	<0.013	<0.013	<0.013	<0.013	0.017	0.015
Other														
Cyanide - Total (CN)	mg/L	0.066	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.0050	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010
Organic Indicators														
Chemical Oxygen Demand	mg/L		111	102	90	75	80	59	118	81	177	115	185	119
Total Organic Carbon	mg/L		3.5	2.1	3.7	3.2	3.4	2.6	1.9	2.3	1.5	1.1	1.2	1.0
Metals														
Arsenic (As)- Dissolved	mg/L	1.9*	0.001508	0.002834	0.002915	0.003750	0.003140	0.004048	0.000865	0.003519	0.005830	0.006633	0.005455	0.005001
Barium (Ba)- Dissolved	mg/L	29*	0.01019	0.01730	0.01400	0.01874	0.01265	0.01900	0.01490	0.02337	0.01250	0.01287	0.01210	0.01260
Beryllium (Be)- Dissolved	mg/L	0.067*	<0.000050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cadmium (Cd)- Dissolved	mg/L	0.0027*	0.000050	0.000014	0.000214	0.000058	0.000090	0.000052	0.000140	0.000130	0.000006	<0.000005	0.000016	0.000008
Calcium (Ca)- Dissolved	mg/L		245	303	312	282	340	313	353	326	315	295	331	294
Chromium (Cr)- Dissolved	mg/L	0.81*	0.00021	0.00454	<0.00010	0.00060	0.00064	0.00375	0.00052	0.00645	<0.00010	0.00012	<0.00010	0.00015
Copper (Cu)- Dissolved	mg/L	0.087*	0.0004	0.0029	0.0032	0.0013	0.0017	0.0017	0.0036	0.0042	<0.0002	0.0003	0.0012	0.0009
Iron (Fe)- Dissolved	mg/L		0.084	0.338	0.633	0.648	0.673	0.786	<0.010	0.516	1.305	0.750	1.310	0.772
Lead (Pb)- Dissolved	mg/L	0.025*	0.000016	0.000034	0.000161	0.000079	0.000106	0.000163	0.000094	0.000186	0.000152	<0.000050	0.000210	0.000085
Magnesium (Mg)- Dissolved	mg/L		110	128	169	129	166	129	166	129	151	162	152	152
Manganese (Mn)- Dissolved	mg/L		0.02	0.03	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03
Mercury (Hg)- Total	mg/L	0.0028	<0.000010	<0.000010	<0.000002	<0.000002	<0.000005	<0.000005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)- Dissolved	mg/L	0.49*	0.00129	0.00131	0.00200	0.00145	0.00203	0.00176	0.00289	0.00280	0.00136	0.00119	0.00184	0.00145
Potassium (K)- Dissolved	mg/L		30.1	28.7	41.0	29.6	45.4	34.1	49.0	30.8	46.6	36.9	43.2	34.4
Selenium (Se)- Dissolved	mg/L	0.063*	<0.00020	<0.00040	<0.00040	<0.00040	<0.00050	<0.00011	<0.00050	0.00036	<0.00050	<0.00050	<0.00050	0.00011
Silver (Ag)- Dissolved	mg/L	0.0015*	<0.000025	<0.000050	<0.000050	<0.000050	0.000020	<0.000010	0.000014	0.000036	0.000020	0.000028	<0.000010	0.000069
Sodium (Na)- Dissolved	mg/L	2,300*	1,140	1,074	1,590	1,126	1,750	1,238	1,750	1,129	1,645	1,306	1,675	1,308
Zinc (Zn)- Dissolved	mg/L	1.1*	0.01309	0.00914	0.03980	0.00980	0.01450	0.01103	0.05180	0.01720	0.00465	0.00400	0.00440	0.00421
Bacteria														
Total Coliforms (MTF)	MPN/100mL		12	23	<3	<3	<1	21	<1	2	<1	5	<1	<1
Fecal Coliforms (MTF)	MPN/100mL		<3	<3	<3	<3	<1	1	<1	1	<1	<1	<1	<1
E. coli (MTF)	MPN/100mL		<3	<3	<3	<3	<1	<1	<1	<1	<1	<1	<1	<1
Field Parameters														
pH	units		7.87	7.73	8.34	8.31	7.30	7.96	7.77	7.78	8.16	8.09	7.88	7.96
Specific Conductivity	(µS/cm)		5,017	5,073	8,015	7,812	9,140	6,836	8,215	6,961	9,185	7,403	8,735	6,635
Polycyclic Aromatic Hydrocarbons														
Naphthalene	mg/L	6.4	<0.000050	0.000083	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Benzo(a)pyrene	mg/L	0.00081	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene	mg/L	0.0024	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Petroleum Hydrocarbons														
F1 (C6-C10 Hydrocarbons)	mg/L	0.75	<0.025	0.107	<0.025	<0.025	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.20	<0.10
F2 (C10-C16 Hydrocarbons)	mg/L	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
F3 (C16-C34 Hydrocarbons)	mg/L	0.50	<0.20	<0.20	<0.20	<0.20	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
F4 (C34-C50 Hydrocarbons)	mg/L	0.50	<0.20	<0.20	<0.20	<0.20	<0.25	<0.25	<0.25	<0.25	0.27	<0.25	<0.25	<0.25
Benzene	mg/L	0.43	<0.00010	<0.00050	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00326	<0.00050
Ethylbenzene	mg/L	2.3	<0.00010	<0.00050	<0.00010	0.00017	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00758	<0.00050
Toluene	mg/L	18	<0.00020	0.00046	0.00048	0.00048	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.02528	<0.00050
Xylene (Total)	mg/L	4.2*	<0.00010	0.00029	<0.00010	0.00095	<0.00050	<0.00050	<0.00050	<0.00050	<0.00064	<0.00064	0.03286	<0.00064
Volatile Organic Carbons														
Vinyl chloride	mg/L	1.7	<0.00020	<0.00020	<0.00020	<0.00020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Pesticides														
Diazinon	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Herbicides														
2,4-D	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0002

Note: Criteria from Ontario Ministry of the Environment, (2011, July 1). Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition
 Note: Where value is expressed as less than (<), the value is halved and used in the calculations, where value is expressed as (>), the value is used in the calculations.
 * Criteria for total chloride, total metals and xylene mixture

BRADY ROAD RESOURCE MANAGEMENT FACILITY ANNUAL REPORT – 2021**5.2 SURFACE WATER**

Surface water flows at the BRRMF are managed by perimeter ditching and the central access road, which creates a barrier between the impacted water ditches on the North and the clean water ditches on the South; there are also 8 surface water retention ponds. The system is designed to run dry for most of the year, as such, grab sampling is performed three times per year: spring run-off, summer run-off, and autumn run-off. The surface water sampling points are shown in Figure 3.

As per the BRRMF Operating Plan, surface water is managed in accordance with the Surface Water Sampling and Analysis Plan (SAP), as specified under Clause 115. Compliance parameters are applied to the upstream and downstream sampling points, with modifications at other locations interior to the site. Sampling for the clean water ponds (SWQ-25-9a and b) is similar to sampling for perimeter ditching. Sampling for impacted water ponds: Active Area Collection Pond (SWQ-25-6), Biosolids Storm Water Pond (SWQ-25-7), Leaf and Yard Waste Storm Water Pond (SWQ-25-8) and dry ponds (SWQ-25-11 a, b, and c) is performed only prior to discharge events. The Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life are used as the regulatory guideline (CCME, 2019). Weekly field monitoring is performed at the weir from spring thaw to freeze-up.

In 2021, a total of 18 surface water samples were analyzed – one upstream sample, two downstream samples, seven interior samples, and eight pond samples. There were no deviations from the Surface Water SAP or from normal sample collection and preservation practices, although we were unable to obtain any autumn samples because the site was completely dry. Weekly weir data is provided in Table 4 and the 2021 surface water results are provided in Tables 5.1 and 5.2.

The analytical results for some of the pond samples exceeded the guidelines for pH, chloride, cyanide, cadmium, copper, iron, nickel, selenium, and zinc; the water was retained in the ponds or hauled for treatment as required. Many of the analytical results for perimeter ditching were highly variable between sample points. The concentrations of iron and selenium exceeded the guidelines at some interior locations, but were below the guideline limits at both the upstream and downstream locations. Samples collected from the ponds and the perimeter ditching frequently contain elevated levels of arsenic, which is due to its natural occurrence in Manitoba soils.



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Table 4. 2021 Weekly Weir Data

Date	Flow (m/s)	pH (units)	Conductivity (m/s)	DO (mg/L)	Temp (°C)
9-Apr-21	0.0	8.50	1.61	11.3	4.2
16-Apr-21	0.0	10.27	0.99	11.1	14.2
23-Apr-21	0.0	9.59	1.22	11.4	14.3
29-Apr-21	0.0	10.08	1.21	11.6	18.4
7-May-21	0.0	9.11	1.44	10.7	15.0
14-May-21	0.0	8.98	1.63	10.7	17.5
21-May-21	0.0	8.37	1.94	10.3	9.2
28-May-21	0.0	9.34	1.90	12.4	15.6
4-Jun-21	0.0	9.53	1.93	13.9	31.1
11-Jun-21	0.0	9.45	1.81	9.4	21.1
18-Jun-21	0.0	9.99	1.93	18.8	21.5
25-Jun-21	0.0	9.78	2.44	9.7	20.5
2-Jul-21	0.0	8.20	4.19	*na	27.5
9-Jul-21	**ns	**ns	**ns	**ns	**ns
16-Jul-21	**ns	**ns	**ns	**ns	**ns
23-Jul-21	**ns	**ns	**ns	**ns	**ns
30-Jul-21	**ns	**ns	**ns	**ns	**ns
6-Aug-21	**ns	**ns	**ns	**ns	**ns
13-Aug-21	**ns	**ns	**ns	**ns	**ns
20-Aug-21	**ns	**ns	**ns	**ns	**ns
28-Aug-21	**ns	**ns	**ns	**ns	**ns

*na - not analysed due to equipment malfunction

**ns - no sample because weir was completely dry

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Table 5.1 2021 Surface Water Monitoring - Ponds

			Ponds							
	Units	Criteria*	SW25-6	SW25-7	SW25-8	SW25-9A	SW25-9B	SW25-11A	SW25-11B	SW25-11C
			19-Apr-21	19-Apr-21	19-Apr-21	19-Apr-21	19-Apr-21	19-Apr-21	19-Apr-21	19-Apr-21
Inorganic Parameters										
Alkalinity - Bicarbonate	mg/L		2,360	271	674	243	201	673	340	392
Alkalinity - Carbonate	mg/L		<3.0	33.4	58.1	11.6	15.9	173	350	322
Alkalinity - Hydroxide	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Total	mg/L		2,360	304	732	255	217	845	690	714
Dissolved Hardness (CaCO3)	mg/L		299	234	313	142	90.2	151	66.5	77.4
pH	units	6.5-9.0	8.09	8.66	8.42	8.41	9.10	9.09	9.78	9.46
Specific Conductivity	(µS/cm)		7,550	2,250	2,710	855	632	6,310	4,780	4,740
Turbidity	(ntu)		84.6	121	37.6	68.7	49.1	231	121	99.3
Total Dissolved Solids	mg/L		4,750	1,500	1,930	545	410	4,240	3,220	3,160
Total Suspended Solids	mg/L		584	275	179	259	114	779	465	471
Total Solids	mg/L		5,340	1,770	2,110	804	524	5,010	3,680	3,630
Dissolved Chloride (Cl)	mg/L	640	1,330	29.9	337	98.0	62.0	1,290	1,000	1,020
Dissolved Sulphate (SO4)	mg/L		381	437	247	78.4	48.0	40.0	525	478
Nutrients										
Ammonia - Dissolved	mg/L N		0.188	0.944	>2.0	>2.0	0.206	>2.0	0.036	0.016
Nitrate - Dissolved	mg/L N	13	0.016	0.637	0.688	0.221	0.117	9.63	0.548	0.012
Total Kjeldahl Nitrogen	mg/L N		249	6.27	15.3	4.60	2.70	61.6	33.3	24.2
Phosphorus - Dissolved	mg/L P		0.586	<0.013	4.13	<0.013	<0.013	<0.013	<0.013	<0.013
Other										
Cyanide - Total (CN)	mg/L	0.0050	0.0072	<0.0010	0.0024	<0.0010	<0.0010	<0.0050	0.0014	0.0010
Organic Indicators										
Carbonaceous Oxygen Demand	mg/L		1,260	183	330	71	99	904	736	662
Biochemical Oxygen Demand	mg/L		63	14	9	4	18	130	142	74
Metals										
Arsenic (As)- Dissolved	mg/L	0.005	0.0288	0.0092	0.0194	0.0043	0.0052	0.0188	0.0232	0.0232
Barium (Ba)- Dissolved	mg/L		0.1210	0.0801	0.0739	0.0537	0.0485	0.1790	0.1030	0.0790
Beryllium (Be)- Dissolved	mg/L		0.00018	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cadmium (Cd)- Dissolved	mg/L	0.00009	0.000155	0.000008	0.000018	0.000006	<0.000005	0.000034	0.000020	0.000021
Calcium (Ca)- Dissolved	mg/L		101	76.8	121	49.4	32.0	52.5	23.1	26.2
Chromium (Cr)- Dissolved	mg/L		0.04940	0.00015	0.00069	<0.00010	<0.00010	0.00353	0.00147	0.00110
Copper (Cu)- Dissolved	mg/L	0.0040	0.02290	0.00167	0.00652	0.00296	0.00264	0.00374	0.00311	0.00355
Iron (Fe)- Dissolved	mg/L	0.30	0.817	0.024	0.080	0.013	0.037	0.047	0.014	0.023
Lead (Pb)- Dissolved	mg/L	0.0070	0.001100	<0.000050	0.000117	<0.000050	0.000068	0.000237	0.000169	0.000113
Magnesium (Mg)- Dissolved	mg/L		292	144	136	46.7	40.0	414	323	306
Manganese (Mn)- Dissolved	mg/L		0.2400	0.0421	0.5010	0.0991	0.0148	0.0490	0.0148	0.0097
Mercury (Hg)- Dissolved	mg/L	0.000026	0.0000135	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000006
Nickel (Ni)- Dissolved	mg/L	0.150	0.2240	0.0106	0.0285	0.0076	0.0080	0.1100	0.0702	0.0617
Potassium (K)- Dissolved	mg/L		199	57.8	347	16.1	15.7	211	179	167
Selenium (Se)- Dissolved	mg/L	0.0010	0.003700	0.000517	0.001000	0.000381	0.000331	0.001560	0.000784	0.000772
Sodium (Na)- Dissolved	mg/L		1,030	158	96.1	46.8	31.9	757	592	575
Zinc (Zn)- Dissolved	mg/L	0.030	0.0813	<0.0010	0.0045	<0.0010	<0.0010	0.0096	0.0017	<0.0010
Bacteria										
Total Coliforms (MTF)	MPN/100mL		6,130	3,970	1,860	2,420	>2,420	>24,200	860	100
Fecal Coliforms (MTF)	MPN/100mL		3,440	310	860	378	1,990	>24,200	590	70
E. coli (MTF)	MPN/100mL		1,200	200	510	461	1,730	>24,200	300	40
Field Parameters										
pH	units	6.5-9.0	8.76	9.49	9.12	9.42	10.03	9.71	10.34	10.40
Specific Conductivity	(µS/cm)		8,500	2,380	2,870	985	705	5,430	5,440	4,920
Temperature			4.4	3.8	7.1	5.2	6.4	7.2	4.8	5.2

Note: Criteria from Canadian Council of Ministers of the Environment, Canadian Environmental Quality Guidelines Summary Table. Water Quality Guidelines for the Protection of Freshwater Aquatic Life. (CCME, 2019)
* Criteria for total chloride and total metals

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Table 5.2 2021 Surface Water Monitoring - Perimeter Ditch

	Units	Criteria*	Upstream		Downstream		Interior					
			SW25-1	SW25-2	SW25-16	SW25-12	SW25-13A	SW25-13B	SW25-14A	SW25-14B	SW25-15A	SW25-15B
			19-Apr-21	19-Apr-21	19-Apr-21	19-Apr-21	19-Apr-21	19-Apr-21	19-Apr-21	19-Apr-21	19-Apr-21	19-Apr-21
Inorganic Parameters												
Alkalinity - Bicarbonate	mg/L		185	213	167	217	233	232	277	293	307	215
Alkalinity - Carbonate	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	13	162
Alkalinity - Hydroxide	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Total	mg/L		185	213	167	217	233	232	277	293	320	378
Dissolved Hardness (CaCO3)	mg/L		105	319	106	172	312	271	329	180	134	104
pH	units	6.5-9.0	7.28	8.00	7.97	7.52	7.97	7.84	8.11	7.94	8.69	9.53
Specific Conductivity	(µS/cm)		433	1,100	615	952	1,730	1,930	2,460	634	1,920	2,060
Turbidity	(ntu)		28.4	683	15.0	11.3	262	15.1	23.4	62.8	34.0	10.0
Total Dissolved Solids	mg/L		270	706	385	637	975	1,080	1,430	433	1,170	1,290
Total Suspended Solids	mg/L		52	2,750	121	7	959	312	1,104	669	291	122
Total Solids	mg/L		322	3,460	506	644	1,930	1,400	2,530	1,100	1,460	1,410
Dissolved Chloride (Cl)	mg/L	640	22	89	56	120	344	370	501	15	322	365
Dissolved Sulphate (SO4)	mg/L		20.4	285	60.6	111	151	178	273	57.5	212	210
Nutrients												
Ammonia - Dissolved	mg/L N		0.013	nr	0.047	<0.003	<0.003	<0.003	0.007	0.045	0.004	0.012
Nitrate - Dissolved	mg/L N	13	<0.003	<0.003	0.028	<0.003	0.018	<0.003	0.373	<0.003	0.018	0.097
Total Kjeldahl Nitrogen	mg/L N		1.0	2.7	2.3	1.2	3.1	1.1	1.7	2.6	5.2	6.5
Phosphorus - Dissolved	mg/L P		0.077	0.036	0.136	0.028	<0.013	<0.013	0.036	0.106	0.561	0.496
Other												
Cyanide - Total (CN)	mg/L	0.0050	<0.0010	0.0026	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011
Organic Indicators												
Carbonaceous Oxygen Demand	mg/L		63	220	126	58	199	60	86	154	211	172
Biochemical Oxygen Demand	mg/L		<4	<4	11	<4	23	4	11	17	52	11
Metals												
Arsenic (As)- Dissolved	mg/L	0.0050	0.00446	0.00403	0.00333	0.00221	0.00153	0.00149	0.00158	0.00872	0.01130	0.01390
Barium (Ba)- Dissolved	mg/L		0.0422	0.0514	0.0353	0.0668	0.0903	0.0897	0.1090	0.1030	0.0512	0.0590
Beryllium (Be)- Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cadmium (Cd)- Dissolved	mg/L	0.00009	0.000024	0.000010	0.000008	0.000014	0.000012	0.000006	0.000011	0.000017	0.000018	0.000007
Calcium (Ca)- Dissolved	mg/L		37.9	70.8	40.6	62.6	93.5	108	140	68.7	51.2	41.9
Chromium (Cr)- Dissolved	mg/L		0.00015	0.00013	0.00017	0.00015	0.00012	0.00015	0.00017	0.00028	0.00092	0.00066
Copper (Cu)- Dissolved	mg/L	0.0040	0.00159	0.00286	0.00282	0.00195	0.00208	0.00209	0.00351	0.00345	0.00350	0.00270
Iron (Fe)- Dissolved	mg/L	0.30	0.070	0.058	0.050	0.121	0.074	0.582	0.041	0.356	0.034	0.030
Lead (Pb)- Dissolved	mg/L	0.0070	0.000089	<0.000050	0.000073	0.000068	0.000051	0.000105	0.000079	0.000273	<0.000050	<0.000050
Magnesium (Mg)- Dissolved	mg/L		20.8	61.6	27.9	45.9	67.4	82.1	123	33.3	104	130
Manganese (Mn)- Dissolved	mg/L		0.2550	0.0613	0.0061	0.1120	0.0398	0.0981	0.0267	0.1840	0.0240	0.0384
Mercury (Hg)- Dissolved	mg/L	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Nickel (Ni)- Dissolved	mg/L	0.150	0.00263	0.00537	0.00290	0.00271	0.00270	0.00310	0.00415	0.00537	0.01920	0.02400
Potassium (K)- Dissolved	mg/L		9.45	30.3	16.5	11.4	14.1	13.9	17.9	19.3	66.7	74.5
Selenium (Se)- Dissolved	mg/L	0.0010	0.000115	0.000411	0.000182	0.000220	0.000260	0.000320	0.000510	0.000225	0.001550	0.000581
Sodium (Na)- Dissolved	mg/L		13.9	49.3	40.7	75.2	146	162	220	13.9	174	223
Zinc (Zn)- Dissolved	mg/L	0.030	0.0015	0.0058	0.0025	0.0065	0.0057	0.0157	0.0098	0.0024	0.0033	0.0013
Bacteria												
Total Coliforms (MTF)	MPN/100mL		>2,420	387	2,480	>2,420	4,350	1,550	1,200	6,290	5,170	291
Fecal Coliforms (MTF)	MPN/100mL		31	3	40	112	50	25	47	5,480	<10	<1
E. coli (MTF)	MPN/100mL		12	4	<10	127	50	21	60	2,810	<10	<1
Field Parameters												
pH	units	6.5-9.0	8.95	9.16	8.95	8.52	8.84	8.59	8.88	8.60	9.70	10.41
Specific Conductivity	(µS/cm)		413	1,205	627	1,263	1,908	1,976	2,640	671	1,847	2,220
Temperature			3.6	6.5	3.1	3.6	1.3	2.7	3.5	5.6	3.4	4.5

Note: Criteria from Canadian Council of Ministers of the Environment. Canadian Environmental Quality Guidelines Summary Table. Water Quality Guidelines for the Protection of Freshwater Aquatic Life. (CCME, 2019)

* Criteria for total chloride and total metals

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The 2016-2021 results for upstream and downstream locations are provided in Table 6 and time versus concentration graphs showing the historical relationship of the analytical parameters at each monitoring location are provided in Appendix B. The analytical results for surface water are variable between locations and year over year, but are generally higher at the downstream locations.

The Contingency Action Plan identified under Clause 125 was not implemented in 2021.

At this time, we have no recommendations for changes to the surface water monitoring program.

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Table 6. 2021 Surface Water Monitoring - Perimeter Ditch Comparison

	Units	Criteria*	2016		2017		2018		2019		2020		2021	
			Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream
Inorganic Parameters														
Alkalinity - Bicarbonate	mg/L		254	349	359	433	174	300	243	447	149	252	185	213
Alkalinity - Carbonate	mg/L		<0.50	<0.50	<0.50	<0.50	<3.0	18	<3.0	16	<3.0	<3.0	<3.0	<3.0
Alkalinity - Hydroxide	mg/L		<0.50	<0.50	<0.50	<0.50	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Alkalinity - Total	mg/L		208	287	294	355	174	319	243	462	149	252	185	213
Dissolved Hardness (CaCO3)	mg/L		515	523	316	448	248	499	175	188	71	77	105	319
pH	units	6.5-9.0	7.40	8.15	7.68	8.80	7.56	8.84	7.51	8.35	7.35	7.76	7.28	8.00
Specific Conductivity	(µS/cm)		1,029	1,588	774	1,154	615	1,590	573	4,637	344	741	433	1,100
Turbidity	(ntu)		151	135	118	87.2	37.2	32.8	279.7	22.1	7.0	12.6	28.4	683.0
Total Dissolved Solids	mg/L		721	1,025	496	810	370	996	373	1,345	208	424	270	706
Total Suspended Solids	mg/L		483	531	379	169	116	167	499	149	54	252	52	2,750
Total Solids	mg/L		1,204	1,557	875	978	486	1,164	871	1,495	262	676	322	3,460
Dissolved Chloride (Cl)	mg/L	640	61.3	209	62.0	151	60.0	220	30	376	13	51	22	89
Dissolved Sulphate (SO4)	mg/L		205	227	32.5	33.2	57.6	170	16	129	<0.4	55	20	285
Nutrients														
Ammonia - Dissolved	mg/L N		0.295	0.730	0.009	0.560	0.041	0.426	0.043	0.688	0.062	0.026	0.013	nr
Nitrate - Dissolved	mg/L N	13	3.96	2.98	<0.003	0.184	0.234	0.500	0.008	0.282	0.006	0.863	<0.003	<0.003
Total Kjeldahl Nitrogen	mg/L N		5.40	13.1	1.95	3.35	2.55	6.85	1.63	5.80	0.30	2.10	0.97	2.74
Phosphorus - Dissolved	mg/L P		0.060	0.060	0.382	0.195	0.085	0.252	0.127	0.567	0.140	0.283	0.077	0.036
Other														
Cyanide - Total (CN)	mg/L	0.0050	0.0016	0.0027	0.0020	0.0023	0.0007	0.0025	<0.0010	0.0019	<0.0010	0.0010	<0.0010	0.0026
Organic Indicators														
Chemical Oxygen Demand	mg/L		131	249	255	135	50	530	143	169	49	154	63	220
Biochemical Oxygen Demand	mg/L		12	51	<3	23	7	13	6	8	4	13	<4	<4
Metals														
Arsenic (As)- Dissolved	mg/L	0.005	0.0029	0.0059	0.0053	0.0086	0.0028	0.0089	0.0040	0.0134	0.0030	0.0054	0.0045	0.0040
Barium (Ba)- Dissolved	mg/L		0.0479	0.0872	0.0540	0.0689	0.0537	0.0702	0.0501	0.0946	0.0276	0.0482	0.0422	0.0514
Beryllium (Be)- Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Cadmium (Cd)- Dissolved	mg/L	0.00009	0.000062	0.000009	<0.000050	0.000007	0.000036	0.000057	0.000012	0.000013	0.000013	0.000400	0.000024	0.000010
Calcium (Ca)- Dissolved	mg/L		126.2	60.4	55.0	42.9	47.7	50.0	50.4	64.1	30.7	45.1	37.9	70.8
Chromium (Cr)- Dissolved	mg/L		0.00020	0.00049	0.00023	0.00026	0.00018	0.00042	0.00018	0.00093	0.00014	0.00042	0.00015	0.00013
Copper (Cu)- Dissolved	mg/L	0.004	0.00348	0.00502	0.00220	0.00267	0.00229	0.00527	0.00134	0.00210	0.00191	0.00117	0.00159	0.00286
Iron (Fe)- Dissolved	mg/L	0.3	0.172	0.032	0.156	0.034	0.059	0.020	0.163	0.062	0.095	0.082	0.070	0.058
Lead (Pb)- Dissolved	mg/L	0.007	0.000041	0.000105	0.000157	0.000150	0.000285	0.000060	0.000077	<0.000050	0.000096	0.000102	0.000089	<0.000050
Magnesium (Mg)- Dissolved	mg/L		48.7	90.7	43.5	55.4	31.3	91.0	32.4	120.9	20.1	44.8	20.8	61.6
Manganese (Mn)- Dissolved	mg/L		0.1614	0.1725	0.3010	0.0378	0.0101	0.0322	0.0892	0.0660	0.0616	0.0611	0.2550	0.0613
Mercury (Hg)- Dissolved	mg/L	0.000026	0.000003	0.000003	0.000002	<0.000002	<0.000005	<0.000005	<0.000005	<0.000005	<0.000010	<0.000010	<0.000050	<0.000050
Nickel (Ni)- Dissolved	mg/L	0.15	0.00277	0.01890	0.00245	0.01090	0.00262	0.02010	0.00340	0.02620	0.00214	0.00781	0.00263	0.00537
Potassium (K)- Dissolved	mg/L		12.3	37.9	9.0	27.0	10.2	68.4	12.0	73.0	9.2	22.9	9.5	30.3
Selenium (Se)- Dissolved	mg/L	0.001	0.000233	0.000475	0.000166	0.000258	0.000155	0.000429	0.000229	0.000403	0.000188	0.000370	0.000115	0.000411
Sodium (Na)- Dissolved	mg/L		31.3	100	36.4	89.2	29.4	124	20	171	8.9	39	13.9	49
Zinc (Zn)- Dissolved	mg/L	0.03	0.0043	0.0053	0.0029	0.0033	0.0026	0.0047	0.0014	0.0026	0.0037	0.0057	0.0015	0.0058
Bacteria														
Total Coliforms (MTF)	MPN/100mL		11,000	>11,000	5,965	5,715	6,710	3,510	2,253	1,950	365	461	>2,420	387
Fecal Coliforms (MTF)	MPN/100mL		336	4,008	2,301	33	23	530	118	1,076	3	17	31	3
E. coli (MTF)	MPN/100mL		336	3,979	2,301	19	6	765	86	972	1	3	12	4
Field Parameters														
pH	units	6.5-9.0	7.40	8.15	7.68	8.80	7.56	8.84	8.18	8.65	8.19	8.02	8.95	9.16
Specific Conductivity	(µS/cm)		947	1,380	720	450	660	1,619	2,029	1,850	3,780	7,060	413	1,205
Temperature	°C		NA	NA	NA	NA	19.7	7.2	11.3	12.1	9.3	10.4	3.6	6.5

Note: Criteria from Canadian Council of Ministers of the Environment. Canadian Environmental Quality Guidelines Summary Table. Water Quality Guidelines for the Protection of Freshwater Aquatic Life. (CCME, 2019)
 * Criteria for total chloride and total metals
 NA - not analyzed
 Upstream results are SW1 and downstream results are SW2.

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5.3 LEACHATE

The leachate management system is a network of manholes/risers, drains, and sumps around the perimeter of the landfill cells, which feed into a header pipe. The leachate flows via gravity and lift stations into a 300,000L storage tank located at the intersection of Charette Road and the access road, which acts as a truck fill station for hauling to the North End Sewage Treatment Plant for treatment. Leachate can also be pumped from eleven collection manholes and one riser if needed; these sites also serve as sampling points. The locations of the manholes and riser are shown on Figure 1.

As per the BRRMF Operating Plan, leachate is managed in accordance with the Leachate Sampling and Analysis Plan (SAP), as specified under Clause 100. The MOE guidelines for non-potable groundwater quality are used as the regulatory guideline (MOE, 2011).

The total volume of leachate removed from the BRRMF in 2021 was 40,669 kL. There were no occurrences of leachate breakout from the development in 2021. The Contingency Action Plan identified under Clause 125 was not implemented in 2021.

In 2021, twelve leachate samples were analyzed; there were no deviations from the Leachate SAP or from normal sample collection and preservation practices. Monthly leachate elevations are provided in Table 7, and the 2021 leachate results are provided in Table 8. The majority of parameters were highly variable between manholes; some of the samples exceeded the guidelines for chloride, copper, lead, nickel, zinc, extractables, and hydrocarbons. Leachate is highly variable due to waste composition, amount of precipitation, site hydrology, waste compaction, cover, and interaction of leachate with the environment.

The 2016-2021 average results are provided in Table 9, and Piper diagrams showing the historical relationship of cations and anions at each monitoring location are provided in Appendix A. Many of the other parameters measured vary significantly from year to year. In 2021, there was an increase in BOD, COD, copper, iron, lead, zinc, hydrocarbons, and bacteria over previous years due to the dry conditions experienced in 2020 and 2021.

We have no recommendations for changes to the leachate monitoring program at this time.

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Table 7. 2021 Leachate Levels

	Date	26-Jan-21	19-Feb-21	22-Mar-21	9-Apr-21	3-May-21	3-Jun-21	5-Jul-21	5-Aug-21	8-Sep-21	6-Oct-21	4-Nov-21	14-Dec-21
Manhole 3	Top of Manhole Elevation (m)	233.66	233.66	233.66	233.66	233.66	233.66	233.66	233.66	233.66	233.66	233.66	233.66
	Depth to Leachate (m)	3.40	2.62	8.53	8.52	5.24	7.72	8.43	8.32	8.37	8.25	8.39	8.54
	Manhole Leachate Elevation (m)	230.26	231.04	225.13	225.14	228.42	225.94	225.23	225.34	225.29	225.41	225.27	225.12
Manhole 8	Top of Manhole Elevation (m)	236.61	236.61	236.61	236.61	236.61	236.61	236.61	236.61	236.61	236.61	236.61	236.61
	Depth to Leachate (m)	11.03	9.22	10.54	10.56	4.16	9.96	13.18	10.64	10.76	10.36	10.76	10.76
	Manhole Leachate Elevation (m)	225.58	227.39	226.07	226.05	232.45	226.65	223.43	225.97	225.85	226.25	225.85	225.85
Manhole 13	Top of Manhole Elevation (m)	234.89	234.89	234.89	234.89	234.89	234.89	234.89	234.89	234.89	234.89	234.89	234.89
	Depth to Leachate (m)	7.29	5.88	5.28	4.62	4.00	8.56	9.85	10.34	9.92	9.72	9.93	9.75
	Manhole Leachate Elevation (m)	227.60	229.01	229.61	230.27	230.89	226.33	225.04	224.55	224.97	225.17	224.96	225.14
Manhole 24	Top of Manhole Elevation (m)	235.00	235.00	235.00	235.00	235.00	235.00	235.00	235.00	235.00	235.00	235.00	235.00
	Depth to Leachate (m)	5.10	8.33	8.96	8.82	8.20	8.51	9.38	9.37	9.25	8.77	9.93	8.80
	Manhole Leachate Elevation (m)	229.90	226.67	226.04	226.18	226.80	226.49	225.62	225.63	225.75	226.23	225.07	226.20
Manhole 27	Top of Manhole Elevation (m)	235.71	235.71	235.71	235.71	235.71	235.71	235.71	235.71	235.71	235.71	235.71	235.71
	Depth to Leachate (m)	2.44	2.44	1.97	2.62	2.13	2.22	2.06	2.27	2.20	2.22	6.72	2.10
	Manhole Leachate Elevation (m)	233.27	233.27	233.74	233.09	233.58	233.49	233.65	233.44	233.51	233.49	228.99	233.61
Manhole 31	Top of Manhole Elevation (m)	234.74	234.74	234.74	234.74	234.74	234.74	234.74	234.74	234.74	234.74	234.74	234.74
	Depth to Leachate (m)	0.97	1.05	2.53	2.14	6.33	0.98	2.17	4.36	3.19	2.47	3.06	1.89
	Manhole Leachate Elevation (m)	233.77	233.69	232.21	232.60	228.41	233.76	232.57	230.38	231.55	232.27	231.68	232.85
Manhole 34	Top of Manhole Elevation (m)	235.42	235.42	235.42	235.42	235.42	235.42	235.42	235.42	235.42	235.42	235.42	235.42
	Depth to Leachate (m)	2.31	2.38	2.32	2.69	2.33	2.07	1.95	1.99	1.90	1.69	2.21	*ns
	Manhole Leachate Elevation (m)	233.11	233.04	233.10	232.73	233.09	233.35	233.47	233.43	233.52	233.73	233.21	*ns
Manhole 46	Top of Manhole Elevation (m)	235.04	235.04	235.04	235.04	235.04	235.04	235.04	235.04	235.04	235.04	235.04	235.04
	Depth to Leachate (m)	**na	**na	6.20	5.94	6.01	5.86	3.64	5.94	6.01	5.77	8.25	5.64
	Manhole Leachate Elevation (m)	**na	**na	228.84	229.10	229.03	229.18	231.40	229.10	229.03	229.27	226.79	229.40
Manhole 47	Top of Manhole Elevation (m)	234.54	234.54	234.54	234.54	234.54	234.54	234.54	234.54	234.54	234.54	234.54	234.54
	Depth to Leachate (m)	3.12	6.12	6.44	6.10	***ns	5.98	5.44	5.97	6.19	6.13	5.20	5.08
	Manhole Leachate Elevation (m)	231.42	228.42	228.10	228.44	***ns	228.56	229.10	228.57	228.35	228.41	229.34	229.46
Bio	Top of Manhole Elevation (m)	234.18	234.18	234.18	234.18	234.18	234.18	234.18	234.18	234.18	234.18	234.18	234.18
	Depth to Leachate (m)	3.82	3.82	2.62	4.76	4.60	4.71	5.24	4.91	1.88	1.59	1.23	5.07
	Manhole Leachate Elevation (m)	230.36	230.36	231.56	229.42	229.58	229.47	228.94	229.27	232.30	232.59	232.95	229.11
Riser 1	Top of Riser Elevation (m)	234.97	234.97	234.97	234.97	234.97	234.97	234.97	234.97	234.97	234.97	234.97	234.97
	Depth to Leachate (m)	13.10	14.40	14.30	14.30	15.00	14.20	14.00	10.60	14.10	14.80	10.70	10.10
	Riser Leachate Elevation (m)	221.87	220.57	220.67	220.67	219.97	220.77	220.97	224.37	220.87	220.17	224.27	224.87

*ns - frozen

**na - unable to measure due to high levels of gas

***ns - technician error

Client File No. 5556.00

Manitoba Environment Act Licence No. 3081 R

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Table 8. 2021 Leachate Monitoring

	Units	Criteria*	LQ25-MH3	LQ25-MH8	LQ25-MH13	LQ25-MH24	LQ25-MH27	LQ25-MH31	LQ25-MH34	LQ25-MH46	LQ25-MH47	Leachate Tank	BIO 1	RISER 1	Composite
			Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21
Field Parameters															
pH	units		7.57	7.58	7.56	7.40	8.68	7.58	8.69	7.52	6.28	8.32	8.47	7.90	
Turbidity	ntu		41.6	62.7	50.6	292.0	6.99	72.1	16.9	191.0	311.0	103.0	89.4	112.0	
Specific Conductivity	uS/cm		13,950	14,040	13,110	11,170	871	12,920	1,772	16,580	14,550	15,090	833	**nr	
Temperature	°C		19.1	19.9	19.6	20.4	21.3	20.7	18.0	21.4	19.9	20.1	18.0	15.6	
Inorganic Parameters															
Alkalinity - Bicarbonate	mg/L		6,090	6,020	5,670	4,820	276	7,240	466	9,140	7,320	7,410	204.0	9,490	
Alkalinity - Carbonate	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	
Alkalinity - Hydroxide	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	
Alkalinity - Total	mg/L		6,090	6,020	5,670	4,820	276	7,240	466	9,140	7,320	7,410	204.0	9,490	
Hardness (as CaCO3)	mg/L		468	766	461	720	140	337	297	507	5,740	603	207	201	
pH	units		7.20	7.08	7.09	7.14	7.69	7.39	7.75	7.29	6.02	8.01	7.53	7.46	
Specific Conductivity	uS/cm		15,800	16,500	14,800	12,200	730	18,100	1,860	21,700	20,400	18,800	781	22,200	
Turbidity	ntu		29.9	129.0	91.6	224.0	3.87	53.1	2.70	101	785	82.4	287	151	
Total Dissolved Solids	mg/L		7,900	4,520	7,960	5,200	443	8,240	967	11,600	29,700	9,900	580	10,300	
Total Suspended Solids	mg/L		30	10,500	164	5,050	21	17	105	287	665	222	800	75	
Total Solids	mg/L		7,930	15,000	8,120	10,300	464	8,260	1,070	11,900	30,400	10,100	1,380	10,400	
Chloride (dissolved)	mg/L	2,300	2,070	2,220	2,020	1,310	41.0	2,420	182	2,410	2,240	2,100	67.5	2,460	
Sulphate (dissolved)	mg/L		<0.4	<0.4	<0.4	428	27	<0.4	187	<0.4	766	<0.4	<0.4	<0.4	
Other															
Cyanide (CN)	mg/L	0.066	0.020	0.024	0.013	0.011	<0.001	0.032	0.001	0.025	0.015	0.004	0.003	0.027	
Nutrients															
Dissolved Ammonia	mg/L		721	995	619	704	2.25	1080	0.28	102	636	131	6.20	509	
Nitrate Nitrite Nitrogen	mg/L		<1.0	1.3	<1.0	<1.0	1.57	<1.0	6.62	<1.0	<2.0	<1.0	7.38	<2.0	
Total Kjeldahl Nitrogen	mg/L		889	1,170	681	5.1	871	1,330	nr***	1,390	1,430	1,500	21.30	1,460	
Phosphorus [Total]	mg/L		2.78	8.51	2.40	6.55	0.0402	6.76	<0.0012	7.10	58.8	9.55	6.58	7.38	
Organic Indicators															
Biological Oxygen Demand	mg/L		135	147	86	150	9	167	<4	3,230	24,100	1,500	28	243	
Chemical Oxygen Demand	mg/L		1,640	3,150	1,410	2,530	53	2,450	75	6,080	>20,000	4,970	475	2,680	
Metals															
Total Arsenic (As)	mg/L	1.9	0.005716	0.023455	0.005762	0.020286	<0.00017	0.019195	<0.00017	0.025062	0.025414	0.037472	0.002487	0.096921	
Total Barium (Ba)	mg/L	29	0.55578	1.58440	0.56035	0.88973	0.070376	0.64241	0.10764	0.15376	0.20357	0.67525	0.13777	0.16563	
Total Beryllium (Be)	mg/L	0.067	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	
Total Cadmium (Cd)	mg/L	0.0027	<0.000007	0.003048	0.000262	0.001622	<0.000007	0.000147	<0.000007	0.000418	0.000287	<0.000007	0.000944	0.000245	
Total Calcium (Ca)	mg/L		187.54	306.56	184.73	288.48	55.989	134.75	118.82	202.93	2,298.0	241.48	82.770	80.641	
Total Chromium (Cr)	mg/L	0.81	0.12798	0.27471	0.04354	0.15801	<0.00004	0.20901	<0.00004	0.16785	0.43693	0.27367	0.04263	0.27357	
Total Chromium (Hexavalent)	mg/L	0.14	0.00099	0.00061	<0.00050	<0.00050	<0.00050	0.00151	0.00077	0.00067	<0.00050	0.00057	0.00094	0.00092	
Total Copper (Cu)	mg/L	0.087	0.018781	0.217540	0.015444	0.182020	0.012306	0.024527	0.016785	0.016385	0.019011	0.022368	0.213670	0.017942	
Total Iron (Fe)	mg/L		7.432	122.01	10.859	190.21	0.6731	3.109	0.0867	24.877	196.28	19.780	13.384	1.775	
Total Lead (Pb)	mg/L	0.025	<0.000065	0.13402	0.010757	0.073345	<0.000065	0.011521	<0.000065	<0.000065	<0.000065	0.009443	0.021155	<0.000065	
Total Magnesium (Mg)	mg/L		460.70	378.78	497.00	358.10	28.378	343.42	77.28	466.85	383.34	309.15	44.098	525.92	
Total Manganese (Mn)	mg/L		0.19947	1.65890	0.43477	1.93620	0.06798	0.18993	0.14839	0.5981	14.156	0.9310	0.24754	0.11302	
Total Mercury (Hg)	mg/L	0.0028	<0.000050	<0.000050	0.000052	<0.000050	<0.000050	0.000391	<0.000050	0.00003	0.000153	0.000030	0.000076	<0.000050	
Total Nickel (Ni)	mg/L	0.49	0.24875	0.34471	0.23003	0.28858	<0.000021	0.29033	0.001297	0.36207	0.74979	0.35341	0.01859	0.59658	
Total Potassium (K)	mg/L		457.32	456.20	421.22	366.11	19.727	516.40	46.117	583.24	736.89	595.91	52.28	559.52	
Dissolved Selenium (Se)	mg/L	0.063	0.00120	0.00127	0.00084	0.00172	0.000229	0.00018	0.00071	0.00392	0.00096	0.00040	0.00073	0.00366	
Total Silver (Ag)	mg/L	0.0015	0.000138	0.000185	0.000075	0.000302	<0.000010	0.000155	<0.000010	0.000103	0.000042	0.000168	0.000173	0.000462	
Total Sodium (Na)	mg/L	2,300	1,377.2	1,283.4	1,252.2	939.1	22.8	1,525.0	99.8	1,568.6	1,608.8	1,649.4	28.524	2,038.3	
Total Zinc (Zn)	mg/L	1.1	0.07310	3.14060	0.13608	1.01320	0.02920	0.09622	0.03721	0.68274	7.0827	0.5720	0.4939	0.17212	
Extractables															
Benzo (a) Pyrene (PAH)	mg/L	0.00081	0.0000254	0.003810	0.00768	0.000195	0.0000803	0.000111	0.0000109	0.0000109	<0.0000050	0.000174	0.000042	0.000082	
Anthracene	mg/L	0.0024	0.000336	0.007720	0.00541	0.00242	0.000015	0.000643	0.000028	0.000092	<0.000010	0.000563	0.000035	0.000024	
4'4' Methylenebis 2 Chloroaniline	ug/L		<1.5	<0.80	<50.0	<5.0	<0.50	<1.0	<0.50	<1.0	<1.0	<1.0	<2.5	<5.0	
Benzo (a) anthracene (PAH)	mg/L	0.0047	0.000081	0.000786	<0.00910	0.000603	0.000031	0.000315	0.000039	0.000046	<0.000010	0.000424	0.000065	0.00002	
Benzo (b/j) fluoroanthene (PAH)	mg/L		0.000026	0.003810	0.00355	0.000305	0.000182	0.000123	0.000026	<0.000010	<0.000010	0.000158	0.000034	<0.000010	
Benzo (g,h,i) Perylene (PAH)	mg/L	0.0002	<0.000020	0.002000	0.00712	0.000738	0.00009	0.000045	<0.000020	<0.000020	<0.000020	0.000071	0.000041	<0.000020	
Hexachlorobenzene	ug/L	3.1	<0.008	<0.080	<0.080	<0.080	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	
Phenanthrene	mg/L	0.58	0.00228	0.02350	0.0239	0.00912	<0.000050	0.00341	<0.000050	0.000572	<0.000050	0.00326	0.000154	0.00011	
Phenol	mg/L	12	0.125	0.29	0.25	<0.10	0.003	<0.10	0.007	1.63	1.820	0.150	0.012	0.001	

Note: Criteria from Ontario Ministry of the Environment. (2011, July 1). Soil, Ground Water and Sediment Standards for Use Under Part XV.I of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition
 *Criteria for total chloride and total selenium.
 ** nr - over range
 *** nr - lab error

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**Water and Waste
Eaux et déchets**

Table 8. 2021 Leachate Monitoring

	Units	Criteria*	LQ25-MH3	LQ25-MH8	LQ25-MH13	LQ25-MH24	LQ25-MH27	LQ25-MH31	LQ25-MH34	LQ25-MH46	LQ25-MH47	Leachate Tank	BIO 1	RISER 1	Composite
			Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21	Aug-21
Petroleum Hydrocarbons															
CCME Petroleum Hydrocarbon Fraction F1	mg/L	0.75	1.12	0.24	0.94	0.33	<-0.10	0.44	<-0.10	3.0	26.3	0.23	<-0.10	0.22	
CCME Petroleum Hydrocarbon Fraction F2	mg/L	0.15	1.97	0.97	1.67	16.5	<-0.10	0.38	<-0.10	0.37	0.33	0.26	0.13	0.24	
CCME Petroleum Hydrocarbon Fraction F3	mg/L	0.50	22.2	23.6	19.9	160.0	<-0.25	0.45	<-0.25	<-0.25	<-0.25	<-0.25	0.56	<-0.25	
CCME Petroleum Hydrocarbon Fraction F4	mg/L	0.50	4.26	3.09	4.27	19.5	<-0.25	<-0.25	<-0.25	<-0.25	<-0.25	<-0.25	<-0.25	<-0.25	
Volatile Organic Carbons															
Vinyl Chloride	mg/L	0.0017	0.0006	<-0.0005	<-0.0005	0.0005	<-0.0005	0.0009	<-0.0005	0.0017	0.0015	<-0.0005	<-0.0005	0.0007	
1,4 Dichlorobenzene	mg/L	0.067	0.0122	0.0106	0.0101	0.0019	<-0.0010	0.005	<-0.0010	0.0015	<-0.0010	0.0013	<-0.0010	0.0015	
Chloroform	mg/L	0.022	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	
Trichloroethene	mg/L	0.017	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	0.00431	<-0.00050	<-0.00050	
Tetrachloroethene	mg/L	0.017	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	<-0.00050	0.00896	<-0.00050	<-0.00050	<-0.00050	
Dioxins and Furans															
2378 TeCDD	pg/L	14,000													<3.30
12378 PeCDD	pg/L	14,000													<3.90
123478 HxCDD	pg/L	14,000													<17.0
123678 HxCDD	pg/L	14,000													<18.0
123789 HxCDD	pg/L	14,000													11
1234678 HpCDD	pg/L	14,000													421
OCDD	pg/L	14,000													4000
Total TCDDs	pg/L	14,000													6.2
Total PeCDD	pg/L	14,000													26.5
Total HxCDD	pg/L	14,000													155
Total HpCDD	pg/L	14,000													1090
2378 TeCDF	pg/L	14,000													<4.10
12378 PeCDF	pg/L	14,000													<22.0
23478 PeCDF	pg/L	14,000													<22.0
123478 HxCDF	pg/L	14,000													<22.0
123678 HxCDF	pg/L	14,000													<22.0
123789 HxCDF	pg/L	14,000													<29.0
234678 HxCDF	pg/L	14,000													<22.0
1234678 HpCDF	pg/L	14,000													63.2
1234789 HpCDF	pg/L	14,000													8.7
OCDF	pg/L	14,000													203
Total TCDF	pg/L	14,000													<4.10
Total PeCDF	pg/L	14,000													<22.0
Total HxCDF	pg/L	14,000													<29.0
Total HpCDF	pg/L	14,000													174
Polychlorinated Biphenyls															
Aroclor 1016	ug/L		<-0.0510	<-6.0	<-2.0	<-0.20	<-0.020	<-0.0560	<-0.020	<-0.020	<-0.020	<-0.140	<-0.020	<-0.060	
Aroclor 1221	ug/L		<-0.0510	<-6.0	<-2.0	<-0.20	<-0.020	<-0.0560	<-0.020	<-0.020	<-0.020	<-0.140	<-0.020	<-0.060	
Aroclor 1232	ug/L		<-0.0510	<-6.0	<-2.0	<-0.20	<-0.020	<-0.0560	<-0.020	<-0.020	<-0.020	<-0.140	<-0.020	<-0.060	
Aroclor 1242	ug/L		<-0.0510	<-6.0	<-2.0	<-0.20	<-0.020	<-0.0560	<-0.020	<-0.020	<-0.020	<-0.140	<-0.020	<-0.060	
Aroclor 1248	ug/L		<-0.0510	<-6.0	<-2.0	<-0.20	<-0.020	<-0.0560	<-0.020	<-0.020	<-0.020	<-0.140	<-0.020	<-0.060	
Aroclor 1254	ug/L		0.051	<-0.80	<-2.0	<-0.20	<-0.020	0.058	<-0.020	<-0.020	<-0.020	0.076	<-0.020	<-0.020	
Aroclor 1260	ug/L		<-0.040	<-0.80	<-2.0	<-0.20	<-0.020	<-0.020	<-0.020	<-0.020	<-0.020	<-0.020	<-0.020	<-0.060	
Total PCBs	ug/L	15	<-0.135	<-14.0	<-6.0	<-0.85	<-0.060	<-0.130	<-0.060	<-0.060	<-0.060	<-0.320	<-0.060	<-0.260	
Pesticides and Herbicides															
Diazinon	ug/L		<-0.60	<-2.2	<-0.90	<-2.7	<-0.10	<-0.15	<-0.10	<-0.20	<-0.20	<-0.60	<-0.10	<-0.50	
2, 4-D	mg/L		<-0.0010	<-0.0010	<-0.0010	<-0.0010	<-0.0001	<-0.0010	<-0.0001	<-0.0010	0.117	0.0036	0.0001	<-0.0010	
Aldrin	ug/L	8.5	<-0.008	<-0.080	<-0.080	<-0.080	<-0.008	<-0.008	<-0.008	<-0.008	<-0.008	<-0.008	<-0.008	<-0.008	
Hexachlorocyclohexane (Lindane)	ug/L	1.2	<-0.008	<-0.080	<-0.080	<-0.080	<-0.008	<-0.008	<-0.008	<-0.008	<-0.008	<-0.008	<-0.008	<-0.008	
MCPA	mg/L		<-0.0010	<-0.0010	<-0.0010	<-0.0010	<-0.0001	<-0.0010	<-0.0001	<-0.0010	0.0017	<-0.0010	<-0.0001	<-0.0001	
Mirex	ug/L		<-0.040	<-0.080	<-0.080	<-0.080	<-0.008	<-0.008	<-0.008	<-0.008	<-0.008	<-0.008	<-0.008	<-0.040	
Methoxychlor	ug/L	6.5	<-0.040	<-0.080	<-0.080	<-0.080	<-0.008	<-0.008	<-0.008	<-0.008	<-0.008	<-0.030	<-0.050	<-0.040	
Bacteria															
Total Coliforms	MPN/100mL		600	5,790	180	5,790	>2,420	19,900	961	560	>24200	50	3,650,000	58	
Fecal Coliforms	MPN/100mL		<10	30	<10	<10	21	<10	1	20	>24200	190	908,000	<10	
E. coli	MPN/100mL		<10	<10	<10	<1	15	<10	<1	10	>24200	<10	52,000	1	

Note: Criteria from Ontario Ministry of the Environment. (2011, July 1). Soil, Ground Water and Sediment Standards for Use Under Part XV.I of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition


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 Water and Waste Eaux et déchets			Table 9. 2021 Leachate Quality Comparison					
			2016	2017	2018	2019	2020	2021
	Units	Criteria	Average	Average	Average	Average	Average	
Field Parameters								
pH	units		7.41	7.63	7.28	7.79	7.80	
Turbidity - NTU	ntu		37.9	119	298	166	112.4	
Specific Conductivity	uS/cm		4,278	9,046	10,580	8,663	10,444	
Temperature	°C		NA	NA	13.8	13.9	11.5	
Inorganic Parameters								
Alkalinity - Bicarbonate	mg/L		4,276	4,479	4,270	4,059	5,348	
Alkalinity - Carbonate	mg/L		130	<5.0	<3.0	<3.0	<3.0	
Alkalinity - Hydroxide	mg/L		<5.0	<5.0	<3.0	<3.0	<3.0	
Alkalinity - Total	mg/L		3,720	3,672	4,270	4,059	5,348	
Hardness (as CaCO ₃)	mg/L		1,708	1,966	2,106	2,704**	871	
pH - units	units		7.24	7.35	7.06	7.24	7.33	
Specific Conductivity	uS/cm		10,604	10,494	11,131	11,170	11,893	
Turbidity - NTU	ntu		193	128	136	100	78.4	
Total Dissolved Solids	mg/L		6,057	5,864	6,140	6,348	7,315	
Total Suspended Solids	mg/L		13,543	579	789	635	374	
Total Solids	mg/L		19,600	6,443	6,924	6,980	7,686	
Chloride (dissolved)	mg/L	2300 *	1,060	1,222	1,163	2,183	1,456	
Sulphate (dissolved)	mg/L		115	273	164	205	97	
Other								
Cyanide (CN)	mg/L	0.066	0.010	0.008	0.021	0.014	0.011	
Nutrients								
Dissolved Ammonia	mg/L		570	504	243	545	642	
Nitrate Nitrogen	mg/L		0.310	1.35	8.48	1.01	1.75	
Total Kjeldhal Nitrogen	mg/L		276	621	342	699	977	
Phosphorus (Total)	mg/L		3.32	3.29	2.12	7.77	3.49	
Organic Indicators								
Biological Oxygen Demand	mg/L		583	726	1,347	1,493	1,340	
Chemical Oxygen Demand	mg/L		1,140	2,540	2,367	2,045	2,049	
Metals								
Total Arsenic (As)	mg/L	1.9	0.0139	0.0248	0.0321	0.0220	0.0179	
Total Barium (Ba)	mg/L	29	0.372	0.376	0.382	0.391	0.393	
Total Beryllium (Be)	mg/L	0.067	0.00014	0.00012	0.00113	<0.00003	<0.00003	
Total Cadmium (Cd)	mg/L	0.0027	0.000307	0.000308	0.000452	<0.000007	<0.000007	
Total Calcium (Ca)	mg/L		147	212	236	309	297	
Total Chromium (Cr)	mg/L	0.81	0.0635	0.0724	0.0756	0.1354	0.1253	
Total Chromium (Hexavalent)	mg/L		0.0050	0.0135	<0.010	<0.010	0.00068	
Total Copper (Cu)	mg/L	0.087	0.0084	0.0128	0.0291	0.0218	0.0147	
Total Iron (Fe)	mg/L		6.8	18.8	20.1	7.9	24.3	
Total Lead (Pb)	mg/L	0.025	0.01072	0.01008	0.01057	0.00490	0.00345	
Total Magnesium (Mg)	mg/L		279	329	368	469	345	
Total Manganese (Mn)	mg/L		0.437	0.832	1.129	1.246	1.749	
Total Mercury (Hg)	mg/L	0.0028	0.000002	0.000021	0.000273	0.000016	0.000031	
Total Nickel (Ni)	mg/L	0.49	0.1546	0.1541	0.2522	0.2962	0.2481	
Total Potassium (K)	mg/L		314	292	364	468	392	
Dissolved Selenium (Se)	mg/L	0.063 *	0.00090	0.00120	0.00186	0.00137	0.00176	
Total Silver (Ag)	mg/L	0.0015	0.000150	0.000090	0.000336	0.000095	0.000092	
Total Sodium (Na)	mg/L	2,300	824	835	1,115	1,365	1,103	
Total Zinc (Zn)	mg/L	1.1	1.18	0.453	0.206	0.530	0.263	

Note: Criteria from Ontario Ministry of the Environment. (2011, July 1). Soil, Ground Water and Sediment Standards for Use Under Part XV.I of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

*Criteria for total chloride and total selenium
 **dissolved hardness
 NA - not analyzed

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 Water and Waste Eaux et déchets			Table 9. 2021 Leachate Quality Comparison					
			2016	2017	2018	2019	2020	2021
			Average	Average	Average	Average	Average	Average
	Units	Criteria						
Extractables								
Benzo (a) Pyrene (PAH)	mg/L	0.00081	0.00079	0.00026	0.00075	0.00117	0.00031	0.00101
Anthracene	mg/L	0.0024	0.00105	0.00089	0.00133	0.00201	0.00101	0.00144
4'4' Methylenebis 2 Chloroaniline	ug/L		NA	<5.0	<13.7	<5.0	<1.0	<5.0
Benzo (a) anthracene (PAH)	mg/L	0.0047	0.00123	0.00089	0.00113	0.00252	0.00010	0.00174
Benzo (b/f) fluoroanthene (PAH)	mg/L		0.00140	0.00049	0.00117	0.00166	0.00081	0.00069
Benzo (g,h,i) Perylene (PAH)	mg/L	0.0002	0.00073	0.00033	0.00103	0.00070	0.00017	0.00085
Hexachlorobenzene	ug/L	3.1	<0.050	<0.050	<5.0	<5.0	<0.040	<0.080
Phenanthrene	mg/L	0.58	0.00374	0.00205	0.00513	0.00748	0.00400	0.00553
Phenol	mg/L	12	0.391	0.677	0.276	0.445	0.183	0.366
Petroleum Hydrocarbons								
CCME Petroleum Hydrocarbon Fraction F1	mg/L	0.75	0.11	0.45	0.11	0.31	0.92	2.75
CCME Petroleum Hydrocarbon Fraction F2	mg/L	0.15	0.17	0.23	20.2	2.01	0.47	1.91
CCME Petroleum Hydrocarbon Fraction F3	mg/L	0.50	<0.20	0.41	371.2	12.3	8.45	18.96
CCME Petroleum Hydrocarbon Fraction F4	mg/L	0.50	<0.20	<0.20	56.3	2.04	1.61	2.68
Volatile Organic Carbons								
Vinyl Chloride	mg/L	0.0017	<0.010	<0.0050	0.0005	0.0007	0.0009	0.0006
1,4 Dichlorobenzene	mg/L	0.067	0.0051	0.0058	0.0022	0.0031	0.0038	0.0038
Chloroform	mg/L	0.022	<0.0050	<0.0025	<0.00050	<0.00050	<0.00050	<0.00050
Trichloroethene	mg/L	0.017	<0.0050	<0.0025	0.00029	0.00053	<0.00050	0.00059
Tetrachloroethene	mg/L	0.017	<0.0050	<0.0025	0.00039	<0.00050	0.00056	0.00098
Polychlorinated Biphenyls								
Aroclor 1016	ug/L		<0.5	<0.50	<0.40	<8.0	<0.13	<2.0
Aroclor 1221	ug/L		<0.5	<0.50	<0.40	<8.0	<0.13	<2.0
Aroclor 1232	ug/L		<0.5	<0.50	<0.40	<8.0	<0.13	<2.0
Aroclor 1242	ug/L		0.12	<0.50	<1.5	<3.0	1.3	<2.0
Aroclor 1248	ug/L		<0.50	<0.50	<0.40	<8.0	<0.13	<2.0
Aroclor 1254	ug/L		0.10	<0.50	<2.0	<8.0	<0.10	0.15
Aroclor 1260	ug/L		0.10	<0.50	<2.0	<8.0	<0.20	<0.40
Total PCBs	ug/L	15	0.11	<0.50	<2.0	3.3	1.3	<6.0
Pesticides and Herbicides								
Diazinon	ug/L		<8	<8	<172	1.4	<62	<0.5
2,4-D	mg/L		<2.0	<1.0	0.002	1.11	0.0041	0.0104
Aldrin	ug/L	8.5	<0.05	<0.05	<2.25	<50	<0.040	<0.080
gamma-Hexachlorocyclohexane (Lindane)	ug/L	1.2	<0.03	<0.03	<10	<50	<0.040	<0.080
MCPA	mg/L		<4.0	<2.0	<0.005	<1.0	0.0005	0.0005
Mirex	ug/L		<0.05	<0.05	<5.0	<50	<0.080	<0.040
Methoxychlor	ug/L	6.5	<0.10	<0.10	<5.0	<50	<0.120	<0.030
Bacteria								
Total Coliforms	MPN/100mL		4,859	6,158	15,448	18,210	9,056	309,209
Fecal Coliforms	MPN/100mL		323	243	3,211	5,033	831	77,707
E. coli	MPN/100mL		322	193	4,453	2,817	770	6,354
			Note: Criteria from Ontario Ministry of the Environment. (2011, July 1). Soil, Ground Water and Sediment Standards for Use Under Part XV.I of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition					

BRADY ROAD RESOURCE MANAGEMENT FACILITY ANNUAL REPORT – 2021**5.4 LANDFILL GAS**

5.4.1 COLLECTION AND FLARING SYSTEM

Landfill gas (LFG) produced at the BRRMF is comprised primarily of methane (CH₄) and carbon dioxide (CO₂) in approximately equal amounts. These greenhouse gases contribute to global warming, but CH₄ has a global warming potential 25 times that of CO₂. To reduce emissions, the LFG is collected via a series of pipes beneath the BRRMF, and sent to a flare where the CH₄ is reduced to CO₂ and water vapor. The landfill gas collection and flaring system (LFGCFS) is run by Integrated Gas Recovery Systems Inc. on behalf of the City of Winnipeg.

As per the BRRMF Operating Plan, LFG operations and monitoring are managed through the Landfill Gas Operating Plan, submitted October 23, 2014, as per Clause 110.

In 2021, the BRRMF LFGCFS operated as intended, although surface emission monitoring identified some areas where gas was escaping due to a weak surface cap. Overall, the majority of the landfill has sufficient cap, and the cap is in good condition.

The 2021 Landfill Gas Collection and Flaring Report, prepared by Integrated Gas Recovery Services Inc., is attached in Appendix C.

5.4.2 SUBSURFACE LANDFILL GAS MONITORING PROGRAM

LFG that is not collected or that cannot escape into the atmosphere may migrate into neighboring land below the ground surface. The purpose of LFG migration monitoring is to detect gas migration before it becomes a safety hazard to neighboring properties.

As per the BRRMF Operating Plan, subsurface LFG migration is managed in accordance with the Subsurface Landfill Gas Monitoring Program, submitted on October 23, 2014, as specified under Clause 111. Probes are monitored monthly for methane (CH₄), oxygen (O₂), carbon monoxide (CO), and hydrogen sulphide (H₂S).

In 2021, the maximum level of CH₄ measured was 0.2%. The Subsurface Landfill Gas Contingency Plan was not activated, indicating that the LFGCFS is operating effectively.

The 2021 subsurface gas migration probe data is provided in Table 10.



Table 10. 2021 External Gas Probe Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
1	27-Jan-21	0.1	21.9	0.0	0.0
1	22-Feb-21	0.0	2.1	0.0	0.0
1	23-Mar-21	0.1	20.0	0.0	0.0
1	21-Apr-21	0.1	20.0	0.0	0.0
1	5-May-21	0.0	20.3	0.0	0.0
1	2-Jun-21	0.0	18.7	0.0	0.0
1	6-Jul-21	0.0	20.3	0.0	0.0
1	17-Aug-21	0.0	19.7	0.0	0.0
1	14-Sep-21	0.0	19.6	0.0	0.0
1	13-Oct-21	0.0	20.5	0.0	0.0
1	10-Nov-21	0.0	21.0	0.0	2.0
1	15-Dec-21	0.0	20.3	0.0	0.0
2	27-Jan-21	0.1	21.1	0.0	0.0
2	22-Feb-21	0.0	21.2	0.0	0.0
2	23-Mar-21	0.0	20.6	0.0	0.0
2	21-Apr-21	0.1	20.8	0.0	0.0
2	5-May-21	0.0	20.1	0.0	0.0
2	2-Jun-21	0.0	19.0	0.0	0.0
2	6-Jul-21	0.0	19.8	0.0	0.0
2	17-Aug-21	0.0	19.8	0.0	0.0
2	14-Sep-21	0.0	17.5	0.0	0.0
2	13-Oct-21	0.0	20.2	0.0	0.0
2	10-Nov-21	0.0	20.2	0.0	2.0
2	15-Dec-21	0.0	20.2	0.0	0.0
3	27-Jan-21	0.0	21.2	0.0	0.0
3	22-Feb-21	0.0	21.4	0.0	0.0
3	23-Mar-21	0.0	20.9	0.0	0.0
3	21-Apr-21	0.1	20.1	0.0	0.0
3	5-May-21	0.0	20.2	0.0	0.0
3	2-Jun-21	0.0	19.8	0.0	0.0
3	6-Jul-21	0.0	20.2	0.0	0.0
3	17-Aug-21	0.0	19.7	0.0	0.0
3	14-Sep-21	0.1	17.8	0.0	0.0
3	13-Oct-21	0.0	20.1	0.0	0.0
3	10-Nov-21	0.0	20.9	0.0	2.0
3	15-Dec-21	0.0	20.9	0.0	2.0



Water and Waste
Eaux et déchets

Table 10. 2021 External Gas Probe Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
4	27-Jan-21	0.2	21.3	0.0	0.0
4	22-Feb-21	0.1	20.1	0.0	0.0
4	23-Mar-21	0.0	20.7	0.0	0.0
4	21-Apr-21	0.1	19.5	0.0	0.0
4	5-May-21	0.0	20.4	0.0	0.0
4	2-Jun-21	0.0	19.7	0.0	0.0
4	6-Jul-21	0.0	20.2	0.0	0.0
4	17-Aug-21	0.0	19.6	0.0	0.0
4	14-Sep-21	0.0	19.3	0.0	0.0
4	13-Oct-21	0.0	20.1	0.0	0.0
4	10-Nov-21	0.0	20.8	0.0	2.0
4	15-Dec-21	0.0	20.8	0.0	2.0
5	27-Jan-21	0.1	21.1	0.0	0.0
5	22-Feb-21	0.1	21.1	0.0	0.0
5	23-Mar-21	0.1	20.5	0.0	0.0
5	21-Apr-21	0.1	20.5	0.0	0.0
5	5-May-21	0.0	20.4	0.0	0.0
5	2-Jun-21	0.0	19.7	0.0	0.0
5	6-Jul-21	0.0	20.3	0.0	0.0
5	17-Aug-21	0.0	19.8	0.0	0.0
5	14-Sep-21	0.1	19.4	0.0	0.0
5	13-Oct-21	0.0	20.3	0.0	0.0
5	10-Nov-21	0.0	20.8	0.0	1.0
5	15-Dec-21	0.0	20.3	0.0	0.0
6	27-Jan-21	0.1	21.9	0.0	0.0
6	22-Feb-21	0.0	21.4	0.0	0.0
6	23-Mar-21	0.1	20.5	0.0	0.0
6	21-Apr-21	0.1	20.9	0.0	0.0
6	5-May-21	0.0	20.5	0.0	0.0
6	2-Jun-21	0.0	19.7	0.0	0.0
6	6-Jul-21	0.0	20.2	0.0	0.0
6	17-Aug-21	0.0	19.8	0.0	0.0
6	14-Sep-21	0.0	20.4	0.0	0.0
6	13-Oct-21	0.0	20.6	0.0	0.0
6	10-Nov-21	0.0	20.8	0.0	2.0
6	15-Dec-21	0.0	20.6	0.0	0.0



Water and Waste
Eaux et déchets

Table 10. 2021 External Gas Probe Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
7	27-Jan-21	0.0	22.7	0.0	0.0
7	22-Feb-21	0.0	21.5	0.0	0.0
7	23-Mar-21	0.0	20.8	0.0	0.0
7	21-Apr-21	0.1	20.8	0.0	0.0
7	5-May-21	0.0	19.9	0.0	0.0
7	2-Jun-21	0.1	19.5	0.0	0.0
7	6-Jul-21	0.0	21.1	0.0	0.0
7	18-Aug-21	0.0	19.3	0.0	0.0
7	14-Sep-21	0.0	20.5	0.0	0.0
7	13-Oct-21	0.0	20.5	0.0	0.0
7	10-Nov-21	0.0	20.8	0.0	1.0
7	15-Dec-21	0.0	20.8	0.0	1.0
8	27-Jan-21	0.0	22.5	0.0	0.0
8	22-Feb-21	0.0	21.5	0.0	0.0
8	23-Mar-21	0.0	20.5	0.0	0.0
8	21-Apr-21	0.1	20.7	0.0	0.0
8	5-May-21	0.0	20.4	0.0	0.0
8	2-Jun-21	0.1	19.7	0.0	0.0
8	6-Jul-21	0.0	21.1	0.0	0.0
8	18-Aug-21	0.0	19.1	9.0	1.0
8	14-Sep-21	0.0	19.7	0.0	0.0
8	13-Oct-21	0.0	21.4	0.0	0.0
8	10-Nov-21	0.0	20.9	0.0	2.0
8	15-Dec-21	0.0	21.4	0.0	0.0
9	27-Jan-21	0.0	22.2	0.0	0.0
9	22-Feb-21	0.0	21.5	0.0	0.0
9	23-Mar-21	0.1	20.1	0.0	0.0
9	21-Apr-21	0.1	20.2	0.0	0.0
9	5-May-21	0.0	20.6	0.0	0.0
9	2-Jun-21	0.1	19.6	0.0	0.0
9	6-Jul-21	0.0	20.9	0.0	0.0
9	18-Aug-21	0.0	19.2	9.0	1.0
9	14-Sep-21	0.0	19.9	0.0	0.0
9	13-Oct-21	0.0	20.5	0.0	0.0
9	10-Nov-21	0.0	20.5	0.0	2.0
9	15-Dec-21	0.0	19.2	9.0	1.0



Table 10. 2021 External Gas Probe Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
10	27-Jan-21	0.0	22.2	0.0	0.0
10	22-Feb-21	0.0	21.5	0.0	0.0
10	23-Mar-21	0.1	20.3	0.0	0.0
10	21-Apr-21	0.1	20.9	0.0	0.0
10	5-May-21	0.0	20.9	0.0	0.0
10	2-Jun-21	0.1	19.7	0.0	0.0
10	6-Jul-21	0.0	21.2	0.0	0.0
10	18-Aug-21	0.0	19.6	10.0	1.0
10	14-Sep-21	0.0	19.4	0.0	0.0
10	13-Oct-21	0.0	20.6	0.0	0.0
10	10-Nov-21	0.0	20.6	0.0	2.0
10	15-Dec-21	0.0	20.6	0.0	2.0
P26E	27-Jan-21	0.1	22.3	0.0	0.0
P26E	22-Feb-21	0.0	21.8	0.0	0.0
P26E	23-Mar-21	0.1	20.1	0.0	0.0
P26E	21-Apr-21	0.1	20.2	0.0	0.0
P26E	5-May-21	0.0	20.9	0.0	0.0
P26E	2-Jun-21	0.1	20.3	0.0	0.0
P26E	6-Jul-21	0.0	21.2	0.0	0.0
P26E	17-Aug-21	0.0	20.1	0.0	0.0
P26E	14-Sep-21	0.1	19.9	0.0	0.0
P26E	13-Oct-21	0.0	20.8	0.0	0.0
P26E	10-Nov-21	0.0	19.8	0.0	2.0
P26E	15-Dec-21	0.1	20.2	0.0	0.0
P28E	27-Jan-21	0.0	23.1	0.0	0.0
P28E	22-Feb-21	0.0	21.7	0.0	0.0
P28E	23-Mar-21	0.0	20.8	0.0	0.0
P28E	21-Apr-21	0.1	20.6	0.0	0.0
P28E	5-May-21	0.0	20.9	0.0	0.0
P28E	2-Jun-21	0.1	20.4	0.0	0.0
P28E	6-Jul-21	0.0	21.1	0.0	0.0
P28E	17-Aug-21	0.0	20.1	0.0	0.0
P28E	14-Sep-21	0.1	20.5	0.0	0.0
P28E	13-Oct-21	0.0	20.4	0.0	0.0
P28E	10-Nov-21	0.0	20.2	0.0	2.0
P28E	15-Dec-21	0.1	21.3	0.0	0.0



Water and Waste
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Table 10. 2021 External Gas Probe Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
P30E	27-Jan-21	0.1	22.1	0.0	0.0
P30E	22-Feb-21	0.0	21.7	0.0	0.0
P30E	23-Mar-21	0.0	20.9	0.0	0.0
P30E	21-Apr-21	0.1	20.8	0.0	0.0
P30E	5-May-21	0.0	20.8	0.0	0.0
P30E	2-Jun-21	0.0	19.5	0.0	0.0
P30E	6-Jul-21	0.0	20.9	0.0	0.0
P30E	17-Aug-21	0.0	19.5	0.0	0.0
P30E	14-Sep-21	0.1	19.9	0.0	0.0
P30E	13-Oct-21	0.0	21.0	0.0	0.0
P30E	10-Nov-21	0.0	20.9	0.0	1.0
P30E	15-Dec-21	0.2	20.2	0.0	0.0
P34E	27-Jan-21	0.0	23.2	0.0	0.0
P34E	22-Feb-21	0.1	21.3	0.0	0.0
P34E	23-Mar-21	0.0	20.7	0.0	0.0
P34E	21-Apr-21	0.1	20.8	0.0	0.0
P34E	5-May-21	0.0	20.9	0.0	0.0
P34E	2-Jun-21	0.2	20.6	0.0	0.0
P34E	6-Jul-21	0.0	21.1	0.0	0.0
P34E	17-Aug-21	0.0	19.5	0.0	0.0
P34E	14-Sep-21	0.0	19.5	0.0	0.0
P34E	13-Oct-21	0.0	21.1	0.0	0.0
P34E	10-Nov-21	0.0	20.3	0.0	2.0
P34E	15-Dec-21	0.2	21.0	0.0	0.0
P106E	27-Jan-21	0.0	20.5	0.0	0.0
P106E	22-Feb-21	0.0	21.5	0.0	0.0
P106E	23-Mar-21	0.1	15.5	0.0	0.0
P106E	21-Apr-21	0.0	20.2	0.2	0.0
P106E	5-May-21	0.0	8.5	0.0	0.0
P106E	2-Jun-21	0.0	18.7	0.0	0.0
P106E	6-Jul-21	0.2	18.5	0.0	0.0
P106E	17-Aug-21	0.0	16.1	im	0.0
P106E	14-Sep-21	0.0	18.3	0.0	0.0
P106E	13-Oct-21	0.0	20.3	0.0	0.0
P106E	10-Nov-21	0.0	19.6	0.0	1.0
P106E	15-Dec-21	0.1	21.3	0.0	0.0

im - instrument malfunction



Table 10. 2021 External Gas Probe Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
P107E	27-Jan-21	0.0	20.8	0.0	0.0
P107E	22-Feb-21	0.0	21.8	0.0	0.0
P107E	23-Mar-21	0.0	20.5	0.0	0.0
P107E	21-Apr-21	0.1	20.6	0.0	0.0
P107E	5-May-21	0.0	20.7	0.0	0.0
P107E	2-Jun-21	0.0	20.3	0.0	0.0
P107E	6-Jul-21	0.2	20.8	0.0	0.0
P107E	17-Aug-21	0.1	20.1	0.0	0.0
P107E	14-Sep-21	0.0	20.5	0.0	0.0
P107E	13-Oct-21	0.0	20.8	0.0	0.0
P107E	10-Nov-21	0.0	20.9	0.0	1.0
P107E	15-Dec-21	0.0	21.1	0.0	0.0
P108E	27-Jan-21	0.0	21.9	0.0	0.0
P108E	22-Feb-21	0.0	21.8	0.0	0.0
P108E	23-Mar-21	0.0	20.6	0.0	0.0
P108E	21-Apr-21	0.1	20.5	0.0	0.0
P108E	5-May-21	0.0	20.3	0.0	0.0
P108E	2-Jun-21	0.0	20.0	0.0	0.0
P108E	6-Jul-21	0.3	20.8	0.0	0.0
P108E	17-Aug-21	0.0	19.9	0.0	0.0
P108E	14-Sep-21	0.0	20.4	0.0	0.0
P108E	13-Oct-21	0.0	20.7	0.0	0.0
P108E	10-Nov-21	0.0	21.0	0.0	1.0
P108E	15-Dec-21	0.1	21.0	0.0	0.0
P109E	27-Jan-21	0.0	22.0	0.0	0.0
P109E	22-Feb-21	0.0	21.5	0.0	0.0
P109E	23-Mar-21	0.0	20.8	0.0	0.0
P109E	21-Apr-21	0.1	20.6	0.0	0.0
P109E	5-May-21	0.0	20.6	0.0	0.0
P109E	2-Jun-21	0.0	19.3	0.0	0.0
P109E	6-Jul-21	0.0	19.6	0.0	0.0
P109E	18-Aug-21	0.0	19.9	0.0	0.0
P109E	14-Sep-21	0.1	17.9	0.0	0.0
P109E	13-Oct-21	0.0	21.3	0.0	0.0
P109E	10-Nov-21	0.0	20.3	0.0	1.0
P109E	15-Dec-21	0.1	20.2	0.0	0.3



Table 10. 2021 External Gas Probe Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
P110E	27-Jan-21	0.1	3.8	0.0	0.0
P110E	22-Feb-21	0.1	3.4	10.0	0.0
P110E	23-Mar-21	0.0	20.9	0.0	0.0
P110E	21-Apr-21	0.1	0.3	0.0	0.0
P110E	5-May-21	0.0	7.8	0.0	0.0
P110E	2-Jun-21	0.0	0.2	0.0	0.0
P110E	6-Jul-21	0.0	3.8	0.0	0.0
P110E	17-Aug-21	0.0	0.4	15.0	0.0
P110E	14-Sep-21	0.0	0.6	0.0	0.0
P110E	13-Oct-21	0.0	5.4	0.0	0.0
P110E	10-Nov-21	0.0	20.9	0.0	0.0
P110E	15-Dec-21	0.1	1.5	0.0	0.0
P111E	27-Jan-21	0.1	21.0	0.0	0.0
P111E	22-Feb-21	0.1	20.8	0.0	0.0
P111E	23-Mar-21	0.0	20.8	0.0	0.0
P111E	21-Apr-21	0.2	20.7	0.0	0.0
P111E	5-May-21	0.0	20.4	0.0	0.0
P111E	2-Jun-21	0.0	20.6	0.0	0.0
P111E	6-Jul-21	0.0	20.3	0.0	0.0
P111E	17-Aug-21	0.0	19.6	0.0	0.0
P111E	14-Sep-21	0.0	20.8	0.0	0.0
P111E	13-Oct-21	0.0	20.4	0.0	0.0
P111E	10-Nov-21	0.0	20.8	0.0	1.0
P111E	15-Dec-21	0.1	21.0	0.0	0.0
P112E	27-Jan-21	n/s	n/s	n/s	n/s
P112E	22-Feb-21	n/s	n/s	n/s	n/s
P112E	23-Mar-21	n/s	n/s	n/s	n/s
P112E	21-Apr-21	n/s	n/s	n/s	n/s
P112E	5-May-21	n/s	n/s	n/s	n/s
P112E	2-Jun-21	0.0	20.6	0.0	0.0
P112E	6-Jul-21	0.0	18.9	0.0	0.0
P112E	17-Aug-21	0.0	19.1	0.0	0.0
P112E	14-Sep-21	0.0	19.2	0.0	0.0
P112E	13-Oct-21	0.0	20.1	0.0	0.0
P112E	10-Nov-21	0.0	20.6	0.0	1.0
P112E	15-Dec-21	0.0	19.1	0.0	0.0

n/s - no sample due to collapse

BRADY ROAD RESOURCE MANAGEMENT FACILITY ANNUAL REPORT – 2021

6.0 NUISANCE MANAGEMENT

In order to reduce odour, litter, and vector nuisances at the landfill, several best practices and operating procedures are used, such as placement of screens, minimizing the working face of each cell, application of appropriate cover material (daily, intermediate, or final), site landscaping, weekly litter control patrols, and odour monitoring. If necessary, a licensed professional will apply vector control products, ensuring that appropriate chemicals are used and are properly handled. Noise is not a significant issue due to the separation from surrounding homes. Fugitive dust emissions are minimized by spraying site roads with uncontaminated surface water.

In 2021, there were 34 odour complaints; in all cases the source of the odour was investigated. If the source of the odour could be located within the BRRMF, we immediately covered the odour causing material, moved the tipping face to a more favorable area if available, and used compost or wood chips to reduce the odour and prevent further occurrence. Table 11 provides a summary of nuisance complaints received in 2021.

Brady Road Resource Management Facility Annual Report – 2021



**Water and Waste
Eaux et déchets**

Table 11. 2021 Nuisance Complaint Monitoring

Date	Complaint	Response
5/14/2021	Resident states that it smells like rotting garbage in the Prairie Pointe area. Resident refused to give contact information.	No contact information was given. We added additional sample points to our odour rounds for the next week in this area.
5/26/2021	Resident states that there is a very foul odour coming from Brady Road Landfill on May 24th around 11 p.m.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill in the South end of the city close to the Perimeter Highway. There was a light South East wind that day which would contribute to the odour staying more concentrated and not dissipating. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
6/11/2021	Resident is reporting bad odour coming out from Brady Landfill. Resident lives in South Pointe and cannot go outside as it smells very bad.	Phoned Resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site. We will add this street on to our list of addresses to check during the odour round.
6/25/2021	Resident is reporting that he can smell the Brady Road Landfill from his residence.	Phoned Resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site. We will add this street on to our list of addresses to check during the odour round.
7/3/2021	Resident states the it really smells this year in St. Norbert.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill. There was a North West wind most of the day on Sunday which would have contributed to an increase in odour in the area. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
7/3/2021	Resident states the Brady dump has been very smelly this year in St. Norbert and wants to know if it is ever going to be closed down.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill. There was a South East wind most of the day on Saturday which may have contributed to odour in the area. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
7/13/2021	Resident reports that the odour along Appleford Gate in Bridgwater Trails was particularly terrible around 21:00 on Friday, July 2nd. Resident believes that the odour originated from Brady.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill. Explained how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
7/20/2021	Resident feels that the smell coming from the Brady Road Landfill and 4R Winnipeg Depot at 1777 Brady Road may be hazardous for his construction team. In addition he would like details such as future plans to move the dump further away from new residential communities such as Prairie Pointe.	Informed the resident that on the day of concern it is not likely that the odour originated from Brady Landfill. There was a NE wind for the majority of the day on Tuesday which would not have been blowing into the Prairie Point community. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
7/21/2021	Resident would like to make a complaint regarding the land fill. Resident states that they can smell the landfill at their home and that it smells very bad and nasty.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill. There was a Southeast wind the majority of the day on Wednesday July 21st and Thursday July 22nd this week, which may have contributed to the odour in the area. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
8/4/2021	Resident states there is a odour coming from the landfill at Brady for about 20 days since July. Resident states this is off and on.	Phoned Resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site. We will add this street on to our list of addresses to check during the odour round.
8/11/2021	Resident reports the Brady Landfill stinks again @ 8:52 pm on August 11th.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill. There was a South West wind and high humidity that would have contributed to a stronger odour originating from Brady Landfill. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
8/14/2021	Resident is reporting that the landfill at Brady smells terrible, and has smelled terrible every summer.	No contact information was given. We added additional sample points to our odour rounds for the next week in this area.
8/15/2021	Resident states the garbage hill is smelling like feces and something needs to be done about this or the city should consider moving it to a different location.	Phoned Resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site. Discussed that a change in operations was the culprit for this current increase in odour and that this process has been halted until we can ensure no additional odour is generated. The Resident was informed that their is no intention on closing the site, however we are currently moving operations further south away from the new development.
8/16/2021	Resident lives in Bridgwater Trails neighborhood, and has been noticing a strong odour coming from the landfill for the last couple of days and intensifying during evenings. The odour is so strong that it's impossible to spend time outside or keep the windows opened.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill. There was a South West wind and high humidity that would have contributed to a stronger odour originating from Brady Landfill. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
8/16/2021	Resident just moved into the Prairie Pointe development and reports strong odors of garbage emitting from Brady landfill at least twice a week. It makes being outside unpleasant.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill. There have been a lot of South winds and high humidity conditions this summer which will contribute to odour travelling into the neighbouring communities. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
8/16/2021	Resident states that there is a toxic methane smell coming from the landfill. They can't enjoy outdoors and it is hard to breathe and causing headaches.	Phoned Resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site. Discussed that a change in operations was the culprit for this current increase in odour and that this process has been halted until we can ensure no additional odour is generated. The Resident was informed that their is no intention on closing the site, however we are currently moving operations further south away from the new development.

Client File No. 5556.00

Manitoba Environment Act Licence No. 3081 R

Brady Road Resource Management Facility Annual Report – 2021

Date	Complaint	Response
8/16/2021	Resident reports they have been living in Bridgwater for a few years and the smell has been bad. It has been so foul that it makes them gag when outdoors.	Phoned Resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site. Discussed that a change in operations was the culprit for this current increase in odour and that this process has been halted until we can ensure no additional odour is generated. The Resident was informed that their is no intention on closing the site, however we are currently moving operations further south away from the new development.
8/16/2021	Resident states that Sunday August 16, in the early evening, the odour was extremely high in the Bridgwater Trails area.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill. There have been a lot of South winds and high humidity conditions this summer which will contribute to odour travelling into the neighbouring communities. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
8/22/2021	Resident reiterates their earlier concern, the garbage hill is smelling like feces and something needs to be done about this or the city should consider moving it to a different location	Phoned Resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site.
8/22/2021	Resident reports that as of Monday, August 16th, the landfill has been emitting a "terrible smell" for the entire weekend.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill. There have been a lot of South winds and high humidity conditions this summer which will contribute to odour travelling into the neighbouring communities. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
8/28/2021	Resident is reporting odour from Brady Landfill. Resident states he can't be outside for more than 10 minutes.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill. There have been a lot of South winds and high humidity conditions this summer, which will contribute to odour travelling into the neighbouring communities. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
8/29/2021	Resident states they are in Prairie Pointe right now and the foul odour from the dump is too much.	Left message for customer indicating that they can contact us to discuss their concerns further.
9/8/2021	Resident wants to complain that she can smell the garbage dump.	Phoned Resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site. Discussed the landfill gas collection system and plans to move further south away from the new developments.
9/9/2021	Resident is following up to again report the odour coming from the landfill is really strong and if it cannot be contained maybe it should be moved.	Phoned Resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site. Discussed the landfill gas collection system and plans to move further south away from the new developments.
9/10/2021	Resident reports that they can smell the garbage dump in Bridgwater.	Phoned Resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site. Discussed the landfill gas collection system and plans to move further south away from the new developments.
9/13/2021	Resident reports there is a strong smell coming from the landfill going through Bridgwater and Prairie Pointe. Resident states this is becoming too common.	Phoned and left message for customer indicating that they can contact us to discuss their concerns further.
9/13/2021	Resident states they are once again reporting the strong odour coming from the landfill through Bridgwater.	Phoned and left message for customer indicating that they can contact us to discuss their concerns further.
9/18/2021	Resident reports that the fecal smell from the dump is all over Bridgwater. They continue to report the same issue and have previously requested the landfill be moved.	Phoned Resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site. Discussed the landfill gas collection system and plans to move further south away from the new developments.
9/23/2021	Resident is considering buying a property close to Brady but is worried about possible odor or flying garbage. She says she heard that they would be moving the landfill further South and would like further information.	Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
9/23/2021	Resident reports an odour on on Tuesday evening, September 21st which was not there during the day. Also, Thursday evening, September 23rd it could be smelled again which they think is from the landfill.	Emailed the resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
9/28/2021	Resident states he smell from the dump is horrid today, for the first time they smell it from inside their home with all windows closed.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill. Due to the recent rise in temperature and a strong south wind, an odour has been detected in neighbouring communities. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
10/3/2021	Resident states they have been complaining to the City about the smell coming from the land fill. There had been a plan talked about to have the landfill moved further south. The Resident wants to know if the Department knows about this plan and if it is still taking place.	Phoned Resident and discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site. Discussed the landfill gas collection system and plans to move further south away from the new developments.
11/9/2021	Resident reports that for the past few days the odour from the Brady Landfill has been fairly bad, it's affecting the breathing of people in the household. Whenever they breathe the outdoor air when it's this bad their throat gets irritated really quickly.	Informed the resident that on the day of concern it is likely that the odour originated from Brady Landfill. There was a weak South East wind for most of the day along with high humidity. This combination would definitely contribute to odour travelling into the neighbouring communities. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.
11/12/2021	Resident states that they would like to report that there is a 3 out of 10 level odour in the area on November 10th.	Informed the resident that on the day of concern it is not likely that the odour originated from Brady Landfill. There was a weak North East wind and low humidity. Typically, this combination would not result in an increase in odour from the landfill being directed in the neighbourhood. Discussed how the City of Winnipeg Solid Waste Services Division is working to reduce the overall amount of odour that is being produced, and moving off site and explained the monitoring protocol for landfill odour around the landfill and in the neighboring communities.

BRADY ROAD RESOURCE MANAGEMENT FACILITY ANNUAL REPORT – 2021

7.0 CONCLUSION

The diversion operations taking place at the BRRMF have been effective in diverting tens of thousands of metric tonnes of material from the landfill.

The quality of the ground water beneath the site has not been negatively impacted, as demonstrated by the comparison of upstream to downstream ground water quality.

The quality of the surface water measured at the Weir is statistically similar to the quality of the surface water upstream of the BRRMF.

Leachate management was successful in 2021 as there were no breakouts of leachate.

The areas where landfill gas is escaping should be repaired.

The BRRMF will continue to operate so as to ensure that the environment is maintained in such a manner as to sustain a high quality of life, including social and economic development, recreation and leisure for present and future Manitobans.

8.0 REFERENCES

1. Brady Road Resource Management Facility – Manitoba Environment Act Licence No. 3081 R

<https://www.winnipeg.ca/waterandwaste/pdfs/garbage/bradylicence.pdf>

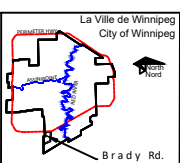
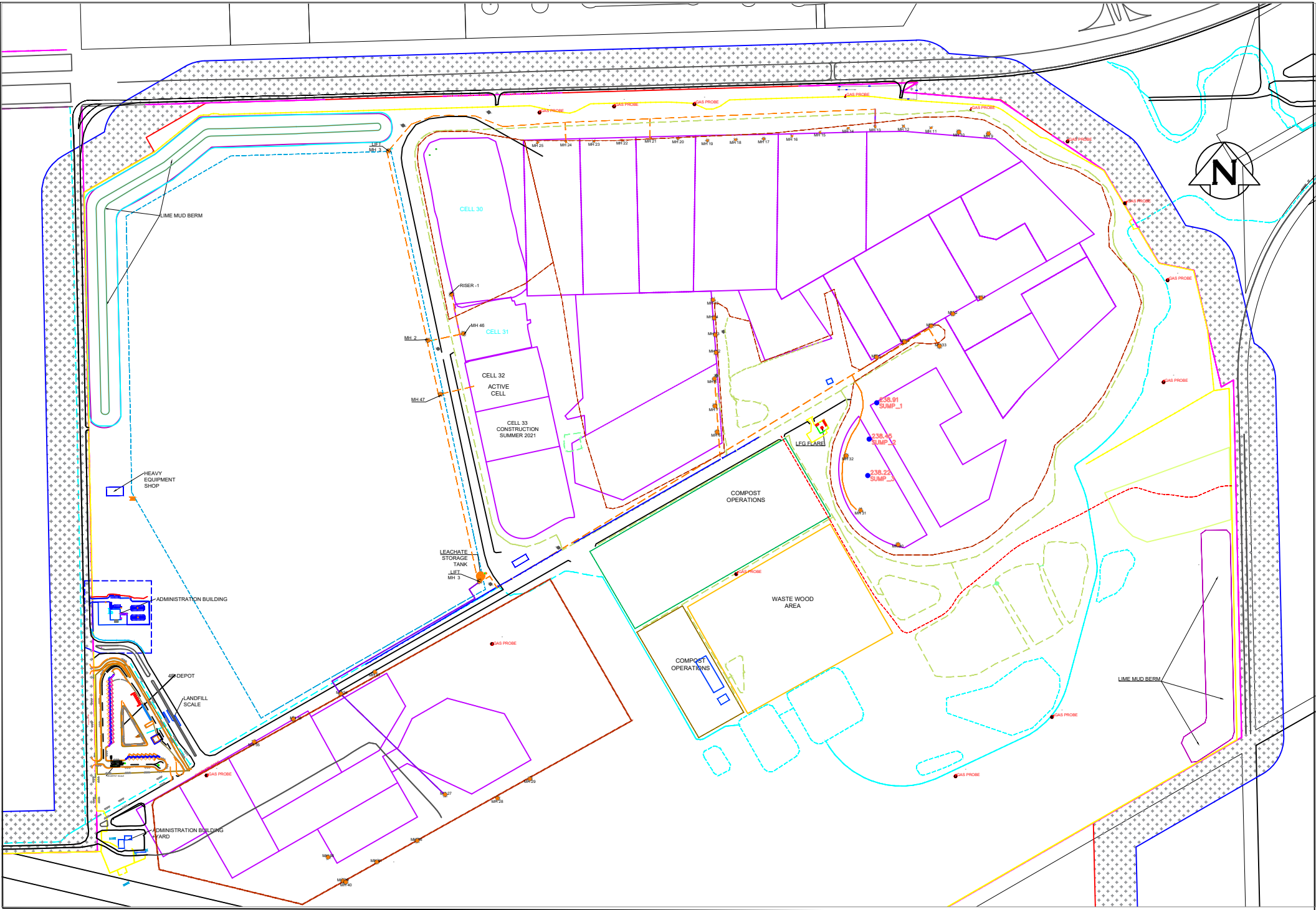
2. Ontario Ministry of the Environment. (2011, July 1). Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act. Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition.

<https://www.ontario.ca/page/soil-ground-water-and-sediment-standards-use-under-part-xv1-environmental-protection-act>

3. Canadian Council of Ministers of the Environment. Canadian Environmental Quality Guidelines Summary Table. Water Quality Guidelines for the Protection of Freshwater Aquatic Life. (CCME, 2019).

<http://ceqg-rcqe.ccme.ca/download/en/221>

FIGURE 1
BRRMF LAYOUT & LEACHATE
COLLECTION SYSTEM

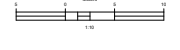


La Ville de Winnipeg
City of Winnipeg

LEGEND / LÉGENDE

	CONTROL ZONE / Zone de contrôle		ADMIN. BUILDING
	LANDFILL SITE/ Site d'enfouissement		CONTOURS LINES @ 0.05m.
	GW Flow Direction		CL
	MANHOLE		CB
	GAS PROBE		GW Well/Lysimeter
	LEACHATE PROBE		Wastewater System
	HYDRANT		Storm Drain System
	THERMOCOUPLE		Water Main
	GW Well		Railway

Scale in metres / Échelle en mètres



METRIC / MÉTRIQUE
UNITED STATES CUSTOMARY SYSTEM / SYSTÈME D'UNITÉS US D'ÉTATS UNIS

NO.	REVISIONS	DATE	BY	DATE

BRRMF ADMINISTRATIVE BUILDING Bâtiment Administratif	
SURVEY BY: RBMB	VALIDATED BY: GR
DRAWN BY: MD	APPROVED BY:
WELLS FEATURES SURVEYED: 2017	EMMN
UPDATED FOR CK: 2021	EM
VERTICAL SCALE: 1:10	PRINTED:
DATE: May 15, 2020	DATE: April 12, 2021

THE CITY OF WINNIPEG / LA VILLE DE WINNIPEG
WATER AND WASTE DEPARTMENT
SOLID WASTE DIVISION

Site No. 25
Brady Rd.
DUMP SITE & DETAIL

WARNING
THE EXACT BOUNDARY OF REFUSE OR DEBRIS IS DETERMINED ONLY BY DETAILED INVESTIGATION.
THE EXISTENCE AND EXACT LOCATION OF ALL UNDERGROUND SERVICES INCLUDING
NEW CONNECTIONS MUST BE CORROBORATED WITH THE APPROPRIATE UTILITY.

ATTENTION
LES LIMITES EXACTES DU DÉBRIS OU DES DÉBRIS SONT DÉTERMINÉES SEULEMENT PAR DES SONDAGES DÉTAILLÉS.
L'EXISTENCE ET LA SITUATION EXACTE DE TOUS LES SERVICES SOUS-SOLIS, Y COMPRIS
LES NOUVEAUX RACCORDEMENTS DOIT ÊTRE VÉRIFIÉE AVEC LES UTILITAIRES APPROPRIÉS.

