STORM WATER MONITORING PROGRAM
2022 ANNUAL REPORT

Hecla Greens Creek Mining Company

1 March 2023

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1. INTRODUCTION

This Storm Water Report is submitted by Hecla Greens Creek Mining Company (HGCMC) pursuant to Parts 1.3, 1.6.2 and 1.8 of Alaska Pollutant Discharge Elimination System (APDES) Permit AK-0043206, effective 1 October 2015. APDES Permit AK-0043206 authorizes HGCMC to discharge from the Greens Creek Mine facility located on Admiralty Island at 11 locations (Table 1).

Table 1: Authorized Discharge Locations

Outfall	Receiving Water or Body	Latitude	Longitude
002	Hawk Inlet	58° 06’ 06” N	134° 46’ 30” W
003	Hawk Inlet	58° 07’ 32” N	134° 45’ 16” W
004	Wetlands	58° 09’ 01” N	134° 45’ 16” W
005.2	Zinc Creek	58° 05’ 28” N	134° 44’ 10” W
005.3	Greens Creek	58° 04’ 23” N	134° 43’ 25” W
005.4	Greens Creek	58° 04’ 21” N	134° 43’ 12” W
005.5	Greens Creek	58° 04’ 41” N	134° 39’ 07” W
006	Greens Creek	58° 04’ 43” N	134° 38’ 49” W
007	Greens Creek	58° 04’ 50” N	134° 38’ 27” W
008	Greens Creek	58° 04’ 52” N	134° 38’ 06” W
009	Greens Creek	58° 04’ 47” N	134° 37’ 47” W

Outfall 002, located at the mouth of Hawk Inlet, discharges treated wastewater contributed by mine contact water, storm water, mill process water, treated domestic wastewater, and intercepted groundwater. Monitoring associated with the APDES Outfall 002 diffuser is included in the Hawk Inlet Monitoring Program Annual Report.

This report includes results of monitoring associated with storm water outfalls 003, 004, 005.2, 005.3, 005.4, 005.5, 006, 007, 008, and 009. Outfall monitoring requirements (AK-0043206 Part 1.3) are summarized in Table 2. Outfall locations are shown in Figure 1.

Table 2: Storm Water Outfall Monitoring Requirements

Outfall	Location	Parameters [a]	Minimum Frequency [b]	Sample Type
003	Southern part of Hawk Inlet facilities area near the cannery buildings	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
004	Pit 7 (inactive rock quarry and topsoil storage) off of A-road at mile 1.9	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
005.2	Zinc Creek (east side of bridge) off of B-road at mile 3.0	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
005.3	Site E (inactive waste rock storage area) off of B-road at mile 4.7	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
005.4	Pit 6 (inactive rock quarry and top soil storage) off of B-road at mile 4.6	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
005.5	Culvert at B-road mile 7.8	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
006	Pond D (sediment pond from inactive waste rock storage area D) off of B-road at mile 8.0	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab
007	Pond C (sediment pond from inactive waste rock storage area C) off of B-road at mile 8.2	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab
008	960 laydown site (initial portal development waste rock)	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab
009	Site 1350 adit inactive waste rock storage area	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab

a. Flow shall be reported in gpm, lead and zinc shall be measured as total recoverable in µg/L, oil & grease and TSS shall be measured in mg/L, pH shall be measured in s.u., and hardness shall be measured as mg/L of $CaCO_3$.

b. The samples must be collected once during the spring runoff or snow-melt and once during the fall rainfall events. Sampling is only required when an outfall is discharging.

Section 1.6.2 of APDES Permit AK-0043206 requires monitoring of the receiving water directly upstream and downstream of where each storm water outfall enters the receiving water. The upstream and downstream monitoring sites are summarized in Table 3 and locations are shown in Figures 2 through 9.

Receiving water monitoring is to be conducted semiannually and at the same time (within three hours) as each associated outfall. Samples are to be collected during the spring runoff or snow-melt and during the fall rainfall events. Because of the time required to visit all ten storm water outfalls and associated receiving water sites, it is likely that each semiannual monitoring event will occur over multiple days and potentially during separate storm events.

Storm event and analytical water quality monitoring data for the reporting period are presented in Section 2.0 of this report. An evaluation of the results for each outfall, including comparison of upstream and downstream monitoring, is presented in Section 3.0 pursuant to AK-0043206 Part 1.8. Graphical presentations of the data at each monitoring station versus time are included in Attachment A. Attachment B is a tabulation of historical data for the outfalls and receiving waters. The data are submitted as an electronic spreadsheet per AK-0043206 Part 1.8.

Table 3: Storm Water Outfall and Receiving Water Monitoring Sites

Location	Outfall	Site	Type	Site Description
Hawk Inlet	003	527SW	S	Stormwater #003 - North Cannery Building @ Culvert Outfall
		529SW	RD	Stormwater - Hawk Inlet Float Plane Dock
Pit 7	004	520SW	S	Stormwater #004 - "A" Road @ 1.8 Mile - Pit "7"
		532SW	RU	Stormwater at Pit 7 - Upstream of Outfall 004
		524SW	RD	Pit 7 - Fowler Creek
Zinc Creek Bridge	005.2	539SW	S	Stormwater #005.2 - "B" Road @ 3.0 Mile - Zinc Creek Bridge
		371SW	RU	Zinc Creek - Above B Road
		368SW	RD	Zinc Creek - 0466 ft below bridge
Site E	005.3	545SW	S	Stormwater #005.3 - "B" Road @ 4.5 Mile - Waste Rock Area "E"
		595SW	RU	Stormwater - Greens Creek upstream of Outfalls 005.3 and 005.4
		591SW	RD	Stormwater Greens Creek Below Site E
Pit 6	005.4	547SW	S	Stormwater #005.4 - "B" Road @ 4.6 Mile - Pit "6"
		595SW	RU	Stormwater - Greens Creek upstream of Outfalls 005.3 and 005.4
		591SW	RD	Stormwater Greens Creek Below Site E
7.8 Mile	005.5	560SW	S	Stormwater #005.5 - "B" Road @ 7.8 Mile - Culvert Outfall
		6SW	RU	Greens Creek - Middle, Above Bruin Creek
		590SW	RD	Stormwater - 920 Down Gradient - Greens Creek
Pond D	006	562SW	S	Stormwater #006 - Pond "D" Overflow - Waste Rock Area "D"
		6SW	RU	Greens Creek - Middle, Above Bruin Creek
		590SW	RD	Stormwater - 920 Down Gradient - Greens Creek
Pond C	007	565SW	S	Stormwater #007 - Pond "C" Overflow - Waste Rock Area "C"
		1SW	RU	Greens Creek - Upper, At 920 Weir
		6SW	RD	Greens Creek - Middle, Above Bruin Creek
960 Site	008	570SW	S	Stormwater #008 - Waste Rock Area "980"
		1SW	RU	Greens Creek - Upper, At 920 Weir
		6SW	RD	Greens Creek - Middle, Above Bruin Creek
1350 Site	009	580SW	S	Stormwater #009 - Site 1350 Adit Inactive Waste Rock Storage Area – East Drainage
		48SW	RU	Greens Creek - Background Control Site
		1SW	RD	Greens Creek - Upper, At 920 Weir

* S = Storm water, RU = Receiving water upstream, RD = Receiving water downstream

2. ANNUAL MONITORING RESULTS

This section includes the results of storm water outfall and receiving waterbody monitoring pursuant to APDES Permit AK-0043206 Parts 1.3 and 1.6.2. Section 2.1 includes the date and duration (in hours) of the storm event sampled; rainfall measurements or estimates (in inches) of the storm event; the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and an estimate of the total volume (in gallons) of the discharge (AK-0043206 Part 1.3.7). Water quality data are included in Section 2.2.

2.1. Storm Event Data

Precipitation and duration data associated with the sampling events that occurred during the reporting period are summarized in Table 4. HGCMC maintains three meteorological stations at the site; one located at the mill site, one located at the tailings facility, and one located at the Hawk Inlet float plane dock. When possible, the meteorological station in closest proximity to the outfalls being sampled is used as the reference station for the precipitation and duration data.

The estimated total gallons of storm water discharged through the outfalls that were sampled during the reporting period are presented in Table 5. These discharge estimates were calculated using the rational method equation. Catchment areas were calculated based on high resolution LiDAR aerial imagery acquired in 2015.