SHEET 1 OF 2	CITY DRAWING NUMBER
BRRMF_MultiPlan_BMS_RS_DWG	

FIGURE 2
GROUND WATER SAMPLING
LOCATIONS

BRADY ROAD LANDFILL



LEGEND

- ▲ OVERBURDEN PIEZOMETER NEST
- GROUNDWATER WELL



B.M. ELEV.	FIELD BOOK #:
POSTED TO LBIS	
1	11/11/25 KB
NO. REVISIONS	DATE BY

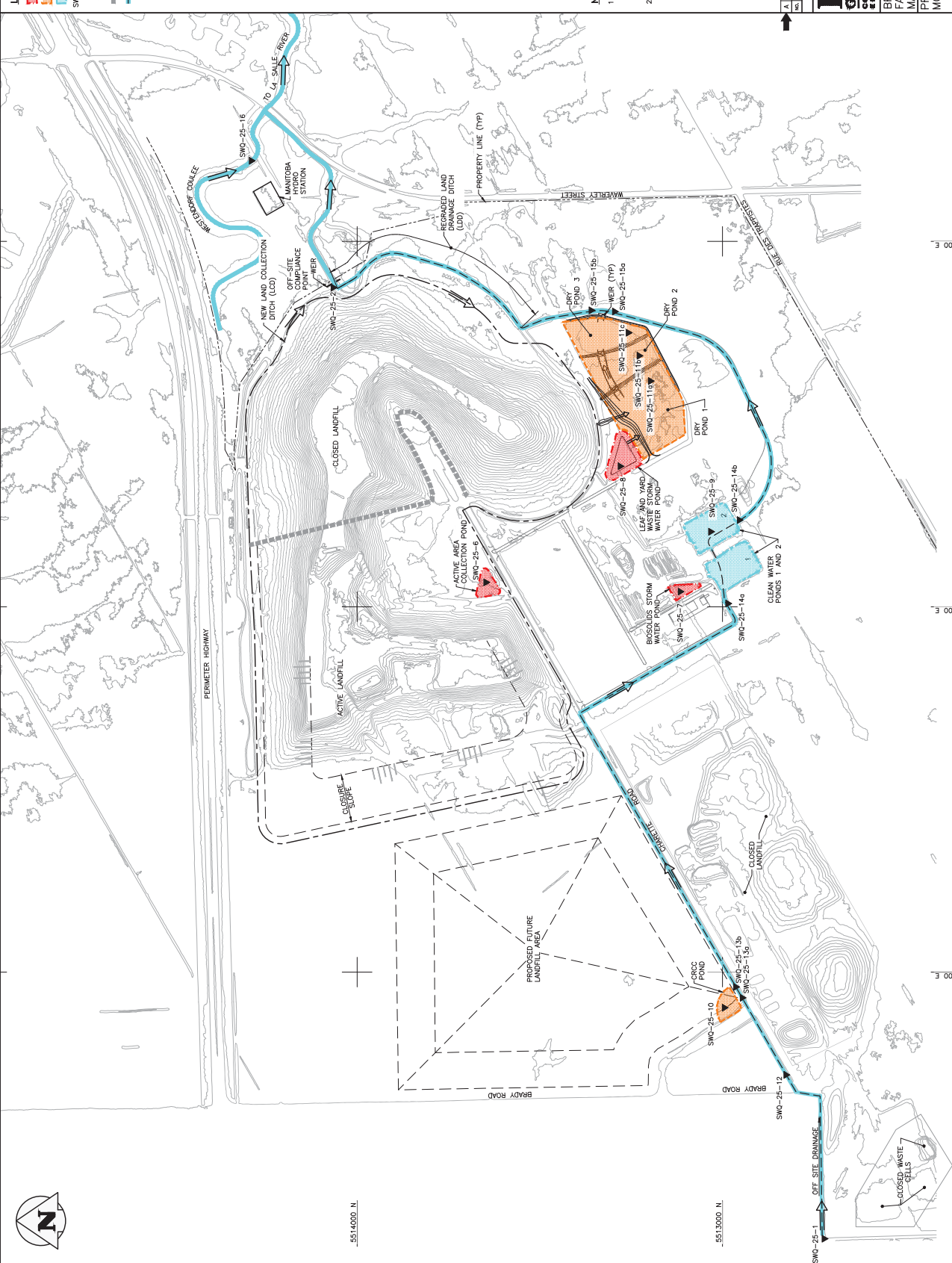

THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT

BRADY ROAD LANDFILL
WELL LOCATIONS

SHEET 1 OF 1

FIGURE 1_R1

FIGURE 3
SURFACE WATER SAMPLING
LOCATIONS



- LEGEND:**
- IMPACTED WATER POND
 - DRY POND
 - CLEAN WATER POND
 - SURFACE WATER SAMPLING LOCATION
 - SURFACE WATER FLOW DIRECTION
 - CLOSED LANDFILL BOUNDARY
 - LAND DRAINAGE DITCH

SWO-25-16
 SWO-25-15b
 SWO-25-15a
 SWO-25-14b
 SWO-25-14a
 SWO-25-13c
 SWO-25-13b
 SWO-25-13a
 SWO-25-12
 SWO-25-11c
 SWO-25-11b
 SWO-25-11a
 SWO-25-10
 SWO-25-9
 SWO-25-8
 SWO-25-7
 SWO-25-6
 SWO-25-5
 SWO-25-4
 SWO-25-3
 SWO-25-2
 SWO-25-1

NOTES:

1. GEOGRAPHY SOURCES ARE CITY OF WINNIPEG, KGS OPERATING AREA AND ADDITIONAL LANDFILL PERIMETER SURVEY BY KGS GROUP 2013.
2. EXACT SURFACE WATER SAMPLING LOCATION TO BE DETERMINED IN FIELD.

SCALE: 1:10000 METRIC
 A 14/05/20 ISSUED WITH DRAFT REPORT

NO.	DATE	REVISIONS / ISSUE



KGS GROUP
 CONSULTING ENGINEERS

THE CITY OF WINNIPEG
 WATER AND WASTEWATER

BRADY ROAD RESOURCE MANAGEMENT
 FACILITY SURFACE WATER
 MANAGEMENT PLAN
 PROPOSED SURFACE WATER
 MONITORING LOCATIONS

MAY 2014

FIGURE 10 A

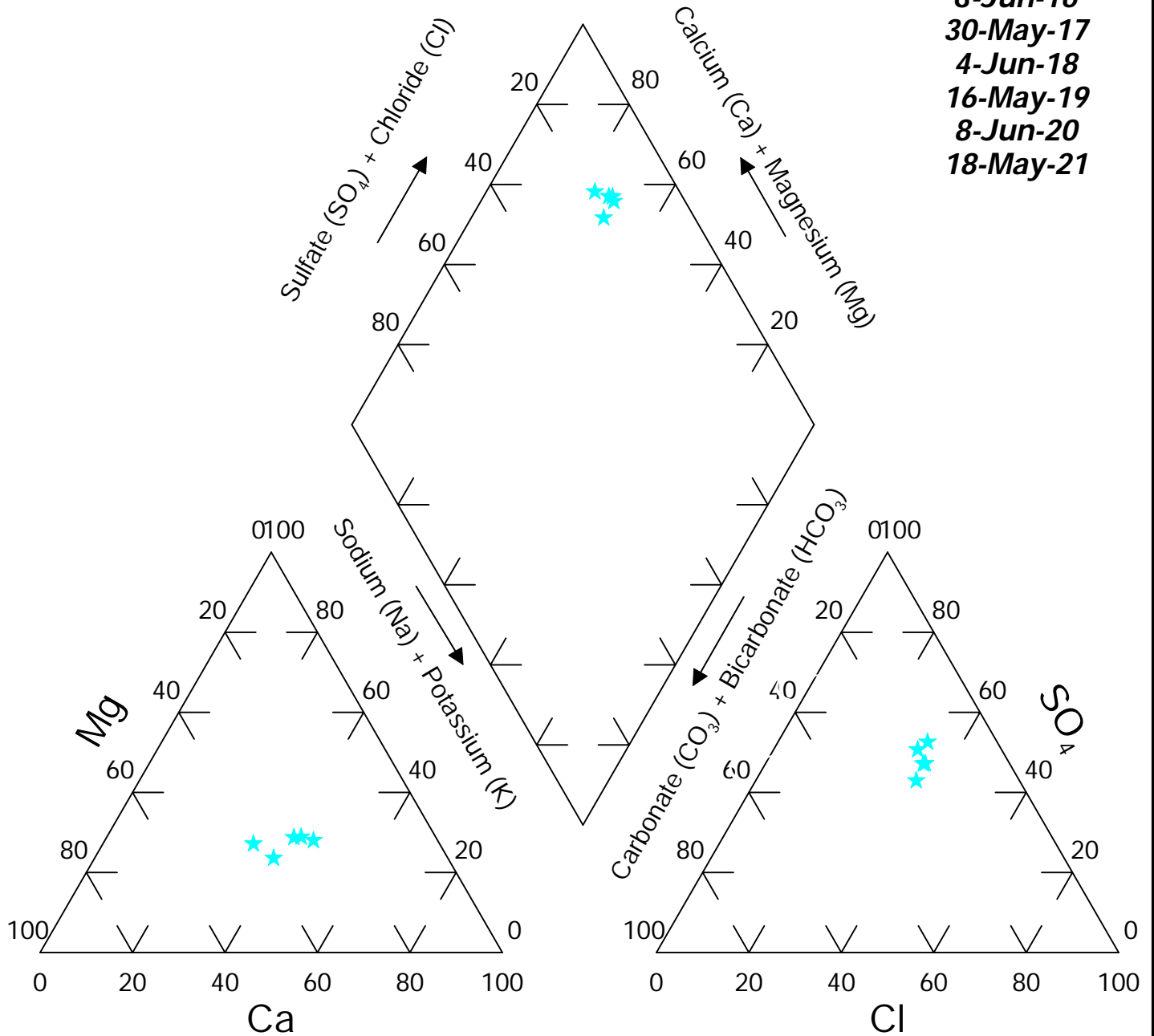
APPENDIX A
2021 PIPER DIAGRAMS

**2021 GROUNDWATER
PIPER DIAGRAMS**

Site: Brady

Location : GWQ25-4N34-CR

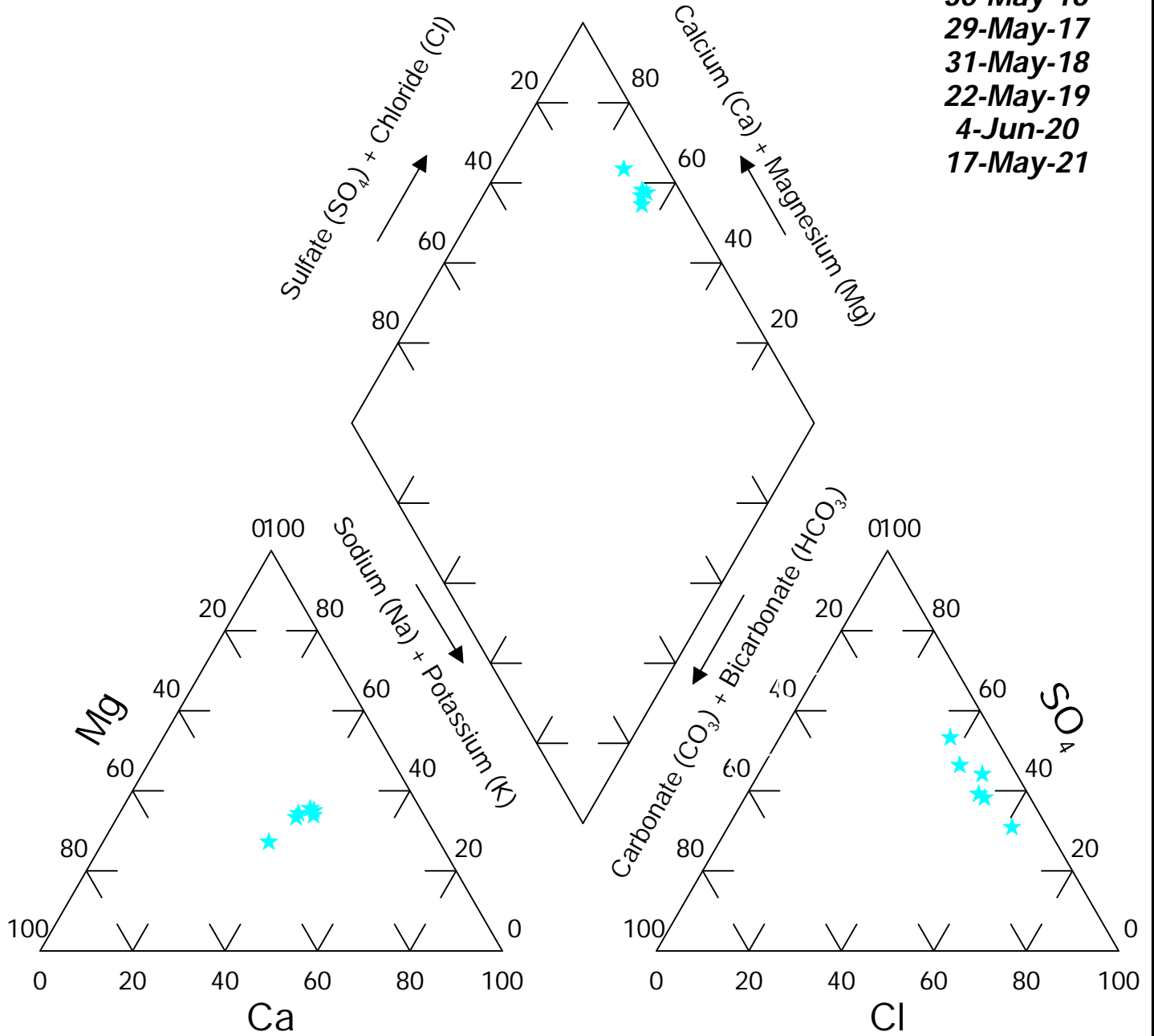
Dates:
8-Jun-16
30-May-17
4-Jun-18
16-May-19
8-Jun-20
18-May-21



Site: Brady

Location : GWQ25-5N62-D

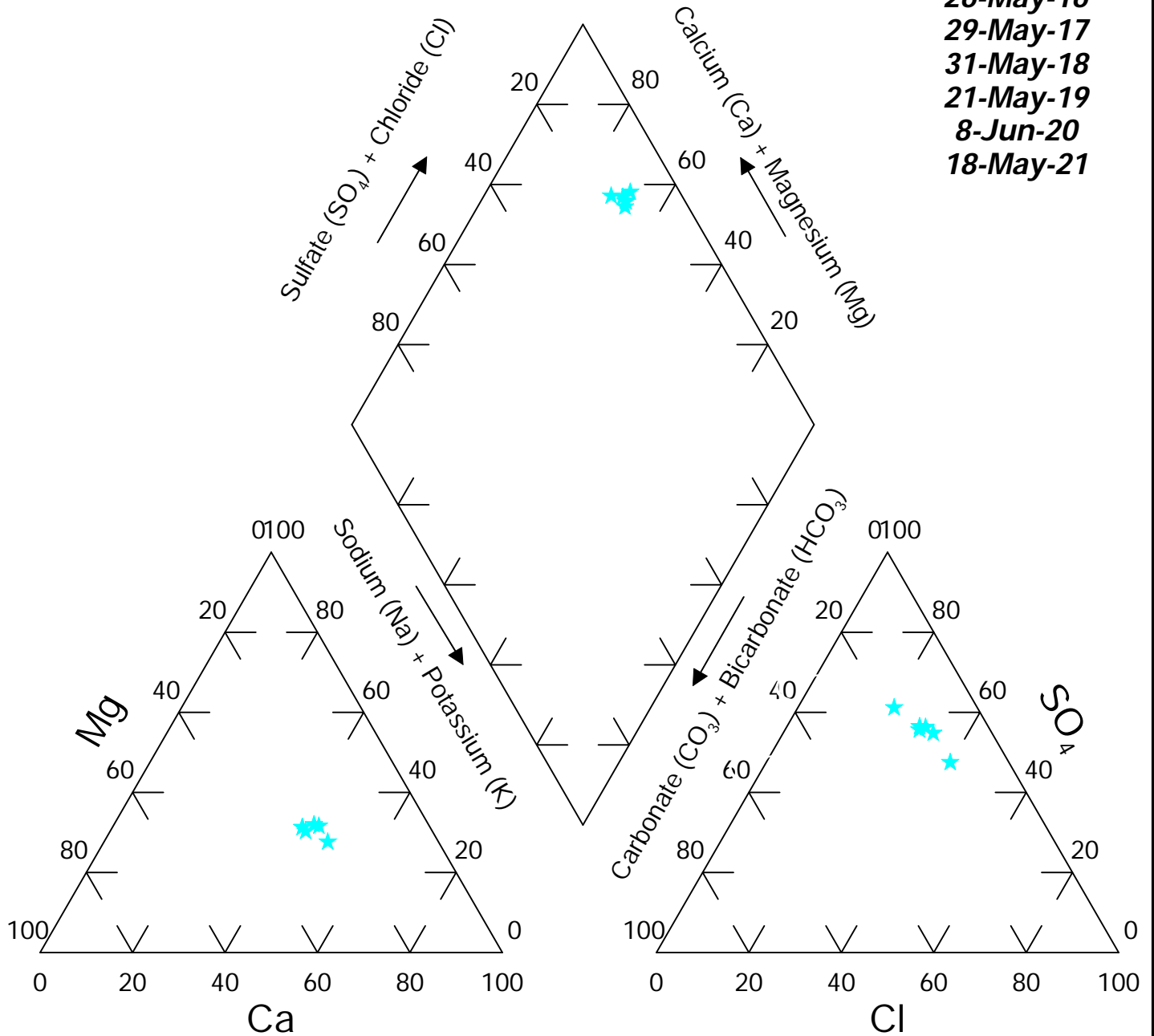
Dates:
 30-May-16
 29-May-17
 31-May-18
 22-May-19
 4-Jun-20
 17-May-21



Site: Brady

Location : GWQ25-6N57-DR

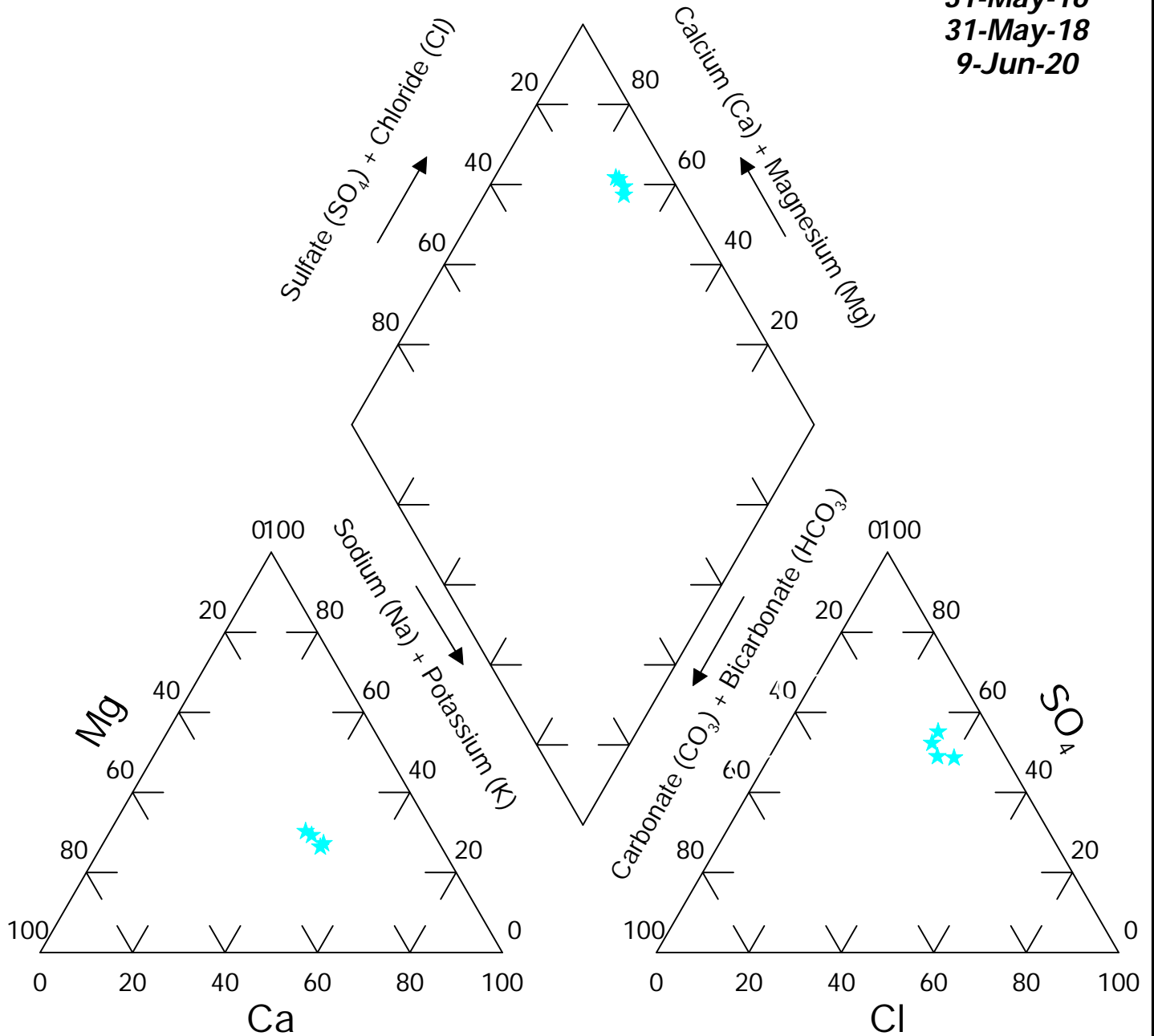
Dates:
 26-May-16
 29-May-17
 31-May-18
 21-May-19
 8-Jun-20
 18-May-21



Site: Brady

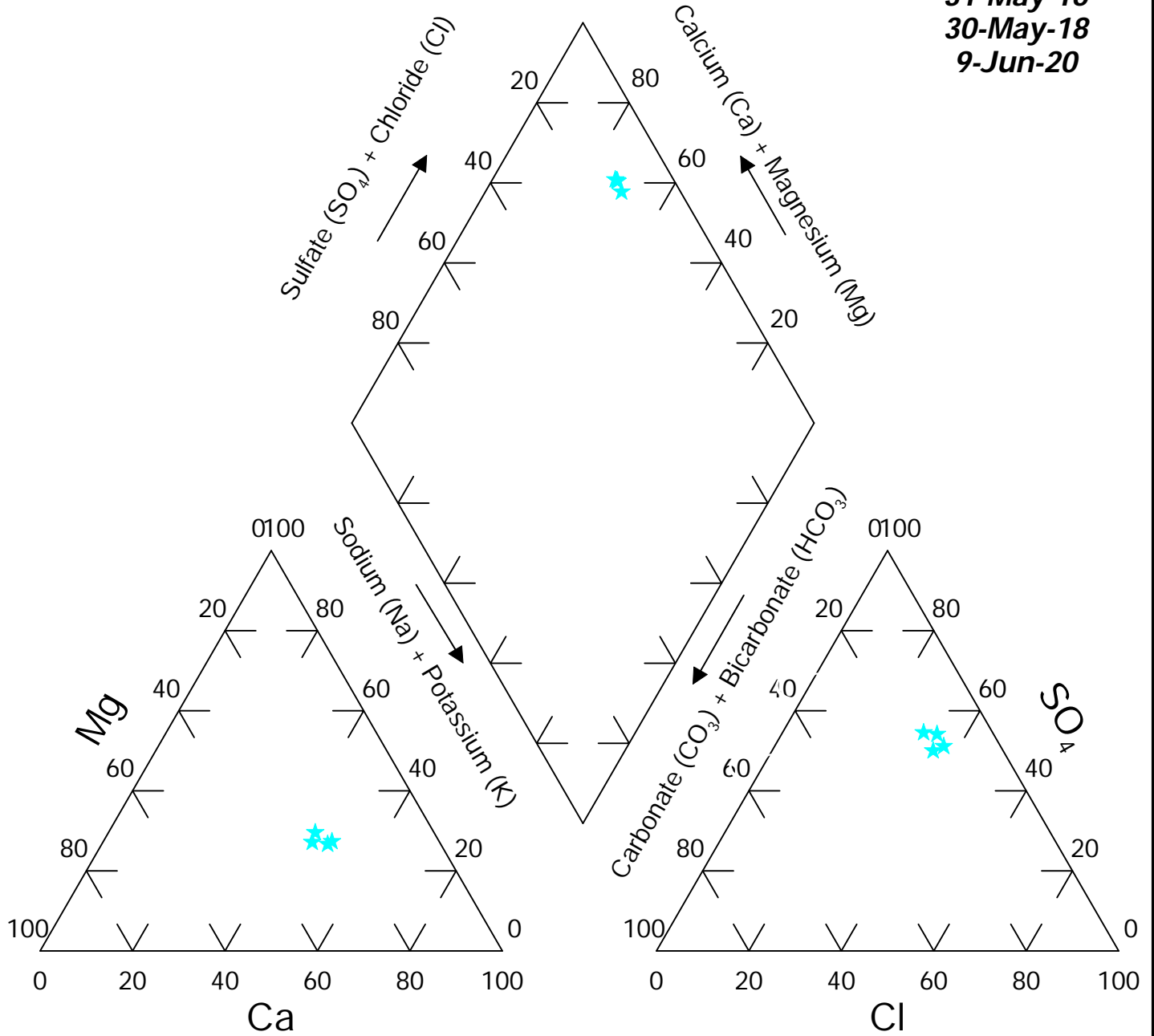
Location : GWQ25-6N58-DR

Dates:
31-May-16
31-May-18
9-Jun-20



Site: Brady
Location : GWQ25-6N59-DR

Dates:
31-May-16
30-May-18
9-Jun-20



Site: Brady

Location : GWQ25-6N60-DR

Dates:

30-May-16

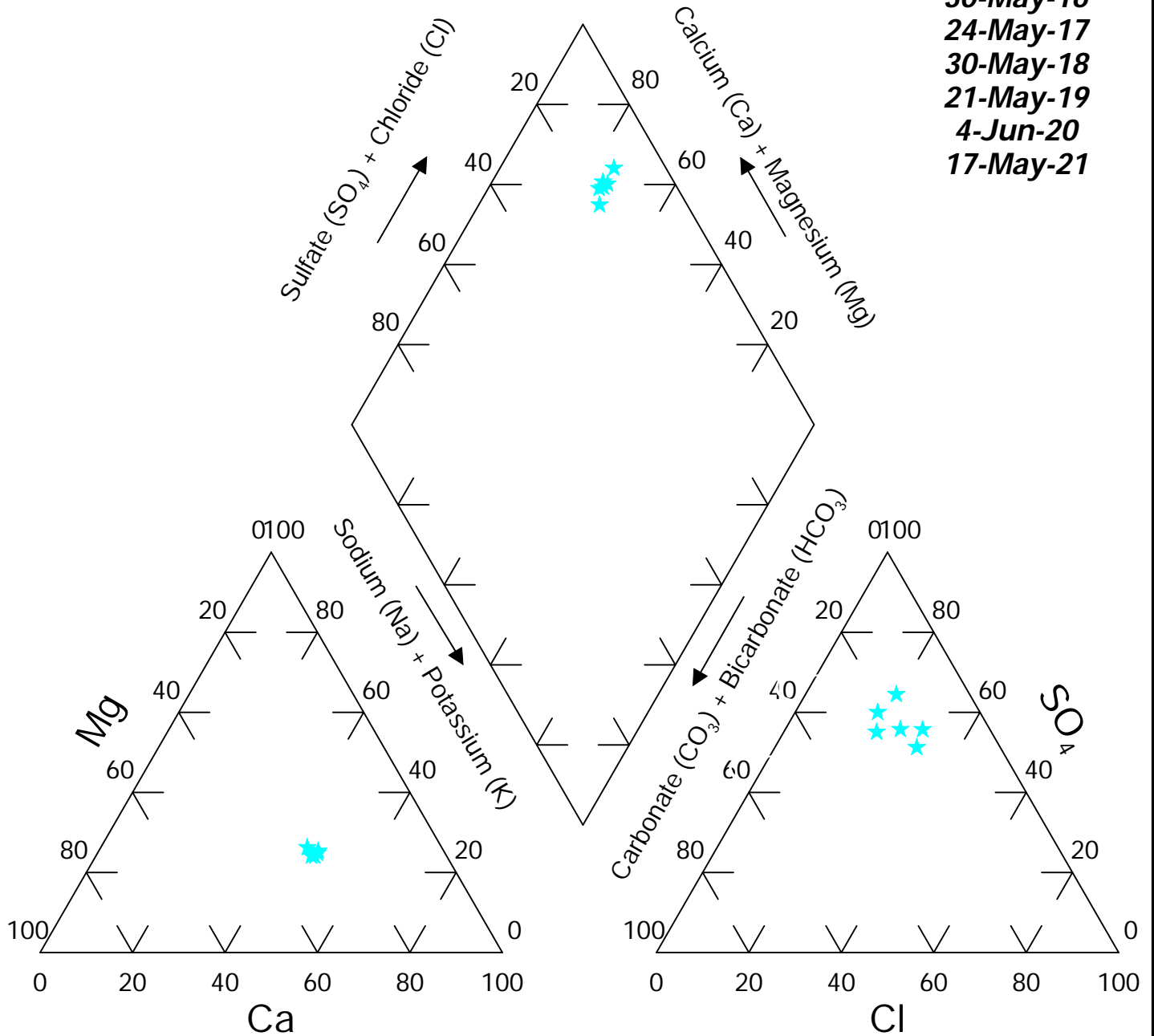
24-May-17

30-May-18

21-May-19

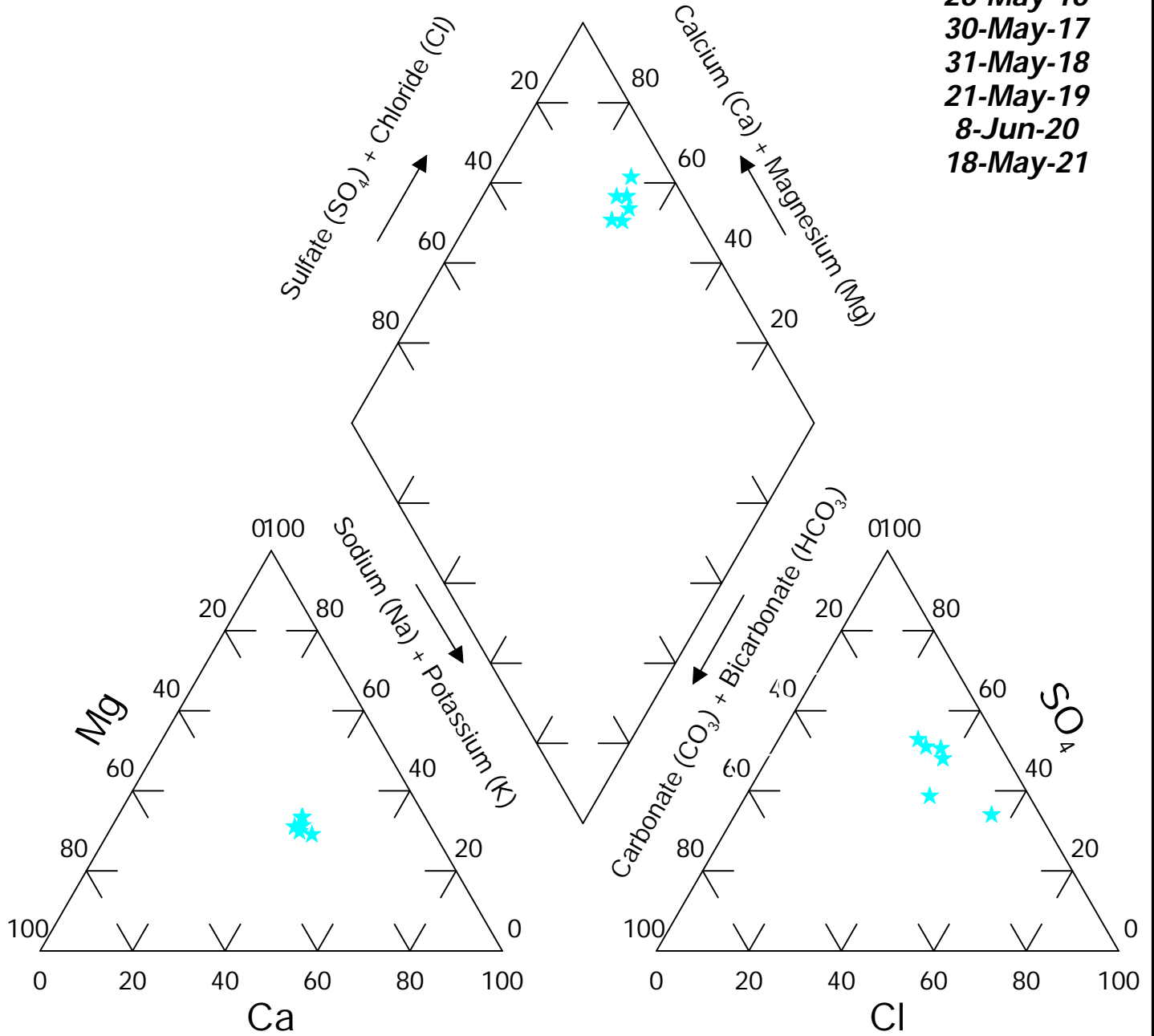
4-Jun-20

17-May-21



Site: Brady
Location : GWQ25-6N63-E

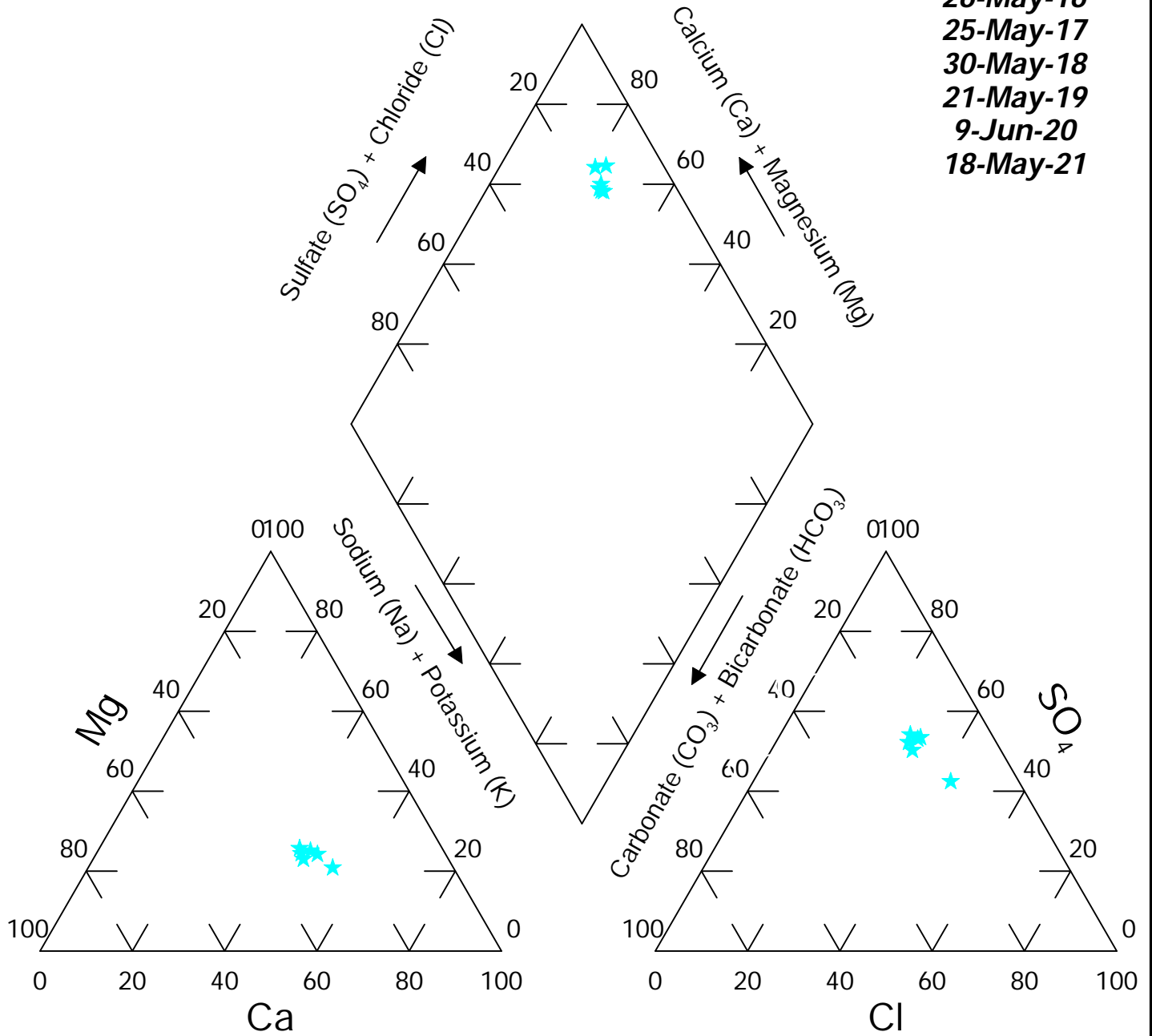
Dates:
 26-May-16
 30-May-17
 31-May-18
 21-May-19
 8-Jun-20
 18-May-21



Site: Brady

Location : GWQ25-6N67-E

Dates:
 26-May-16
 25-May-17
 30-May-18
 21-May-19
 9-Jun-20
 18-May-21



Site: Brady

Well #: 4N34-D/DR

Dates:
 7-Jun-16
 25-May-17
 4-May-18
 16-May-19
 8-Jun-20
 17-May-21

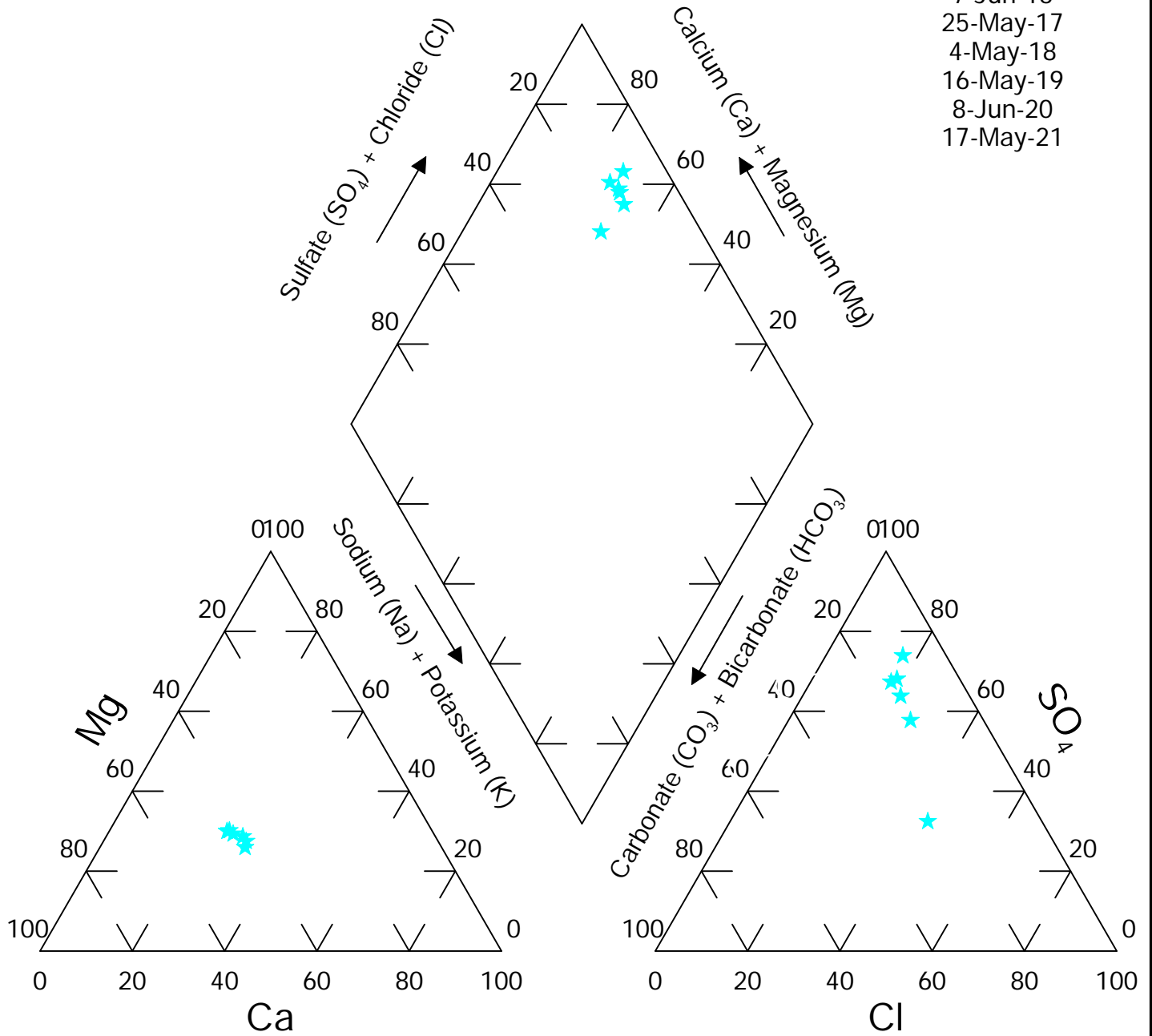


FIGURE: 10P

Site: Brady

Well #: 5N62-E

Dates:

- 30-May-16
- 27-Oct-16
- 29-May-17
- 17-Oct-17
- 31-May-18
- 15-Oct-18
- 22-May-19
- 3-Oct-19
- 4-Jun-20
- 13-Oct-20
- 17-May-21
- 5-Oct-21

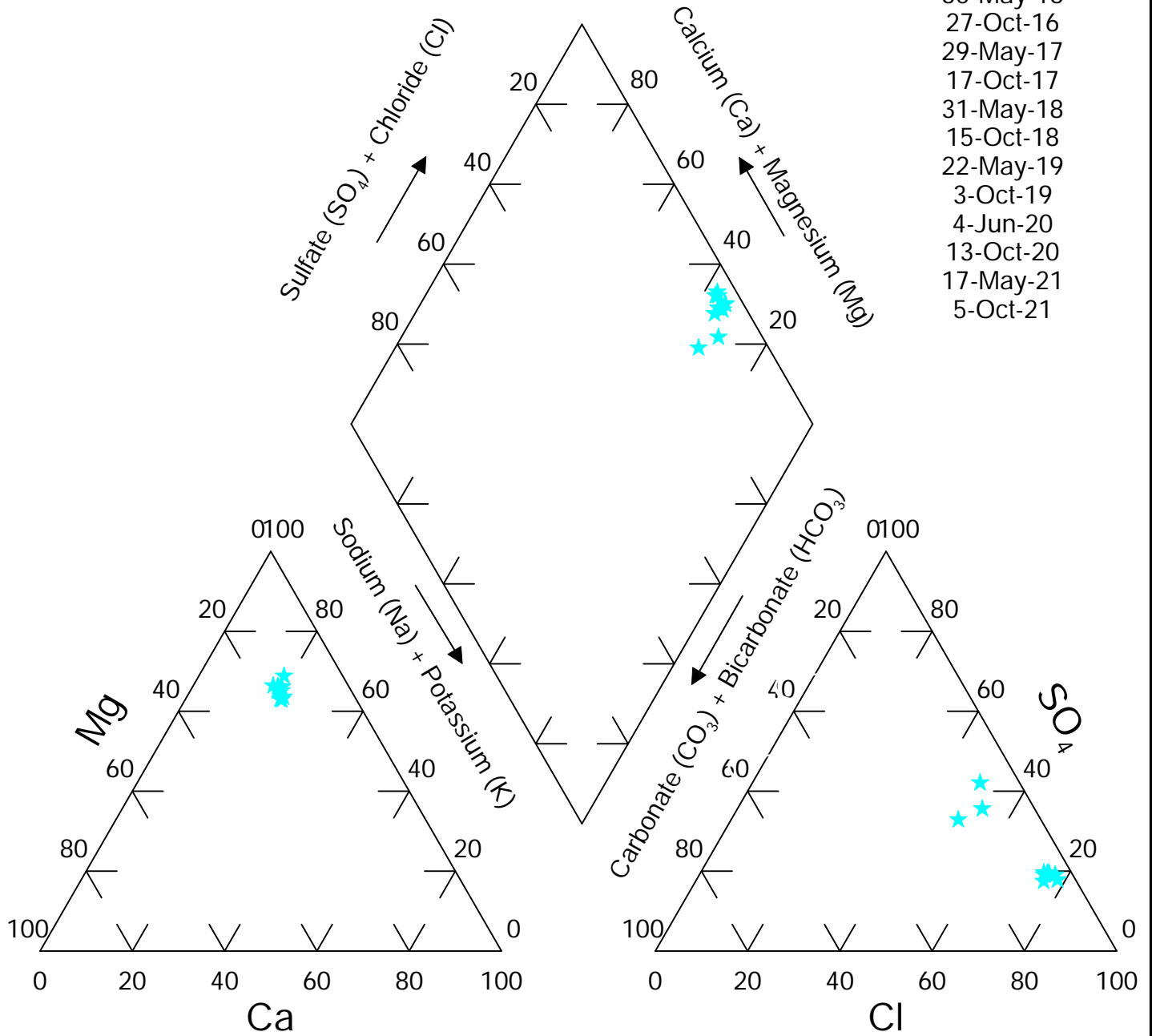


FIGURE: 11P

Site: Brady
Well #: 6N57-F/FR

Dates:
26-May-16
24-May-17
30-May-18
21-May-19
8-Jun-20
19-May-21

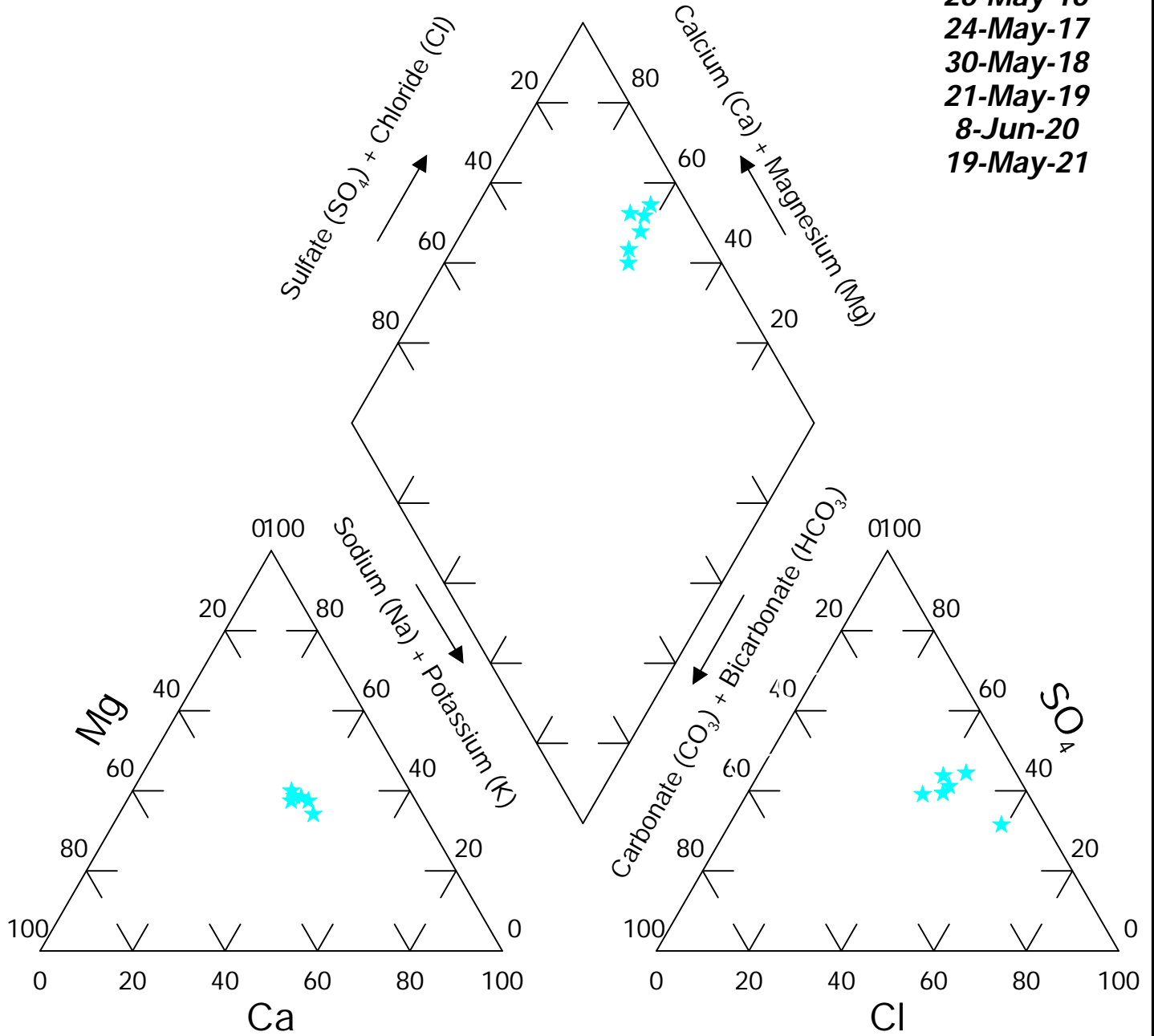
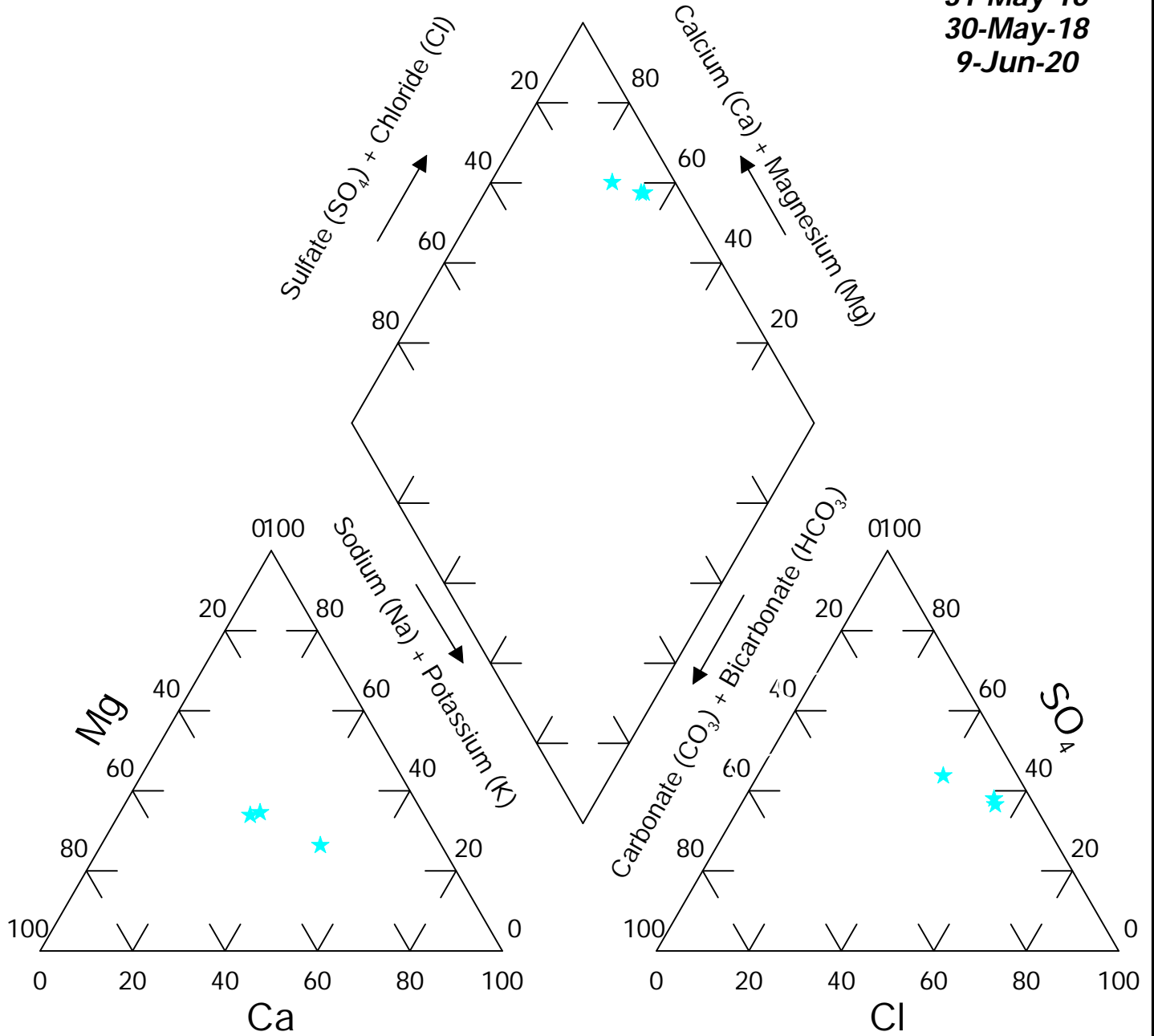


FIGURE: 12P

Site: Brady
Well #: 6N58FR

Dates:
31-May-16
30-May-18
9-Jun-20



Site: Brady
Well #: 6N59-F/FR

Dates:
30-May-16
30-May-18
9-Jun-20

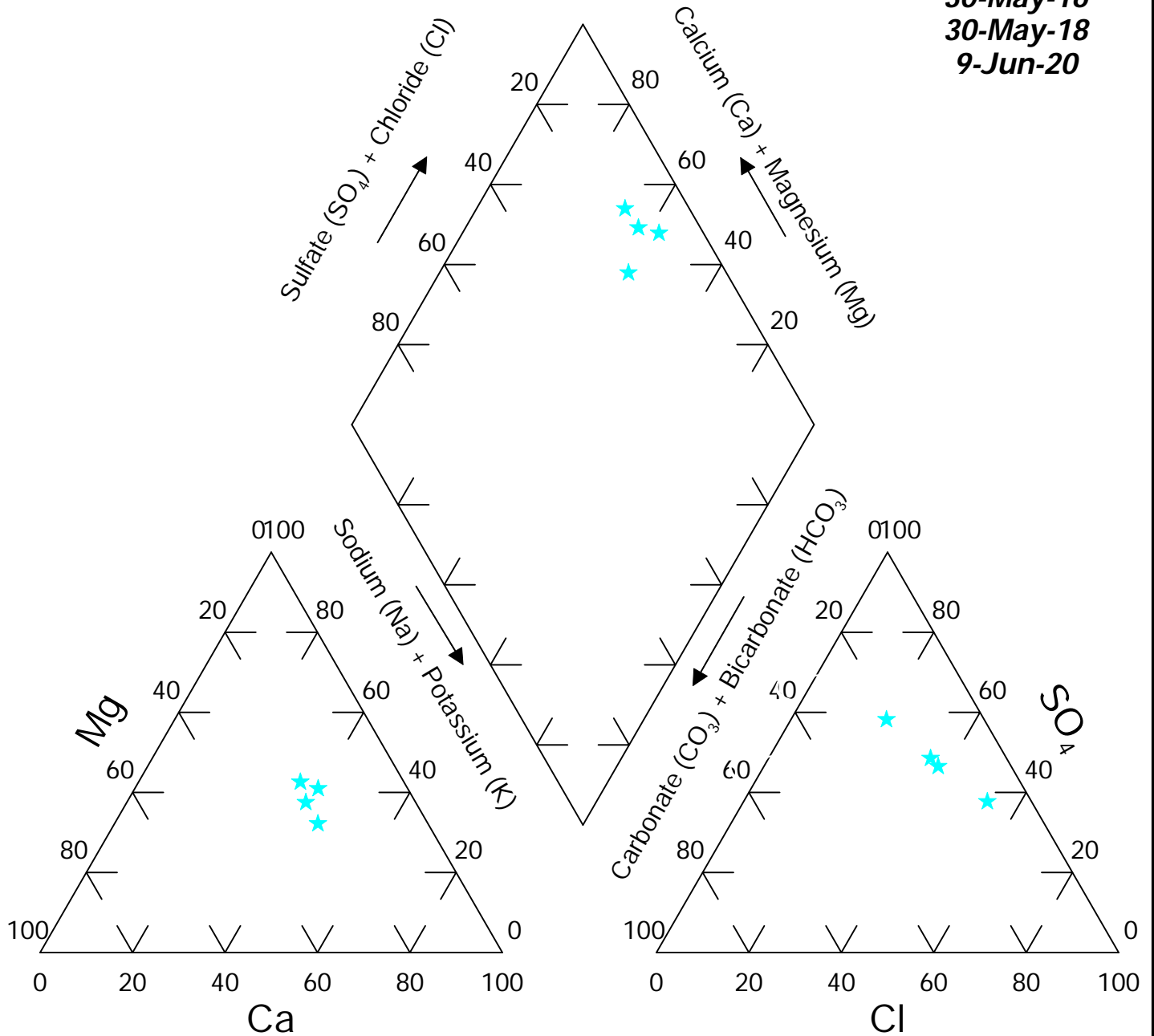


FIGURE: 14P

Site: Brady
Well #: 6N60-E/ER

Dates:
 30-May-16
 27-Oct-16
 24-May-17
 17-Oct-17
 30-May-18
 15-Oct-18
 21-May-19
 3-Oct-19
 4-Jun-20
 15-Oct-20
 17-May-21
 5-Oct-21

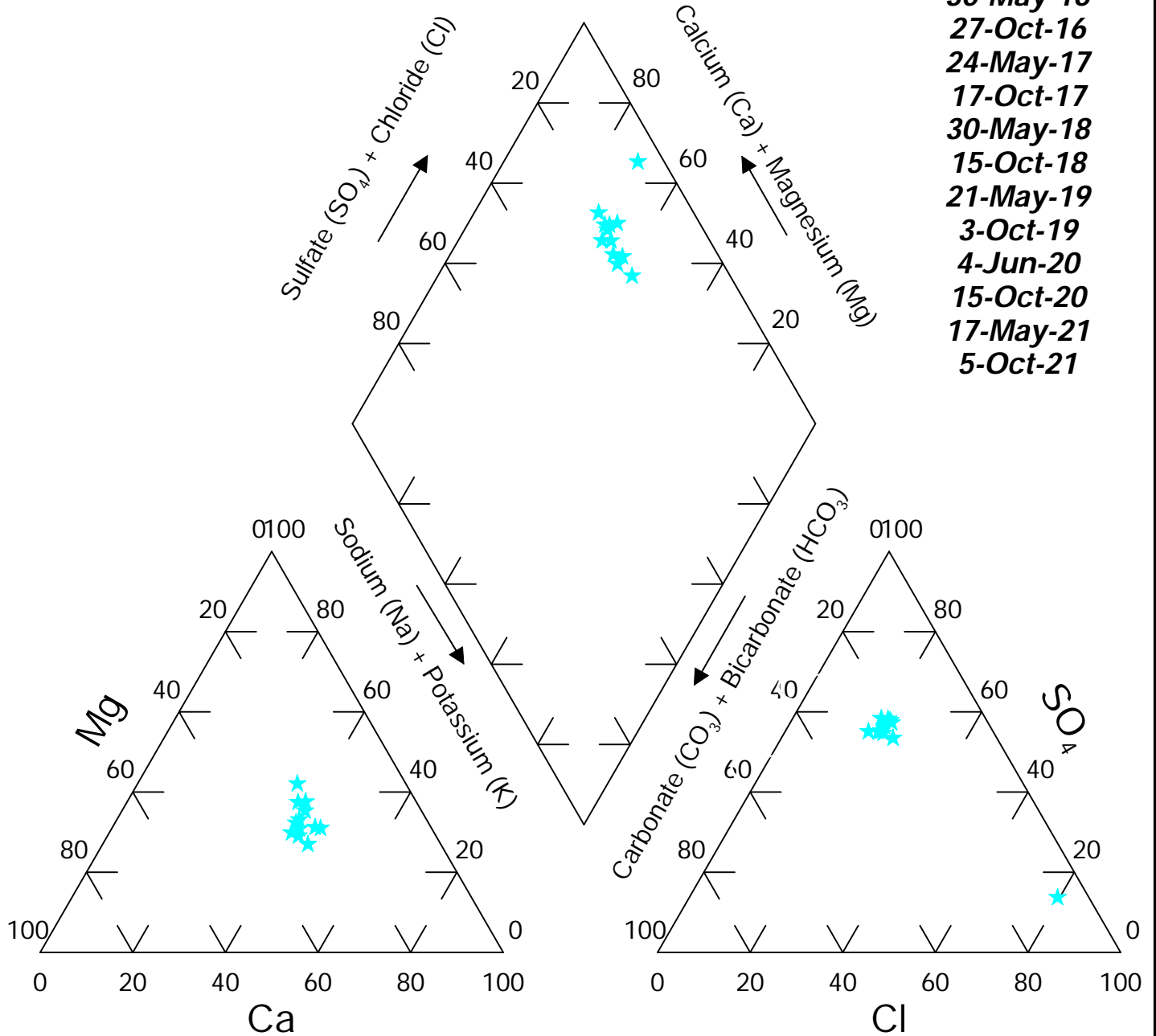


FIGURE: 15P

Site: Brady
Well #: 6N63-F

Dates:
 26-May-16
 29-May-17
 31-May-18
 21-May-19
 10-Jun-20
 18-May-21

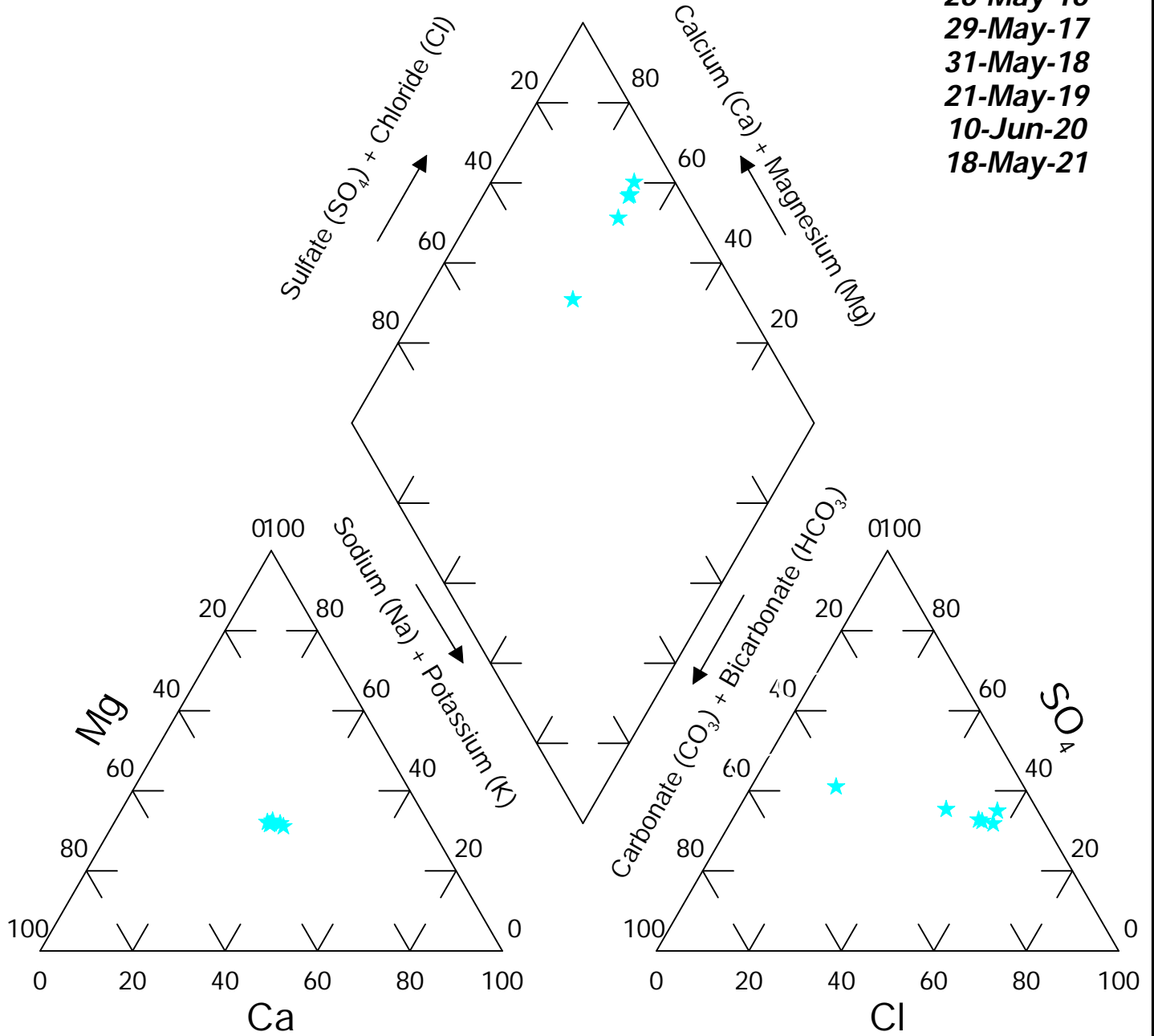


FIGURE: 16P

Site: Brady
Well #: 6N67-F

Dates:
 26-May-16
 25-May-17
 30-May-18
 21-May-19
 9-Jun-20
 18-May-21

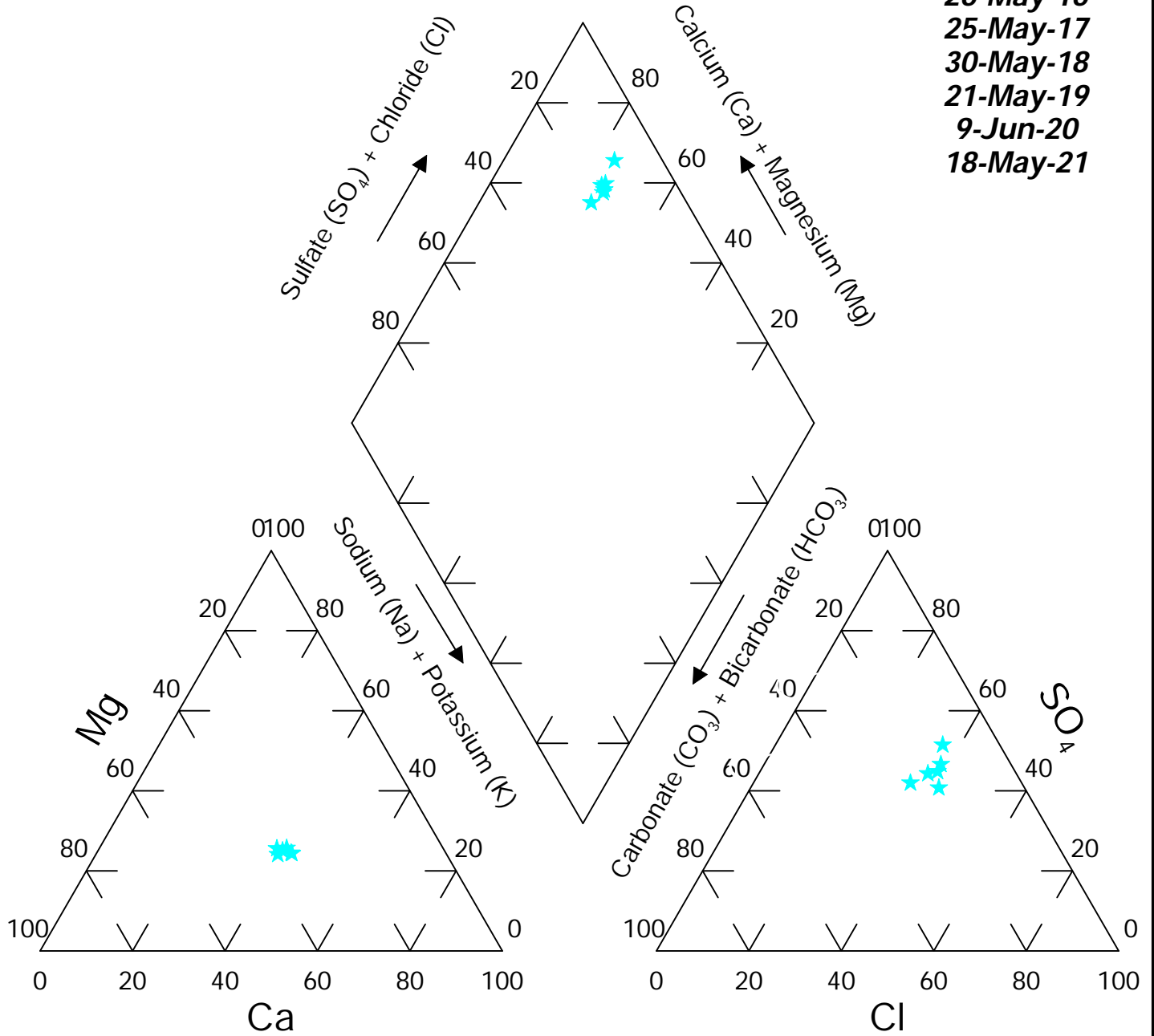
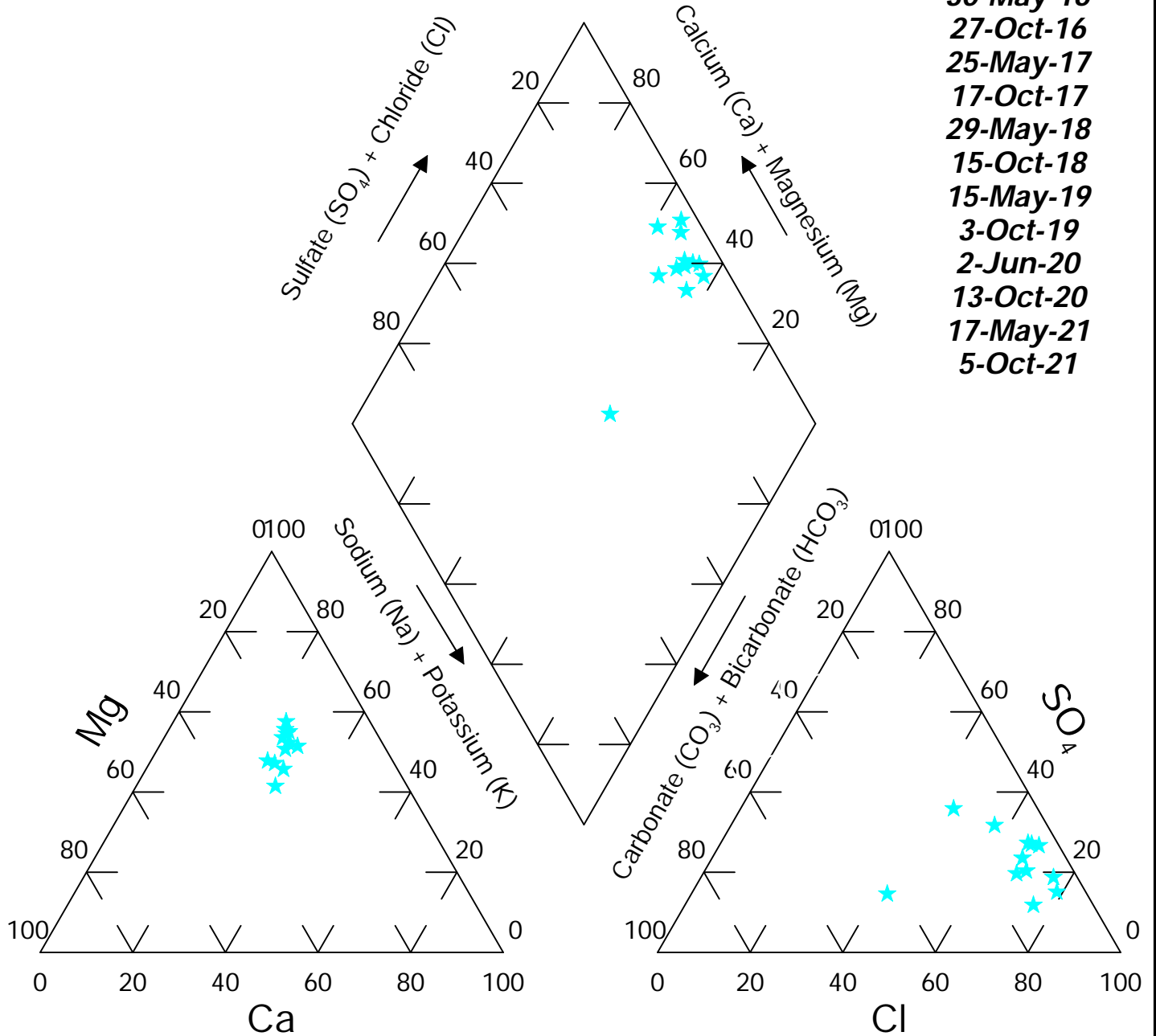


FIGURE: 17P

Site: Brady Well #: 13A

Dates:
 30-May-16
 27-Oct-16
 25-May-17
 17-Oct-17
 29-May-18
 15-Oct-18
 15-May-19
 3-Oct-19
 2-Jun-20
 13-Oct-20
 17-May-21
 5-Oct-21



Site: Brady Well #: 14A

- Dates:**
 30-May-16
 28-Oct-16
 25-May-17
 17-Oct-17
 29-May-18
 16-Oct-18
 15-May-19
 3-Oct-19
 3-Jun-20
 15-Oct-20
 17-May-21
 5-Oct-21

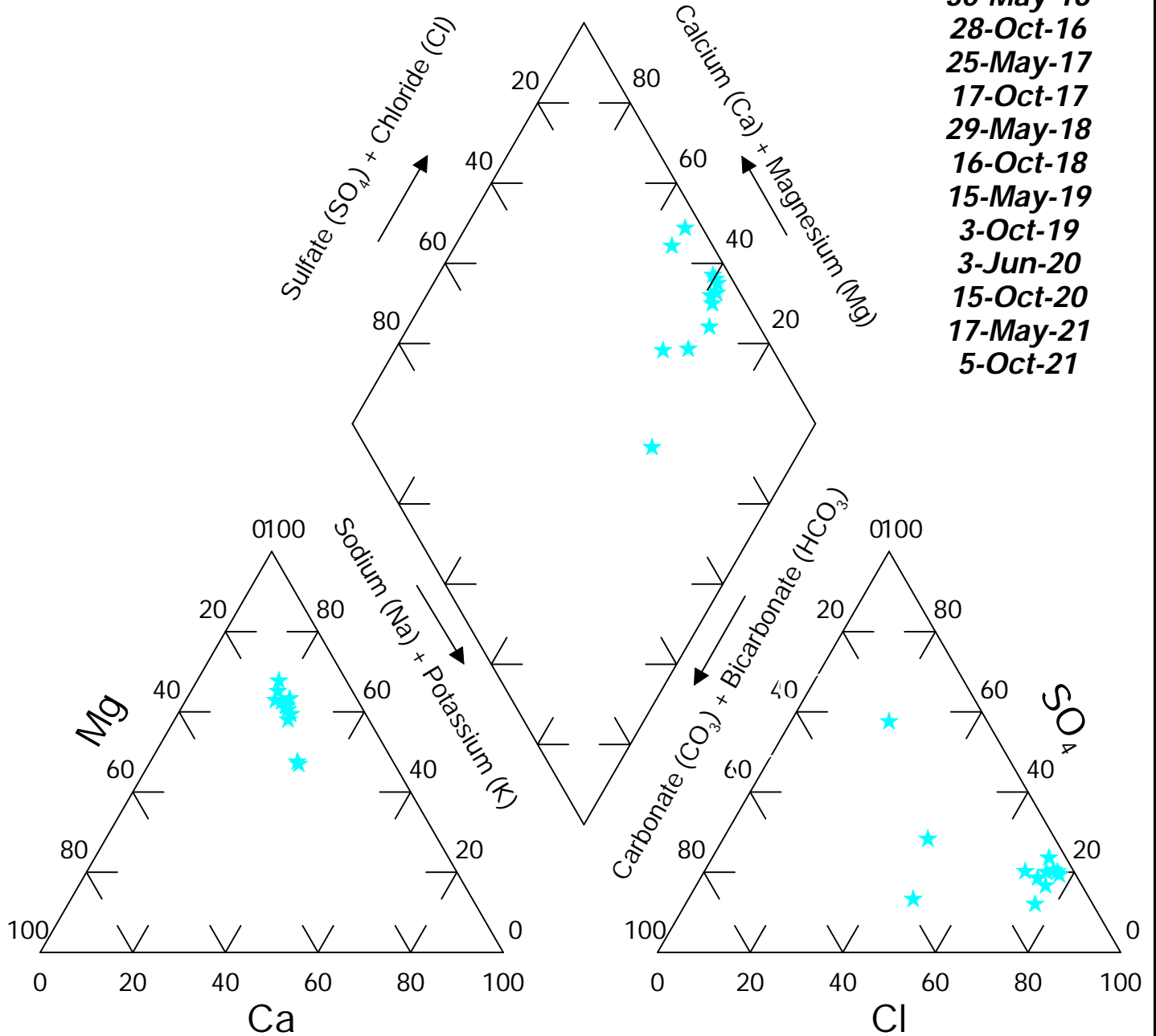
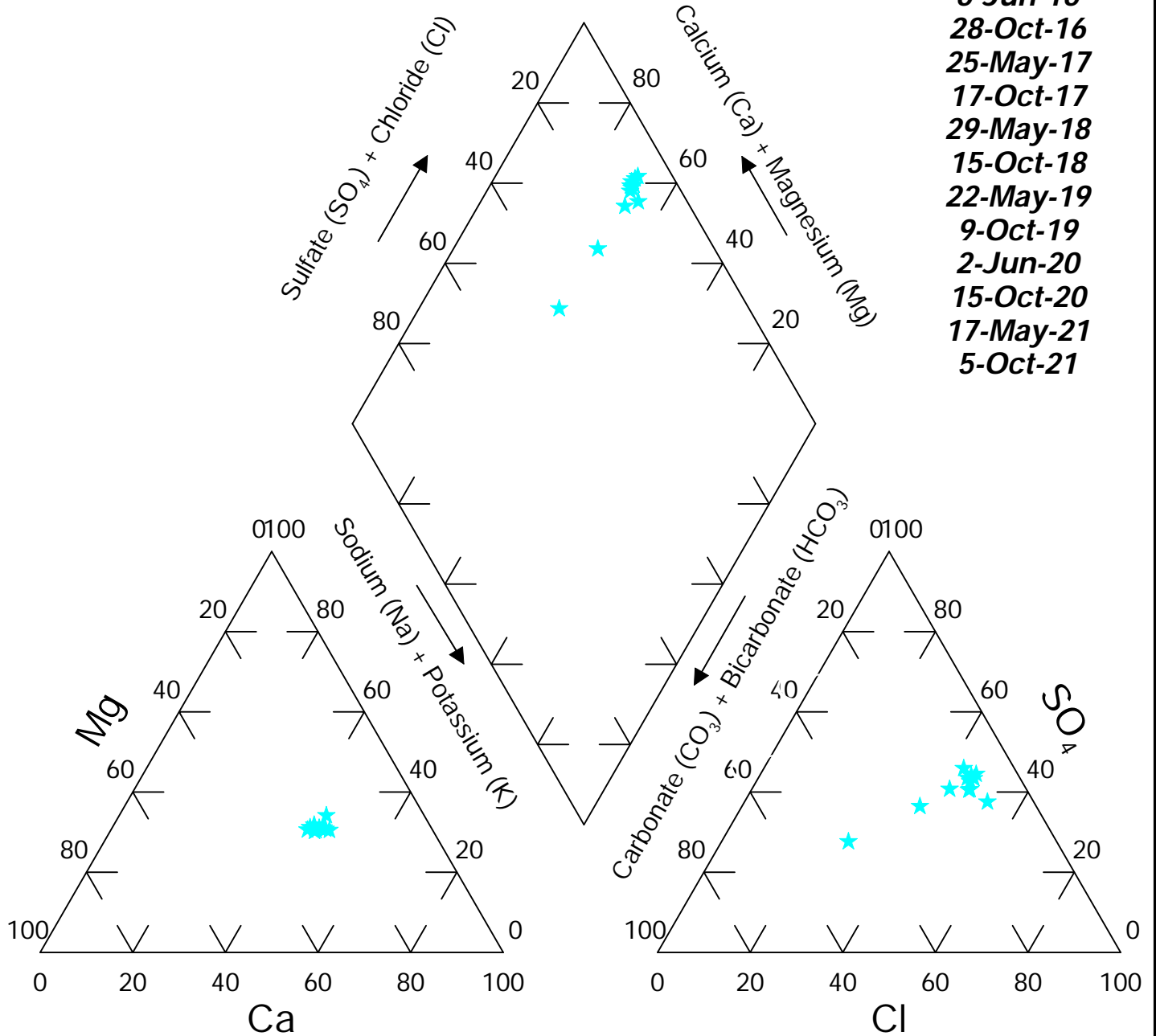


FIGURE: 13P

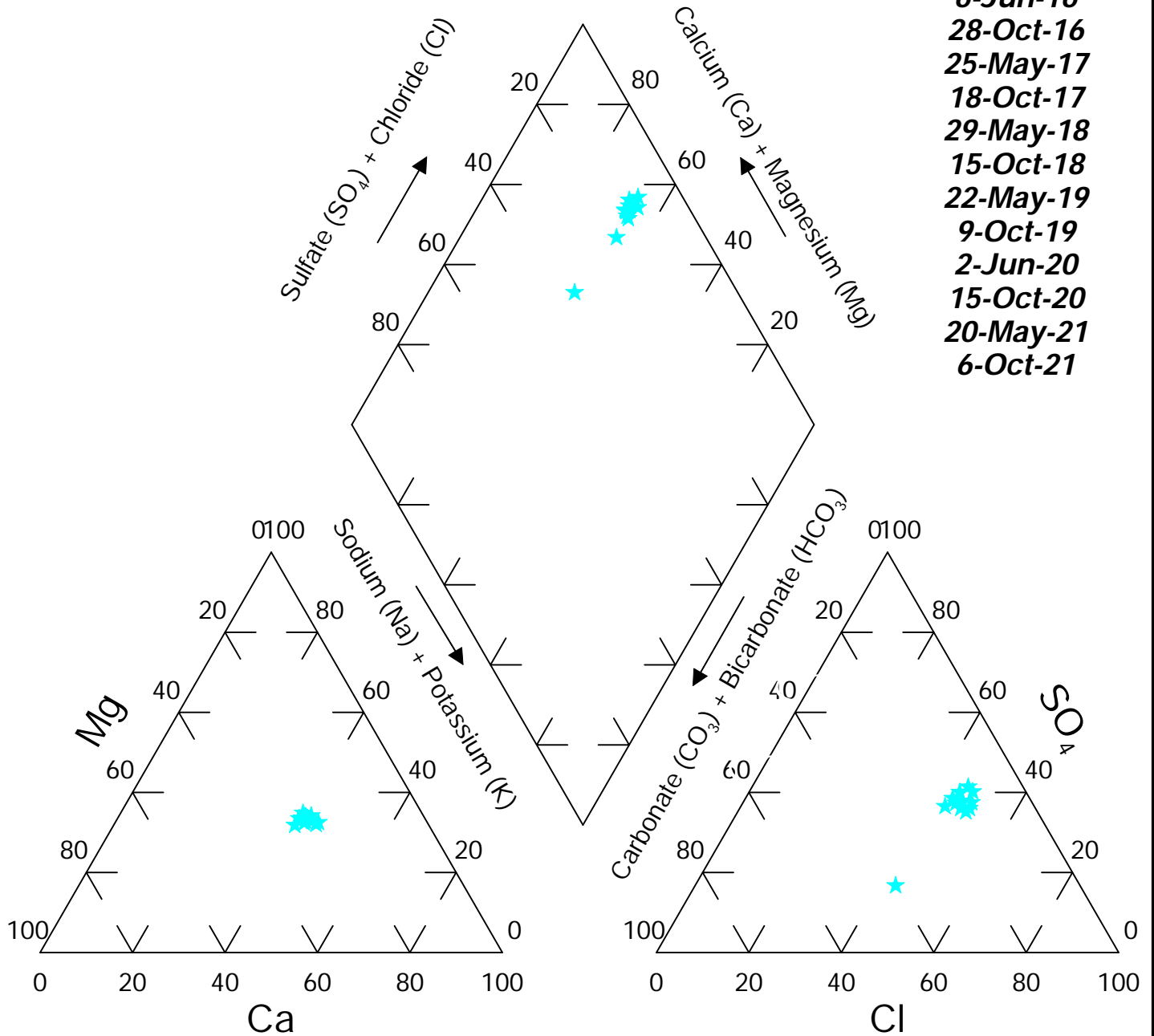
Site: Brady Well #: 15A

- Dates:**
 6-Jun-16
 28-Oct-16
 25-May-17
 17-Oct-17
 29-May-18
 15-Oct-18
 22-May-19
 9-Oct-19
 2-Jun-20
 15-Oct-20
 17-May-21
 5-Oct-21



Site: Brady Well #: 16A

Dates:
 6-Jun-16
 28-Oct-16
 25-May-17
 18-Oct-17
 29-May-18
 15-Oct-18
 22-May-19
 9-Oct-19
 2-Jun-20
 15-Oct-20
 20-May-21
 6-Oct-21



Site: Brady Well #: W4

Dates:

- 24-May-16
- 26-Oct-16
- 23-May-17
- 19-Oct-17
- 24-May-18
- 16-Oct-18
- 9-May-19
- 7-Oct-19
- 28-May-20
- 20-Oct-20
- 13-May-21
- 29-Sep-21

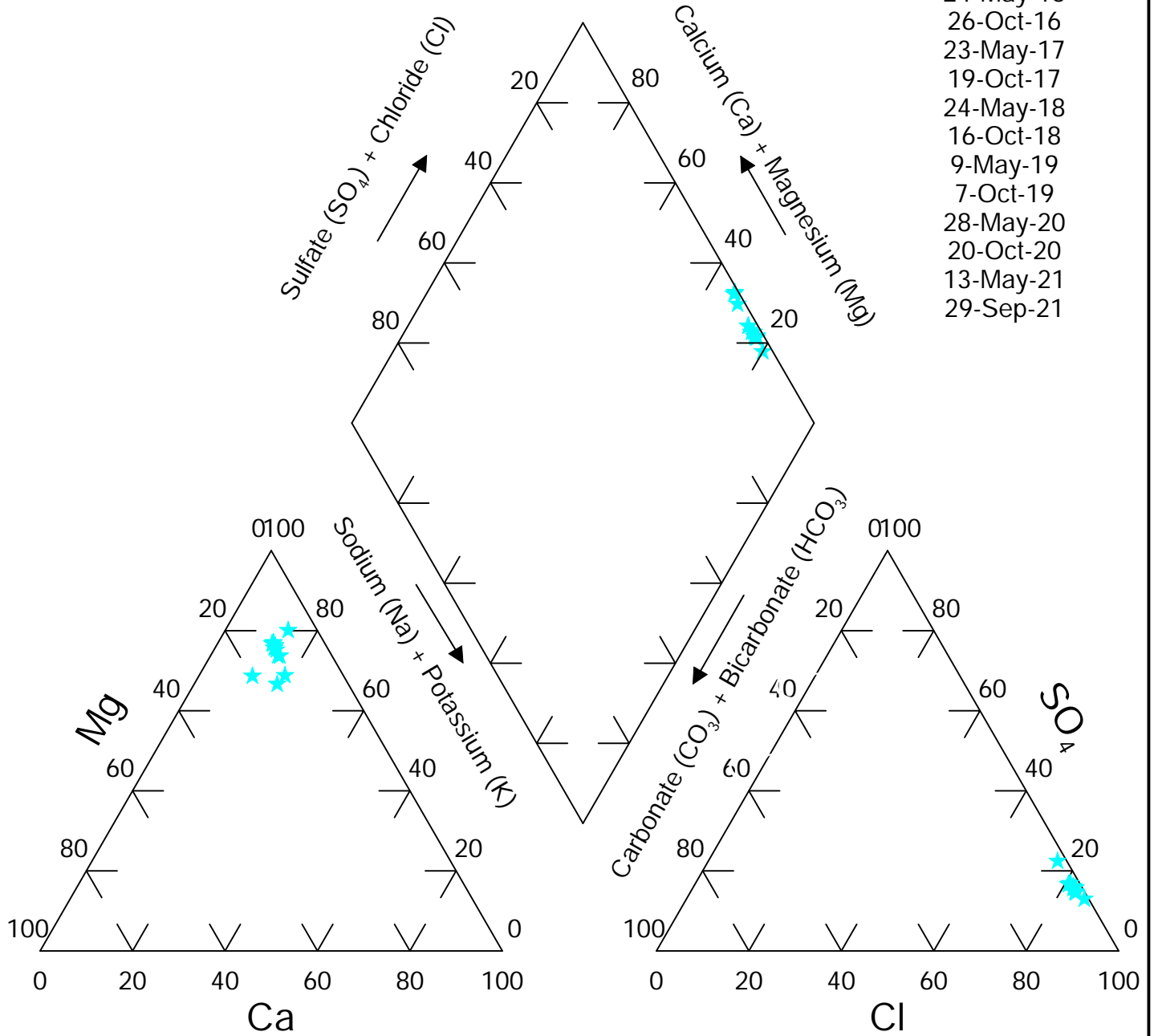


FIGURE: 1P

Site: Brady Well #: W5

Dates:
 24-May-16
 26-Oct-16
 23-May-17
 19-Oct-17
 24-May-18
 18-Oct-18
 9-May-19
 7-Oct-19
 28-May-20
 15-Oct-20
 13-May-21
 29-Sep-21

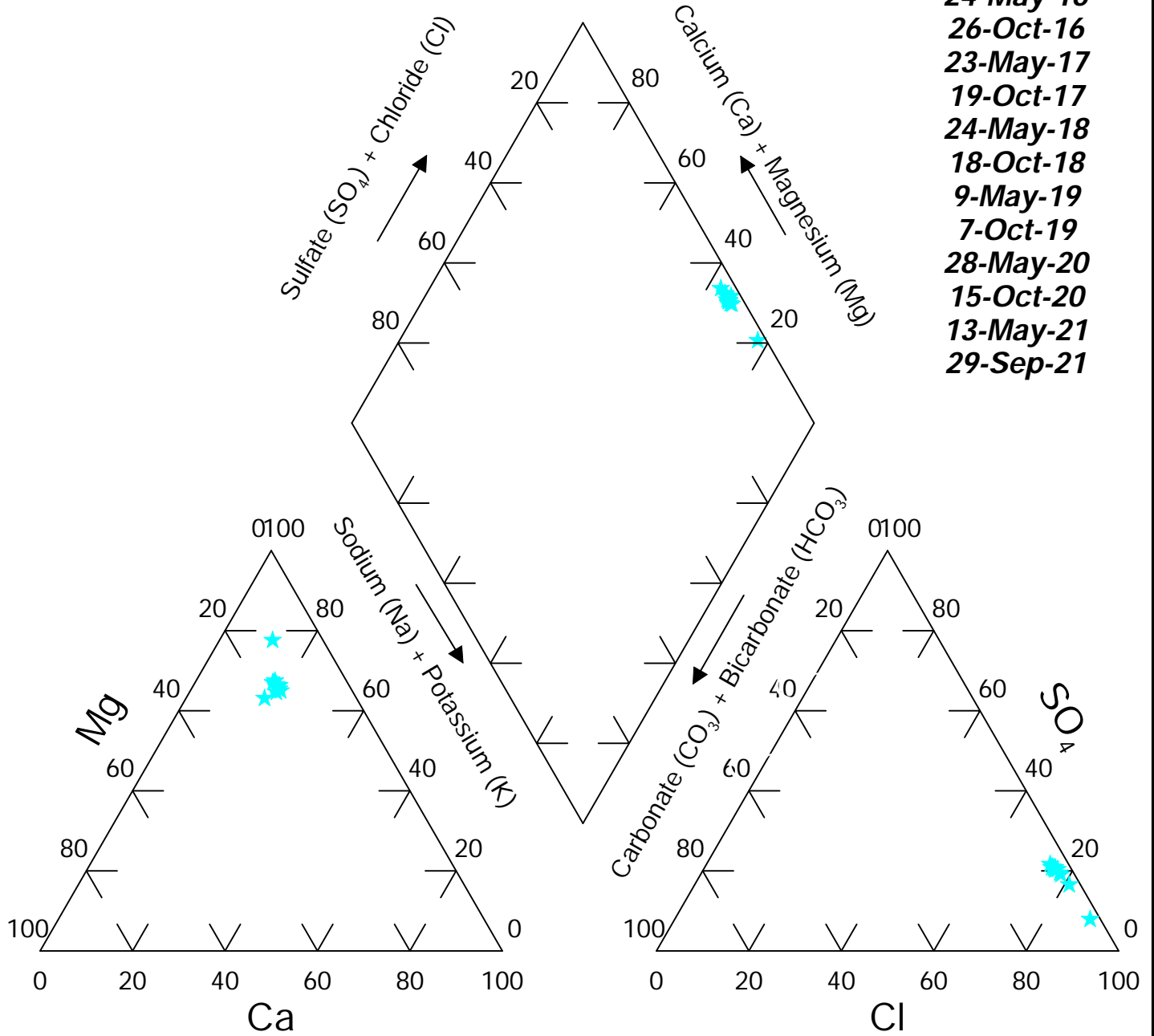


FIGURE: 2P

Site: Brady Well #: W6

Dates:

- 30-May-16
- 25-Oct-16
- 24-May-17
- 17-Oct-17
- 23-May-18
- 18-Oct-18
- 14-May-19
- 13-Nov-19
- 4-Jun-20
- 15-Oct-20
- 13-May-21
- 4-Oct-21

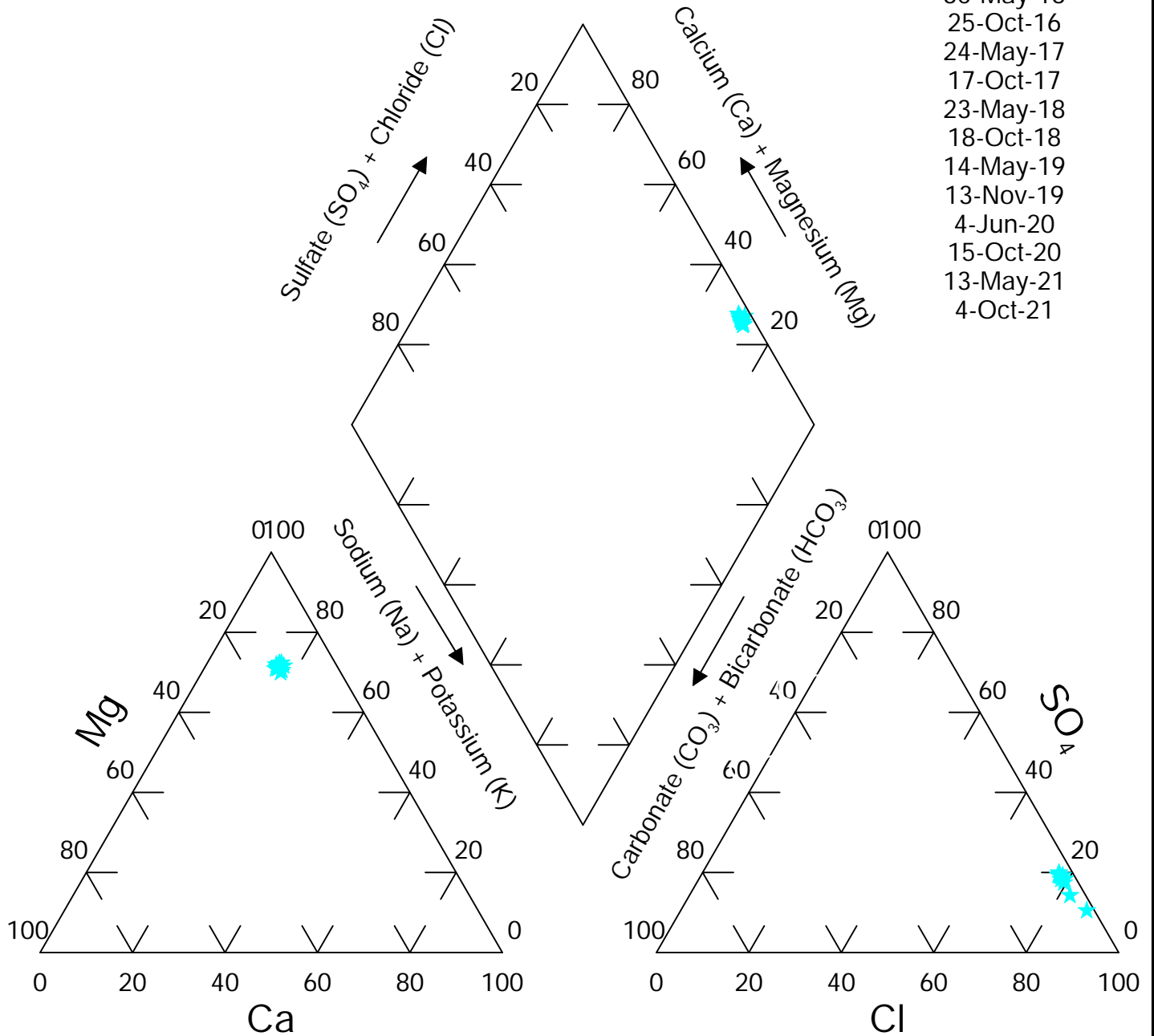


FIGURE: 3P

Site: Brady Well #: W7

Dates:
 24-May-16
 24-Oct-16
 24-May-17
 17-Oct-17
 23-May-18
 17-Oct-18
 14-May-19
 13-Nov-19
 4-Jun-20
 20-Oct-20
 13-May-21
 5-Oct-21