2.2. Water Quality Data

Analytical results for the required monitoring parameters (Table 2) for each outfall and associated receiving water sites are presented in Table 6. Also provided are the method detection limit (MDL) and minimum level of quantification (ML) for total recoverable lead, total recoverable zinc, oil and grease, and total suspended solids. As required by Permit Part 1.3.6, if a value is less than the MDL it is reported as less than the numeric value of the MDL, and if a value is less than the ML it is reported as less than the numeric value of the ML.

The results in Table 6 are organized first by the permitted outfall, and then by the date of the sample or observation. The results for the storm water effluent (S) are grouped with the receiving water upstream sites (RU) and downstream sites (RD), as appropriate for each sampling event. A discussion and evaluation of the results for each outfall and sampling event is provided in the following section.

Table 4: Storm Event Details

Date	1/22/2022	4/27/2022	6/21/2022	9/27/2022	10/1/2022	10/13/2022
Outfalls Sampled	003, 006, 007	003, 005.4	008, 009	007	003, 005.2, 005.3, 005.4, 005.5, 007	008, 009
Outfalls Observed (not sampled)	NA	004, 005.2	004, 005.2, 005.5	NA	004, 006	004
Meteorological Station Reference*	Tailings	Tailings	Tailings	Tailings	Tailings	Tailings
SAMPLE EVENT						
Duration (hours)	49.50	11.25	5.50	19.75	48.50	27.50
Start Date	1/20/22	4/27/22	6/21/22	9/26/22	9/29/22	10/12/22
Start Time	22:00	03:45	08:15	06:15	07:00	11:00
Precipitation (inches)	4.14	0.35	0.36	1.87	2.96	1.74
Same Day Precip. (inches)	1.72	0.36	0.39	0.12	0.79	1.11
PRIOR EVENT						
Lapse Between Events (hours)	22.75	19.00	11.50	6.50	53.00	71.25
Duration (hours)	13.75	17.25	10.00	10.75	19.75	7.25
Start Date	1/19/22	4/25/22	6/20/22	9/25/22	9/26/22	10/9/22
Start Time	09:30	15:30	10:45	13:00	06:15	04:30
Precipitation (inches)	0.20	0.46	0.24	0.34	1.87	0.33

* The Mill Site meteorological station was malfunctioning during 2022 storm events

Table 5: Storm Water Outfall Area and Estimated Total Discharge Volume

Outfall	Date	Catchment Area (acres)	Total Discharge (gallons)
003	1/22/2022	0.2	15,676
006	1/22/2022	7.9	619,218
007	1/22/2022	2.8	250,823
003	4/27/2022	0.2	1,315
005.4	4/27/2022	1.9	7,138
008	6/21/2022	0.7	2,696
009	6/21/2022	3.3	12,708
007	9/27/2022	2.8	113,181
003	10/1/2022	0.2	11,154
005.2	10/1/2022	0.6	14,341
005.3	10/1/2022	6.8	270,885
005.4	10/1/2022	1.9	60,551
005.5	10/1/2022	5.3	126,678
007	10/1/2022	2.8	178,465
008	10/13/2022	0.7	13,064
009	10/13/2022	3.3	61,586