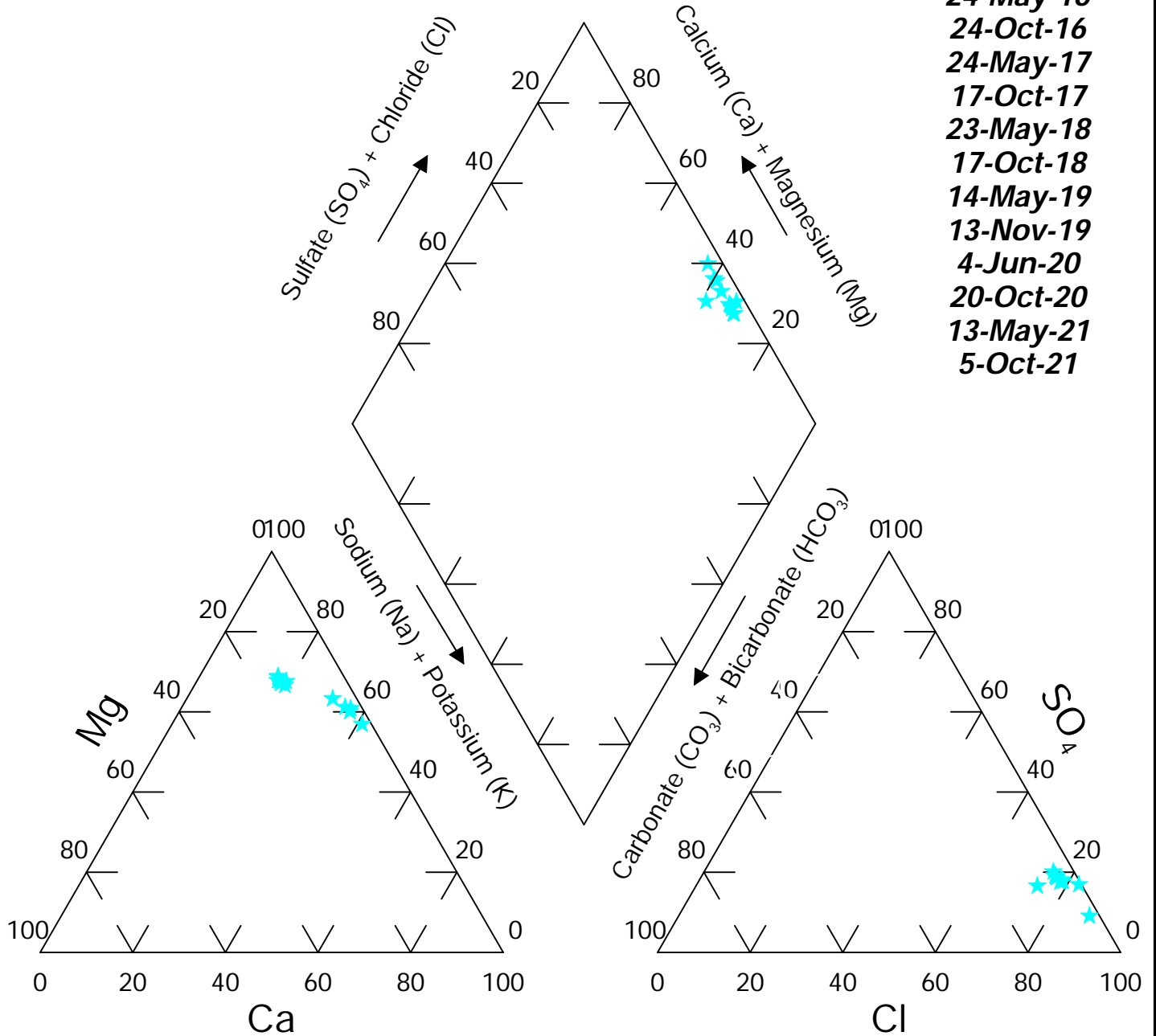


FIGURE: 4P

Site: Brady Well #: W8

Dates:
 25-May-16
 24-Oct-16
 24-May-17
 17-Oct-17
 29-May-18
 18-Oct-18
 13-May-19
 13-Nov-19
 4-Jun-20
 20-Oct-20
 13-May-21
 4-Oct-21

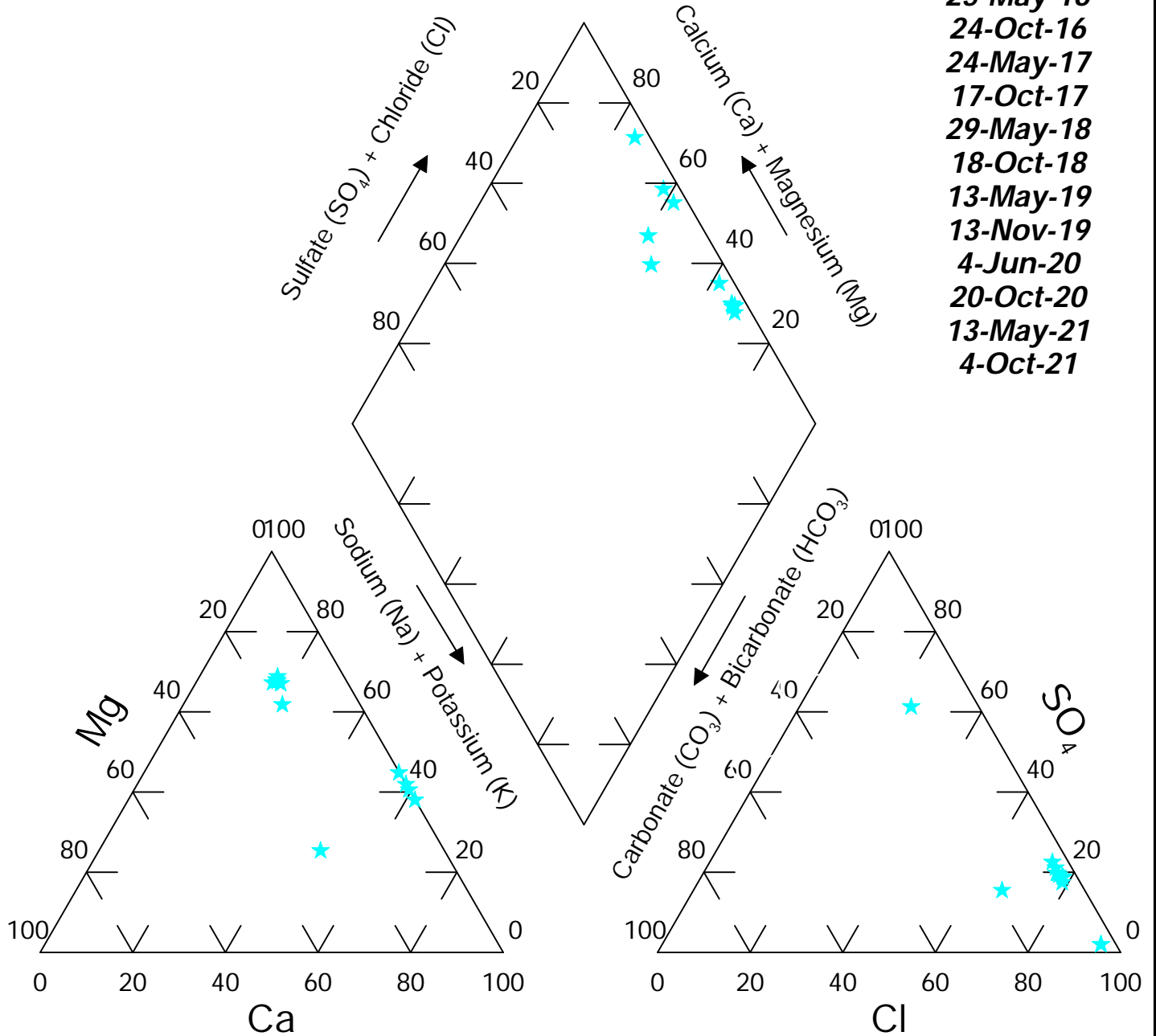


FIGURE: 5P

Site: Brady Well #: W9

- Dates:**
 24-May-16
 26-Oct-16
 23-May-17
 18-Oct-17
 24-May-18
 18-Oct-18
 15-May-19
 8-Oct-19
 4-Jun-20
 20-Oct-20
 12-May-21
 5-Oct-21

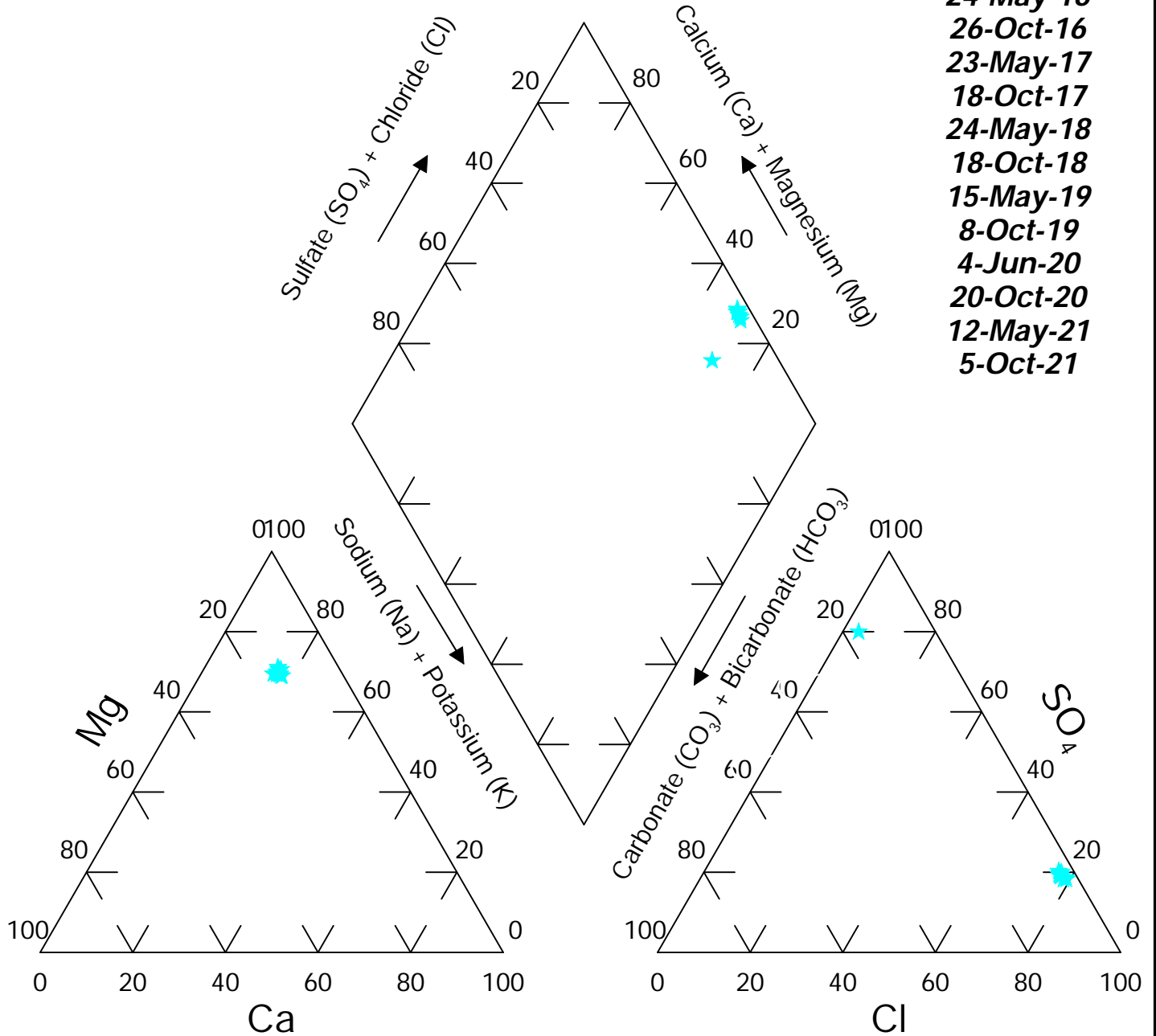


FIGURE: 6P

Site: Brady

Well #: W10/W10R

Dates:

- 25-May-16
- 26-Oct-16
- 23-May-17
- 18-Oct-17
- 24-May-18
- 16-Oct-18
- 15-May-19
- 8-Oct-19
- 27-May-20
- 23-Jul-20
- 14-Oct-20
- 12-Mar-21
- 4-Oct-21

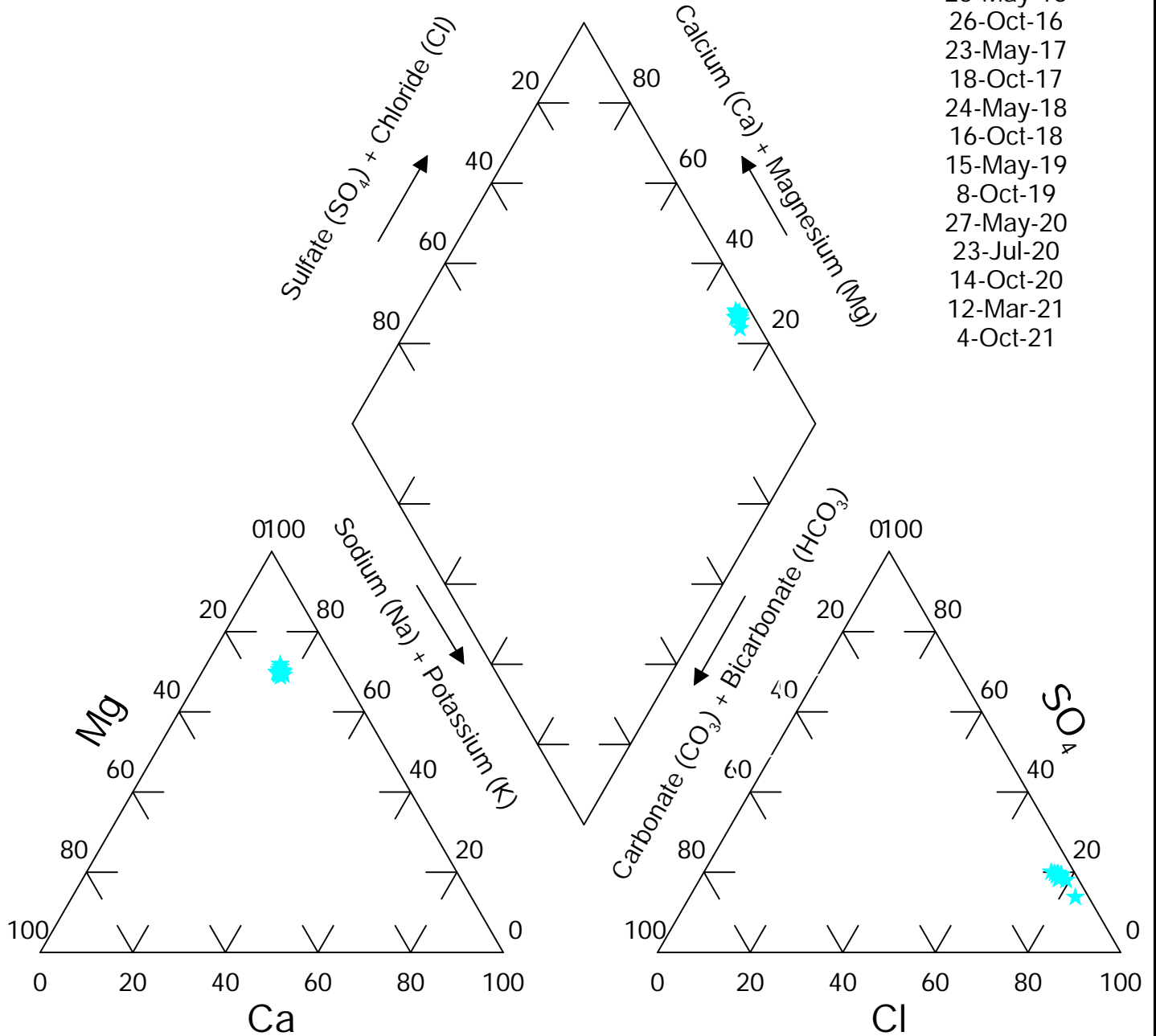


FIGURE: 7P

Site: Brady Well #: W11

Dates:

- 25-May-16
- 26-Oct-16
- 23-May-17
- 18-Oct-17
- 24-May-18
- 17-Oct-18
- 15-May-19
- 8-Oct-19
- 12-May-21
- 4-Oct-21

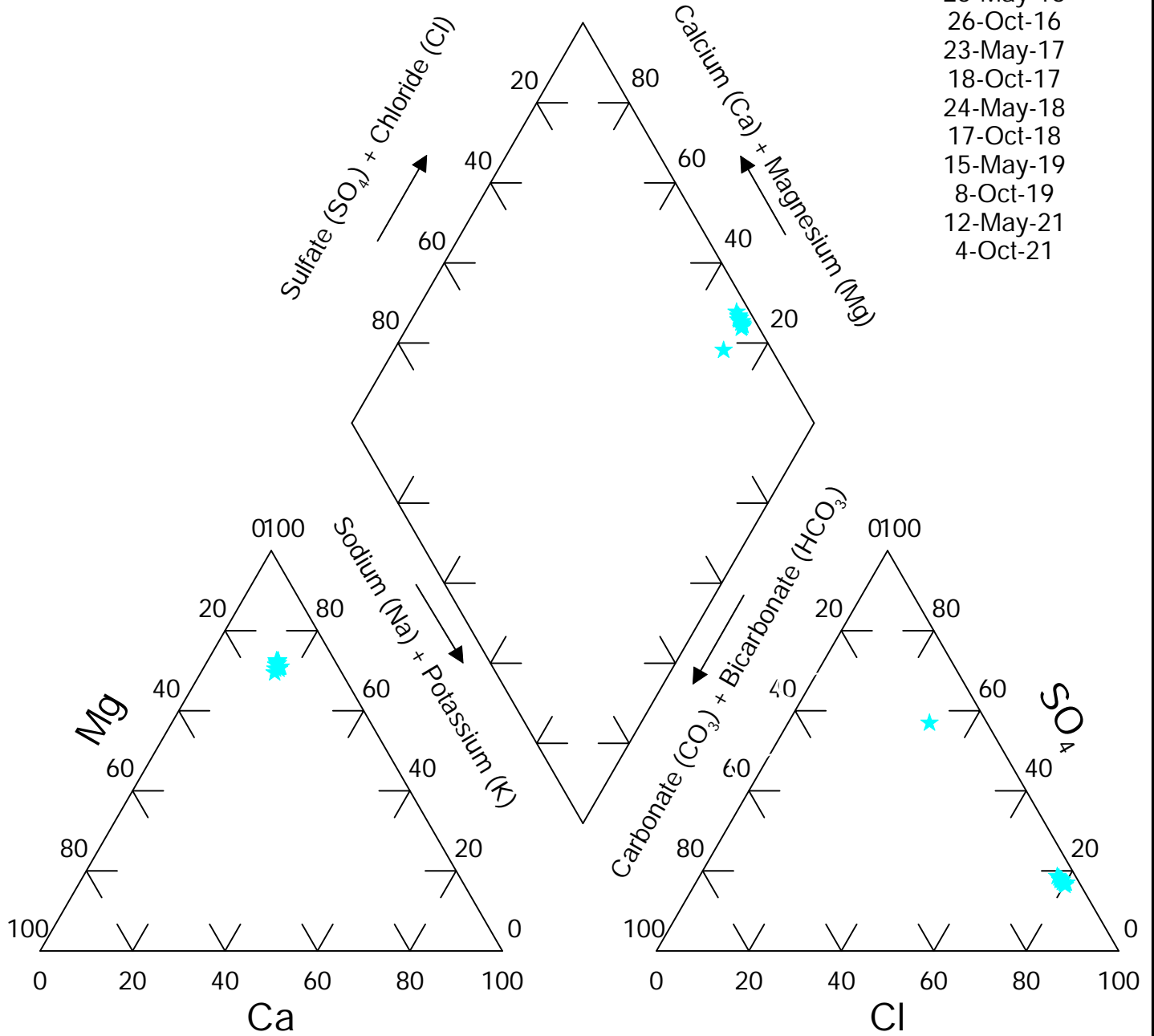


FIGURE: 8P

Site: Brady Well #: W12

Dates:

- 25-May-16
- 26-Oct-16
- 25-May-17
- 17-Oct-17
- 24-May-18
- 17-Oct-18
- 15-May-19
- 14-Oct-19
- 24-May-20
- 14-Oct-20
- 12-May-21
- 4-Oct-21

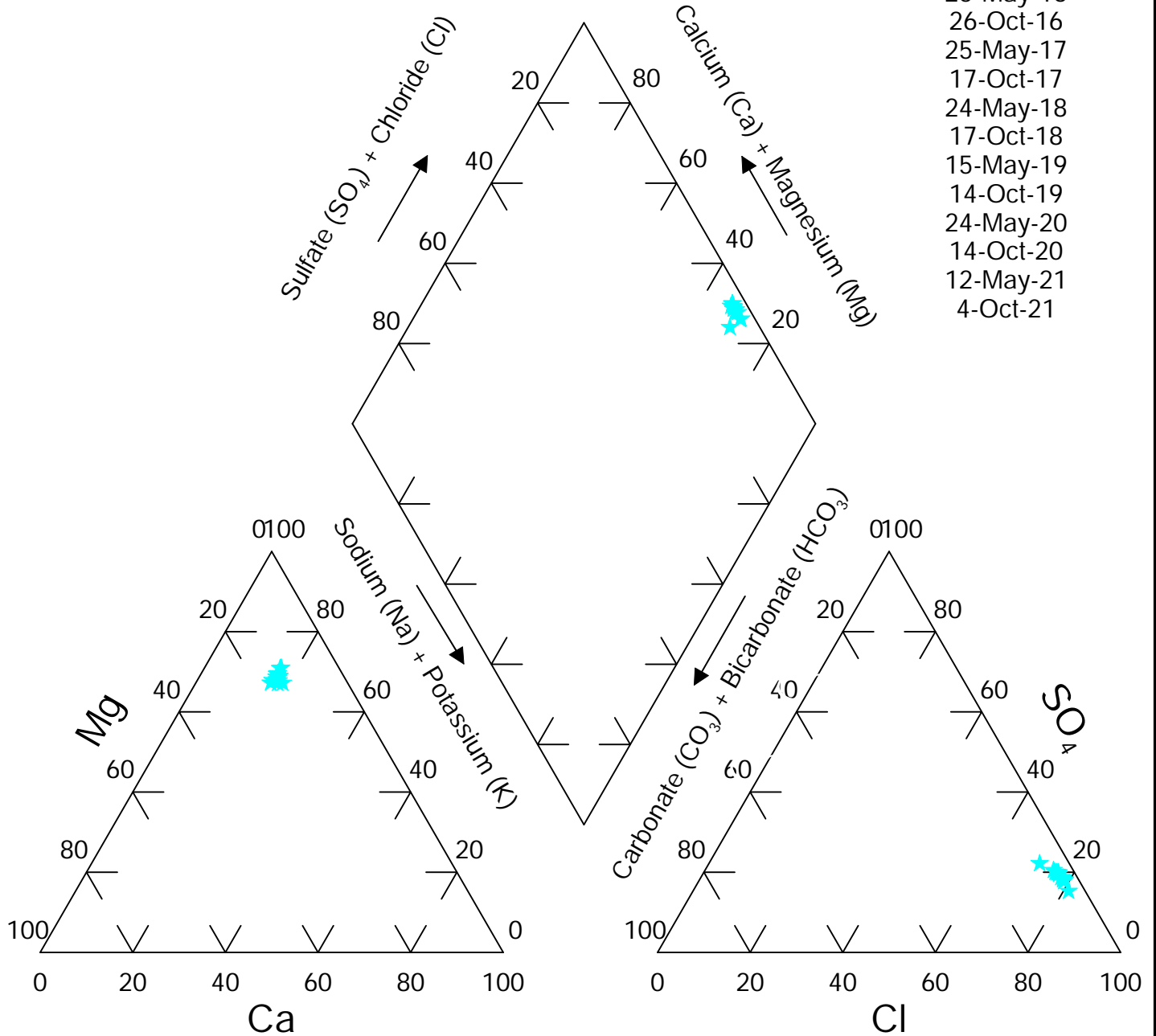


FIGURE: 9P

Site: Brady Location : W13

Dates:
 27-May-16
 24-Oct-16
 24-May-17
 16-Oct-17
 28-May-18
 17-Oct-18
 13-May-19
 8-Oct-19
 2-Jun-20
 20-Oct-20
 12-May-21
 29-Sep-21

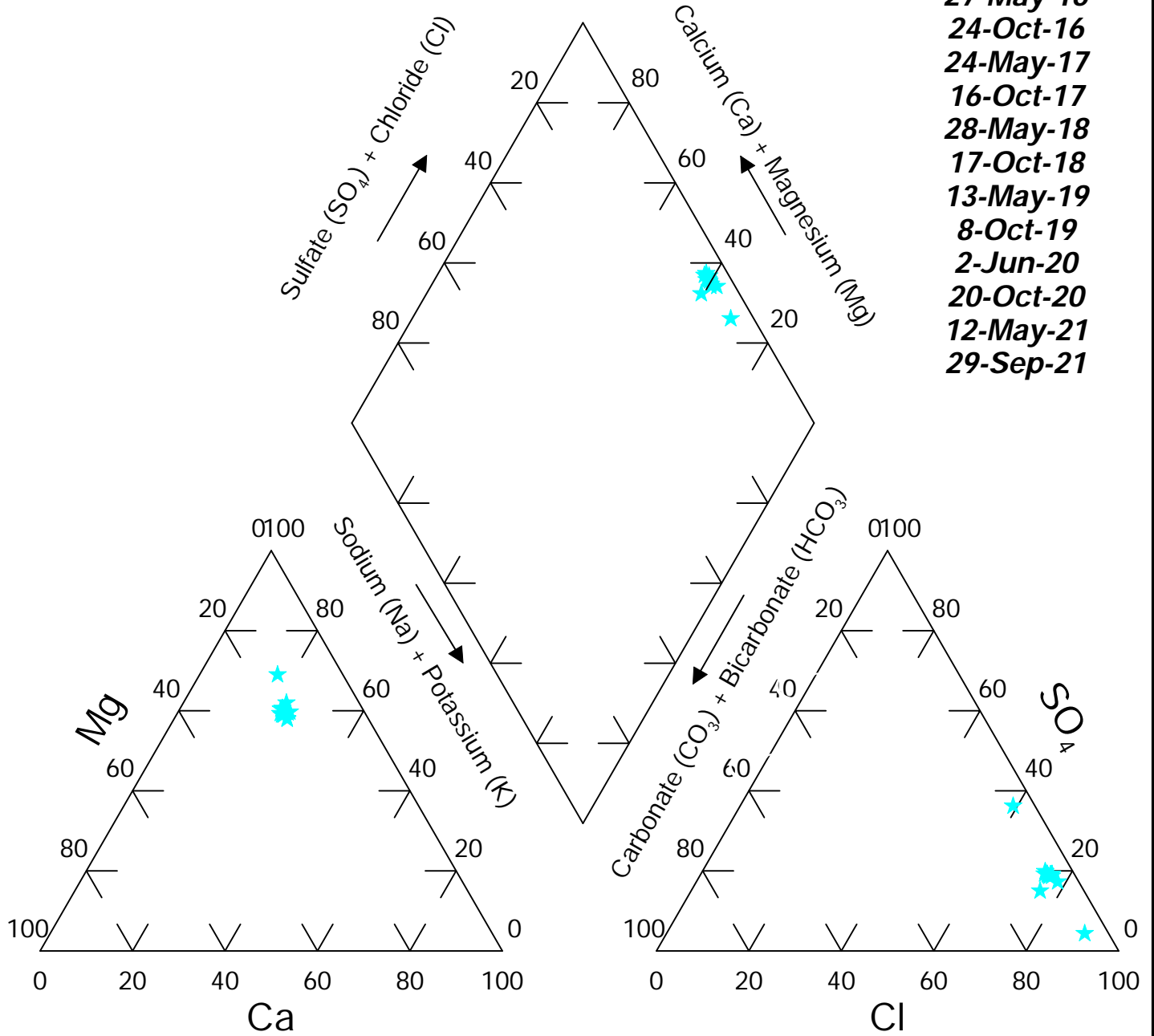


FIGURE: 1z

Site: Brady Location : GWQ25-W14

- Dates:**
 25-May-16
 26-Oct-16
 25-May-17
 16-Oct-17
 28-May-18
 18-Oct-18
 15-May-19
 13-Nov-19
 3-Jun-20
 15-Oct-20
 12-May-21
 4-Oct-21

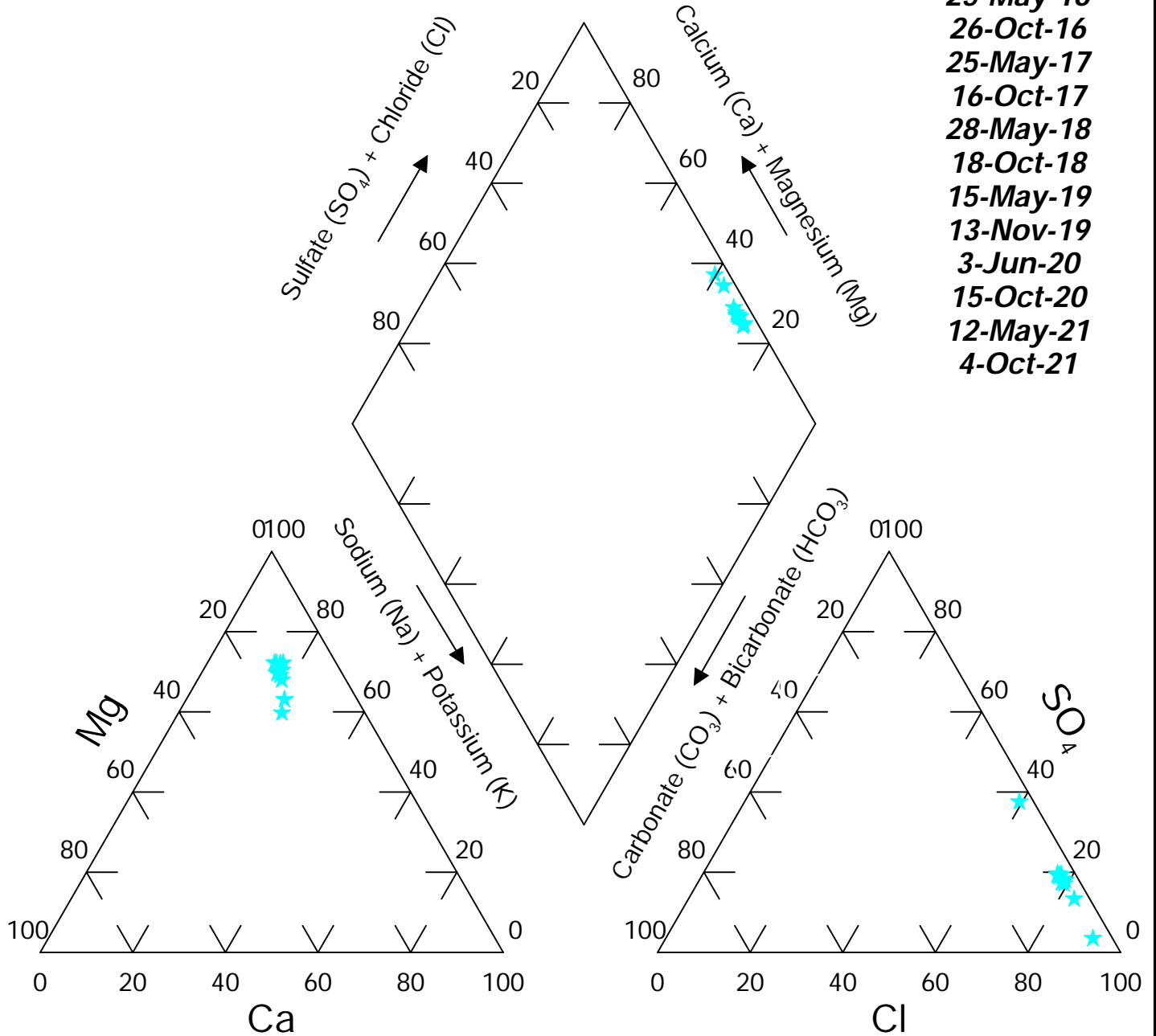


FIGURE: 2z

Site: Brady

Location : GWQ25-W15

Dates:
 30-May-16
 25-Oct-16
 25-May-17
 16-Oct-17
 28-May-18
 22-Oct-18
 15-May-19
 13-Oct-19
 2-Jun-20
 20-Oct-20
 12-May-21
 29-Sep-21

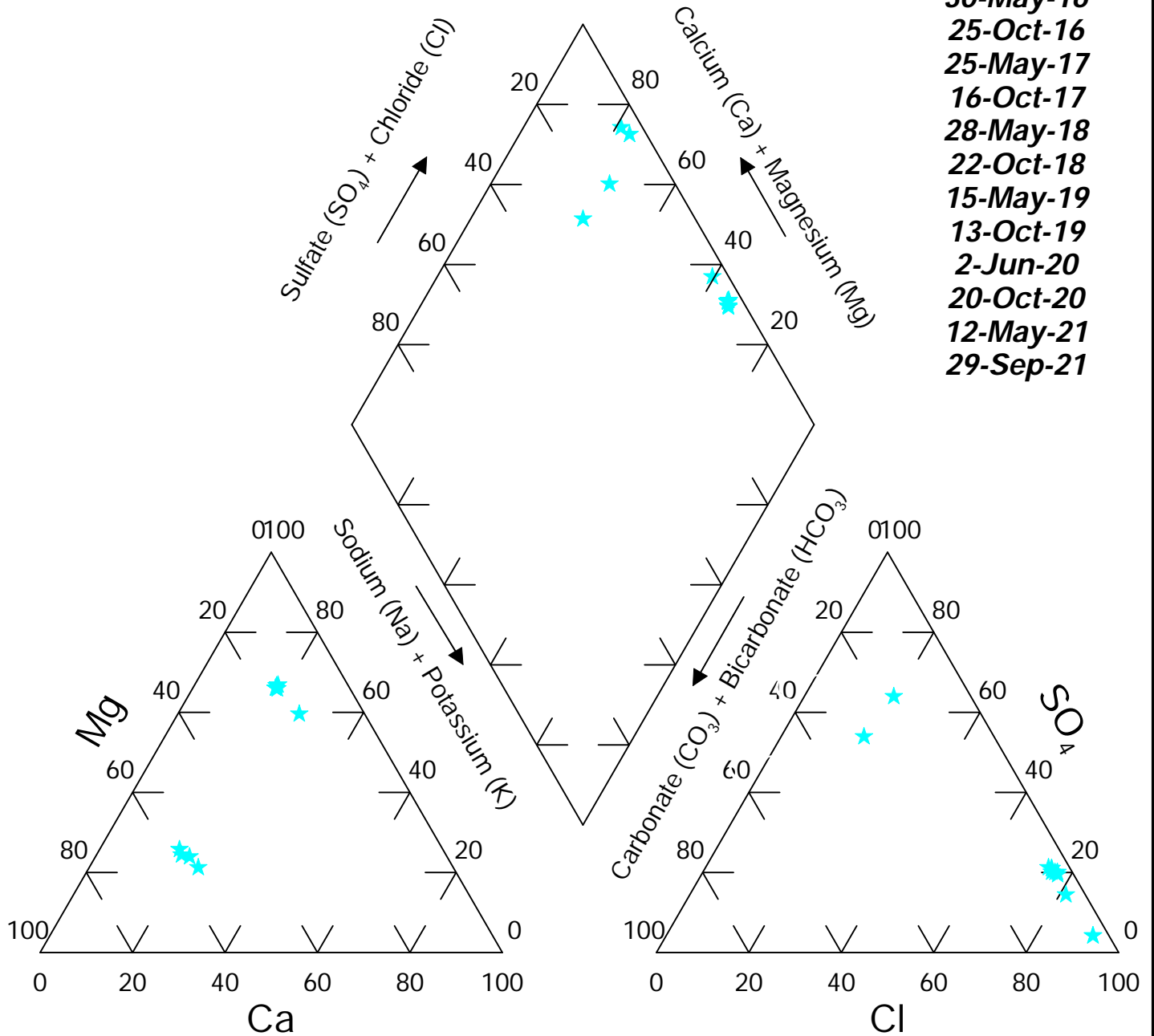


FIGURE: 3z

Site: Brady

Location : GWQ25-W16

Dates:
 30-May-16
 25-Oct-16
 25-May-17
 16-Oct-17
 28-May-18
 22-Oct-18
 15-May-19
 8-Dec-19
 2-Jun-20
 21-Oct-20
 12-May-21
 29-Sep-21

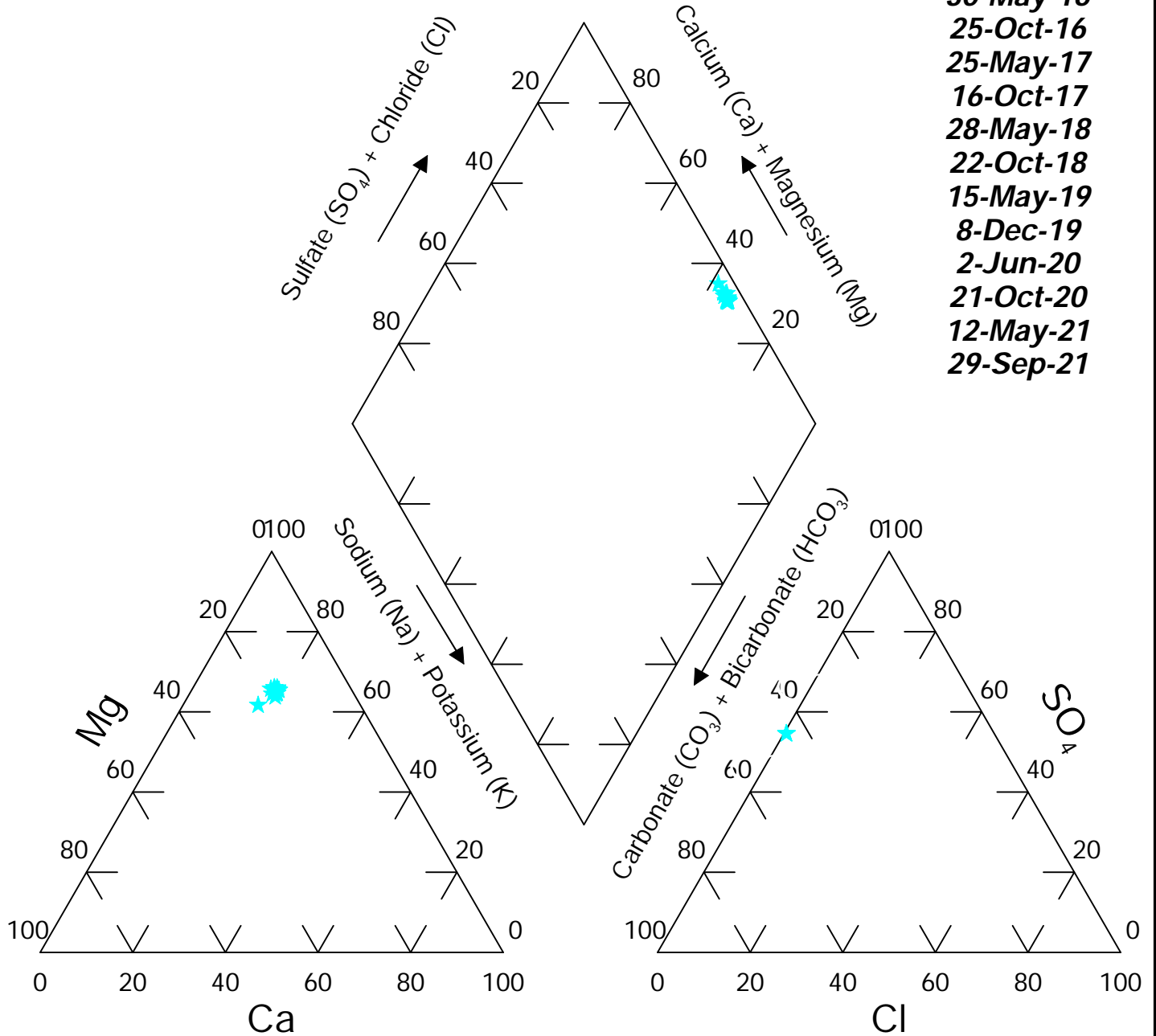


FIGURE: 4z

**2021 LEACHATE
PIPER DIAGRAMS**

Site: Brady
Location: MH3

Dates:
 8-Sep-16
 26-Sep-17
 31-Jul-18
 11-Sep-19
 8-Sep-20
 10-Aug-21

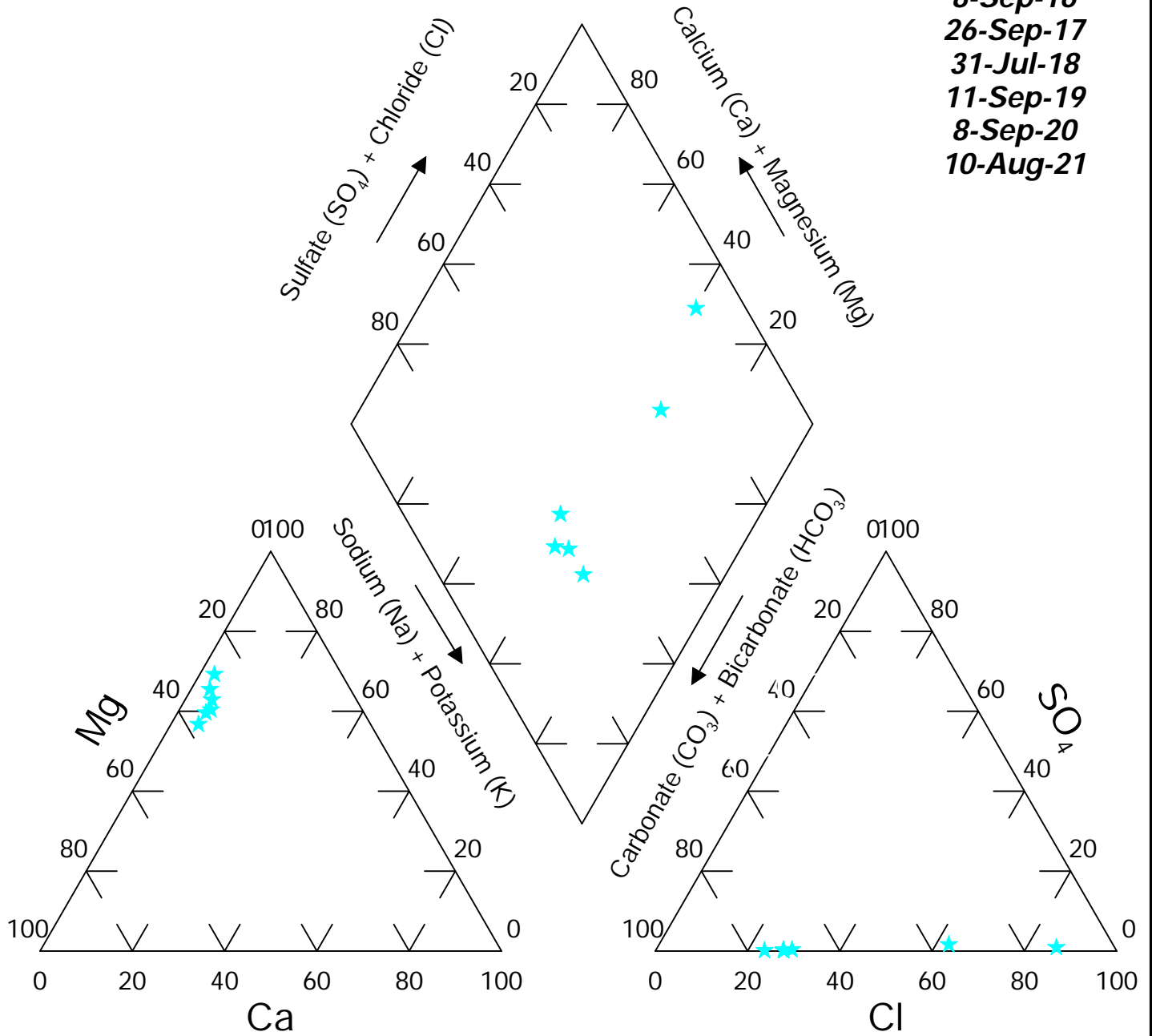


FIGURE: 18P

Site: Brady Location: MH8

Dates:
 7-Sep-16
 26-Sep-17
 31-Jul-18
 11-Sep-19
 9-Sep-20
 10-Aug-21

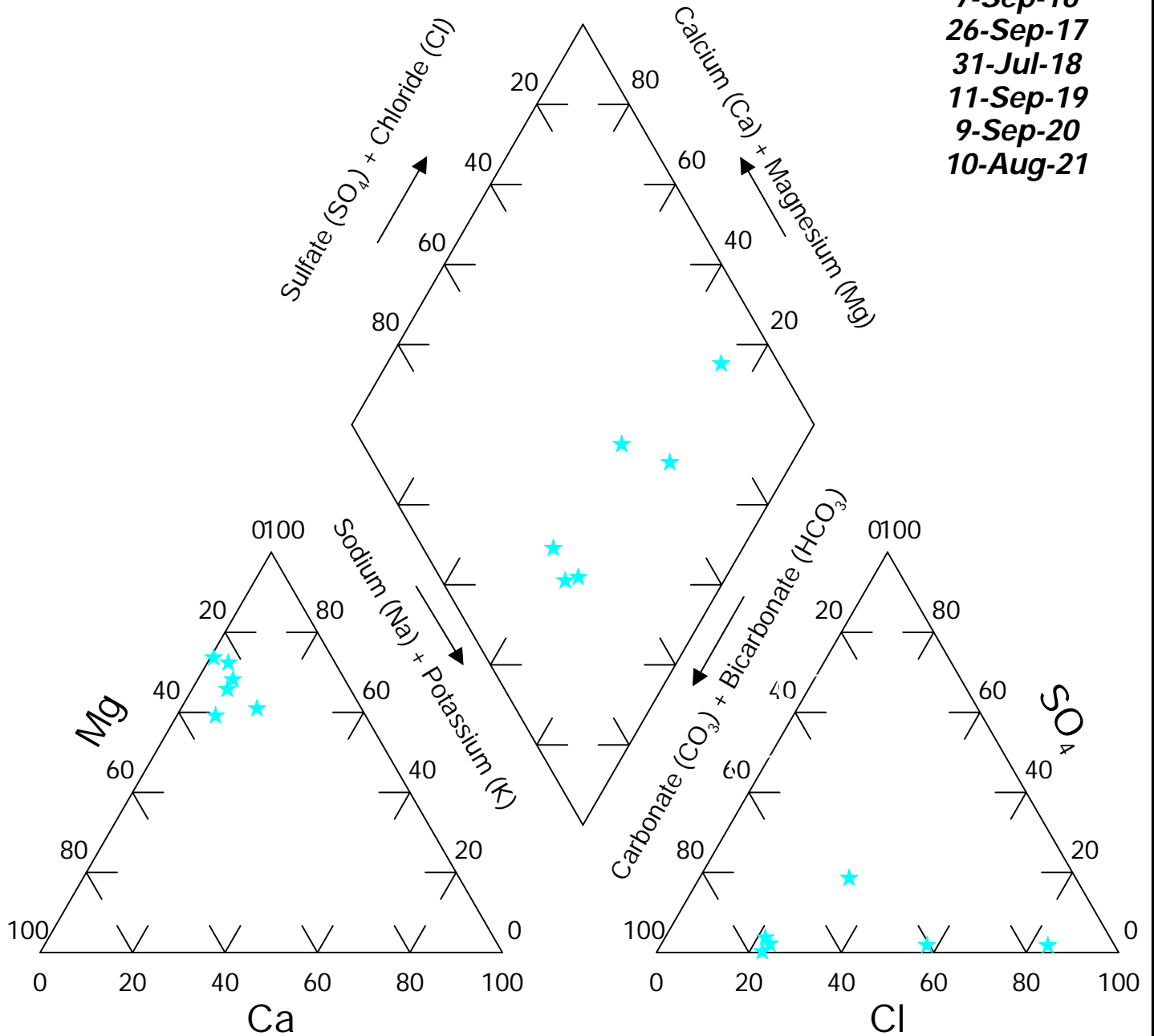


FIGURE: 19P

Site: Brady Location: MH13

Dates:
 9-Sep-16
 26-Sep-17
 31-Jul-18
 12-Sep-19
 8-Sep-20
 10-Aug-21

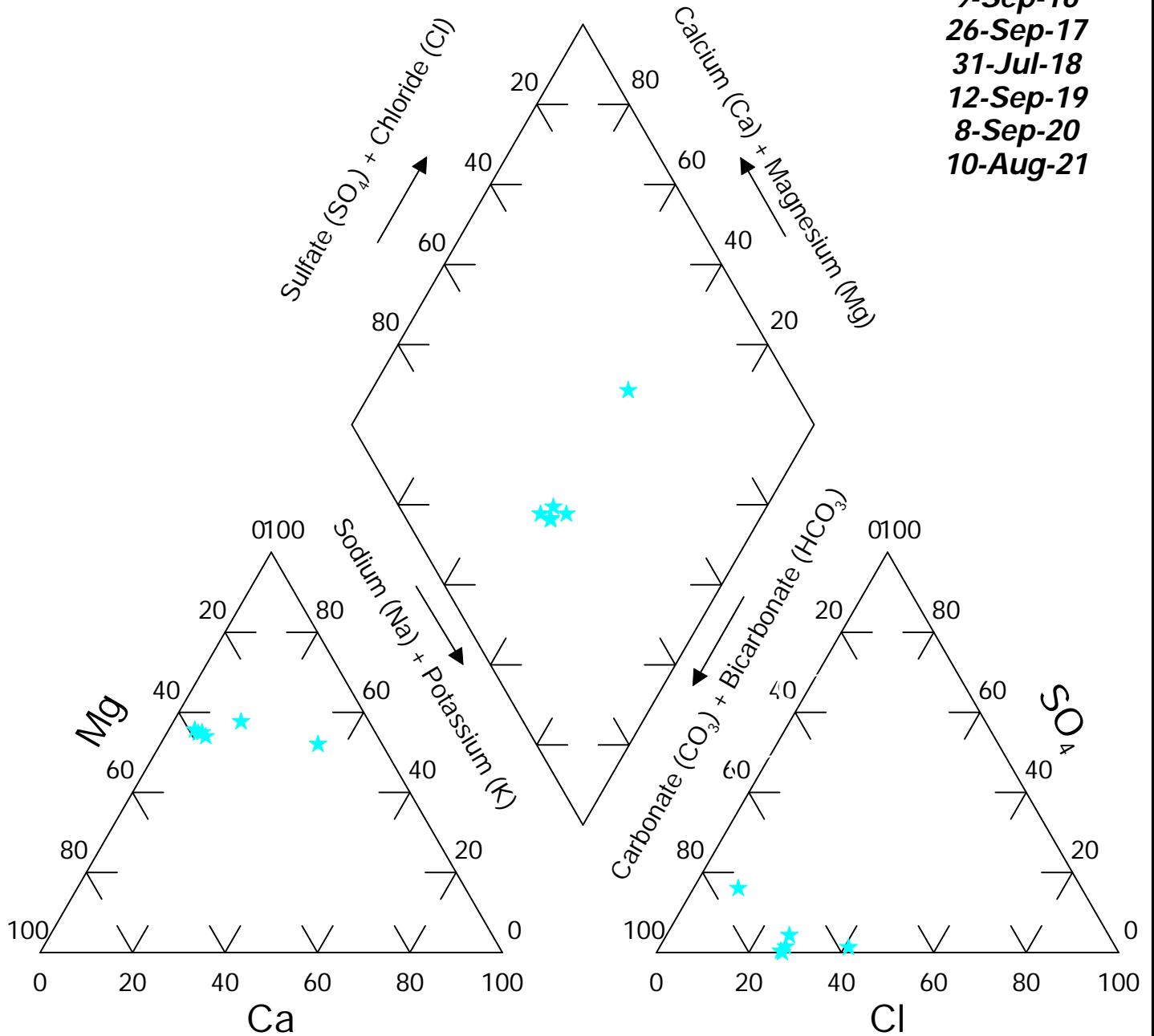


FIGURE: 20P

Site: Brady
Location: MH24

Dates:
 7-Sep-16
 26-Sep-17
 31-Jul-18
 11-Sep-19
 8-Sep-20
 10-Aug-21

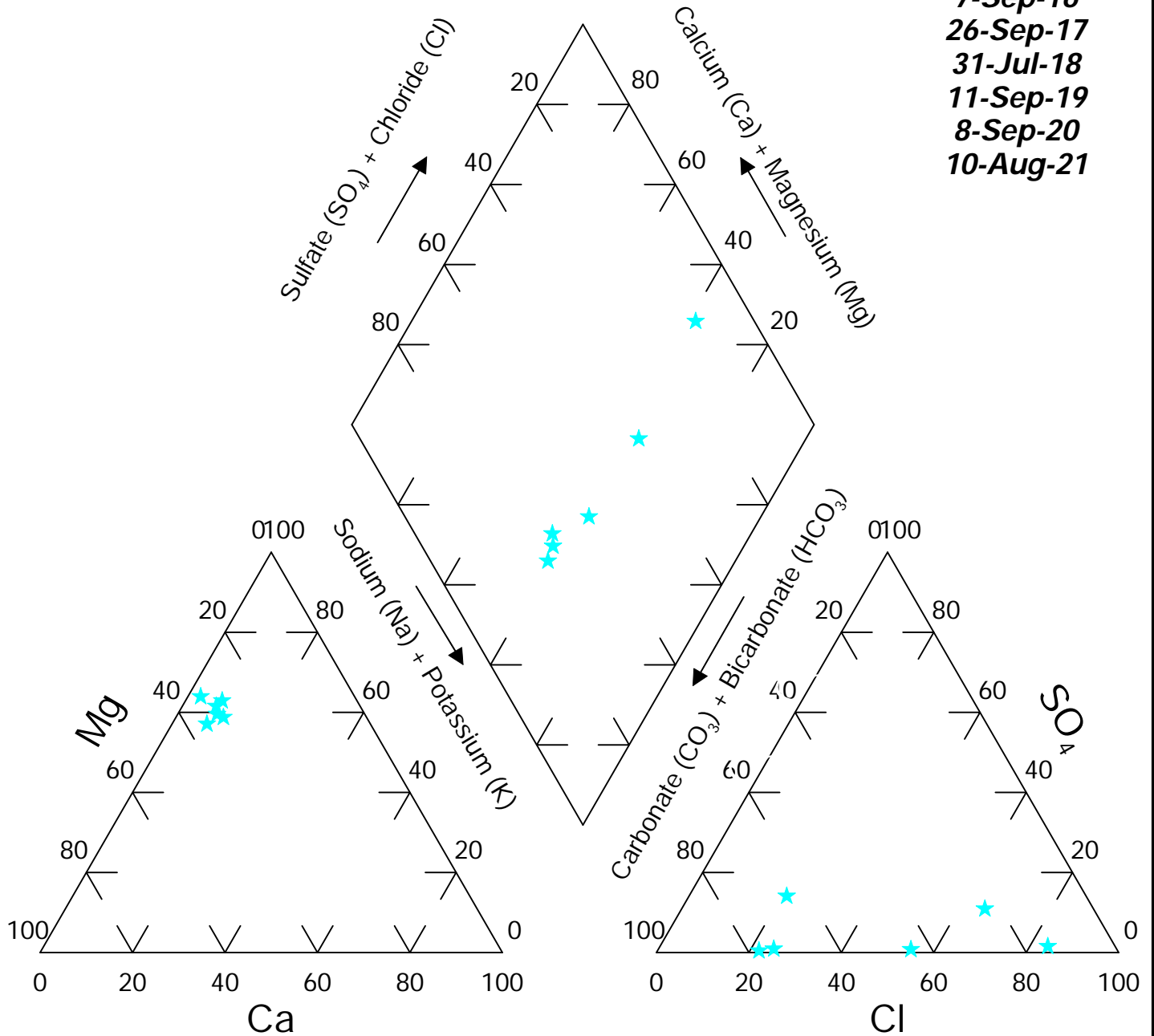


FIGURE: 21P

Site: Brady Location: MH27

Dates:
 7-Sep-16
 26-Sep-17
 31-Jul-18
 11-Sep-19
 8-Sep-20
 10-Aug-21

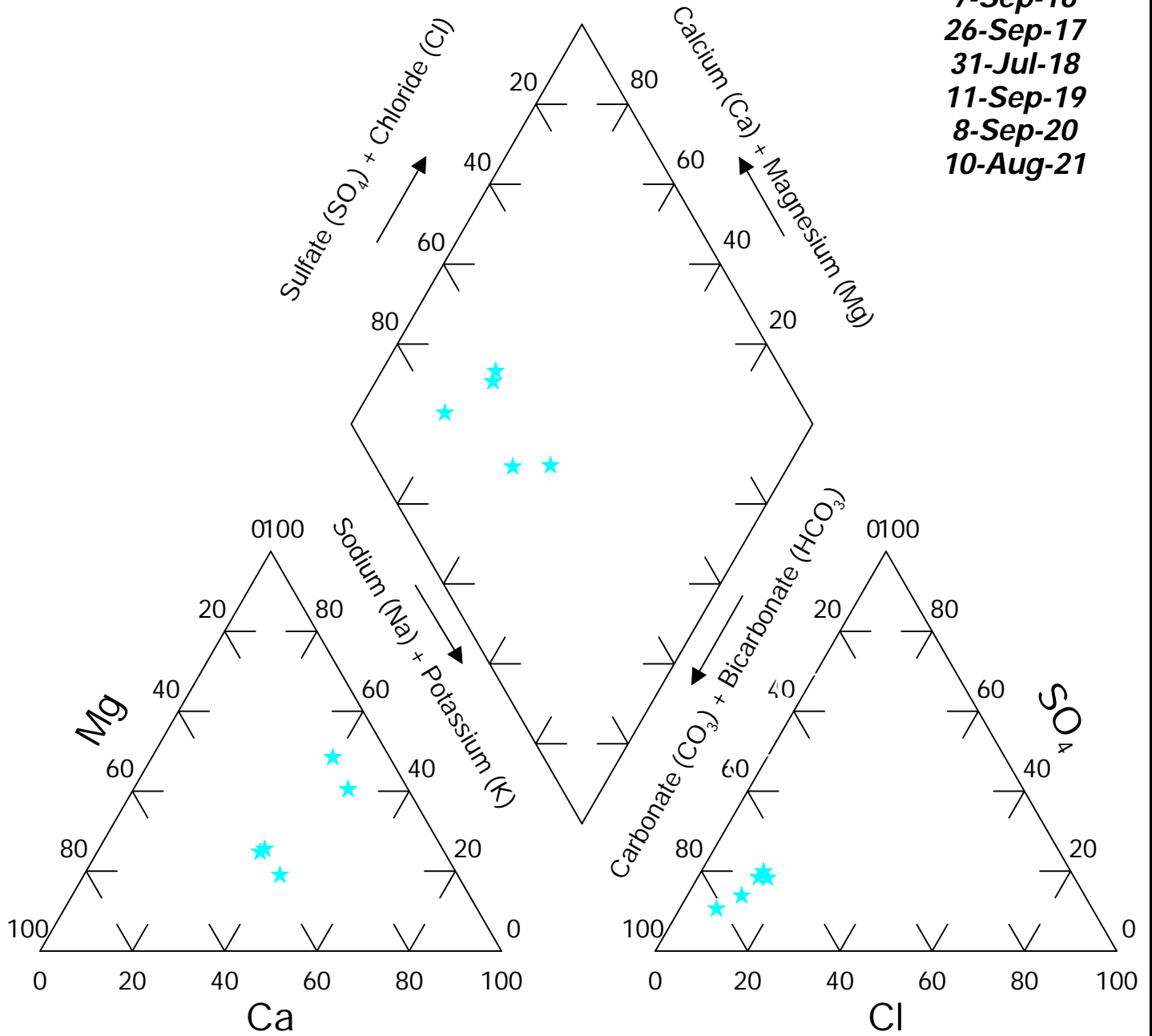


FIGURE: 22P

Site: Brady Location: MH31

Dates:
 7-Sep-16
 26-Sep-17
 31-Jul-18
 11-Sep-19
 8-Sep-20
 10-Aug-21

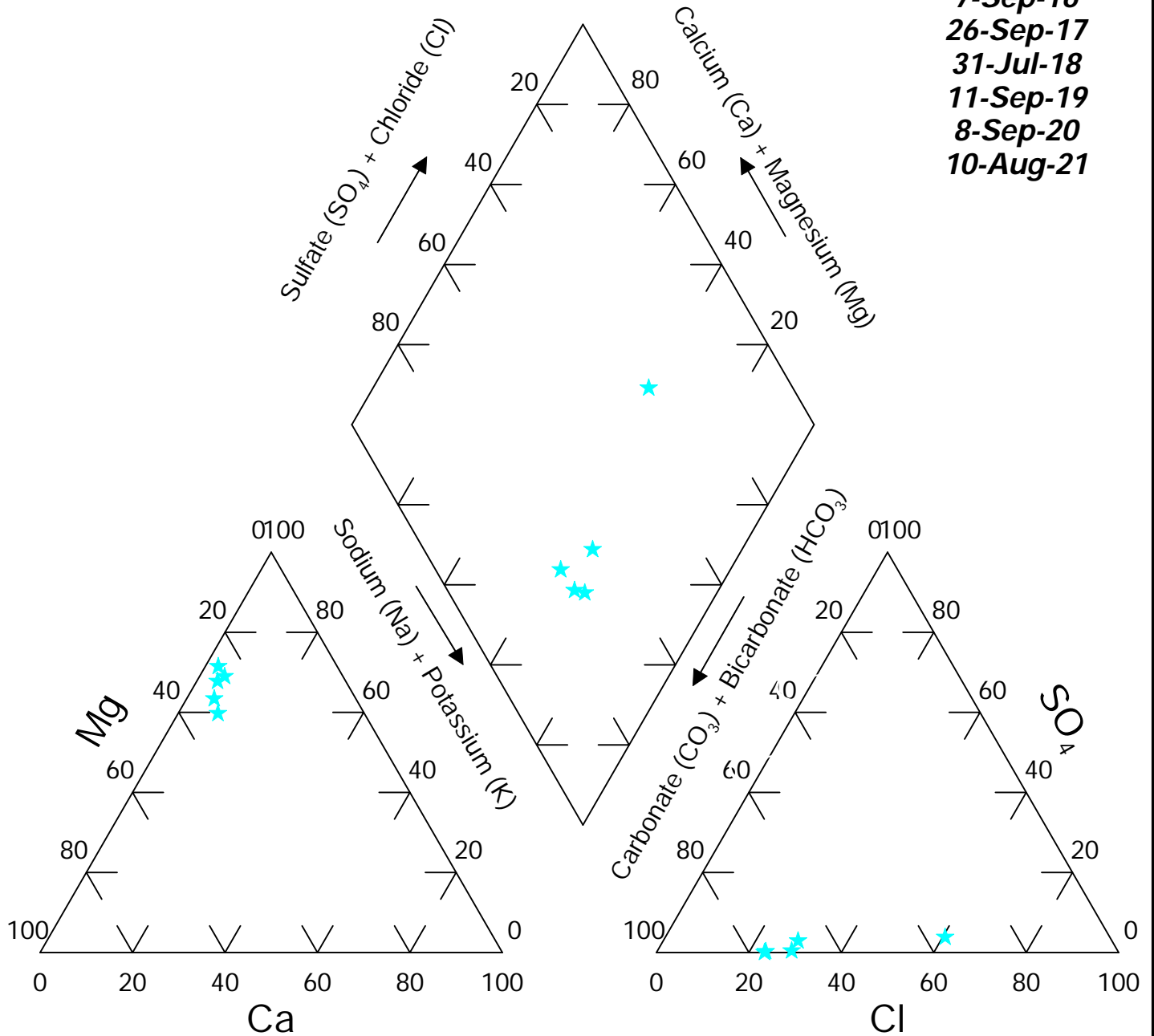


FIGURE: 23P

Site: Brady Location: MH34

Dates:
 8-Sep-16
 26-Sep-17
 31-Jul-18
 11-Sep-19
 8-Sep-20
 10-Aug-21

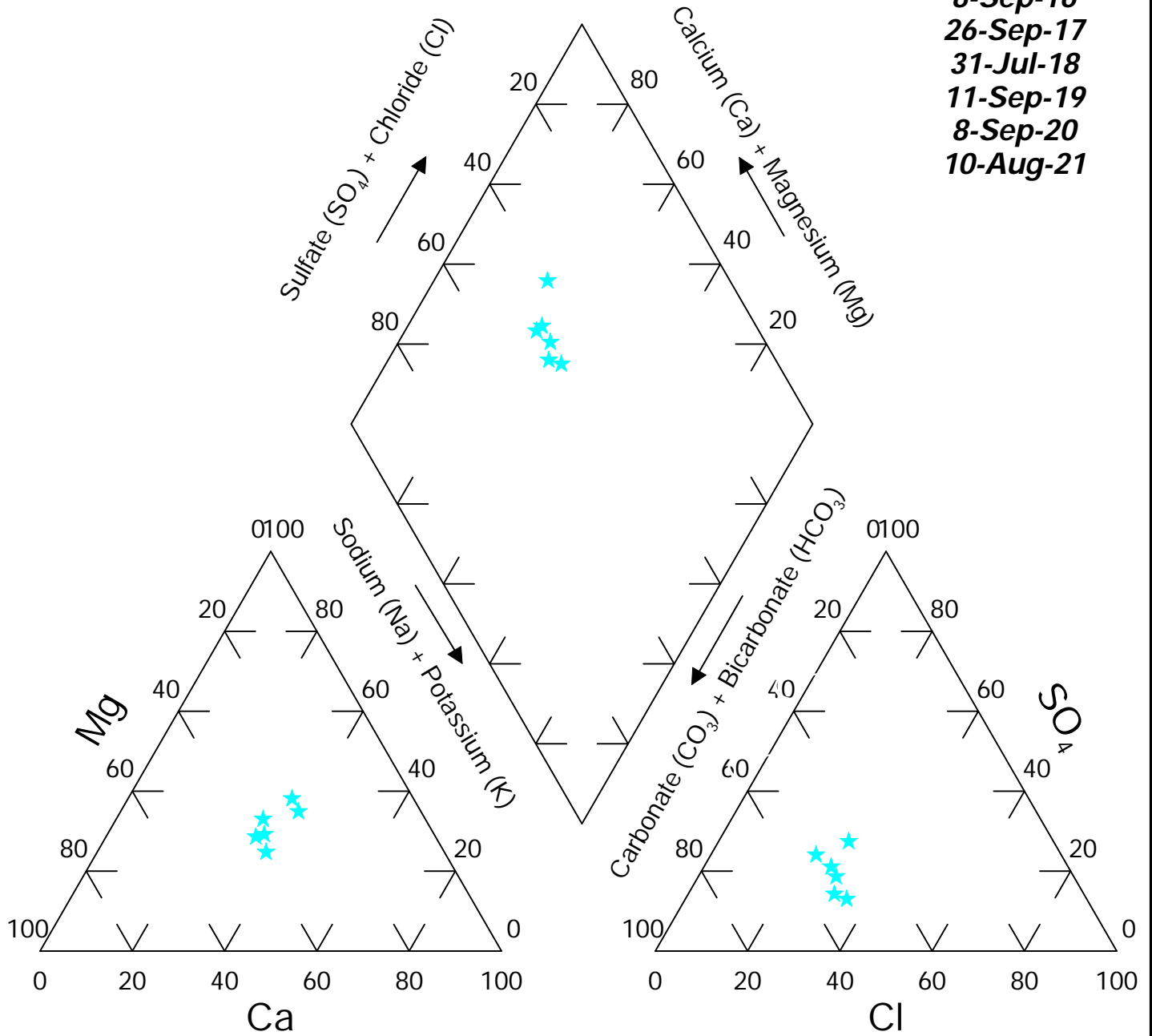


FIGURE: 24P

Site: Brady
Location: MH46

Date:
31-Jul-18
11-Sep-19
8-Sep-20
10-Aug-21

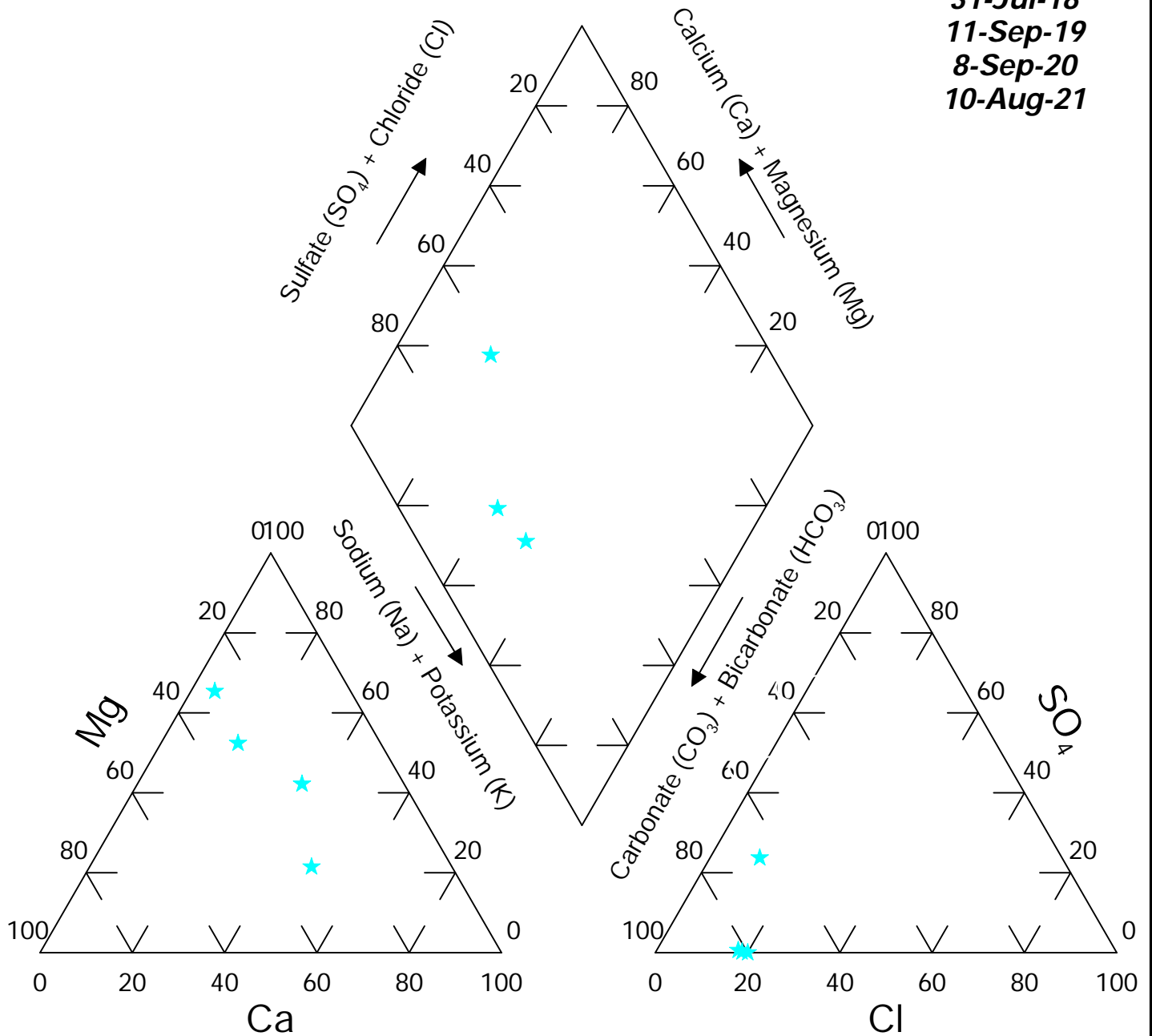


FIGURE: 21P

Site: Brady
Location: MH47

Date:
8-Sep-20
10-Aug-21

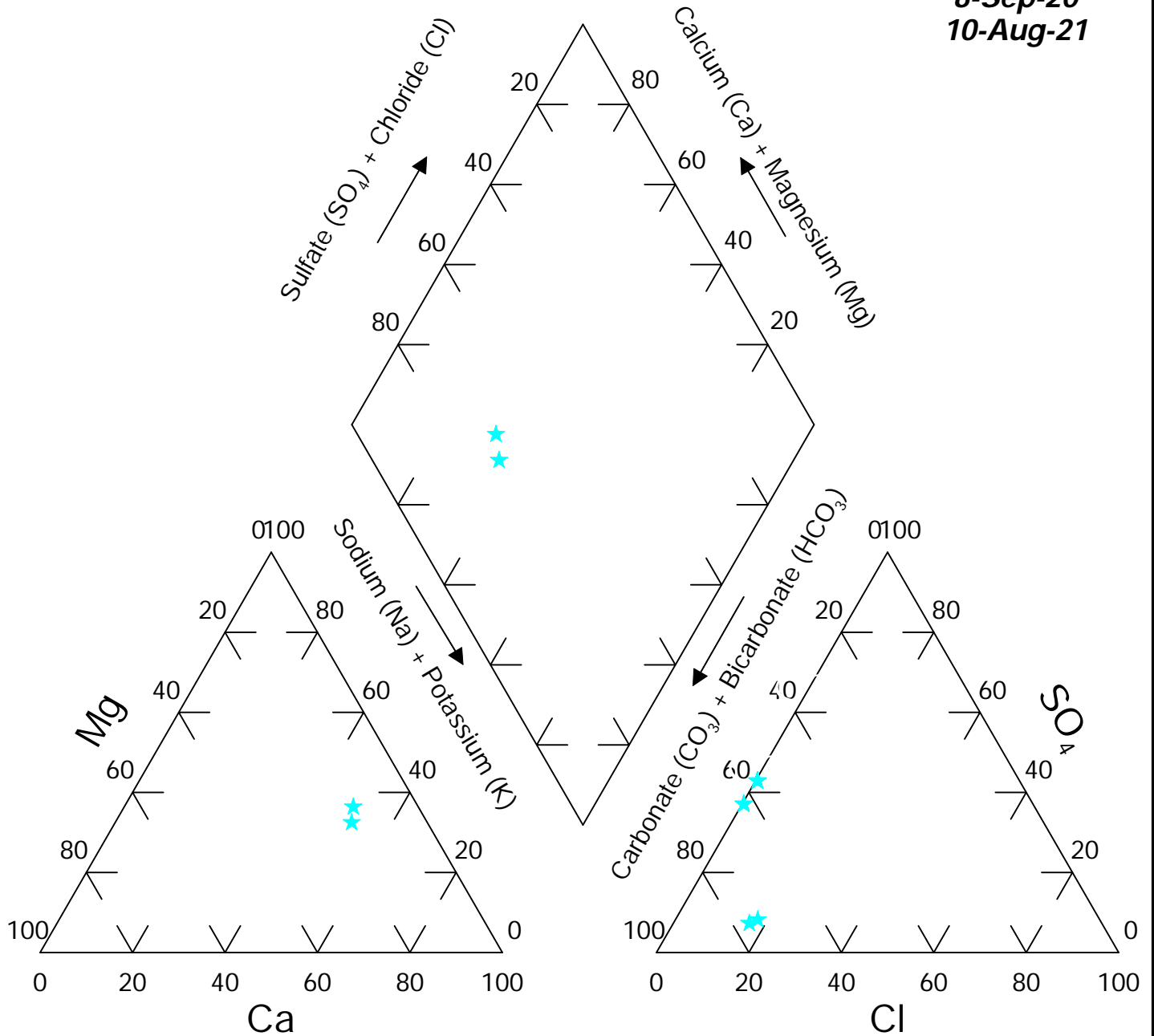


FIGURE: 21P

Site: Brady Location: *Riser 1*

Dates:
 29-Oct-15
 8-Sep-16
 26-Sep-17
 31-Jul-18
 10-Sep-19
 8-Sep-20

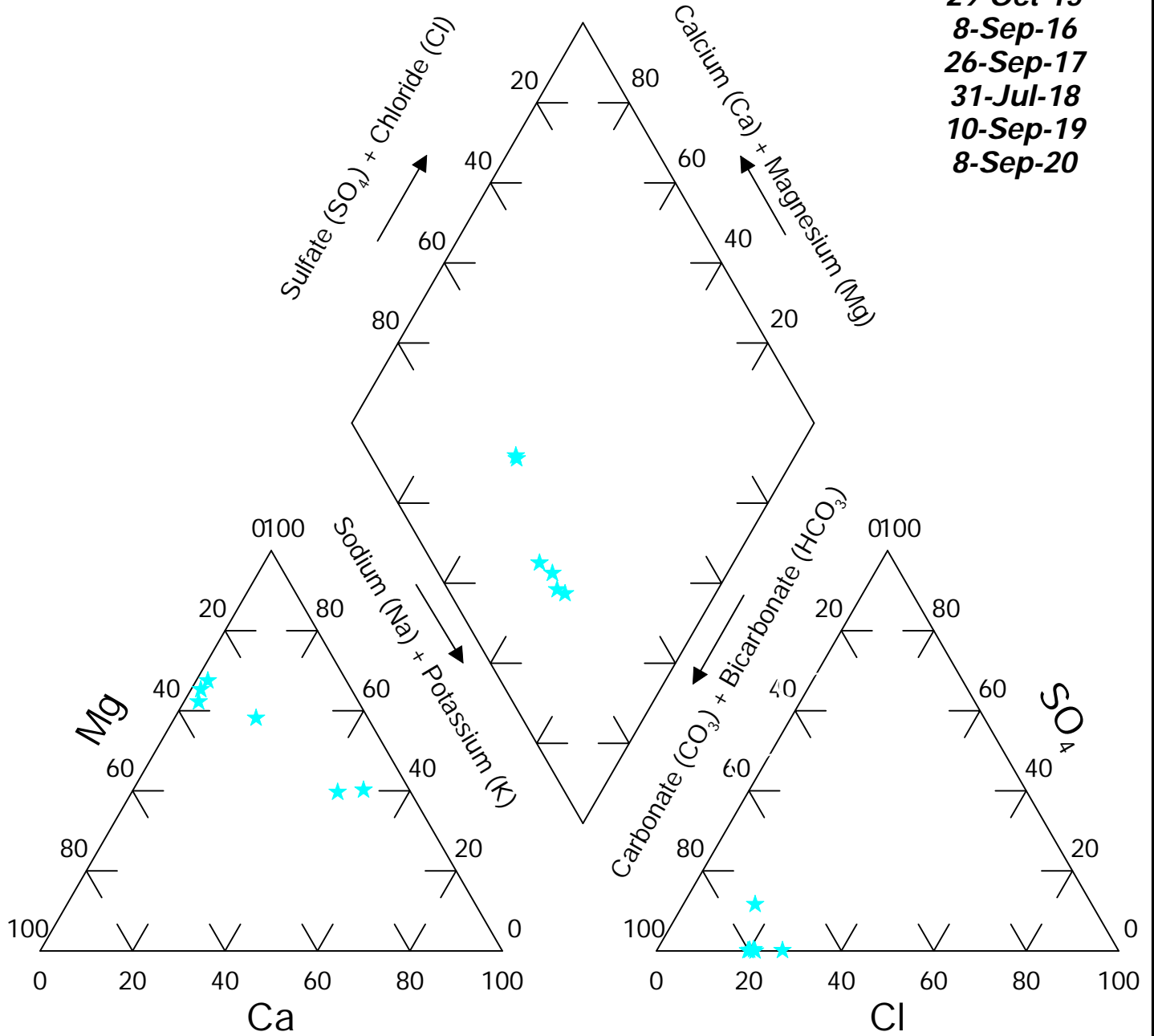


FIGURE: 18P

Site: Brady Location: MH BIO

Dates:
 8-Sep-16
 26-Sep-17
 31-Jul-18
 10-Sep-19
 8-Sep-20
 10-Aug-21

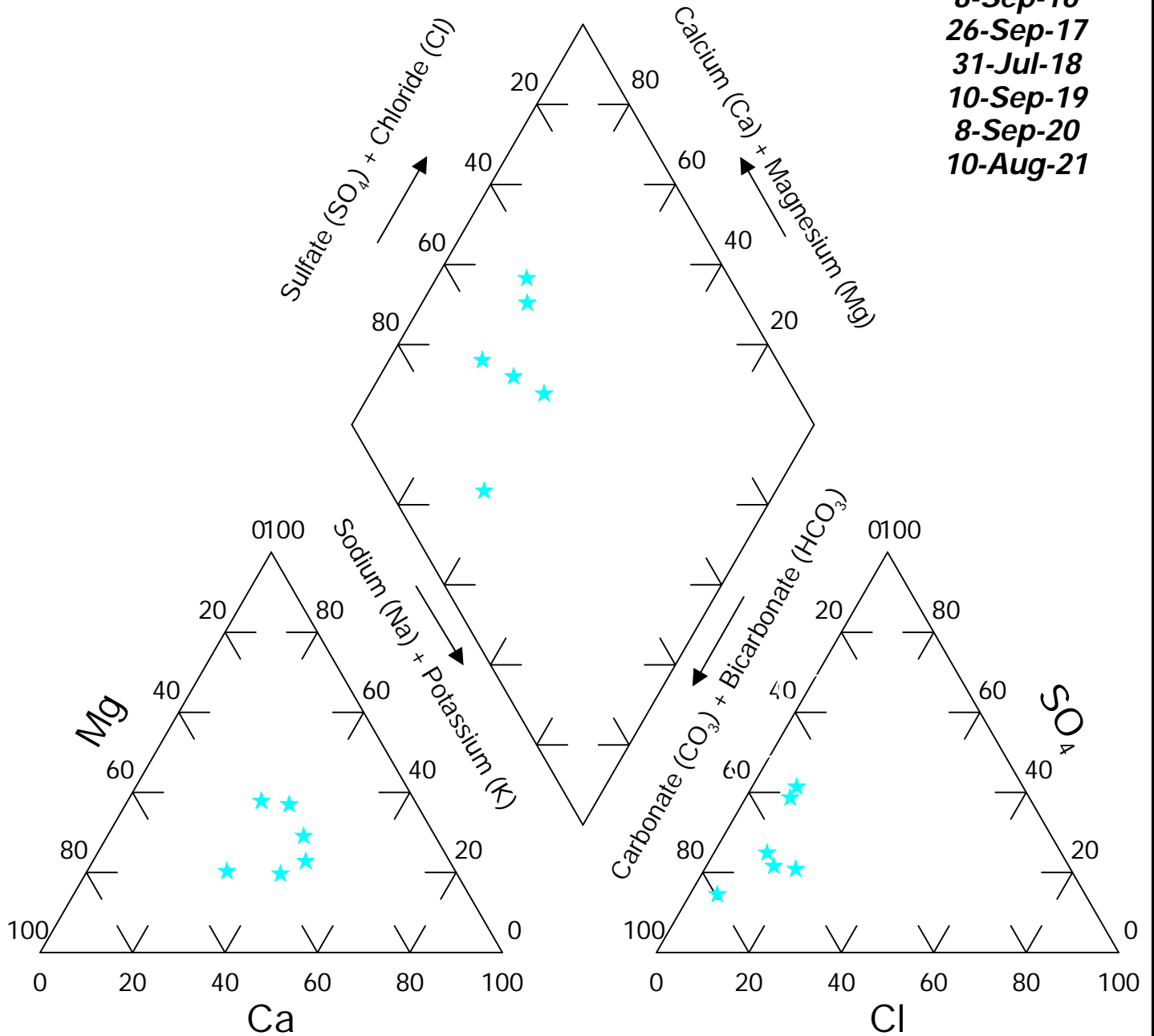
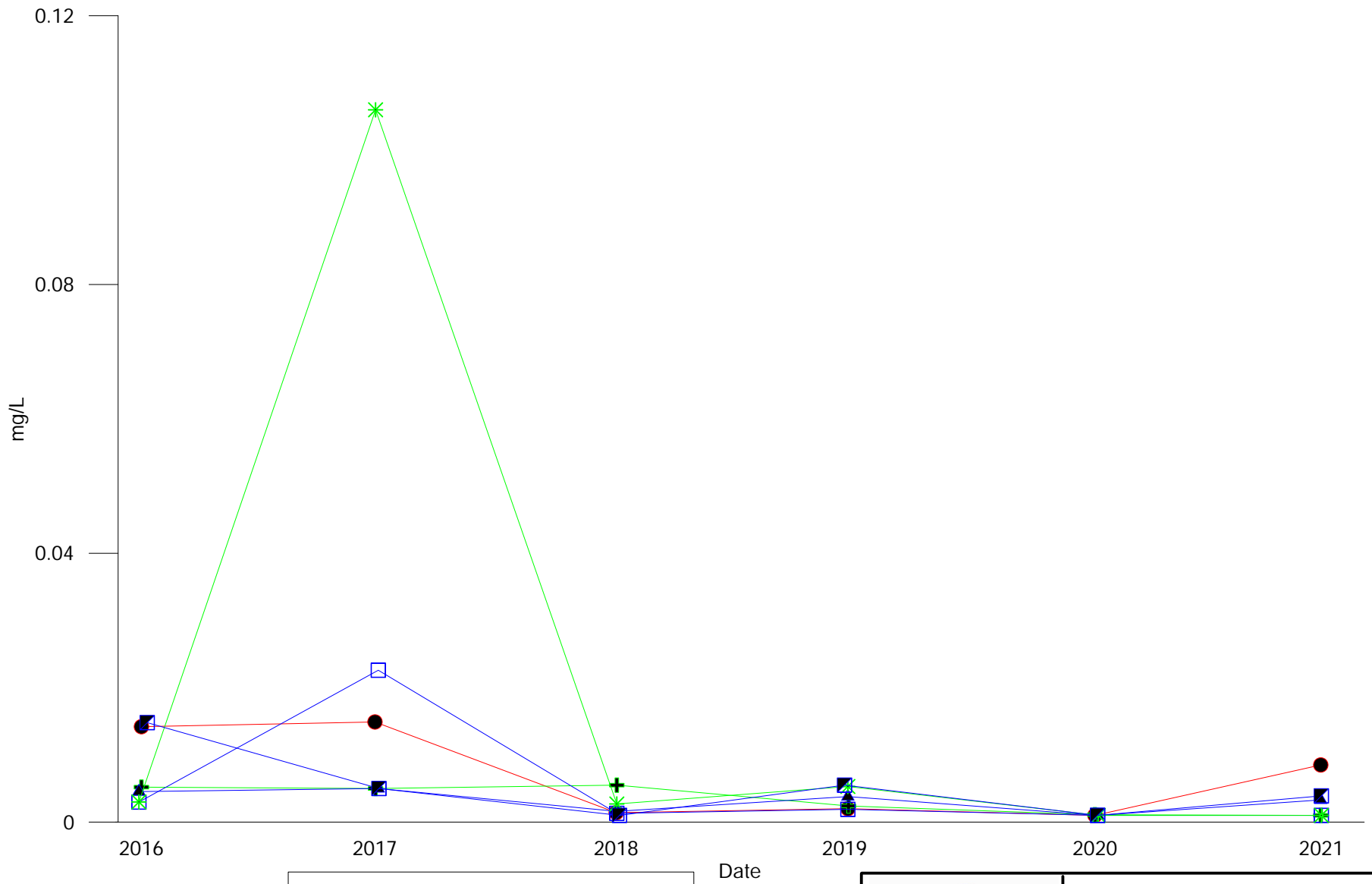


FIGURE: 18P

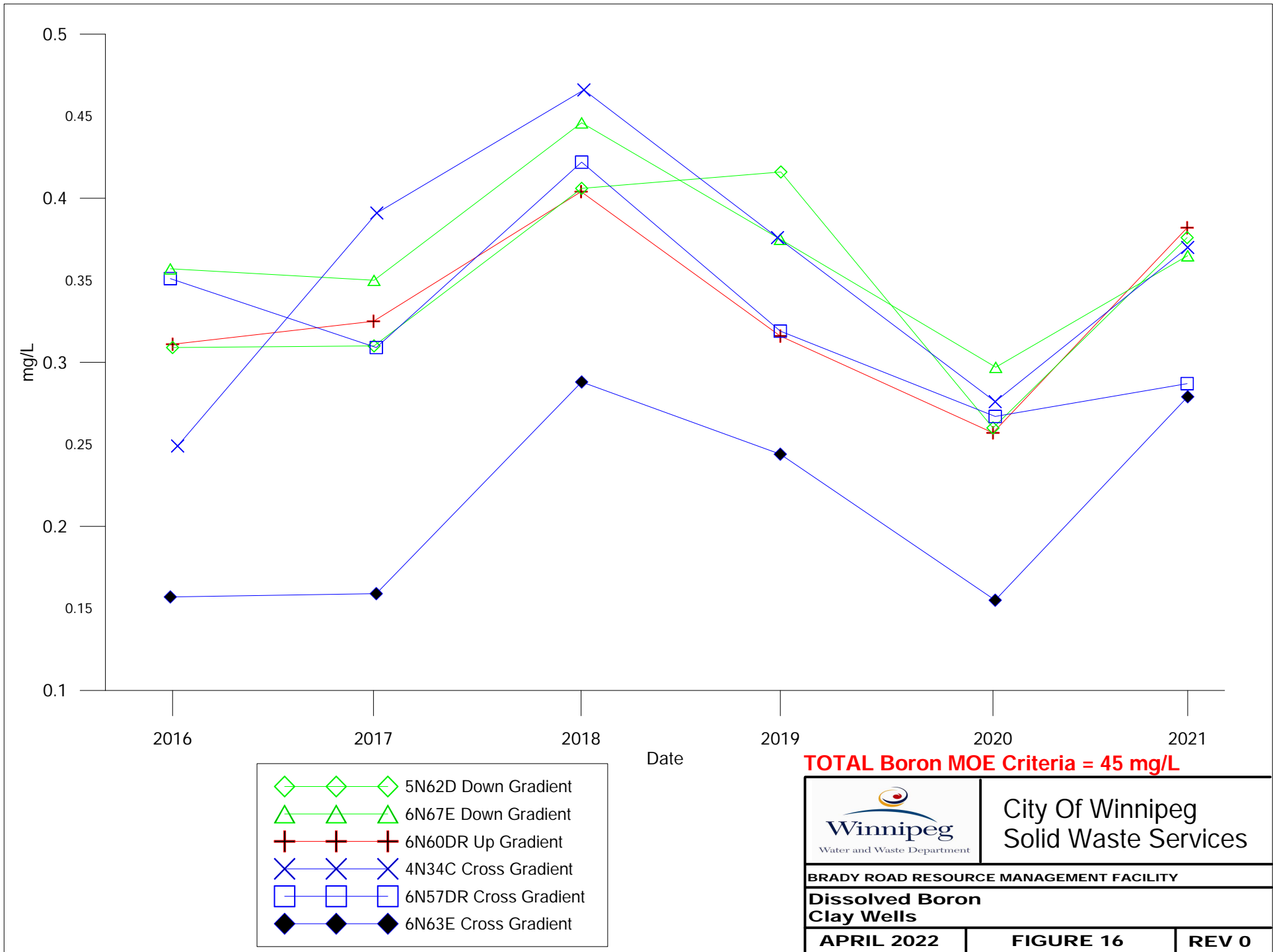
APPENDIX B
2021 TIME VS
CONCENTRATION GRAPHS

**2021 GROUNDWATER
TIME VS CONCENTRATION GRAPHS**



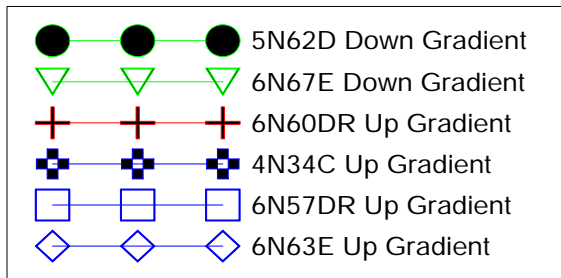
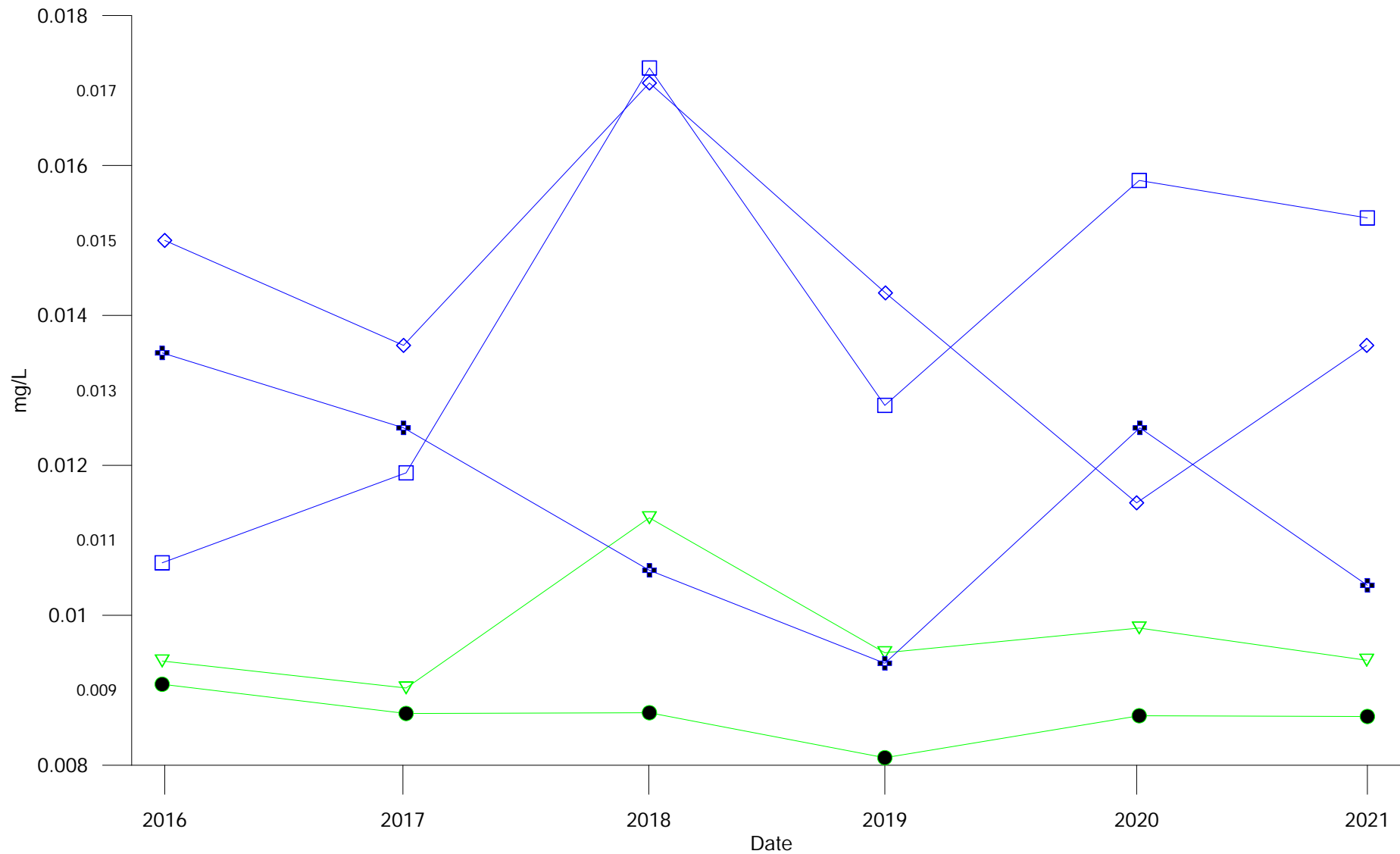
- + + + 5N62D Down Gradient
- * * * 6N67E Down Gradient
- ● ● 6060DR Up Gradient
- ▲ ▲ ▲ 6N57DR Cross Gradient
- □ □ 6N63E Cross Gradient
- ▣ ▣ ▣ 4N34C Cross Gradient

	City Of Winnipeg Solid Waste Services
BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Aluminium Clay Wells	
APRIL 2022	FIGURE 15
REV 0	