Table 6: Storm Water Outfall and Receiving Water Monitoring Results

Outfall	Type *	Site	Date	Time	Flow	pH*	Hardness	Lead-TR			Zinc-TR			Oil & Grease			TSS		
					(gpm)	(su)	(mg/L)	(µg/L)	MDL	ML	(µg/L)	MDL	ML	(mg/L)	MDL	ML	(mg/L)	MDL	ML
003	S	527SW	1/22/2022	10:00	100	6.62	82	12.2	0.1	0.5	104	6	15	<1.9	1.9	9.3	17	5	20
	RD	529SW	1/22/2022	10:15			1220	3.52	0.5	2.5	13.2	6	15	<1.9	1.9	9.3	36	5	20
	S	527SW	4/27/2022	16:10	0.5	7.53	143	11	0.1	0.5	71.5	6	15	<1.8	1.8	9.2	<5	5	20
	RD	529SW	4/27/2022	16:20		8	718	0.7	0.2	1	<6	6	15	<1.9	1.9	9.6	9	5	20
	S	527SW	10/1/2022	15:15	1.1	7.71	104	1.7	0.1	0.5	73.4	6	15				<5	5	20
	RD	529SW	10/1/2022	15:25		7.91	2830	4.12	1	5	71.4	60	150				37	5	20
004	S	520SW	4/27/2022	14:00	No sample taken due to no discharge														
	S	520SW	6/21/2022	14:15	No sample taken due to no discharge														
	S	520SW	10/1/2022	15:45	No sample taken due to no discharge														
	S	520SW	10/13/2022	12:55	No sample taken due to no discharge														
005.2	S	539SW	4/27/2022	13:00	No sample taken due to no discharge														
	S	539SW	6/21/2022	13:55	No sample taken due to no discharge														
	S	539SW	9/30/2022	10:45	1	4.68	36	7.68	0.1	0.5	39.3	6	15	<1.9	1.9	9.4	<5	5	20
	RU	371SW	9/30/2022	11:15		7.08	30	0.15	0.1	0.5	10	6	15	<1.9	1.9	9.4	<5	5	20
	RD	368SW	9/30/2022	10:55		7.31	30	0.14	0.1	0.5	11.3	6	15	<2	2	10.1	<5	5	20
005.3	S	545SW	4/27/2022	11:00	140	7.63	236	218	0.1	0.5	687	12	30	<1.8	1.8	9.2	288	10	40
	RU	595SW	4/27/2022	12:15		7.75	54	2.69	0.1	0.5	20.1	6	15	<1.9	1.9	9.6	22	5	20
	RD	591SW	4/27/2022	12:00		7.71	54	2.56	0.1	0.5	17.8	6	15	<1.9	1.9	9.6	17	5	20
	S	545SW	9/29/2022	14:25	300	7.59	183	211	0.1	0.5	518	6	15	<1.9	1.9	9.4	<5	5	20
	RU	595SW	9/29/2022	15:30		7.98	67	2.71	0.1	0.5	15.4	6	15	<1.9	1.9	9.5	16	5	20
	RD	591SW	9/29/2022	15:15		7.85	66	1.11	0.1	0.5	11.3	6	15	<1.9	1.9	9.4	12	5	20
005.4	S	547SW	4/27/2022	11:20	5	7.48	34	0.22	0.1	0.5	6.7	6	15	<1.8	1.8	9.2	<5	5	20
	RU	595SW	4/27/2022	12:15		7.75	54	2.69	0.1	0.5	20.1	6	15	<1.9	1.9	9.6	22	5	20
	RD	591SW	4/27/2022	12:00		7.71	54	2.56	0.1	0.5	17.8	6	15	<1.9	1.9	9.6	17	5	20
	S	547SW	9/29/2022	14:35	3	7.2	31	0.11	0.1	0.5	<6	6	15	<1.9	1.9	9.4	<5	5	20
	RU	595SW	9/29/2022	15:30		7.98	67	2.71	0.1	0.5	15.4	6	15	<1.9	1.9	9.5	16	5	20
	RD	591SW	9/29/2022	15:15		7.85	66	1.11	0.1	0.5	11.3	6	15	<1.9	1.9	9.4	12	5	20
005.5	S	560SW	6/21/2022	11:15	0	No sample taken due to no discharge													
	S	560SW	10/1/2022	14:00	0.02	8	84	467	0.1	0.5	365	6	15				28	5	20
	RU	6SW	10/1/2022			No sample taken; high flows prevented access for safety reasons													
	RD	590SW	10/1/2022			No sample taken; high flows prevented access for safety reasons													