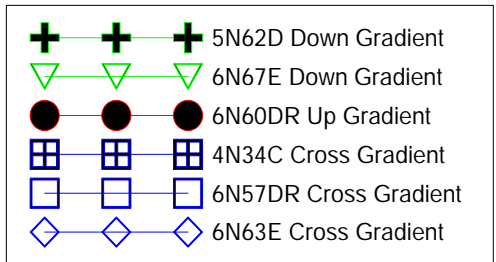
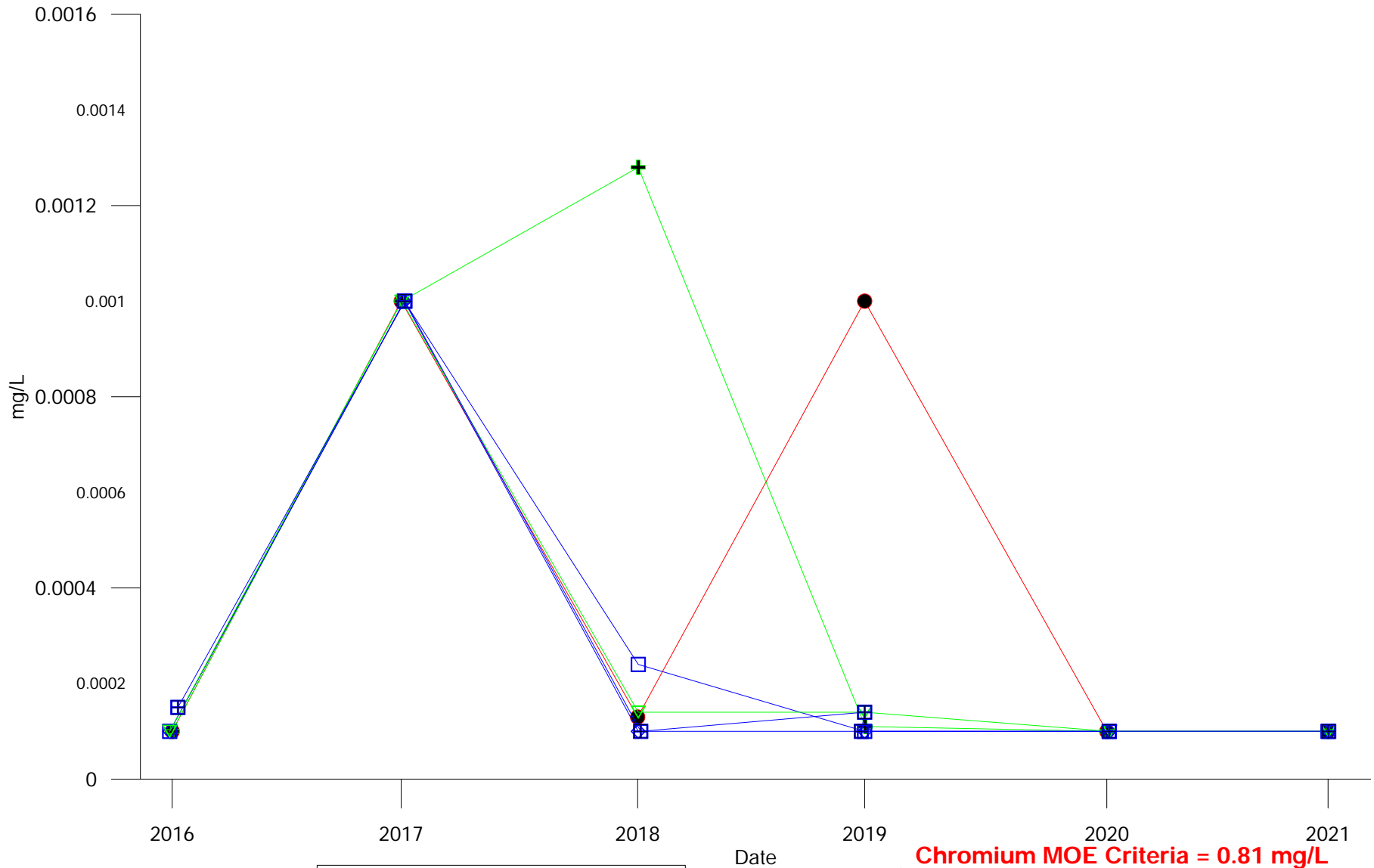
TOTAL Boron MOE Criteria = 45 mg/L

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Boron Clay Wells		
APRIL 2022	FIGURE 16	REV 0



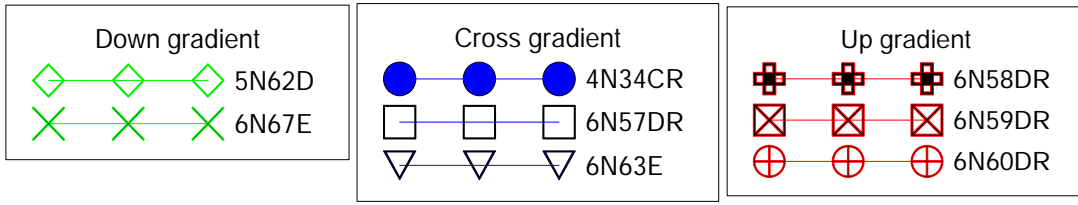
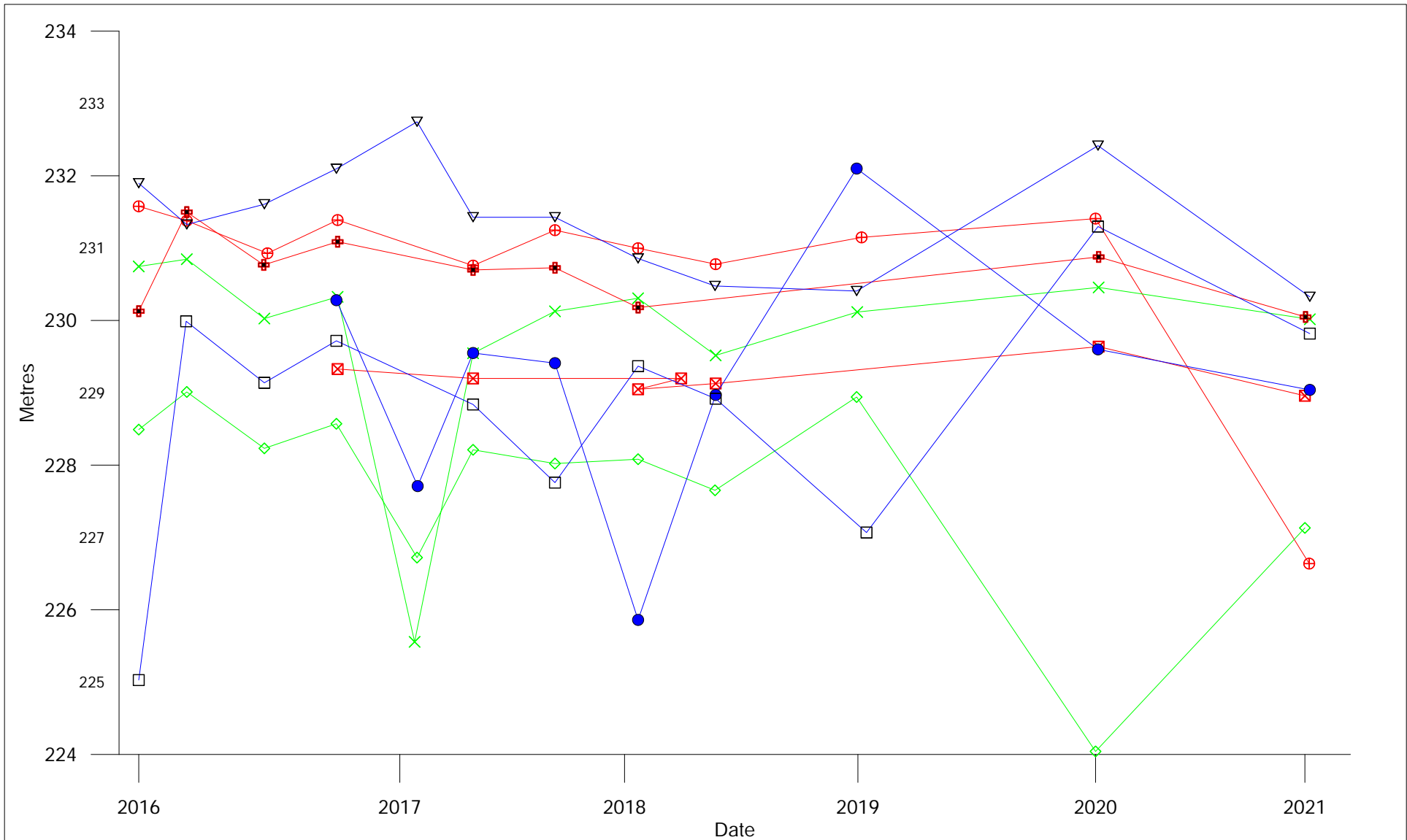
Barium MOE Criteria = 29 mg/L

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Barium Clay Wells		
APRIL 2022	FIGURE 17	REV 0

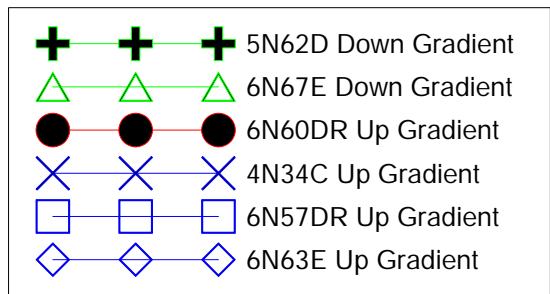
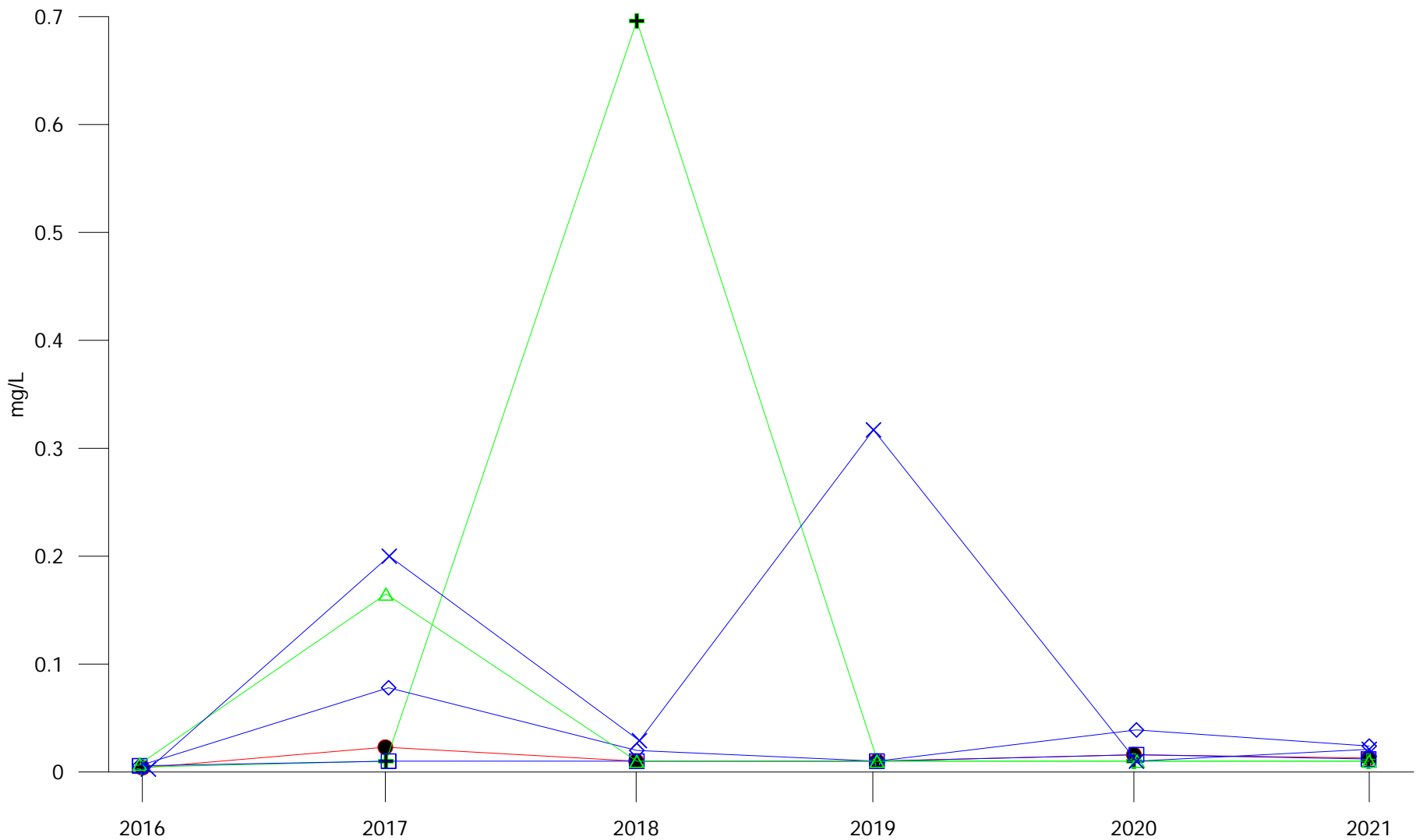


Chromium MOE Criteria = 0.81 mg/L

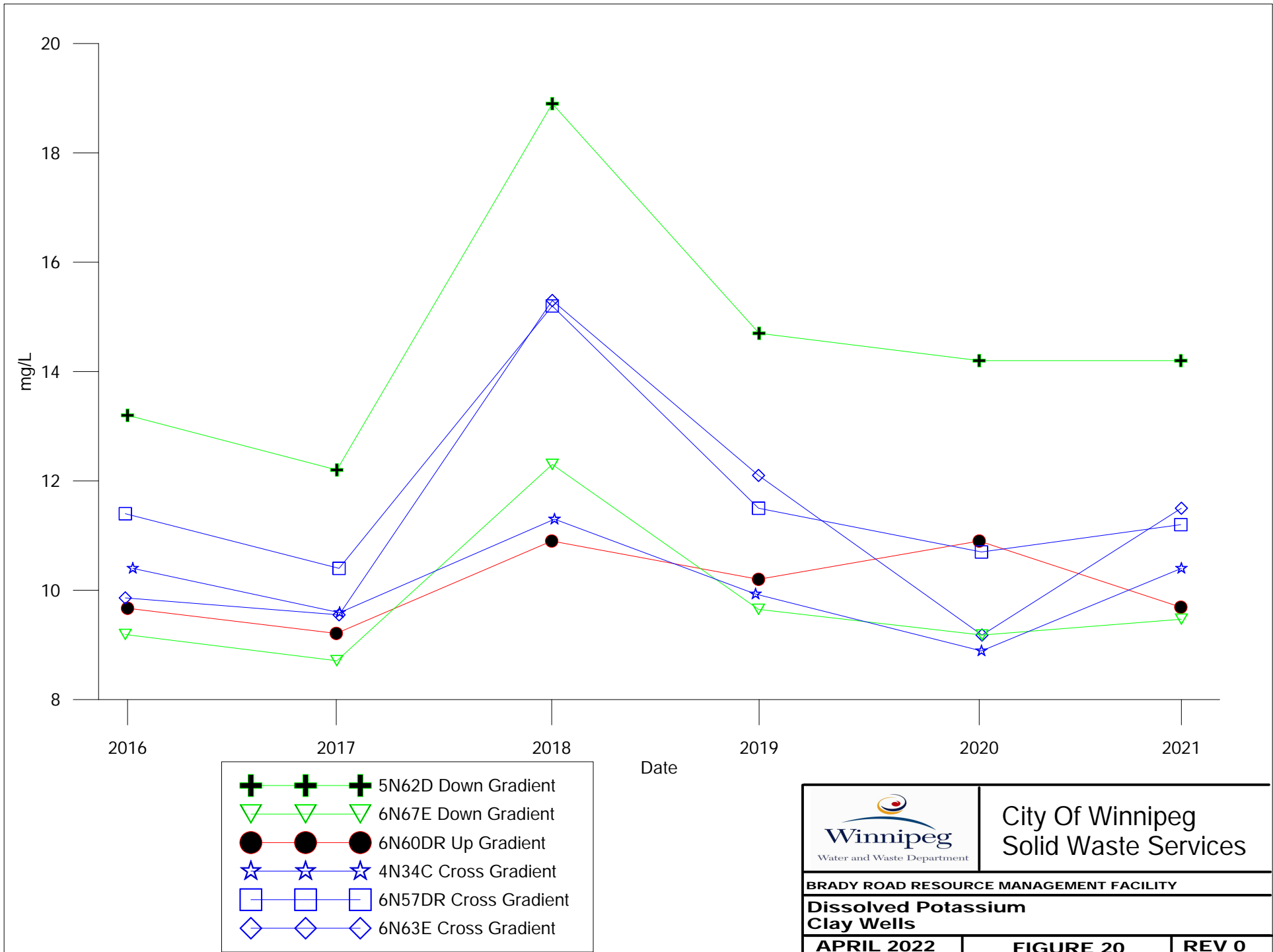
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Chromium Clay Wells		
APRIL 2022	FIGURE 18	REV 0



	<p>City Of Winnipeg Solid Waste Services</p>
	<p>BRADY ROAD RESOURCE MANAGEMENT FACILITY</p> <p>GROUNDWATER ELEVATIONS CLAY WELLS</p>
<p>APRIL 2022</p>	<p>FIGURE GW-3-2 REV 0</p>

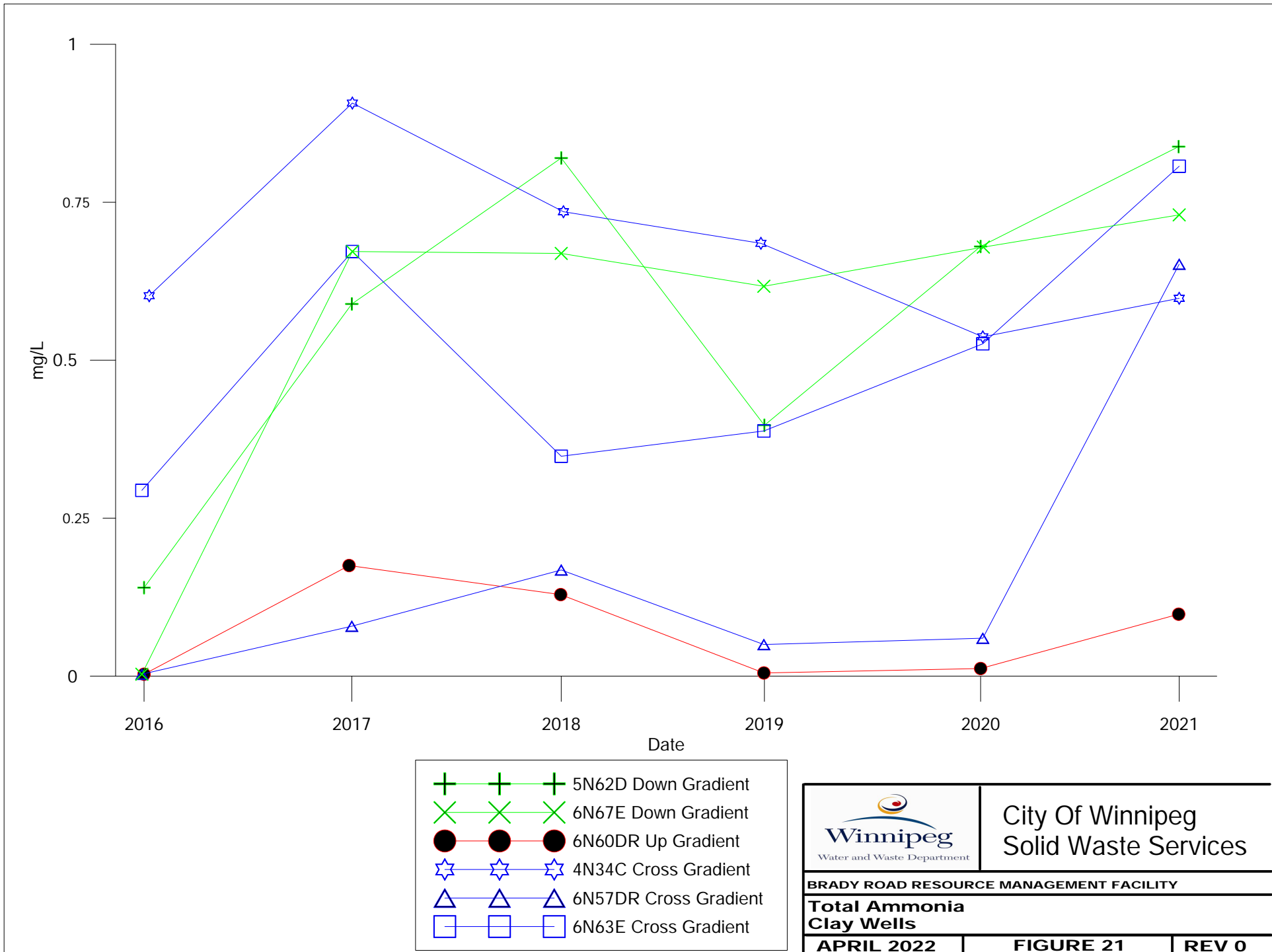


	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Iron Clay Wells		
APRIL 2022	FIGURE 19	REV 0

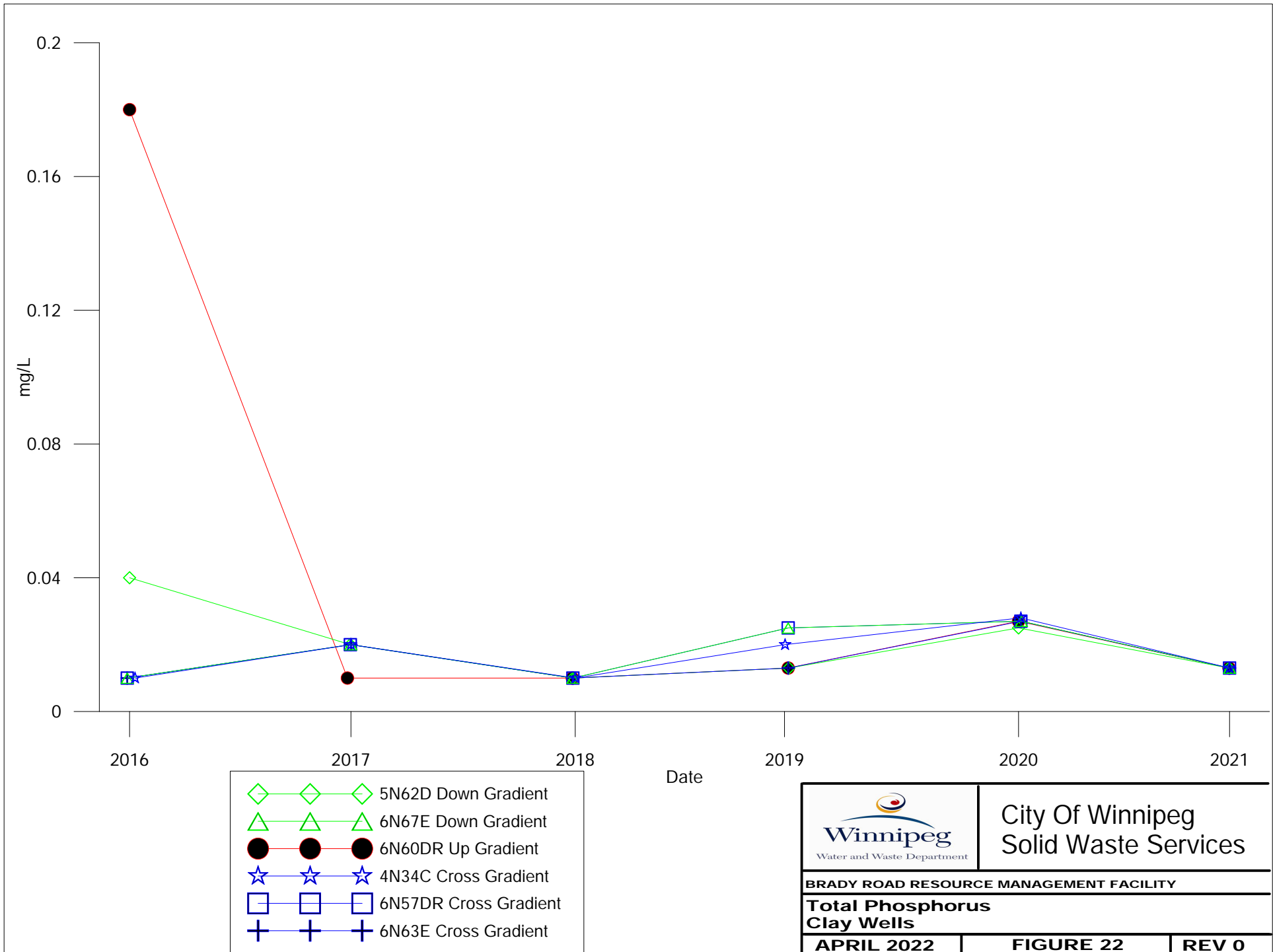


City Of Winnipeg
Solid Waste Services

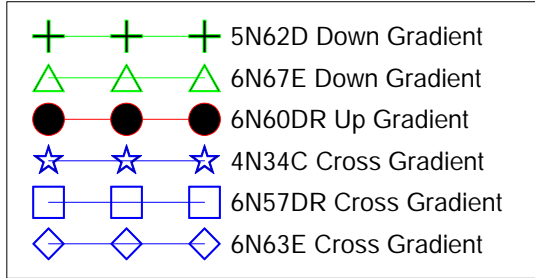
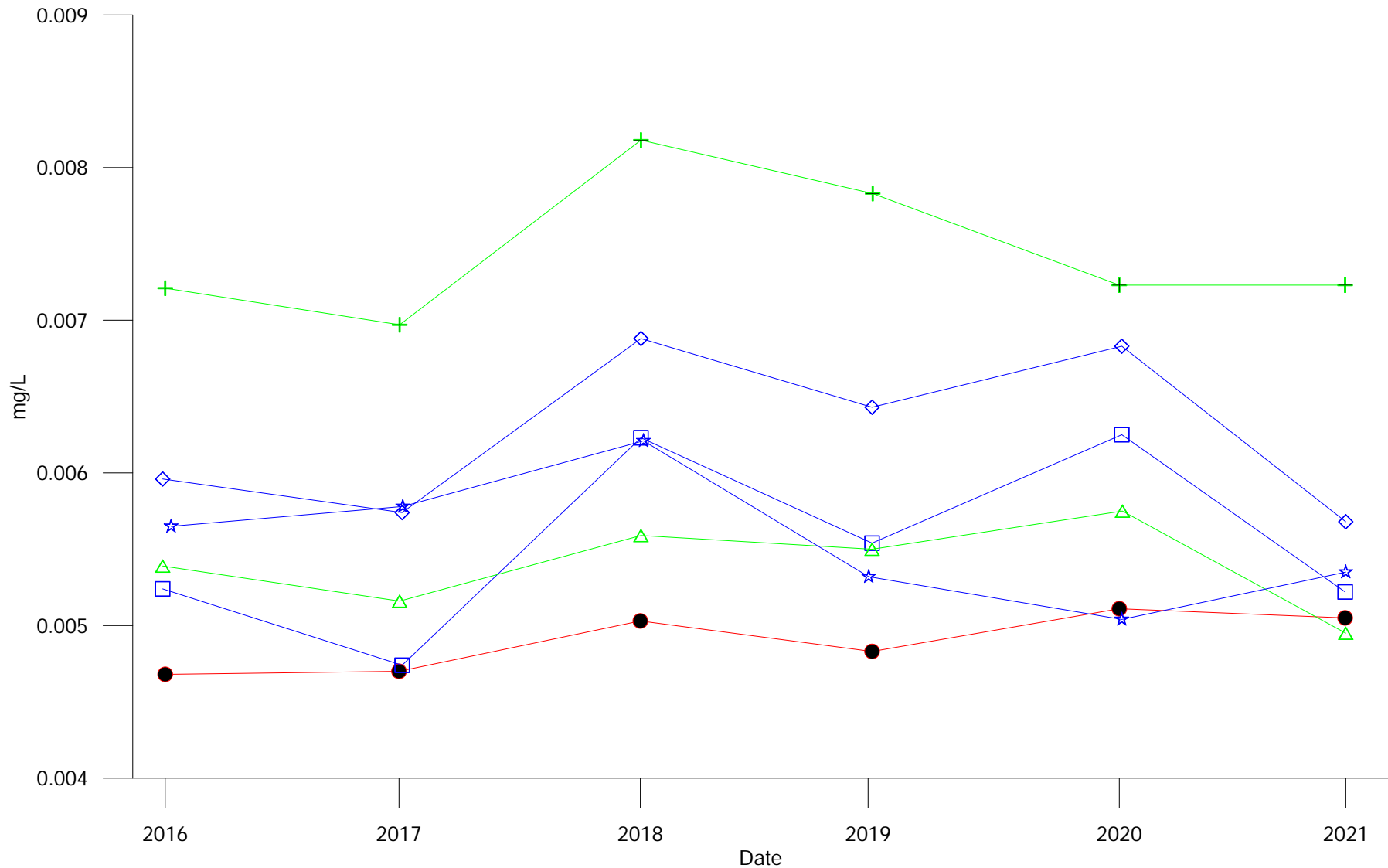
BRADY ROAD RESOURCE MANAGEMENT FACILITY		
Dissolved Potassium Clay Wells		
APRIL 2022	FIGURE 20	REV 0



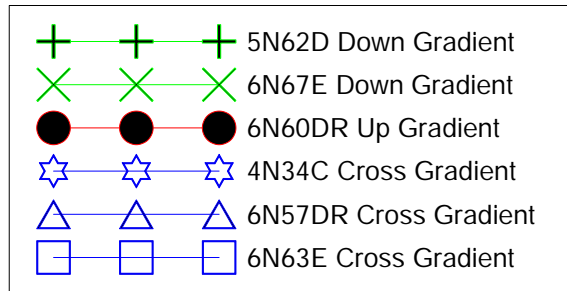
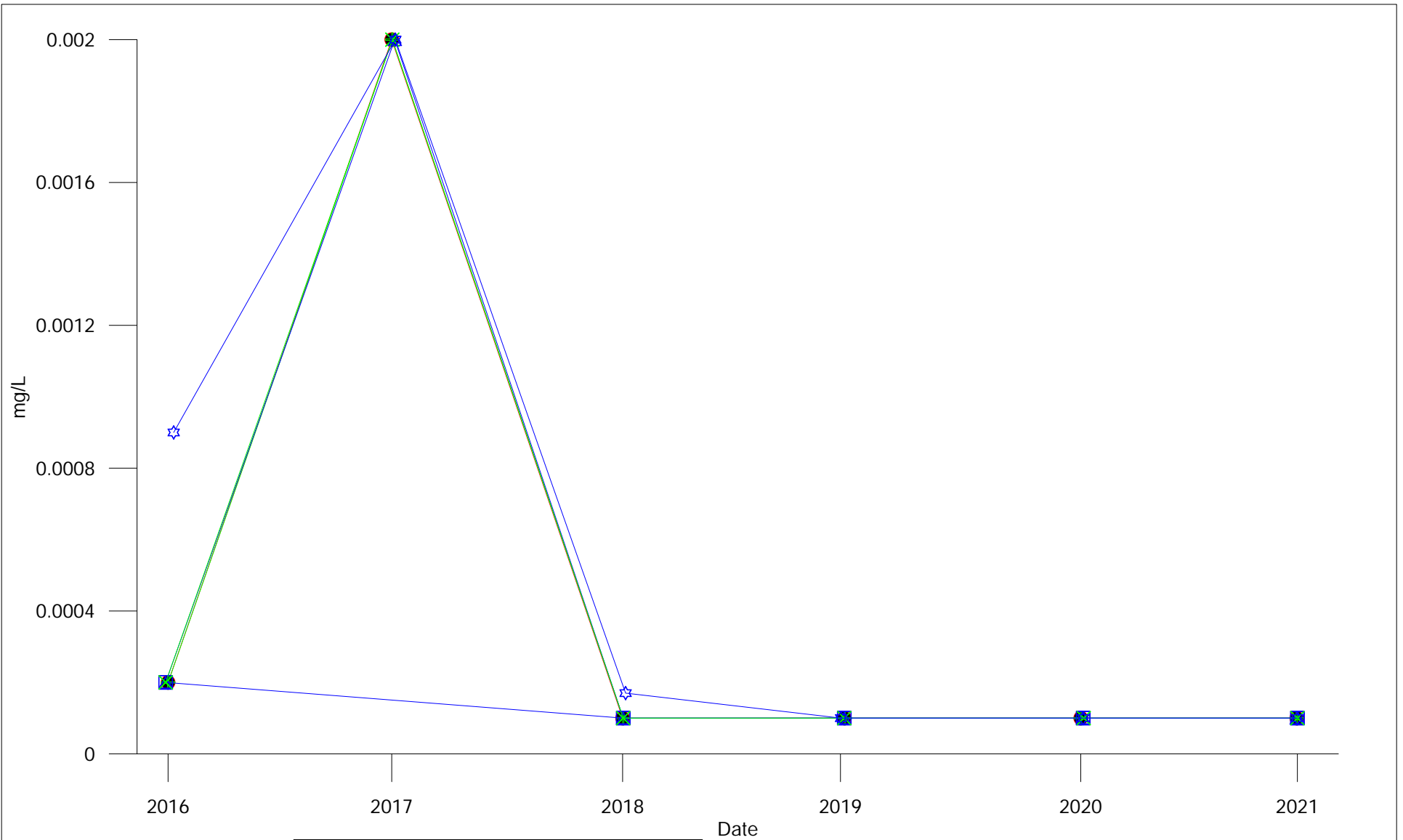
City Of Winnipeg
Solid Waste Services



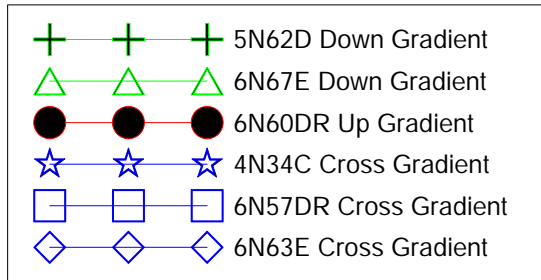
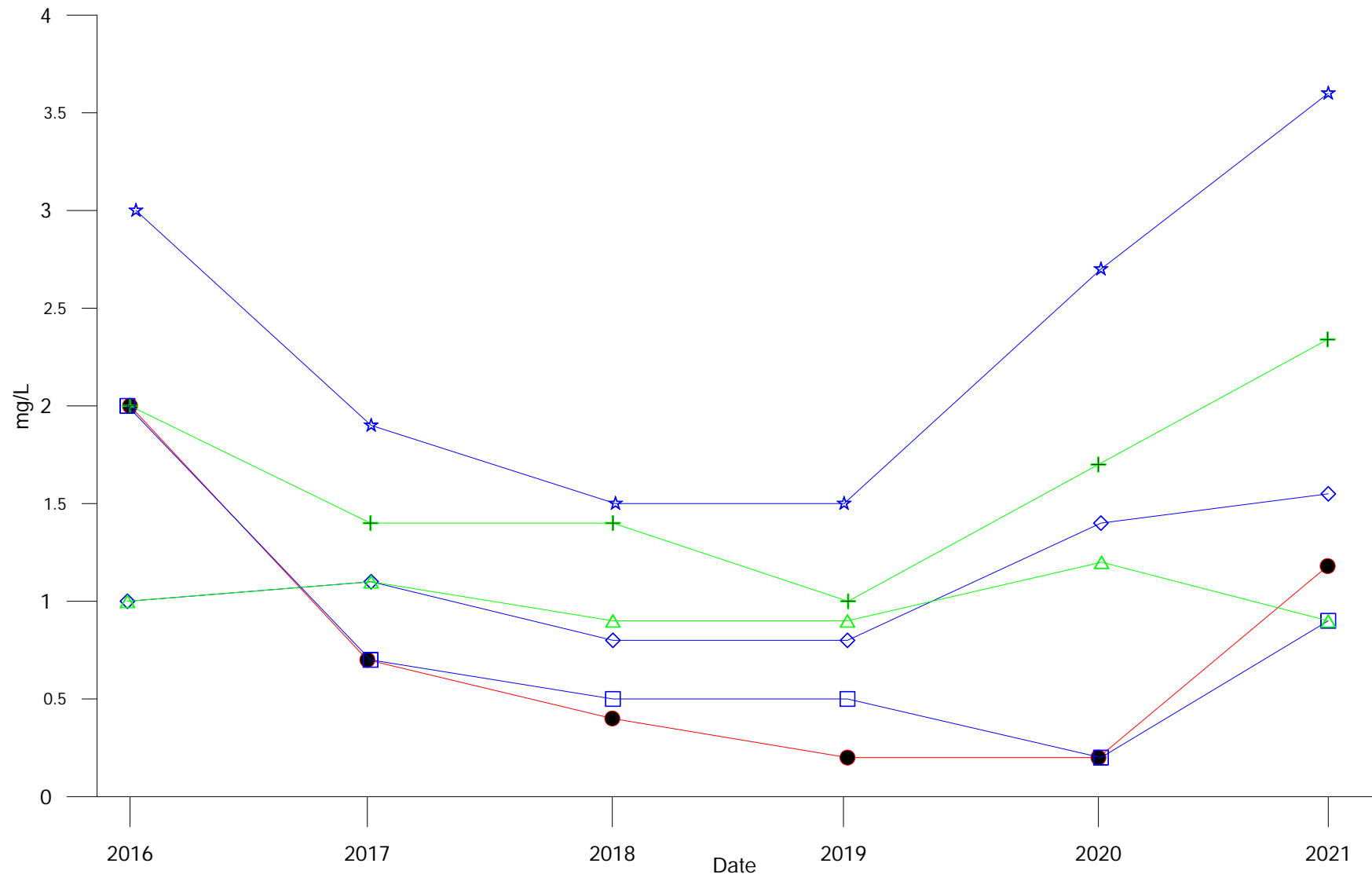
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Total Phosphorus Clay Wells		
APRIL 2022	FIGURE 22	REV 0



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Rubidium Clay Wells		
APRIL 2022	FIGURE 23	REV 0



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Tin Clay Wells		
APRIL 2022	FIGURE 24	REV 0



City Of Winnipeg
Solid Waste Services

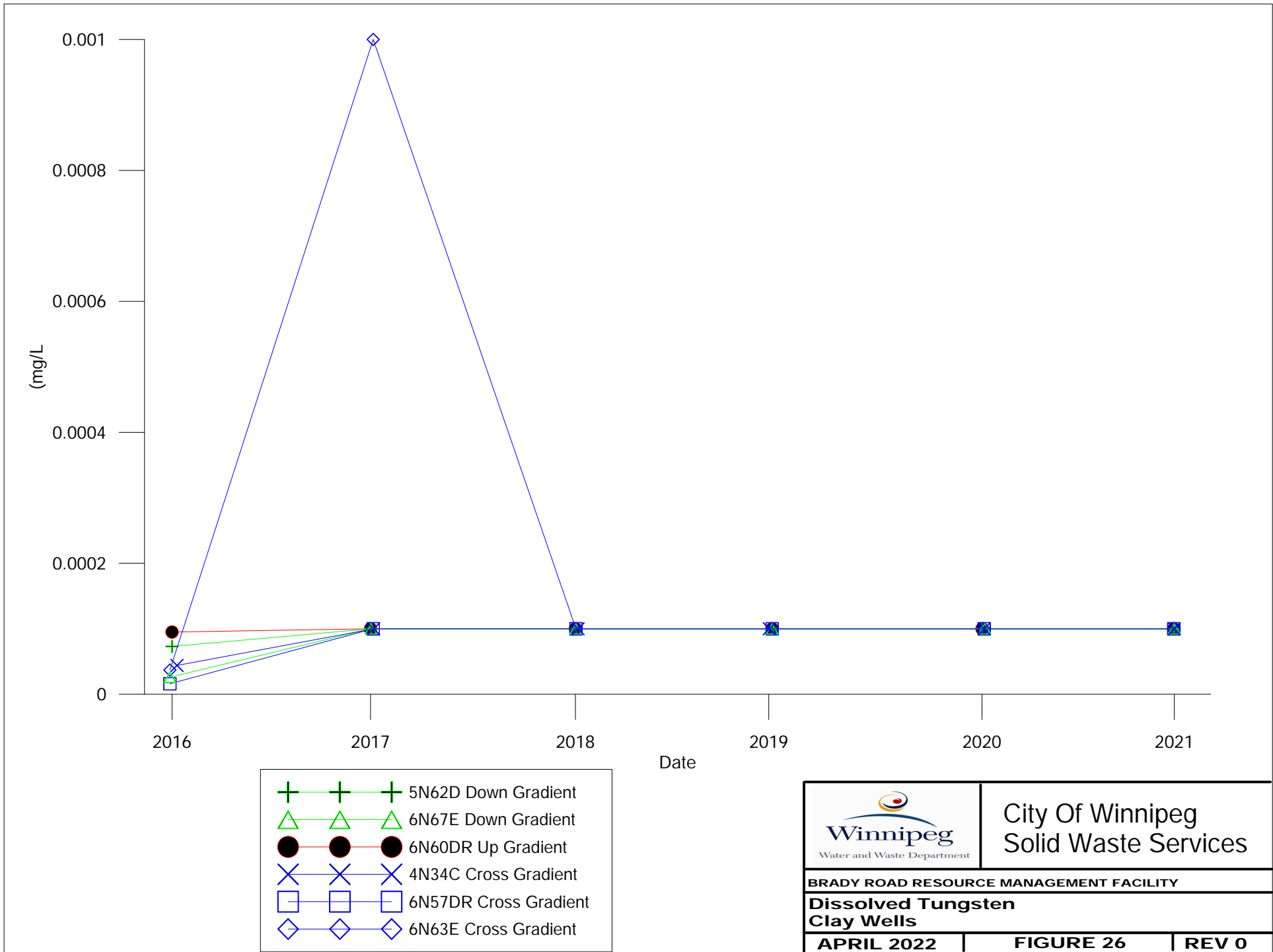
BRADY ROAD RESOURCE MANAGEMENT FACILITY

Total Kjeldahl Nitrogen
Clay Wells

APRIL 2022

FIGURE 25

REV 0

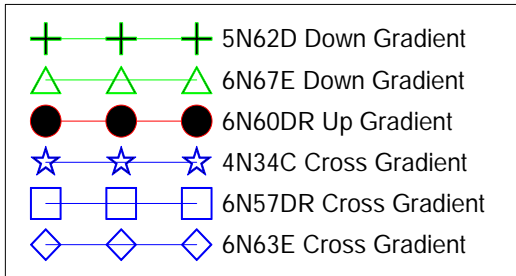
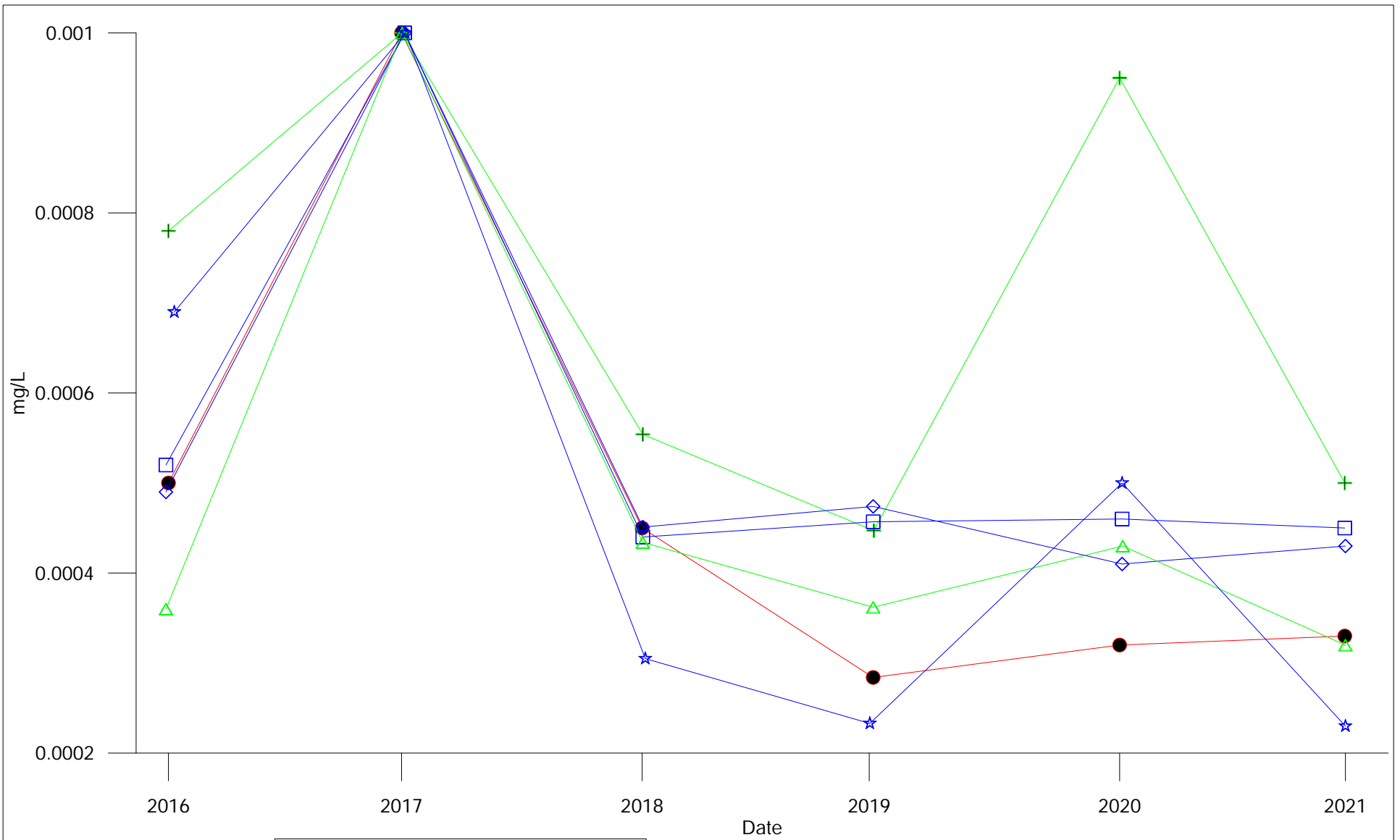


City Of Winnipeg
Solid Waste Services

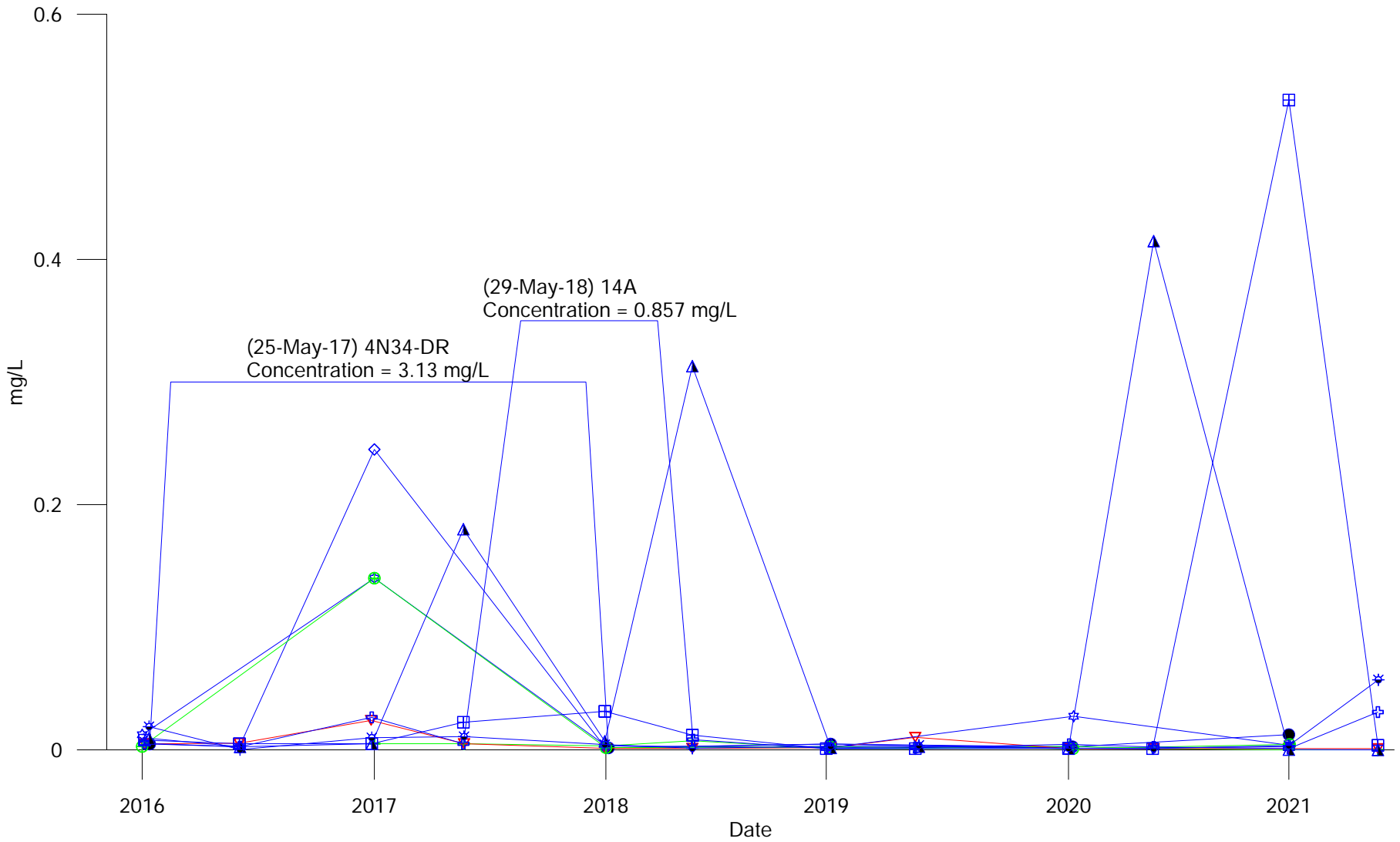
BRADY ROAD RESOURCE MANAGEMENT FACILITY

Dissolved Tungsten
Clay Wells

APRIL 2022 | FIGURE 26 | REV 0



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Zirconium Clay Wells		
APRIL 2022	FIGURE 27	REV 0



Cross gradient
 13A
 14A

Cross gradient
 16A
 4N34DDR
 6N57F
 6N63F
 15A

Up gradient
 6N60E

Down gradient
 5N62E
 6N67F



City Of Winnipeg
 Solid Waste Services

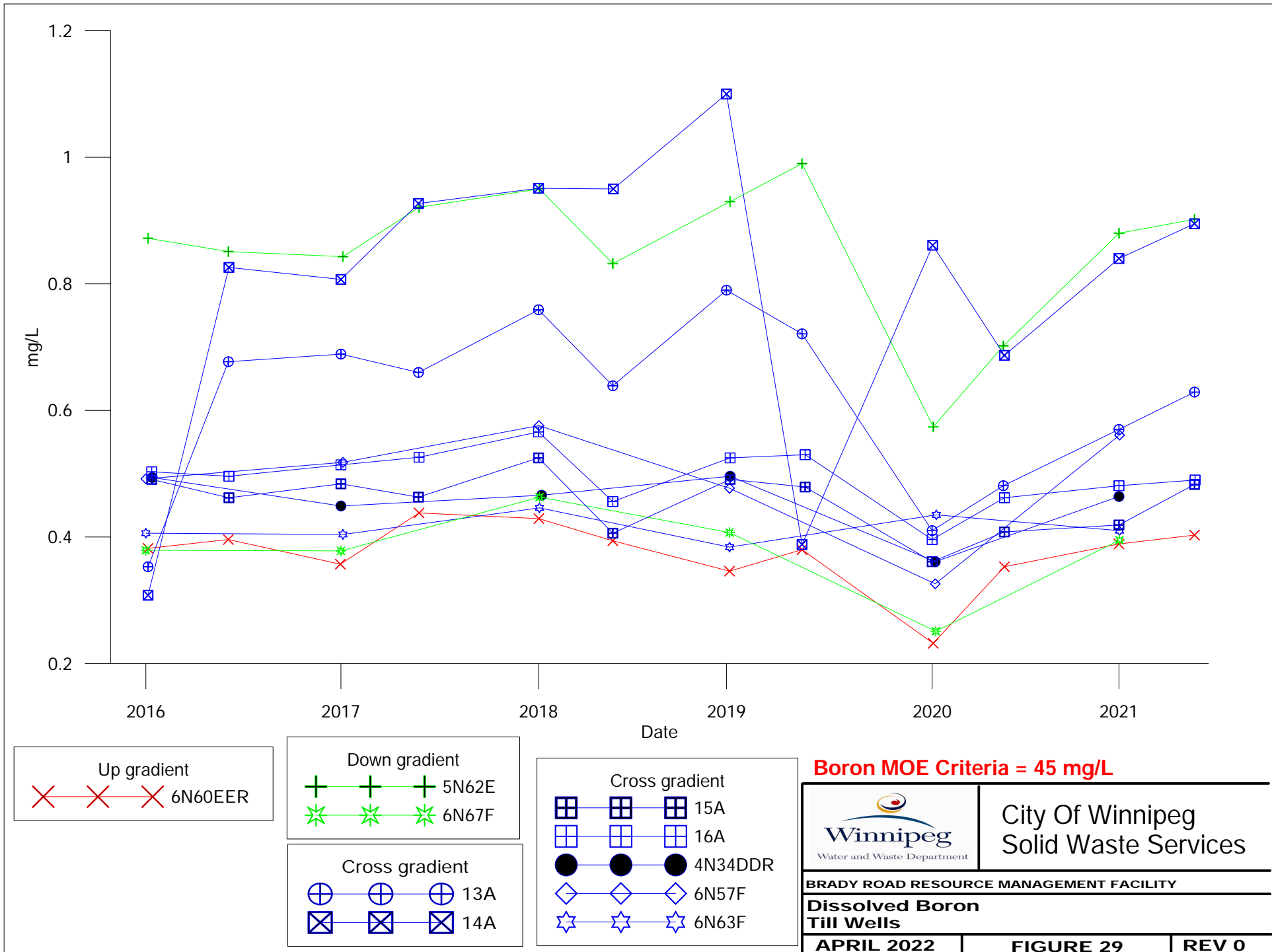
BRADY ROAD RESOURCE MANAGEMENT FACILITY

Dissolved Aluminium
 Till Wells

APRIL 2022

FIGURE 28

REV 0



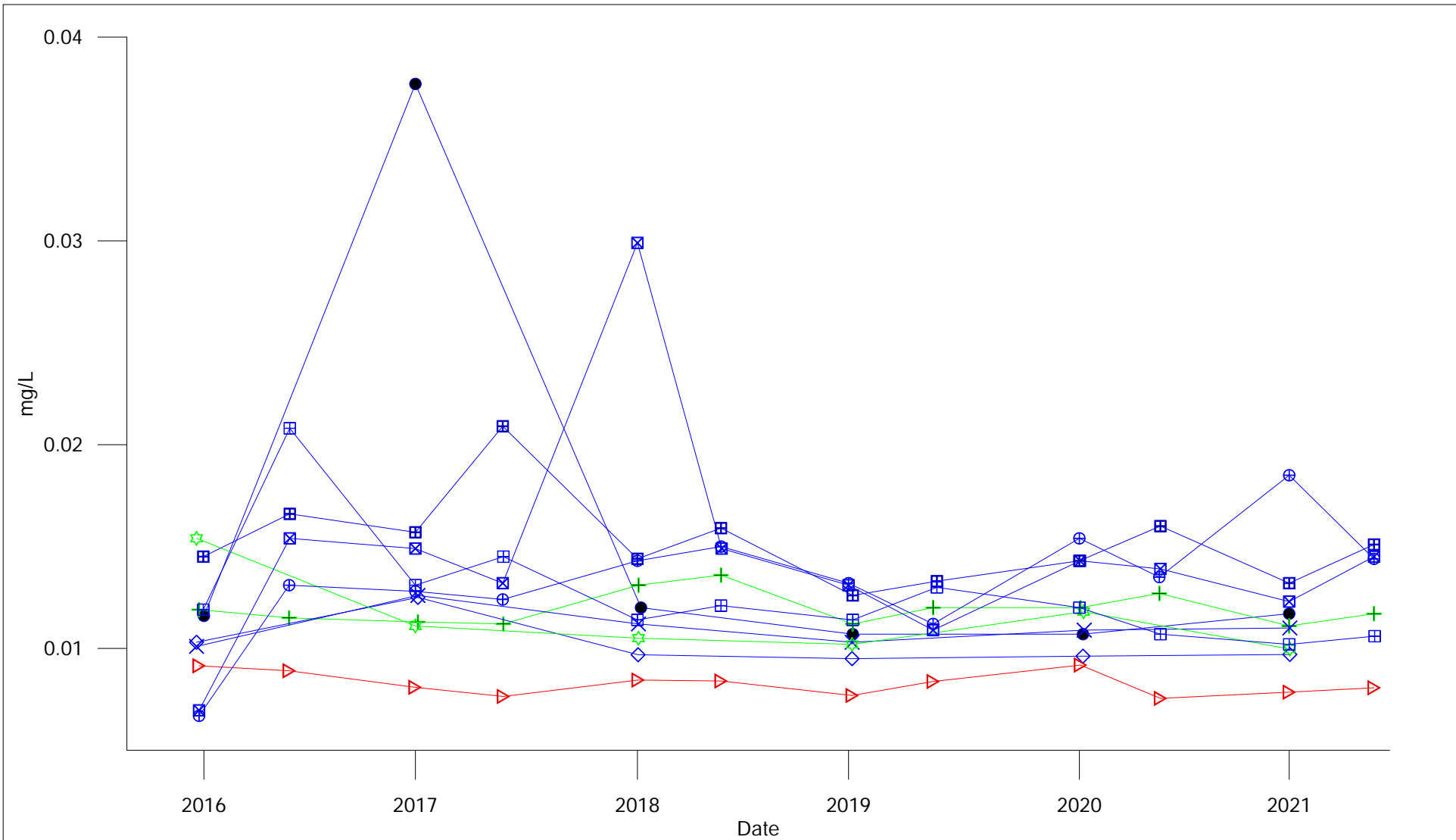
Winnipeg
Water and Waste Department

City Of Winnipeg
Solid Waste Services

BRADY ROAD RESOURCE MANAGEMENT FACILITY

Dissolved Boron
Till Wells

APRIL 2022 | **FIGURE 29** | **REV 0**



Up gradient
 6N60EER

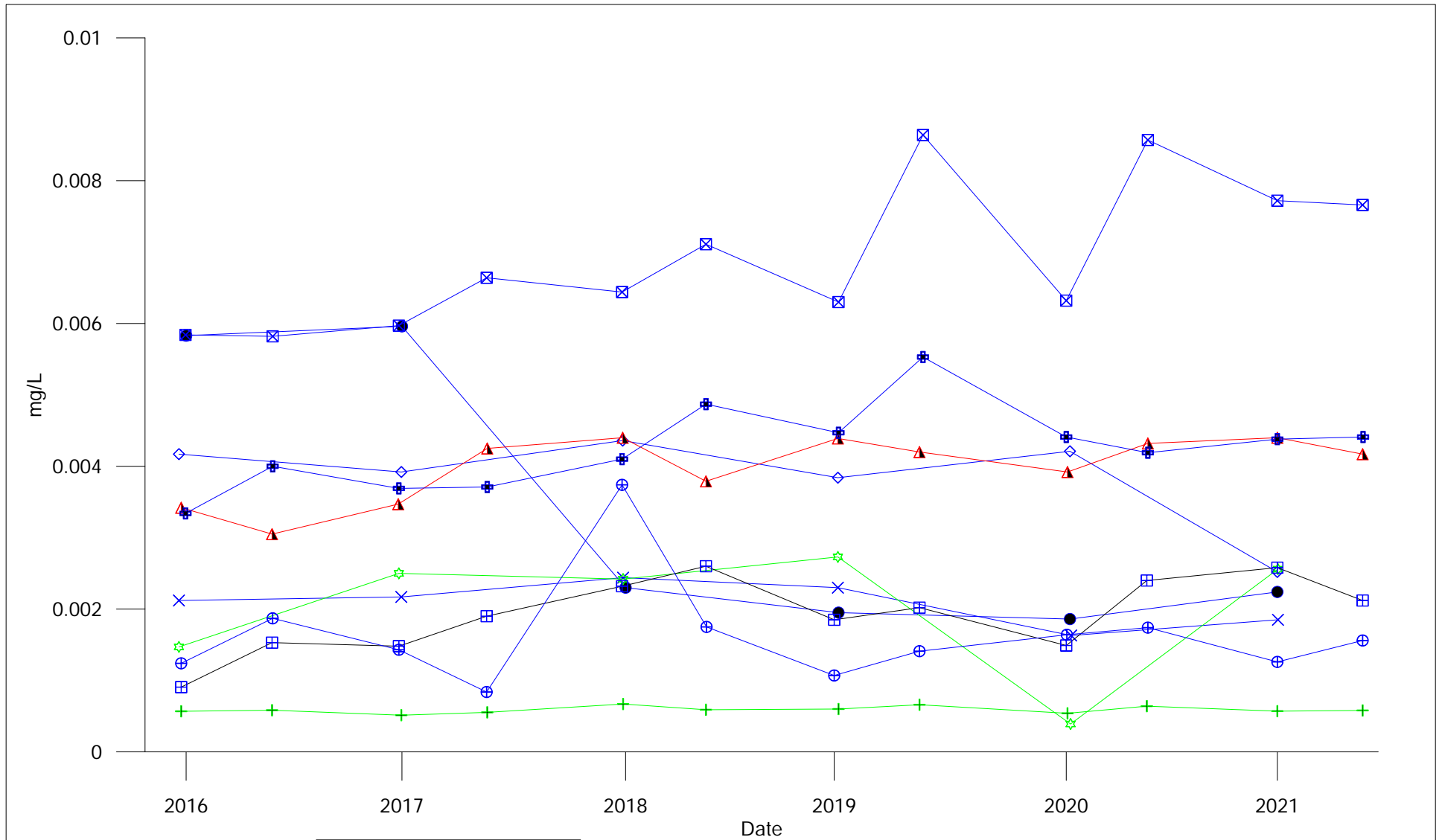
Down gradient
 5N62E
 6N67F

Cross gradient
 13A
 14A

Cross gradient
 15A
 16A
 4N34DDR
 6N57F
 6N63F

Barium MOE Criteria = 29 mg/L

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Barium Till Wells		
APRIL 2022	FIGURE 30	REV 0



Up gradient
 6N60EER

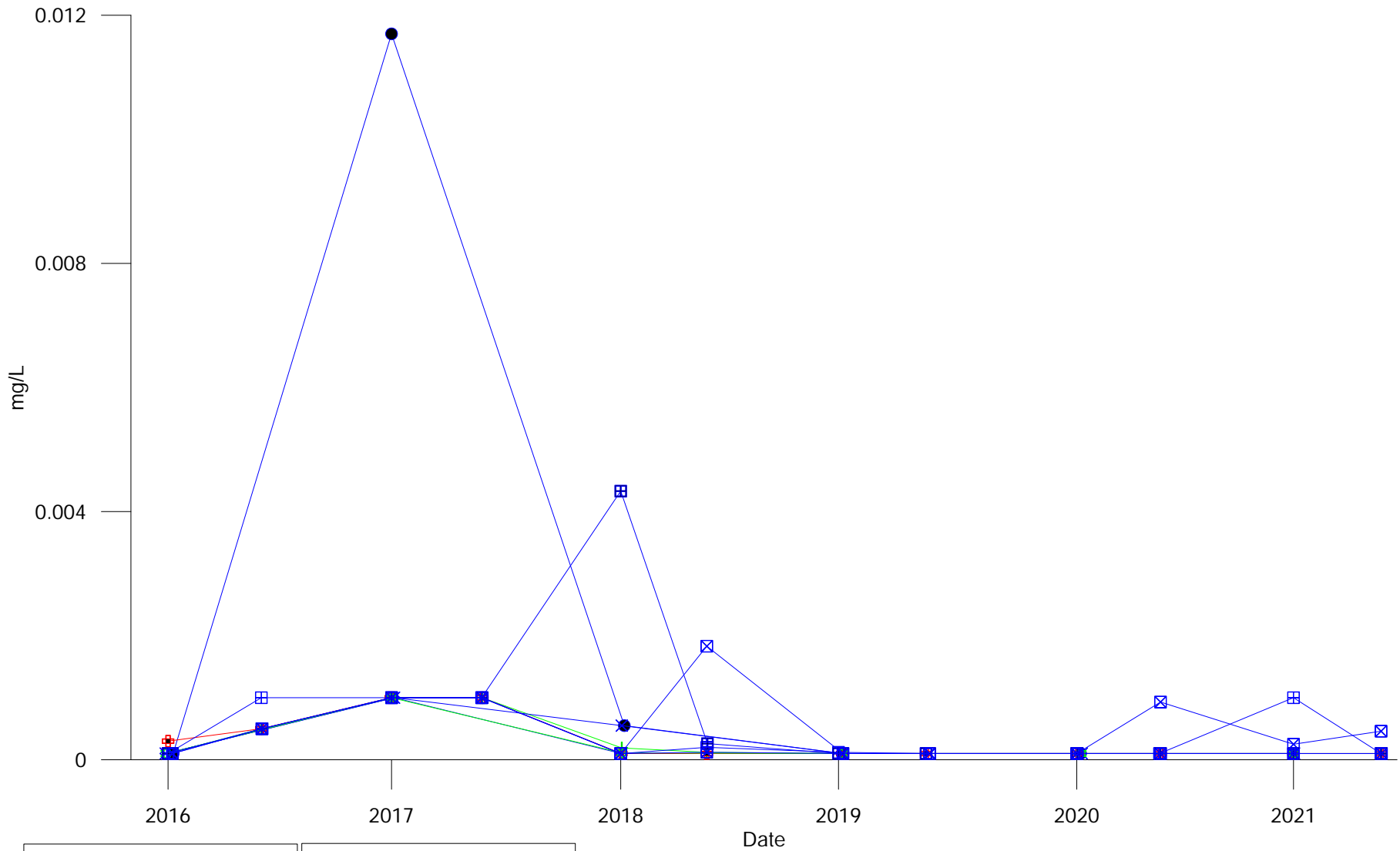
Down gradient
 5N62E
 6N67F

Cross gradient
 13A
 14A

Cross gradient
 15A
 16A
 4N34DDR
 6N57F
 6N63F

Cobalt MOE Criteria = 0.066 mg/L

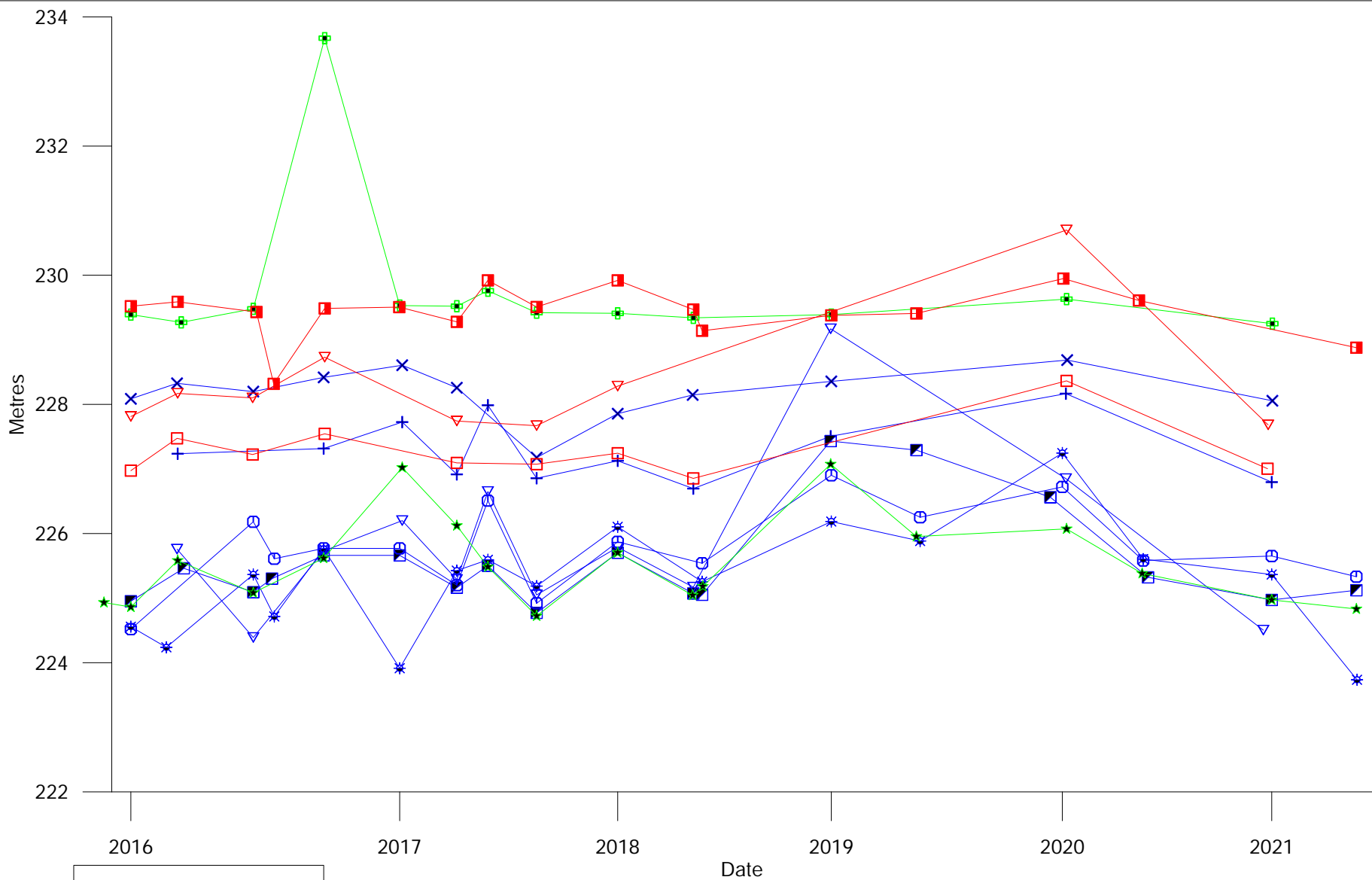
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Cobalt Till Wells		
APRIL 2022	FIGURE 31	REV 0



Chromium MOE Criteria = 0.81 mg/L

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Chromium Till Wells		
APRIL 2022	FIGURE 32	REV 0

<p>Up gradient</p> 6N60E	<p>Down gradient</p> 5N62E 6N67F	<p>Cross gradient</p> 15A 16A 4N34DDR 6N57F 6N63F
<p>Cross gradient</p> 13A 14A		



Cross gradient


- 13A
- 15A
- 6N57FR
- 16A
- 4N34DR
- 6N63F

Up gradient

- 6N58FR
- 6N59FR
- 6N60ER

Down gradient

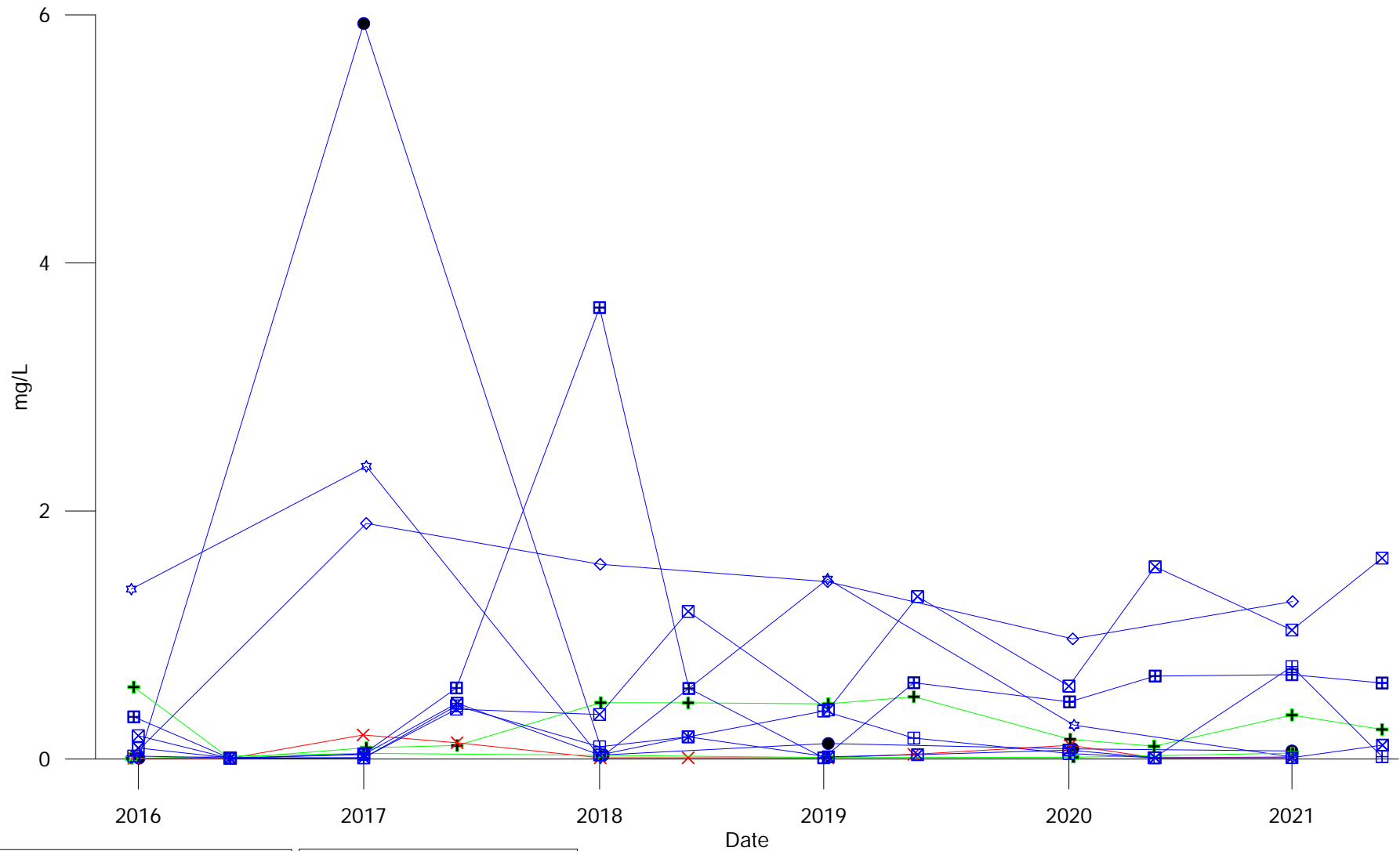
- 5N62E
- 6N67F


City Of Winnipeg
Solid Waste Services

BRADY ROAD RESOURCE MANAGEMENT FACILITY

GROUNDWATER ELEVATION
TILL WELLS

APRIL 2022 | FIGURE GW-1-1 | REV 0



Up gradient
 X X X 6N60EER

Down gradient
 + + + 5N62E
 + + + 6N67F

Cross gradient
 □ □ □ 13A
 □ □ □ 14A

Cross gradient
 □ □ □ 15A
 □ □ □ 16A
 ● ● ● 4N34DDR
 ◇ ◇ ◇ 6N57F
 ☆ ☆ ☆ 6N63F



City Of Winnipeg
 Solid Waste Services

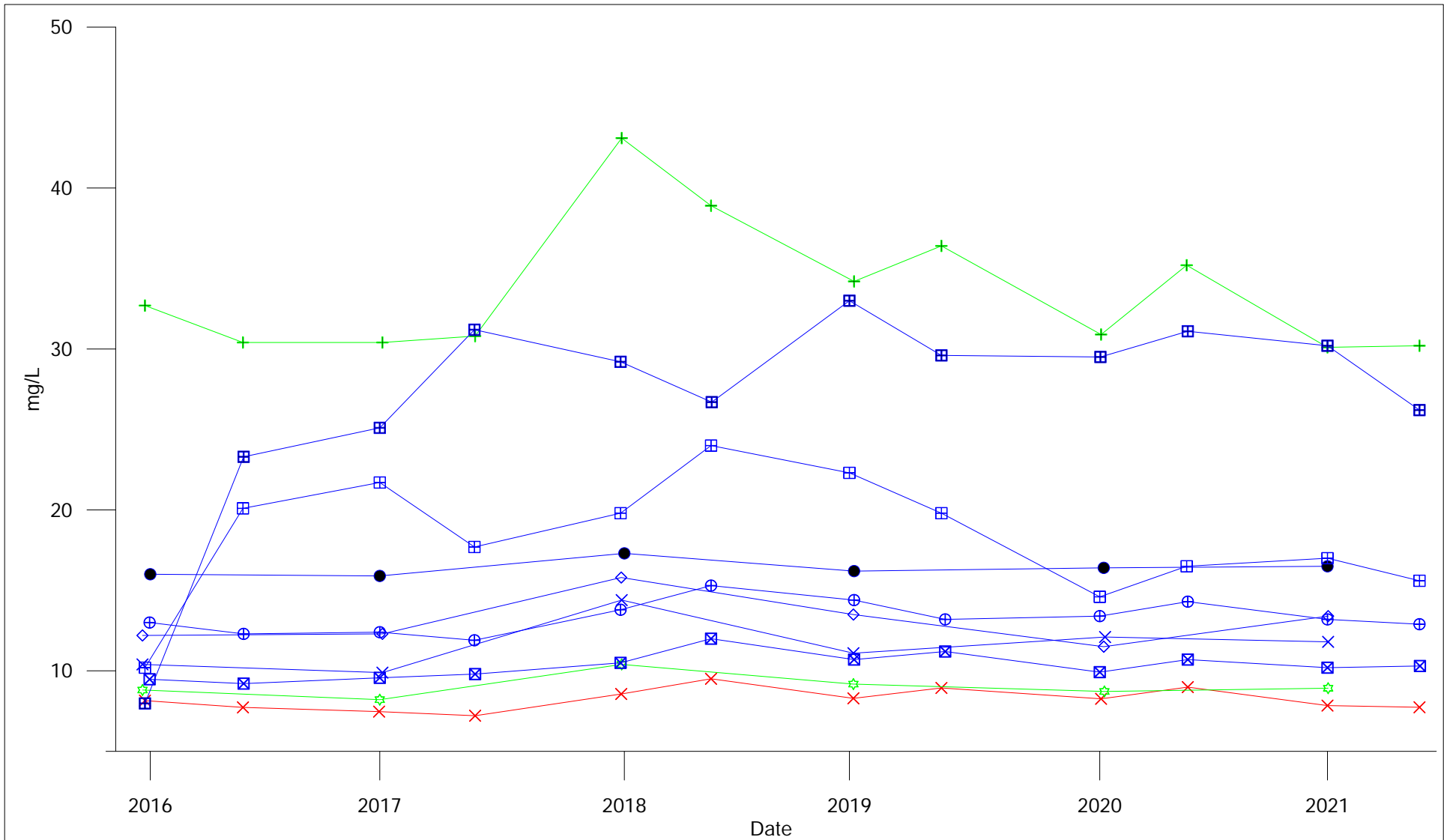
BRADY ROAD RESOURCE MANAGEMENT FACILITY

Dissolved Iron
 Till Wells

APRIL 2022

FIGURE 33

REV 0



Up gradient
 6N60EER

Down gradient
 5N62E
 6N67F

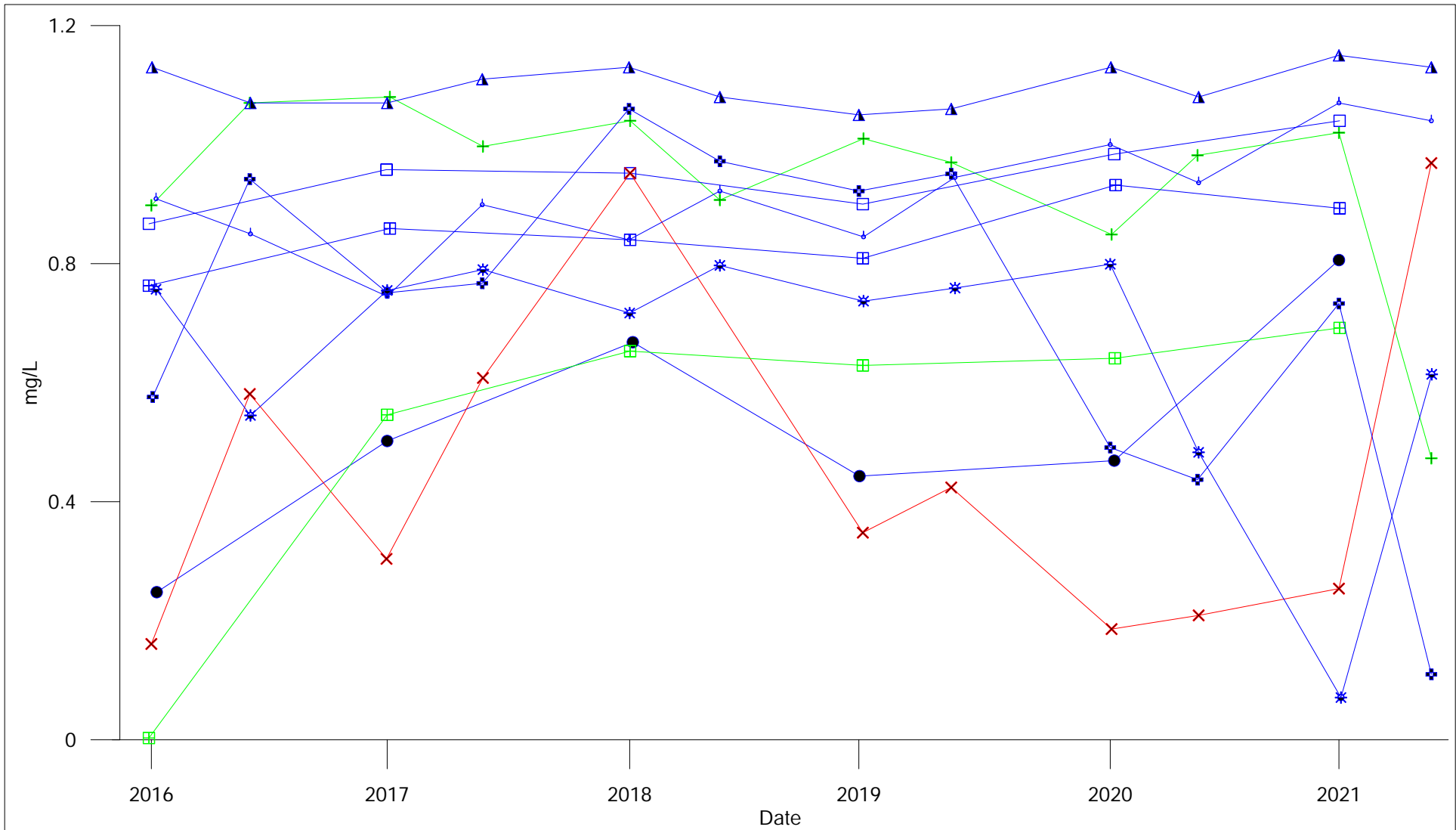
Cross gradient
 13A
 14A

Cross gradient
 15A
 16A
 4N34DDR
 6N57F
 6N63F



City Of Winnipeg
 Solid Waste Services

BRADY ROAD RESOURCE MANAGEMENT FACILITY
Dissolved Potassium
Till Wells
 APRIL 2022 | FIGURE 34 | REV 0

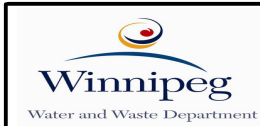


Up gradient
 X X X 6N60EER

Cross gradient
 + + + 13A
 ▲ ▲ ▲ 14A

Down gradient
 + + + 5N62E
 □ □ □ 6N67F

Cross gradient
 ○ ○ ○ 15A
 * * * 16A
 ● ● ● 4N34DDR
 □ □ □ 6N57F
 □ □ □ 6N63F



City Of Winnipeg
 Solid Waste Services

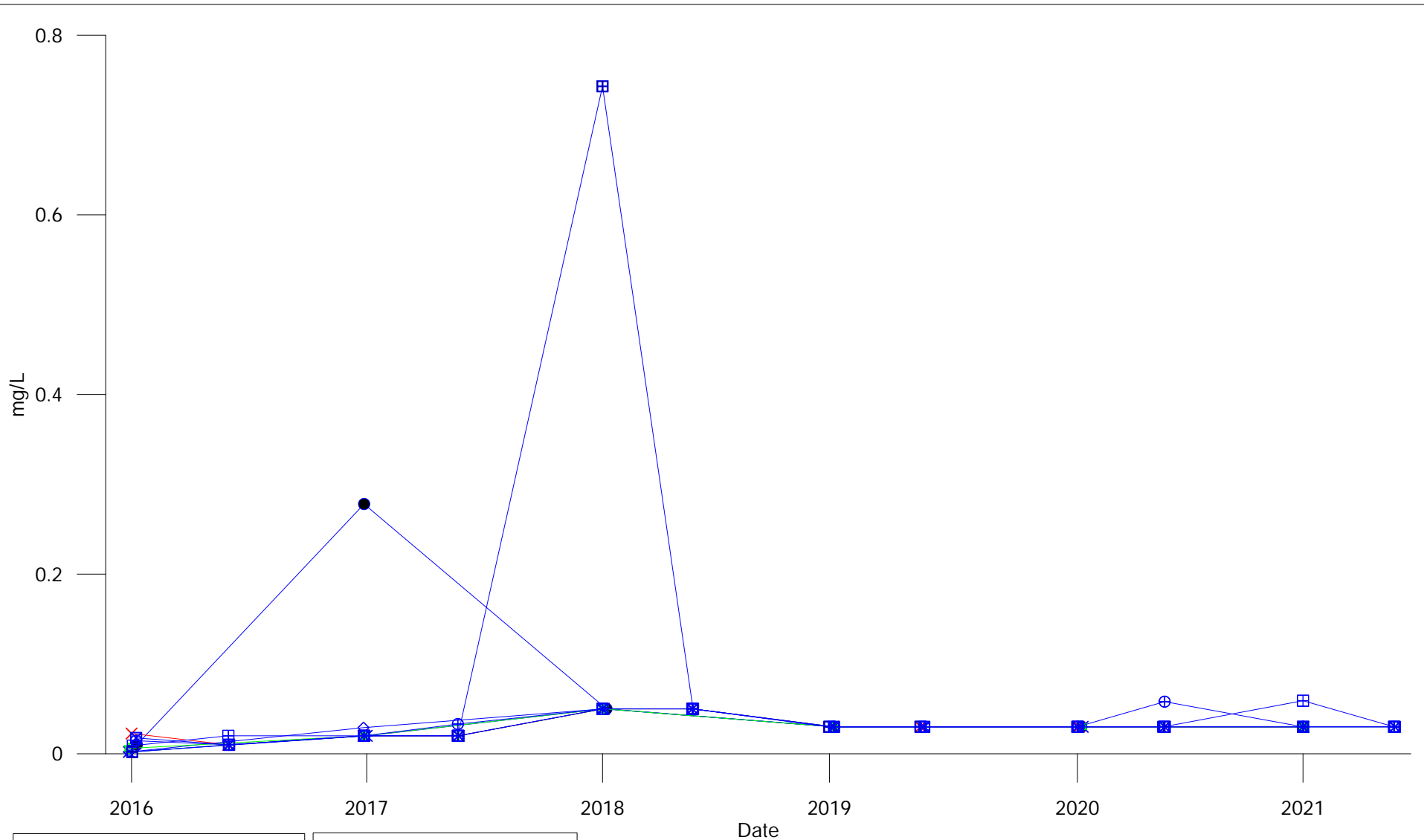
BRADY ROAD RESOURCE MANAGEMENT FACILITY

Total Ammonia
 Till Wells

APRIL 2021

FIGURE 37

REV 0



Up gradient
 X—X—X 6N60EER

Down gradient
 +—+—+ 5N62E
 ☆—☆—☆ 6N67F

Cross gradient
 □—□—□ 13A
 ⊞—⊞—⊞ 14A

Cross gradient
 ⊠—⊠—⊠ 16A
 ●—●—● 4N34DDR
 ◇—◇—◇ 6N57F
 ✱—✱—✱ 6N63F
 ⊕—⊕—⊕ 15A



City Of Winnipeg
 Solid Waste Services

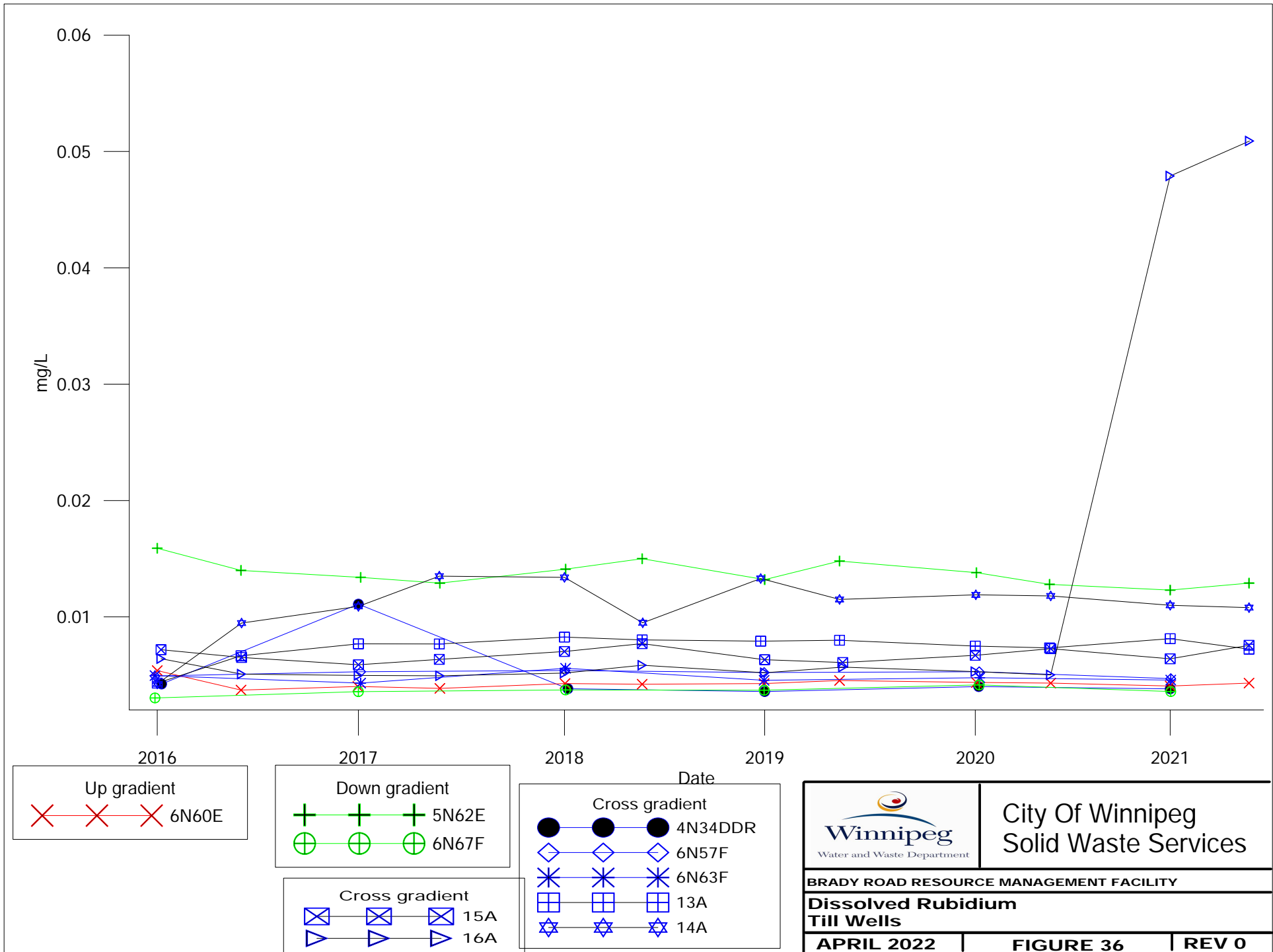
BRADY ROAD RESOURCE MANAGEMENT FACILITY

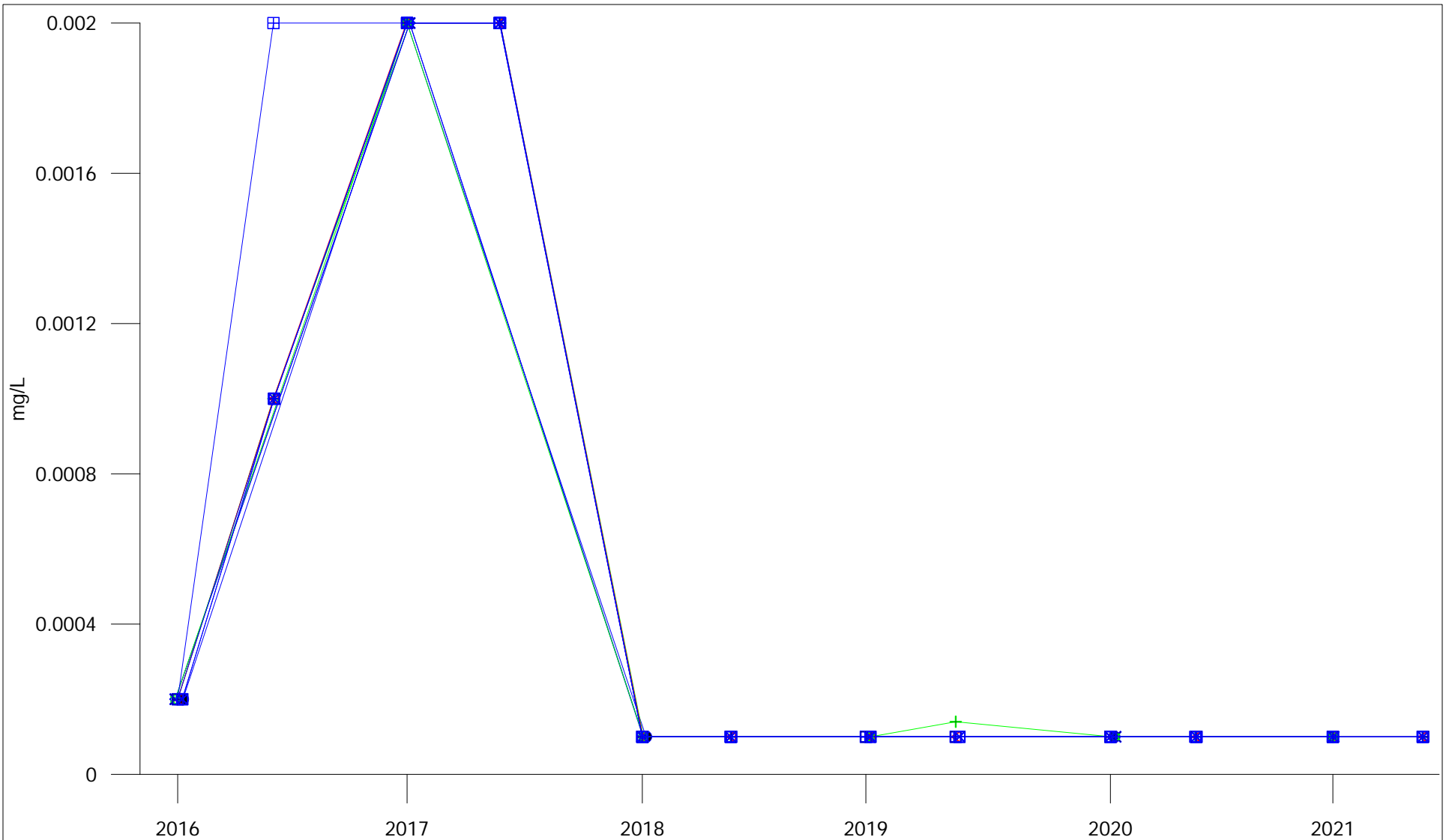
Phosphorus
 Till Wells

APRIL 2022

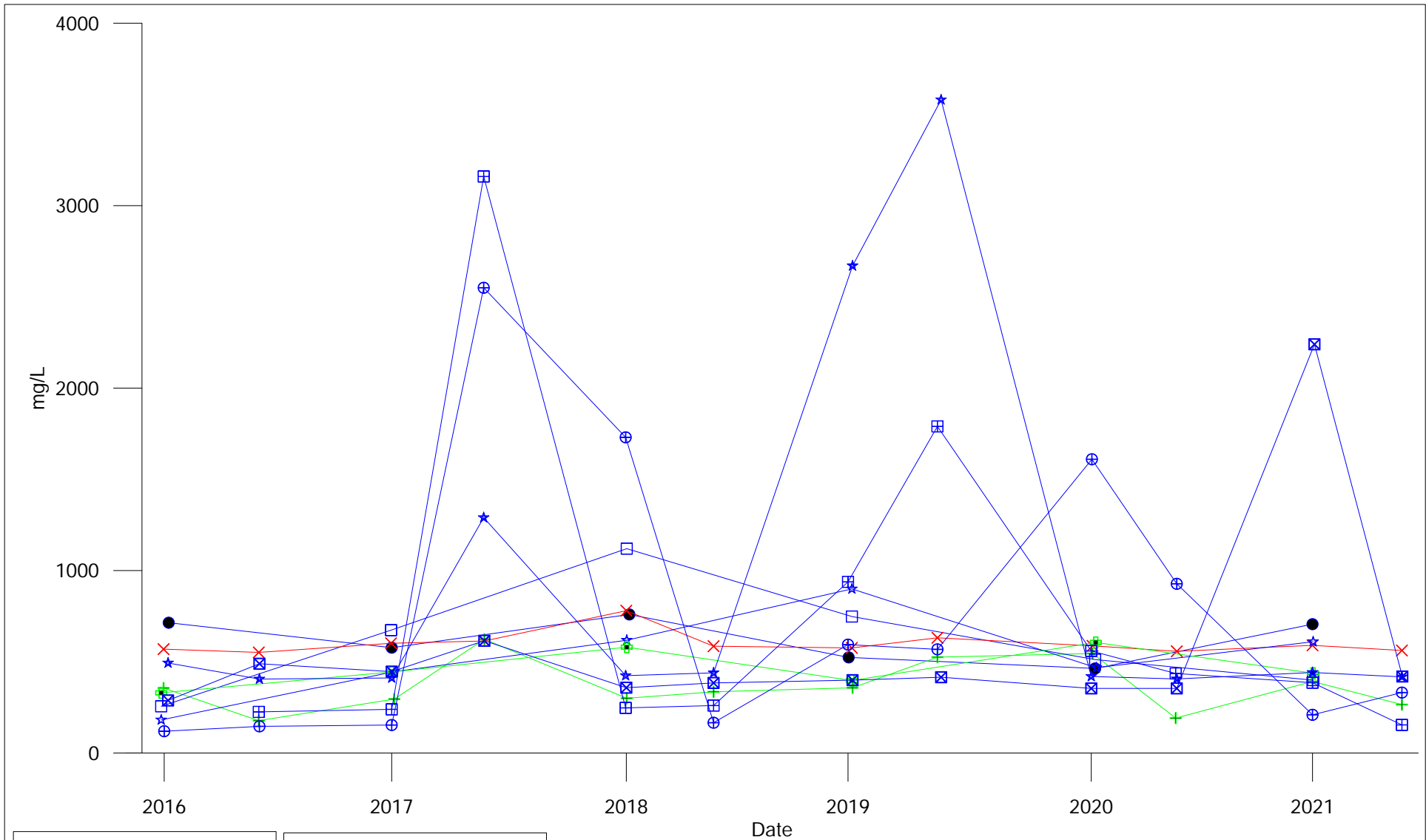
FIGURE 35

REV 0





<p>Up gradient</p> <p>6N60EER</p>	<p>Cross gradient</p> <p>4N34DDR 6N57F 6N63F 13A 14A</p>	<p>Down gradient</p> <p>5N62E 6N67F</p>	<p>Cross gradient</p> <p>15A 16A</p>
Date			
		<p>City Of Winnipeg Solid Waste Services</p>	
BRADY ROAD RESOURCE MANAGEMENT FACILITY			
Dissolved Tin Till Wells			
APRIL 2022	FIGURE 38	REV 0	



Up gradient
 × × × 6N60E

Down gradient
 + + + 5N62E
 ■ ■ ■ 6N67F

Cross gradient
 ⊞ ⊞ ⊞ 13A
 ⊕ ⊕ ⊕ 14A

Cross gradient
 ☆ ☆ ☆ 15A
 ⊠ ⊠ ⊠ 16A
 ● ● ● 4N34DDR
 □ □ □ 6N57F
 ☆ ☆ ☆ 6N63F



City Of Winnipeg
 Solid Waste Services

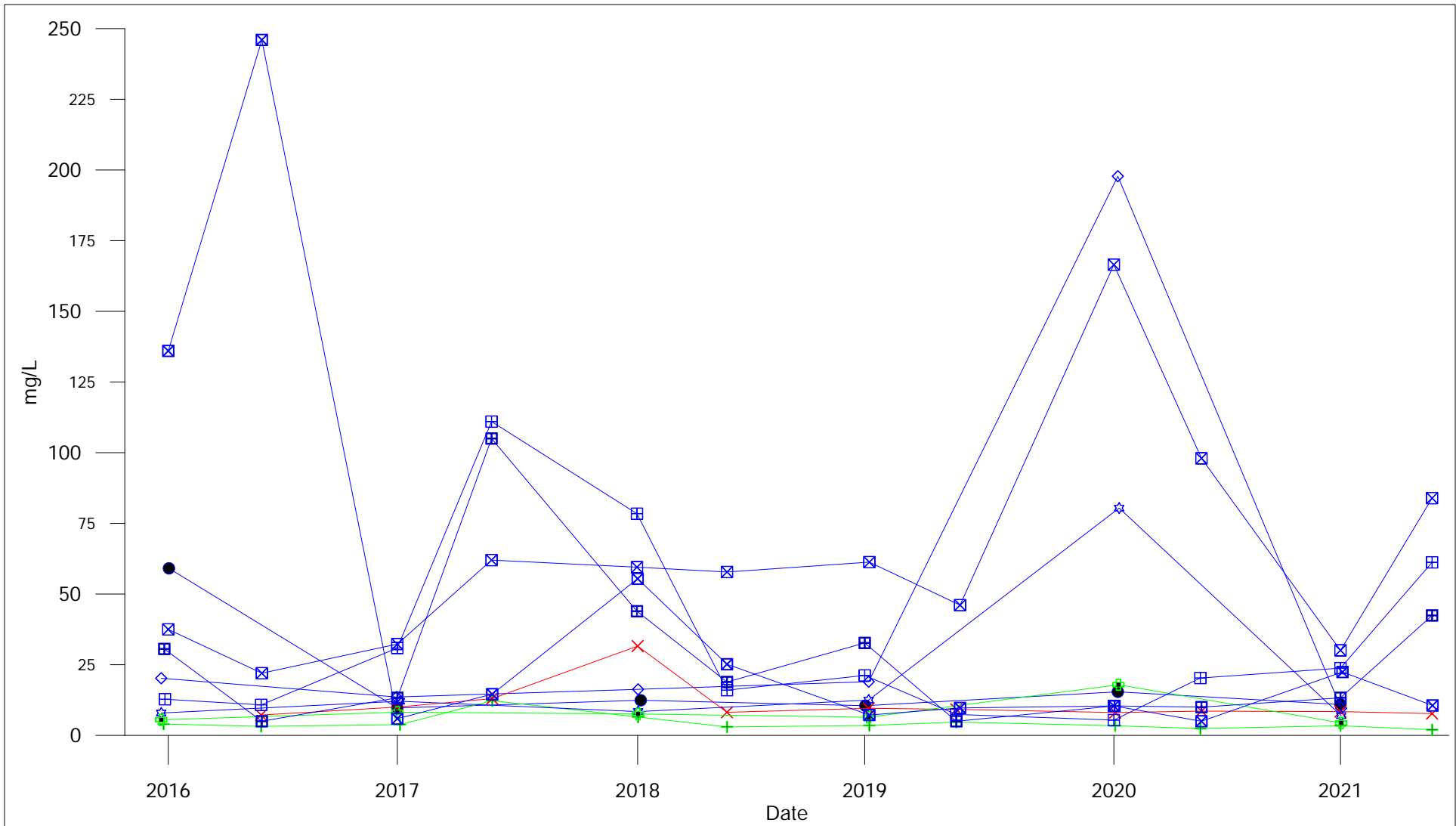
BRADY ROAD RESOURCE MANAGEMENT FACILITY

Total Alkalinity
 Till Wells

APRIL 2022

FIGURE 40

REV 0



Up gradient

× × × 6N60E

Down gradient

+ + + 5N62E
 + + + 6N67F

Cross gradient

□ □ □ 13A
 □ □ □ 14A

Cross gradient

□ □ □ 15A
 □ □ □ 16A
 ● ● ● 4N34DDR
 ◇ ◇ ◇ 6N57F
 ☆ ☆ ☆ 6N63F

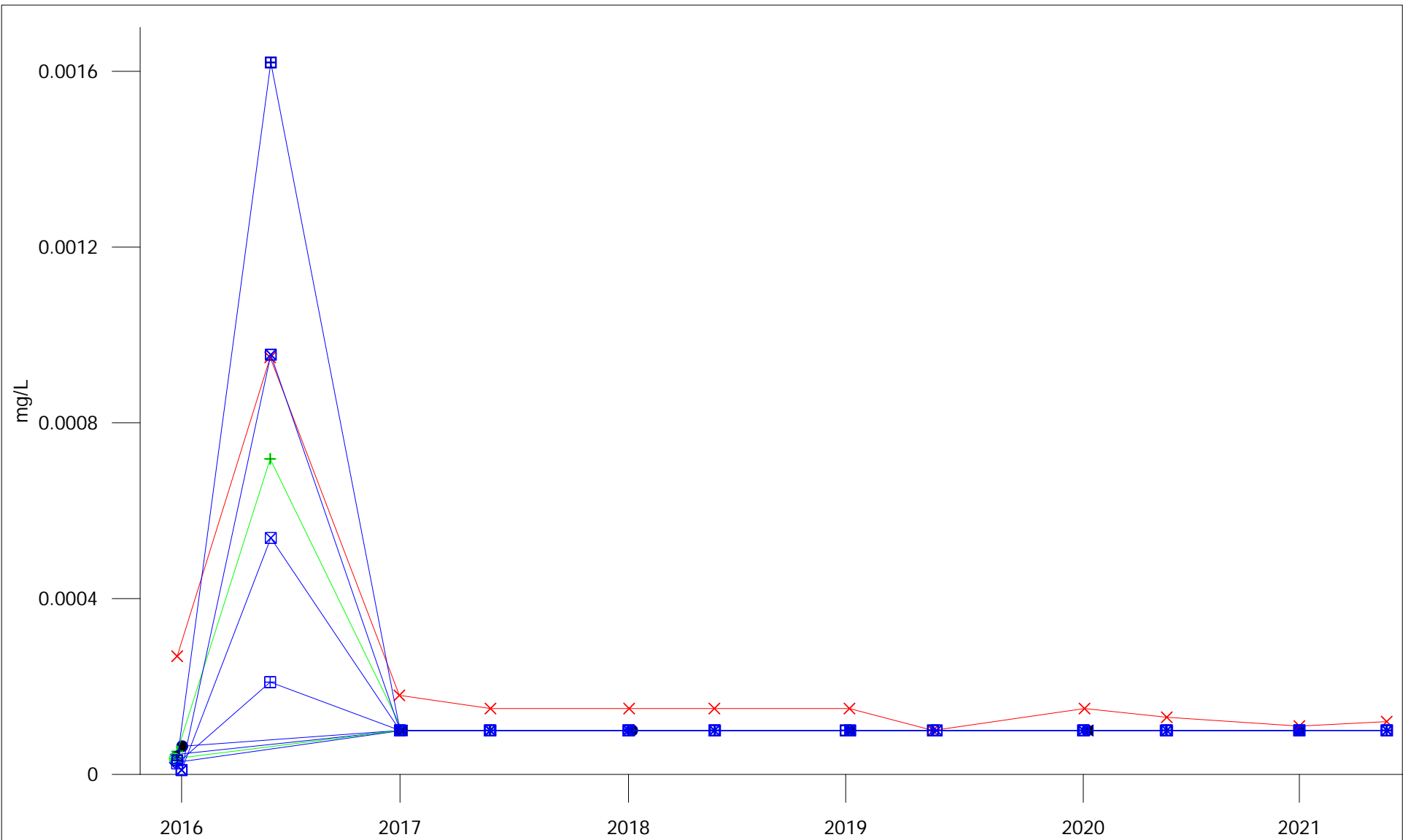


City Of Winnipeg
 Solid Waste Services

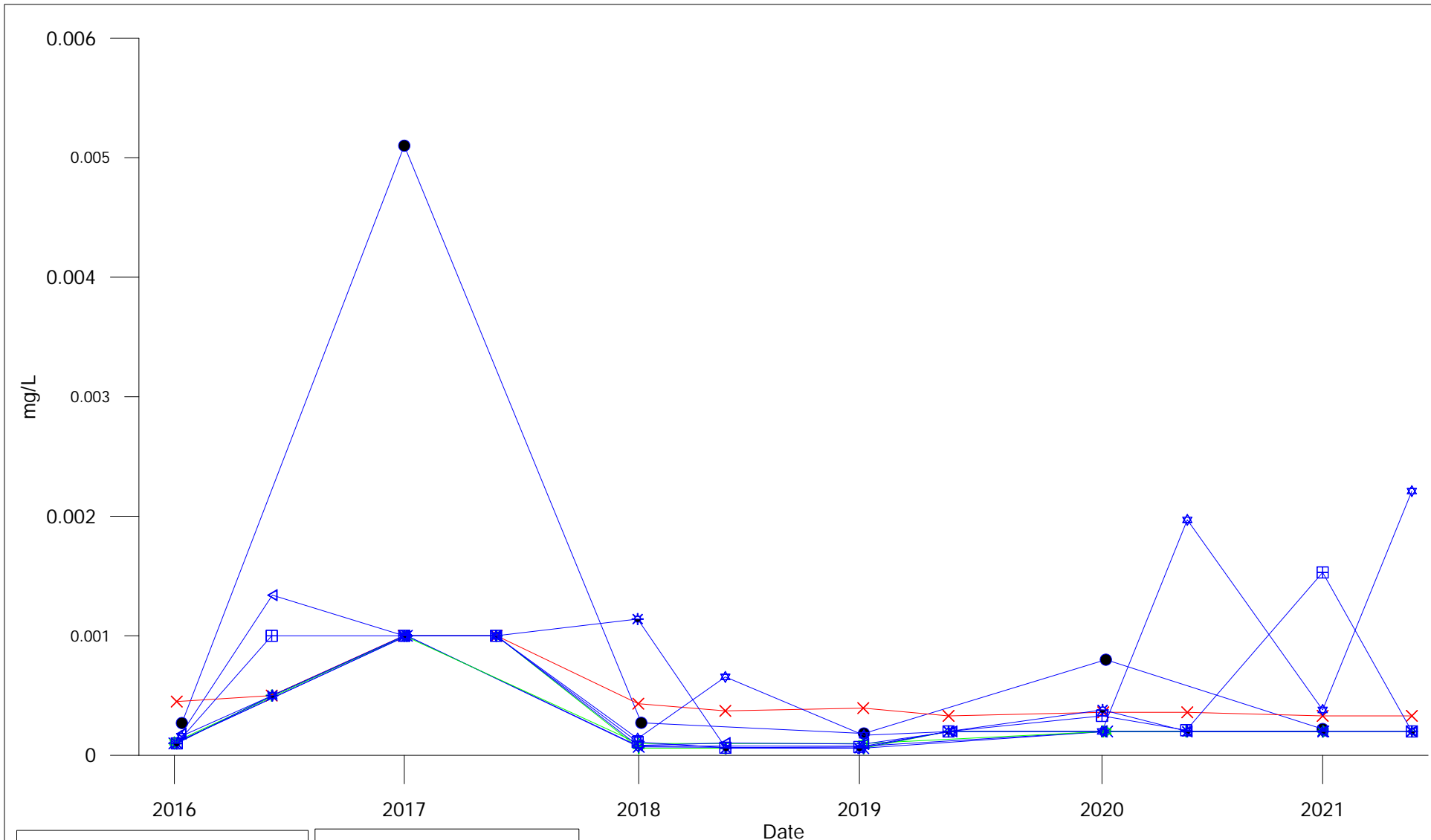
BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Total Organic Carbon
 Till Wells**

APRIL 2021 | FIGURE 39 | REV 0



<p>Up gradient</p>	<p>Down gradient</p>	<p>Cross gradient</p>		<p>City Of Winnipeg Solid Waste Services</p>
6N60E	5N62E 6N67F	4N34DDR 6N57F 6N63F 13A 14A	<p>BRADY ROAD RESOURCE MANAGEMENT FACILITY</p>	
<p>Dissolved Tungsten Till Wells</p>				
15A 16A	<p>APRIL 2021 FIGURE 41 REV 0</p>			



Up gradient
 X X X 6N60EER

Down gradient
 + + + 5N62E
 ☆ ☆ ☆ 6N67F

Cross gradient
 □ □ □ 13A
 ☆ ☆ ☆ 14A

Cross gradient
 ☆ ☆ ☆ 15A
 △ △ △ 16A
 ● ● ● 4N34DDR
 ◇ ◇ ◇ 6N57F
 * * * 6N63F

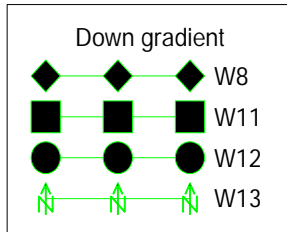
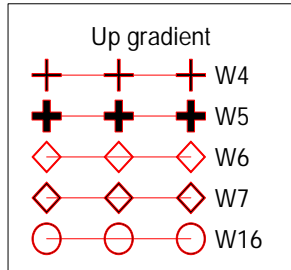
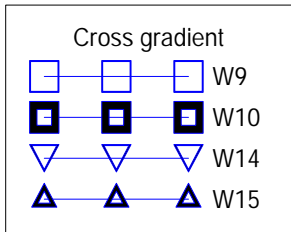
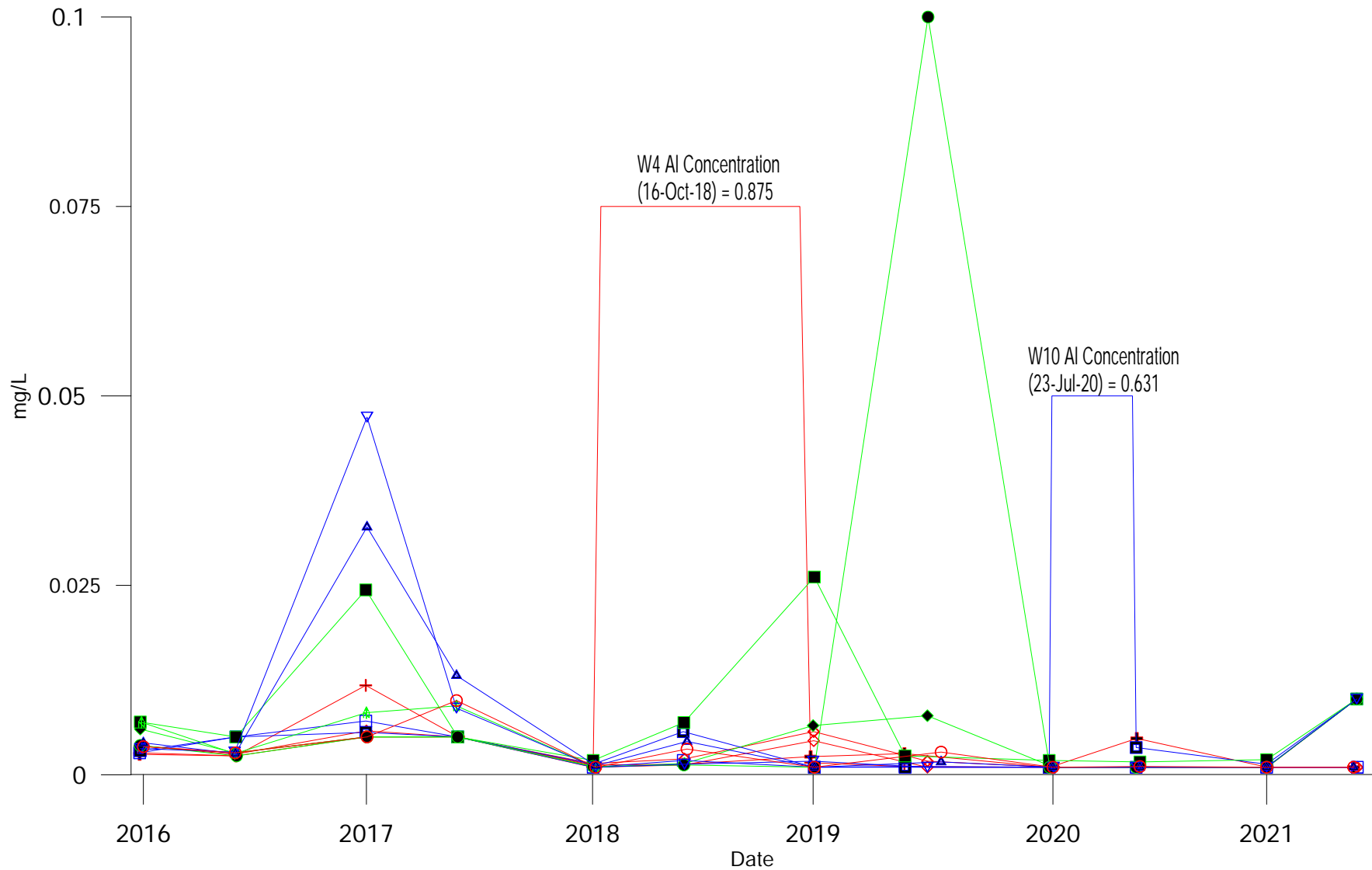


City Of Winnipeg
 Solid Waste Services

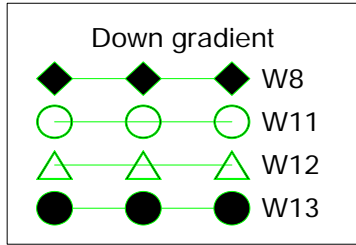
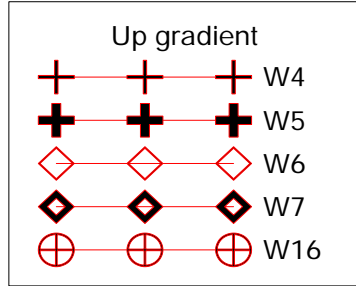
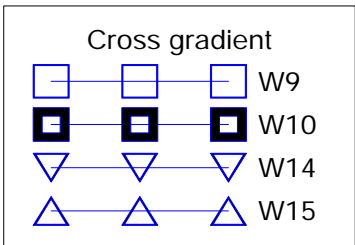
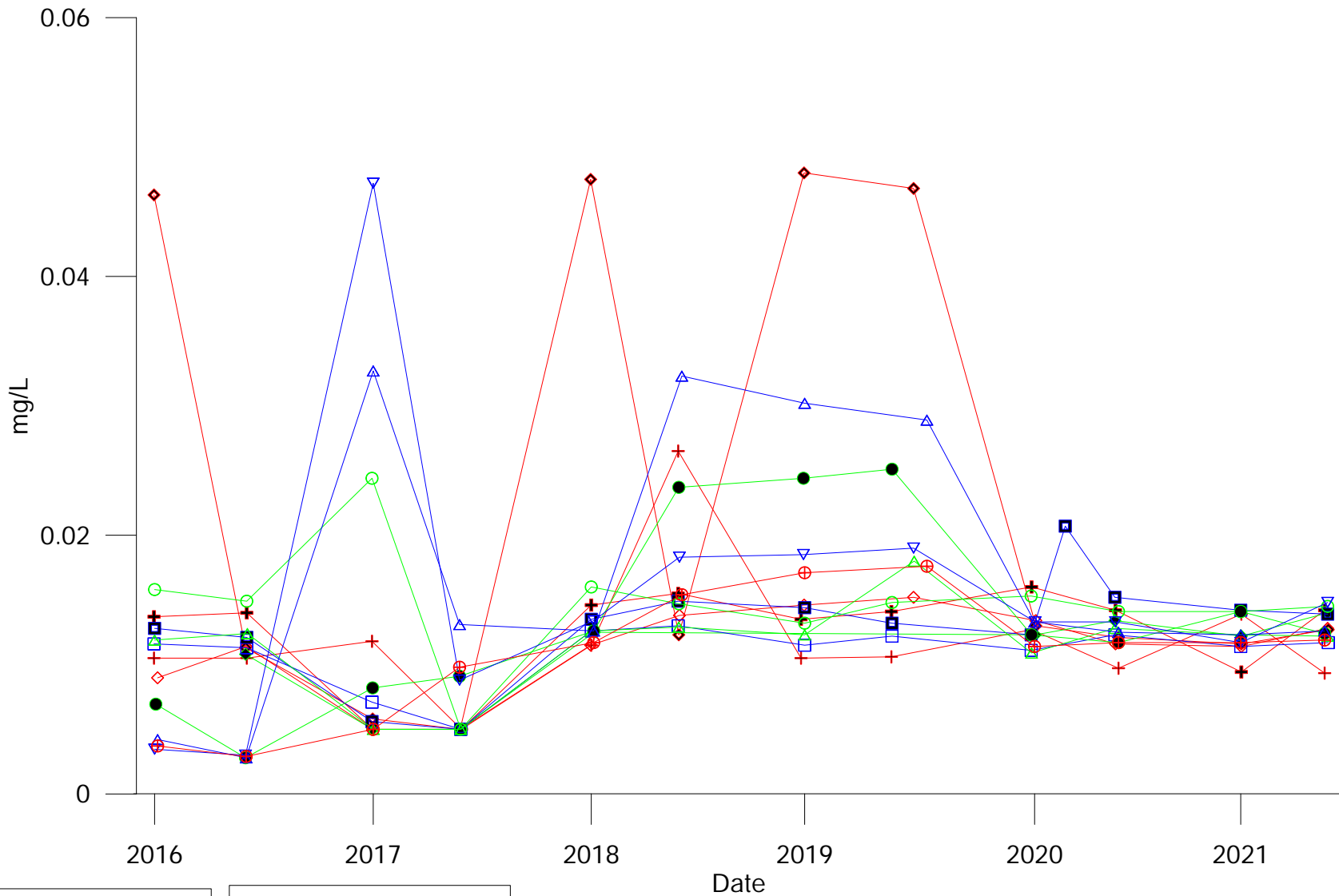
BRADY ROAD RESOURCE MANAGEMENT FACILITY

Dissolved Zirconium
 Till Wells

APRIL 2021 | FIGURE 42 | REV 0

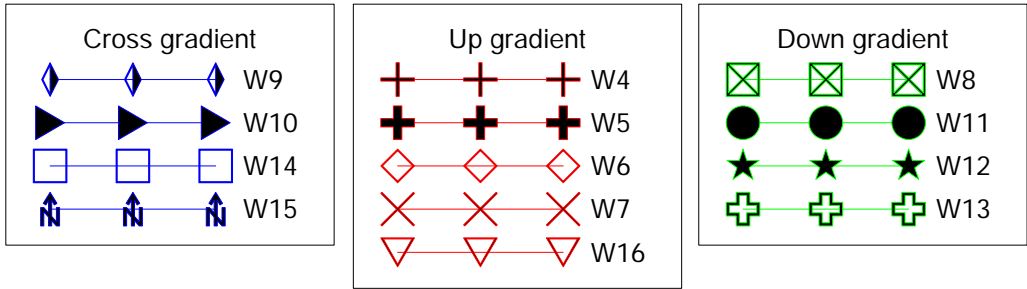
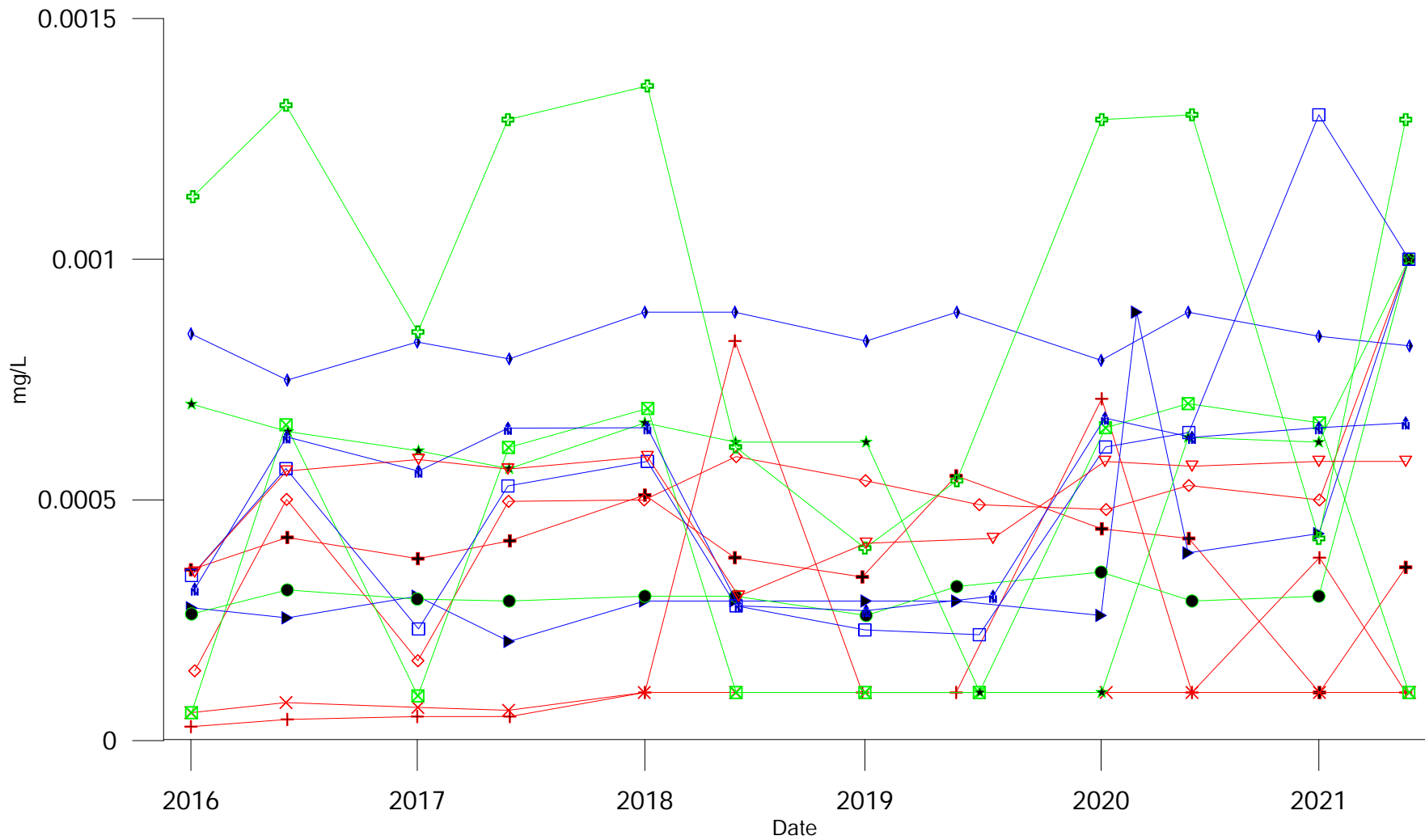


	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Aluminium Concentration Bedrock Wells		
APRIL 2022	FIGURE 1	REV 0



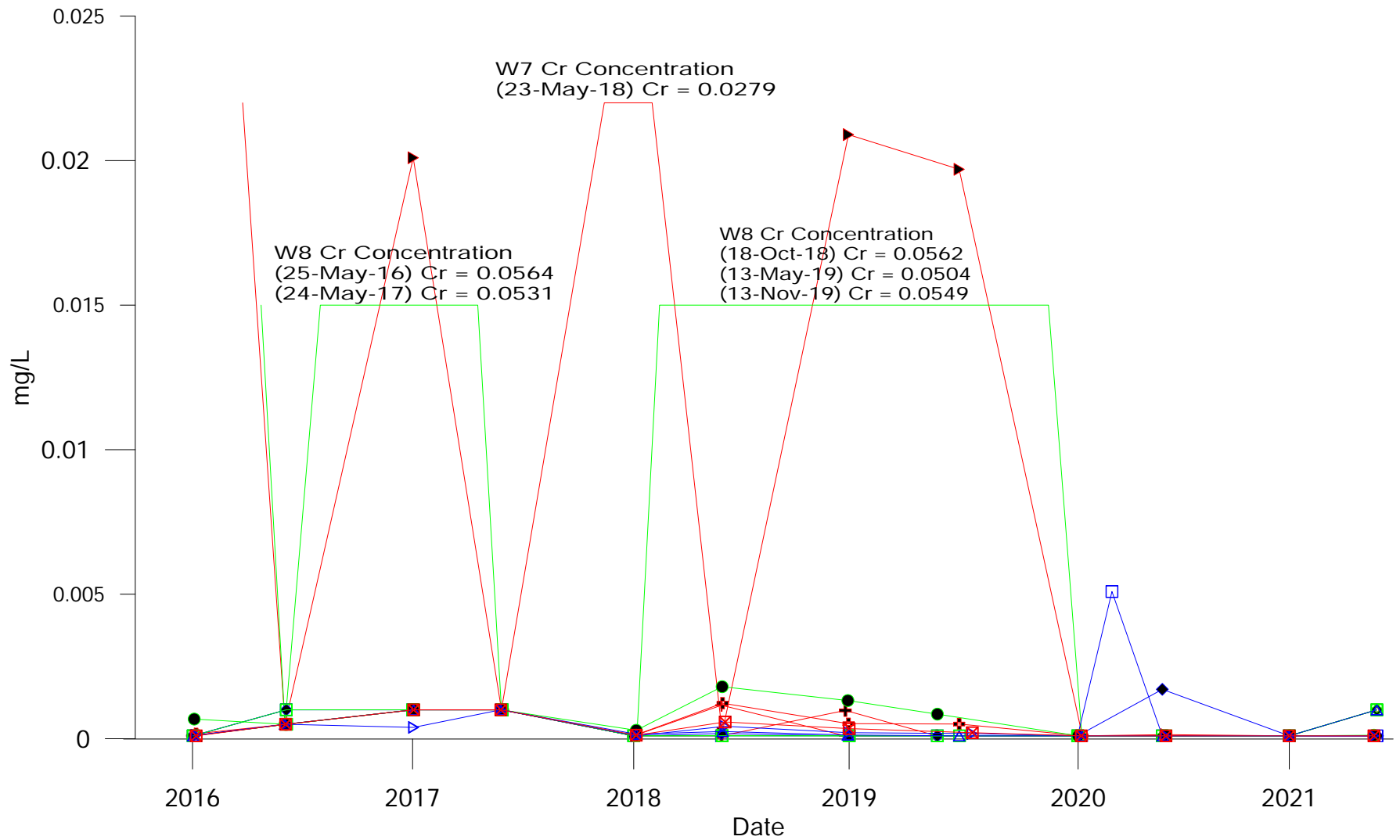
Barium MOE Criteria = 29 mg/L

	City of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Barium Concentration Bedrock Wells		
APRIL 2022	FIGURE 2	REV 0

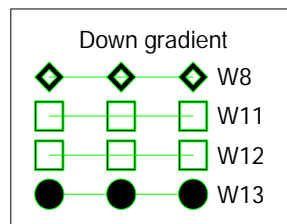
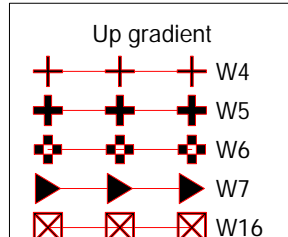
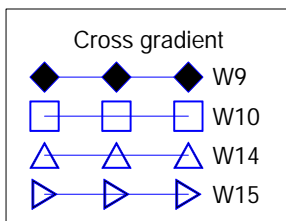


MOE Cobalt Criteria = 0.066 mg/L

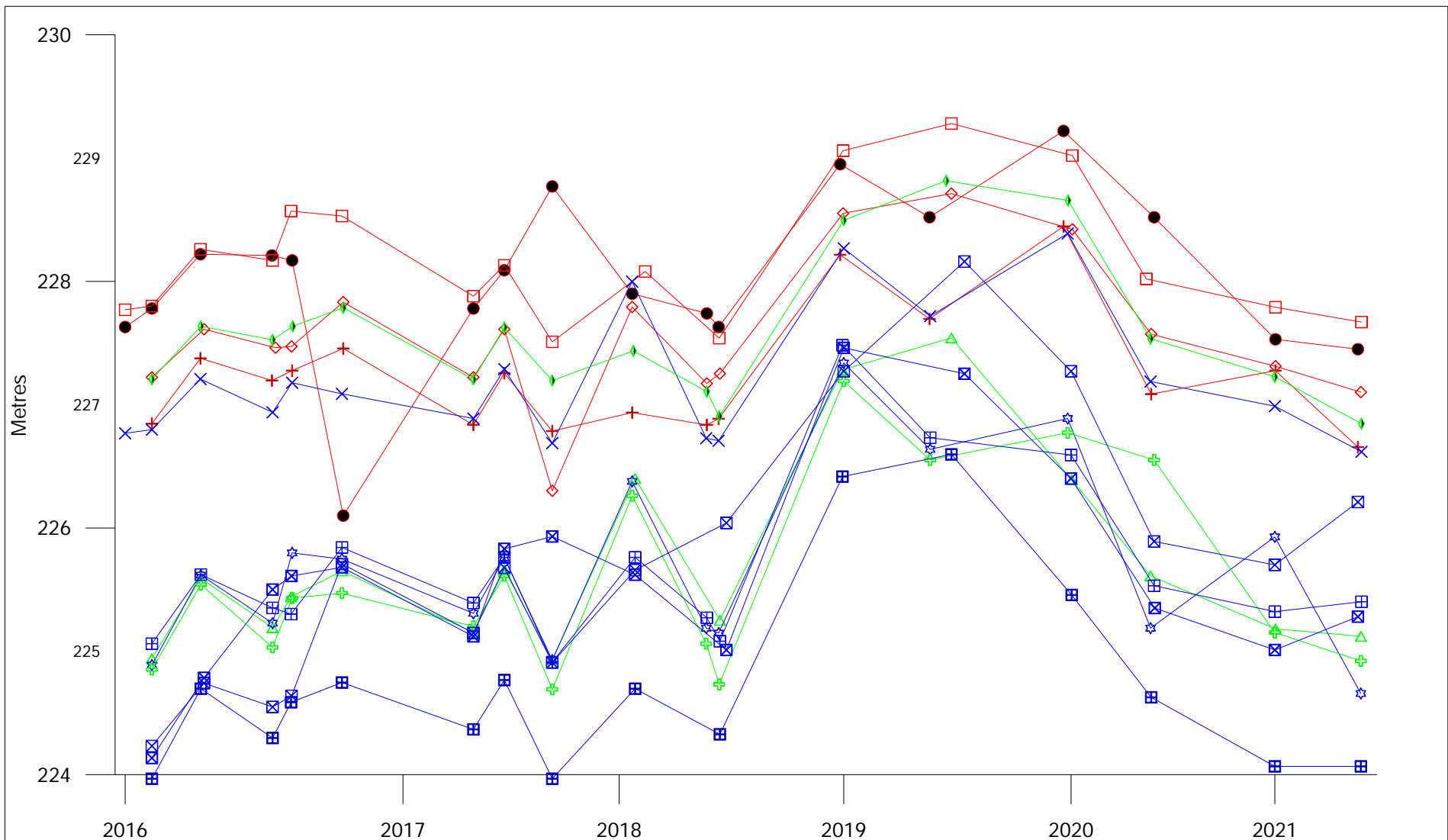
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Cobalt Concentration Bedrock Wells		
APRIL 2022	FIGURE 3	REV 0



Chromium MOE Criteria = 0.81 mg/L



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Chromium Concentration Bedrock Wells		
APRIL 2022	FIGURE 4	REV 0



Cross gradient

- W13
- W14
- W15
- W16

Cross gradient

- W10
- W9

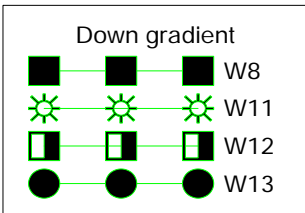
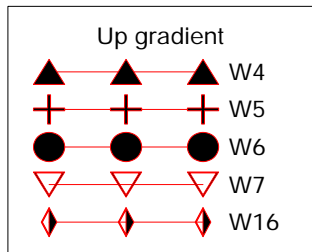
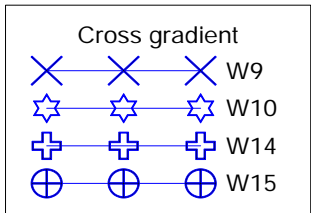
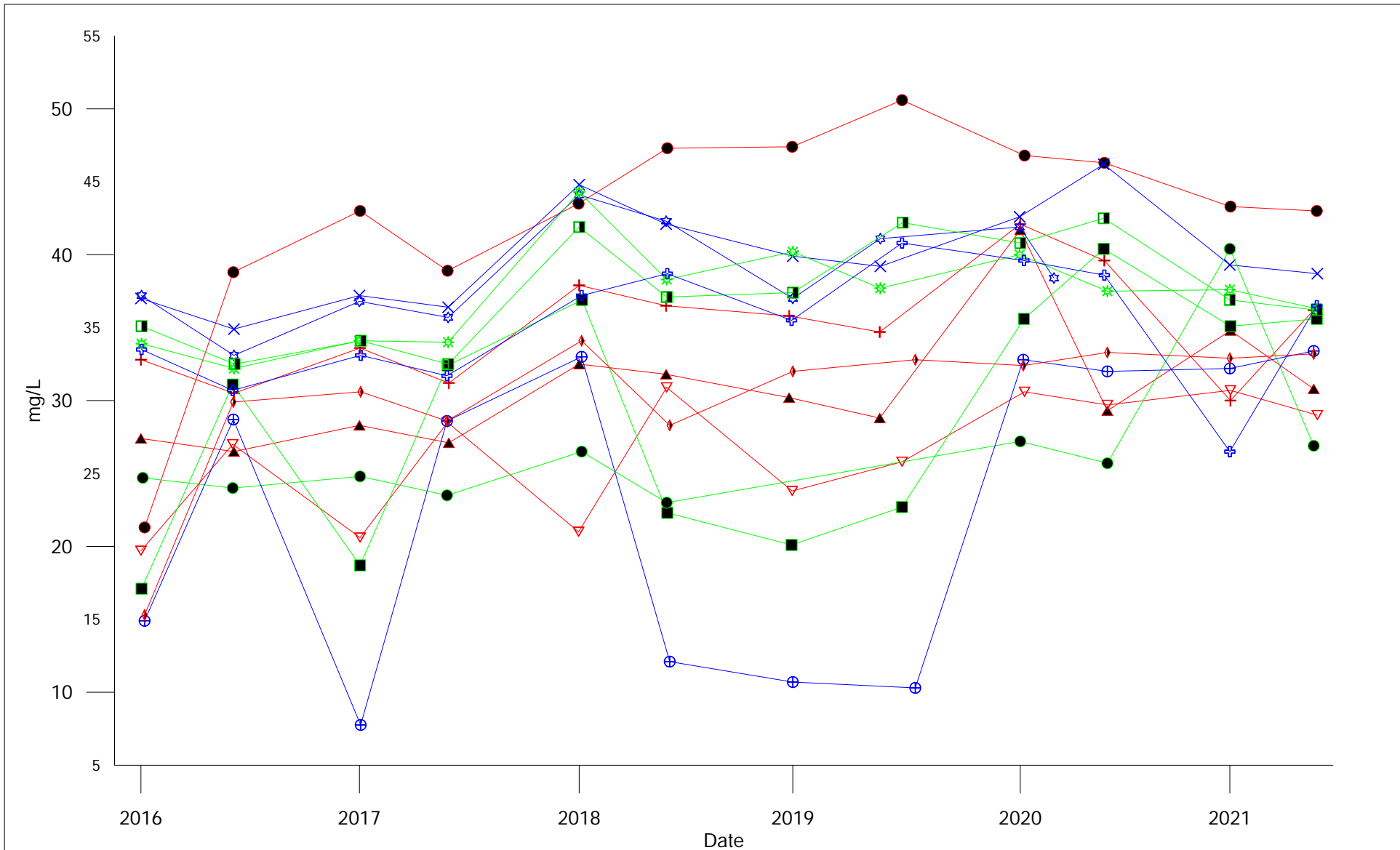
Up gradient

- W11
- W12
- W8

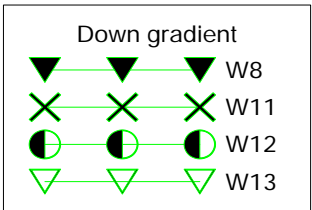
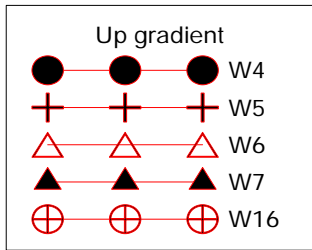
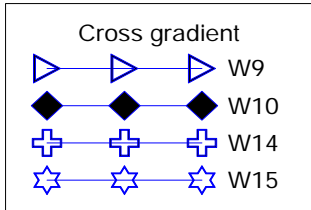
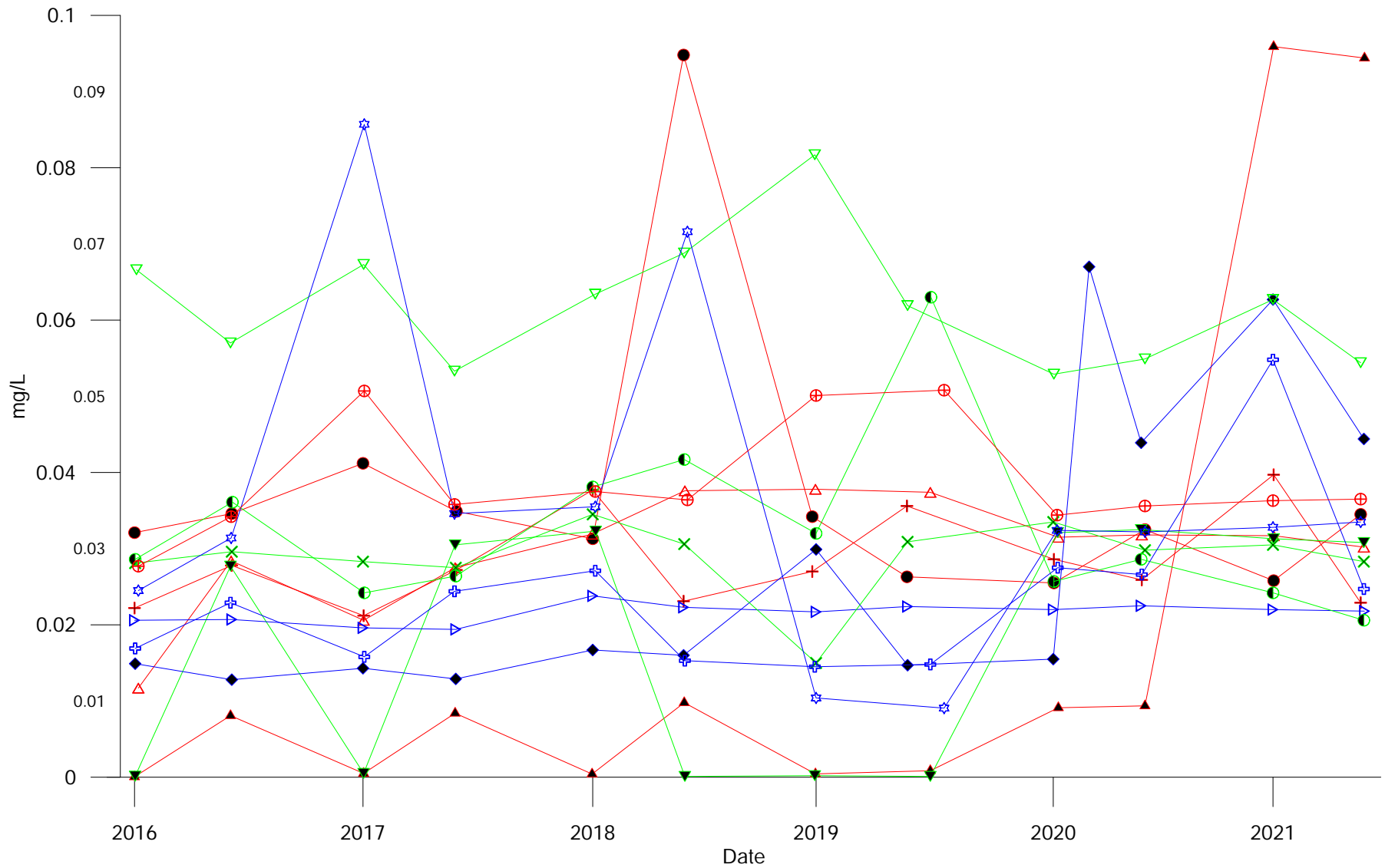
Down gradient

- W4
- W5
- W6
- W7

	<p>City Of Winnipeg Solid Waste Services</p>
	<p>BRADY ROAD RESOURCE MANAGEMENT FACILITY</p>
<p>GROUNDWATER ELEVATION Bedrock Wells</p>	
<p>APRIL 2022</p>	<p>FIGURE GW-2 REV 0</p>



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Potassium Concentration Bedrock Wells		
APRIL 2022	FIGURE 5	REV 0



City Of Winnipeg
Solid Waste Services

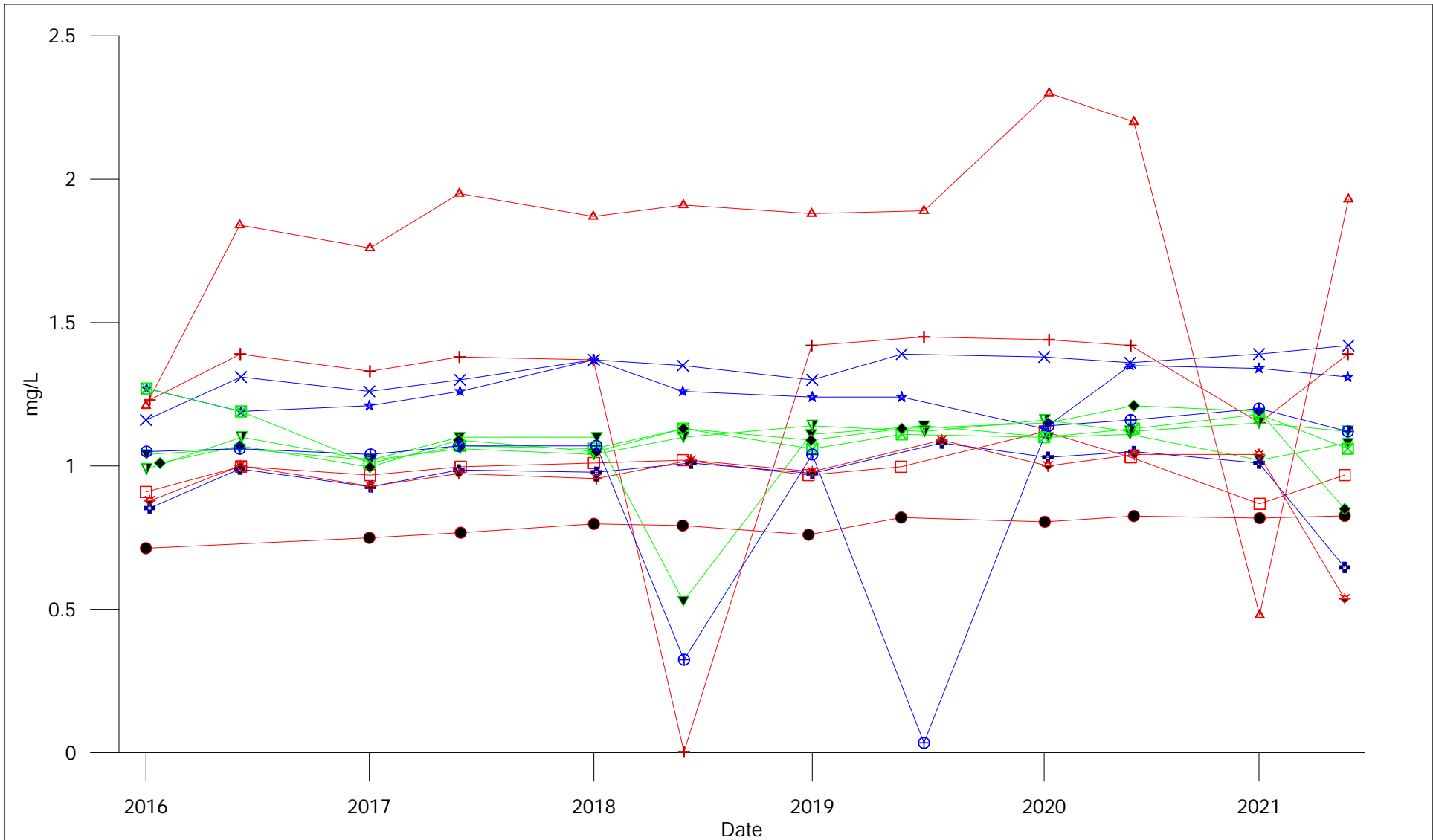
BRADY ROAD RESOURCE MANAGEMENT FACILITY

Dissolved Manganese Concentration
Bedrock Wells

APRIL 2022

FIGURE 7

REV 0



Cross gradient

- W9
- W10
- W14
- W15

Up gradient

- W4
- W5
- W6
- W7
- W16

Down gradient

- W8
- W11
- W12
- W13



City Of Winnipeg
Solid Waste Services

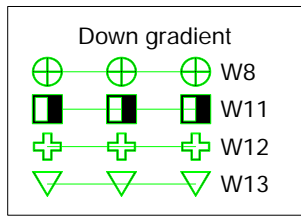
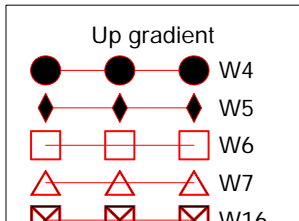
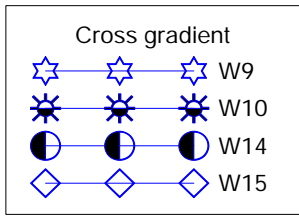
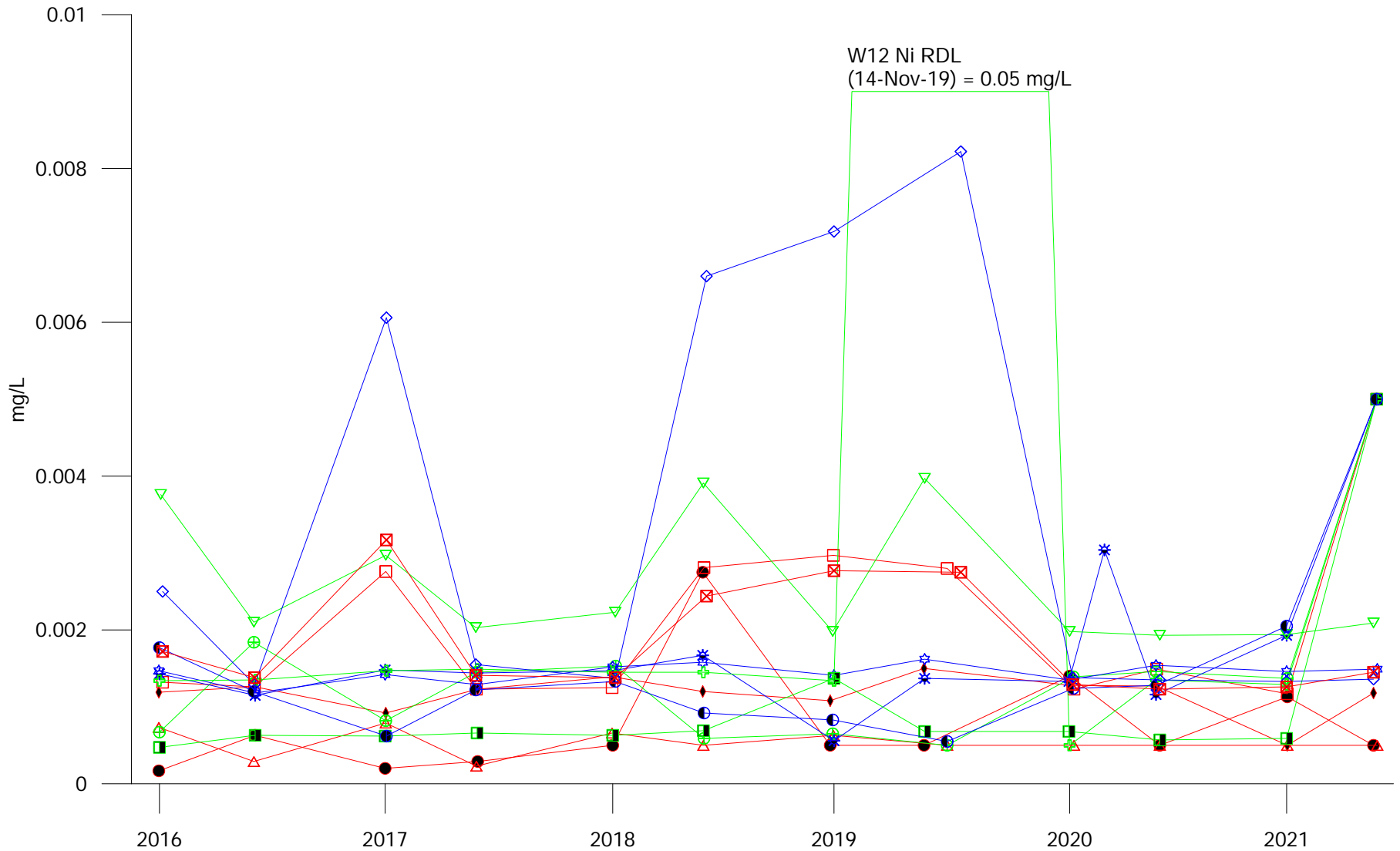
BRADY ROAD RESOURCE MANAGEMENT FACILITY

Ammonia Concentration
Bedrock Wells

APRIL 2022

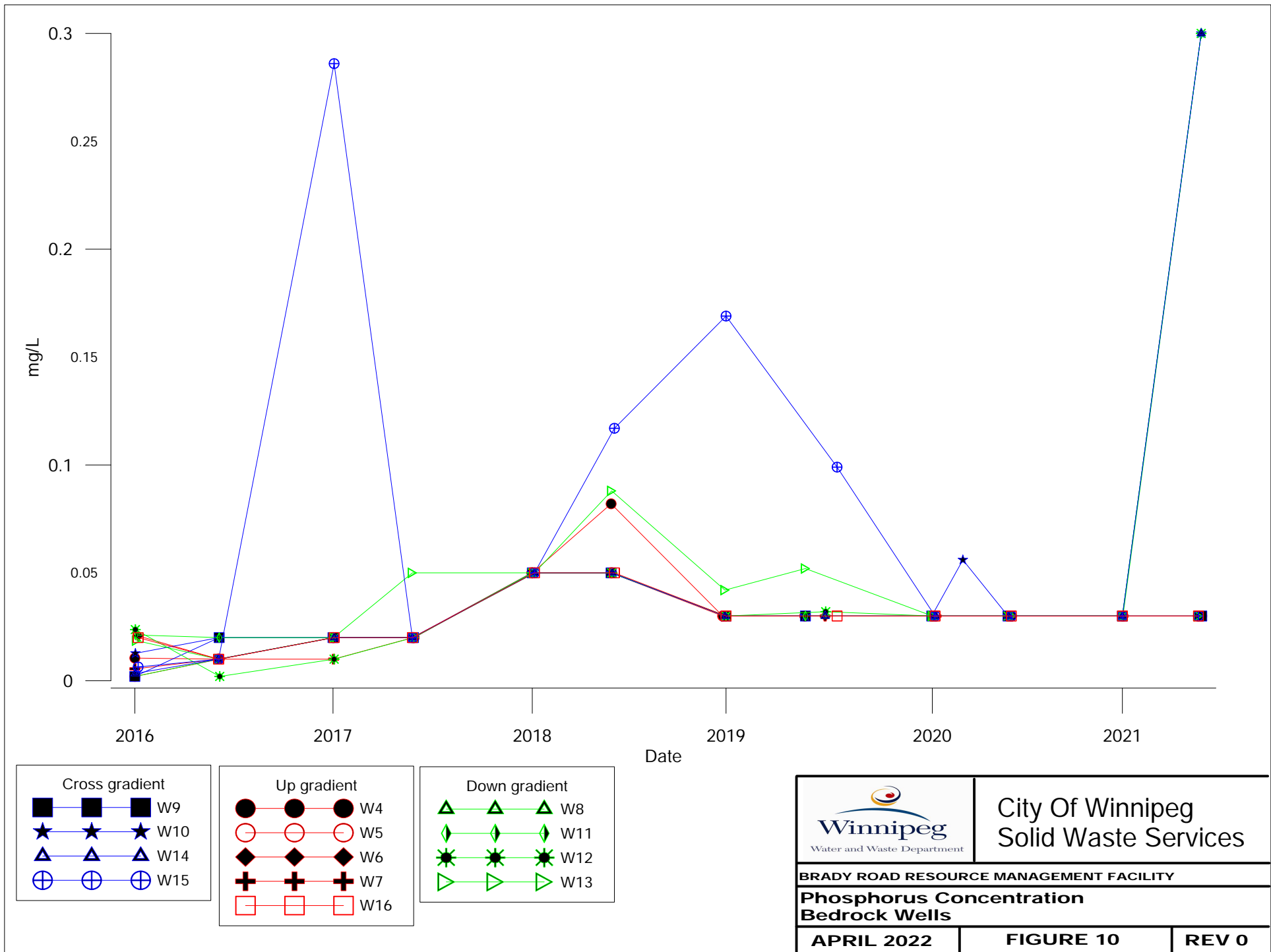
FIGURE 8

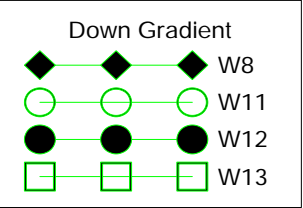
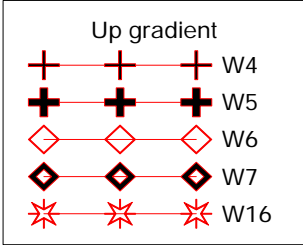
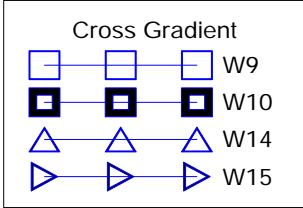
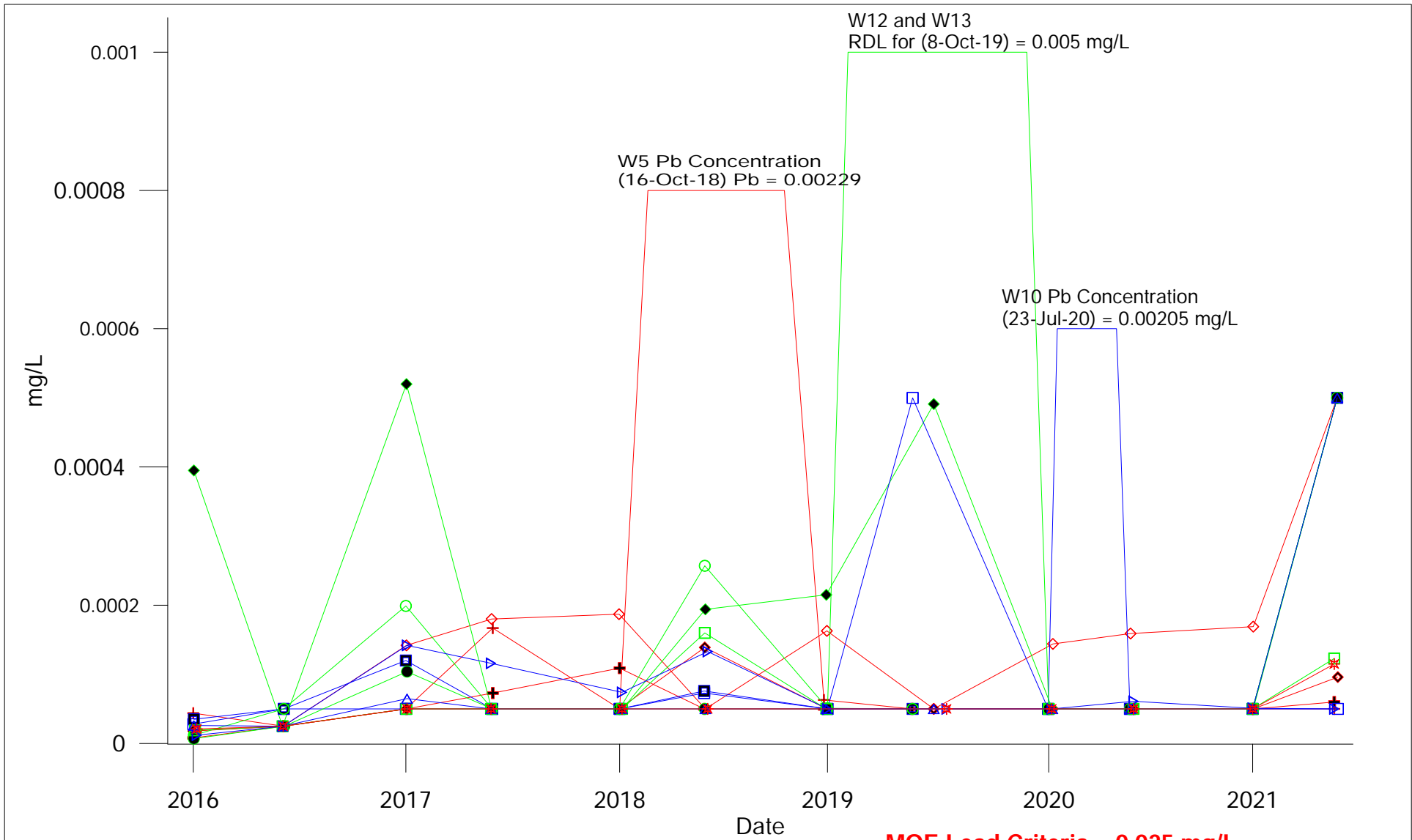
REV 0




MOE Nickel Criteria = 0.49 mg/L

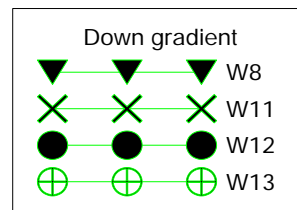
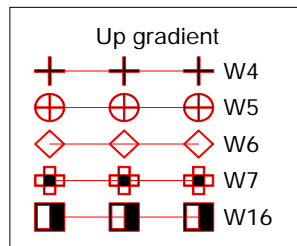
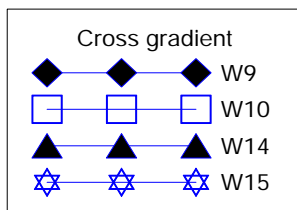
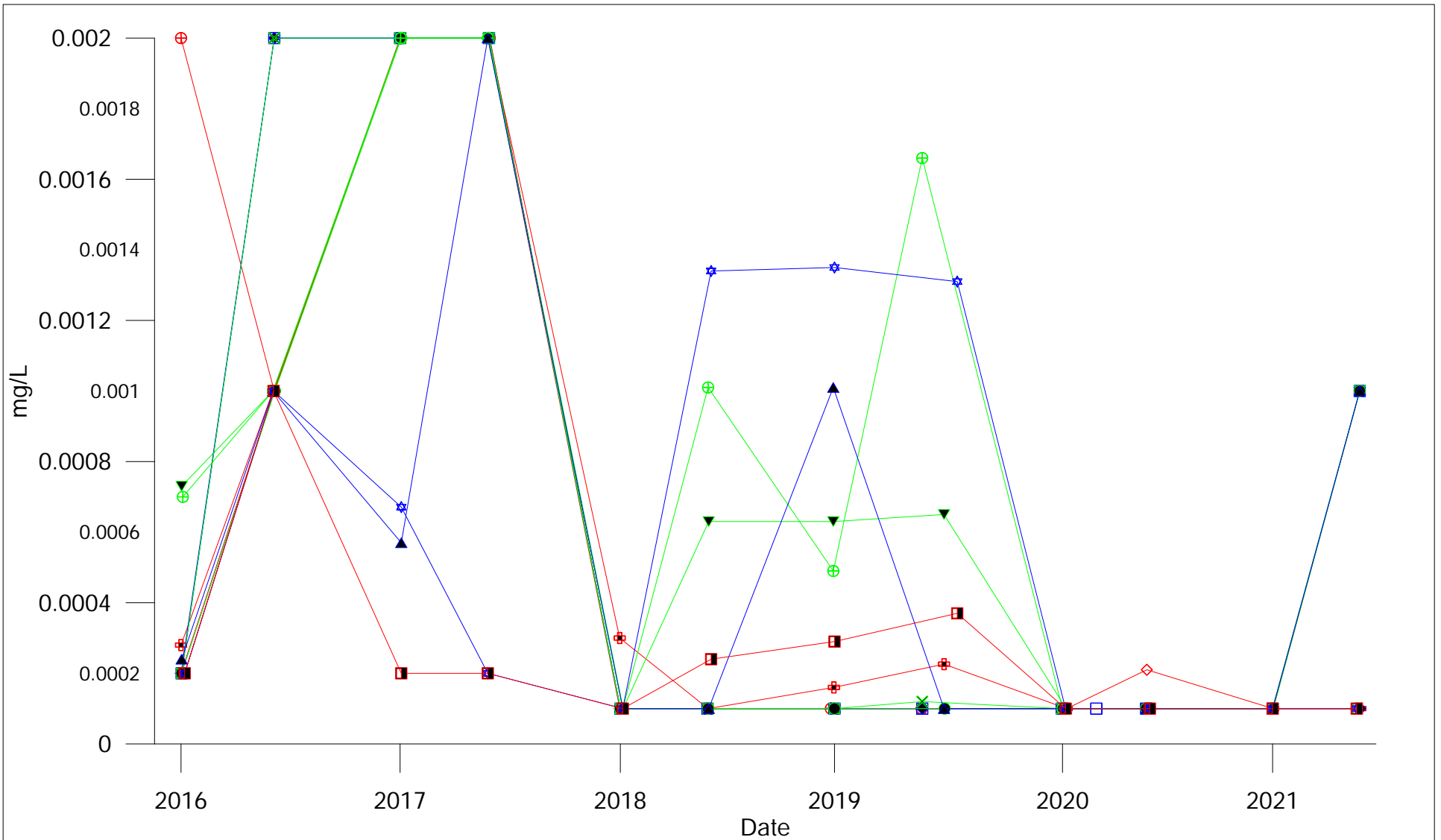
		City Of Winnipeg Solid Waste Services	
BRADY ROAD RESOURCE MANAGEMENT FACILITY			
Dissolved Nickel Concentration Bedrock Wells			
APRIL 2022	FIGURE 9	REV 0	



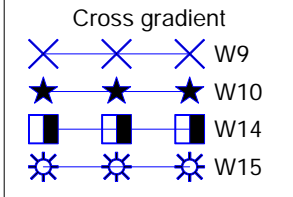
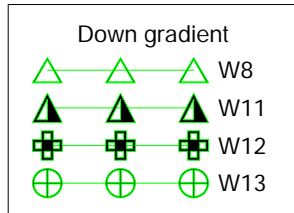
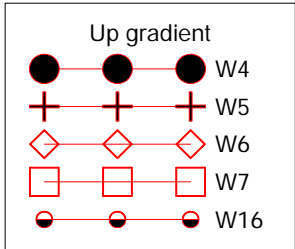
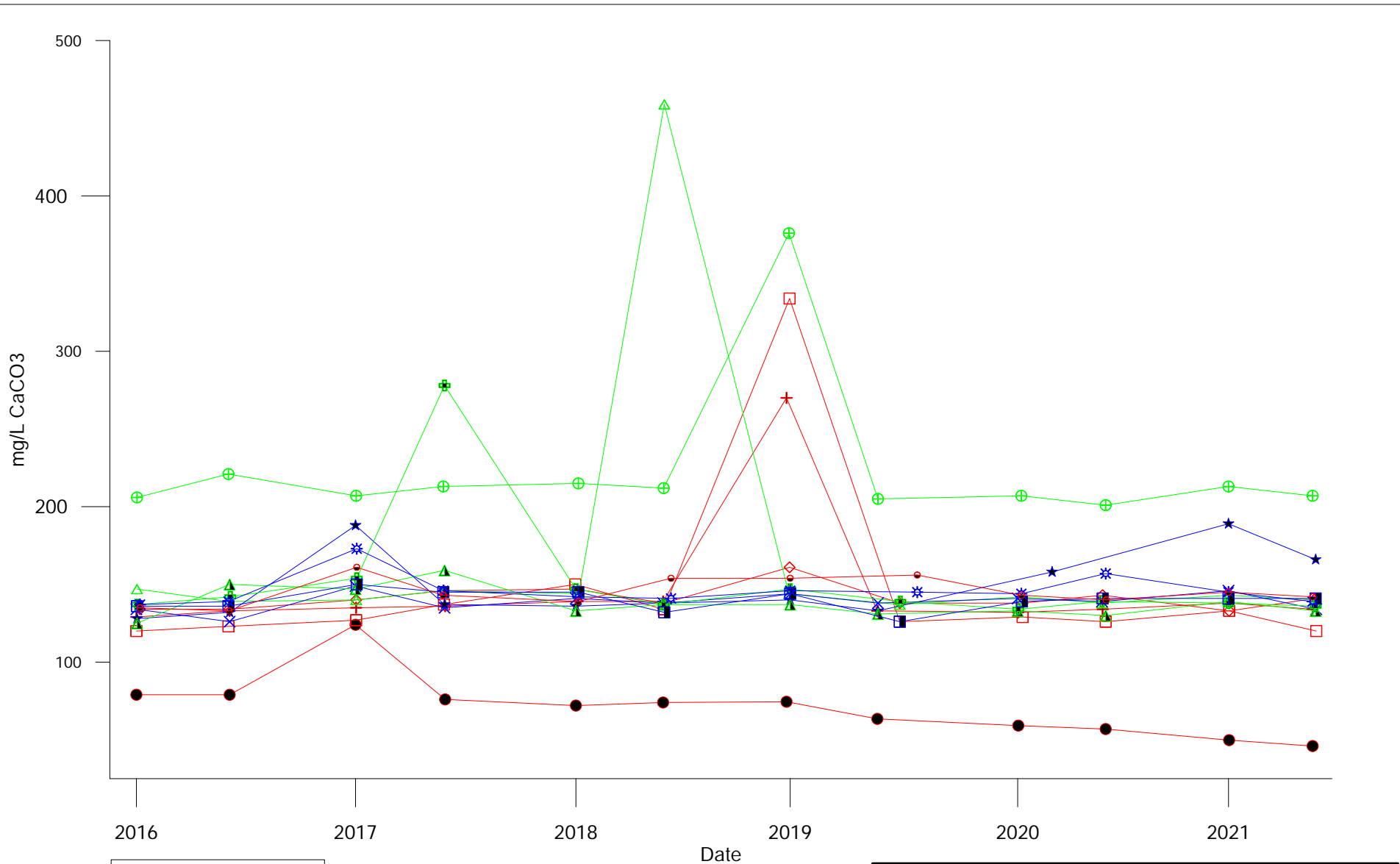


MOE Lead Criteria = 0.025 mg/L

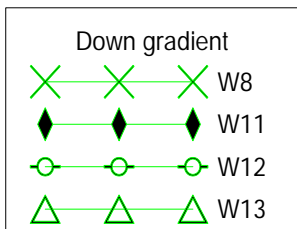
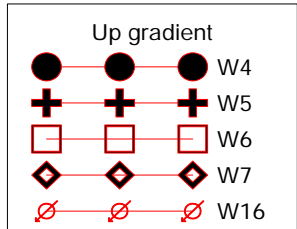
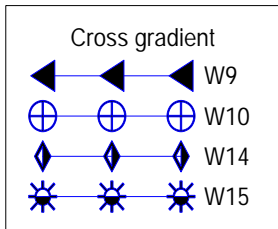
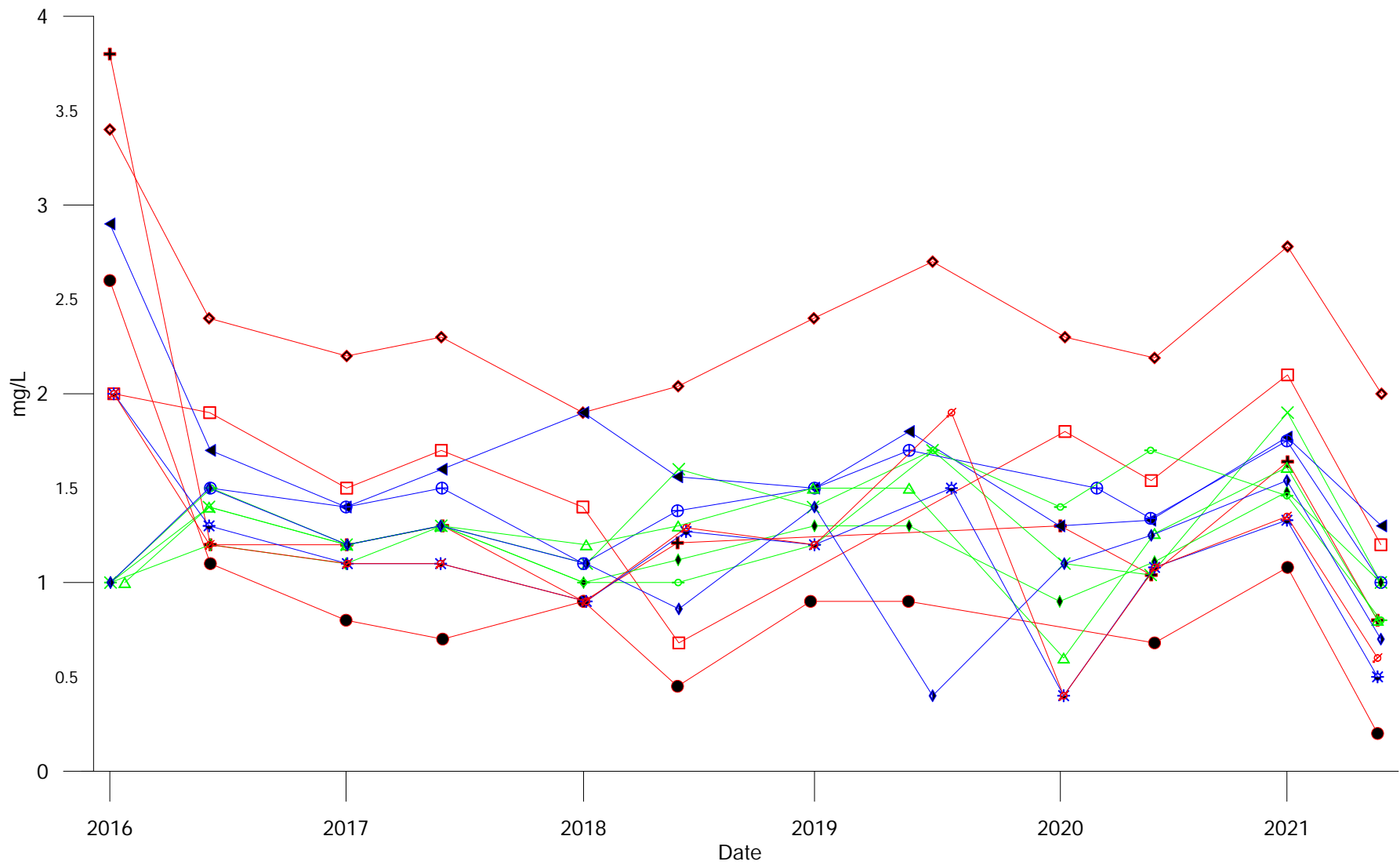
		City Of Winnipeg Solid Waste Services	
BRADY ROAD RESOURCE MANAGEMENT FACILITY			
Dissolved Lead Concentration Bedrock Wells			
APRIL 2022	FIGURE 6	REV 0	



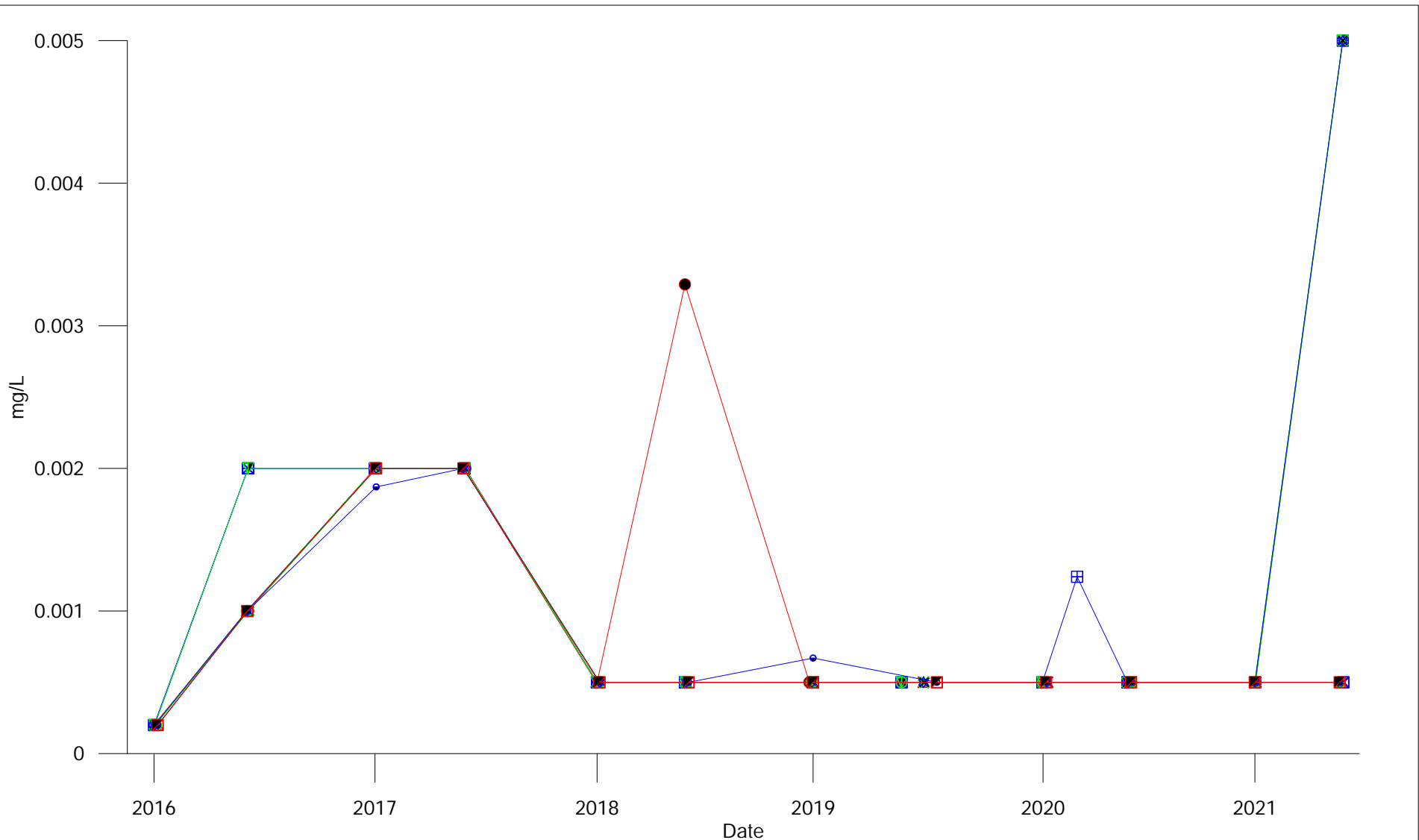
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Tin Concentration Bedrock Wells		
APRIL 2022	FIGURE 11	REV 0



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Total Alkalinity Bedrock Wells		
APRIL 2022	FIGURE 12	REV 0



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
TKN Concentration Bedrock Wells		
APRIL 2022	FIGURE 12	REV 0



Vanadium MOE Criteria = 0.25 mg/L

Cross gradient

- W9
- W10
- W14
- W15

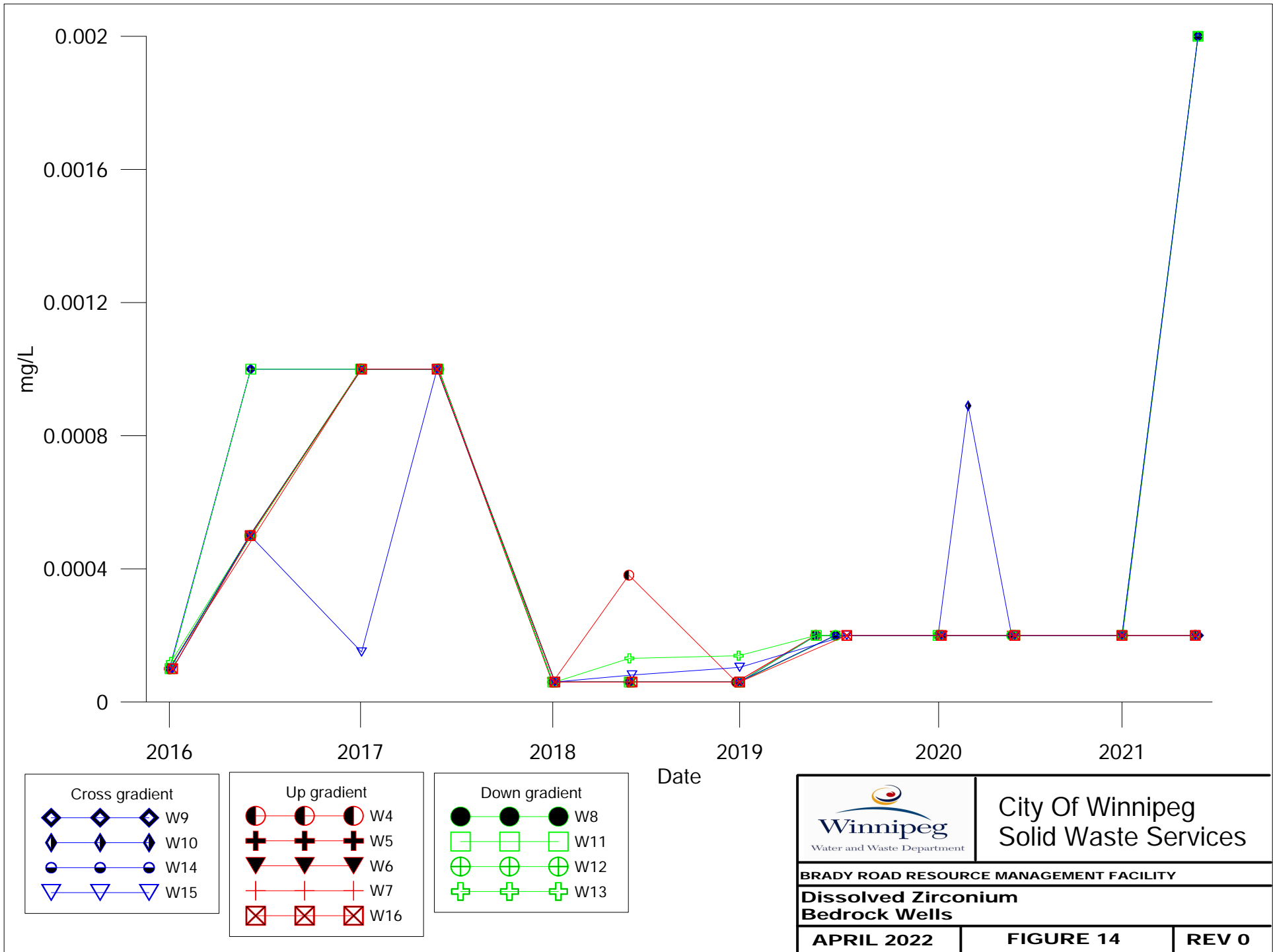
Up gradient

- W4
- W5
- W6
- W7
- W16

Down gradient

- W8
- W11
- W12
- W13

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Vanadium Bedrock Wells		
APRIL 2022	FIGURE 13	REV 0



City Of Winnipeg
Solid Waste Services

BRADY ROAD RESOURCE MANAGEMENT FACILITY

Dissolved Zirconium
Bedrock Wells

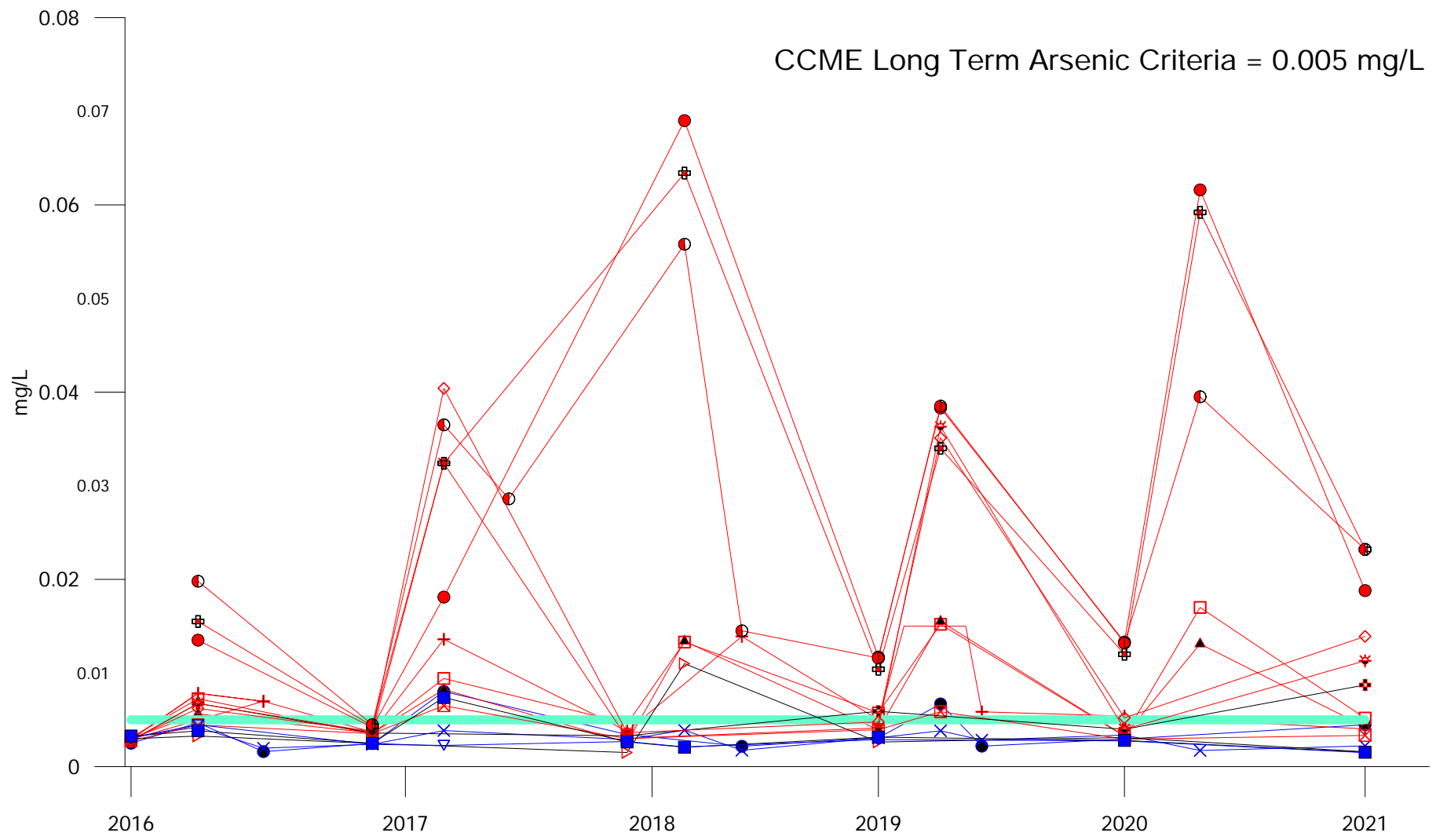
APRIL 2022

FIGURE 14

REV 0

**2021 SURFACE WATER
TIME VS CONCENTRATION GRAPHS**

CCME Long Term Arsenic Criteria = 0.005 mg/L



Up Stream

- SW25-1
- × SW25-12
- SW25-13A
- ▽ SW25-13B

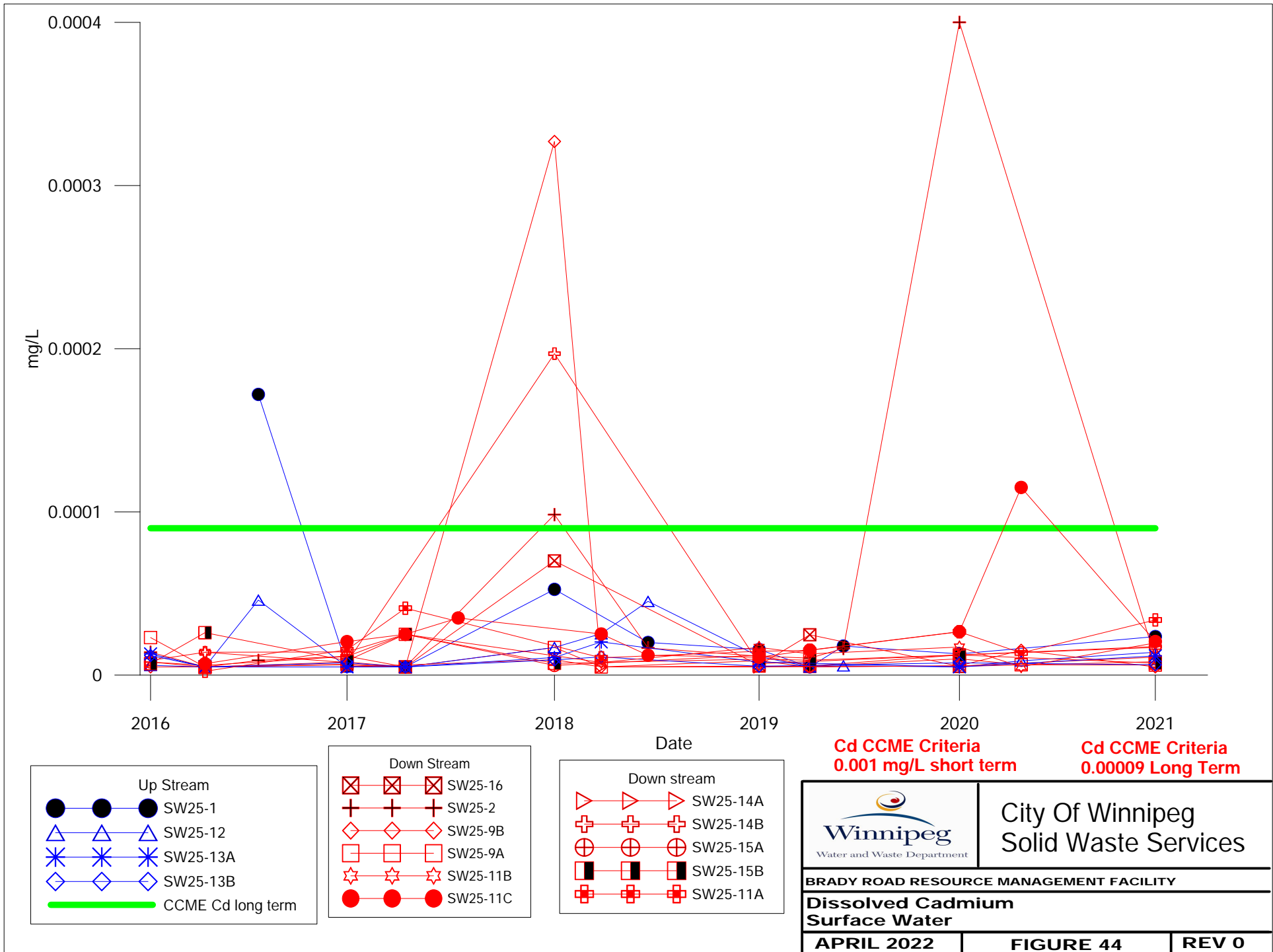
Down Stream

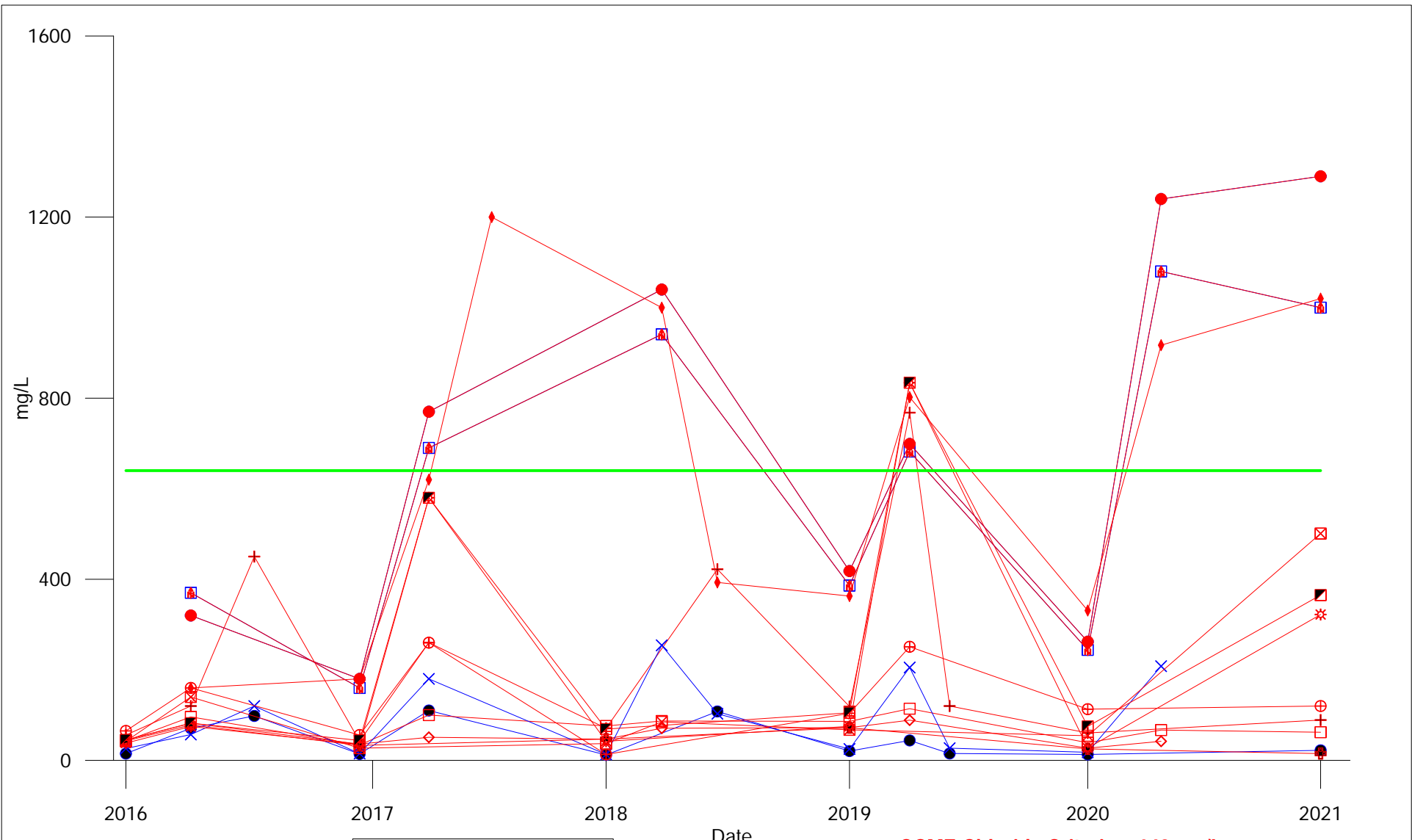
- ⊠ SW25-16
- ⊕ SW25-2
- SW25-9B
- ▲ SW25-9A
- ⊞ SW25-11B
- ◐ SW25-11C

Down Stream

- ▷ CCME
- ▷ SW25-14A
- ⊞ SW25-14B
- ⊛ SW25-15A
- ◇ SW25-15B
- SW25-11A

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Arsenic Surface Water		
APRIL 2022	FIGURE 43	REV 0