Outfall	Type *	Site	Date	Time	Flow	pH*	Hardness	Lead-TR			Zinc-TR			Oil & Grease			TSS		
					(gpm)	(su)	(mg/L)	(µg/L)	MDL	ML	(µg/L)	MDL	ML	(mg/L)	MDL	ML	(mg/L)	MDL	ML
006	S	562SW	1/22/2022	12:40		7.2	198	5.51	0.1	0.5	670	6	15						
	RU	54SW	1/22/2022	12:50		7.73	41	5.93	0.1	0.5	74.4	6	15				33	5	20
	RD	590SW	1/22/2022		No sample taken; outfall was not discharging														
007	S	565SW	1/21/2022	14:45		6.11	56	42.9	0.1	0.5	190	6	15				10	5	20
	S	565SW	1/22/2022	12:05	150	7.2	80	408	0.1	0.5	806	6	15				83	5	20
	RU	1SW	1/22/2022	13:40		7.02	30	2.05	0.1	0.5	34.1	6	15				29	5	20
	RD	54SW	1/22/2022	12:50		7.73	41	5.93	0.1	0.5	74.4	6	15				33	5	20
	S	565SW	9/27/2022	9:05		6.79	99	344	0.1	0.5	454	6	15	<1.9	1.9	9.5	7	5	20
	RU	1SW	9/27/2022	9:25		7.64	44	1.88	0.1	0.5	13.6	6	15	<1.9	1.9	9.5	16	5	20
	RD	6SW	9/27/2022	9:15		7.36	46	2.13	0.1	0.5	19.2	6	15	<1.9	1.9	9.7	13	5	20
	S	565SW	10/1/2022	12:40	0	7.7	138	253	0.1	0.5	396	6	15				50	5	20
	RU	1SW	10/1/2022	13:00		7.66	55	12.4	0.1	0.5	85.7	6	15				198	5	20
	RD	6SW	10/1/2022			No sample taken; high flows prevented access for safety reasons													
008	S	570SW	6/21/2022	12:20	5	7.21	160	0.37	0.1	0.5	24.3	6	15				<5	5	20
	RU	1SW	6/21/2022	12:35		7.54	38	0.13	0.1	0.5	6.3	6	15				<5	5	20
	RD	6SW	6/21/2022	13:25		7.57	39	<0.1	0.1	0.5	<6	6	15				<5	5	20
	S	570SW	10/13/2022	10:55	18	7.9	150	0.49	0.1	0.5	34	6	15				<5	5	20
	RU	1SW	10/13/2022	10:45		7.5	42	1.33	0.1	0.5	15.3	6	15				23	5	20
	RD	6SW	10/13/2022	10:30		7.7	41	1.79	0.1	0.5	20.5	6	15				36	5	20
009	S	580SW	6/21/2022	12:00	5	6.78	70	0.47	0.1	0.5	519	6	15				<5	5	20
	RU	48SW	6/21/2022	12:55		7.54	37	<0.1	0.1	0.5	<6	6	15				<5	5	20
	RD	1SW	6/21/2022	12:35		7.54	38	0.13	0.1	0.5	6.3	6	15				<5	5	20
	S	580SW	10/13/2022	11:15	15	7.42	38	0.37	0.1	0.5	138	6	15				<5	5	20
	RU	48SW	10/13/2022	11:50		7.77	45	0.81	0.1	0.5	9	6	15				13	5	20
	RD	1SW	10/13/2022	10:45		7.5	42	1.33	0.1	0.5	15.3	6	15				23	5	20

3. WATER QUALITY MONITORING SUMMARY

Permit AK-0043206 does not establish numeric effluent limits for the individual storm water outfalls. As stated in the Permit Fact Sheet, this is due to the difficulty in developing numeric limits for storm water discharges that are extremely variable in flow and pollutant concentrations and the uncertainty regarding the effect of the storm water discharges on the receiving waters. Instead, the permit requires HGCMC to implement corrective action if a storm water discharge exceeds a water quality criterion *and* results in a statistically significant reduction in receiving water quality for the same criterion.

Statistics can be used to define the statistical uncertainty between sample values collected at different sites (e.g., upstream and downstream receiving waters). Statistics can never prove that a difference between sample values is real, only the probability that one may exist, given the available data. Statistical tests rely on using estimates of the true mean and true variance of a population, where larger sample populations increase statistical confidence. Statistical analyses in progress include evaluation of probability distributions (normality) and appropriate methods for handling non-detect data and outlier testing. HGCMC will continue to work towards selection of appropriate statistical methods to determine if storm water outfall discharges are causing significant reduction in receiving water quality. For this report, monitoring results are discussed in general terms as well as in relation to Alaska Water Quality Standards (AWQS). Table 7 is a tabulation of water quality collected during the reporting period compared to applicable AWQS[1].

[1] Water quality standards are from the Alaska Department of Conservation "ALASKA WATER QUALITY CRITERIA MANUAL FOR TOXIC AND OTHER DELETERIOUS ORGANIC AND INORGANIC SUBSTANCES" as amended through December 12, 2008.