Up Stream

- SW25-1
- × SW25-12
- + SW25-13A
- SW25-13B

Down Stream

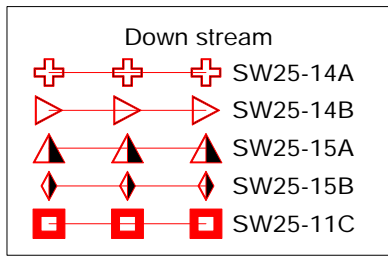
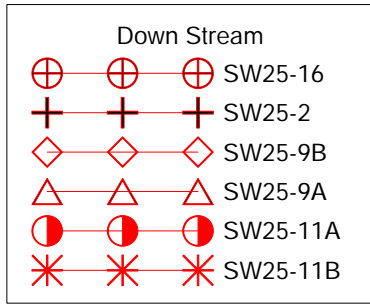
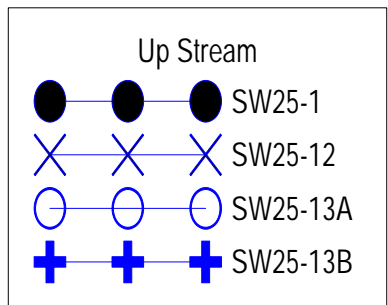
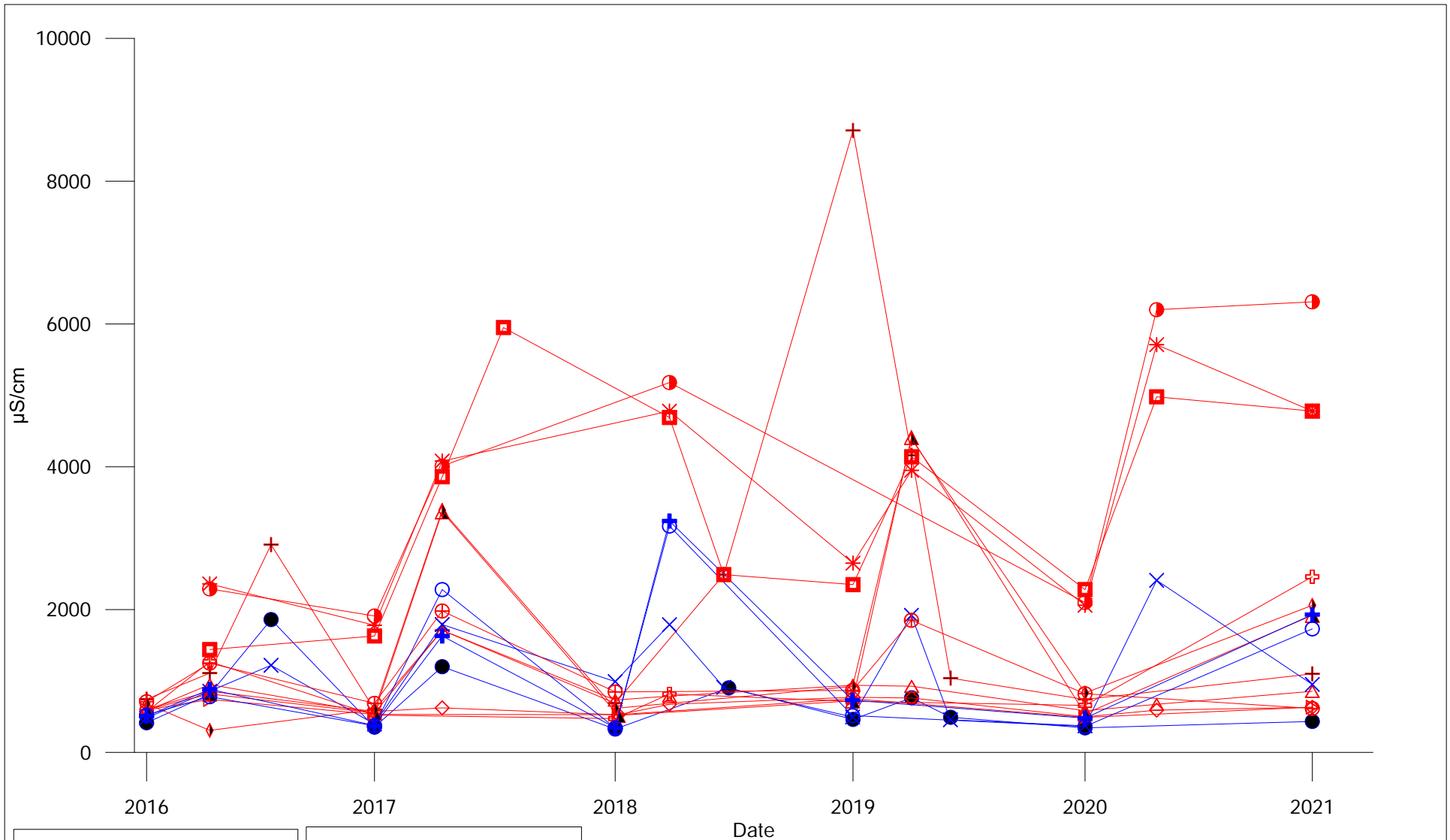
- ⊕ SW25-16
- + SW25-2
- ◇ SW25-9B
- SW25-9A
- SW25-11A
- CCME LIMIT

Down stream

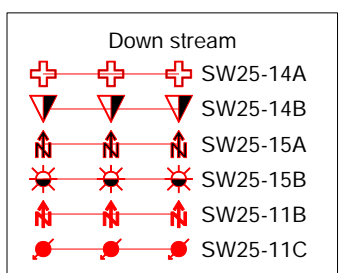
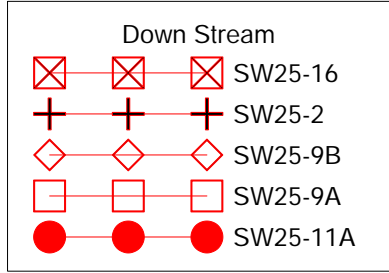
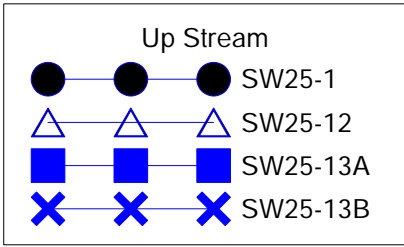
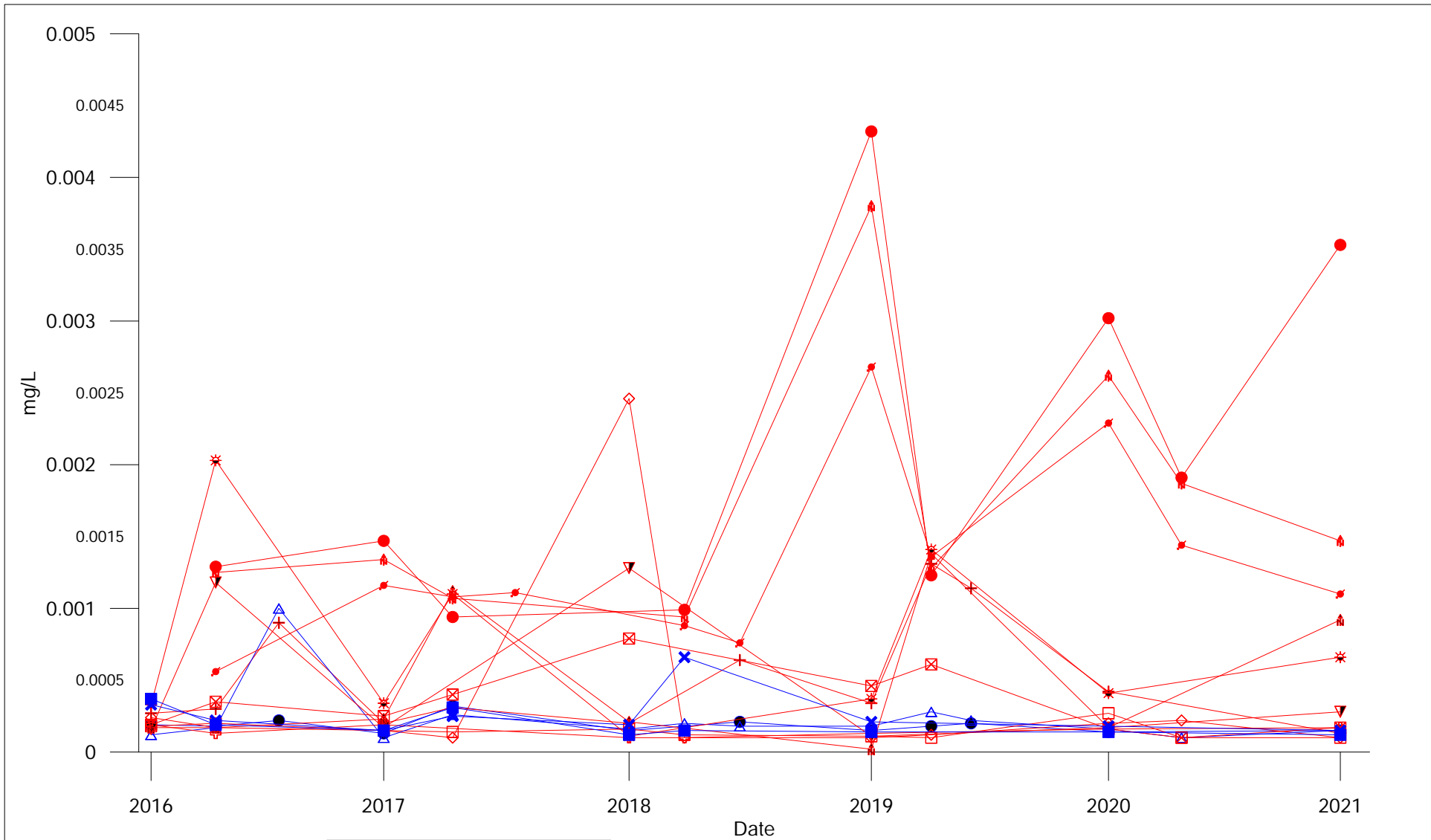
- ⊗ SW25-14A
- ⊕ SW25-14B
- ⊗ SW25-15A
- ⊗ SW25-15B
- ⊗ SW25-11B
- ⊗ SW25-11C

CCME Chloride Criteria = 640 mg/L

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Chloride Surface Water		
APRIL 2022	FIGURE 45	REV 0



<p>Winnipeg Water and Waste Department</p>	<p>City Of Winnipeg Solid Waste Services</p>	
	<p>BRADY ROAD RESOURCE MANAGEMENT FACILITY</p>	
<p>Specific Conductance Surface Water</p>		
<p>APRIL 2022</p>	<p>FIGURE 51</p>	<p>REV 0</p>



City Of Winnipeg
Solid Waste Services

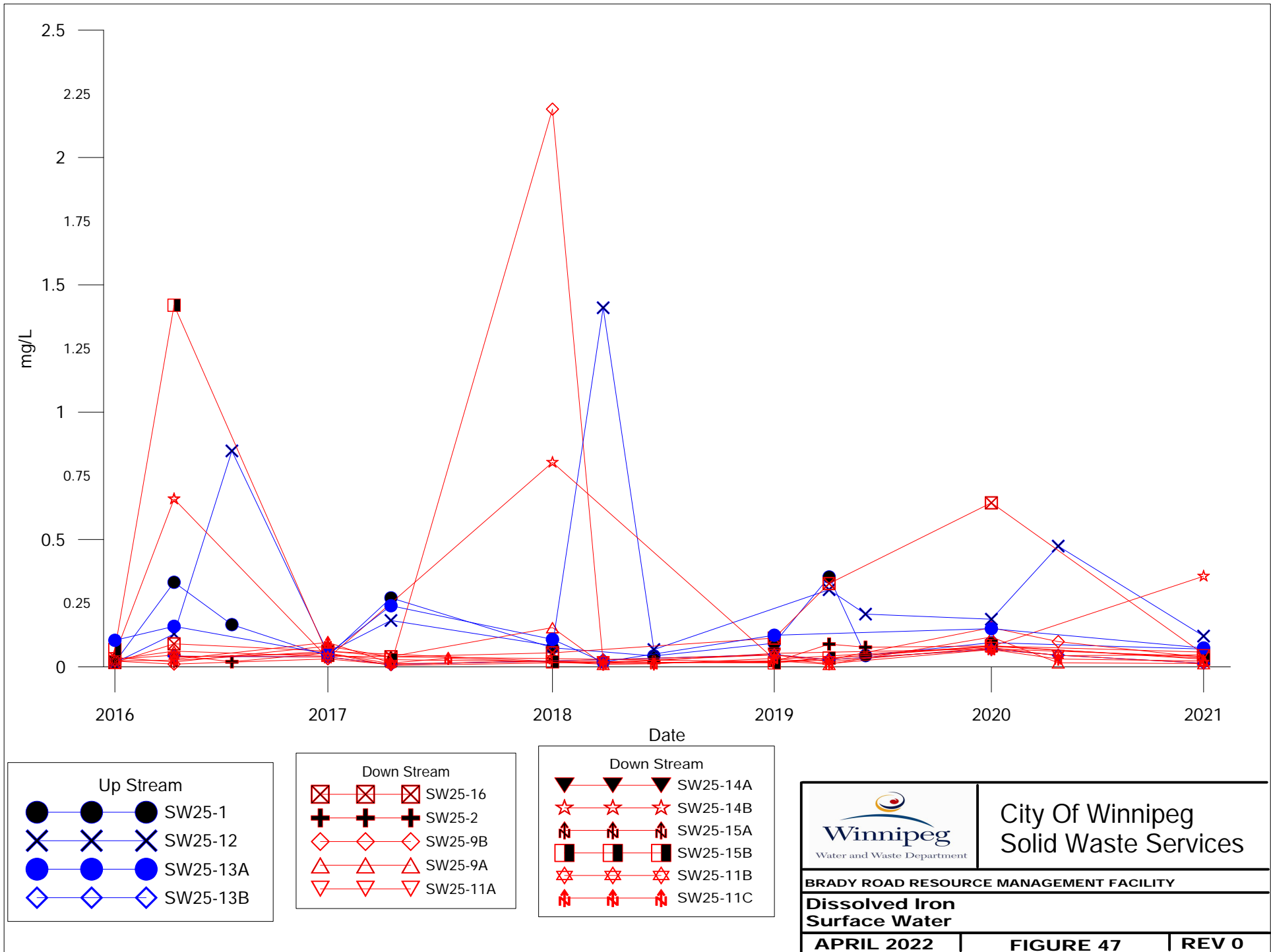
BRADY ROAD RESOURCE MANAGEMENT FACILITY

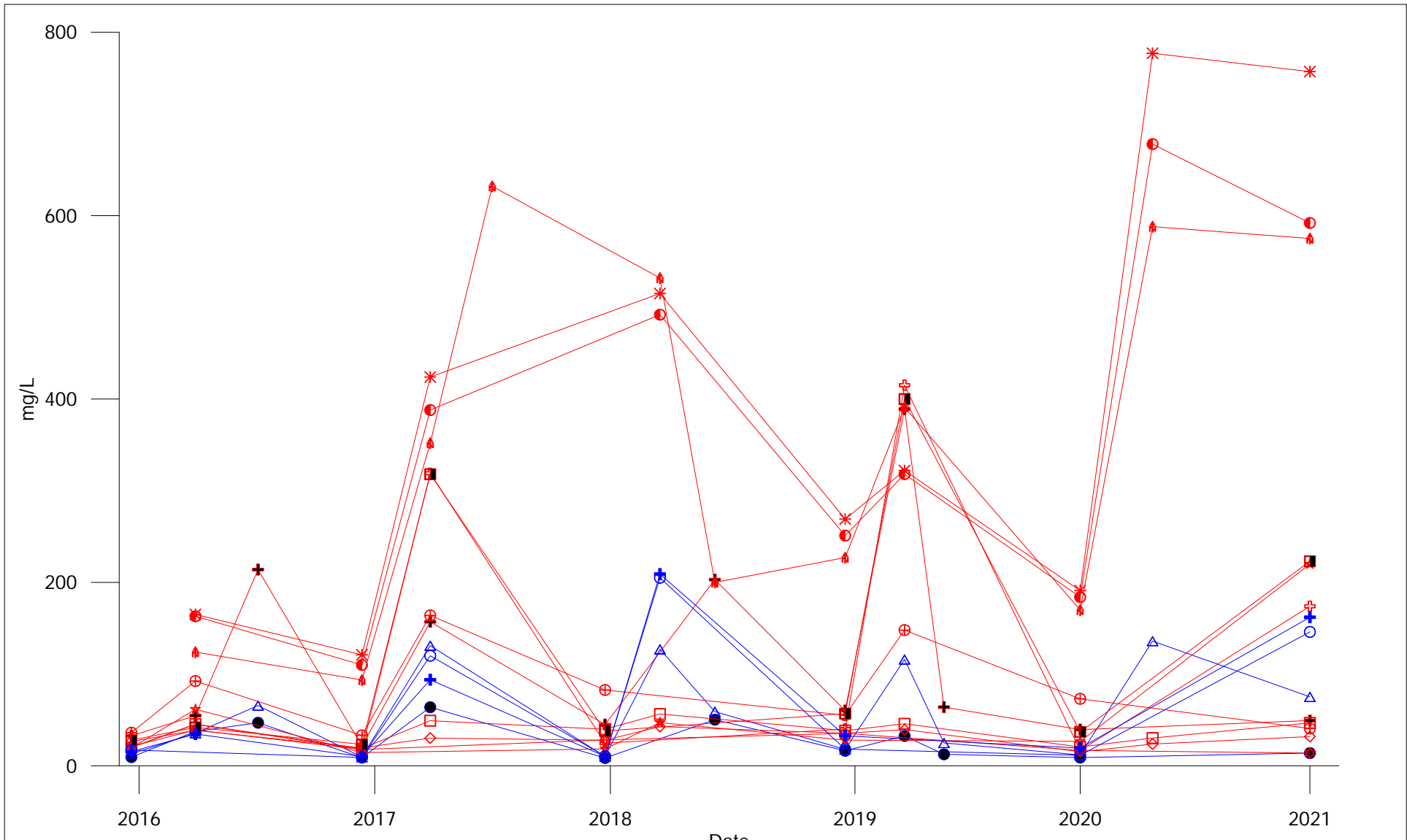
Dissolved Chromium
Surface Water

APRIL 2022

FIGURE 46

REV 0





Up Stream

- SW25-1
- △ SW25-12
- SW25-13A
- ⊕ SW25-13B

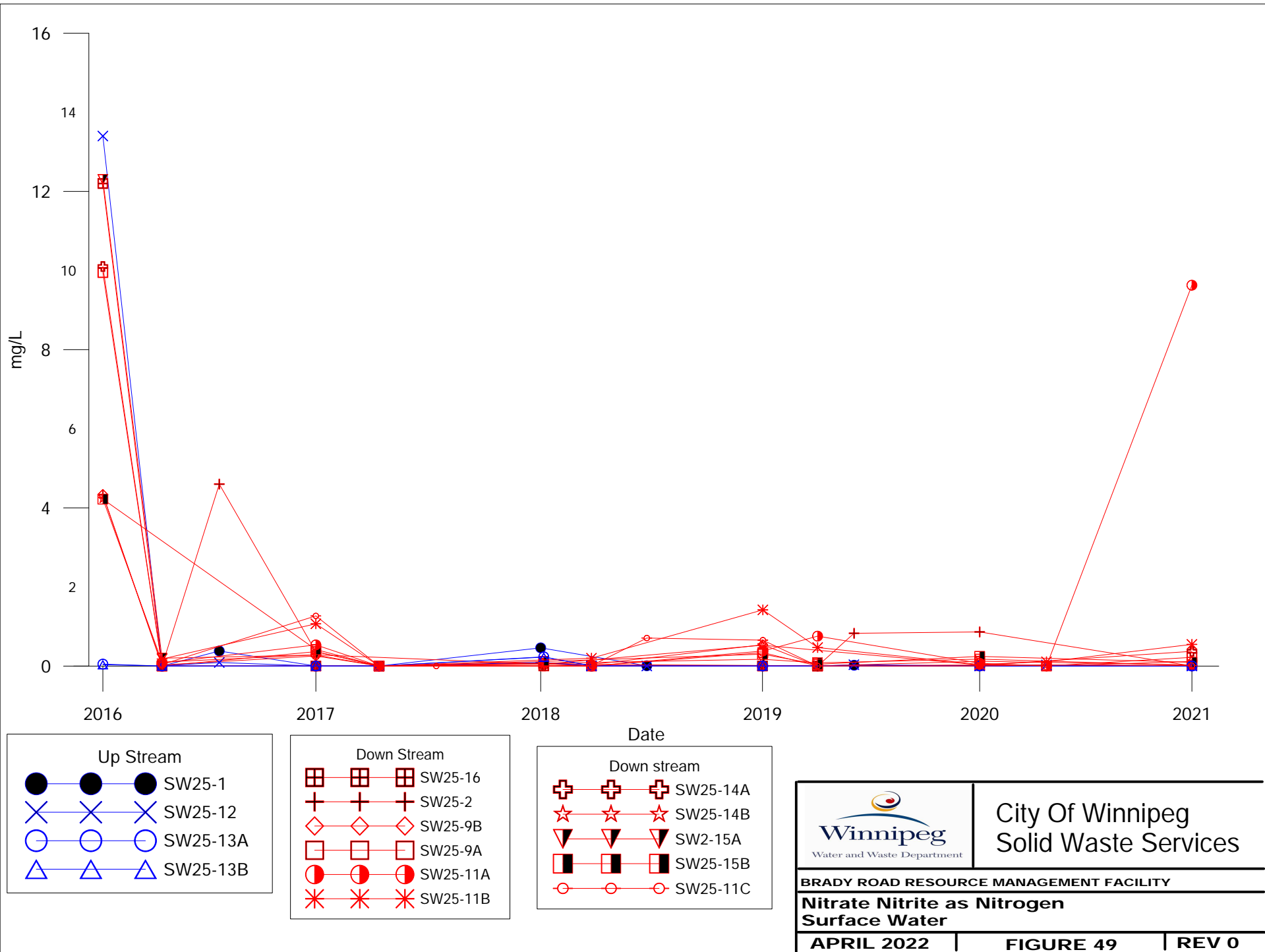
Down Stream

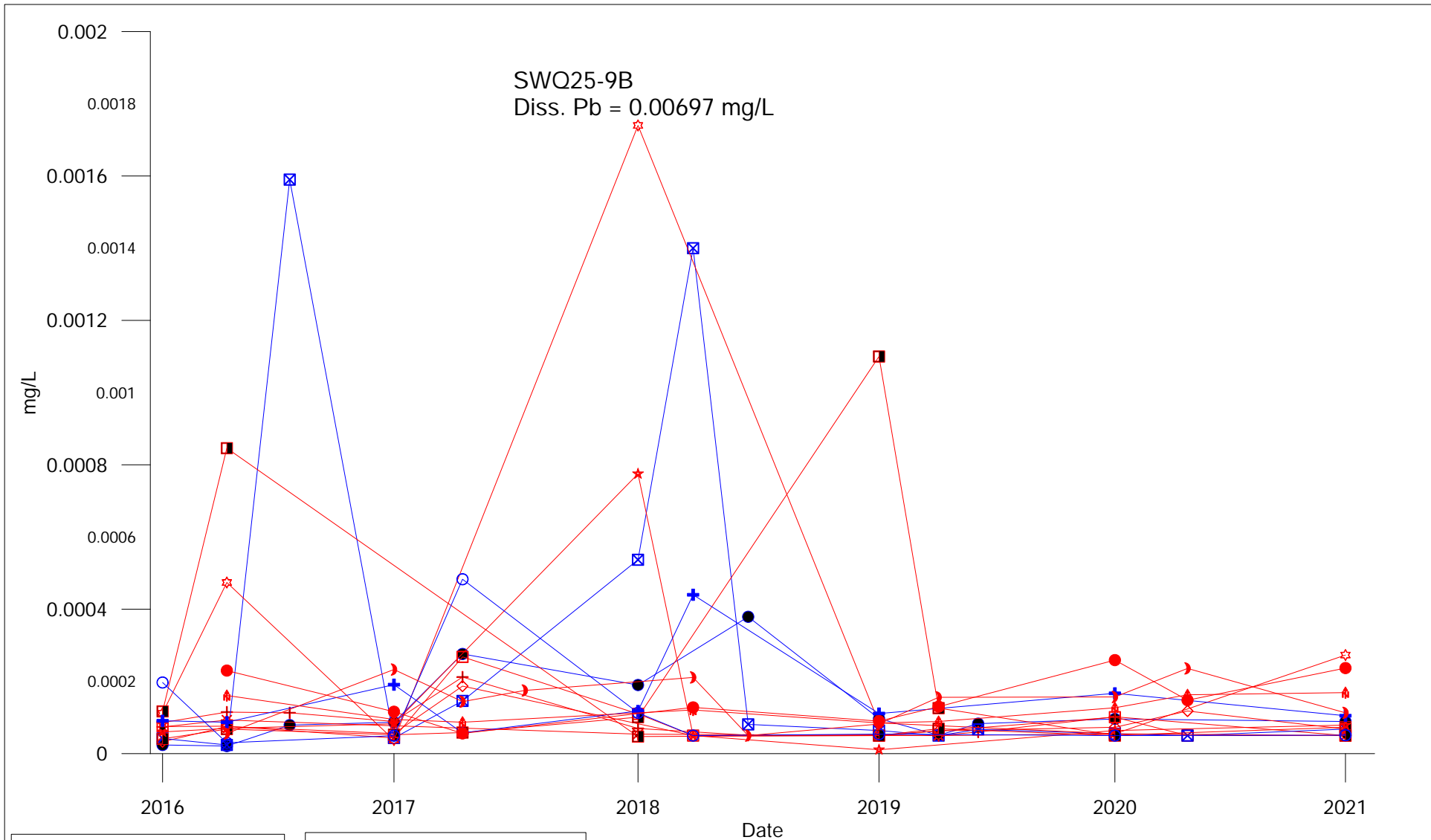
- ⊕ SW25-16
- ⊕ SW25-2
- ◇ SW25-9B
- SW25-9A
- * SW25-11A
- ◐ SW25-11B

Down stream

- ☆ SW25-14A
- ☆ SW25-14B
- ⊕ SW25-15A
- SW25-15B
- ♠ SW25-11C

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
Dissolved Sodium Surface Water		
APRIL 2022	FIGURE 50	REV 0





Up Stream

- SW25-1
- ⊠ SW25-12
- SW25-13A
- ⊕ SW25-13B

Down Stream

- ◻ SW25-16
- ⊕ SW25-2
- ◇ SW25-9B
- ◻ SW25-9A
- SW25-11A

Down stream

- ☆ SW25-14A
- ☆ SW25-14B
- ⊗ SW25-15A
- ◻ SW25-15B
- ⦿ SW25-11B
- ☾ SW25-11C



City Of Winnipeg
Solid Waste Services

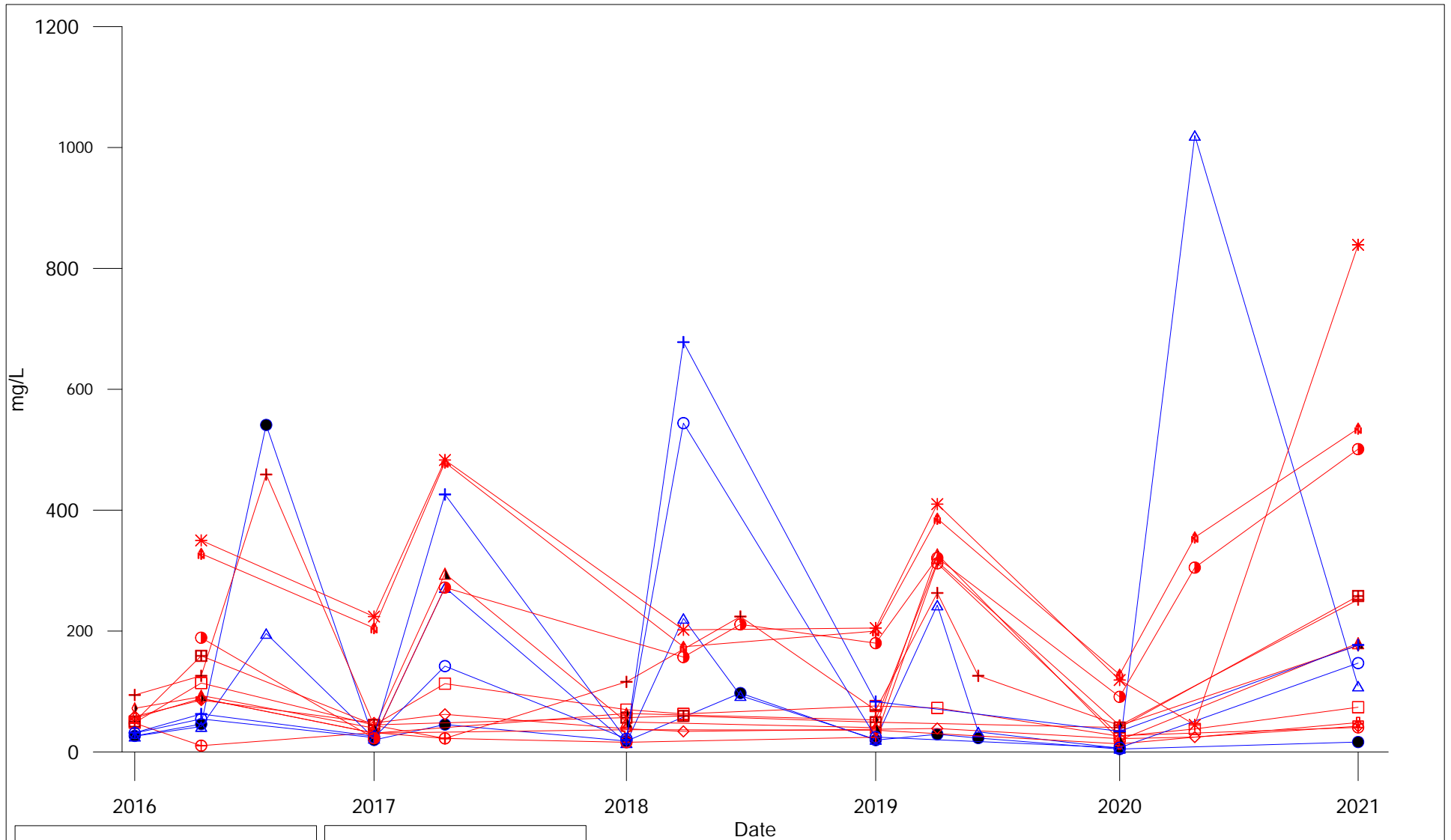
BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Dissolved Lead
Surface Water**

APRIL 2022

FIGURE 48

REV 0



Up Stream	
●	SW25-1
△	SW25-12
○	SW25-13A
+	SW25-13B

Down Stream	
⊕	SW25-16
+	SW25-2
◇	SW25-9B
□	SW25-9A
*	SW25-11A
⬆	SW25-11B

Down stream	
⊞	SW25-14A
+	SW25-14B
▲	SW25-15A
◆	SW25-15B
◐	SW25-11C



City Of Winnipeg
Solid Waste Services

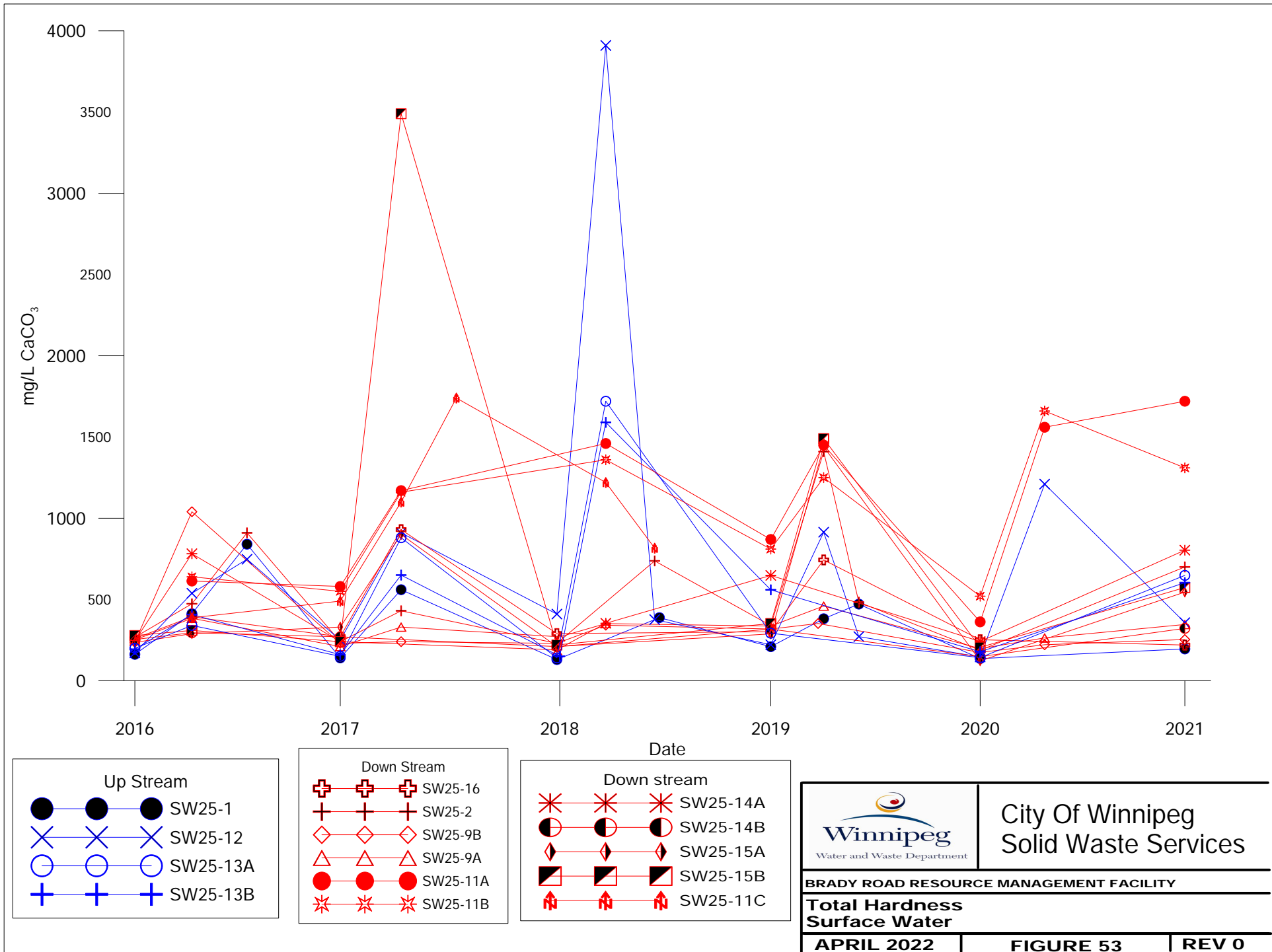
BRADY ROAD RESOURCE MANAGEMENT FACILITY

Sulfate
Surface Water

APRIL 2022

FIGURE 52

REV 0



APPENDIX C
2021 LANDFILL GAS
COLLECTION AND FLARING
REPORT

**2021 ANNUAL MONITORING REPORT
CITY OF WINNIPEG**

**BRADY ROAD RESOURCE MANAGEMENT FACILITY
LANDFILL GAS COLLECTION AND FLARING SYSTEM**

Prepared for

THE CITY OF WINNIPEG

Prepared by

INTEGRATED GAS RECOVERY SERVICES INC.

March 31, 2022



2021 ANNUAL MONITORING REPORT CITY OF WINNIPEG

BRADY ROAD RESOURCE MANAGEMENT FACILITY LANDFILL GAS COLLECTION AND FLARING SYSTEM

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1.0 INTRODUCTION

The City of Winnipeg operates the Landfill Gas Collection and Flaring System at the Brady Road Resource Management Facility in Winnipeg, Manitoba, which operates under Manitoba Conservation Licence 3081. After a short commissioning phase, the system became operational full time in August 2013 after approval to operate was received by the Office of the Fire Commissioner.

Operation of the system including maintenance and monitoring was completed by Comcor Environmental Limited (Comcor) on behalf of its partner Integrated Gas Recovery Services (IGRS).

This report outlines work performed and data collected during the operation of the Landfill Gas Collection and Flaring System during 2021.

2.0 LANDFILL GAS COLLECTION SYSTEM

There are two main components of the LGCFS that require monitoring. These include:

- Landfill Gas Collection Wellfield
- Mechanical System

The purpose and procedures associated with the monitoring of each of these components are discussed separately below. The recommended monitoring frequency is presented in Table 1.

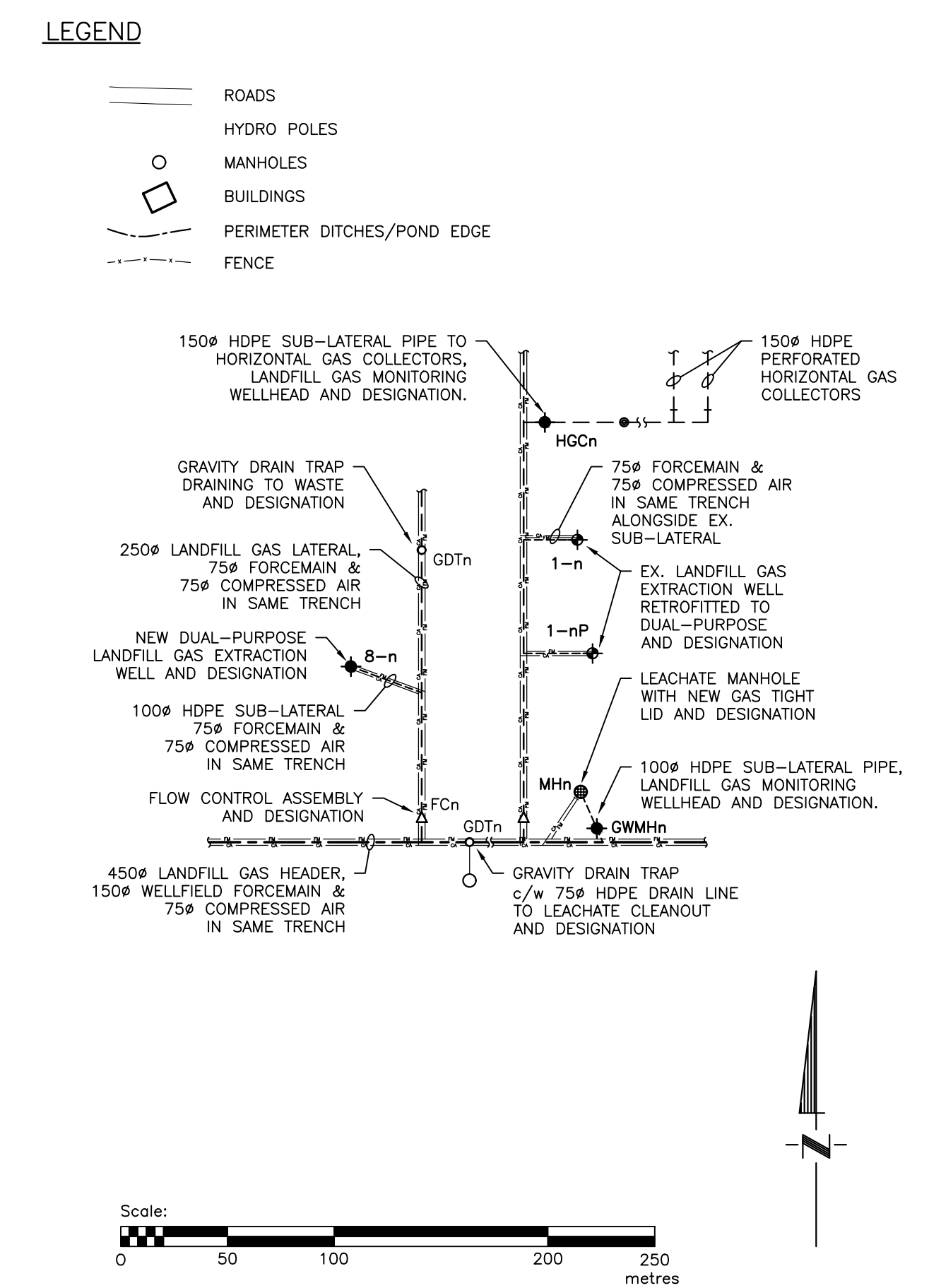
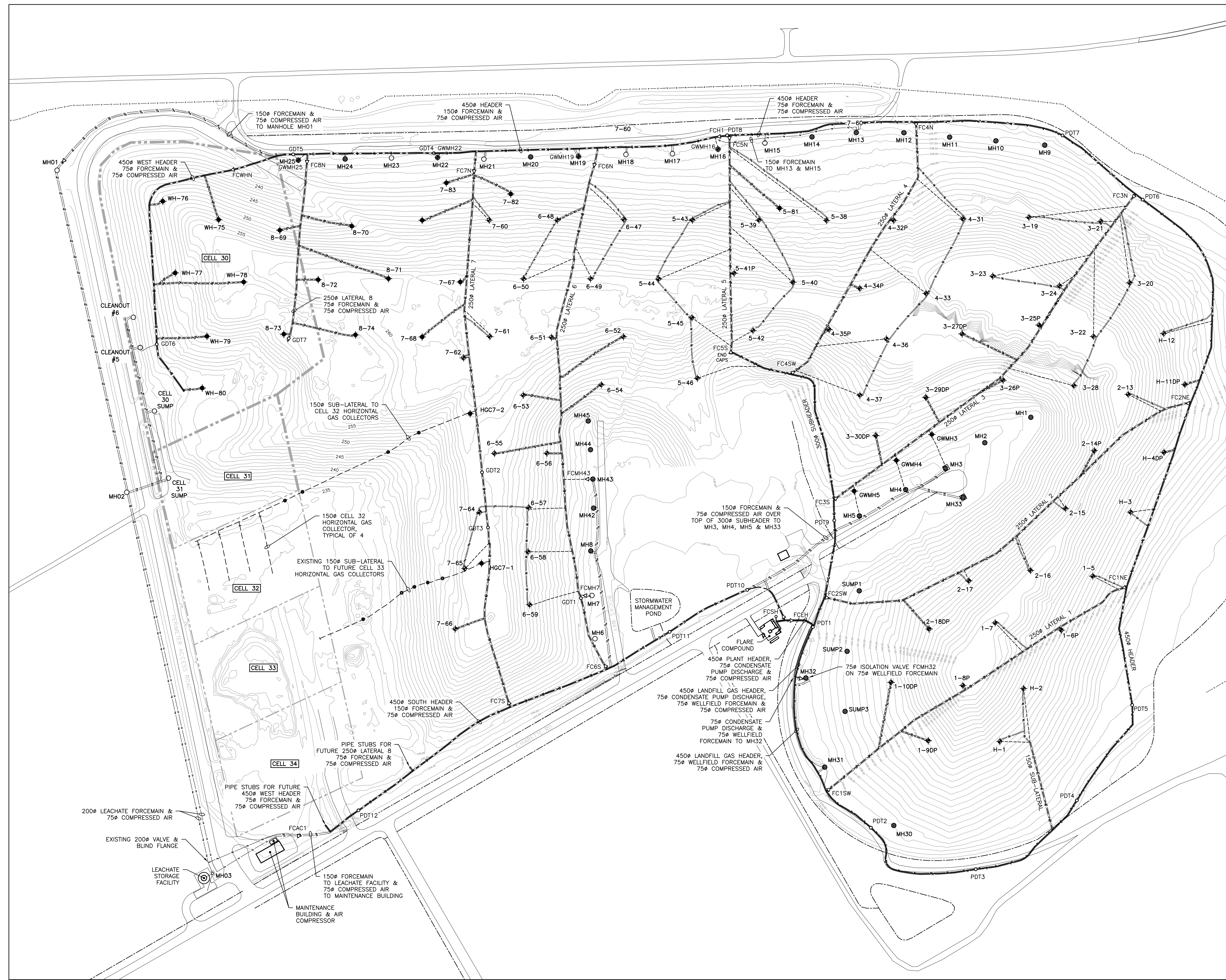
Table 1: Summary of Monitoring Frequency

System Component	Monitoring Frequency
Wellfield Monitoring	Monthly
Remote Mechanical System Monitoring	Weekly
Mechanical System Monitoring	Weekly

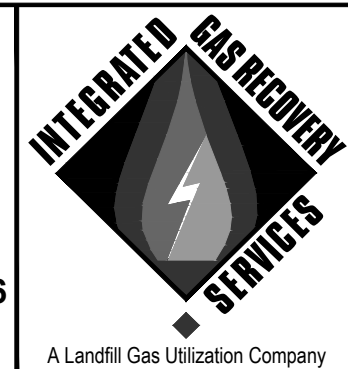
2.1 Wellfield System Expansions

The 2020 wellfield expansion was finalized in December 2020, with the exception of the installation of the new air compressor system. The 2020 expansion generally included the installation of landfill gas infrastructure and vertical wells into the northwest corner of the site, the installation of four horizontal gas collectors into Cell 32 on the west side of the site, pneumatic leachate pumps at existing and new vertical landfill gas extraction wells and the new air compressor to power the pumps. Gas collection was also added to three leachate manholes and leachate manhole/sump lid retrofits were completed to further reduce odours. Figure 1 presents existing wellfield conditions at the site.

In April and May 2021, the container-mounted 60 HP Atlas Copco air compressor system in the flaring compound was installed and commissioned. While the new and retrofitted dual purpose wells installed during the 2020 expansion were brought online in December 2020, the pumps were not operating until late May 2021, when the new air compressor was installed to provide power to the pumps. The existing air compressor did not have the capacity to power the additional and retrofitted dual purpose wells.



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 ENVIRONMENTAL LIMITED
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 tel (519) 621-6669 • fax (519) 621-9944



City of Winnipeg
 Brady Road
 Resource Management
 Facility

FIGURE 1
 EXISTING SITE CONDITIONS
 MARCH 2022

2.2 Wellfield System Monitoring

The wellfield system monitoring consists of measuring vacuum/pressure in each well and lateral pipe, as well as the percentage of methane, oxygen and carbon dioxide in the landfill gas, and parts per million of carbon monoxide and hydrogen sulphide at each location. These measurements were taken using a portable gas meter/analyzer such as a Landtec GEM-5000, or equivalent. Vacuum fluctuations were noted, as it can be an indication of water within the piping system.

Each wellhead was monitored for the velocity of gas using an anemometer. The measured velocities were used to calculate landfill gas flow rates by multiplying the velocity by the pipe cross-sectional area.

The monitoring data collected during the monthly round is beneficial to determine if the wellfield is operating as intended. Changes to the wellhead valve position were made to ensure maximum gas collection from the landfill. The system was monitored and field balanced by a technician experienced in the operation of this type of system.

The new wells installed in 2020 were monitored during the 2021 reporting year. During 2021, it was observed that the PVC check valve connections on the forcemain cap were breaking, likely due to the weight of the forcemain discharge flex hose from the well head. Due to these issues, as well as freezing issues during the winter, it was decided that these check valves were to be removed from all of the dual purpose wells. The check valves were removed in May 2021. Check valves are generally installed to prevent backflow to protect other components such as piping, other valves, pumps etc. Comcor determined that the ball check valve built into the pumps would sufficiently prevent backflow.

During 2021, there were no elevated levels of Carbon Monoxide (CO) (>500 ppm). Previous elevated levels occasionally found at GW 2-13 and GW 1-7 as noted in the 2018 Annual Report were remediated. During the 2021 monitoring period, the highest CO level recorded at GW 1-7 was 64 ppm (during the March monitoring round) and 101 ppm at GW 2-13 (during the September monitoring round). From mid- 2016 to October 2017, GW1-7 was closed due to low methane levels and high CO. The CO levels dropped in late 2017 and the temperature readings were within a more typical range, and thus the well was cracked for gas collection. The highest CO levels at 1-7 tends to occur during spring and summer. Elevated carbon monoxide within landfill gas can be an indicator of a subsurface fire within the waste. There was no indication of a subsurface fire in 2021.

In June 2021, Comcor observed a lack of vacuum on the newly installed Lateral 8 and West Header piping. Further investigation revealed that wellfield vacuum was also not present at gravity drain trap GDT4 and the landfill gas wellhead at leachate manhole MH22 on the North Header. To investigate the lack of vacuum, flow control assembly FC7N on Lateral 7 was closed and measurements were taken on either side of the valve. It was determined that vacuum was present on both sides of the valve suggesting that the North Header was blocked somewhere in between the Lateral 7 tie-in point and the MH22 tie-in point resulting in the lack of vacuum. As a result,

Tervita was engaged to further investigate the blockage. Tervita excavated the North Header, and it was determined that a highpoint existed between Lateral 7 and MH22. To remediate the issue, the sump at GDT4 was lowered by approximately one foot, and the North Header piping was regraded to drain to GDT4. Tervita also repaired a well that was broken during the capping project at the site.

The wellfield monitoring data and valve positions can be found in Table 2.

Pump counter measurements were recorded on a monthly basis at all active dual purpose gas/leachate collection wells. During the monthly pump counter measurements, the following items were noted:

- The pump counter at PDT1 was replaced in April and June 2021.
- Maintenance was performed on the pump counter at PDT2 in May 2021.
- Counters were replaced at the following locations in 2021:
 - PDT5 in January 2021
 - PDT6 in October 2021
 - Dual purpose well 2-18 in January 2021
 - Dual purpose well 3-29 in June 2021
 - Dual purpose well 3-30 in January 2021
 - Dual purpose well 5-39 in November 2021
- The pump counters at PDT4, PDT5, and PDT7 were not functioning throughout the 2021 reporting year due to flooding, thus readings were not recorded. The pumps however are working and are monitored to ensure that they are still operational.
- PDT8 was flooded during 2021, causing the regulator and counter to break. The regulator and counter were not replaced in 2021.

The majority of the pumps in the dual purpose wells were not operating until May 2021, as the capacity of the existing air compressor limited the number of pumps that could operate. When the new air compressor was brought online in May 2021, the pumps in the new and retrofitted dual purpose wells were turned on.

The pumps were turned on for a select number of the new and retrofitted dual purpose wells when the wells were commissioned in December 2020. The City decided to turn on the pumps at wells where it was observed that the ground was saturated.

In instances when there was a lack of a functioning pump counter, the pumps were checked on a monthly basis to confirm operation, and were found to be functioning as intended at all inspections. Table 3 presents the pump counter measurements recorded at both the pump drain traps and active dual purpose wells in 2021.

Water level monitoring requirements are for water levels to be measured on a semi-annual basis. Table 4 presents the water levels measured in 2021. The percent of open screen available for gas collection at each well is estimated based on water levels. During the January monitoring event,

the water levels for some of the new wells were not taken because they had only recently been brought online.

Based on pump counters and water levels recorded throughout 2021, dual purpose well pumps continue to remove leachate consistently. In 2021, the average open screen percentage of the monitored dual-purpose wells was 39%.

In August and June 2018, pumps at wells 3-27 and 3-30 respectively, were reinstalled due to suspicion that they may not be functioning as designed as a result of leachate and siltation residue making the pump inoperable. The pumps in wells 3-27 and 3-30 were replaced in 2021. The pumps were both operating. The lack of pump counter numbers recorded is likely due to a malfunctioning counter.

Winter operations of the dual – purpose wells was always a concern since installing the dual purpose wells. As an attempt to alleviate freezing in these wells specially designed well insulation was purchased and installed. Although the insulation was successful in the fall of 2021, by the end of year freezing was beginning to occur in the wells. For 2022 additional insulation or means to protect the wells should be investigated. In addition, now that the wells are operational a maintenance program should be developed.

Table 2: Wellfield Monitoring Data

Units			25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21
Weather Conditions										Sunny	Sunny	Sunny	Sunny	Cloudy
Ambient Temperature °C										26	20	5	-7	-16
Control Panel	<i>Flow Rate</i>	CFM	800	750	750	750	750	800	900	950	1000	1000	1000	950
	<i>CH₄</i>	%	44.2	38.1	49.1	50.1	49.5	49.1	49.8	49.0	48.5	48.4	44.5	43.6
	<i>O₂</i>	%	3.3	3.6	2.4	2.3	1.9	1.8	1.4	1.6	1.5	2.2	3.4	4.9
	<i>Wellfield Vac</i>	"H ₂ O	-16.3	-11.5	-8.7	-9.0	-8.6	-10.6	-9.7	-8.5	-9.4	-11.4	-10.7	-12.0
	<i>Outlet Press.</i>	"H ₂ O	3.2	3.2	3.3	3.2	3.3	3.3	3.8	3.0	3.2	3.5	4.0	3.7
LOCATIONS														
H-1 well bore seal	<i>Well</i>	"H ₂ O	-1.87	-2.48	-3.99	-0.02	-0.01	-0.02	-0.03	-0.05	-0.02	-0.03	-1.27	-0.68
	<i>Lateral</i>	"H ₂ O	-10.69	-8.31	-8.76	-6.34	-7.58	-6.39	-8.22	-6.30	-4.71	-5.60	-9.64	-12.57
	<i>CH₄</i>	%	41.6	44.6	28.5	31.2	33.8	36.7	36.9	42.3	48.0	58.0	50.1	1.4
	<i>CO₂</i>	%	28.5	29.8	20.1	22.5	21.4	22.8	24.7	25.6	27.0	32.8	28.6	0.9
	<i>O₂</i>	%	1.6	2.1	8.0	5.4	5.1	6.3	4.8	3.9	4.1	2.6	3.6	22.2
	<i>BAL (N₂)</i>	%	28.3	23.5	43.4	40.9	39.7	34.2	33.6	28.2	20.9	6.6	17.7	75.5
	<i>CO</i>	PPM	15	11	14	12	15	19	14	10	9	9	5	5
	<i>H₂S</i>	PPM	10	11	15	12	7	10	11	10	15	1	2	2
	<i>Vel Min</i>	m/s	0.00	0.00	-	-	-	-	-	-	0.00	1.11	0.87	frozen
	<i>Vel Max</i>	m/s	0.00	0.00	-	-	-	-	-	-	0.00	1.64	1.34	frozen
	<i>Flow</i>	CFM	0.00	0.00	-	-	-	-	-	-	0.00	12.99	10.44	-
	<i>Temp</i>	°C	4.9	6.3	-	-	-	-	-	-	24.9	28.1	24.1	frozen
	<i>Comments</i>		cracked	cracked	closed	closed	closed	closed	closed	closed	cracked	1/2T	1/2T	frozen open
	H-2	<i>Well</i>	"H ₂ O	-0.04	-0.05	-0.63	-0.58	-0.47	-0.69	-0.03	-0.03	-0.03	-0.04	-1.47
<i>Lateral</i>		"H ₂ O	10.27	-9.47	-7.35	-6.97	-5.15	-6.57	-7.64	-6.99	-4.65	-5.02	-7.62	-11.59
<i>CH₄</i>		%	37.4	36.7	41.6	40.5	21.1	25.8	31.9	41.5	49.7	58.3	50.4	48.3
<i>CO₂</i>		%	33.1	30.7	38.7	37.1	29.5	30.4	30.5	31.5	31.8	38.0	28.6	32.6
<i>O₂</i>		%	1.2	2.3	1.1	2.1	4.2	5.2	5.3	5.0	4.8	1.9	1.1	1.8
<i>BAL (N₂)</i>		%	28.3	30.3	18.6	20.3	45.2	38.6	32.3	22.0	13.7	1.8	19.9	17.3
<i>CO</i>		PPM	11	10	12	14	10	18	18	16	12	4	3	5
<i>H₂S</i>		PPM	4	11	17	14	10	14	15	14	19	9	8	10
<i>Vel Min</i>		m/s	-	-	0.44	0.00	0.00	-	-	-	0.00	1.24	0.00	0.67
<i>Vel Max</i>		m/s	-	-	0.68	0.00	0.00	-	-	-	0.00	1.47	0.00	1.04
<i>Flow</i>		CFM	-	-	5.29	0.00	0.00	-	-	-	0.00	12.80	0.00	8.08
<i>Temp</i>		°C	-	-	17.1	18.3	17.4	-	-	-	26.9	23.4	18.6	15.3
<i>Comments</i>			closed	closed	cracked	cracked	cracked	closed	closed	closed	cracked	1/2T	1/2T	1/2T
H-3		<i>Well</i>	"H ₂ O	-0.06	-0.09	-0.04	-0.02	-0.06	-0.04	-0.03	-0.03	-0.02	-0.04	-0.03
	<i>Lateral</i>	"H ₂ O	-11.48	-11.68	-6.53	-6.33	-7.45	-6.95	-8.11	-5.98	-6.26	-6.01	-5.24	-9.58
	<i>CH₄</i>	%	43.6	30.6	23.7	25.1	26.3	32.6	36.8	22.7	16.8	21.2	17.3	18.1
	<i>CO₂</i>	%	32.6	19.7	18.6	19.7	21.7	22.8	22.7	25.7	13.2	14.2	16.2	15.8
	<i>O₂</i>	%	2.2	3.9	10.7	9.3	8.4	7.6	6.4	6.7	13.1	11.2	10.9	11.0
	<i>BAL (N₂)</i>	%	21.6	45.8	47.0	45.9	43.6	37.0	34.1	44.9	56.9	53.4	55.6	55.1
	<i>CO</i>	PPM	5	6	9	11	15	19	10	8	5	12	10	15
	<i>H₂S</i>	PPM	5	6	2	8	7	10	5	4	3	4	5	8
	<i>Vel Min</i>	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	<i>Vel Max</i>	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	<i>Flow</i>	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	<i>Temp</i>	°C	-	-	-	-	-	-	-	-	-	-	-	-
	<i>Comments</i>		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed

Table 2: Wellfield Monitoring Data

			25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21
H-4 DP	Well	"H ₂ O	-0.98	-1.57	-2.28	-0.01	-0.02	-0.03	-0.03	-0.03	-0.04	-0.02	-0.03	-0.03
	Lateral	"H ₂ O	-11.30	-8.47	-7.26	-6.39	-7.66	-6.98	-8.21	-5.33	-6.47	-6.22	-6.57	-8.66
	CH ₄	%	38.4	40.3	26.0	27.8	29.4	36.7	36.8	33.9	30.7	29.5	25.4	26.1
	CO ₂	%	34.7	35.0	19.5	20.9	21.7	22.4	23.8	24.1	22.9	25.2	26.8	26.3
	O ₂	%	2.5	3.9	10.2	8.4	7.6	6.3	5.1	6.6	8.2	7.4	8.0	8.1
	BAL (N ₂)	%	24.4	20.8	44.3	42.9	41.3	34.6	34.3	35.4	38.2	37.9	39.8	39.5
	CO	PPM	8	10	3	5	9	12	12	5	2	8	10	7
	H ₂ S	PPM	12	11	13	17	19	25	15	14	17	14	19	14
	Vel Min	m/s	0.00	0.00	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	0.00	0.00	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	0.00	0.00	-	-	-	-	-	-	-	-	-	-
	Temp	°C	6.4	4.3	-	-	-	-	-	-	-	-	-	-
	Comments		cracked	cracked	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
1-5 well bore seal	Well	"H ₂ O	-0.02	-0.09	-0.04	-0.03	-0.03	-0.02	-0.02	-0.03	-0.02	-0.04	-0.03	-0.04
	Lateral	"H ₂ O	-7.54	-11.39	-6.28	-6.87	-5.47	-6.84	-7.99	-5.23	-5.76	-5.84	-6.44	-9.33
	CH ₄	%	30.8	22.6	15.0	17.4	19.5	22.6	25.7	24.9	21.1	25.2	24.1	21.4
	CO ₂	%	27.3	18.4	13.0	14.0	18.6	19.8	20.0	22.6	17.8	19.2	22.3	21.7
	O ₂	%	7.4	5.6	12.3	11.5	10.4	12.0	11.6	8.4	9.8	8.5	9.4	9.6
	BAL (N ₂)	%	34.5	53.4	59.7	57.1	51.5	45.6	42.7	44.1	51.3	47.1	44.2	47.3
	CO	PPM	17	10	2	4	9	10	15	10	7	8	10	8
	H ₂ S	PPM	1	5	9	10	21	25	17	9	5	11	14	12
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
1-6 DP	Well	"H ₂ O	-0.09	-0.05	-0.06	-0.04	-0.05	-0.03	-0.03	-0.04	-0.05	-0.03	-0.03	-0.02
	Lateral	"H ₂ O	-6.81	-10.67	-6.94	-6.66	-5.12	-6.34	-7.28	-6.44	-6.09	-5.82	-6.61	-8.63
	CH ₄	%	53.3	25.6	28.3	27.8	28.9	32.6	33.6	35.2	36.7	34.2	30.2	28.6
	CO ₂	%	34.6	22.0	21.7	22.7	21.4	22.8	25.8	27.6	28.8	27.9	28.1	26.4
	O ₂	%	2.1	3.6	7.7	6.3	5.9	5.1	6.3	5.6	3.9	6.5	7.0	7.1
	BAL (N ₂)	%	10.0	48.8	42.3	43.2	43.8	39.5	34.3	31.6	30.6	31.4	34.7	37.9
	CO	PPM	4	5	6	7	11	15	18	12	3	9	12	10
	H ₂ S	PPM	21	19	22	19	22	20	29	15	41	33	54	32
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
1-7	Well	"H ₂ O	0.12	-0.01	-0.01	0.03	-0.02	-0.03	-0.04	-0.04	-0.05	-0.03	-0.04	-0.03
	Lateral	"H ₂ O	-7.65	-11.63	-8.75	-7.94	-7.14	-6.39	-8.64	-6.33	-3.99	-5.44	-6.57	-8.63
	CH ₄	%	56.0	36.1	40.3	41.6	40.5	42.8	41.5	30.6	22.6	21.5	20.3	20.1
	CO ₂	%	43.3	33.8	35.0	33.8	32.9	31.9	33.6	31.5	19.5	20.2	22.4	23.9
	O ₂	%	0.4	2.4	3.3	3.4	4.1	3.7	5.3	6.3	9.6	11.2	10.5	11.0
	BAL (N ₂)	%	0.3	27.7	21.4	21.2	22.5	21.6	19.6	31.6	48.3	47.1	46.8	45.0
	CO	PPM	42	50	64	60	42	40	50	33	23	21	25	25
	H ₂ S	PPM	13	10	15	14	19	14	24	47	58	45	51	42
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed

Table 2: Wellfield Monitoring Data

			25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21
1-8	Well	"H ₂ O	0.26	-0.10	-0.02	0.01	-0.03	-0.04	-0.02	-0.03	-0.03	-0.01	-0.02	-0.03
	Lateral	"H ₂ O	-10.21	-11.57	-7.00	-7.24	-6.58	-7.23	-8.65	-6.33	-7.22	-6.56	-5.88	-8.66
	CH ₄	%	54.9	40.6	38.7	39.1	37.1	39.6	40.5	42.8	46.8	29.3	31.5	25.7
	CO ₂	%	40.4	28.4	29.6	28.6	27.3	28.5	28.6	30.6	35.1	20.9	22.4	23.8
	O ₂	%	1.0	3.9	6.1	7.0	6.1	5.4	5.6	4.1	2.4	8.8	8.4	9.0
	BAL (N ₂)	%	3.7	27.1	25.6	25.3	29.5	26.5	25.3	22.5	15.7	41.0	37.7	41.5
	CO	PPM	14	15	13	15	19	22	20	16	15	0	1	5
	H ₂ S	PPM	50	42	48	47	55	40	50	77	148	88	58	61
	Vel Min	m/s	-	-	-	-	-	-	-	-	0.00	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	0.00	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	0.00	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	24.8	-	-	-
	Comments			closed	closed	closed	closed	closed	closed	closed	cracked	closed	closed	closed
1-9 DP	Well	"H ₂ O	-0.14	-2.89	-0.10	-0.05	-0.03	-0.04	-0.04	-0.03	-0.02	-0.04	-0.03	-0.02
	Lateral	"H ₂ O	-7.02	-8.45	-8.69	-7.38	-8.11	-7.54	-8.27	-6.33	-5.47	-5.94	-6.47	-8.66
	CH ₄	%	60.0	25.7	33.6	37.9	36.8	35.9	38.0	30.4	27.5	29.5	28.4	25.1
	CO ₂	%	37.2	20.2	25.1	23.1	24.2	25.7	25.6	20.6	21.1	22.5	23.9	24.8
	O ₂	%	2.4	7.5	5.9	5.4	4.3	3.6	5.7	6.0	8.5	7.5	8.1	8.0
	BAL (N ₂)	%	0.4	46.6	35.4	33.6	34.7	34.8	30.7	43.0	42.9	40.5	39.6	42.1
	CO	PPM	11	15	12	15	10	12	15	10	5	8	7	11
	H ₂ S	PPM	19	7	11	8	6	4	12	12	14	11	13	15
	Vel Min	m/s	0.00	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	0.00	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	0.00	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	5.1	-	-	-	-	-	-	-	-	-	-	-
	Comments			cracked	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
1-10 DP	Well	"H ₂ O	-0.04	-0.05	-2.60	-1.87	-0.04	-0.03	-0.05	-0.03	-0.02	-0.06	-0.04	-0.04
	Lateral	"H ₂ O	-6.36	-8.67	-8.75	-7.87	-8.31	-7.54	-8.14	-6.14	-5.24	-5.84	-6.32	-7.54
	CH ₄	%	31.0	41.6	53.9	50.7	16.3	22.1	25.6	26.9	24.3	24.9	25.1	26.8
	CO ₂	%	18.7	20.4	31.6	30.9	9.5	22.1	25.4	22.4	15.1	20.1	23.8	24.1
	O ₂	%	17.5	16.1	3.4	2.4	13.5	9.6	8.6	10.1	11.4	8.9	9.0	9.3
	BAL (N ₂)	%	32.8	21.9	11.1	16.0	60.7	46.2	40.4	40.6	49.2	46.1	42.1	39.8
	CO	PPM	5	10	12	10	0	2	5	4	5	4	5	6
	H ₂ S	PPM	4	11	14	10	8	15	5	4	3	5	7	10
	Vel Min	m/s	-	-	0.00	0.00	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	0.00	0.00	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	0.00	0.00	-	-	-	-	-	-	-	-
	Temp	°C	-	-	14.3	15.9	-	-	-	-	-	-	-	-
	Comments			closed	closed	cracked	cracked	closed	closed	closed	closed	closed	closed	closed
H-11 DP	Well	"H ₂ O	0.29	-0.22	-0.77	-1.02	-0.66	-0.95	-1.00	-1.22	0.96	0.88	-0.05	-1.27
	Lateral	"H ₂ O	-8.61	-10.67	-7.68	-7.41	-6.84	-7.14	-7.25	-6.96	-4.19	-5.39	-8.87	-13.57
	CH ₄	%	37.4	45.7	52.3	51.4	39.8	42.6	43.5	46.5	51.9	53.7	47.5	43.9
	CO ₂	%	32.3	33.1	37.7	38.9	28.4	29.1	29.6	30.9	35.2	36.2	33.4	25.6
	O ₂	%	1.5	2.4	1.6	2.4	4.6	5.2	5.3	4.0	2.5	1.6	2.8	8.3
	BAL (N ₂)	%	28.8	18.8	8.4	7.3	27.2	23.1	21.6	18.6	10.4	8.5	16.3	22.2
	CO	PPM	12	10	5	9	7	10	12	6	2	1	5	3
	H ₂ S	PPM	69	84	110	104	43	52	34	66	110	129	57	58
	Vel Min	m/s	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.75	0.98	1.18
	Vel Max	m/s	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.98	2.17	1.69
	Flow	CFM	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.62	14.88	13.56
	Temp	°C	-	5.8	10.9	15.4	15.4	36.2	39.6	35.1	26.7	20.4	18.4	16.3
	Comments			closed	cracked	cracked	cracked	cracked	cracked	cracked	cracked	1/2T	1/2T	1/2T

Table 2: Wellfield Monitoring Data

			25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
H-12 well bore seal	Well	"H ₂ O	-1.45	-1.05	-1.20	-1.47	-1.34	-1.57	-1.98	-1.30	-0.99	-1.22	-1.57	-1.34	
	Lateral	"H ₂ O	-10.74	-11.69	-5.45	-6.21	-6.20	-6.94	-8.65	-6.31	-3.83	-5.85	-9.62	-12.68	
		CH ₄	%	45.8	41.5	38.5	39.7	49.5	50.1	36.7	48.6	56.8	49.5	52.3	61.3
		CO ₂	%	31.6	25.6	23.5	25.8	33.0	32.9	26.1	32.9	40.2	35.2	30.8	34.2
		O ₂	%	1.4	2.4	7.3	6.1	1.8	2.0	7.1	1.6	0.4	2.8	2.6	1.9
		BAL (N ₂)	%	21.2	30.5	30.7	28.4	15.7	15.0	30.1	16.9	2.6	12.5	14.3	2.6
		CO	PPM	10	11	9	7	8	10	12	10	3	3	4	5
		H ₂ S	PPM	22	25	34	39	31	26	111	122	186	153	122	57
		Vel Min	m/s	0.44	0.00	0.00	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.04
		Vel Max	m/s	0.94	0.00	0.87	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.39
		Flow	CFM	6.52	0.00	4.11	7.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.48
		Temp	°C	8.2	3.9	15.2	16.8	17.3	38.4	17.3	25.9	30.1	23.1	21.1	17.0
		Comments		cracked	cracked	cracked	cracked	cracked	cracked	cracked	cracked	1/2T	cracked	cracked	1/2T
	2-13	Well	"H ₂ O	-7.65	-7.24	-6.40	-6.84	-5.87	-5.31	-6.30	-4.58	-2.57	-2.44	-3.24	-4.57
Lateral		"H ₂ O	-12.12	-9.34	-7.36	-7.28	-6.71	-6.92	-8.27	-6.74	-3.75	-5.54	-8.03	-10.57	
		CH ₄	%	56.2	55.1	58.7	57.4	57.2	54.7	48.1	50.6	57.4	58.0	57.8	58.6
		CO ₂	%	38.6	37.8	41.1	40.2	39.3	33.1	35.4	39.1	38.4	36.3	37.0	
		O ₂	%	0.9	1.1	0.2	1.1	1.8	3.3	1.0	0.4	0.7	0.7	1.0	
		BAL (N ₂)	%	4.3	6.0	0.0	1.3	1.7	7.2	15.5	13.0	3.1	2.9	5.2	3.4
		CO	PPM	70	71	67	67	59	61	75	68	101	88	54	47
		H ₂ S	PPM	99	89	151	151	114	120	210	234	287	253	198	215
		Vel Min	m/s	3.47	3.11	4.11	3.81	2.68	2.07	2.94	2.17	2.39	2.71	2.17	2.04
		Vel Max	m/s	3.98	4.05	4.96	4.22	3.61	2.69	3.41	2.66	3.21	3.35	2.65	3.51
		Flow	CFM	35.20	33.83	42.85	37.94	29.72	-	30.00	22.82	26.46	28.63	22.77	26.22
		Temp	°C	10.8	6.3	18.4	20.8	21.4	37.4	39.4	37.2	40.9	36.3	22.1	15.2
		Comments		2	2	2	2	2	2	1	1	2	2	2	
2-14 well bore seal		Well	"H ₂ O	0.38	-1.24	-1.67	-1.27	-0.98	-0.04	-0.03	-0.06	-0.04	-0.02	-0.03	-0.03
	Lateral	"H ₂ O	-8.37	-10.95	-5.39	-6.33	-7.81	-8.32	-7.54	-5.22	-3.83	-6.08	-6.33	-8.69	
		CH ₄	%	58.3	46.1	40.6	41.8	34.1	35.8	34.0	45.6	50.2	40.6	38.5	37.5
		CO ₂	%	41.7	32.9	30.2	32.7	25.5	26.8	28.6	31.5	36.8	29.2	28.1	28.2
		O ₂	%	0.0	2.4	5.3	4.8	6.9	5.1	5.8	2.5	1.3	6.0	6.2	7.1
		BAL (N ₂)	%	0.0	18.6	23.9	20.7	33.5	32.3	31.6	20.4	11.7	24.2	27.2	27.2
		CO	PPM	32	22	10	15	4	5	9	5	1	5	6	8
		H ₂ S	PPM	38	22	31	32	30	22	16	22	48	61	78	52
		Vel Min	m/s	0.00	0.00	0.00	0.00	-	-	-	0.00	-	-	-	-
		Vel Max	m/s	0.00	0.00	0.00	0.00	-	-	-	0.00	-	-	-	-
		Flow	CFM	0.00	0.00	0.00	0.00	-	-	-	0.00	-	-	-	
		Temp	°C	6.4	4.2	12.7	12.7	-	-	-	26.8	-	-	-	
		Comments		cracked	cracked	cracked	cracked	closed.	closed.	closed.	closed.	cracked	closed	closed	closed
	2-15	Well	"H ₂ O	-1.57	-0.08	-0.02	-0.01	-0.03	-0.02	-0.03	-0.03	-0.03	-0.05	-0.04	-0.05
Lateral		"H ₂ O	-12.1	-11.5	-7.1	-6.9	-6.8	-7.2	-8.1	-7.4	-4.5	-5.2	-6.4	-8.6	
		CH ₄	%	37.5	27.6	23.4	22.8	25.6	26.7	29.4	41.8	35.8	36.7	37.1	
		CO ₂	%	28.3	22.4	20.4	21.6	22.4	24.0	12.1	24.8	32.1	30.5	31.6	
		O ₂	%	5.8	4.7	9.1	8.7	7.0	6.4	7.3	4.1	3.9	2.8	3.2	
		BAL (N ₂)	%	28.4	45.3	47.1	46.9	45.0	42.9	51.2	31.5	22.2	30.9	28.5	
		CO	PPM	30.0	28.0	30.0	32.0	36.0	25.0	34.0	30.0	14.0	19.0	15.0	
		H ₂ S	PPM	5.0	8.0	2.0	5.0	7.0	9.0	19.0	17.0	30.0	33.0	24.0	
		Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	
		Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	
		Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	
		Temp	°C	-	-	-	-	-	-	-	-	-	-	-	
		Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	

Table 2: Wellfield Monitoring Data

	Units	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
2-16	Well	"H ₂ O	-1.57	-0.66	0.17	-1.29	-0.57	-0.48	-0.57	-1.38	-0.69	-0.84	-1.24	-2.47
	Lateral	"H ₂ O	-12.24	-11.68	-8.14	-7.88	-6.32	-5.17	-7.03	-6.94	-4.53	-5.74	-7.15	-12.30
	CH ₄	%	41.2	42.9	57.4	53.4	42.2	45.7	46.3	47.5	47.0	51.0	48.2	42.5
	CO ₂	%	30.7	32.6	42.1	41.8	32.0	31.9	33.4	33.0	33.7	35.6	30.1	26.4
	O ₂	%	5.5	4.2	0.5	1.1	3.8	4.3	4.8	3.0	3.4	3.0	4.2	5.8
	BAL (N ₂)	%	22.6	20.3	0.0	3.7	22.0	18.1	15.5	16.5	15.9	10.4	17.5	25.3
	CO	PPM	18	19	37	30	20	15	12	5	0	0	5	2
	H ₂ S	PPM	19	32	47	33	21	15	22	33	48	47	38	52
	Vel Min	m/s	0.00	0.00	1.24	1.57	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vel Max	m/s	0.00	0.00	1.85	1.93	1.24	0.97	0.58	0.00	0.74	0.00	0.00	0.00
	Flow	CFM	0.00	0.00	14.60	16.54	9.54	4.58	2.74	0.00	3.50	0.00	0.00	0.00
	Temp	°C	6.4	5.3	16.4	20.8	21.4	34.4	38.6	30.9	35.1	21.4	18.1	12.4
	Comments		cracked	cracked	1/2T	1/2T	cracked	cracked	cracked	cracked	cracked	cracked	cracked	cracked
	2-17	Well	"H ₂ O	-2.47	-0.44	-0.58	-0.87	-0.84	-0.67	-0.03	-0.03	-0.02	-0.05	-0.24
Lateral		"H ₂ O	-11.67	-10.87	-6.70	-6.88	-7.58	-8.10	-7.72	-6.33	-4.40	-6.62	-7.61	-12.36
CH ₄		%	35.3	45.2	48.8	47.5	46.4	42.8	38.7	42.1	58.8	46.6	44.1	45.2
CO ₂		%	25.1	35.4	36.8	35.2	32.3	29.7	27.5	32.8	38.9	32.2	30.5	30.8
O ₂		%	7.5	3.5	1.6	2.0	3.8	5.4	6.4	5.5	0.4	4.0	4.8	5.8
BAL (N ₂)		%	32.1	15.9	12.8	15.3	17.5	22.1	27.4	19.6	1.9	17.2	20.6	18.2
CO		PPM	9	10	11	9	11	12	0	5	6	0	2	5
H ₂ S		PPM	3	10	5	9	12	7	15	12	6	15	11	12
Vel Min		m/s	-	0.00	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00
Vel Max		m/s	-	0.00	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00
Flow		CFM	-	0.00	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00
Temp		°C	-	10.8	14.7	15.9	18.6	-	-	-	24.3	25.8	18.6	12.0
Comments			closed	cracked	cracked	cracked	cracked	closed	closed	closed	cracked	cracked	cracked	cracked
2-18		Well	"H ₂ O	-0.68	-0.01	-0.11	-0.04	-0.02	-0.05	-0.03	-0.03	-0.02	-0.04	-0.03
	Lateral	"H ₂ O	-11.19	-10.57	-6.35	-6.46	-5.26	-6.48	-8.15	-6.95	-5.50	-5.95	-6.98	-8.69
	CH ₄	%	22.8	26.7	30.6	31.7	30.7	31.9	29.4	35.1	42.1	38.5	30.4	28.6
	CO ₂	%	16.8	31.4	30.6	29.6	28.5	26.5	29.0	30.8	32.5	30.2	28.4	27.4
	O ₂	%	14.2	5.2	4.3	5.6	4.8	4.8	5.7	3.1	3.0	3.4	4.6	5.8
	BAL (N ₂)	%	46.2	36.7	34.5	33.1	36.0	36.8	35.9	31.0	22.4	27.9	36.6	38.2
	CO	PPM	9	20	82	88	50	41	51	22	14	16	15	19
	H ₂ S	PPM	1	20	11	19	17	15	19	36	26	29	19	28
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
	3-19	Well	"H ₂ O	-0.06	-0.04	-0.06	-0.03	-0.04	-0.05	-0.02	-0.02	-0.04	-0.06	-0.05
Lateral		"H ₂ O	-11.28	-11.57	-7.02	-6.35	-5.68	-6.21	-6.28	-5.96	-4.94	-5.77	-6.37	-9.68
CH ₄		%	34.8	30.0	31.5	30.9	31.4	34.8	36.2	30.6	26.3	31.5	30.4	26.3
CO ₂		%	32.7	25.6	23.8	22.6	23.8	25.9	26.2	25.8	20.7	22.4	24.9	24.7
O ₂		%	4.9	3.2	3.8	8.7	7.2	4.8	8.0	7.1	9.3	11.5	10.9	10.5
BAL (N ₂)		%	27.6	41.2	40.9	37.8	37.6	34.5	29.6	36.5	43.7	34.6	33.8	38.5
CO		PPM	10	11	11	6	10	7	1	2	0	3	5	9
H ₂ S		PPM	17	11	14	16	14	19	29	33	29	15	10	12
Vel Min		m/s	-	-	-	-	-	-	-	-	-	-	-	-
Vel Max		m/s	-	-	-	-	-	-	-	-	-	-	-	-
Flow		CFM	-	-	-	-	-	-	-	-	-	-	-	-
Temp		°C	-	-	-	-	-	-	-	-	-	-	-	-
Comments			closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed

Table 2: Wellfield Monitoring Data

	<i>Units</i>	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
3-20	Well	"H ₂ O	-9.47	-7.36	-4.68	-5.47	-4.35	-3.54	-5.12	-1.24	-0.57	-0.11	-0.34	-0.67
	Lateral	"H ₂ O	-11.90	-11.38	-5.67	-6.97	-5.83	-4.98	-7.44	-6.39	-5.28	-7.86	-8.20	-12.57
	CH ₄	%	51.6	48.5	52.5	53.9	52.5	50.3	47.0	44.7	35.1	44.7	38.6	0.5
	CO ₂	%	25.7	26.4	39.4	38.5	39.1	36.5	35.1	30.6	27.2	33.3	30.4	0.1
	O ₂	%	2.4	3.0	1.4	2.3	1.5	2.0	3.5	4.1	6.7	7.8	10.2	21.6
	BAL (N ₂)	%	20.3	22.1	6.7	5.3	6.9	11.2	14.4	20.6	31.0	14.2	20.8	77.8
	CO	PPM	14	15	24	29	26	22	19	15	17	15	12	2
	H ₂ S	PPM	11	9	7	8	8	10	11	10	9	18	15	0
	Vel Min	m/s	3.54	2.34	3.12	3.27	2.67	2.18	2.14	1.27	0.55	0.00	0.00	frozen
	Vel Max	m/s	4.28	3.33	4.28	3.68	3.11	2.68	3.68	1.68	1.11	0.00	0.00	frozen
	Flow	CFM	36.95	26.79	34.96	32.84	27.31	22.96	27.50	13.94	7.84	0.00	0.00	-
	Temp	°C	12.7	8.4	15.7	18.4	19.2	25.1	29.6	27.3	28.6	17.5	17.5	frozen
	Comments		2	2	2	2	2	2	1	1/2T	cracked	cracked	cracked	closed
3-21	Well	"H ₂ O	0.14	-0.03	-0.01	-0.03	-0.04	-0.02	-0.01	-0.02	-0.03	-0.04	-0.04	-0.05
	Lateral	"H ₂ O	-9.34	-11.57	-7.36	-7.22	-6.21	-6.39	-7.97	-5.33	-5.15	-5.74	-6.98	-9.00
	CH ₄	%	37.2	22.3	19.1	20.5	24.6	20.4	12.7	14.8	15.0	21.2	20.1	23.1
	CO ₂	%	28.5	18.4	14.4	15.6	17.2	11.4	9.9	14.9	15.0	16.0	18.4	19.3
	O ₂	%	3.6	5.8	13.2	14.0	13.0	14.2	16.2	10.8	12.6	13.7	12.5	13.1
	BAL (N ₂)	%	30.7	53.5	53.3	49.9	45.2	54.0	61.2	59.5	57.4	49.1	49.0	44.5
	CO	PPM	5	4	4	5	9	2	0	2	1	4	5	5
	H ₂ S	PPM	4	4	1	3	9	4	0	2	4	3	5	1
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
3-22 well bore seal	Well	"H ₂ O	-7.68	-7.98	-6.74	-4.75	-4.78	-3.47	-4.78	-3.58	-2.47	-2.55	-3.05	-4.02
	Lateral	"H ₂ O	-12.47	-11.24	-9.78	-6.74	-6.10	-5.96	-8.69	-6.87	-4.02	-6.11	-6.37	-6.48
	CH ₄	%	56.8	55.1	54.7	52.1	48.1	54.9	55.7	56.7	58.2	47.0	48.1	50.0
	CO ₂	%	40.6	40.3	38.7	38.4	34.5	36.7	39.2	38.5	39.9	33.5	32.8	35.4
	O ₂	%	0.8	1.2	1.1	1.4	3.1	2.8	2.0	1.1	0.7	5.1	2.4	1.2
	BAL (N ₂)	%	1.8	3.4	5.5	8.1	14.3	5.6	3.1	3.7	1.2	14.4	16.7	13.4
	CO	PPM	24	29	14	24	36	28	47	40	30	22	20	25
	H ₂ S	PPM	43	59	41	96	40	45	69	70	76	49	57	31
	Vel Min	m/s	3.24	3.29	2.47	3.01	3.58	2.97	2.58	2.41	2.57	1.77	1.57	1.47
	Vel Max	m/s	4.01	3.68	3.25	3.68	4.01	3.67	3.06	2.66	2.99	2.31	2.35	1.98
	Flow	CFM	34.25	32.93	27.03	31.61	35.86	31.37	26.65	23.95	26.27	19.28	18.52	16.30
	Temp	°C	17.4	15.6	18.6	19.6	21.0	28.4	29.4	27.1	30.4	21.6	14.7	12.0
	Comments		2	2	2	1	1	2	2	2	2	1	1	1
3-23	Well	"H ₂ O	-7.93	-8.35	-7.45	-5.24	-4.87	-4.12	-2.17	-2.87	-1.47	-0.09	-0.06	-0.06
	Lateral	"H ₂ O	-12.81	-11.03	-10.39	-7.45	-5.17	-6.36	-6.32	-4.55	-3.91	-6.42	-6.58	-9.68
	CH ₄	%	50.3	50.8	51.5	52.6	53.4	37.5	40.5	39.3	35.4	31.2	30.9	28.1
	CO ₂	%	35.1	36.7	34.8	35.8	36.6	26.2	37.4	30.7	25.4	20.1	22.4	25.6
	O ₂	%	2.5	1.7	3.8	3.2	1.7	7.2	2.4	5.8	7.1	8.5	9.1	10.3
	BAL (N ₂)	%	12.1	10.8	9.9	8.4	8.3	29.1	19.7	24.2	32.1	40.2	37.6	36.0
	CO	PPM	11	9	19	10	15	1	16	10	0	8	15	12
	H ₂ S	PPM	33	31	41	57	71	194	120	147	173	173	147	102
	Vel Min	m/s	2.14	2.44	2.05	2.17	2.69	2.10	1.47	0.44	-	-	-	-
	Vel Max	m/s	2.37	3.14	3.21	2.66	3.02	2.68	1.96	1.22	-	-	-	-
	Flow	CFM	21.31	26.36	24.85	22.82	26.98	22.58	16.21	7.84	-	-	-	-
	Temp	°C	5.8	10.5	10.8	15.4	18.6	25.1	30.4	28.6	-	-	-	-
	Comments		2	2	2	2	2	1	1	1/2T	closed	closed	closed	closed

Table 2: Wellfield Monitoring Data

	<i>Units</i>	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
3-24	Well	"H ₂ O	-0.26	-0.04	-0.05	-0.03	0.02	-0.01	-0.03	-0.03	-0.02	-0.05	-0.04	-0.05
	Lateral	"H ₂ O	-12.52	-9.54	-8.33	-5.67	-3.44	-4.87	-7.37	-6.99	-4.04	-5.44	-6.57	-8.36
	CH ₄	%	46.1	35.6	30.4	26.7	24.3	25.9	26.1	29.8	30.0	28.4	26.8	25.4
	CO ₂	%	36.0	29.6	30.6	29.5	30.1	24.7	19.7	24.8	23.1	22.1	23.6	21.4
	O ₂	%	2.9	2.5	2.5	3.5	2.9	5.0	10.3	9.6	8.1	10.2	9.9	10.0
	BAL (N ₂)	%	15.0	32.3	36.5	40.3	42.7	44.4	43.9	35.8	38.8	39.3	39.7	43.2
	CO	PPM	12	18	10	15	10	14	19	20	22	17	15	19
	H ₂ S	PPM	99	101	19	45	22	133	328	244	282	255	167	203
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
3-25	Well	"H ₂ O	-8.44	-7.60	-2.98	-3.69	-3.47	-3.68	-4.75	-3.87	-2.47	-2.88	-4.69	-4.87
	Lateral	"H ₂ O	-12.71	-11.27	-8.47	-6.97	-7.01	-7.54	-6.82	-7.68	-4.73	-7.31	-8.47	-13.69
	CH ₄	%	31.6	39.7	45.9	49.0	49.1	51.5	51.9	47.5	43.8	52.2	54.0	42.1
	CO ₂	%	20.3	21.7	37.4	33.9	34.5	35.7	35.4	31.5	29.9	33.6	34.6	32.6
	O ₂	%	9.7	6.4	5.1	3.9	2.7	3.0	2.5	3.3	4.7	4.0	3.4	2.7
	BAL (N ₂)	%	38.4	32.2	11.6	13.2	13.7	9.8	10.2	17.7	21.6	10.2	8.0	22.6
	CO	PPM	2	8	15	10	15	10	0	5	0	2	4	5
	H ₂ S	PPM	40	55	52	42	26	84	105	88	110	119	101	69
	Vel Min	m/s	2.55	2.37	1.68	2.35	1.47	2.47	2.17	2.36	1.27	1.87	1.25	-
	Vel Max	m/s	2.96	3.02	1.90	2.66	2.03	2.99	2.64	3.64	1.66	2.38	1.60	-
	Flow	CFM	26.03	25.47	16.91	23.67	16.54	25.80	22.73	28.35	13.84	20.08	13.47	-
	Temp	°C	4.1	10.7	12.4	15.7	19.6	25.1	28.6	28.5	24.9	21.0	20.4	-
	Comments		2	1	1	1	1	1	1	1	1/2T	1/2T	1	frozen open
3-26	Well	"H ₂ O	-9.21	-7.63	-5.74	-4.21	-3.21	-2.57	-2.45	-2.47	-2.35	-0.02	-0.03	-0.03
	Lateral	"H ₂ O	-12.57	-10.28	-9.35	-5.96	-4.93	-5.97	-8.85	5.04	-5.92	-8.33	-6.87	-9.47
	CH ₄	%	51.9	50.8	51.9	51.8	52.3	49.5	43.6	45.8	46.0	30.7	32.4	31.5
	CO ₂	%	34.1	36.9	35.9	36.7	34.5	33.5	31.1	32.5	33.5	22.4	25.4	26.7
	O ₂	%	1.9	2.5	2.4	1.4	2.6	3.2	4.8	3.3	3.4	12.4	11.4	11.9
	BAL (N ₂)	%	12.1	9.8	9.8	10.1	10.6	13.8	20.5	18.4	17.1	34.5	30.8	29.9
	CO	PPM	10	12	18	15	11	5	2	5	3	3	5	9
	H ₂ S	PPM	10	17	14	22	30	100	143	128	173	95	84	64
	Vel Min	m/s	2.47	2.14	2.33	2.04	1.59	0.85	1.21	0.69	0.68	-	-	-
	Vel Max	m/s	3.65	2.93	2.87	2.56	2.04	1.64	1.69	1.47	1.33	-	-	-
	Flow	CFM	28.92	23.95	24.57	21.73	17.15	11.76	13.70	10.21	9.50	-	-	-
	Temp	°C	5.3	10.7	14.3	17.1	19.3	24.8	29.7	29.3	28.1	-	-	-
	Comments		2	2	2	2	2	1	1	1/2T	1/2T	closed	closed	closed
3-27 DP	Well	"H ₂ O	-0.02	-0.05	-0.03	-0.02	-0.14	-0.25	-0.65	-0.02	-0.01	-0.84	-0.57	-1.35
	Lateral	"H ₂ O	-10.33	-10.65	-9.14	-6.33	-5.72	-6.45	-7.31	-5.33	-4.87	-6.58	-8.11	-11.20
	CH ₄	%	41.5	32.4	36.8	35.9	39.4	35.1	32.1	40.5	49.2	48.0	45.3	0.6
	CO ₂	%	36.2	28.1	25.7	24.8	28.4	25.9	23.1	31.0	34.6	32.7	30.6	31.7
	O ₂	%	2.8	6.3	5.4	6.3	5.8	6.2	8.8	5.9	2.5	4.2	5.7	22.5
	BAL (N ₂)	%	19.5	33.2	32.1	33.0	26.4	32.8	36.0	22.6	13.7	15.1	18.4	45.2
	CO	PPM	14	18	10	15	12	5	2	5	3	3	5	0
	H ₂ S	PPM	26	22	11	33	50	55	70	54	87	95	106	0
	Vel Min	m/s	-	-	-	-	0.00	-	-	-	0.00	0.00	0.00	frozen
	Vel Max	m/s	-	-	-	-	0.00	-	-	-	0.00	0.00	0.00	frozen
	Flow	CFM	-	-	-	-	0.00	-	-	-	0.00	0.00	0.00	-
	Temp	°C	-	-	-	-	18.3	-	-	-	22.8	20.5	15.3	frozen
	Comments		closed	closed	closed	closed	cracked	closed	closed	closed	cracked	cracked	cracked	frozen open

Table 2: Wellfield Monitoring Data

	<i>Units</i>	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
3-28	Well	"H ₂ O	-0.04	-0.87	-0.07	-0.24	-0.47	-0.03	-0.02	-0.03	-0.02	-0.04	-0.05	
	Lateral	"H ₂ O	-12.39	-10.98	-9.41	-5.24	-5.29	-6.12	-7.99	-6.98	-5.13	-6.37	-6.94	-9.67
	CH ₄	%	22.4	47.4	43.7	45.9	44.7	24.9	24.8	25.1	20.4	22.7	23.4	21.4
	CO ₂	%	20.5	33.6	35.9	34.6	32.4	23.4	17.7	18.6	16.1	17.6	18.6	19.6
	O ₂	%	5.2	4.1	3.5	4.0	4.9	7.6	11.4	10.4	11.8	12.8	11.4	12.1
	BAL (N ₂)	%	51.9	14.9	16.9	15.5	18.0	44.1	46.1	45.9	51.7	46.9	46.6	46.9
	CO	PPM	5	4	9	8	10	5	3	4	1	2	5	9
	H ₂ S	PPM	28	22	44	55	63	51	69	47	68	55	47	67
	Vel Min	m/s	-	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-
	Vel Max	m/s	-	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-
	Flow	CFM	-	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-
	Temp	°C	-	8.5	10.9	14.3	19.3	-	-	-	-	-	-	-
	Comments		closed	cracked	cracked	cracked	cracked	closed	closed	closed	closed	closed	closed	closed
3-29 DP	Well	"H ₂ O	-0.08	-0.02	-0.03	-0.02	-0.01	-0.02	-0.03	-0.03	-0.02	-0.03	-0.03	
	Lateral	"H ₂ O	-11.96	-10.69	-8.43	-5.77	-4.24	-5.14	-6.93	-7.84	-6.40	-6.87	-7.45	-8.66
	CH ₄	%	25.9	19.4	15.4	17.6	16.5	14.9	10.6	20.3	29.3	28.1	26.9	27.6
	CO ₂	%	20.4	22.4	15.3	14.8	13.7	12.7	9.3	23.1	24.2	23.6	25.1	24.1
	O ₂	%	6.2	10.4	12.0	12.7	11.9	12.9	14.5	12.4	7.2	8.1	8.8	8.1
	BAL (N ₂)	%	47.5	47.8	57.3	54.9	57.9	59.5	65.6	44.2	39.3	40.2	39.2	40.2
	CO	PPM	8	14	8	10	5	7	5	8	4	5	7	10
	H ₂ S	PPM	15	9	12	12	15	16	14	10	11	15	19	18
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
3-30 DP	Well	"H ₂ O	-0.18	-0.04	-0.05	-0.12	-0.10	-0.05	-0.02	-0.02	-0.03	-0.02	-0.03	
	Lateral	"H ₂ O	-11.25	-10.47	-8.61	-5.62	-4.58	-5.69	-7.57	-6.71	-5.68	-6.39	-7.02	-9.47
	CH ₄	%	38.1	25.9	17.4	22.3	21.5	24.7	26.8	22.7	19.5	24.8	25.9	26.7
	CO ₂	%	32.0	14.6	19.6	18.4	19.9	20.9	22.2	18.6	15.9	14.2	15.3	15.0
	O ₂	%	2.9	6.3	5.4	8.6	7.3	8.4	8.9	10.5	11.0	10.0	9.4	8.9
	BAL (N ₂)	%	27.0	53.2	57.6	50.7	51.3	46.0	42.1	48.2	53.6	51.0	49.4	49.4
	CO	PPM	4	8	7	12	18	14	5	8	4	9	15	12
	H ₂ S	PPM	14	18	12	5	6	10	10	84	146	163	142	198
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
4-31	Well	"H ₂ O	-6.82	-7.36	-4.78	-4.55	-1.66	-2.14	-2.10	-1.99	-2.51	-1.54	-2.64	-1.24
	Lateral	"H ₂ O	-11.63	-10.06	-6.30	-7.26	-2.45	-4.69	-5.30	-6.42	-5.24	-6.05	-8.94	-11.65
	CH ₄	%	49.5	45.1	41.8	42.1	52.1	45.7	39.5	41.5	48.5	51.2	45.3	31.2
	CO ₂	%	33.8	30.9	31.1	30.6	38.0	31.9	29.2	28.4	25.6	36.3	35.1	20.3
	O ₂	%	3.3	4.1	4.8	3.9	2.1	3.8	5.4	6.8	4.5	2.3	3.9	8.6
	BAL (N ₂)	%	13.4	19.9	22.3	23.4	7.8	18.6	25.9	23.3	21.4	10.2	15.7	39.9
	CO	PPM	15	18	6	8	9	5	2	6	7	2	4	5
	H ₂ S	PPM	94	99	66	59	124	84	101	124	122	128	105	36
	Vel Min	m/s	1.24	1.57	0.78	0.96	1.47	1.28	0.00	1.88	1.75	1.25	1.02	-
	Vel Max	m/s	1.69	1.99	1.24	1.54	2.02	1.64	0.68	1.95	1.99	1.66	1.58	-
	Flow	CFM	13.84	16.82	9.54	11.81	16.49	13.80	3.21	18.10	17.67	13.75	12.28	-
	Temp	°C	6.8	10.7	14.3	15.9	18.6	25.7	34.1	29.5	26.5	25.6	21.5	-
	Comments		1	1	1/2T	1/2T	1	1	1/2T	1/2T	1/2T	1	1	closed