Table 7: Comparison of Water Quality Data to Alaska Water Quality Standards

Sample Data[1,2]							Alaska Water Quality Standards (AWQS)[3]		
Outfall	**Type[4]**	**Site**	**Date**	**pH (su)**	**Pb (µg/L)**	**Zn (µg/L)**	**Acute Pb (µg/L)**	**Chronic Pb (µg/L)**	**Acute and Chronic Zn (µg/L)**
003	S	527SW	1/22/2022	6.62	12.2	104	63.42	2.47	101
	RD	529SW	1/22/2022		3.52	13.2	1,972	76.84	998
	S	527SW	4/27/2022	7.53	11	71.5	129	5.02	162
	RD	529SW	4/27/2022	8.00	0.7	*0*	1,004	39.13	637
	S	527SW	10/1/2022	7.71	1.7	73.4	85.82	3.34	124
	RD	529SW	10/1/2022	7.91	4.12	71.4	5,755	224	2,035
005.2	S	539SW	9/30/2022	4.68	7.68	39.3	22.24	0.87	50.42
	RU	371SW	9/30/2022	7.08	0.15	10	17.63	0.69	43.20
	RD	368SW	9/30/2022	7.31	0.14	11.3	17.63	0.69	43.20
005.3	S	545SW	4/27/2022	7.63	218	687	244	9.49	248
	RU	595SW	4/27/2022	7.75	2.69	20.1	37.26	1.45	71.08
	RD	591SW	4/27/2022	7.71	2.56	17.8	37.26	1.45	71.08
	S	545SW	9/29/2022	7.59	211	518	176	6.87	200
	RU	595SW	9/29/2022	7.98	2.71	15.4	49.04	1.91	85.34
	RD	591SW	9/29/2022	7.85	1.11	11.3	48.11	1.87	84.26
005.4	S	547SW	4/27/2022	7.48	0.22	6.7	20.68	0.81	48.03
	RU	595SW	4/27/2022	7.75	2.69	20.1	37.26	1.45	71.08
	RD	591SW	4/27/2022	7.71	2.56	17.8	37.26	1.45	71.08
	S	547SW	9/29/2022	7.2	0.11	*0*	18.38	0.72	44.42
	RU	595SW	9/29/2022	7.98	2.71	15.4	49.04	1.91	85.34
	RD	591SW	9/29/2022	7.85	1.11	11.3	48.11	1.87	84.26
005.5	S	560SW	10/1/2022	8.00	467	365	65.39	2.55	103
006	S	562SW	1/22/2022	7.20	5.51	670	195	7.59	214
	RU	54SW	1/22/2022	7.73	5.93	74.4	26.24	1.02	56.29
007	S	565SW	1/21/2022	6.11	42.9	190	39.03	1.52	73.31
	S	565SW	1/22/2022	7.20	408	806	61.46	2.39	99.18
	RU	1SW	1/22/2022	7.02	2.05	34.1	17.63	0.69	43.20
	RD	54SW	1/22/2022	7.73	5.93	74.4	26.24	1.02	56.29
	S	565SW	9/27/2022	6.79	344	454	80.61	3.14	119
	RU	1SW	9/27/2022	7.64	1.88	13.6	28.71	1.12	59.76
	RD	6SW	9/27/2022	7.36	2.13	19.2	30.38	1.18	62.05
	S	565SW	10/1/2022	7.70	253	396	123	4.79	157
	RU	1SW	10/1/2022	7.66	12.4	85.7	38.14	1.49	72.20
008	S	570SW	6/21/2022		0.37	24.3	149	5.79	178
	RU	1SW	6/21/2022		0.13	6.3	23.82	0.93	52.78
	RD	6SW	6/21/2022		*0*	*0*	24.62	0.96	53.95
	S	570SW	10/13/2022	7.90	0.49	34	137	5.33	169
	RU	1SW	10/13/2022	7.50	1.33	15.3	27.06	1.05	57.45
	RD	6SW	10/13/2022	7.70	1.79	20.5	26.24	1.02	56.29
009	S	580SW	6/21/2022		0.47	519	51.85	2.02	88.57
	RU	48SW	6/21/2022		*0*	*0*	23.03	0.90	51.60
	RD	1SW	6/21/2022		0.13	6.3	23.82	0.93	52.78
	S	580SW	10/13/2022	7.42	0.37	138	23.82	0.93	52.78
	RU	48SW	10/13/2022	7.77	0.81	9	29.54	1.15	60.91
	RD	1SW	10/13/2022	7.50	1.33	15.3	27.06	1.05	57.45