Table 2: Wellfield Monitoring Data

	Units	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
4-32	Well	"H ₂ O	-8.47	-9.78	-5.78	-5.97	-1.77	-2.14	-4.17	-4.15	-2.88	-3.54	-2.98	-3.66
	Lateral	"H ₂ O	-12.33	-11.69	-6.08	-6.94	-2.34	-4.21	-6.25	-5.44	-5.88	-5.59	-8.14	-10.27
	CH ₄	%	51.1	52.6	55.5	54.7	51.2	51.5	51.9	52.6	50.8	53.6	51.4	5.1
	CO ₂	%	32.8	31.1	41.7	40.1	39.0	37.2	39.0	35.9	36.5	39.4	38.6	4.2
	O ₂	%	1.2	2.0	0.7	0.8	1.8	1.5	1.5	2.1	2.9	1.4	1.5	22.0
	BAL (N ₂)	%	14.9	14.3	2.1	4.4	8.0	9.8	7.6	9.4	9.8	5.6	8.5	68.7
	CO	PPM	15	12	6	7	9	8	2	5	4	1	3	0
	H ₂ S	PPM	42	66	150	123	111	139	199	215	233	191	154	5
	Vel Min	m/s	3.66	2.47	4.58	3.47	1.11	1.57	2.34	2.66	2.55	2.11	2.17	frozen
	Vel Max	m/s	3.87	3.99	4.97	4.11	1.35	1.98	3.09	2.88	3.01	2.64	2.66	frozen
	Flow	CFM	35.58	30.52	45.12	35.81	11.62	16.77	25.66	26.17	26.27	22.44	22.82	-
	Temp	°C	2.5	5.5	15.0	19.6	20.1	30.1	34.7	34.1	29.5	21.5	14.2	frozen
	Comments		2	2	2	2	2	2	2	2	2	2	2	2
4-33	Well	"H ₂ O	-8.50	-5.78	-4.12	-2.47	-1.24	-2.69	-2.57	-0.94	-1.41	-0.47	-1.24	-3.00
	Lateral	"H ₂ O	-12.47	-10.28	-8.66	-4.88	-3.85	-5.14	-6.59	-6.41	-5.22	-7.12	-8.63	-12.40
	CH ₄	%	54.3	50.0	50.3	49.8	48.4	46.8	47.0	44.8	45.1	43.2	40.4	1.2
	CO ₂	%	35.6	37.8	36.8	36.1	33.4	32.9	31.4	32.5	29.4	28.8	25.8	0.1
	O ₂	%	1.3	2.8	2.4	2.7	3.2	3.8	3.9	5.4	8.7	5.2	6.1	19.6
	BAL (N ₂)	%	8.8	9.4	10.5	11.4	15.0	16.5	17.7	17.3	16.8	22.8	27.7	79.1
	CO	PPM	12	10	15	10	14	5	2	11	8	2	5	0
	H ₂ S	PPM	>500	>500	>500	>500	458	>500	>500	>500	>500	>500	>500	2
	Vel Min	m/s	2.01	1.59	2.44	1.88	2.03	2.58	2.14	0.00	0.00	0.00	0.00	-
	Vel Max	m/s	2.53	1.98	2.97	2.57	2.89	2.90	2.38	0.00	0.00	0.00	0.00	-
	Flow	CFM	21.45	16.87	25.56	21.02	23.25	25.89	21.36	0.00	0.00	0.00	0.00	-
	Temp	°C	6.3	10.8	12.4	17.0	19.3	31.7	36.1	35.2	26.8	23.5	22.0	-
	Comments		2	2	2	2	1	1	1/2T	cracked	cracked	cracked	cracked	frozen
4-34	Well	"H ₂ O	-0.05	0.01	-0.01	-0.02	-0.09	-0.51	-2.14	-1.95	-2.18	-2.14	-0.05	-0.04
	Lateral	"H ₂ O	-10.75	-10.95	-8.47	-4.78	-2.90	-4.12	-6.77	-5.88	-6.12	-5.11	-6.47	-8.65
	CH ₄	%	19.2	36.4	39.5	40.6	41.6	44.9	52.4	50.9	51.5	41.9	40.2	40.1
	CO ₂	%	32.4	25.1	28.1	29.4	29.8	30.1	36.0	32.5	36.4	30.3	28.6	24.8
	O ₂	%	6.3	8.6	5.5	5.1	4.2	3.8	1.7	2.5	3.1	5.1	6.2	6.9
	BAL (N ₂)	%	42.1	29.9	26.9	24.9	24.4	21.2	9.9	14.1	9.0	22.7	25.0	28.2
	CO	PPM	6	11	8	10	11	5	2	3	6	2	5	6
	H ₂ S	PPM	211	197	245	157	354	409	>500	>500	>500	>500	>500	>500
	Vel Min	m/s	-	-	-	-	0.00	0.00	2.47	1.57	2.15	-	-	-
	Vel Max	m/s	-	-	-	-	0.00	0.00	3.00	2.11	2.31	-	-	-
	Flow	CFM	-	-	-	-	0.00	0.00	25.84	17.39	21.07	-	-	-
	Temp	°C	-	-	-	-	19.3	19.3	34.7	29.5	24.5	34.7	-	-
	Comments		closed	closed	closed	closed	cracked	cracked	1/2T	1/2T	1/2T	closed	closed	closed
4-35 well bore seal	Well	"H ₂ O	0.11	0.06	0.03	0.07	0.05	0.03	-0.02	-0.02	-0.02	-0.03	-0.04	-0.03
	Lateral	"H ₂ O	-11.08	-9.45	-8.33	-5.63	-3.73	-4.21	-5.26	-5.97	-6.35	-5.30	-6.32	-8.63
	CH ₄	%	39.4	34.7	35.8	34.6	33.1	38.9	40.1	36.8	34.2	31.3	30.6	30.1
	CO ₂	%	34.2	28.6	27.3	28.1	27.5	29.1	28.7	27.3	24.9	23.5	24.8	26.4
	O ₂	%	4.0	4.5	4.1	4.5	5.4	4.8	4.8	5.6	7.1	8.3	9.0	8.5
	BAL (N ₂)	%	22.4	32.2	32.8	32.8	34.0	27.2	26.4	30.3	33.8	36.9	35.6	35.0
	CO	PPM	11	10	12	15	11	12	7	8	10	7	8	10
	H ₂ S	PPM	56	84	147	111	150	174	281	222	122	145	127	124
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed

Table 2: Wellfield Monitoring Data

	Units	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
4-36	Well	"H ₂ O	-	-	-	-	-	-	-	-	-	-	-	
	Lateral	"H ₂ O	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	
	CH ₄	%	-	-	-	-	-	-	-	-	-	-	-	
	CO ₂	%	-	-	-	-	-	-	-	-	-	-	-	
	O ₂	%	-	-	-	-	-	-	-	-	-	-	-	
	BAL (N ₂)	%	-	-	-	-	-	-	-	-	-	-	-	
	CO	PPM	-	-	-	-	-	-	-	-	-	-	-	
	H ₂ S	PPM	-	-	-	-	-	-	-	-	-	-	-	
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	
	Comments		NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	
4-37	Well	"H ₂ O	-0.04	-0.04	-0.05	-0.04	-0.05	-0.03	-0.02	-0.08	-0.15	-0.03	-0.04	
	Lateral	"H ₂ O	-12.47	-8.63	-5.99	-4.77	-2.64	-3.97	-4.43	-5.44	-6.22	-4.39	-6.35	-8.14
	CH ₄	%	39.5	22.5	18.4	5.7	3.7	4.2	5.7	5.0	4.9	4.5	12.5	8.6
	CO ₂	%	24.8	13.8	10.6	3.5	3.4	6.8	4.9	5.5	4.2	5.4	6.0	4.9
	O ₂	%	5.0	14.7	12.7	17.5	16.4	17.2	16.8	16.8	14.9	17.6	16.4	17.2
	BAL (N ₂)	%	30.7	49.0	58.3	73.3	76.5	71.8	72.6	72.7	76.0	72.5	65.1	69.3
	CO	PPM	10	9	8	5	4	4	1	8	7	4	5	9
	H ₂ S	PPM	26	6	4	5	4	11	51	23	16	19	14	14
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
5-38	Well	"H ₂ O	-0.05	-0.02	-0.03	-0.01	-0.01	-0.01	-0.02	-0.06	-0.04	-0.05	-0.04	-0.03
	Lateral	"H ₂ O	-11.23	-11.68	-6.87	-7.53	-5.32	-4.87	-4.03	-5.84	-5.84	-6.57	-6.54	-10.22
	CH ₄	%	41.0	33.6	34.7	29.6	30.1	31.9	32.2	30.2	28.4	26.3	27.9	25.8
	CO ₂	%	32.9	25.6	28.1	19.9	22.3	24.8	25.0	29.0	23.5	24.1	23.1	26.3
	O ₂	%	2.4	3.1	2.7	9.5	8.7	6.8	7.7	10.2	11.2	10.4	9.5	8.4
	BAL (N ₂)	%	23.7	37.7	34.5	41.0	38.9	36.5	35.1	30.6	36.9	39.2	39.5	39.5
	CO	PPM	12	12	11	10	11	8	7	12	10	2	5	2
	H ₂ S	PPM	36	30	25	10	5	15	61	41	25	14	14	10
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
5-39 well bore seal	Well	"H ₂ O	-7.44	-9.77	-5.44	5.67	-2.01	-1.57	-2.14	-2.54	-3.21	-1.54	-1.57	-1.24
	Lateral	"H ₂ O	-11.68	-11.27	-6.23	-7.14	-3.46	-3.21	-3.43	-5.84	-6.54	-5.64	-4.69	-3.21
	CH ₄	%	52.8	53.6	54.9	55.1	54.2	52.9	50.5	51.2	51.8	54.0	55.1	55.0
	CO ₂	%	39.7	35.2	38.6	37.4	38.3	36.7	35.4	30.5	32.5	38.5	37.6	35.6
	O ₂	%	1.8	1.9	1.7	2.1	1.3	2.1	3.0	4.5	3.5	1.5	1.4	2.7
	BAL (N ₂)	%	5.7	9.3	4.8	5.4	6.2	8.3	11.1	13.8	12.2	6.0	5.9	6.7
	CO	PPM	18	15	17	18	21	14	10	16	11	7	8	10
	H ₂ S	PPM	29	22	42	35	48	187	140	153	160	145	120	66
	Vel Min	m/s	2.69	2.47	3.47	3.67	2.34	2.14	2.14	1.88	2.01	2.10	1.96	1.02
	Vel Max	m/s	3.41	4.66	4.11	4.22	2.99	2.96	2.68	2.14	2.55	2.84	2.33	1.21
	Flow	CFM	28.82	33.69	35.81	37.28	25.18	24.10	22.76	18.99	21.54	23.34	20.27	10.54
	Temp	°C	4.6	5.9	14.3	18.3	22.4	34.7	36.1	30.5	28.4	26.4	24.1	14.3
	Comments		2	2	2	2	2	2	2	2	2	2	2	2

Table 2: Wellfield Monitoring Data

	<i>Units</i>	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
5-40	Well	"H ₂ O	-0.06	-0.02	-0.01	-0.02	-0.01	-0.02	-0.03	-0.01	-0.02	-0.03	-0.05	-0.03
	Lateral	"H ₂ O	-10.55	-9.66	-5.44	-4.32	-3.17	-4.21	-5.58	-5.48	-6.54	-5.69	-8.64	-9.34
	CH ₄	%	42.8	33.5	30.6	32.6	33.9	30.9	31.3	30.5	29.8	28.4	23.9	22.4
	CO ₂	%	32.9	28.7	29.6	28.5	26.7	26.4	26.1	25.4	21.2	20.3	17.5	15.6
	O ₂	%	2.5	5.4	8.4	4.9	6.2	5.9	6.7	8.7	9.4	9.1	10.8	12.4
	BAL (N ₂)	%	21.8	32.4	31.4	34.0	33.2	36.8	35.9	35.4	39.6	42.2	47.8	49.6
	CO	PPM	8	12	13	13	10	4	1	6	8	10	2	1
	H ₂ S	PPM	104	110	154	111	103	105	151	144	165	124	157	201
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
5-41	Well	"H ₂ O	0.38	-0.01	-0.11	-0.98	-0.68	-1.40	-1.98	-2.14	-1.58	-2.84	-3.47	-4.31
	Lateral	"H ₂ O	-10.27	-7.12	-7.60	-4.55	-2.93	-2.47	-3.11	-6.84	-5.84	-4.55	-5.44	-8.21
	CH ₄	%	39.6	40.6	42.1	45.7	46.6	54.8	57.2	56.4	57.4	57.9	55.4	32.1
	CO ₂	%	28.2	33.5	31.4	32.6	31.6	33.9	36.2	35.1	36.8	37.1	34.9	26.4
	O ₂	%	2.6	2.5	2.8	2.5	3.5	2.8	0.9	0.8	1.5	1.1	1.3	4.3
	BAL (N ₂)	%	29.6	23.4	23.7	19.2	18.3	8.5	5.7	7.7	4.3	3.9	8.4	37.2
	CO	PPM	8	9	7	11	11	9	2	9	7	2	5	5
	H ₂ S	PPM	44	54	100	144	181	222	426	430	354	410	369	154
	Vel Min	m/s	-	-	0.00	1.24	1.02	1.96	2.69	2.41	2.51	2.10	1.98	1.01
	Vel Max	m/s	-	-	0.00	1.55	1.47	2.57	2.79	2.99	3.10	2.14	2.33	1.54
	Flow	CFM	-	-	0.00	13.18	11.76	21.40	25.89	25.51	26.51	20.03	20.36	12.05
	Temp	°C	-	-	12.0	17.4	22.3	32.0	39.6	29.8	25.4	25.1	20.3	15.3
	Comments		closed	closed	cracked	1/2T	1/2T	1	1	1	1	2	2	1
5-42	Well	"H ₂ O	-3.61	-7.36	-5.96	-3.87	-3.61	-2.47	0.02	-0.15	-0.11	-0.04	-0.05	-0.03
	Lateral	"H ₂ O	-10.46	-10.39	-9.43	-5.93	-4.87	-3.97	-4.19	-5.84	-6.45	-5.69	-8.44	-10.57
	CH ₄	%	52.8	53.8	54.4	55.2	56.0	22.9	14.8	15.4	13.7	14.2	15.6	13.9
	CO ₂	%	30.7	35.4	36.4	38.6	39.3	14.8	10.7	11.5	13.5	12.0	10.8	9.4
	O ₂	%	3.5	2.8	2.8	1.4	0.8	5.8	14.3	16.4	12.5	14.7	15.8	14.7
	BAL (N ₂)	%	13.0	8.0	6.4	4.8	3.9	56.5	60.2	56.7	60.3	59.1	57.8	62.0
	CO	PPM	15	15	19	10	18	10	3	11	16	12	5	2
	H ₂ S	PPM	169	254	305	247	317	69	88	92	87	55	19	19
	Vel Min	m/s	2.69	1.68	2.66	2.04	1.47	-	-	-	-	-	-	-
	Vel Max	m/s	3.01	2.24	3.25	2.55	1.96	-	-	-	-	-	-	-
	Flow	CFM	26.93	18.52	27.92	21.69	16.21	-	-	-	-	-	-	-
	Temp	°C	5.8	10.9	12.8	17.3	18.3	-	-	-	-	-	-	-
	Comments		20%	2%	2%	2%	2%	closed	closed	closed	closed	closed	closed	closed
5-43	Well	"H ₂ O	-0.22	-0.33	-4.78	-4.51	-1.14	-1.54	-1.59	-2.01	-1.58	-1.74	-1.69	-2.14
	Lateral	"H ₂ O	-10.86	-10.33	-5.61	-6.02	-3.23	-4.02	-4.22	-5.84	-6.74	-4.44	-6.32	-10.33
	CH ₄	%	40.5	47.3	53.1	52.3	48.7	49.0	48.9	47.5	48.1	54.8	50.7	46.9
	CO ₂	%	26.1	32.6	36.1	35.9	33.6	32.6	31.7	30.5	33.2	36.6	34.2	30.7
	O ₂	%	1.8	2.3	2.2	2.4	3.1	3.5	3.9	4.5	2.5	1.7	2.9	5.2
	BAL (N ₂)	%	31.6	17.8	8.6	9.4	14.6	14.9	15.5	17.5	16.2	6.9	12.2	17.2
	CO	PPM	5	8	7	9	11	9	4	9	11	3	5	9
	H ₂ S	PPM	68	65	108	95	25	140	164	121	94	166	127	102
	Vel Min	m/s	-	0.00	2.45	1.96	1.05	1.54	1.34	1.64	1.28	1.84	1.24	-
	Vel Max	m/s	-	0.00	3.77	2.58	1.24	2.01	1.69	2.11	1.66	2.14	1.98	-
	Flow	CFM	-	0.00	29.39	21.45	10.82	16.77	14.32	17.72	13.89	18.80	15.21	-
	Temp	°C	-	10.7	12.0	15.4	25.1	35.1	36.8	29.4	25.2	24.1	17.5	-
	Comments		closed	cracked	1	1	1	1	1	1	1	1	1	1

Table 2: Wellfield Monitoring Data

	Units	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
5-44	Well	"H ₂ O	0.02	-0.03	-0.01	-0.29	-0.87	-0.57	-0.69	-0.84	-0.38	-0.75	-0.60	-0.98
	Lateral	"H ₂ O	-6.91	-8.63	-6.78	-6.30	-2.05	-3.09	-3.78	-5.84	-6.88	-3.30	-5.14	-8.66
	CH ₄	%	49.6	42.0	41.8	43.2	47.9	48.9	52.1	48.5	47.2	45.5	40.6	26.4
	CO ₂	%	37.9	35.9	31.6	32.9	33.9	35.9	38.0	36.5	38.4	35.6	32.4	24.1
	O ₂	%	2.7	3.3	3.0	4.5	2.2	1.1	0.7	1.2	2.5	3.2	2.9	5.9
	BAL (N ₂)	%	9.8	18.8	23.6	19.4	16.0	14.1	9.2	13.8	11.9	15.7	24.1	43.6
	CO	PPM	6	5	12	21	11	8	2	15	8	3	5	2
	H ₂ S	PPM	>500	>500	>500	318	>500	>500	>500	>500	>500	468	347	301
	Vel Min	m/s	-	-	-	0.00	0.00	0.00	0.00	1.87	1.48	2.11	1.28	-
	Vel Max	m/s	-	-	-	0.00	0.00	0.00	0.00	2.01	1.85	2.79	1.66	-
	Flow	CFM	-	-	-	0.00	0.00	0.00	0.00	18.33	15.73	23.15	13.89	-
	Temp	°C	-	-	-	5.7	14.6	32.1	36.7	32.1	29.4	25.3	20.1	-
	Comments		closed	closed	closed	cracked	1/2T	1/2T	1	1/2T	1/2T	1/2T	1/2T	closed
5-45	Well	"H ₂ O	-2.01	-3.65	-0.02	-0.02	0.01	-0.01	-0.02	-0.12	-0.16	-0.05	-0.05	-0.03
	Lateral	"H ₂ O	-11.67	-10.54	-6.23	-5.98	-4.17	-4.87	-6.03	-5.45	-6.10	-5.37	-6.99	-8.14
	CH ₄	%	49.8	33.0	25.9	26.3	28.6	24.9	33.8	34.5	30.1	24.6	28.4	1.2
	CO ₂	%	30.4	31.6	22.5	24.6	25.7	26.9	28.4	21.5	26.5	29.4	28.6	0.5
	O ₂	%	2.3	2.5	3.1	4.4	4.1	3.8	5.4	6.5	7.2	5.7	2.8	17.5
	BAL (N ₂)	%	17.5	32.9	48.5	44.7	41.6	44.4	32.4	37.5	36.2	40.3	40.2	80.8
	CO	PPM	5	4	8	7	10	8	2	6	11	5	2	0
	H ₂ S	PPM	89	52	22	19	24	27	48	54	42	10	15	20
	Vel Min	m/s	0.67	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	1.25	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	9.07	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	4.8	-	-	-	-	-	-	-	-	-	-	-
	Comments		1/2T	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	frozen
5-46	Well	"H ₂ O	-0.68	-0.03	-0.04	-0.09	-0.05	-0.02	-0.02	-0.03	-0.14	-0.05	-0.09	-0.08
	Lateral	"H ₂ O	-10.27	-10.53	-8.63	-5.12	-4.35	-4.21	-5.97	-5.44	-6.20	-6.33	-7.54	-10.47
	CH ₄	%	6.9	1.6	2.2	1.4	0.7	2.9	10.0	13.5	12.4	15.4	12.9	11.3
	CO ₂	%	5.9	6.2	4.1	2.4	2.0	4.1	8.2	6.5	11.5	12.4	13.5	14.9
	O ₂	%	15.4	18.5	16.3	17.4	17.7	16.8	15.5	16.5	13.5	14.3	15.7	14.8
	BAL (N ₂)	%	71.8	73.7	77.4	78.8	79.6	76.2	66.3	63.5	62.6	57.9	57.9	59.0
	CO	PPM	3	4	9	9	5	4	5	8	9	8	10	5
	H ₂ S	PPM	0	2	9	4	9	1	1	12	13	15	24	10
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
6-47	Well	"H ₂ O	-7.12	-6.89	-5.33	-3.24	-1.45	-3.45	-0.45	-0.48	-0.84	-0.45	-0.66	-0.88
	Lateral	"H ₂ O	-11.54	-11.69	-6.21	-6.71	-2.35	-4.77	-4.28	-5.84	-5.15	-5.71	-8.62	-10.68
	CH ₄	%	52.6	48.1	34.0	43.9	52.4	39.6	40.1	47.5	43.8	55.9	45.1	43.5
	CO ₂	%	32.6	27.9	22.4	28.8	35.9	27.8	33.9	35.4	31.2	35.6	27.1	26.1
	O ₂	%	1.9	2.3	8.0	5.3	2.0	6.1	2.5	3.1	1.8	1.5	2.4	6.2
	BAL (N ₂)	%	12.9	21.7	35.6	22.0	9.7	26.5	23.5	14.0	23.2	7.0	25.4	24.2
	CO	PPM	8	9	5	6	10	1	18	17	16	1	2	5
	H ₂ S	PPM	29	30	38	38	76	133	147	154	174	87	41	77
	Vel Min	m/s	2.69	3.36	1.22	1.06	1.65	1.02	0.00	1.11	1.31	1.99	1.22	1.02
	Vel Max	m/s	3.61	3.87	1.68	1.62	1.96	1.42	0.00	1.21	1.51	2.84	1.68	1.33
	Flow	CFM	29.77	34.16	13.70	12.66	17.06	11.53	0.00	10.96	13.32	22.82	13.70	11.10
	Temp	°C	5.9	9.4	10.3	15.3	24.7	29.4	35.1	29.8	24.8	22.1	18.4	15.0
	Comments		2T	2T	1T	1T	2	1/2T	1/2T	1/2T	1/2T	1	1	1

Table 2: Wellfield Monitoring Data

	<i>Units</i>	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
6-48	Well	"H ₂ O	-3.57	-5.69	-2.47	-3.14	-1.04	-0.57	-0.47	-0.02	-0.08	-0.05	-0.04	-0.04
	Lateral	"H ₂ O	-9.68	-10.69	-5.93	-6.48	-2.09	-4.12	-4.41	-5.84	-6.54	-8.12	-11.39	-12.44
	CH ₄	%	46.0	49.2	58.0	56.4	38.4	40.1	24.9	29.5	22.4	24.5	23.9	22.0
	CO ₂	%	31.8	30.6	32.3	30.8	25.8	26.7	13.5	15.4	16.5	16.5	17.1	15.8
	O ₂	%	2.8	2.4	1.1	1.8	3.0	2.1	11.3	10.2	11.5	10.2	11.3	11.8
	BAL (N ₂)	%	19.4	17.8	8.6	11.0	32.8	31.1	50.3	44.9	49.6	48.8	47.7	50.4
	CO	PPM	11	10	8	10	11	15	1	3	5	3	3	3
	H ₂ S	PPM	11	20	35	26	23	24	15	20	22	15	10	14
	Vel Min	m/s	0.00	0.00	1.24	1.58	0.00	0.00	-	-	-	-	-	-
	Vel Max	m/s	0.00	0.00	1.58	1.98	0.00	0.00	-	-	-	-	-	-
	Flow	CFM	0.00	0.00	13.32	16.82	0.00	0.00	-	-	-	-	-	-
	Temp	°C	5.2	9.6	13.6	16.2	19.6	22.4	-	-	-	-	-	-
	Comments		1/2T	1/2T	1T	1T	cracked	cracked	closed	closed	closed	closed	closed	closed
	6-49	Well	"H ₂ O	-2.11	-4.57	-2.68	-3.47	-2.68	-2.47	-0.64	-0.54	-0.84	-0.57	-1.87
Lateral		"H ₂ O	-9.78	-10.69	-6.47	-6.08	-4.26	-5.69	-4.59	-5.84	-6.11	-4.90	-5.99	-8.47
CH ₄		%	47.7	48.2	51.4	52.0	47.2	45.8	37.0	40.2	42.5	54.5	55.4	54.9
CO ₂		%	35.8	33.0	34.8	36.6	33.6	31.7	26.3	28.4	24.1	36.8	34.0	34.9
O ₂		%	1.4	1.2	1.5	1.7	2.1	3.6	6.4	8.4	4.9	1.2	1.3	1.4
BAL (N ₂)		%	15.1	17.6	12.3	9.7	17.1	18.9	30.3	23.0	28.5	7.5	9.3	8.8
CO		PPM	8	10	11	10	12	5	3	4	9	3	7	5
H ₂ S		PPM	211	188	325	413	236	321	433	420	388	169	147	201
Vel Min		m/s	1.99	1.47	1.97	2.17	2.44	1.14	0.00	0.00	0.00	1.41	1.57	1.87
Vel Max		m/s	3.57	2.33	2.44	2.55	2.93	1.57	0.00	0.00	0.00	1.55	1.96	2.14
Flow		CFM	26.27	17.95	20.84	22.30	25.37	12.80	0.00	0.00	0.00	13.99	16.68	18.95
Temp		°C	9.1	5.7	12.4	16.7	17.8	25.7	36.1	35.1	29.5	21.5	20.6	14.2
Comments			1T	1T	1T	1T	1/2T	1/2T	cracked	cracked	cracked	1/2T	1T	1T
6-50		Well	"H ₂ O	-0.05	-0.04	-0.05	-0.02	-0.03	-0.03	-0.02	-0.05	-0.01	-0.03	-0.02
	Lateral	"H ₂ O	-8.65	-7.22	-4.83	-3.89	-3.55	-4.12	-2.57	-5.85	-6.44	-5.38	-4.68	-5.32
	CH ₄	%	44.5	22.0	15.8	9.7	10.6	12.8	14.3	13.8	20.4	12.8	8.1	9.6
	CO ₂	%	32.9	16.3	6.9	7.6	9.6	9.9	10.5	11.5	13.7	10.4	6.3	5.1
	O ₂	%	2.5	10.7	15.3	17.3	16.4	15.4	15.9	16.2	12.5	16.0	15.3	19.4
	BAL (N ₂)	%	20.1	51.0	62.0	65.4	63.4	61.9	59.3	58.5	53.4	60.8	70.3	65.9
	CO	PPM	9	14	11	10	4	5	4	6	8	1	2	1
	H ₂ S	PPM	93	99	19	0	2	5	2	3	5	0	0	1
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
	6-51	Well	"H ₂ O	-0.05	-0.02	-0.06	-0.07	-0.02	-1.44	-0.68	-0.54	-0.61	-0.84	-1.47
Lateral		"H ₂ O	-10.48	-10.25	-8.44	-4.21	-3.20	-5.67	-4.34	-5.48	-5.31	-4.82	-5.33	-8.12
CH ₄		%	36.1	37.4	38.4	40.6	37.4	40.2	37.4	37.5	42.5	54.4	52.0	37.5
CO ₂		%	36.2	35.4	36.7	33.8	35.3	33.9	31.4	33.5	32.5	39.4	38.2	21.5
O ₂		%	1.0	1.8	1.7	1.4	1.8	2.0	3.6	4.1	3.5	1.5	2.2	9.3
BAL (N ₂)		%	26.7	25.4	23.2	24.2	23.8	23.9	26.9	24.9	21.5	4.7	7.6	31.7
CO		PPM	12	15	19	20	23	15	7	9	11	5	9	4
H ₂ S		PPM	45	15	55	27	49	99	84	90	81	43	61	66
Vel Min		m/s	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vel Max		m/s	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flow		CFM	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp		°C	-	-	-	10.9	12.8	26.4	36.4	33.2	27.5	23.5	14.8	11.8
Comments			closed	closed	closed	cracked	1/2T	1/2T	cracked	cracked	cracked	1/2T	1/2T	frozen open

Table 2: Wellfield Monitoring Data

			25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21
6-52	Well	"H ₂ O	-0.01	-	-0.03	-0.02	0.02	-0.01	-0.02	-0.05	0.01	-0.03	-0.02	-0.01
	Lateral	"H ₂ O	-11.69	-9.64	-6.54	-4.87	-3.65	-4.49	-4.49	-5.45	-5.88	-6.14	-9.64	-11.37
	CH ₄	%	31.6	31.5	30.6	31.4	30.1	28.3	34.0	32.5	31.5	22.4	12.3	11.4
	CO ₂	%	26.8	24.1	24.0	26.1	25.0	25.1	26.9	32.1	30.2	25.1	15.7	12.8
	O ₂	%	5.8	4.3	4.8	5.1	8.0	5.3	4.7	5.4	3.5	5.4	10.0	18.3
	BAL (N ₂)	%	35.8	40.1	40.6	37.4	36.9	41.3	34.4	30.0	34.8	47.1	62.0	57.5
	CO	PPM	5	6	4	9	10	5	3	5	6	2	1	0
	H ₂ S	PPM	10	6	8	15	12	5	2	2	3	2	2	0
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
6-53	Well	"H ₂ O	-1.54	-1.36	-2.34	-2.68	-2.59	-2.47	-1.57	-1.44	-1.84	-1.64	-2.47	-3.47
	Lateral	"H ₂ O	-10.39	-8.66	-8.47	-5.47	-4.54	-4.89	-3.00	-5.44	-6.84	-4.13	-8.47	-11.60
	CH ₄	%	45.6	50.4	54.8	61.5	62.5	54.2	46.8	48.7	49.5	60.3	59.3	58.9
	CO ₂	%	29.1	33.5	39.4	37.8	36.6	35.9	32.8	33.5	31.4	37.6	37.0	38.2
	O ₂	%	1.4	1.8	1.2	0.7	0.9	1.4	0.6	0.5	1.2	0.4	0.8	1.5
	BAL (N ₂)	%	23.9	14.3	4.6	0.0	0.0	8.5	19.8	17.3	17.9	1.7	2.9	1.4
	CO	PPM	19	18	10	15	13	15	6	8	11	2	5	3
	H ₂ S	PPM	>500	>500	>500	>500	382	421	>500	>500	>500	21	128	>500
	Vel Min	m/s	1.22	0.58	1.24	2.17	2.48	2.11	1.24	1.55	1.45	1.66	1.96	2.00
	Vel Max	m/s	1.76	0.97	1.58	2.55	3.22	2.57	1.69	1.69	1.99	1.88	2.47	2.34
	Flow	CFM	14.08	7.32	13.32	22.30	26.93	22.11	13.84	15.31	16.25	16.73	20.93	20.51
	Temp	°C	5.5	6.6	9.6	12.9	17.9	28.6	34.7	29.8	28.5	24.1	20.8	16.3
	Comments		1/2T	1/2T	1	2	2	2	2	1	1	2	2	2
6-54	Well	"H ₂ O	-1.47	-1.59	-1.20	-1.47	-1.22	-1.34	-1.17	-1.84	-1.64	-1.17	-1.24	-
	Lateral	"H ₂ O	-11.63	-10.57	Surging	Surging	Surging	Surging	Surging	Surging	Surging	Surging	-10.14	-13.47
	CH ₄	%	43.2	44.1	49.5	55.7	59.5	58.4	50.3	52.4	51.5	45.8	39.1	1.2
	CO ₂	%	32.6	34.8	33.9	38.1	39.3	38.1	35.7	36.8	34.8	31.8	28.4	0.4
	O ₂	%	3.0	3.2	1.7	1.2	0.4	0.8	1.9	2.5	1.8	3.3	1.7	22.9
	BAL (N ₂)	%	21.2	17.9	14.9	5.0	0.8	2.7	12.1	8.3	11.9	19.1	30.8	75.5
	CO	PPM	15	17	19	10	11	15	3	5	9	2	5	1
	H ₂ S	PPM	167	104	144	99	90	68	233	212	251	52	17	1
	Vel Min	m/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
	Vel Max	m/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
	Flow	CFM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
	Temp	°C	0.0	0.0	0.0	0.0	15.8	25.4	31.4	29.8	26.5	22.1	15.2	-
	Comments		1/2T	1/2T	1/2T	1	1	1	1	1	1	1/2T	1/2T	frozen
6-55	Well	"H ₂ O	-3.67	-4.12	-4.61	-2.00	-3.69	-1.24	-1.69	-1.84	-1.55	-1.99	-1.87	-3.47
	Lateral	"H ₂ O	-9.64	-10.68	-8.47	-5.44	-5.57	-3.19	-2.24	-5.48	-5.31	-2.99	-6.95	-10.35
	CH ₄	%	42.1	47.6	49.1	58.4	60.6	55.6	53.1	55.4	53.1	58.8	55.9	52.3
	CO ₂	%	31.9	39.6	38.0	40.3	39.4	38.6	37.7	36.2	37.8	39.0	36.4	35.2
	O ₂	%	4.0	3.4	4.2	0.4	0.0	0.2	0.5	0.6	2.9	0.3	1.5	2.5
	BAL (N ₂)	%	22.0	9.4	8.7	0.9	0.0	5.6	8.7	7.8	6.2	1.9	6.2	10.0
	CO	PPM	9	10	9	12	15	10	5	9	6	3	8	5
	H ₂ S	PPM	>500	>500	>500	>500	>500	>500	>500	>500	>500	98	255	>500
	Vel Min	m/s	3.64	3.66	2.11	2.01	2.47	1.36	1.24	1.99	1.55	2.55	1.54	2.01
	Vel Max	m/s	4.22	3.87	2.47	2.34	2.98	2.05	1.83	2.88	1.95	2.95	2.03	2.66
	Flow	CFM	37.14	35.58	21.64	20.55	25.75	16.11	14.50	23.01	16.54	25.99	16.87	22.06
	Temp	°C	3.6	5.9	9.2	10.9	14.8	28.4	35.4	29.8	26.5	26.4	18.6	15.6
	Comments		1T	1T	1T	2	2	2	2	2	2	2	2	2

Table 2: Wellfield Monitoring Data

	Units	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
6-56	Well	"H ₂ O	0.11	-0.01	0.01	-0.01	-0.04	-0.02	-0.03	-0.02	0.01	0.02	0.04	0.03
	Lateral	"H ₂ O	-9.15	-7.41	-8.77	-4.57	-3.97	NLV	NLV	NLV	NLV	NLV	NLV	NLV
	CH ₄	%	32.2	17.4	14.7	16.9	12.7	15.6	19.6	21.2	22.2	25.3	21.4	20.1
	CO ₂	%	28.6	20.1	19.7	15.7	13.8	14.9	17.4	16.7	15.4	17.4	19.6	18.9
	O ₂	%	3.3	2.2	2.4	5.5	6.8	8.4	7.3	8.4	6.5	8.9	9.2	9.1
	BAL (N ₂)	%	35.9	60.3	63.2	61.9	66.7	61.1	55.7	53.7	55.9	48.4	49.8	51.9
	CO	PPM	9	10	14	20	26	15	10	15	12	15	11	10
	H ₂ S	PPM	>500	>500	>500	>500	4	9	3	6	5	4	6	6
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
	6-57	Well	"H ₂ O	0.06	-0.04	-0.02	-0.05	-0.02	-0.05	-0.02	-0.06	-0.05	-0.04	-0.05
Lateral		"H ₂ O	-9.33	-9.66	-8.47	-5.12	-4.96	-6.39	-10.32	-5.54	-6.64	-7.68	-8.66	-10.78
CH ₄		%	32.8	29.7	28.7	30.2	29.0	15.9	11.3	10.8	19.5	17.5	19.6	18.4
CO ₂		%	24.3	26.8	25.2	26.3	25.4	19.5	17.8	22.5	21.5	20.1	22.6	23.4
O ₂		%	4.2	3.4	4.3	2.3	2.1	3.3	4.3	5.5	6.4	6.5	7.2	8.9
BAL (N ₂)		%	38.7	40.1	41.8	41.2	43.5	61.3	66.6	61.2	52.6	55.9	50.6	49.3
CO		PPM	15	14	10	19	17	15	7	11	22	15	14	10
H ₂ S		PPM	27	19	30	28	18	28	15	20	28	24	29	17
Vel Min		m/s	-	-	-	-	-	-	-	-	-	-	-	-
Vel Max		m/s	-	-	-	-	-	-	-	-	-	-	-	-
Flow		CFM	-	-	-	-	-	-	-	-	-	-	-	-
Temp		°C	-	-	-	-	-	-	-	-	-	-	-	-
Comments			closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
6-58		Well	"H ₂ O	-0.03	-0.05	-0.03	-0.02	-0.01	-0.02	-0.03	0.01	-0.02	-0.03	-0.03
	Lateral	"H ₂ O	-9.15	-7.86	-8.47	-5.78	-4.10	-6.47	-9.50	-5.33	-4.88	-5.68	-8.21	-10.85
	CH ₄	%	31.1	30.9	31.0	32.8	33.8	24.9	22.8	21.8	23.5	24.6	23.8	22.9
	CO ₂	%	24.3	30.9	28.3	27.9	25.5	23.9	21.1	20.5	23.8	25.3	25.7	24.1
	O ₂	%	2.8	1.6	2.0	1.9	2.8	4.3	5.0	4.5	6.5	6.6	7.2	8.8
	BAL (N ₂)	%	41.8	36.6	38.7	37.4	37.9	46.9	51.1	53.2	46.2	43.5	43.3	44.2
	CO	PPM	29	22	20	19	16	15	13	15	16	12	10	18
	H ₂ S	PPM	15	19	33	56	87	101	133	152	163	147	122	101
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
	6-59	Well	"H ₂ O	-0.50	-1.98	-1.25	-1.47	-1.24	-1.57	-2.47	-0.06	-0.08	-0.05	-0.04
Lateral		"H ₂ O	-9.27	-10.57	-8.66	-5.84	-4.81	-6.47	-10.25	-5.52	-4.35	-5.67	-6.66	-8.47
CH ₄		%	42.5	45.9	48.3	42.8	37.6	35.4	30.9	22.5	16.5	17.6	19.2	18.4
CO ₂		%	31.9	32.6	35.6	36.9	27.9	29.6	22.3	20.5	21.5	22.3	23.7	21.0
O ₂		%	2.2	2.8	3.0	1.8	2.9	3.4	6.4	7.5	8.4	9.6	9.9	8.7
BAL (N ₂)		%	23.4	18.7	13.1	18.5	31.6	31.6	40.4	49.5	53.6	50.5	47.2	51.9
CO		PPM	15	10	15	12	16	12	6	8	10	8	12	15
H ₂ S		PPM	15	17	30	40	36	47	50	66	64	66	51	72
Vel Min		m/s	1.55	0.78	1.22	1.54	0.00	0.00	-	-	-	-	-	-
Vel Max		m/s	2.03	1.22	1.67	1.96	0.00	0.00	-	-	-	-	-	-
Flow		CFM	16.91	9.45	13.65	16.54	0.00	0.00	-	-	-	-	-	-
Temp		°C	4.8	5.5	6.3	10.5	14.3	24.8	-	-	-	-	-	-
Comments			cracked	cracked	cracked	1	1/2T	cracked	closed	closed	closed	closed	closed	closed

Table 2: Wellfield Monitoring Data

	Units	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
7-60	Well	"H ₂ O	-6.34	-7.30	-5.47	-5.67	-1.02	-2.47	-3.25	-3.25	-3.68	-2.47	-2.57	-1.57
	Lateral	"H ₂ O	-9.22	-10.89	-6.53	-7.02	-1.11	-6.35	-4.10	-5.27	-5.47	-5.27	-6.11	-6.33
	CH ₄	%	55.6	54.3	51.8	52.6	64.0	42.6	36.1	35.6	37.2	35.8	30.9	20.1
	CO ₂	%	30.4	29.4	27.8	26.4	32.7	30.9	25.2	24.1	23.1	24.7	22.1	10.1
	O ₂	%	1.1	1.5	3.5	2.8	0.5	1.1	1.2	1.5	1.8	1.1	2.5	14.8
	BAL (N ₂)	%	12.9	14.8	16.9	18.2	2.8	25.4	37.5	38.8	37.9	38.4	44.5	55.0
	CO	PPM	10	8	8	10	12	5	2	5	5	5	3	0
	H ₂ S	PPM	24	23	33	28	15	22	47	30	56	69	32	10
	Vel Min	m/s	4.33	3.08	3.47	4.57	1.14	1.67	1.69	1.24	1.33	1.07	0.87	1.27
	Vel Max	m/s	5.11	4.58	4.01	5.66	1.55	2.11	2.51	1.96	1.98	2.33	1.64	2.14
	Flow	CFM	44.60	36.19	35.34	48.33	12.71	17.86	19.84	15.12	15.64	16.06	11.86	16.11
	Temp	°C	5.5	10.1	16.3	18.4	19.0	26.1	29.3	28.4	24.7	23.1	18.4	8.8
	Comments		2	2	2	2	2	1	1/2T	1/2T	1/2T	1/2T	1/2T	frozen open
	7-61	Well	"H ₂ O	-3.67	-2.34	-3.01	-2.47	-2.31	-2.45	-1.35	-2.57	-2.34	-2.47	-1.24
Lateral		"H ₂ O	-4.23	-4.21	-4.26	-3.14	-4.00	-3.96	-2.31	-5.69	-4.74	-5.12	-5.14	-6.24
CH ₄		%	54.7	53.2	55.3	55.5	57.5	54.2	55.2	55.3	55.9	54.7	53.7	53.8
CO ₂		%	45.1	44.9	44.2	43.2	39.6	38.6	40.8	35.9	36.1	37.6	38.1	33.2
O ₂		%	0.2	0.8	0.3	0.5	0.3	0.8	0.7	0.8	1.0	1.3	1.2	2.0
BAL (N ₂)		%	0.0	1.1	0.2	0.8	2.6	6.4	3.3	8.0	7.0	6.4	7.0	11.0
CO		PPM	41	50	33	45	36	41	36	40	30	24	35	41
H ₂ S		PPM	258	214	199	269	>500	>500	>500	>500	>500	>500	>500	>500
Vel Min		m/s	1.47	2.14	2.01	2.08	1.47	2.03	2.45	1.57	1.47	1.57	2.01	1.23
Vel Max		m/s	1.98	2.66	2.25	2.66	1.98	2.69	3.11	2.03	1.66	1.90	2.65	1.55
Flow		CFM	16.30	22.68	20.13	22.40	16.30	22.30	26.27	17.01	14.79	16.39	22.02	13.13
Temp		°C	6.1	10.4	15.4	17.5	6.1	25.7	32.4	33.6	29.4	24.7	22.7	20.1
Comments			2	2	2	2	2	2	2	2	2	2	2	frozen open
7-62		Well	"H ₂ O	-4.68	-4.44	-3.44	-2.11	-3.69	-2.18	-1.57	-2.04	-1.25	-2.14	-1.66
	Lateral	"H ₂ O	-11.04	-10.57	-8.61	-5.14	-5.31	-3.87	-1.61	-6.47	-2.57	-4.33	-3.57	-2.57
	CH ₄	%	57.0	56.2	55.3	56.3	56.2	55.1	51.7	51.8	50.9	52.9	50.9	52.6
	CO ₂	%	40.5	41.4	41.5	38.4	39.2	39.6	36.7	36.4	38.5	37.1	33.2	33.8
	O ₂	%	2.5	2.3	2.5	1.5	1.8	1.8	1.7	1.4	2.3	2.2	1.8	1.4
	BAL (N ₂)	%	0.0	0.1	0.7	3.8	2.8	3.5	9.9	10.4	8.3	7.8	14.1	12.2
	CO	PPM	23	55	29	17	22	15	0	9	1	2	8	5
	H ₂ S	PPM	119	124	111	157	134	267	>500	>500	>500	>500	>500	>500
	Vel Min	m/s	2.34	2.14	2.47	2.14	2.00	1.59	1.14	1.45	1.21	1.67	1.23	1.14
	Vel Max	m/s	3.11	2.97	3.01	2.36	2.68	2.11	1.25	1.98	1.36	2.11	1.99	1.68
	Flow	CFM	25.75	24.14	25.89	21.26	22.11	17.48	11.29	16.21	12.14	17.86	15.21	13.32
	Temp	°C	5.1	6.8	14.3	16.2	25.1	30.7	38.6	24.1	26.8	25.4	18.6	12.4
	Comments		2	2	2	2	2	2	2	2	2	2	2	2
	7-63	Well	"H ₂ O	-0.09	-0.57	-3.12	-5.47	-4.27	-4.17	-3.57	-2.17	-1.84	-2.57	-2.99
Lateral		"H ₂ O	-8.66	-10.31	-6.93	-6.26	-6.31	-5.98	-4.09	-4.01	-5.11	-5.33	-6.32	8.14
CH ₄		%	33.6	43.9	49.0	54.9	52.4	50.6	46.7	44.1	43.2	43.2	40.3	22.9
CO ₂		%	20.1	24.7	26.4	31.2	30.6	32.6	31.1	30.9	28.6	26.1	25.9	14.6
O ₂		%	2.9	3.6	3.0	2.7	2.0	3.6	4.3	5.1	5.2	5.2	6.6	15.3
BAL (N ₂)		%	43.4	27.8	21.6	11.2	15.0	13.2	17.9	19.9	23.0	26.6	27.2	47.2
CO		PPM	10	11	10	8	10	5	2	5	4	3	5	9
H ₂ S		PPM	22	19	22	89	68	124	270	187	193	208	154	66
Vel Min		m/s	-	0.00	1.02	2.17	1.57	2.34	1.69	1.22	0.00	1.24	1.58	1.02
Vel Max		m/s	-	0.00	1.32	3.45	2.03	2.66	2.36	1.63	0.00	1.43	2.02	1.54
Flow		CFM	-	0.00	11.06	26.55	17.01	23.62	19.14	13.47	0.00	12.61	17.01	12.10
Temp		°C	-	2.4	10.7	16.7	22.9	25.4	29.5	25.1	19.6	18.4	15.4	10.3
Comments			closed	cracked	1	2	2	2	1	1	1/2T	1/2T	1/2T	1

Table 2: Wellfield Monitoring Data

Units			25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21
7-64	Well	"H ₂ O	-4.77	-1.98	-1.22	-1.11	-1.04	-1.34	-0.98	-1.57	-1.22	-1.25	-1.00	-3.68
	Lateral	"H ₂ O	-6.51	-2.58	-1.98	-1.57	-1.39	-2.57	-3.00	-2.44	-4.88	-5.96	-5.47	-8.14
	CH ₄	%	53.2	54.7	56.4	55.9	57.9	43.8	39.1	53.6	55.9	54.8	53.8	54.8
	CO ₂	%	40.3	38.4	39.7	38.6	39.6	36.4	34.7	33.4	35.6	34.9	35.8	42.2
	O ₂	%	0.1	1.1	0.9	0.5	0.7	1.5	2.5	1.8	1.7	1.5	1.1	1.1
	BAL (N ₂)	%	6.4	5.8	3.0	5.0	1.8	18.3	23.7	11.2	6.8	8.8	9.3	2.0
	CO	PPM	8	7	10	10	12	10	4	8	5	7	8	5
	H ₂ S	PPM	28	67	47	55	87	96	140	133	99	157	103	147
	Vel Min	m/s	2.47	2.04	1.96	1.57	1.24	1.34	0.88	1.39	1.27	1.28	0.89	1.22
	Vel Max	m/s	3.66	2.68	2.11	1.66	1.56	1.95	1.30	2.01	1.51	1.93	1.24	1.69
	Flow	CFM	28.96	22.30	19.23	15.26	13.23	15.54	10.30	16.06	13.13	15.17	10.06	13.75
	Temp	°C	6.9	5.8	7.5	12.8	16.4	30.1	35.4	34.1	28.6	22.8	18.3	12.7
	Comments		2	2	2	2	2	1	1/2T	1T	1T	1T	1T	1T
7-65	Well	"H ₂ O	0.11	0.04	0.06	0.02	0.04	0.03	-1.56	-0.04	-0.05	-0.03	-0.04	-0.04
	Lateral	"H ₂ O	Surging	NLV	NLV	NLV	NLV	NLV	-2.65	-3.47	-4.12	-4.88	-5.66	-5.21
	CH ₄	%	19.7	52.1	55.9	57.1	58.6	55.1	19.2	20.6	22.5	25.8	24.1	23.6
	CO ₂	%	19.6	36.3	38.4	40.5	40.6	35.9	21.5	23.5	24.1	22.9	23.6	24.7
	O ₂	%	4.2	1.5	1.0	1.1	0.8	1.4	4.6	5.0	5.1	5.3	4.6	5.0
	BAL (N ₂)	%	56.5	10.1	4.7	1.3	0.0	7.6	54.7	50.9	48.3	46.0	47.7	46.7
	CO	PPM	7	10	11	10	15	11	7	8	9	10	8	10
	H ₂ S	PPM	16	102	157	222	319	245	96	67	58	101	87	102
	Vel Min	m/s	Surging	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	Surging	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	6.7	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	2	2	2	2	2	closed	closed	closed	closed	closed	closed
7-66	Well	"H ₂ O	0.14	0.12	0.11	0.11	0.08	0.06	0.08	0.11	0.09	0.06	0.07	0.08
	Lateral	"H ₂ O	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV
	CH ₄	%	57.1	56.9	58.1	58.0	58.3	56.8	59.6	60.2	59.6	58.4	58.2	59.5
	CO ₂	%	33.8	31.8	31.9	33.9	32.9	35.6	34.8	34.1	34.1	33.9	34.1	33.2
	O ₂	%	2.8	0.9	1.2	1.0	0.4	0.5	0.8	1.0	1.1	0.8	1.0	0.6
	BAL (N ₂)	%	6.3	10.4	8.8	7.1	8.4	7.1	4.8	4.7	5.2	6.9	6.7	6.7
	CO	PPM	10	14	12	8	9	11	14	15	13	10	12	10
	H ₂ S	PPM	217	334	204	>500	>500	>500	>500	>500	>500	>500	>500	>500
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV
7-67	Well	"H ₂ O	-1.24	-1.54	-1.11	-0.98	-0.25	-0.67	1.02	-2.47	-2.47	-1.69	-1.57	-1.34
	Lateral	"H ₂ O	-11.07	-9.37	-8.45	-3.65	-1.71	-1.66	-1.96	-4.39	-5.21	-3.68	-4.87	-6.24
	CH ₄	%	53.1	52.6	51.6	49.2	49.1	50.1	54.5	53.9	52.0	52.8	48.2	42.8
	CO ₂	%	35.0	33.9	34.2	36.1	32.8	33.8	35.8	34.2	35.4	32.8	31.4	29.3
	O ₂	%	2.3	1.6	2.0	1.5	3.3	1.5	1.6	1.9	1.6	2.7	2.5	5.1
	BAL (N ₂)	%	9.6	11.9	12.2	13.2	14.8	14.6	8.1	10.0	11.0	12.4	17.9	22.8
	CO	PPM	7	11	10	9	10	6	4	4	6	5	8	5
	H ₂ S	PPM	106	98	100	104	177	255	412	400	298	360	215	345
	Vel Min	m/s	0.44	0.00	0.00	0.00	0.00	0.00	Surging	Surging	Surging	Surging	Surging	1.24
	Vel Max	m/s	0.93	0.00	0.00	0.00	0.00	0.00	Surging	Surging	Surging	Surging	Surging	1.66
	Flow	CFM	6.47	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	13.70
	Temp	°C	4.2	7.4	10.6	13.6	15.3	24.7	28.4	28.5	25.7	22.7	19.3	15.0
	Comments		1	1	1/2T	1/2T	1/2T	1/2T	1	1	1	1	1	1/2T

Table 2: Wellfield Monitoring Data

	<i>Units</i>	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21	
7-68	Well	"H ₂ O	-0.01	-0.01	0.03	0.02	-0.03	0.34	0.47	0.25	0.35	-1.33	-0.48	-1.01
	Lateral	"H ₂ O	-1.62	-2.01	-1.57	-1.04	-2.33	NLV	NLV	NLV	NLV	-2.47	-3.69	-4.24
	CH ₄	%	30.8	31.4	28.6	32.6	36.8	54.1	58.7	56.2	57.0	50.4	39.4	23.8
	CO ₂	%	23.2	24.6	26.9	25.7	30.1	36.4	39.6	38.1	37.4	32.1	28.1	18.3
	O ₂	%	8.7	5.7	6.3	7.3	5.3	1.2	0.5	0.6	1.0	1.5	5.1	9.6
	BAL (N ₂)	%	37.3	38.3	38.2	34.4	27.8	8.3	1.2	5.1	4.6	16.0	27.4	48.3
	CO	PPM	5	6	10	7	9	4	4	5	5	8	5	2
	H ₂ S	PPM	45	55	19	28	135	>500	>500	>500	>500	247	364	268
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	1.57	0.00	frozen
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	1.99	0.00	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	16.82	0.00	-
	Temp	°C	-	-	-	-	-	-	-	-	-	22.5	19.4	-
	Comments		1	closed	closed	closed	closed	2	2	2	2	2	1	frozen open
8-69	Well	"H ₂ O	-2.45	-2.45	-1.47	-0.47	-1.57	-2.14	-1.47	-2.01	-2.02	-2.35	-2.57	-1.57
	Lateral	"H ₂ O	-8.63	-7.45	-5.12	-2.69	-3.66	-4.69	-3.55	-4.00	-4.37	-6.34	-5.21	-2.68
	CH ₄	%	51.4	52.3	50.3	50.7	50.1	52.3	55.1	54.8	54.1	53.6	52.9	50.0
	CO ₂	%	32.8	30.4	34.1	35.6	30.6	33.7	36.5	35.6	34.6	33.2	35.1	32.2
	O ₂	%	1.6	2.4	2.0	3.0	2.0	1.5	1.4	1.5	2.0	2.3	2.0	3.3
	BAL (N ₂)	%	14.2	14.9	13.6	10.7	17.3	12.5	7.0	8.1	9.3	10.9	10.0	14.5
	CO	PPM	15	18	19	20	12	10	4	5	7	5	6	9
	H ₂ S	PPM	28	24	20	24	>500	>500	>500	>500	>500	>500	>500	>500
	Vel Min	m/s	1.33	1.05	0.47	0.00	1.66	1.02	1.58	1.24	0.87	1.68	0.74	1.47
	Vel Max	m/s	2.51	1.66	0.99	0.78	2.14	1.22	2.33	1.85	1.54	2.01	1.36	1.98
	Flow	CFM	18.14	12.80	6.90	3.69	17.95	10.58	18.47	14.60	11.39	17.43	9.92	16.30
	Temp	°C	5.6	8.8	11.5	15.2	20.1	19.3	29.4	25.1	24.3	22.8	18.4	12.4
	Comments		1/2T	1/2T	1/2T	1/2T	1/2T	1/2T	1/2T	1/2T	1/2T	1/2T	1/2T	1/2T
8-70	Well	"H ₂ O	-0.12	-0.12	-0.07	-0.04	-0.12	-0.01	-0.14	-0.06	-0.05	-0.07	-0.05	-0.06
	Lateral	"H ₂ O	-7.36	-5.47	-4.90	-3.25	-4.02	-4.71	-3.94	-4.57	-5.68	-6.36	-4.31	-3.11
	CH ₄	%	39.4	38.4	39.1	36.8	40.3	38.4	40.1	41.3	41.6	42.5	41.3	38.4
	CO ₂	%	24.1	25.7	26.1	23.6	26.8	25.9	28.3	29.1	30.2	28.3	29.6	27.4
	O ₂	%	2.9	3.0	3.5	3.4	1.5	1.7	2.9	3.3	3.3	3.6	4.3	5.6
	BAL (N ₂)	%	33.6	32.9	31.3	36.2	31.4	34.0	28.7	26.3	24.9	25.6	24.8	28.6
	CO	PPM	8	12	11	7	10	9	3	5	4	6	9	5
	H ₂ S	PPM	55	47	63	69	87	110	206	187	198	134	187	174
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed
8-71	Well	"H ₂ O	-0.68	-0.87	-0.40	-0.55	-0.57	-0.94	-0.06	-0.14	-0.24	-0.64	-0.02	-0.09
	Lateral	"H ₂ O	-6.51	-5.47	-4.78	-4.02	-6.66	-5.47	-3.67	-4.22	-4.68	-4.90	-5.99	-6.21
	CH ₄	%	57.0	54.7	53.1	52.6	55.7	53.9	40.2	39.6	41.6	42.6	35.6	30.9
	CO ₂	%	41.6	40.1	42.8	40.2	38.6	40.1	29.0	27.5	26.8	25.1	24.1	20.1
	O ₂	%	1.4	2.4	2.9	2.6	1.1	1.3	5.4	6.0	2.4	4.3	3.3	10.9
	BAL (N ₂)	%	0.0	2.8	1.2	4.6	4.6	4.7	25.4	26.9	29.2	28.0	37.0	38.1
	CO	PPM	8	9	11	15	15	10	6	5	8	4	1	5
	H ₂ S	PPM	67	87	85	57	85	111	241	187	195	200	127	175
	Vel Min	m/s	0.44	0.44	0.00	0.00	0.58	1.68	0.44	1.27	1.11	1.39	0.00	-
	Vel Max	m/s	0.86	1.00	0.00	0.00	1.10	2.00	0.94	1.63	1.82	2.01	0.00	-
	Flow	CFM	6.14	6.80	0.00	0.00	7.94	17.39	6.52	13.70	13.84	16.06	0.00	-
	Temp	°C	7.8	10.8	12.9	16.0	15.2	18.3	29.4	28.6	24.6	23.4	20.3	-
	Comments		1/2T	1/2T	1/2T	1/2T	1/2T	1	1/2T	1/2T	1/2T	1/2T	cracked	closed

Table 2: Wellfield Monitoring Data

			25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21
8-72	Well	"H ₂ O	-3.56	-3.01	-2.81	-1.65	-2.58	-2.58	-2.14	-2.35	-2.74	-4.87	-3.68	-2.99
	Lateral	"H ₂ O	-5.52	-4.67	-4.97	-3.43	-4.01	-3.24	-2.85	-3.24	-3.36	-5.21	-5.17	-5.27
	CH ₄	%	59.3	58.6	59.6	60.1	59.3	58.6	57.7	56.2	55.8	54.3	55.3	53.2
	CO ₂	%	40.2	41.1	39.6	38.5	38.2	39.6	38.6	37.2	36.1	35.2	33.6	31.8
	O ₂	%	0.6	0.3	0.5	0.9	0.5	0.5	0.4	0.8	0.7	1.0	1.2	3.6
	BAL (N ₂)	%	-0.1	0.0	0.3	0.5	2.0	1.3	3.3	5.8	7.4	9.5	9.9	11.4
	CO	PPM	11	15	12	11	8	10	6	4	5	10	8	5
	H ₂ S	PPM	68	57	86	68	101	222	387	295	268	202	237	188
	Vel Min	m/s	1.69	2.04	2.58	1.42	1.55	1.89	1.88	1.97	2.35	1.57	1.47	1.24
	Vel Max	m/s	2.57	2.68	3.21	1.80	2.03	2.34	2.34	2.47	2.86	2.33	2.27	1.66
	Flow	CFM	20.13	22.30	27.36	15.21	16.91	19.99	19.94	20.98	24.62	18.43	17.67	13.70
	Temp	°C	5.1	10.5	15.3	18.4	18.6	20.7	25.6	26.3	27.4	24.3	18.6	12.4
	Comments		2	2	2	2	2	2	2	2	2	2	2	2
8-73	Well	"H ₂ O	-3.69	-3.05	-2.57	-1.57	-2.35	-3.25	-2.45	-3.21	-2.98	-3.27	-1.54	-1.47
	Lateral	"H ₂ O	-4.92	-4.69	-3.68	-2.47	-4.21	-4.77	-3.05	-4.25	-5.21	-6.57	-3.69	-2.68
	CH ₄	%	58.0	58.1	57.2	57.5	58.0	57.4	56.9	55.1	54.2	53.2	52.8	51.0
	CO ₂	%	42.0	41.5	41.6	41.8	40.3	38.4	39.1	38.6	36.8	35.6	33.8	34.2
	O ₂	%	0.0	0.0	0.1	0.0	0.5	0.2	0.5	0.4	0.9	0.9	1.0	1.9
	BAL (N ₂)	%	0.0	0.4	1.1	0.7	1.2	4.0	3.5	5.9	8.1	10.3	12.4	12.9
	CO	PPM	15	12	18	10	12	10	5	8	6	8	4	8
	H ₂ S	PPM	151	132	124	87	233	>500	>500	>500	>500	>500	>500	>500
	Vel Min	m/s	2.66	2.68	2.31	1.96	1.572.33	1.47	2.34	2.01	1.57	2.10	1.66	1.00
	Vel Max	m/s	3.48	3.66	3.58	2.47	3.48	2.10	2.66	2.58	2.03	2.56	1.80	1.45
	Flow	CFM	29.01	29.95	27.83	20.93	-	16.87	23.62	21.69	17.01	22.02	16.35	11.58
	Temp	°C	7.5	8.4	9.6	15.3	15.2	20.8	32.4	30.6	24.1	21.8	20.2	15.2
	Comments		2	2	2	2	2	2	2	2	2	2	2	2
8-74	Well	"H ₂ O	-3.68	-2.57	-2.17	-1.58	-1.85	-2.47	-2.11	-2.04	-2.14	-2.03	-2.01	-2.14
	Lateral	"H ₂ O	-6.23	-5.32	-4.96	-3.69	-4.10	-3.24	-2.32	-2.68	-3.57	-3.22	-3.58	-3.68
	CH ₄	%	55.4	54.2	54.9	56.3	55.0	55.4	56.4	56.5	57.0	57.6	56.8	55.2
	CO ₂	%	38.6	39.8	37.0	35.1	35.2	36.8	38.9	38.4	36.1	35.2	36.8	37.6
	O ₂	%	0.4	1.0	2.9	1.2	1.0	0.5	0.7	0.9	1.1	1.0	1.5	1.2
	BAL (N ₂)	%	5.6	5.0	5.2	7.4	8.8	7.3	4.0	4.2	5.8	6.2	4.9	6.0
	CO	PPM	8	15	12	19	12	11	11	8	10	9	8	10
	H ₂ S	PPM	57	68	41	50	225	>500	>500	>500	>500	>500	>500	>500
	Vel Min	m/s	2.44	2.58	1.47	1.25	2.14	2.18	2.47	1.37	1.69	1.57	1.47	2.24
	Vel Max	m/s	3.68	3.69	1.93	1.68	2.33	3.05	2.69	1.69	2.34	1.96	1.92	2.58
	Flow	CFM	28.92	29.62	16.06	13.84	21.12	24.71	24.38	14.46	19.04	16.68	16.02	22.77
	Temp	°C	5.0	8.5	12.5	15.3	19.0	25.7	30.4	31.4	29.1	25.1	24.8	19.6
	Comments		2	2	2	2	2	2	2	2	2	2	2	2
WH-75	Well	"H ₂ O	-2.66	-1.69	-2.66	-2.66	-1.87	-1.98	-2.47	-2.30	-1.87	-2.01	-1.65	-1.24
	Lateral	"H ₂ O	-7.01	-5.47	-5.24	-4.35	-4.00	-3.44	-3.73	-4.68	-5.68	-4.68	-4.01	-2.74
	CH ₄	%	52.9	53.6	51.8	55.9	52.3	51.8	51.7	50.3	49.6	48.3	49.2	47.3
	CO ₂	%	39.0	38.5	37.6	37.4	38.3	37.6	35.7	33.6	34.3	33.0	32.5	31.6
	O ₂	%	0.2	0.5	1.4	1.1	1.0	0.5	1.8	1.9	0.9	0.8	1.1	2.5
	BAL (N ₂)	%	7.9	7.4	9.2	5.6	8.4	10.1	10.8	14.2	15.2	17.9	17.2	18.6
	CO	PPM	11	15	19	15	15	9	4	5	8	5	9	10
	H ₂ S	PPM	54	64	99	66	17	111	268	302	180	196	222	158
	Vel Min	m/s	1.20	1.58	1.47	1.00	1.21	1.57	1.39	1.58	1.98	1.47	1.87	1.01
	Vel Max	m/s	1.98	2.03	1.96	1.54	1.88	2.09	2.00	2.25	2.36	2.14	2.58	1.65
	Flow	CFM	15.02	17.06	16.21	12.00	14.60	17.29	16.02	18.10	20.51	17.06	21.02	12.57
	Temp	°C	6.6	8.6	15.3	18.5	22.6	25.6	29.4	30.6	27.0	26.8	22.1	18.6
	Comments		1	1	1	1	1	1	1	1	1	1	1	1

Table 2: Wellfield Monitoring Data

			25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21
WH-76	Well	"H ₂ O	-3.23	-2.47	-1.47	-2.00	-2.34	-2.63	-2.47	-2.14	-2.05	-1.84	-1.55	-1.00
	Lateral	"H ₂ O	-6.47	-5.36	-4.99	-3.69	-4.58	-4.15	-3.75	-4.68	-5.99	-3.84	-3.68	-2.14
	CH ₄	%	51.6	50.7	50.6	51.0	51.4	50.9	51.6	50.9	52.6	51.7	50.9	48.2
	CO ₂	%	28.5	29.5	27.3	29.3	30.6	33.1	34.2	32.0	36.2	32.6	30.2	32.1
	O ₂	%	1.0	1.2	1.3	1.7	1.4	1.4	2.3	2.1	1.7	1.5	3.0	4.2
	BAL (N ₂)	%	18.9	18.6	20.8	18.0	16.6	14.6	11.9	15.0	9.5	14.2	15.9	15.5
	CO	PPM	15	19	20	18	8	10	4	12	15	10	8	3
	H ₂ S	PPM	47	54	40	45	101	>500	>500	>500	>500	>500	>500	>500
	Vel Min	m/s	1.11	1.25	1.33	0.00	1.25	1.39	1.65	1.98	2.03	2.35	1.44	1.02
	Vel Max	m/s	1.57	1.68	1.54	0.00	1.68	1.84	2.03	2.35	2.69	3.21	20.50	1.35
	Flow	CFM	12.66	13.84	13.56	0.00	13.84	15.26	17.39	20.46	22.30	26.27	103.66	11.20
	Temp	°C	5.2	9.6	10.2	13.6	18.8	19.3	29.6	33.7	30.6	24.8	22.0	16.4
	Comments		1	1	1	1	1	1	1	1	1	1	1	1
	WH-77	Well	"H ₂ O	-0.47	-0.02	-0.05	-0.01	-0.24	-1.57	-0.57	-0.95	-1.12	-1.27	-0.99
Lateral		"H ₂ O	-6.33	-5.72	-4.58	-3.68	-5.34	-5.97	-3.08	-4.01	-4.56	-4.69	-4.03	-2.85
CH ₄		%	48.7	47.3	45.8	43.2	44.8	50.6	42.1	45.9	46.9	44.8	44.5	46.8
CO ₂		%	32.6	31.8	31.6	30.9	32.0	31.8	30.3	31.6	29.5	28.2	27.3	30.5
O ₂		%	0.8	1.5	1.5	1.9	1.2	1.8	4.4	3.2	2.8	4.0	3.5	3.6
BAL (N ₂)		%	17.9	19.4	21.1	24.0	22.0	15.8	23.2	19.3	20.8	23.0	24.7	19.1
CO		PPM	19	22	33	20	22	22	5	6	10	8	4	3
H ₂ S		PPM	39	68	52	18	45	165	373	215	200	247	187	124
Vel Min		m/s	0.00	0.00	0.00	0.00	0.00	1.25	0.00	1.21	0.87	0.00	0.00	0.00
Vel Max		m/s	0.00	0.00	0.00	0.00	0.00	2.11	0.00	1.68	1.54	0.00	0.00	0.00
Flow		CFM	0.00	0.00	0.00	0.00	0.00	15.88	0.00	13.65	11.39	0.00	0.00	0.00
Temp		°C	3.6	-	12.3	10.8	15.0	19.3	29.4	25.1	24.8	22.0	21.1	18.9
Comments			cracked	cracked	cracked	cracked	cracked	1	1/2T	1/2T	1/2T	1/2T	1/2T	1/2T
WH-78		Well	"H ₂ O	-2.11	-1.88	-1.47	-2.11	-2.16	-2.78	-3.13	-3.35	-2.68	-241.00	-3.13
	Lateral	"H ₂ O	-3.23	-2.87	-2.99	-1.57	-4.02	-3.65	-4.08	-4.68	-5.68	-4.66	-4.08	-2.55
	CH ₄	%	58.2	58.6	57.3	56.9	57.8	53.9	48.3	49.5	47.3	46.2	48.3	49.3
	CO ₂	%	40.0	39.7	38.6	38.2	38.2	36.8	33.1	31.0	30.4	28.2	33.1	33.5
	O ₂	%	0.7	1.1	1.4	1.0	1.2	1.8	2.9	2.6	2.0	3.6	2.9	4.1
	BAL (N ₂)	%	1.1	0.6	2.7	3.9	2.9	7.5	15.7	16.9	20.3	22.0	15.7	13.1
	CO	PPM	14	19	10	8	12	12	8	15	10	15	8	7
	H ₂ S	PPM	67	86	50	94	101	>500	>500	>500	>500	>500	>500	>500
	Vel Min	m/s	2.69	2.57	1.55	-	1.33	2.17	2.14	1.87	1.33	1.55	2.14	2.55
	Vel Max	m/s	3.41	3.21	1.93	-	1.85	2.67	2.55	2.41	1.41	1.86	2.55	3.01
	Flow	CFM	28.82	27.31	16.44	-	15.02	22.87	22.16	20.22	12.95	16.11	22.16	26.27
	Temp	°C	4.2	6.7	12.5	-	19.6	25.6	28.9	33.6	26.3	22.0	22.3	17.6
	Comments		2	2	2	2	2	2	2	2	2	2	2	2
	WH-79	Well	"H ₂ O	-0.03	-0.03	-0.02	-0.05	-0.03	0.14	0.24	0.36	-	-	-
Lateral		"H ₂ O	-4.47	-4.59	-4.01	-2.65	-3.65	NLV	NLV	NLV	NLV	NLV	NLV	NLV
CH ₄		%	36.2	35.6	37.3	35.2	35.2	45.7	52.3	51.7	52.3	-	-	-
CO ₂		%	33.6	35.1	32.7	34.8	31.0	32.9	34.7	33.1	-	-	-	-
O ₂		%	1.2	1.5	1.6	1.1	1.5	1.5	2.0	2.5	-	-	-	-
BAL (N ₂)		%	29.0	27.8	28.4	28.9	32.3	19.9	11.6	12.1	-	-	-	-
CO		PPM	8	11	7	5	15	14	6	10	-	-	-	-
H ₂ S		PPM	65	82	55	21	45	133	405	321	-	-	-	-
Vel Min		m/s	-	-	-	-	-	-	-	-	-	-	-	-
Vel Max		m/s	-	-	-	-	-	-	-	-	-	-	-	-
Flow		CFM	-	-	-	-	-	-	-	-	-	-	-	-
Temp		°C	-	-	-	-	-	-	-	-	-	-	-	-
Comments			closed	closed	closed	closed	closed	1	1	1	1	1	1	1

Table 2: Wellfield Monitoring Data

	Units	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21
WH-80	Well	"H ₂ O	-1.25	-0.68	-0.47	-0.60	-0.85	0.34	0.23	0.65	-	-	-
	Lateral	"H ₂ O	-4.35	-4.02	-3.66	-2.69	2.34	NLV	NLV	NLV	NLV	NLV	NLV
	CH ₄	%	48.6	47.5	47.3	48.6	49.2	50.9	52.9	52.9	-	-	-
	CO ₂	%	27.6	29.3	29.6	25.3	26.1	28.5	30.7	28.1	-	-	-
	O ₂	%	0.4	1.0	1.1	16.0	1.2	1.0	1.2	1.5	-	-	-
	BAL (N ₂)	%	23.4	22.2	22.0	10.1	23.5	19.6	15.2	17.5	-	-	-
	CO	PPM	12	15	19	18	15	19	19	22	-	-	-
	H ₂ S	PPM	23	29	32	64	36	87	139	196	-	-	-
	Vel Min	m/s	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-
	Vel Max	m/s	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-
	Flow	CFM	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-
	Temp	°C	8.2	12.6	-	-	19.6	-	-	-	-	-	-
	Comments		cracked	cracked	cracked	cracked	cracked	1	1	1	1	1	1
5-81	Well	"H ₂ O	-0.47	-	-	-	-	-	-	-	-	-	-
	Lateral	"H ₂ O	-10.47	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV
	CH ₄	%	40.2	-	-	-	-	-	-	-	-	-	-
	CO ₂	%	28.0	-	-	-	-	-	-	-	-	-	-
	O ₂	%	2.6	-	-	-	-	-	-	-	-	-	-
	BAL (N ₂)	%	29.2	-	-	-	-	-	-	-	-	-	-
	CO	PPM	10	-	-	-	-	-	-	-	-	-	-
	H ₂ S	PPM	28	-	-	-	-	-	-	-	-	-	-
	Vel Min	m/s	0.00	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	0.00	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	0.00	-	-	-	-	-	-	-	-	-	-
	Temp	°C	3.9	-	-	-	-	-	-	-	-	-	-
	Comments		cracked	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV
7-82	Well	"H ₂ O	-1.56	-1.69	-1.22	-0.09	-0.02	-0.01	-0.03	0.02	0.03	-0.02	-0.03
	Lateral	"H ₂ O	-7.33	-9.47	-6.57	-6.99	-3.47	-4.02	-4.12	-5.14	-6.47	-5.14	-6.95
	CH ₄	%	41.6	38.1	25.0	28.7	30.4	28.3	24.8	25.3	26.9	25.9	23.1
	CO ₂	%	27.1	28.6	18.1	19.5	22.1	25.7	24.9	25.3	25.2	26.8	24.2
	O ₂	%	1.0	1.5	11.3	10.9	9.7	8.6	8.5	8.1	8.5	7.9	8.1
	BAL (N ₂)	%	30.3	31.8	45.6	40.9	37.8	37.4	41.8	41.3	39.4	39.4	44.6
	CO	PPM	24	25	13	15	10	14	11	15	14	12	19
	H ₂ S	PPM	68	70	109	124	168	108	149	127	156	123	103
	Vel Min	m/s	0.00	0.00	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	0.00	0.00	-	-	-	-	-	-	-	-	-
	Flow	CFM	0.00	0.00	-	-	-	-	-	-	-	-	-
	Temp	°C	4.6	5.3	-	-	-	-	-	-	-	-	-
	Comments		cracked	cracked	closed	closed	closed	closed	closed	closed	closed	closed	closed
7-83	Well	"H ₂ O	-0.10	-0.03	-0.04	-0.01	0.02	0.01	0.02	0.03	0.02	0.00	0.01
	Lateral	"H ₂ O	-5.26	-7.47	-5.36	-5.52	-2.14	-3.24	-4.35	-5.12	-5.68	-5.33	-4.57
	CH ₄	%	39.4	1.0	1.2	0.2	1.1	0.2	0.0	1.0	1.2	0.5	0.0
	CO ₂	%	25.1	0.6	0.3	0.2	0.5	0.3	0.1	0.2	0.2	0.4	1.4
	O ₂	%	6.4	17.3	15.7	19.5	18.0	20.1	20.3	20.1	18.6	20.0	19.7
	BAL (N ₂)	%	29.1	81.1	82.8	80.1	80.4	79.4	79.6	78.7	80.0	79.1	78.9
	CO	PPM	54	3	2	1	2	2	0	1	2	1	4
	H ₂ S	PPM	112	1	2	2	2	1	1	2	1	2	1
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	-	-
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C	-	-	-	-	-	-	-	-	-	-	-
	Comments		closed	closed	closed	closed	closed	closed	closed	closed	closed	closed	closed

Table 2: Wellfield Monitoring Data

	<i>Units</i>	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21
MH-3	Well	"H ₂ O											
	Lateral	"H ₂ O											
	CH ₄	%											
	CO ₂	%											
	O ₂	%											
	BAL (N ₂)	%	-	-	-	-	-	-	-	-	-	-	-
	CO	PPM											
	H ₂ S	PPM											
	Vel Min	m/s											
	Vel Max	m/s											
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C											
	Comments												
	MH-4	Well	"H ₂ O										
Lateral		"H ₂ O											
CH ₄		%											
CO ₂		%											
O ₂		%											
BAL (N ₂)		%	-	-	-	-	-	-	-	-	-	-	-
CO		PPM											
H ₂ S		PPM											
Vel Min		m/s											
Vel Max		m/s											
Flow		CFM	-	-	-	-	-	-	-	-	-	-	-
Temp		°C											
Comments													
MH-5		Well	"H ₂ O										
	Lateral	"H ₂ O											
	CH ₄	%											
	CO ₂	%											
	O ₂	%											
	BAL (N ₂)	%	-	-	-	-	-	-	-	-	-	-	-
	CO	PPM											
	H ₂ S	PPM											
	Vel Min	m/s											
	Vel Max	m/s											
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C											
	Comments												
	MH-7	Well	"H ₂ O										
Lateral		"H ₂ O											
CH ₄		%											
CO ₂		%											
O ₂		%											
BAL (N ₂)		%	-	-	-	-	-	-	-	-	-	-	-
CO		PPM											
H ₂ S		PPM											
Vel Min		m/s											
Vel Max		m/s											
Flow		CFM	-	-	-	-	-	-	-	-	-	-	-
Temp		°C											
Comments													

Table 2: Wellfield Monitoring Data

	<i>Units</i>	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21
MH-43	Well	"H ₂ O											
	Lateral	"H ₂ O											
	CH ₄	%											
	CO ₂	%											
	O ₂	%											
	BAL (N ₂)	%	-	-	-	-	-	-	-	-	-	-	-
	CO	PPM											
	H ₂ S	PPM											
	Vel Min	m/s											
	Vel Max	m/s											
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C											
	Comments												
MH-16	Well	"H ₂ O						0.00	0.00	0.00	0.00	0.00	0.00
	Lateral	"H ₂ O						4.72	4.72	4.72	4.72	4.72	4.72
	CH ₄	%						39.0	39.0	39.0	39.0	39.0	39.0
	CO ₂	%						30.8	30.8	30.8	30.8	30.8	30.8
	O ₂	%						4.4	4.4	4.4	4.4	4.4	4.4
	BAL (N ₂)	%	-	-	-	-	-	25.8	25.8	25.8	25.8	25.8	25.8
	CO	PPM						1	1	1	1	1	1
	H ₂ S	PPM						77	77	77	77	77	77
	Vel Min	m/s						-	-	-	-	-	-
	Vel Max	m/s						-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	-
	Temp	°C						-	-	-	-	-	-
	Comments							closed	closed	closed	closed	closed	closed
MH-19	Well	"H ₂ O						-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
	Lateral	"H ₂ O						-4.51	-4.51	-4.51	-4.51	-4.51	-4.51
	CH ₄	%						34.9	34.9	34.9	34.9	34.9	34.9
	CO ₂	%						27.2	27.2	27.2	27.2	27.2	27.2
	O ₂	%						7.1	7.1	7.1	7.1	7.1	7.1
	BAL (N ₂)	%	-	-	-	-	-	30.8	30.8	30.8	30.8	30.8	30.8
	CO	PPM						1	1	1	1	1	1
	H ₂ S	PPM						78	78	78	78	78	78
	Vel Min	m/s						-	-	-	-	-	-
	Vel Max	m/s						-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	
	Temp	°C						-	-	-	-	-	
	Comments							closed	closed	closed	closed	closed	closed
MH-22	Well	"H ₂ O						0.00	0.00	0.00	0.00	0.00	0.00
	Lateral	"H ₂ O						-4.37	-4.37	-4.37	-4.37	-4.37	-4.37
	CH ₄	%						27.2	27.2	27.2	27.2	27.2	27.2
	CO ₂	%						20.8	20.8	20.8	20.8	20.8	20.8
	O ₂	%						9.9	9.9	9.9	9.9	9.9	9.9
	BAL (N ₂)	%	-	-	-	-	-	42.1	42.1	42.1	42.1	42.1	42.1
	CO	PPM						2	2	2	2	2	2
	H ₂ S	PPM						91	91	91	91	91	91
	Vel Min	m/s						-	-	-	-	-	-
	Vel Max	m/s						-	-	-	-	-	-
	Flow	CFM	-	-	-	-	-	-	-	-	-	-	
	Temp	°C						-	-	-	-	-	
	Comments							closed	closed	closed	closed	closed	closed

Table 2: Wellfield Monitoring Data

	<i>Units</i>	25-Jan-21	27-Feb-21	29-Mar-21	29-Apr-21	20-May-21	25-Jun-21	8-Jul-21	25-Aug-21	25-Sep-21	25-Oct-21	25-Nov-21	16-Dec-21
MH-25	<i>Well</i>							0.00	0.00	0.00	0.00	0.00	0.00
	<i>Lateral</i>							NLV	NLV	NLV	NLV	NLV	NLV
	<i>CH₄</i>							58.9	58.9	58.9	58.9	58.9	58.9
	<i>CO₂</i>							37.0	37.0	37.0	37.0	37.0	37.0
	<i>O₂</i>							0.6	0.6	0.6	0.6	0.6	0.6
	<i>BAL (N₂)</i>	-	-	-	-	-	-	3.5	3.5	3.5	3.5	3.5	3.5
	<i>CO</i>							2	2	2	2	2	2
	<i>H₂S</i>							418	418	418	418	418	418
	<i>Vel Min</i>							-	-	-	-	-	-
	<i>Vel Max</i>							-	-	-	-	-	-
	<i>Flow</i>							-	-	-	-	-	-
	<i>Temp</i>							-	-	-	-	-	-
	<i>Comments</i>							NLV	NLV	NLV	NLV	NLV	NLV

Note: Velocities and flows with values of zero had either no flow or immeasurable flow because the valve was either closed or cracked open.

Table 3: Pump Counters

Location	Prev. Counter	January 25, 2021			February 26, 2021			March 26, 2021			April 26, 2021			May 20, 2021			June 25, 2021		
		Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo
PDT 1	1402	1402	0	0	1402	0	0	1402	0	0	1370	-	-	1370	0	0	347	-	-
PDT 2	107974	107985	11	28.6	107987	2	5.2	107998	11	28.6	107998	0	0	107882	-	-	107882	0	0
PDT 3	18098	18099	1	2.6	18099	0	0	18099	0	0	18099	0	0	18099	0	0	18099	0	0
PDT 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PDT 5	60910	16090	-	-	16090	0	0	16090	0	0	16090	0	0	16090	0	0	16090	0	0
PDT 6	154003	154257	254	660.4	155304	1047	2722.2	156411	1107	2878.2	156947	536	1393.6	157417	470	1222	159420	2003	5207.8
PDT 7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PDT 8	52924	-	-	-	-	-	-	-	-	-	-	-	-	53089	-	-	53089	0	0
PDT 9	21965	22347	382	993.2	22857	510	1326	23475	618	1606.8	23965	490	1274	24078	113	293.8	27514	3436	8933.6
PDT 10	1124	1196	72	187.2	1257	61	158.6	1387	130	338	1421	34	88.4	1476	55	143	1485	9	23.4
PDT 11	4132	5102	970	2522	6247	1145	2977	7865	1618	4206.8	9635	1770	4602	12204	2569	6679.4	14578	2374	6172.4
PDT 12	31	31	0	0	31	0	0	31	0	0	31	0	0	31	0	0	31	0	0
H-1	-	10	10	26	10	0	0	10	0	0	10	0	0	10	0	0	17	7	18.2
H-2	-	13	13	33.8	13	0	0	13	0	0	13	0	0	13	0	0	15	2	5.2
H-3	-	37	37	96.2	37	0	0	37	0	0	37	0	0	52	15	39	82578	82526	214567.6
H-4	426948	429634	2686	6983.6	436875	7241	18826.6	443526	6651	17292.6	448357	4831	12560.6	451614	3257	8468.2	462471	10857	28228.2
1-5	-	4055	4055	10543	4055	0	0	4055	0	0	4055	0	0	4057	2	5.2	26740	22683	58975.8
1-6	-	17452	17452	45375.2	17452	0	0	17452	0	0	17452	0	0	17454	2	5.2	87513	70059	182153.4
1-7	-	1025	1025	2665	1025	0	0	1025	0	0	1025	0	0	1025	0	0	2487	1462	3801.2
1-8	-	45	45	117	45	0	0	45	0	0	45	0	0	48	3	7.8	20366	20318	52826.8
1-9	812087	813363	1276	3317.6	813363	0	0	813363	0	0	813363	0	0	824063	10700	27820	828457	4394	11424.4
1-10	623077	623160	83	215.8	623160	0	0	623160	0	0	623160	0	0	633207	10047	26122.2	638451	5244	13634.4
H-11	927145	986706	59561	154858.6	986706	0	0	986706	0	0	986706	0	0	986708	2	5.2	986741	33	85.8
H-12	-	12	12	31.2	12	0	0	12	0	0	12	0	0	12	0	0	25748	25736	66913.6
2-13	-	611	611	1588.6	611	0	0	611	0	0	611	0	0	2121	1510	3926	2172	51	132.6
2-14	-	40	40	104	40	0	0	40	0	0	40	0	0	45	5	13	59412	59367	154354.2
2-15	-	32	32	83.2	32	0	0	32	0	0	32	0	0	34	2	5.2	17458	17424	45302.4
2-16	-	13	13	33.8	13	0	0	13	0	0	13	0	0	21	8	20.8	34	13	33.8
2-17	-	185591	185591	482536.6	185591	0	0	185591	0	0	185591	0	0	185603	12	31.2	284416	98813	256913.8
2-18	830087	161400	-	-	161400	0	0	161400	0	0	161400	0	0	161403	3	7.8	304289	142886	371503.6
3-19	-	13	13	33.8	13	0	0	13	0	0	13	0	0	13	0	0	101	88	228.8
3-20	-	21	21	54.6	21	0	0	21	0	0	21	0	0	22	1	2.6	50478	50456	131185.6
3-21	-	12	12	31.2	12	0	0	12	0	0	12	0	0	15	3	7.8	1547	1532	3983.2
3-22	-	22	22	57.2	22	0	0	22	0	0	22	0	0	22	0	0	4027	4005	10413
3-23	-	13	13	33.8	13	0	0	13	0	0	13	0	0	13	0	0	8475	8462	22001.2
3-24	-	23	23	59.8	23	0	0	23	0	0	23	0	0	23	0	0	78125	78102	203065.2
3-25	-	20	20	52	20	0	0	20	0	0	20	0	0	20	0	0	134795	134775	350415
3-26	-	12	12	31.2	12	0	0	12	0	0	12	0	0	12	0	0	6027	6015	15639
3-27	69456	238024	168568	438276.8	238024	0	0	238024	0	0	238024	0	0	238279	255	663	238279	0	0
3-28	-	29	29	75.4	29	0	0	29	0	0	29	0	0	29	0	0	32478	32449	84367.4
3-29	830087	830095	8	20.8	830095	0	0	830095	0	0	830095	0	0	830095	0	0	7	-	-
3-30	69488	49460	-	-	49460	0	0	49460	0	0	49460	0	0	49460	0	0	60237	10777	28020.2
4-31	-	13	13	33.8	13	0	0	13	0	0	13	0	0	14	1	2.6	17	3	7.8
4-32	-	11	11	28.6	11	0	0	11	0	0	11	0	0	12	1	2.6	81	69	179.4
4-33	-	13	13	33.8	13	0	0	13	0	0	13	0	0	16451	16438	42738.8	75421	58970	153322

Table 3: Pump Counters

Location	Prev. Counter	January 25, 2021			February 26, 2021			March 26, 2021			April 26, 2021			May 20, 2021			June 25, 2021		
		Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo
4-34		6	6	15.6	6	0	0	6	0	0	6	0	0	6	0	0	102451	102445	266357
4-35		8	8	20.8	8	0	0	8	0	0	8	0	0	8	0	0	26958	26950	70070
4-36		15	15	39	15	0	0	15	0	0	15	0	0	15	0	0	16	1	2.6
4-37		13	13	33.8	13	0	0	13	0	0	13	0	0	13	0	0	1024	1011	2628.6
5-38		520468	520468	1353216.8	520468	0	0	520468	0	0	520468	0	0	520469	1	2.6	520469	0	0
5-39		9	9	23.4	9	0	0	9	0	0	9	0	0	12	3	7.8	19478	19466	50611.6
5-40		4	4	10.4	4	0	0	4	0	0	4	0	0	4	0	0	5	1	2.6
5-41		16	16	41.6	16	0	0	16	0	0	16	0	0	16	0	0	19	3	7.8
5-42		10	10	26	10	0	0	10	0	0	10	0	0	10	0	0	47522	47512	123531.2
5-43		7	7	18.2	7	0	0	7	0	0	7	0	0	12	5	13	20	8	20.8
5-44		8	8	20.8	8	0	0	8	0	0	8	0	0	11	3	7.8	12	1	2.6
5-45		10	10	26	10	0	0	10	0	0	10	0	0	10	0	0	47	37	96.2
5-46		647	647	1682.2	647	0	0	647	0	0	647	0	0	647	0	0	655	8	20.8
6-47		178069	178069	462979.4	178069	0	0	178069	0	0	178069	0	0	260657	82588	214728.8	651278	390621	1015614.6
6-48		7373	7373	19169.8	7373	0	0	7373	0	0	7373	0	0	7374	1	2.6	7375	1	2.6
6-49		16	16	41.6	16	0	0	16	0	0	16	0	0	16	0	0	22	6	15.6
6-50		8	8	20.8	8	0	0	8	0	0	8	0	0	8	0	0	2486	2478	6442.8
6-51		11	11	28.6	11	0	0	11	0	0	11	0	0	11	0	0	12	1	2.6
6-52		16	16	41.6	16	0	0	16	0	0	16	0	0	16	0	0	1247	1231	3200.6
6-53		12	12	31.2	12	0	0	12	0	0	12	0	0	12	0	0	15	3	7.8
6-54		5	5	13	5	0	0	5	0	0	5	0	0	5	0	0	201574	201569	524079.4
6-55		4	4	10.4	4	0	0	4	0	0	4	0	0	4	0	0	14857	14853	38617.8
6-56		3841	3841	9986.6	3841	0	0	3841	0	0	3841	0	0	3841	0	0	100247	96406	250655.6
6-57		14	14	36.4	14	0	0	14	0	0	14	0	0	14	0	0	15	1	2.6
6-58		6	6	15.6	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0
6-59		13	13	33.8	13	0	0	13	0	0	13	0	0	13	0	0	16	3	7.8
7-60		628	628	1632.8	628	0	0	628	0	0	628	0	0	33666	33038	85898.8	95871	62205	161733
7-61		15	15	39	15	0	0	15	0	0	15	0	0	15	0	0	168	153	397.8
7-62		14	14	36.4	14	0	0	14	0	0	14	0	0	14	0	0	24698	24684	64178.4
7-63		16	16	41.6	16	0	0	16	0	0	16	0	0	17	1	2.6	30578	30561	79458.6
7-64		11	11	28.6	11	0	0	11	0	0	11	0	0	11	0	0	16247	16236	42213.6
7-65		9	9	23.4	9	0	0	9	0	0	9	0	0	9	0	0	19	10	26
7-66		9	9	23.4	9	0	0	9	0	0	9	0	0	9	0	0	12	3	7.8
7-67		19	19	49.4	19	0	0	19	0	0	19	0	0	19	0	0	23	4	10.4
7-68		3	3	7.8	3	0	0	3	0	0	3	0	0	3	0	0	3	0	0
8-69		4	4	10.4	4	0	0	4	0	0	4	0	0	4	0	0	4	0	0
8-70		9	9	23.4	9	0	0	9	0	0	9	0	0	9	0	0	64872	64863	168643.8
8-71		15	15	39	15	0	0	15	0	0	15	0	0	15	0	0	6451	6436	16733.6
8-72		17	17	44.2	17	0	0	17	0	0	17	0	0	17	0	0	10247	10230	26598
8-73		12	12	31.2	12	0	0	12	0	0	12	0	0	12	0	0	12	0	0
8-74		13	13	33.8	13	0	0	13	0	0	13	0	0	13	0	0	13	0	0
WH-75		8	8	20.8	8	0	0	8	0	0	8	0	0	8	0	0	6	-	-
WH-76		4	4	10.4	4	0	0	4	0	0	4	0	0	4	0	0	18	14	36.4
WH-77		6	6	15.6	6	0	0	6	0	0	6	0	0	6	0	0	8562	8556	22245.6
WH-78		14	14	36.4	14	0	0	14	0	0	14	0	0	14	0	0	14	0	0
WH-79		16	16	41.6	16	0	0	16	0	0	16	0	0	16	0	0	16	0	0
WH-80		13	13	33.8	13	0	0	13	0	0	13	0	0	13	0	0	13	0	0
5-81		597	597	1552.2	597	0	0	597	0	0	597	0	0	2017	1420	3692	2057	40	104
7-82		175601	175601	456562.6	175601	0	0	175601	0	0	175601	0	0	260608	85007	221018.2	324518	63910	166166
7-83		7	7	18.2	7	0	0	7	0	0	7	0	0	11	4	10.4	16	5	13

Table 3: Pump Counters

Location	July 10, 2021			August 10, 2021			September 10, 2021			October 20, 2021			November 20, 2021			December 20, 2021		
	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo
PDT 1	347	0	0	665	318	826.8	690	25	65	898	208	540.8	924	26	67.6	952	28	72.8
PDT 2	107882	0	0	107882	0	0	107882	0	0	107882	0	0	107882	0	0	BURIED	-	-
PDT 3	18099	0	0	18099	0	0	18099	0	0	18099	0	0	18099	0	0	18099	0	0
PDT 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PDT 5	16090	0	0	16090	0	0	16090	0	0	-	-	-	-	-	-	-	-	-
PDT 6	160009	589	1531.4	160009	0	0	160009	0	0	441	-	-	441	0	0	441	0	0
PDT 7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PDT 8	53089	0	0	53089	0	0	53089	0	0	-	-	-	-	-	-	-	-	-
PDT 9	29002	1488	3868.8	29002	0	0	29002	0	0	30309	1307	3398.2	30548	239	621.4	BURIED	-	-
PDT 10	1491	6	15.6	1491	0	0	1491	0	0	2435	944	2454.4	2648	213	553.8	BURIED	-	-
PDT 11	15347	769	1999.4	15347	0	0	15347	0	0	17760	2413	6273.8	17985	225	585	BURIED	-	-
PDT 12	31	0	0	31	0	0	31	0	0	31	0	0	31	0	0	BURIED	-	-
H-1	17	0	0	22	5	13	22	0	0	22	0	0	22	0	0	22	0	0
H-2	15	0	0	17	2	5.2	17	0	0	17	0	0	17	0	0	17	0	0
H-3	94985	12407	32258.2	96422	1437	3736.2	97804	1382	3593.2	97804	0	0	97804	0	0	97804	0	0
H-4	469448	6977	18140.2	469901	453	1177.8	469966	65	169	471340	1374	3572.4	471399	59	153.4	471410	11	28.6
1-5	38772	12032	31283.2	50324	11552	30035.2	61976	11652	30295.2	70700	8724	22682.4	77251	6551	17032.6	81254	4003	10407.8
1-6	119161	31648	82284.8	148536	29375	76375	193606	45070	117182	212282	18676	48557.6	229685	17403	45247.8	245874	16189	42091.4
1-7	3091	604	1570.4	3266	175	455	3500	234	608.4	3500	0	0	3500	0	0	3500	0	0
1-8	27971	7605	19773	37621	9650	25090	42008	4387	11406.2	46407	4399	11437.4	51021	4614	11996.4	58485	7464	19406.4
1-9	830169	1712	4451.2	832596	2427	6310.2	834366	1770	4602	835154	788	2048.8	836748	1594	4144.4	837958	1210	3146
1-10	640508	2057	5348.2	642100	1592	4139.2	646375	4275	11115	647665	1290	3354	649221	1556	4045.6	650841	1620	4212
H-11	986743	2	5.2	986753	10	26	986741	-	-	986741	0	0	986741	0	0	986741	0	0
H-12	31675	5927	15410.2	40332	8657	22508.2	55197	14865	38649	72371	17174	44652.4	89684	17313	45013.8	101574	11890	30914
2-13	2191	19	49.4	2257	66	171.6	2310	53	137.8	2458	148	384.8	2597	139	361.4	2702	105	273
2-14	75894	16482	42853.2	86422	10528	27372.8	102499	16077	41800.2	102499	0	0	102499	0	0	102499	0	0
2-15	23818	6360	16536	28455	4637	12056.2	35628	7173	18649.8	38518	2890	7514	40254	1736	4513.6	43488	3234	8408.4
2-16	34	0	0	35	1	2.6	37	2	5.2	37	0	0	37	0	0	37	0	0
2-17	332268	47852	124415.2	391247	58979	153345.4	417004	25757	66968.2	426845	9841	25586.6	434854	8009	20823.4	457851	22997	59792.2
2-18	372865	68576	178297.6	425179	52314	136016.4	458680	33501	87102.6	483051	24371	63364.6	501458	18407	47858.2	517849	16391	42616.6
3-19	160	59	153.4	285	125	325	318	33	85.8	2114	1796	4669.6	2536	422	1097.2	4857	2321	6034.6
3-20	59209	8731	22700.6	65333	6124	15922.4	73431	8098	21054.8	73431	0	0	73431	0	0	73431	0	0
3-21	1818	271	704.6	6598	4780	12428	12095	5497	14292.2	21295	9200	23920	26849	5554	14440.4	34854	8005	20813
3-22	4632	605	1573	6574	1942	5049.2	9996	3422	8897.2	11356	1360	3536	12033	677	1760.2	13644	1611	4188.6
3-23	10596	2121	5514.6	38477	27881	72490.6	62911	24434	63528.4	75376	12465	32409	80360	4984	12958.4	84512	4152	10795.2
3-24	93980	15855	41223	120547	26567	69074.2	153287	32740	85124	168005	14718	38266.8	178547	10542	27409.2	184632	6085	15821
3-25	137205	2410	6266	165477	28272	73507.2	212169	46692	121399.2	234071	21902	56945.2	245320	11249	29247.4	254187	8867	23054.2
3-26	6418	391	1016.6	6428	10	26	6435	7	18.2	6435	0	0	6435	0	0	6435	0	0
3-27	238279	0	0	238279	0	0	238279	0	0	238279	0	0	238279	0	0	238279	0	0
3-28	36676	4198	10914.8	45221	8545	22217	62661	17440	45344	71598	8937	23236.2	75854	4256	11065.6	82015	6161	16018.6
3-29	10	3	7.8	11	1	2.6	11	0	0	11	0	0	11	0	0	11	0	0
3-30	69460	9223	23979.8	69460	0	0	69462	2	5.2	69462	0	0	69462	0	0	69462	0	0
4-31	17	0	0	17	0	0	17	0	0	17	0	0	17	0	0	17	0	0
4-32	94	13	33.8	1202	1108	2880.8	2100	898	2334.8	2473	373	969.8	2473	0	0	2473	0	0
4-33	143874	68453	177977.8	294352	150478	391242.8	405100	110748	287944.8	468470	63370	164762	468729	259	673.4	468729	0	0

Table 3: Pump Counters

Location	July 10, 2021			August 10, 2021			September 10, 2021			October 20, 2021			November 20, 2021			December 20, 2021		
	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo
4-34	264154	161703	420427.8	409754	145600	378560	584215	174461	453598.6	647577	63362	164741.2	701547	53970	140322	750111	48564	126266.4
4-35	34419	7461	19398.6	40809	6390	16614	69554	28745	74737	91593	22039	57301.4	98741	7148	18584.8	102453	3712	9651.2
4-36	16	0	0	16	0	0	16	0	0	16	0	0	16	0	0	16	0	0
4-37	1559	535	1391	1688	129	335.4	1721	33	85.8	1787	66	171.6	13457	11670	30342	18541	5084	13218.4
5-38	520484	15	39	584214	63730	166698	610252	26038	67698.8	655010	44758	116370.8	671244	16234	42208.4	687326	16082	41813.2
5-39	26600	7122	18517.2	85421	58821	152934.6	115421	30000	78000	139811	24390	63414	27074	-	-	27074	0	0
5-40	5	0	0	5	0	0	5	0	0	6	1	2.6	6	0	0	6	0	0
5-41	19	0	0	19	0	0	19	0	0	21	2	5.2	21	0	0	21	0	0
5-42	54230	6708	17440.8	63258	9028	23472.8	78451	15193	39501.8	97227	18776	48817.6	102447	5220	13572	108445	5998	15594.8
5-43	27	7	18.2	6452	6425	16705	11245	4793	12461.8	27988	16743	43531.8	28244	256	665.6	28657	413	1073.8
5-44	12	0	0	12	0	0	12	0	0	13	1	2.6	13	0	0	13	0	0
5-45	53	6	15.6	53	0	0	53	0	0	54	1	2.6	54	0	0	54	0	0
5-46	659	4	10.4	659	0	0	659	0	0	664	5	13	670	6	15.6	679	9	23.4
6-47	818457	167179	434665.4	857421	38964	101306.4	988542	131121	340914.6	191419	-	-	284959	93540	243204	348751	63792	165859.2
6-48	7377	2	5.2	7377	0	0	7377	0	0	7377	0	0	7383	6	15.6	7387	4	10.4
6-49	22	0	0	22	0	0	33	11	28.6	39	6	15.6	25693	25654	66700.4	68455	42762	111181.2
6-50	3639	1153	2997.8	4244	605	1573	6541	2297	5972.2	7145	604	1570.4	8017	872	2267.2	8652	635	1651
6-51	12	0	0	12	0	0	12	0	0	12	0	0	12	0	0	12	0	0
6-52	3197	1950	5070	3197	0	0	3197	0	0	8245	5048	13124.8	9852	1607	4178.2	11541	1689	4391.4
6-53	29	14	36.4	40	11	28.6	55	15	39	68	13	33.8	68	0	0	70	2	5.2
6-54	311088	109514	284736.4	342512	31424	81702.4	410214	67702	176025.2	484248	74034	192488.4	694851	210603	547567.8	801254	106403	276647.8
6-55	21669	6812	17711.2	50212	28543	74211.8	66754	16542	43009.2	83715	16961	44098.6	83715	0	0	83723	8	20.8
6-56	184698	84451	219572.6	245154	60456	157185.6	302151	56997	148192.2	344857	42706	111035.6	351444	6587	17126.2	362013	10569	27479.4
6-57	129	114	296.4	248	119	309.4	308	60	156	344	36	93.6	350	6	15.6	350	0	0
6-58	7	1	2.6	7	0	0	7	0	0	7	0	0	7	0	0	7	0	0
6-59	17	1	2.6	17	0	0	17	0	0	17	0	0	17	0	0	17	0	0
7-60	156708	60837	158176.2	187951	31243	81231.8	197311	9360	24336	287485	90174	234452.4	369745	82260	213876	438915	69170	179842
7-61	283	115	299	283	0	0	283	0	0	283	0	0	283	0	0	283	0	0
7-62	36928	12230	31798	48512	11584	30118.4	63991	15479	40245.4	84556	20565	53469	100355	15799	41077.4	122489	22134	57548.4
7-63	44486	13908	36160.8	53245	8759	22773.4	85748	32503	84507.8	134854	49106	127675.6	167812	32958	85690.8	209847	42035	109291
7-64	21377	5130	13338	21568	191	496.6	22358	790	2054	23014	656	1705.6	24887	1873	4869.8	25470	583	1515.8
7-65	68	49	127.4	13241	13173	34249.8	34854	21613	56193.8	85412	50558	131450.8	105487	20075	52195	134841	29354	76320.4
7-66	247	235	611	1312	1065	2769	3214	1902	4945.2	6745	3531	9180.6	11021	4276	11117.6	13251	2230	5798
7-67	29	6	15.6	29	0	0	29	0	0	29	0	0	29	0	0	29	0	0
7-68	3	0	0	3	0	0	3	0	0	3	0	0	3	0	0	3	0	0
8-69	51	47	122.2	103475	103424	268902.4	123398	19923	51799.8	163452	40054	104140.4	193200	29748	77344.8	203398	10198	26514.8
8-70	113098	48226	125387.6	168447	55349	143907.4	185690	17243	44831.8	236552	50862	132241.2	296335	59783	155435.8	348771	52436	136333.6
8-71	9025	2574	6692.4	10541	1516	3941.6	11328	787	2046.2	16874	5546	14419.6	23121	6247	16242.2	28485	5364	13946.4
8-72	19055	8808	22900.8	61849	42794	111264.4	129784	67935	176631	264875	135091	351236.6	391784	126909	329963.4	503157	111373	289569.8
8-73	15	3	7.8	15	0	0	15	0	0	15	0	0	15	0	0	15	0	0
8-74	16	3	7.8	16	0	0	25	9	23.4	30	5	13	41	11	28.6	46	5	13
WH-75	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0
WH-76	167	149	387.4	217	50	130	278	61	158.6	327	49	127.4	496	169	439.4	561	65	169
WH-77	14123	5561	14458.6	14123	0	0	14123	0	0	14123	0	0	14123	0	0	14123	0	0
WH-78	51	37	96.2	51	0	0	51	0	0	51	0	0	51	0	0	51	0	0
WH-79	16	0	0	16	0	0	16	0	0	16	0	0	16	0	0	16	0	0
WH-80	18	5	13	18	0	0	18	0	0	18	0	0	18	0	0	18	0	0
5-81	2114	57	148.2	12245	10131	26340.6	18457	6212	16151.2	27074	8617	22404.2	27074	0	0	27074	0	0
7-82	372628	48110	125086	372628	0	0	372628	0	0	372628	0	0	372628	0	0	372628	0	0
7-83	19	3	7.8	19	0	0	19	0	0	19	0	0	19	0	0	19	0	0

Table 4: Water Levels

			January 5/2021				May 16/2021				Sept 16/2021			
Units	meters	meters	meters	meters	°C	%	meters	meters	°C	%	meters	meters	°C	%
Locations	Screen Length	Installed Well Depth	Depth to Water	Depth to Bottom	Temperature	Open Screen	Depth to Water	Depth to Bottom	Temperature	Open Screen	Depth to Water	Depth to Bottom	Temperature	Open Screen
H-1	12	14.63	7.70	14.20	39.4	43.14	7.90	14.30	40.3	44.78	7.90	14.30	40.3	44.78
H-2	14	16.77	9.10	17.90	35.4	44.11	9.30	17.90	37.1	45.56	9.30	17.90	37.1	45.56
H-3	12	15.24	7.00	15.50	28.4	32.40	6.40	15.70	31.5	27.48	6.40	15.70	31.5	27.48
H-4	11	14.02	8.10	9.80	24.9	46.02	10.90	9.90	36.2	71.53	10.90	9.90	36.2	71.53
1-5	11	13.72	7.90	14.20	38.6	45.46	7.40	14.30	39.6	40.78	7.40	14.30	39.6	40.78
1-6	12	15.55	10.70	16.10	25.1	60.24	10.10	16.00	27.1	55.32	10.10	16.00	27.1	55.32
1-7	18	21.34	14.00	19.70	37.6	59.87	13.80	19.70	37.1	58.77	13.80	19.70	37.1	58.77
1-8	21	24.39	8.00	23.20	40.4	23.20	7.90	23.00	41.6	22.73	7.90	23.00	41.6	22.73
1-9	12	14.63	9.00	14.50	44.1	53.80	9.20	14.70	51.8	55.44	9.20	14.70	51.8	55.44
1-10	9	12.20	8.50	11.40	41.2	59.60	8.00	11.50	40.5	54.13	8.00	11.50	40.5	54.13
H-11	9	12.80	Foam	11.90	33.5	-	Foam	12.00	34.6	-	Foam	12.00	34.6	-
H-12	13	16.16	5.70	16.20	23.7	20.22	5.50	16.10	35.6	18.70	5.50	16.10	35.6	18.70
2-13	21	25.00	-	-	-	-	-	-	-	-	-	-	-	-
2-14	20	22.56	6.60	21.50	34.0	19.46	6.40	21.40	43.2	18.45	6.40	21.40	43.2	18.45
2-15	18	21.65	8.70	17.80	33.9	29.23	6.90	17.50	36.2	19.39	6.90	17.50	36.2	19.39
2-16	26	28.35	21.40	28.00	36.4	73.17	21.40	28.10	37.1	73.17	21.40	28.10	37.1	73.17
2-17	15	18.29	15.40	16.20	14.7	81.02	15.60	16.10	15.4	82.34	15.60	16.10	15.4	82.34
2-18	15	18.29	14.70	15.40	36.4	76.43	14.90	15.60	40.3	77.74	14.90	15.60	40.3	77.74
3-19	12	14.94	8.00	14.40	19.5	43.10	8.90	14.50	32.8	50.48	8.90	14.50	32.8	50.48
3-20	11	13.26	8.30	13.70	27.2	53.50	8.60	14.00	18.3	56.31	8.60	14.00	18.3	56.31
3-21	5	7.62	3.70	7.50	16.7	14.24	3.40	7.60	27.5	7.68	3.40	7.60	27.5	7.68
3-22	24	26.68	8.40	18.10	33.4	24.12	8.60	19.00	36.9	24.95	8.60	19.00	36.9	24.95
3-23	23	25.91	11.00	15.10	31.5	34.77	10.50	17.40	34.2	32.59	10.50	17.40	34.2	32.59
3-24	21	23.48	7.10	19.20	35.6	23.27	7.60	20.10	36.1	25.61	7.60	20.10	36.1	25.61
3-25	18	21.34	7.50	18.20	34.9	24.33	8.20	18.40	37.4	28.16	8.20	18.40	37.4	28.16
3-26	9	12.20	4.40	14.10	22.0	14.77	5.20	13.80	35.4	23.52	5.20	13.80	35.4	23.52
3-27	21	24.09	6.60	19.20	40.9	18.07	7.00	19.50	41.5	19.94	7.00	19.50	41.5	19.94
3-28	12	15.24	3.10	15.40	16.9	0.42	4.70	15.20	32.4	13.54	4.70	15.20	32.4	13.54
3-29	12	14.63	8.20	15.00	31.7	47.24	8.50	14.80	29.6	49.70	8.50	14.80	29.6	49.70
3-30	7	9.76	5.50	8.20	38.5	41.83	5.80	8.30	40.5	45.93	5.80	8.30	40.5	45.93
4-31	16	18.75	9.60	18.20	22.6	43.37	9.40	18.10	39.4	42.14	9.40	18.10	39.4	42.14
4-32	10	12.50	6.30	11.30	28.6	36.45	6.60	11.50	36.2	39.53	6.60	11.50	36.2	39.53
4-33	24	26.68	7.90	20.10	25.7	23.02	8.20	20.40	34.8	24.25	8.20	20.40	34.8	24.25
4-34	20	22.56	6.30	20.00	31.8	17.94	6.60	20.10	33.6	19.46	6.60	20.10	33.6	19.46
4-35	15	17.38	8.10	18.80	25.9	39.14	8.30	18.70	30.4	40.45	8.30	18.70	30.4	40.45
4-36	15	18.29	3.30	18.00	35.1	1.65	2.60	17.80	37.5	0.00	2.60	17.80	37.5	0.00
4-37	12	14.94	9.80	14.60	33.9	57.86	10.30	15.20	34.6	61.96	10.30	15.20	34.6	61.96
5-38	8	10.67	5.20	11.90	13.8	28.22	5.90	12.00	19.6	37.41	5.90	12.00	19.6	37.41
5-39	8	10.67	5.10	12.20	12.7	26.91	13.40	12.30	16.5	135.81	13.40	12.30	16.5	135.81
5-40	18	21.95	6.10	13.60	36.7	13.35	5.40	13.40	37.5	9.52	5.40	13.40	37.5	9.52
5-41	17	18.90	11.00	15.90	27.6	52.87	10.60	16.10	28.9	50.49	10.60	16.10	28.9	50.49
5-42	12	16.16	10.10	14.60	30.1	50.32	9.90	14.70	31.6	48.68	9.90	14.70	31.6	48.68
5-43	14	16.16	5.9	12.1	18.2	25.23	6.2	12.3	25.3	27.41	6.2	12.3	25.3	27.41
5-44	19	21.95	12.6	13.5	32.6	50.53	11.5	14.1	36.1	44.71	11.5	14.1	36.1	44.71
5-45	15	16.77	7	15.4	27.4	35.92	7.1	15.4	29.4	36.58	7.1	15.4	29.4	36.58
5-46	16	18.90	8.2	16.9	20.4	32.49	8.3	16.8	26.4	33.12	8.3	16.8	26.4	33.12
6-47	14	15.85	5.5	13.8	20.8	24.53	5.5	14	22.8	24.53	5.5	14	22.8	24.53
6-48	15	17.68	5.5	15.2	25.9	16.75	5.7	15.1	28.3	18.12	5.7	15.1	28.3	18.12
6-49	20	23.48	14.9	23.1	30.4	58.02	14.5	23.4	33.7	56.06	14.5	23.4	33.7	56.06
6-50	14	17.38	13.6	16.8	35.4	73.63	13.6	16.8	39.4	73.63	13.6	16.8	39.4	73.63
6-51	12	14.94	5.8	5.5	22.5	25.06	6.2	5.6	30.2	28.34	6.2	5.6	30.2	28.34
6-52	6	9.15	4.9	7.6	24.1	30.36	4.7	7.7	29.5	27.08	4.7	7.7	29.5	27.08
6-53	22	23.63	14.5	20.9	32.6	58.70	14.4	21	35	58.25	14.4	21	35	58.25
6-54	13	15.85	7	15.4	22.7	32.47	6.7	15	29.6	30.18	6.7	15	29.6	30.18
6-55	18	21.34	16.1	21.8	30.5	71.35	15.8	21.7	33.5	69.71	15.8	21.7	33.5	69.71
6-56	10	12.80	4.8	13	33.9	20.44	4.7	12.5	36	19.44	4.7	12.5	36	19.44
6-57	-	-	11.2	14.4	25.4	-	11.6	14.5	34.1	-	11.6	14.5	34.1	-
6-58	-	-	9.5	21.3	23.8	-	8.9	21.6	20.7	-	8.9	21.6	20.7	-
6-59	17	20.12	16.5	21.8	25.7	78.79	16	21.6	30.5	75.86	16	21.6	30.5	75.86
7-60	13	15.55	5.6	13.9	24.6	20.41	5.8	14.1	24.9	22.01	5.8	14.1	24.9	22.01
7-61	13	15.24	6.4	12	23.8	30.93	6.3	12	32.5	30.15	6.3	12	32.5	30.15
7-62	17	18.29	16.5	16.8	25.3	89.31	16.7	16.7	36.9	90.50	16.7	16.7	36.9	90.50
7-63	11	14.00	6.7	12.5	32.6	33.64	6.2	12.3	32.6	29.09	6.2	12.3	32.6	29.09

Table 4: Water Levels

			January 5/2021				May 16/2021				Sept 16/2021			
Units	meters	meters	meters	meters	°C	%	meters	meters	°C	%	meters	meters	°C	%
Locations	Screen Length	Installed Well Depth	Depth to Water	Depth to Bottom	Temperature	Open Screen	Depth to Water	Depth to Bottom	Temperature	Open Screen	Depth to Water	Depth to Bottom	Temperature	Open Screen
7-64	22	24.09	16.8	26.1	30.1	66.81	16.9	26.2	30.7	67.27	16.9	26.2	30.7	67.27
7-65	24	26.22	17.5	27.8	31.6	63.33	16.4	27.5	33.8	58.71	16.4	27.5	33.8	58.71
7-66	19	22.00	15.7	22.5	29.8	66.84	14.3	22.7	30.5	59.47	14.3	22.7	30.5	59.47
7-67	26	28.50	-	-	-	-	-	-	-	-	-	-	-	-
7-68	28	31.30	14.8	17.4	22.7	41.70	15.4	17.3	32.8	43.82	15.4	17.3	32.8	43.82
8-69	16	19.10	4.9	14.8	13.5	11.80	6.2	14.7	27.6	19.88	6.2	14.7	27.6	19.88
8-70	13	15.50	6.2	14.6	26.5	25.60	5.9	14.3	31.8	23.20	5.9	14.3	31.8	23.20
8-71	27	30.00	-	-	-	-	-	-	-	-	-	-	-	-
8-72	27	29.50	14.5	27.1	35.4	43.40	14.7	27.3	35.4	44.15	14.7	27.3	35.4	44.15
8-73	24	26.50	8.3	18.9	25.9	22.55	10.8	18.6	33	33.19	10.8	18.6	33	33.19
8-74	27	29.80	8.6	18.1	27.1	20.90	7.6	18.4	37.5	17.16	7.6	18.4	37.5	17.16
WH-75	20	22.70	-	-	-	-	6.1	13.7	38.3	15.74	6.1	13.7	38.3	15.74
WH-76	15	17.80	-	-	-	-	8.7	10.8	30.5	38.51	8.7	10.8	30.5	38.51
WH-77	15	17.90	-	-	-	-	6.7	12.9	29.4	24.83	6.7	12.9	29.4	24.83
WH-78	24	27.20	-	-	-	-	8.4	19.7	35.1	22.31	8.4	19.7	35.1	22.31
WH-79	19	21.80	-	-	-	-	10.8	17.5	27.6	41.49	10.8	17.5	27.6	41.49
WH-80	15	18.00	-	-	-	-	7.6	16.8	18.5	30.67	7.6	16.8	18.5	30.67
5-81	6	9.00	-	-	-	-	2.4	5.1	22.4	0.00	2.4	5.1	22.4	0.00
7-82	8	11.00	-	-	-	-	3	6	30.5	0.00	3	6	30.5	0.00
7-83	8	10.90	-	-	-	-	1.8	5.7	28.4	0.00	1.8	5.7	28.4	0.00

2.3 Surface Emission Monitoring

As required by the City, surface emission monitoring is requested to be carried out semi-annually, weather conditions permitting, by Comcor. This monitoring is performed using a portable flame ionization detector (FID) and a GPS, marking locations where concentrations of hydrocarbons were greater than 500 ppm. The surface emission monitoring was completed in May and October for the 2021 reporting year. Several areas were noted where there were significant volumes of gas detected, including areas where cap was weak and pipe emanated from the landfill surface. In previous surveys, manholes were identified as significant sources of surface emissions, however since completion of the leachate manhole/sump lid retrofits, only very low emissions were detected. The reports from the two surface emission monitoring events in 2021 have been included in Appendix B.

2.4 Mechanical System Monitoring

The main operational control of the mechanical system is carried out by the Programmable Logic Controller (PLC). The PLC also provides information on the operating status of the system, and records all data electronically which can be downloaded when required. Specific details on these items are included in the Flare Operation and Maintenance Manual. At a minimum the PLC records:

- Landfill gas composition and temperature
- Flare operating times
- Blower operating times
- Landfill gas flow rate
- Volume of landfill gas collected and flared
- Greenhouse Gas Emission Reduction in CO₂ equivalents.

These items were also monitored remotely and were reviewed at minimum on a weekly basis to ensure that all parameters outlined above are being recorded and that all system data indicates that the overall system is operating properly. The system review was carried out by a technician experienced in the operation of such systems.

Comcor staff also carried out the maintenance of the system as outlined by the Operations and Maintenance Manual. Other notable maintenance that was performed in 2021 included:

- Replacement of flare thermocouples
- Commissioning and connecting the new air compressor to the system
- Electrical maintenance including work associated with the operation of the new air compressor, replacement of the flare louvre actuators, and replacement of a blower VFD drive fan. An issue with the flame scanner repeatedly shutting down due to an amplifier shutter fault caused by the scanner observing too much flame was also resolved by HS Electric.

Data for 2021 has been compiled, and is found in Appendix A.

2.4.1 System Pressure Measurements

Monitoring ports at the inlet and outlet to the blower were measured and recorded on a monthly frequency, using a suitably scaled pressure gauge. Gauge fluctuations were noted, as it can be an indication of water within the system.

Data for 2021 has been compiled, and is found in Table 2.

2.4.2 System Gas Measurements

The purpose of the main blower skid gas analyzer system is to monitor the oxygen and methane concentrations of the landfill gas being transferred by the LGFCS to the flare. As a safety precaution, if either the oxygen concentration gets too high, or the methane concentration gets too low, an alarm is sent to the main computer control panel PLC to shut the system down. Having records of the gas concentrations also allows for better analysis of the system and aids in troubleshooting when problems arise.

A pump, located within the gas analyzer system cabinet in the control room, is used to draw a continuous sample of process gas from the header pipe on the blower discharge side. After entering the analyzer, the sample is drawn through a de-mister and a series of filters to remove any particulate or moisture that may affect the monitoring equipment. The methane and oxygen concentrations of the sample are then measured by an infra-red methane analyzer and oxygen analyzer. The methane and oxygen concentrations are displayed on separate LED display screens mounted on the front face of the gas analyzer panel. The gas analyzer system will send signals to the PLC that will trigger a number of system alarms/warnings including low methane and high oxygen.

All system failures and/or alarms are displayed on the main control circuit panel. Any alarms that shut down the system are relayed by the auto messaging to the system operator.

During 2021, the system operated as intended with the analyzer data recorded at an interval of five minutes or better and any system alarms were sent to the operator. This data was recorded and summarized into a daily value and can be found in Appendix A.

In addition to the main system analyser, concentrations of methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂) were measured manually, recorded monthly at the blower inlet and blower outlet, and compared to the insitu monitoring devices to ensure accuracy. These measurements were taken using a proper gas meter/analyzer such as a Landtec GEM-5000+, or equivalent.

2.4.3 System Flow Rate Measurements

Landfill gas velocities and temperatures at each landfill gas extraction well in the wellfield were measured and recorded on a monthly basis using an anemometer, if possible. These velocities were used to calculate landfill gas flow rates by multiplying by the pipe's cross sectional area.

A thermal mass flow meter continuously calculates flows to the flare and this data was recorded on an interval of 5 minutes or less.

The monitoring completed in 2021 is found in Table 2 and a summary of daily plant data can be found in Appendix A.

3.0 FLARE AND GREENHOUSE GAS EMISSIONS

3.1 Flare Emissions

The flare stack is equipped with four thermocouples that measure the temperature in the flare stack. These thermocouples are monitored by the system control panel PLC at intervals of 5 minutes or better. The control system is continuously monitoring the flame conditions and will shut down the LGCFSS system immediately if flame is lost.

If the system shuts down for any reason, the fail safe valve will close and prevent any non-combusted landfill gas from being released to the atmosphere, thereby controlling the emissions from the flare.

3.2 Greenhouse Gas Emissions

The landfill gas is comprised of primarily methane and carbon dioxide in approximately equal amounts. In addition there are other trace amounts of a large number of compounds. Methane and carbon dioxide are greenhouse gases but methane has a global warming potential 25 times that of carbon dioxide. By combusting the methane in the flare the resultant products are carbon dioxide and water vapour which reduces its global warming potential by approximately 95 percent.

The control panel records both flow and methane gas concentration being collected from the system and sent to be combusted in the flare. These quantities are measured and recorded at intervals of 5 minutes or less. The data collected can be readily processed to calculate the greenhouse gas emission reduction expressed as carbon dioxide equivalents.

For the Brady Road Landfill, greenhouse gas emissions have been calculated based on operational data and can be found in Appendix A.

4.0 CONDENSATE COLLECTION SYSTEM

The purpose of the Condensate Collection System component of the LGCFS is to remove moisture from the landfill gas and to collect condensate from the collection laterals/header pipes. Collection and removal of the condensate increases the efficiency of the landfill gas collection in the wellfield and minimizes the moisture being passed through the mechanical system.

Condensate and moisture are removed from the system at three main locations. First, relative low points have been provided in the gas collection header to allow any free moisture to drain by gravity out of the underground gas collection system. In the wellfield, this moisture drains into condensate gravity style and pump style drain traps which have pneumatic pumps installed inside the sump. Next, prior to the gas entering the blowers, a condensate moisture separator removes most of the residual water droplets remaining in the gas. At this stage the residual water drains by gravity into the condensate chamber.

The condensate chamber stores the water until the pump at the bottom of the chamber is activated either manually or automatically through a series of floats. The water is then pumped through a 75 mm diameter HDPE forcemain and is discharged into the leachate collection system.

As of the 2019 expansion work, Viridian VP4 pneumatic pumps are installed in nine manholes (MH3, MH4, MH5, MH8, MH31, MH32, MH33, MH42 and MH43). Leachate collected from these manholes is sent directly to the storage tank located in the southwest corner of the Site. As of the 2020 expansion work, QED AP3 pneumatic pumps were installed in 18 new dual-purpose wells and 57 existing gas wells were retrofitted for leachate collection. Condensate/leachate collected from the dual-purpose wells, pump drain traps, and the condensate chamber can either be sent directly to the storage tank or to MH32. Under normal operating conditions, condensate/leachate will be sent directly to the storage tank. If the storage tank is offline, leachate/condensate can be sent to MH32 by opening the isolation valve located on the condensate line to MH32.

5.0 CONCLUSIONS AND RECOMMENDATIONS

1. During operation in 2021, the Brady Road Resource Management Facility Gas Collection and Flaring System operated as was intended.
2. During surface emission monitoring, some areas were noted where gas was escaping. These were identified in areas where surface cap was weak and pipe emanated from the landfill surface. In order to get maximum efficiency from the LGCFS, these issues should be looked at in the future.
3. Investigate better freeze protection for the dual-purpose wells and develop a maintenance program.
4. The system should continue to operate on a full-time basis and be monitored according to the Operation and Maintenance Manual for the site.

All of which is Respectfully Submitted,

INTEGRATED GAS RECOVERY SERVICES



Callie Churchill, EIT
Engineering Project Coordinator



Shannan McGarr, B.Sc.
Wellfield Operations Manager

APPENDIX A
FLARE DATA

Date	CO2 Equivalents			Landfill Gas Flow							Methane	Oxygen	Run Hours	Flare	Flare	Temperature			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg						Avg	Min.	Avg.	Max.	Daily	Cumu.	Daily
	Tonnes CO2	Tonnes CO2	Tonnes CO2	scf	scf	scf	meter3	scfm	MMBTU	(%)	(%)	°C	°C	°C	Hours	Hours	Hours	Hours				
January 1, 2021	233	233	233	1151703	1151703	1151703	32625	800	514	44.1	3.8	24	0	882	900	923	0	25755.1	24.6	34234.7		
January 2, 2021	474	474	241	2302226	2302226	1150523	32592	799	530	45.5	3.6	24	0	883	900	925	0	25755.1	24.6	34259.3		
January 3, 2021	715	715	241	3454236	3454236	1152010	32634	800	531	45.6	3.5	24	0	884	900	916	0	25755.1	24.7	34284		
January 4, 2021	953	953	238	4606114	4606114	1151878	32630	800	523	44.9	3.7	24	0	882	900	926	0	25755.1	23.6	34307.6		
January 5, 2021	1194	1194	241	5758061	5758061	1151947	32632	800	530	45.4	3.5	24	0	858	900	972	0	25755.1	24.7	34332.2		
January 6, 2021	1304	1304	110	6283040	6283040	524979	14872	800	242	45.6	3.3	10.9	0	885	900	922	0	25755.1	11.8	34344		
January 7, 2021	1414	1414	110	6784045	6784045	501005	14192	799	241	47.6	3.1	10.4	1	-7	895	911	0	25755.1	10.3	34354.3		
January 8, 2021	1571	1571	157	7522903	7522903	738858	20930	799	344	46.1	3.4	15.4	0	886	900	914	0	25755.1	16.1	34370.3		
January 9, 2021	1571	1571	0	7522903	7522903	0	0	0	0	0	0	0	0	0	0	0	0	0	25755.1	0	34370.3	
January 10, 2021	1571	1571	0	7522903	7522903	0	0	0	0	0	0	0	0	0	0	0	0	0	25755.1	0	34370.3	
January 11, 2021	1715	1715	144	8190750	8190750	667847	18919	798	317	46.9	3.3	13.9	1	-3	894	922	0	25755.1	13.4	34383.7		
January 12, 2021	1959	1959	244	9341624	9341624	1150874	32602	799	538	46.2	3.5	24	0	885	900	917	0	25755.1	24.6	34408.3		
January 13, 2021	2207	2207	248	10492405	10492405	1150781	32599	799	546	46.9	3.1	24	0	874	900	926	0	25755.1	24.6	34432.9		
January 14, 2021	2450	2450	243	11645116	11645116	1152711	32654	801	535	45.9	3.4	24	0	876	900	921	0	25755.1	24.7	34457.6		
January 15, 2021	2693	2693	243	12797584	12797584	1152468	32647	800	534	45.8	3.2	24	0	863	900	929	0	25755.1	23.6	34481.1		
January 16, 2021	2948	2948	255	13949687	13949687	1152103	32637	800	561	48.2	2.3	24	0	879	900	924	0	25755.1	24.7	34505.8		
January 17, 2021	3199	3199	251	15102110	15102110	1152423	32646	800	552	47.3	2.5	24	0	878	900	917	0	25755.1	24.6	34530.4		
January 18, 2021	3445	3445	246	16254217	16254217	1152107	32637	800	541	46.4	2.7	24	0	872	900	918	0	25755.1	24.6	34555		
January 19, 2021	3691	3691	246	17406085	17406085	1151868	32630	800	541	46.4	2.7	24	0	883	900	920	0	25755.1	23.7	34578.6		
January 20, 2021	3841	3841	150	18084611	18084611	678526	19221	800	331	48.2	2.2	14.1	0	867	900	939	0	25755.1	15.2	34593.9		
January 21, 2021	3960	3960	119	18632867	18632867	548256	15531	799	263	47.3	2.8	11.4	1	7	891	929	0	25755.1	11.2	34605		
January 22, 2021	4207	4207	247	19785248	19785248	1152381	32645	800	543	46.5	2.8	24	0	879	900	929	0	25755.1	24.6	34629.6		
January 23, 2021	4452	4452	245	20936156	20936156	1150908	32603	799	540	46.3	2.8	24	0	876	900	919	0	25755.1	23.6	34653.2		
January 24, 2021	4691	4691	239	22088725	22088725	1152569	32650	800	525	45.1	3.2	24	0	883	900	917	0	25755.1	24.7	34677.9		
January 25, 2021	4930	4930	239	23241057	23241057	1152332	32643	800	526	45.1	3.1	24	0	877	900	923	0	25755.1	24.6	34702.4		
January 26, 2021	5164	5164	234	24394182	24394182	1153125	32666	801	514	44	3.3	24	0	881	900	919	0	25755.1	24.7	34727.1		
January 27, 2021	5389	5389	225	25545756	25545756	1151574	32622	800	496	42.6	3.5	24	0	882	900	917	0	25755.1	24.6	34751.7		
January 28, 2021	5615	5615	226	26697274	26697274	1151518	32620	800	497	42.7	3.6	24	0	880	900	917	0	25755.1	23.6	34775.3		
January 29, 2021	5842	5842	227	27848575	27848575	1151301	32614	800	499	42.9	3.5	24	0	879	900	917	0	25755.1	24.7	34799.9		
January 30, 2021	6066	6066	224	28999798	28999798	1151223	32612	799	493	42.3	3.7	24	0	886	900	919	0	25755.1	24.6	34824.5		
January 31, 2021	6290	6290	224	30151984	30151984	1152186	32639	800	493	42.3	3.6	24	0	881	900	922	0	25755.1	24.6	34849.1		
February 1, 2021	6520	230	230	31304089	1152105	1152105	32637	800	506	43.4	3.3	24	0	879	900	920	0	25755.1	23.6	34872.6		
February 2, 2021	6753	463	233	32455418	2303434	1151329	32615	800	512	43.9	3.2	24	0	881	900	918	0	25755.1	24.7	34897.3		
February 3, 2021	6988	698	235	33606879	3454895	1151461	32619	800	516	44.3	3.2	24	0	886	900	929	0	25755.1	24.6	34921.9		
February 4, 2021	7217	927	229	34755723	4603739	1148844	32544	800	504	43.4	3.4	23.9	1	0	899	931	0	25755.1	24.1	34946		
February 5, 2021	7442	1152	225	35907411	5755427	1151688	32625	800	495	42.5	3.6	24	0	871	900	925	0	25755.1	24.7	34970.7		
February 6, 2021	7665	1375	223	37059029	6907045	1151618	32623	800	492	42.2	3.4	24	0	856	900	930	0	25755.1	24.7	34995.3		
February 7, 2021	7883	1593	218	38211803	8059819	1152774	32656	801	480	41.1	2.6	24	0	877	900	919	0	25755.1	23.6	35018.9		
February 8, 2021	8093	1803	210	39363939	9211955	1152136	32638	800	462	39.6	2.6	24	0	883	900	914	0	25755.1	24.6	35043.5		
February 9, 2021	8297	2007	204	40516104	10364120	1152165	32639	800	448	38.4	2.9	24	0	881	900	918	0	25755.1	24.7	35068.2		
February 10, 2021	8495	2205	198	41667233	11515249	1151129	32609	799	435	37.4	3.2	24	0	873	900	924	0	25755.1	24.6	35092.7		
February 11, 2021	8685	2395	190	42778004	12626020	1110771	31466	771	417	37.1	3.1	24	0	866	899	915	0	25755.1	23.7	35116.4		
February 12, 2021	8870	2580	185	43858558	13706574	1080554	30610	750	408	37.3	3.1	24	0	879	900	918	0	25755.1	24.6	35141		
February 13, 2021	9054	2764	184	44938885	14786901	1080327	30604	750	405	37	3.2	24	0	888	900	914	0	25755.1	24.6	35165.6		
February 14, 2021	9237	2947	183	46016590	15864606	1077705	30529	750	403	37	3.2	24	0	899	924	0	25755.1	24.4	35189.9			
February 15, 2021	9423	3133	186	47095060	16943076	1078470	30551	750	409	37.5	3.1	23.9	1	0	899	914	0	25755.1	24.5	35214.4		
February 16, 2021	9609	3319	186	48175098	18023114	1080038	30595	750	410	37.5	3.2	24	0	876	900	918	0	25755.1	24.7	35239.1		
February 17, 2021	9793	3503	184	49255610	19103626	1080512	30609	750	405	37	3.4	24	0	882	900	921	0	25755.1	23.6	35262.6		
February 18, 2021	9977	3687	184	50337057	20185073	1081447	30635	751	406	37.1	3.3	24	0	883	900	914	0	25755.1	24.7	35287.3		
February 19, 2021	10163	3873	186	51417983	21265999	1080926	30620	751	409	37.4	3.3	24	0	876	900	918	0	25755.1	24.7	35312		
February 20, 2021	10332	4042	169	52391749	22239765	973766	27585	750	371	37.6	3.3	21.6	0	888	900	914	0	25755.1	22.3	35334.3		
February 21, 2021	10332	4042	0	52391749	22239765	0	0	0	0	0	0	0	0	0	0	0	0	0	25755.1	0	35334.3	
February 22, 2021	10477	4187	145	53065116	22913132	673367	19075	749	319	46.9	2.4	15	1	-2	894	930	0	25755.1	14.5	35348.8		
February 23, 2021	10705	4415	228	54145705	23993721	1080589	30611	750	501	45.8	3	24	0	870	900	927	0	25755.1	24.7	35373.5		
February 24, 2021	10933	4643	228	55226003	25074019	1080298	30603	750	500	45.8	3.1	24	0	877	900	919	0	25755.1	24.7	35398.1		
February 25, 2021	11169	4879	236	56305989	26154005	1079986	30594	750	518	47.4	2.4	24	0	878	900	921	0	25755.1	23.6	35421.7		
February 26, 2021	11401	5111	232	57386207	27234223	1080218	30600	750	510	46.7	2.9	24	0	867	900	923	0	25755.1	24.7	35446.4		
February 27, 2021	11633	5343	232	58465986	28314002	1079779	30588	750	511	46.7	3.3	24	0	865	900	923	0	25755.1	24.7	35471.1		
February 28, 2021	11857	5567	224	59543643	29391659	1077657	30528	750	493	45.2	3.1	23.9	1	872	900	922	0	25755.1	24	35495		

Date	CO2 Equivalents						Landfill Gas Flow						Methane	Oxygen	Run Hours	Flare	Flare Starts	Temperature			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg	Avg	Avg						Min.	Avg.	Max.	Daily	Cumu.	Daily	Cumu.
	Tonnes CO2	Tonnes CO2	Tonnes CO2	scf	scf	scf	meter3	scfm	MMBTU	(%)	(%)	(%)	°C	°C	°C	Hours	Hours	Hours	Hours					
March 8, 2021	13481	1624	195	67202874	7659231	894799	25348	749	430	47.4	2.5	19.9	1	16	896	927	0	25755.1	20.4	35668				
March 9, 2021	13692	1835	211	68153248	8609605	950374	26922	750	463	48.2	2.3	21.1	0	877	900	928	0	25755.1	22	35690				
March 10, 2021	13814	1957	122	68693461	9149818	540213	15303	749	269	49.2	2.2	12	1	-4	892	932	0	25755.1	12.1	35702.1				
March 11, 2021	14047	2190	233	69773492	10229849	1080031	30595	750	511	46.8	2.9	24	0	865	900	930	0	25755.1	23.6	35725.7				
March 12, 2021	14284	2427	237	70853303	11309660	1079811	30589	750	521	47.7	2.6	24	0	887	900	914	0	25755.1	24.6	35750.3				
March 13, 2021	14519	2662	235	71933114	12389471	1079811	30589	750	516	47.2	2.8	24	0	878	900	926	0	25755.1	24.7	35774.9				
March 14, 2021	14756	2899	237	73013941	13470298	1080827	30618	750	521	47.7	2.5	24	0	868	900	925	0	25755.1	23.6	35798.5				
March 15, 2021	14956	3099	200	73903024	14359381	889083	25186	750	440	48.9	2.2	19.8	0	885	900	914	0	25755.1	19.5	35818				
March 16, 2021	15074	3217	118	74432781	14889138	529757	15007	750	259	48.2	2.5	11.8	2	255	896	920	0	25755.1	28.5	35846.5				
March 17, 2021	15309	3452	235	75512689	15969046	1079908	30592	750	516	47.2	2.7	24	0	867	900	921	0	25755.1	24.6	35871.1				
March 18, 2021	15545	3688	236	76592797	17049154	1080108	30597	750	520	47.6	2.6	24	0	870	900	924	0	25755.1	24.7	35895.8				
March 19, 2021	15786	3929	241	77673219	18129576	1080422	30606	750	530	48.5	2.4	24	0	889	900	918	0	25755.1	23.7	35919.5				
March 20, 2021	16029	4172	243	78753378	19209735	1080159	30599	750	534	48.8	2.3	24	0	882	900	917	0	25755.1	24.7	35944.1				
March 21, 2021	16267	4410	238	79833266	20289623	1079888	30591	750	524	47.9	2.5	24	0	866	900	928	0	25755.1	24.7	35968.8				
March 22, 2021	16459	4602	192	80698329	21154686	865063	24506	750	423	48.3	2.5	19.2	2	7	893	941	0	25755.1	19.8	35988.6				
March 23, 2021	16696	4839	237	81778298	22234655	1079969	30593	750	521	47.7	2.7	24	0	865	900	924	0	25755.1	23.6	36012.2				
March 24, 2021	16936	5079	240	82857903	23314260	1079605	30583	750	529	48.4	2.5	24	0	871	900	929	0	25755.1	24.7	36036.9				
March 25, 2021	17175	5318	239	83937713	24394070	1079810	30589	750	526	48.2	2.5	24	0	878	900	918	0	25755.1	24.7	36061.5				
March 26, 2021	17413	5556	238	85017854	25474211	1080141	30598	750	523	47.8	2.6	24	0	877	900	919	0	25755.1	24.7	36086.2				
March 27, 2021	17650	5793	237	86098343	26554700	1080489	30608	750	522	47.8	2.6	24	0	866	900	928	0	25755.1	23.7	36109.9				
March 28, 2021	17893	6036	243	87179082	27635439	1080739	30615	751	533	48.8	2.3	24	0	880	900	921	0	25755.1	24.6	36134.5				
March 29, 2021	18141	6284	248	88259065	28715422	1079983	30594	750	545	49.9	2	24	0	836	900	944	0	25755.1	24.7	36159.1				
March 30, 2021	18370	6513	229	89335368	29791725	1076303	30490	749	503	46.2	2.9	23.9	1	0	899	959	0	25755.1	24.1	36183.2				
March 31, 2021	18601	6744	231	90416369	30872726	1081001	30623	751	508	46.5	2.8	24	0	867	900	921	0	25755.1	24.7	36207.9				
April 1, 2021	18843	242	232	91496879	1080510	1080510	30609	750	531	48.6	2.2	24	0	881	900	921	0	25755.1	23.6	36231.5				
April 2, 2021	19085	484	242	92577265	2160896	1080386	30605	750	533	48.7	2.3	24	0	850	900	933	0	25755.1	24.7	36256.1				
April 3, 2021	19324	723	239	93657537	3241168	1080272	30602	750	527	48.2	2.3	24	0	881	900	922	0	25755.1	24.6	36280.7				
April 4, 2021	19567	966	243	94739445	4323076	1081908	30648	751	535	48.9	2.2	24	0	872	900	928	0	25755.1	24.6	36305.3				
April 5, 2021	19810	1209	243	95819584	5403215	1080139	30598	750	535	48.9	2.2	24	0	857	900	930	0	25755.1	24.7	36330				
April 6, 2021	20050	1449	240	96900081	6483712	1080497	30608	750	527	48.2	2.4	24	0	864	900	923	0	25755.1	23.6	36353.5				
April 7, 2021	20192	1591	142	97536047	7119678	635966	18016	750	312	48.5	2.3	14.1	0	885	900	924	0	25755.1	15.2	36368.8				
April 8, 2021	20295	1694	103	97975264	7558895	439217	12442	749	226	50.9	1.7	9.8	1	8	892	938	0	25755.1	9.9	36378.6				
April 9, 2021	20393	1792	98	98397980	7981611	422716	11975	750	216	50.4	1.9	9.4	1	62	894	937	0	25755.1	9.7	36388.3				
April 10, 2021	20393	1792	0	98397980	7981611	0	0	0	0	0	0	0	0	0	0	0	0	25755.1	0	36388.3				
April 11, 2021	20491	1890	98	98815883	8399514	417903	11838	750	215	50.9	1.9	9.3	1	8	892	945	0	25755.1	8.4	36396.7				
April 12, 2021	20734	2133	243	99895633	9479264	1079750	30587	750	534	48.9	2.3	24	0	845	900	932	0	25755.1	24.7	36421.4				
April 13, 2021	20968	2367	234	1.01E+08	10559566	1080302	30603	750	514	47	2.6	24	0	805	900	922	0	25755.1	24.6	36446				
April 14, 2021	21198	2597	230	1.02E+08	11639058	1079492	30580	750	506	46.3	2.7	24	0	865	900	932	0	25755.1	24.7	36470.6				
April 15, 2021	21430	2829	232	1.03E+08	12718641	1079583	30582	750	511	46.8	2.5	24	0	883	900	915	0	25755.1	23.6	36494.2				
April 16, 2021	21667	3066	237	1.04E+08	13798195	1079554	30582	750	522	47.8	2.4	24	0	859	900	929	0	25755.1	24.6	36518.8				
April 17, 2021	21912	3311	245	1.05E+08	14878415	1080220	30600	750	539	49.3	2.2	24	0	859	900	927	0	25755.1	24.7	36543.5				
April 18, 2021	22153	3552	241	1.06E+08	15957166	1078751	30559	749	530	48.5	2.4	24	0	847	900	945	0	25755.1	24.6	36568				
April 19, 2021	22395	3794	242	1.07E+08	17038206	1081040	30624	751	533	48.7	2.4	24	0	848	900	929	0	25755.1	23.6	36591.6				
April 20, 2021	22637	4036	242	1.09E+08	18118551	1080345	30604	750	532	48.6	2.4	24	0	870	900	928	0	25755.1	24.7	36616.3				
April 21, 2021	22883	4282	246	1.1E+08	19198056	1079505	30580	750	541	49.5	2.2	24	0	865	900	931	0	25755.1	24.6	36640.9				
April 22, 2021	23124	4523	241	1.11E+08	20278859	1080803	30617	751	530	48.5	2.5	24	0	864	900	934	0	25755.1	24.7	36665.5				
April 23, 2021	23357	4756	233	1.12E+08	21359005	1080146	30598	750	513	46.9	2.7	24	0	869	900	935	0	25755.1	24.6	36690.1				
April 24, 2021	23605	5004	248	1.13E+08	22440215	1081210	30629	751	546	49.9	1.9	24	0	867	900	933	0	25755.1	23.6	36713.7				
April 25, 2021	23853	5252	248	1.14E+08	23520260	1080045	30596	750	545	49.8	1.9	24	0	876	900	920	0	25755.1	24.6	36738.3				
April 26, 2021	24102	5501	249	1.15E+08	24598405	1078145	30542	750	547	50.1	1.9	23.9	1	0	899	933	0	25755.1	25	36763.2				
April 27, 2021	24348	5747	246	1.16E+08	25679878	1081473	30636	751	541	49.4	2.1	24	0	863	900	929	0	25755.1	23.7	36786.9				
April 28, 2021	24593	5992	245	1.17E+08	26760586	1080708	30614	751	538	49.2	2.1	24	0	859	900	941	0	25755.1	24.6	36811.5				
April 29, 2021	24838	6237	245	1.18E+08	27841261	1080675	30613	750	538	49.2	2.2	24	0	856	900	950	0	25755.1	24.7	36836.2				
April 30, 2021	25087	6486	249	1.19E+08	28921429	1080168	30599	750	548	50.2	1.9	24	0	877	900	927	0	25755.1	23.7	36859.8				
May 1, 2021	25336	249	249	1.2E+08	1079884	1079884	30591	750	547	50.1	2	24	0	847	900	941	0	25755.1	24.7	36884.5				
May 2, 2021	25579	492	243	1.21E+08	2160018	1080134	30598	750	535	49	2.2	24	0	865	900	932	0	25755.1	24.6	36909.1				
May 3, 2021	25822	735	243	1.23E+08	3240452	1080434	30607	750	534	48.8	2.2	24	0	871	900	927	0	25755.1	24.7	36933.8				
May 4, 2021	26063	976	241	1.24E+08	4307529	1067077	30228	749	530	49.1	2.2	23.7	1	186	897	940	0	25755.1	23.4	36957.1				
May 5, 2021	26307	1220	244	1.25E+08	5387955																			

Date	CO2 Equivalents			Landfill Gas Flow							Methane	Oxygen	Run Hours	Flare Starts	Flare	Temperature			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg						Avg	Min.	Avg.	Max.	Daily	Cumu.	Daily
	Tonnes CO2	Tonnes CO2	Tonnes CO2	scf	scf	scf	meter3	scfm	MMBTU	(%)	(%)	°C	°C	°C	Hours	Hours	Hours	Hours				
May 13, 2021	28245	3158	233	1.33E+08	14027368	1079922	30592	750	513	46.9	2.2	24	0	869	900	923	0	25755.1	23.6	37176.4		
May 14, 2021	28471	3384	226	1.34E+08	15107403	1080035	30595	750	497	45.5	2.6	24	0	863	900	936	0	25755.1	24.7	37201.1		
May 15, 2021	28710	3623	239	1.36E+08	16187117	1079714	30586	750	526	48.2	1.6	24	0	850	900	940	0	25755.1	24.7	37225.8		
May 16, 2021	28949	3862	239	1.37E+08	17267143	1080026	30595	750	526	48.1	1.6	24	0	858	900	936	0	25755.1	24.7	37250.4		
May 17, 2021	29167	4080	218	1.38E+08	18256617	989474	28030	750	479	47.8	1.6	21.9	0	868	900	926	0	25755.1	22.3	37272.8		
May 18, 2021	29302	4215	135	1.38E+08	18837737	581120	16462	748	297	50.6	1.3	13	2	24	887	941	0.7	25755.8	12	37284.8		
May 19, 2021	29544	4457	242	1.39E+08	19918612	1080075	30619	751	531	48.6	1.6	24	0	871	900	929	0	25755.8	24.6	37309.3		
May 20, 2021	29782	4695	238	1.4E+08	20999607	1080995	30622	751	523	47.8	1.7	24	0	863	900	933	0	25755.8	23.7	37333		
May 21, 2021	30021	4934	239	1.41E+08	22080052	1080445	30607	750	525	48	1.7	24	0	868	900	926	0	25755.8	24.7	37357.7		
May 22, 2021	30260	5173	239	1.42E+08	23160769	1080717	30615	751	525	48	1.6	24	0	868	900	954	0	25755.8	24.7	37382.4		
May 23, 2021	30502	5415	242	1.44E+08	24241120	1080351	30604	750	532	48.6	1.5	24	0	886	900	917	0	25755.8	24.7	37407		
May 24, 2021	30747	5660	245	1.45E+08	25320862	1079742	30587	750	539	49.4	1.4	24	0	873	900	947	0	25755.8	23.6	37430.6		
May 25, 2021	30985	5898	238	1.46E+08	26401179	1080317	30603	750	524	47.9	1.7	24	0	815	900	950	0	25755.8	24.7	37455.3		
May 26, 2021	31217	6130	232	1.47E+08	27481158	1079979	30594	750	510	46.6	1.8	24	0	870	900	939	0	25755.8	24.7	37480		
May 27, 2021	31454	6367	237	1.48E+08	28561867	1080709	30614	751	521	47.7	1.6	24	0	879	900	924	0	25755.8	23.6	37503.5		
May 28, 2021	31694	6607	240	1.49E+08	29641506	1079639	30584	750	527	48.2	1.5	24	0	879	900	918	0	25755.8	24.7	37528.2		
May 29, 2021	31934	6847	240	1.5E+08	30722062	1080556	30610	750	529	48.3	1.5	24	0	877	900	932	0	25755.8	24.7	37552.9		
May 30, 2021	32169	7082	235	1.51E+08	31802627	1080565	30610	750	516	47.2	1.8	24	0	866	900	944	0	25755.8	24.7	37577.6		
May 31, 2021	32289	7202	120	1.52E+08	32881338	1078711	30558	749	264	24.2	12	24	0	872	900	932	0	25755.8	23.6	37601.1		
June 1, 2021	32358	69	69	1.53E+08	707977	707977	20056	749	151	21.1	13.6	15.7	1	88	895	948	0	25755.8	17	37618.1		
June 2, 2021	32509	220	151	1.54E+08	1354068	646091	18302	749	333	50.9	1.4	14.4	1	25	895	936	0	25755.8	14.1	37632.2		
June 3, 2021	32755	466	246	1.55E+08	2434138	1080070	30596	750	541	49.5	1.6	24	0	857	900	939	0	25755.8	24.7	37656.9		
June 4, 2021	32999	710	244	1.56E+08	3513717	1079579	30582	750	536	49.1	1.6	24	0	849	900	938	0	25755.8	23.7	37680.5		
June 5, 2021	33238	949	239	1.57E+08	4594820	1081103	30626	751	527	48.1	1.7	24	0	861	900	933	0	25755.8	24.7	37705.2		
June 6, 2021	33473	1184	235	1.58E+08	5674810	1079990	30594	750	516	47.2	1.8	24	0	855	900	936	0	25755.8	24.6	37729.8		
June 7, 2021	33705	1416	232	1.59E+08	6754084	1079274	30574	750	510	46.7	1.8	24	0	868	900	921	0	25755.8	24.7	37754.5		
June 8, 2021	33939	1650	234	1.6E+08	7833612	1079528	30581	750	514	47	1.7	24	0	881	900	915	0	25755.8	23.7	37778.1		
June 9, 2021	34183	1894	244	1.61E+08	8950910	1117298	31651	776	538	47.5	1.5	24	0	846	900	943	0	25755.8	24.6	37802.7		
June 10, 2021	34437	2148	254	1.62E+08	10102816	1151906	32631	800	558	47.9	1.4	24	0	872	900	925	0	25755.8	24.7	37827.4		
June 11, 2021	34693	2404	256	1.63E+08	11254747	1151931	32632	800	563	48.3	1.3	24	0	856	900	934	0	25755.8	23.7	37851.1		
June 12, 2021	34943	2654	250	1.65E+08	12404991	1150244	32584	799	549	47.2	1.6	24	0	847	900	957	0	25755.8	24.6	37875.6		
June 13, 2021	35193	2904	250	1.66E+08	13556318	1151327	32615	800	550	47.2	1.5	24	0	857	900	942	0	25755.8	24.7	37900.3		
June 14, 2021	35441	3152	248	1.67E+08	14704848	1148530	32536	799	545	46.9	1.6	24	0	862	900	942	0	25755.8	24.7	37925		
June 15, 2021	35557	3268	116	1.67E+08	15235102	530254	15021	800	256	47.6	1.4	11	1	0	898	920	0	25755.8	23.6	37948.6		
June 16, 2021	35809	3520	252	1.69E+08	16386667	1151565	32622	800	555	47.6	1.3	24	0	863	900	923	0	25755.8	24.6	37973.1		
June 17, 2021	35938	3649	129	1.69E+08	16984475	597808	16935	800	285	47.1	1.4	12.5	0	878	900	923	0	25755.8	13.4	37986.6		
June 18, 2021	36072	3783	134	1.7E+08	17610848	626373	17744	800	295	46.5	1.6	13.1	1	0	898	932	0	25755.8	35.1	38021.7		
June 19, 2021	36315	4026	243	1.71E+08	18763010	1152162	32638	800	534	45.8	1.9	24	0	867	900	922	0	25755.8	24.7	38046.4		
June 20, 2021	36552	4263	237	1.72E+08	19915573	1152563	32650	800	522	44.8	2.3	24	0	857	900	933	0	25755.8	24.7	38071.1		
June 21, 2021	36787	4498	235	1.73E+08	21067493	1151920	32632	800	518	44.4	2.3	24	0	869	900	930	0	25755.8	24.7	38095.7		
June 22, 2021	37027	4738	240	1.74E+08	22219535	1152042	32635	800	528	45.3	2.2	24	0	857	900	943	0	25755.8	23.7	38119.4		
June 23, 2021	37273	4984	246	1.76E+08	23371504	1151969	32633	800	540	46.3	1.9	24	0	859	900	934	0	25755.8	24.7	38144.1		
June 24, 2021	37517	5228	244	1.77E+08	24521655	1150151	32581	799	537	46.2	2.1	24	0	856	900	929	0	25755.8	24.7	38168.8		
June 25, 2021	37750	5461	233	1.78E+08	25675083	1153428	32674	801	513	44	2.9	24	0	860	900	936	0	25755.8	23.6	38192.3		
June 26, 2021	37972	5683	222	1.79E+08	26826115	1151032	32606	799	489	42	3	24	0	860	900	940	0	25755.8	24.7	38217		
June 27, 2021	38210	5921	238	1.8E+08	27978219	1152104	32637	800	522	44.8	2.3	24	0	853	900	937	0	25755.8	24.7	38241.7		
June 28, 2021	38467	6178	257	1.81E+08	29130065	1151846	32629	800	565	48.4	1.4	24	0	864	900	943	0	25755.8	24.7	38266.4		
June 29, 2021	38725	6436	258	1.83E+08	30282638	1152573	32650	800	568	48.7	1.3	24	0	851	900	930	0	25755.8	23.7	38290		
June 30, 2021	38987	6698	262	1.84E+08	31435642	1153004	32662	801	576	49.4	1	24	0	867	900	937	0	25755.8	24.7	38314.7		
July 1, 2021	39251	264	264	1.85E+08	1151708	1151708	32626	800	580	49.7	0.7	24	0	860	900	939	0	25755.8	24.7	38339.4		
July 2, 2021	39517	530	266	1.86E+08	2304147	1152439	32646	800	585	50.2	0.6	24	0	870	900	940	0	25755.8	23.7	38363		
July 3, 2021	39786	799	269	1.87E+08	3457805	1153658	32681	801	592	50.7	0.5	24	0	878	900	920	0	25755.8	24.7	38387.7		
July 4, 2021	40053	1066	267	1.88E+08	4609008	1151203	32611	799	587	50.4	0.5	24	0	846	900	964	0	25755.8	24.7	38412.4		
July 5, 2021	40330	1343	277	1.89E+08	5843622	1234614	34974	857	609	48.8	0.8	24	0	862	900	949	0	25755.8	23.7	38436.1		
July 6, 2021	40615	1628	285	1.91E+08	7140098	1296476	36727	900	627	47.8	0.9	24	0	867	900	925	0	25755.8	24.7	38460.8		
July 7, 2021	40904	1917	289	1.92E+08	8435374	1295276	36693	900	636	48.5	0.7	24	0	868	900	932	0	25755.8	24.7	38485.4		
July 8, 2021	41193	2206	289	1.93E+08	9730514	1295140	36689	899	636	48.5	0.7	24	0	874	900	931	0	25755.8	24.6	38510		
July 9, 2021	41482	2495	289	1.95E+08	11024786	1294272	36664	899	635	48.5	0.8	24	0	869	900	940	0	25755.8	23.7	38533.7		
July 10, 2021	41773	2786	291	1.96E+08	12320256</																	

Date	CO2 Equivalents			Landfill Gas Flow						Methane	Oxygen	Flare	Flare	Temperature			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg	Avg	Run Hours	Starts	Min.	Avg.	Max.	Daily	Cumu.	Daily	Cumu.
	Tonnes CO2	Tonnes CO2	Tonnes CO2	scf	scf	scf	meter3	scfm	MMBTU	(%)	(%)			°C	°C	°C	Hours	Hours	Hours	Hours
July 18, 2021	44074	5087	292	2.06E+08	22689031	1295600	36702	900	642	49	1.6	24	0	879	900	920	0	25755.8	24.7	38753.9
July 19, 2021	44363	5376	289	2.08E+08	23985898	1296867	36738	901	636	48.5	1.7	24	0	845	900	938	0	25755.8	23.6	38777.4
July 20, 2021	44651	5664	288	2.09E+08	25281834	1295936	36711	900	634	48.3	1.8	24	0	846	900	937	0	25755.8	24.7	38802.1
July 21, 2021	44940	5963	289	2.1E+08	26578097	1296263	36721	900	636	48.5	1.8	24	0	879	900	923	0	25755.8	24.7	38826.8
July 22, 2021	45229	6242	289	2.12E+08	27873932	1295835	36708	900	636	48.5	1.8	24	0	855	900	922	0	25755.8	23.7	38850.4
July 23, 2021	45524	6537	295	2.13E+08	29199950	1296018	36714	900	648	49.4	1.5	24	0	863	900	933	0	25755.8	24.7	38875.1
July 24, 2021	45819	6832	295	2.14E+08	30465125	1295175	36690	899	648	49.4	1.3	24	0	854	899	971	0	25755.8	24.7	38899.8
July 25, 2021	46112	7125	293	2.15E+08	31760950	1295825	36708	900	645	49.2	1.3	24	0	842	900	971	0	25755.8	23.7	38923.5
July 26, 2021	46405	7418	293	2.17E+08	33056375	1295425	36697	900	645	49.2	1.4	24	0	866	900	941	0	25755.8	24.7	38948.1
July 27, 2021	46699	7712	294	2.18E+08	34352211	1295836	36708	900	646	49.3	1.5	24	0	868	900	931	0	25755.8	24.7	38972.8
July 28, 2021	46991	8004	292	2.19E+08	35647377	1295166	36689	899	642	49	1.6	24	0	861	900	932	0	25755.8	24.7	38997.5
July 29, 2021	47043	8056	52	2.2E+08	35884400	237023	6714	900	115	48	1.8	4.3	0	886	900	918	0	25755.8	4.6	39002.1
July 30, 2021	47197	8210	154	2.2E+08	36545015	660615	18714	900	338	50.6	1.7	12.2	1	47	896	934	0	25755.8	11.8	39013.9
July 31, 2021	47487	8500	290	2.21E+08	37840530	1295515	36699	900	637	48.6	2	24	0	854	900	943	0	25755.8	24.7	39038.5
August 1, 2021	47776	289	289	2.23E+08	1295196	1295196	36690	899	636	48.5	2	24	0	863	900	938	0	25755.8	24.7	39063.2
August 2, 2021	48067	580	291	2.24E+08	2591184	1295988	36713	900	639	48.7	1.9	24	0	863	900	938	0	25755.8	23.7	39086.9
August 3, 2021	48359	872	292	2.25E+08	3887550	1296366	36723	900	641	48.9	1.9	24	0	862	900	941	0	25755.8	24.7	39111.6
August 4, 2021	48651	1164	292	2.27E+08	5184265	1296715	36733	901	643	49	1.8	24	0	861	900	934	0	25755.8	24.7	39136.2
August 5, 2021	48940	1453	289	2.28E+08	6480985	1296720	36733	900	635	48.4	1.9	24	0	843	900	934	0	25755.8	23.7	39159.9
August 6, 2021	49229	1742	289	2.29E+08	7778148	1297163	36746	901	635	48.4	1.9	24	0	860	900	940	0	25755.8	24.7	39184.6
August 7, 2021	49346	1859	117	2.3E+08	8302384	524236	14851	899	257	48.5	1.9	9.7	0	876	900	921	0	25755.8	10.5	39195
August 8, 2021	49346	1859	0	2.3E+08	8302384	0	0	0	0	0	0	0	0	0	0	0	0	25755.8	0	39195
August 9, 2021	49511	2024	165	2.31E+08	9015406	713022	20198	899	363	50.3	1.8	13.3	1	18	894	961	0	25755.8	13.1	39208.1
August 10, 2021	49807	2320	296	2.32E+08	10311346	1295940	36711	900	651	49.6	1.9	24	0	860	900	934	0	25755.8	23.7	39231.8
August 11, 2021	50099	2612	292	2.33E+08	11607142	1295796	36707	900	641	48.9	2	24	0	838	900	969	0	25755.8	24.7	39256.5
August 12, 2021	50383	2896	284	2.34E+08	12902640	1295498	36699	900	626	47.7	2.2	24	0	850	900	957	0	25755.8	24.7	39281.2
August 13, 2021	50669	3182	286	2.36E+08	14198637	1295997	36713	900	628	47.9	2.1	24	0	851	900	947	0	25755.8	24.7	39305.9
August 14, 2021	50959	3472	290	2.37E+08	15494396	1295759	36706	900	638	48.7	1.9	24	0	873	900	938	0	25755.8	23.7	39329.5
August 15, 2021	51251	3764	292	2.38E+08	16790758	1296362	36723	900	643	49	1.8	24	0	875	900	924	0	25755.8	24.7	39354.2
August 16, 2021	51545	4058	294	2.4E+08	18087538	1296780	36735	901	646	49.3	1.7	24	0	886	900	916	0	25755.8	24.7	39378.9
August 17, 2021	51834	4347	289	2.41E+08	19384385	1296847	36737	901	635	48.4	1.9	24	0	872	900	932	0	25755.8	23.7	39402.5
August 18, 2021	52110	4623	276	2.42E+08	20628366	1243981	35239	900	607	48.2	2	23	0	862	900	931	0	25755.8	24.3	39426.2
August 19, 2021	52128	4641	18	2.42E+08	20704171	75805	2147	898	40	52.4	1.2	1.4	1	38	857	937	0	25755.8	1.4	39428.2
August 20, 2021	52300	4813	172	2.43E+08	21439272	735101	20824	900	377	50.7	1.5	13.6	1	19	895	940	0	25755.8	13.8	39442
August 21, 2021	52485	4998	185	2.44E+08	22257384	818112	23175	901	407	49.1	1.9	15.1	0	865	900	949	0	25755.8	15.4	39457.5
August 22, 2021	52485	4998	0	2.44E+08	22257384	0	0	0	0	0	0	0	0	0	0	0	0	25755.8	0	39457.5
August 23, 2021	52673	5186	188	2.45E+08	23070804	813420	23043	900	413	50.2	1.8	15.1	1	17	896	939	0	25755.8	15	39472.5
August 24, 2021	52970	5483	297	2.46E+08	24365631	1294827	36680	899	653	49.8	1.8	24	0	858	900	939	0	25755.8	23.6	39496.1
August 25, 2021	53152	5665	182	2.47E+08	25159611	793980	22492	900	400	49.9	1.7	14.6	1	35	896	950	4.3	25760.1	12.1	39508.2
August 26, 2021	53295	5808	143	2.47E+08	25746673	587062	16630	895	315	53	0.9	11	7	9	860	939	8.4	25768.4	1.6	39509.8
August 27, 2021	53510	6023	215	2.48E+08	26651442	904769	25630	900	474	51.7	1.2	16.7	0	883	900	917	17.6	25786	0	39509.8
August 28, 2021	53510	6023	0	2.48E+08	26651442	0	0	0	0	0	0	0	0	0	0	0	0	25786	0	39509.8
August 29, 2021	53510	6023	0	2.48E+08	26651442	0	0	0	0	0	0	0	0	0	0	0	0	25786	0	39509.8
August 30, 2021	53695	6208	185	2.49E+08	27425021	773579	21914	950	406	51.9	1.5	13.6	1	19	897	950	13.2	25799.2	0	39509.8
August 31, 2021	54013	6526	318	2.5E+08	28792904	1367883	38749	950	700	50.6	1.6	24	0	876	900	932	24.1	25823.3	0	39509.8
September 1, 2021	54282	269	289	2.51E+08	1157584	1157584	32792	950	592	50.6	1.6	20.3	1	285	899	944	19.5	25842.8	0	39509.8
September 2, 2021	54599	586	317	2.53E+08	2526616	1369032	38782	951	696	50.3	1.6	24	0	867	900	922	24.1	25866.9	0	39509.8
September 3, 2021	54781	768	182	2.54E+08	3319747	793131	22468	951	400	49.9	1.6	13.9	0	850	900	954	14.5	25881.5	0	39509.8
September 4, 2021	54781	768	0	2.54E+08	3319747	0	0	0	0	0	0	0	0	0	0	0	0	25881.5	0	39509.8
September 5, 2021	54781	768	0	2.54E+08	3319747	0	0	0	0	0	0	0	0	0	0	0	0	25881.5	0	39509.8
September 6, 2021	54923	910	142	2.54E+08	3927101	607354	17205	949	313	50.9	1.7	10.7	1	25	897	1005	9.7	25891.1	0	39509.8
September 7, 2021	55236	1223	313	2.56E+08	5294343	1367242	38731	949	688	49.7	1.9	24	0	837	949	970	24.1	25915.2	0	39509.8
September 8, 2021	55329	1316	93	2.56E+08	5693904	399561	11319	947	205	50.7	1.7	7	1	36	895	1132	7.2	25922.4	0	39509.8
September 9, 2021	55537	1524	208	2.57E+08	6587935	894031	25326	948	458	50.6	1.6	15.7	1	20	897	1116	15.8	25938.3	0	39509.8
September 10, 2021	55852	1839	315	2.58E+08	7955381	1367446	38737	950	693	50.1	1.7	24	0	856	900	936	24.1	25962.4	0	39509.8
September 11, 2021	56160	2147	308	2.6E+08	9323170	1367789	38747	950	678	49	1.9	24	0	837	900	952	23.1	25985.5	0	39509.8
September 12, 2021	56469	2456	309	2.61E+08	10691191	1368021	38753	950	679	49.1	1.9	24	0	857	900	936	24.2	26009.7	0	39509.8
September 13, 2021	56781	2768	312	2.62E+08	12060194	1369003	38781	951	682	49.6	1.7	24	0	877	900	928	24.1	26033.8	0	39509.8
September 14, 2021	57089	3076	308	2.64E+08	13427139	1366945	38723	949	677	48.9	1.9	24	0	844	900	953	24.1	26057.9	0	39509.8
September 15, 2021	57327	3314	238	2.65E+08	14484541	1057402	29954	968	524	48.9	1.9	18.2	0	864	900	935	18.4	26076.3	0	39509.8
September 16, 2021	57448	3435	121	2.65E+08	15010200	525659														

Date	CO2 Equivalents			Landfill Gas Flow						Methane		Oxygen		Run Hours	Flare Starts	Temperature			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg	Avg	Min.	Avg.			Max.	Daily	Cumu.	Daily	Cumu.		
	Tonnes CO2	Tonnes CO2	Tonnes CO2	scf	scf	scf	meter3	scfm	MMBTU	(%)	(%)	°C	°C			°C	Hours	Hours	Hours	Hours		
September 22, 2021	58367	4354	327	2.69E+08	19048415	1437181	40712	1000	719	49.5	2	23.9	1	877	900	930	23.7	26151.9	0	39509.8		
September 23, 2021	58690	4677	323	2.71E+08	20488037	1439622	40782	1000	710	48.7	2.1	24	0	862	900	940	24.1	26176	0	39509.8		
September 24, 2021	59010	4997	320	2.72E+08	21927859	1439822	40787	1000	703	48.2	2.2	24	0	839	900	959	23.2	26199.2	0	39509.8		
September 25, 2021	59333	5320	323	2.74E+08	23368416	1440557	40808	1000	710	48.7	2.1	24	0	880	900	922	24.2	26223.4	0	39509.8		
September 26, 2021	59649	5636	316	2.75E+08	24807599	1439183	40769	999	695	47.7	2.3	24	0	865	900	942	24.2	26247.6	0	39509.8		
September 27, 2021	59966	5953	317	2.77E+08	26248661	1441062	40822	1001	697	47.8	2.2	24	0	851	900	956	24.1	26271.7	0	39509.8		
September 28, 2021	60284	6271	318	2.78E+08	27689695	1441034	40822	1001	698	47.9	2.2	24	0	859	900	939	23.2	26295	0	39509.8		
September 29, 2021	60598	6585	314	2.79E+08	29130289	1440594	40809	1000	690	47.3	2.4	24	0	849	900	958	24.2	26319.2	0	39509.8		
September 30, 2021	60900	6887	302	2.81E+08	30515467	1385178	39239	1000	664	47.4	2.2	23.1	1	185	899	1008	23.2	26342.4	0	39509.8		
October 1, 2021	61223	7223	323	2.82E+08	3199948	1439948	40791	1000	710	48.7	1.7	24	0	864	900	933	23.2	26365.6	0	39509.8		
October 2, 2021	61371	7471	148	2.83E+08	2095287	655339	18564	1001	326	49.1	1.6	10.9	0	880	900	923	11.8	26377.3	0	39509.8		
October 3, 2021	61371	7471	0	2.83E+08	2095287	0	0	0	0	0	0	0	0	0	0	0	0	26377.3	0	39509.8		
October 4, 2021	61547	647	176	2.84E+08	2874864	779577	22084	999	388	49.2	2.1	13.1	2	0	895	1055	12.4	26389.7	0	39509.8		
October 5, 2021	61802	902	255	2.85E+08	4014991	1140127	32298	1000	560	48.5	2.3	19	1	22	899	1029	19.1	26408.8	0	39509.8		
October 6, 2021	62054	1154	252	2.86E+08	5157596	1142605	32368	999	553	47.9	2.6	19	1	31	898	1015	19.2	26428	0	39509.8		
October 7, 2021	62369	1469	315	2.87E+08	6597746	1440150	40797	1000	692	47.5	2.7	24	0	872	900	922	23.2	26451.2	0	39509.8		
October 8, 2021	62679	1779	310	2.89E+08	8038554	1440808	40815	1001	681	46.7	2.8	24	0	862	900	940	24.2	26475.4	0	39509.8		
October 9, 2021	62925	2025	246	2.9E+08	9182553	1143999	32407	1000	542	46.8	2.8	19	0	862	900	932	19.6	26495.1	0	39509.8		
October 10, 2021	62925	2025	0	2.9E+08	9182553	0	0	0	0	0	0	0	0	0	0	0	0	26495.1	0	39509.8		
October 11, 2021	63019	2119	94	2.9E+08	9609501	426948	12095	999	207	47.9	2.7	7.1	1	68	897	1034	7	26502	0	39509.8		
October 12, 2021	63330	2430	311	2.92E+08	11409893	1440392	40803	1000	684	46.9	2.9	24	0	852	900	942	23.1	26525.2	0	39509.8		
October 13, 2021	63650	2750	320	2.93E+08	12490682	1440789	40815	1001	703	48.2	2.5	24	0	880	900	914	24.2	26549.4	0	39509.8		
October 14, 2021	63651	2751	1	2.93E+08	12494774	4092	116	1015	2	48.8	2.2	0	0	899	900	902	0.7	26550.1	0	39509.8		
October 15, 2021	63833	2933	182	2.94E+08	13310453	815679	23107	1000	401	48.6	2.4	13.6	1	16	898	945	13.3	26563.3	0	39509.8		
October 16, 2021	63898	2998	65	2.96E+08	14750123	1439670	40783	1000	142	9.8	18.2	24	0	880	900	919	24.1	26587.4	0	39509.8		
October 17, 2021	63904	3004	6	2.96E+08	15021201	271078	7679	1000	14	5.2	19.9	4.5	0	888	900	910	4.7	26592.1	0	39509.8		
October 18, 2021	64094	3194	190	2.97E+08	15867819	846618	23983	999	419	48.9	2.5	14.1	1	16	897	969	13.3	26605.3	0	39509.8		
October 19, 2021	64399	3499	305	2.98E+08	17308444	1440625	40810	1000	672	46.1	3.2	24	0	853	900	953	24.2	26629.5	0	39509.8		
October 20, 2021	64687	3787	288	2.99E+08	18610361	1301917	36881	999	633	48.1	2.5	21.7	1	12	898	956	21.8	26651.4	0	39509.8		
October 21, 2021	64952	4052	265	3.01E+08	19780536	1170175	33149	1001	583	49.3	2	19.5	0	846	900	957	19.7	26671.1	0	39509.8		
October 22, 2021	65116	4216	164	3.01E+08	20484634	704098	19946	999	361	50.7	1.7	11.7	1	2	896	1037	11.3	26682.3	0	39509.8		
October 23, 2021	65116	4216	0	3.01E+08	20484634	0	0	0	0	0	0	0	0	0	0	0	0	26682.3	0	39509.8		
October 24, 2021	65116	4216	0	3.01E+08	20484634	0	0	0	0	0	0	0	0	0	0	0	0	26682.3	0	39509.8		
October 25, 2021	65310	4410	194	3.02E+08	21306634	822000	23286	997	426	51.2	1.7	13.8	1	-2	897	1076	13.6	26696.3	0	39509.8		
October 26, 2021	65642	4742	332	3.04E+08	22739030	1432396	40577	999	729	50.3	1.9	23.9	1	367	901	1100	23.1	26719.4	0	39509.8		
October 27, 2021	65891	4991	249	3.05E+08	23811604	1072574	30384	1000	548	50.5	1.7	17.9	1	3	898	941	18	26737.4	0	39509.8		
October 28, 2021	66215	5315	324	3.06E+08	25252046	1440442	40805	1000	712	48.9	2.1	24	0	862	900	939	24.2	26761.6	0	39509.8		
October 29, 2021	66457	5557	242	3.07E+08	26331185	1079139	30570	1000	533	48.8	2	18	0	879	900	930	18.2	26779.9	0	39509.8		
October 30, 2021	66457	5557	0	3.07E+08	26331185	0	0	0	0	0	0	0	0	0	0	0	0	26779.9	0	39509.8		
October 31, 2021	66457	5557	0	3.07E+08	26331185	0	0	0	0	0	0	0	0	0	0	0	0	26779.9	0	39509.8		
November 1, 2021	66565	108	108	3.08E+08	461435	461435	13072	998	237	50.8	1.9	7.7	1	124	896	1016	7.7	26787.5	0	39509.8		
November 2, 2021	66744	287	179	3.08E+08	1246767	785332	22247	998	393	49.4	1.7	13.1	1	-4	893	941	13	26800.5	0	39509.8		
November 3, 2021	67054	597	310	3.1E+08	2687105	1440338	40802	1000	681	46.7	2.1	24	0	886	900	912	23	26823.5	0	39509.8		
November 4, 2021	67359	902	305	3.11E+08	4127526	1440421	40804	1000	672	46.1	2.2	24	0	870	900	928	24.1	26847.6	0	39509.8		
November 5, 2021	67661	1204	302	3.13E+08	5567906	1440380	40803	1000	665	45.6	2.3	24	0	876	900	921	24.1	26871.7	0	39509.8		
November 6, 2021	67949	1492	288	3.14E+08	7090989	1441183	40826	1001	634	43.5	2.9	24	0	879	900	922	24.1	26895.8	0	39509.8		
November 7, 2021	68236	1779	287	3.16E+08	8450155	1441066	40823	1001	632	43.3	3	24	0	884	900	914	25.1	26920.9	0	39509.8		
November 8, 2021	68526	2069	290	3.17E+08	9890462	1440307	40801	1000	637	43.7	3.2	24	0	861	900	930	23.1	26944	0	39509.8		
November 9, 2021	68821	2364	295	3.18E+08	11330885	1440423	40804	1000	649	44.5	3.3	24	0	878	900	922	24.1	26968.1	0	39509.8		
November 10, 2021	68922	2465	101	3.19E+08	11819031	488146	13828	999	222	45	3.2	8.1	0	886	900	914	8.9	26977	0	39509.8		
November 11, 2021	68922	2465	0	3.19E+08	11819031	0	0	0	0	0	0	0	0	0	0	0	0	26977	0	39509.8		
November 12, 2021	69081	2624	159	3.2E+08	12549898	730867	20704	1000	350	47.3	2.7	12.2	2	318	897	968	12.9	26989.8	0	39509.8		
November 13, 2021	69391	2934	310	3.21E+08	13990033	1440135	40796	1000	682	46.8	2.8	24	0	886	900	921	23.2	27013	0	39509.8		
November 14, 2021	69696	3239	305	3.23E+08	15430469	1440436	40805	1000	670	46	3	24	0	885	900	918	24.1	27037.1	0	39509.8		
November 15, 2021	70032	3575	336	3.24E+08	16871061	1440592	40809	1000	739	50.7	3.4	24	0	885	900	918	24.2	27061.3	0	39509.8		
November 16, 2021	70348	3891	316	3.25E+08	18307661	1436600	40696	1000	695	47.8	2.6	23.9	1	874	900	922	23.6	27085	0	39509.8		
November 17, 2021	70666	4209	318	3.27E+08	19747292	1439631	40782	1000	698	47.9	3.2	24	0	879	900	922	24.1	27109.1	0	39509.8		
November 18, 2021	70994	4537	328	3.28E+08	21188348	1441056	40822	1001	721	49.4	3.6	24	0	881	900	925	24.1	27133.2	0	39509.8		
November 19, 2021	71339	4882	345	3.3E+08	22629182	1440834	40816	1001	759	52	3.1	24	0	883	900	916	23.2	27156.4	0	39509.8		
November 20, 2021	71659	5202	320	3.31E+08	2406																	

Date	CO2 Equivalents			Landfill Gas Flow						Methane	Oxygen	Flare	Flare	Temperature			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg	Avg	Run Hours	Starts	Min.	Avg.	Max.	Daily	Cumu.	Daily	Cumu.
	Tonnes CO2	Tonnes CO2	Tonnes CO2	scf	scf	scf	meter3	scfm	MMBTU	(%)	(%)			°C	°C	°C	Hours	Hours	Hours	Hours
November 27, 2021	73000	6543	296	3.37E+08	30062645	1440801	40815	1001	651	44.6	3.4	24	0	882	900	917	23.2	27280.1	0	39509.8
November 28, 2021	73297	6840	297	3.39E+08	31502208	1439563	40780	1000	652	44.8	3.3	24	0	883	900	912	24.1	27304.2	0	39509.8
November 29, 2021	73594	7137	297	3.4E+08	32942235	1440027	40793	1000	654	44.9	3.3	24	0	888	900	910	24.1	27328.3	0	39509.8
November 30, 2021	73889	7432	295	3.42E+08	34381903	1439668	40783	1000	650	44.6	3.3	24	0	884	900	916	24.2	27352.5	0	39509.8
December 1, 2021	74191	302	302	3.43E+08	1439852	1439852	40788	1000	665	45.6	3.1	24	0	882	900	916	23.1	27375.6	0	39509.8
December 2, 2021	74477	588	286	3.44E+08	2880077	1440225	40799	1000	628	43.1	3.8	24	0	885	900	923	24.1	27399.7	0	39509.8
December 3, 2021	74767	878	290	3.46E+08	4320486	1440409	40804	1000	639	43.8	3.6	24	0	885	900	915	24.2	27423.9	0	39509.8
December 4, 2021	75057	1168	290	3.47E+08	5761224	1440738	40813	1001	637	43.7	3.6	24	0	885	900	915	24.1	27448	0	39509.8
December 5, 2021	75347	1458	290	3.49E+08	7201394	1440170	40797	1000	638	43.8	3.7	24	0	871	900	930	23.2	27471.2	0	39509.8
December 6, 2021	75534	1645	187	3.49E+08	7858465	657071	18614	999	411	61.8	6.3	11	1	-18	895	919	11.9	27483.1	0	39509.8
December 7, 2021	75707	1818	173	3.5E+08	8691779	833314	23606	999	381	45.2	3.4	13.9	1	-17	896	928	13.4	27496.4	0	39509.8
December 8, 2021	75996	2107	289	3.52E+08	10132274	1440495	40806	1000	635	43.6	3.8	24	0	875	900	919	24.2	27520.6	0	39509.8
December 9, 2021	76282	2393	286	3.53E+08	11572377	1440103	40795	1000	628	43.1	3.9	24	0	885	900	915	23.1	27543.8	0	39509.8
December 10, 2021	76566	2677	284	3.55E+08	13012552	1440175	40797	1000	624	42.8	4	24	0	888	900	914	24.1	27567.9	0	39509.8
December 11, 2021	76855	2966	289	3.56E+08	14452384	1439832	40788	1000	635	43.6	3.8	24	0	888	900	910	24.2	27592.1	0	39509.8
December 12, 2021	77137	3248	282	3.57E+08	15889972	1437588	40724	1000	620	42.6	4.1	23.9	1	884	900	914	23.7	27615.8	0	39509.8
December 13, 2021	77399	3510	262	3.59E+08	17290170	1400198	39665	972	577	40.7	4.5	24	0	881	900	919	24.1	27639.9	0	39509.8
December 14, 2021	77676	3787	277	3.6E+08	18658093	1367923	38751	950	610	44	3.6	24	0	883	900	913	24.1	27664	0	39509.8
December 15, 2021	77952	4063	276	3.62E+08	20025880	1367787	38747	950	607	43.8	3.8	24	0	870	900	931	23.2	27687.2	0	39509.8
December 16, 2021	78220	4331	268	3.63E+08	21394612	1368732	38773	951	590	42.6	4.7	24	0	867	900	934	24.2	27711.4	0	39509.8
December 17, 2021	78470	4581	250	3.64E+08	22729974	1335362	37828	927	550	40.7	4.7	24	0	881	900	919	24.1	27735.5	0	39509.8
December 18, 2021	78721	4832	251	3.66E+08	24025343	1295369	36695	900	552	42.1	4.3	24	0	890	900	914	24.2	27759.7	0	39509.8
December 19, 2021	78980	5091	259	3.67E+08	25321935	1296592	36730	900	570	43.4	3.9	24	0	886	900	918	23.2	27782.9	0	39509.8
December 20, 2021	79235	5346	255	3.68E+08	26618070	1296135	36717	900	561	42.7	4.6	24	0	891	900	910	24.1	27807	0	39509.8
December 21, 2021	79486	5597	251	3.69E+08	27913848	1295778	36707	900	553	42.2	3.8	24	0	891	900	911	24.2	27831.2	0	39509.8
December 22, 2021	79737	5848	251	3.71E+08	29206668	1292820	36623	900	552	42.2	4.4	23.9	1	0	899	912	24.1	27855.3	0	39509.8
December 23, 2021	79993	6104	256	3.72E+08	30503187	1296519	36728	900	562	42.9	4.3	24	0	879	900	914	23.1	27878.4	0	39509.8
December 24, 2021	80240	6351	247	3.73E+08	31799203	1296016	36714	900	544	41.5	4.8	24	0	875	900	925	24.2	27902.6	0	39509.8
December 25, 2021	80474	6585	234	3.75E+08	33095780	1296577	36729	900	516	39.3	5.8	24	0	887	900	914	24.2	27926.9	0	39509.8
December 26, 2021	80646	6757	172	3.76E+08	34024771	928991	26316	900	378	40.2	6.5	17.2	0	890	900	909	17.5	27944.4	0	39509.8
December 27, 2021	80650	6761	4	3.76E+08	34043528	18757	531	844	9	48	3.4	0.4	1	-15	734	907	0.4	27944.8	0	39509.8
December 28, 2021	80753	6864	103	3.76E+08	34560309	516781	14639	848	226	43.2	5.3	10.2	2	-17	890	946	9.3	27954	0	39509.8
December 29, 2021	80918	7029	165	3.77E+08	35416954	856645	24267	849	362	41.8	6.4	16.8	1	-20	896	921	16.9	27971	0	39509.8
December 30, 2021	81144	7255	226	3.78E+08	36641068	1224114	34677	850	497	40.1	6.2	24	0	889	900	914	24.2	27995.2	0	39509.8
December 31, 2021	81353	7464	209	3.79E+08	37825028	1183960	33539	822	460	38.4	5.9	24	0	875	900	914	24.3	28019.5	0	39509.8

APPENDIX B
SURFACE EMISSION REPORTS

May 15, 2021

Mr. Irvin Slike
Project Coordinator
The City of Winnipeg
1120 Waverly Street
Winnipeg MB
R3T 0P4

Project No. 9-457

Dear Mr. Slike:

**RE: Landfill Gas Emissions Survey
Area 1 - Landfill Gas Collection and Flaring System
Brady Road Resource Management Facility, Winnipeg, MB**

1.0 BACKGROUND

As part of the Operations contract with the City of Winnipeg (City), Integrated Gas Recovery Services (IGRS) is required to perform Surface Emission Surveys (survey) during each calendar year to assess the effectiveness of the gas collection well field at the Brady Road Resource Management Facility (Site). In May 2021, IGRS performed the first survey of 2021. The survey will provide information on the performance of the landfill gas (LFG) collection system as well as any areas on the landfill surface that may require attention to limit amounts of LFG being released to the atmosphere. The results of the May 2021 survey can be compared to the previous surveys completed as well as future surveys in order to determine areas that may consistently have high surface levels of LFG.

The flaring system was commissioned the week of July 8th, 2013. After completing the initial survey, the system has since been running on a constant basis with flow rates consistently between 800-1000 CFM.

This report discusses the results of the Surface Emission Survey, evaluates the emission and odour sources, and provides recommended remedial measures. The Surface Emissions Survey Protocol (Protocol) is included in Attachment A.



2.0 METHODOLOGY

The survey is based on the United States Environmental Protection Agency's (USEPA) New Source Performance Standards (NSPS) for surface emissions monitoring at municipal solid waste landfills. The Protocol prepared by Comcor describes the procedures used for the survey and is included as Attachment A.

A SEM 5000 Site FID landfill gas surface emission monitor was used to perform the survey. A serpentine pattern was used to cover the entirety of the landfill site survey area. This path was tracked by GPS and is displayed in Figure 2.

3.0 OPERATIONAL AND SITE CONDITIONS

The results of this sweep are a good initial indicator of the effectiveness of the gas collection system. After examining the results, areas indicating high levels of emissions may need to be looked at for remedial action.

The survey was performed over the entirety of the previously capped area, as well as the newly capped Cell 30, both where LFG collection wells are installed, and in the active area where there is no LFG collection system. The survey was completed on May 8th, 9th and 12th, 2021 by Comcor staff. The LFG collection and flaring system had been running consistently, and all wells had been previously balanced prior to the sweep being performed to allow for optimal readings to be taken.

Weather during this time period was also considered. All dates on which the survey was conducted, the weather fell within the acceptable guidelines as outlined in Attachment A.

4.0 RESULTS

Background Emissions

Background methane concentration readings are taken before a surface sweep is conducted in order to identify which surface emissions are results of the landfill, and which are from alternative sources offsite. Each day, prior to commencing the survey, Comcor took background concentration readings both upwind and downwind at a distance of 30 meters or more from the limit of waste. In all cases, readings were between 0-2 ppm, and no further action was required to correct readings taken during the survey.

Measured Emissions and Remedial Measures



In accordance with the Protocol, a minimum concentration of 400 ppm was used as the emission exceedance threshold. Figure 1 presents the locations of the emission exceedances.

The majority of the exceedances were all directly related to gas escaping through the landfill surface itself. In most instances, the emissions were clearly indicated by the lack of vegetation on the affected area. Figure 1 presents the locations of the exceedances, of which, a number are clustered together. When compared with a map of the location of the header and laterals it is very clear that the majority of exceedances arise from these locations. This is potentially caused by ineffective recapping of the area following the installation of the header, laterals, and more recently the compressed air and force main lines to all wells. These areas are easily identifiable by the distinct lack of vegetation regrowth on these areas.

The remaining exceedance locations were located on the top of the hill, where it is much more difficult to determine the cause as the top is still unfinished and currently being recovered and capped and remains to be seen if it will be an issue.

Special attention was paid to the areas that had been excavated during the installation of compressed air and force main lines during the 2020 construction project. These areas largely provided no indications of excessive methane escape. 5 locations of significance did arise, the area excavated around wells 3-28, 4-37, 4-31, 6-52 and 7-83 all showed significant methane escape through the cap. It is worth noting that this survey was completed after the excavation at these wells and after they had been recovered with fresh capping material indicating further action may need to be taken to reduce these emissions.

Vegetation and Clay Cap Condition

Special attention and observation was also given to the condition of the clay cap and vegetation in these areas. Large cracks and ruts in the clay cap can allow gas to escape the landfill mound, and stressed or missing vegetation indicates that gas is escaping through the clay cap and is affecting the health of the plant.

During this survey there were many areas of stressed vegetation aside from those which were previously noted, many of which did not exceed the methane threshold, but do need to be watched for future issues that may arise from potential gas emissions.

5.0 CONCLUSIONS

The number of exceedances recorded since last survey has fallen, but this can be accounted for by the difficulty with which potential exceedance locations can be identified and tested due to low vegetation growth. Manholes were also directly monitored to test the effectiveness of the new air tight lids that were installed in the last construction project. Very low methane



emissions were detected emitting from the manholes with properly installed lids. Overall, the majority of the landfill has sufficient cap, or cap in good condition. The proceeding surveys remaining in the season will provide a better indicator primarily of where the cap might not be performing correctly. Continued monitoring and surface emission surveys in the future will determine if any of the recorded exceedances have been dealt with, or increase or decrease over time.

There was also a large area currently being covered, which is indicated by the black box on figured 3, this area was not able to be effectively monitored due to the ongoing work in the area.

If you have any questions or concerns, please contact the undersigned.

Yours truly,

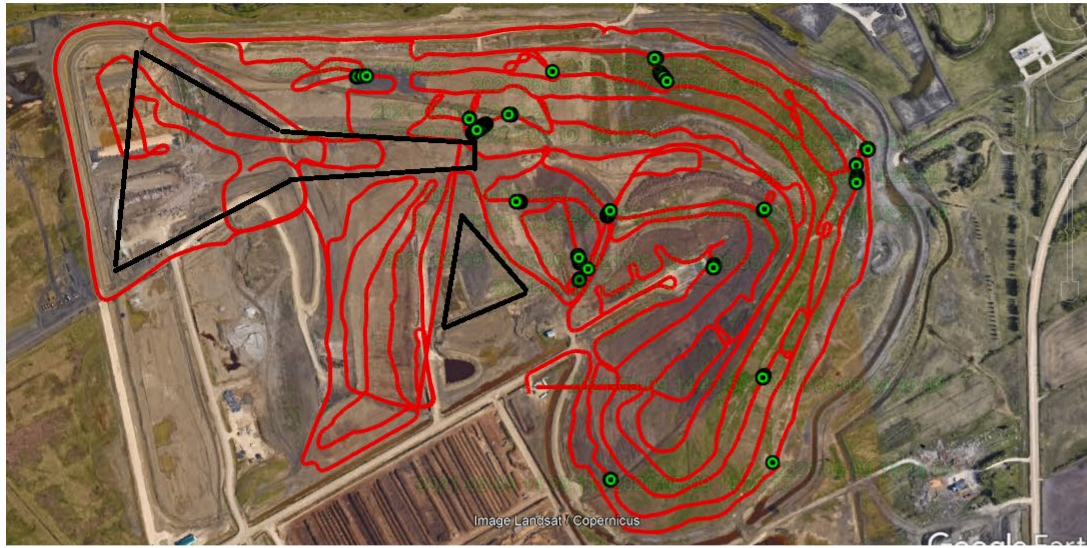
COMCOR ENVIRONMENTAL LIMITED
Jordan DeMerchant



COMCOR







November 5, 2021

Mr. Duy Doan
Project Coordinator
The City of Winnipeg
1120 Waverly Street
Winnipeg MB
R3T 0P4

Project No. 9-457

Dear Mr. Doan:

**RE: Landfill Gas Emissions Survey
Area 1 - Landfill Gas Collection and Flaring System
Brady Road Resource Management Facility, Winnipeg, MB**

1.0 BACKGROUND

As part of the Operations contract with the City of Winnipeg (City), Integrated Gas Recovery Services (IGRS) is required to perform Surface Emission Surveys (survey) during each calendar year to assess the effectiveness of the gas collection well field at the Brady Road Resource Management Facility (Site). In October 2021, IGRS performed the second survey of 2021. The survey will provide information on the performance of the landfill gas (LFG) collection system as well as any areas on the landfill surface that may require attention to limit amounts of LFG being released to the atmosphere. The results of the October 2021 survey can be compared to the previous surveys completed as well as future surveys in order to determine areas that may consistently have high surface levels of LFG.

The flaring system was commissioned the week of July 8th, 2013. After completing the initial survey, the system has since been running on a constant basis with flow rates consistently between 800-1000 CFM.

This report discusses the results of the Surface Emission Survey, evaluates the emission and odour sources, and provides recommended remedial measures. The Surface Emissions Survey Protocol (Protocol) is included in Attachment A.



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3.0 OPERATIONAL AND SITE CONDITIONS

The results of this sweep are a good initial indicator of the effectiveness of the gas collection system. After examining the results, areas indicating high levels of emissions may need to be looked at for remedial action.

The survey was performed over the entirety of the previously capped area, as well as the newly capped Cell 30, both where LFG collection wells are installed, and in the active area where there is no LFG collection system. The survey was completed on October 26th, 28th, and 29th, 2021 by Comcor staff. The LFG collection and flaring system had been running consistently, and all wells had been previously balanced prior to the sweep being performed to allow for optimal readings to be taken.

Weather during this time period was also considered. All dates on which the survey was conducted, the weather fell within the acceptable guidelines as outlined in Attachment A.

4.0 RESULTS

Background Emissions

Background methane concentration readings are taken before a surface sweep is conducted in order to identify which surface emissions are results of the landfill, and which are from alternative sources offsite. Each day, prior to commencing the survey, Comcor took background concentration readings both upwind and downwind at a distance of 30 meters or more from the limit of waste. In all cases, readings were between 0-2 ppm, and no further action was required to correct readings taken during the survey.

Measured Emissions and Remedial Measures



In accordance with the Protocol, a minimum concentration of 300 ppm was used as the emission exceedance threshold. Figure 1 presents the locations of the emission exceedances.

The majority of the exceedances were all directly related to gas escaping through the landfill surface itself. In most instances, the emissions were clearly indicated by the lack of vegetation on the affected area. Figure 1 presents the locations of the exceedances, of which, a number are clustered together. When compared with a map of the location of the header and laterals it is very clear that the majority of exceedances arise from these locations. This is potentially caused by ineffective recapping of the area following the installation of the header, laterals, and more recently the compressed air and force main lines to all wells. These areas are easily identifiable by the distinct lack of vegetation regrowth on these areas.

The remaining exceedance locations were generally located on the top of the hill, where it is much more difficult to determine the cause as the top is still unfinished and currently being recovered and capped and remains to be seen if it will be an issue.

Special attention was paid to the areas that had been excavated during the installation of compressed air and force main lines during the 2020 construction project. These areas largely provided no indications of excessive methane escape. 8 locations of significance did arise surrounding wells, the area excavated around wells 3-28, 3-22, 3-20, 4-37, 4-35, 4-31, 6-52 and 7-83 all showed significant methane escape through the cap. It is worth noting that this survey was completed after the excavation at these wells and after they had been recovered with fresh capping material indicating further action may need to be taken to reduce these emissions.

Vegetation and Clay Cap Condition

Special attention and observation was also given to the condition of the clay cap and vegetation in these areas. Large cracks and ruts in the clay cap can allow gas to escape the landfill mound, and stressed or missing vegetation indicates that gas is escaping through the clay cap and is affecting the health of the plant.

During this survey there were many areas of stressed vegetation aside from those which were previously noted, many of which did not exceed the methane threshold, but do need to be watched for future issues that may arise from potential gas emissions.

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The number of exceedances recorded since last survey has risen, but this can be accounted for by the difficulty with which potential exceedance locations can be identified and tested due to low vegetation growth. Manholes were also directly monitored to test the effectiveness of the new air tight lids that were installed in the last construction project. Very low methane emissions were



detected emitting from the manholes with properly installed lids. Overall, the majority of the landfill has sufficient cap, or cap in good condition. The proceeding surveys remaining in the season will provide a better indicator primarily of where the cap might not be performing correctly. Continued monitoring and surface emission surveys in the future will determine if any of the recorded exceedances have been dealt with, or increase or decrease over time.

There was also a large area currently active with cover and dumping operations, which is indicated by the black box on figure 3, this area was not able to be effectively monitored due to the ongoing work in the area.

If you have any questions or concerns, please contact the undersigned.

Yours truly,

COMCOR ENVIRONMENTAL LIMITED
Jordan DeMerchant