1 - Shaded cells indicate exceedance of AWQS

2 - Italic font indicates the laboratory result was non-detect and tabulated value is zero if less than the Method Detection Limit (MDL) or the value of MDL if less than the Minimum Level of Quantification (ML)

3 - AWQS are from the Alaska Department of Conservation "ALASKA WATER QUALITY CRITERIA MANUAL FOR TOXIC AND OTHER DELETERIOUS ORGANIC AND INORGANIC SUBSTANCES" as amended through December 12, 2008

4 - S = Storm water, RU = Receiving water upstream, RD = Receiving water downstream

3.1. Storm Water Outfall 003 – Hawk Inlet

Outfall 003, a culvert pipe located adjacent to the North Cannery Building, drains the storm water runoff from a small area approximately 0.2 acres in size (Figure 2). Outfall 003 discharges directly into Hawk Inlet, and therefore there is only one associated receiving water monitoring site (Site 529). The lead and zinc concentrations in the January sample from the outfall exceeded the AWQS and the lead concentration exceeded the chronic lead criteria in the April sample. The January sample was a non-routine sample in that it was collected during a major rain on snow event and power outage. This resulted in additional flow reporting to the outfall from sources normally captured by pumps. Lead and zinc concentrations in the receiving Hawk Inlet water were well below the marine chronic aquatic life criteria due to low discharge rate through the outfall and the immense dilution volume of Hawk Inlet.

3.2. Storm Water Outfall 004 – Pit 7

Outfall 004 is located downgradient of a constructed wetlands that receives runoff from Pit 7 (Figure 3), which is a former rock quarry and current reclamation material storage pile. Flow has not been observed at this outfall during storm events since 2012, and there was no flow observed during the storm event monitoring conducted during this reporting period. There was no activity at Pit 7 during the reporting period and no signs of erosion from the reclamation material stockpile.

3.3. Storm Water Outfall 005.2 – Zinc Creek Bridge

Outfall 005.2 is located near the bottom of the north abutment, upstream side, of the Zinc Creek Bridge located at 3.0-mile on the B-Road (Figure 4). The drainage area for this outfall, approximately 0.6 acres in size, captures runoff from a short section of road and a portion of the abutment. Receiving water monitoring is conducted at Site 371 (upstream) and Site 368 (downstream) in Zinc Creek.

The pH of the outfall sample collected during 2022 storm event monitoring is within the range of historical values for this outfall. The lead concentration in the outfall exceeded the chronic AWQS. In samples collected from the receiving water, pH is near neutral and lead and zinc concentrations are below the water quality criteria. The data indicate that the discharge from the outfall did not have an adverse impact on Zinc Creek.

3.4. Storm Water Outfall 005.3 – Site E

Outfall 005.3 is located in a small drainage that runs between the B-Road and inactive waste rock Site E (Figure 5). The drainage area contributing to the outfall location is approximately 6.8 acres. The drainage flows into Greens Creek approximately one-half mile from the outfall location. Receiving water monitoring is conducted in Greens Creek at Site 595 (upstream) and Site 591 (downstream).

Water quality at the outfall is influenced by the Site E waste rock and has exhibited highly variable lead and zinc concentrations throughout its monitoring history (Attachment A). Concentrations of both lead and zinc exceeded AWQS in the April and September outfall samples. Lead concentrations in both the upstream and downstream receiving water samples exceeded the chronic criterion in the April samples. The lead concentration also exceeded the chronic criterion in the upstream sample collected in September, but not in the downstream receiving water sample.

In 2008, HGCMC initiated a program of removing Site E waste rock for co-disposal in the tailings facility. Through 2022, approximately 169,000 cubic yards of material have been removed. Approximately 22,400 cubic yards of material were removed in 2022. The water quality at Outfall 005.3 is expected to show gradual improvement as the waste rock removal activities progress.

3.5. Storm Water Outfall 005.4 – Pit 6

Outfall 005.4 is the discharge location for runoff from a reclamation material storage area in an old road construction quarry called Pit 6 (Figure 5). The catchment area draining to the outfall is approximately 1.9 acres in size. There has been no activity in Pit 6 since 2009 and the area is stabilized and vegetated. Storm water runoff flows into Greens Creek approximately one-half mile from the outfall location. Receiving water monitoring is performed in Greens Creek at Site 595 (upstream) and Site 591 (downstream).

Water quality at Outfall 005.4 is excellent, with lead and zinc concentrations consistently below the Alaska Water Quality Standards since 2009.

3.6. Storm Water Outfall 005.5 – 7.8 Mile B-Road Culvert

Outfall 005.5 is a culvert that drains a portion of the B-Road surface above mile 7.8 (Figure 6). The catchment area draining to the culvert is approximately 5.3 acres, most of which is undisturbed forest on the uphill side of the road. Discharge from the culvert is to a forested hillside, approximately 200 feet from Greens Creek. Flows through the culvert during storm event monitoring have been low and typically less than 10 gpm. As a result, the drainage infiltrates into the forest duff and a point source discharge to Greens Creek has not been observed.

Access to this section of Greens Creek below the culvert is challenging, particularly during storm events. Therefore, the sites for the upstream and downstream receiving water monitoring were chosen to address safety concerns while also satisfying the intent of the Permit. Site 6, which is also sampled on a regular basis under the Fresh Water Monitoring Program (FWMP), was selected as the upstream receiving water site (Figure 6). Site 590, located below mile 7.6, was selected as the downstream site.

BMPs previously implemented near this outfall resulted in a reduction in sediment load and lower metal concentrations. Lead and zinc concentrations in the sample collected from the outfall exceeded AWQS during the October storm event. The upstream and downstream receiving water sites were not accessible because high flows prevented access for safety reasons.

3.7. Storm Water Outfall 006 – Pond D Overflow

Under normal circumstances, pump systems maintain a low water level in Pond D and route storm water to treatment facilities or for use in the mill. In the event that discharges do occur, the designated upstream and downstream receiving water locations for this outfall are Site 6 and Site 590, respectively (Figure 6).

It is likely that Pond D overflowed on the evening of 1/21/22 during the substantial late January runoff event (Tables 4 and 5). Samples were collected from the outfall and from Site 54 as a surrogate for the upstream receiving water site on 1/22/22 (Site 6 was inaccessible). Pond D was not overflowing at that time but the water quality is likely representative of what was overflowing the previous evening. The downstream receiving water sample was not collected because there was no discharge from the outfall at the time. The zinc concentration exceeded the AWQS in the outfall sample, and both lead and zinc concentrations exceeded standards in the upstream receiving water sample.

3.8. Storm Water Outfall 007 – Pond C Overflow

The Pond C system, consisting of an upper and lower pond, collects storm water runoff from an inactive waste rock storage area and a section of the B-Road (Figure 7). Hecla's standard practice is to pump water collected in the Pond C system to water treatment facilities and not routinely discharge storm water through Outfall 007. Should discharge from Outfall 007 occur, designated receiving water monitoring locations in Greens Creek are Site 1 (the 920 weir) for the upstream site and Site 6 for the downstream site.

Pond C began to overflow on 1/21/22 and continued through 1/22/22 because an upslope diversion ditch failed (frozen and plugged pipe) sending additional runoff to Pond C. Both pumps were running continuously and unable to keep up with the flow. A sample was collected directly from the lower pond on 1/21/22 shortly after the lower pond filled and started discharging. No receiving water sites were sampled due to the high creek flows and unsafe conditions. On 1/22/22 follow up samples were collected from the outfall, from Site 1 for upstream receiving water, and Site 54 for downstream receiving water (Site 6 was inaccessible).

Concentrations of lead and zinc exceeded the AWQS in the lower pond sample (1/21/22), the outfall pipe sample (1/22/22), and in the downstream receiving water sample (1/22/22). The lead concentration also exceeded in chronic criterion in the upstream receiving water sample collected on 1/22/22. The difference in water quality in the source samples are likely attributed to the higher total suspended solids concentration observed as the event continued and additional sediment was flushed out of upper Pond C into the lower pond.

Discharges from the outfall also occurred in September and October. Lead and zinc concentrations exceeded the AWQS in outfall samples collected during both events. The lead concentration exceeded the chronic criterion in samples collected from the upstream and downstream receiving water sites during the September event, and both lead and zinc exceeded criteria in the upstream receiving water sample collected during the October event. The downstream site was not accessible and therefore no sample was collected in October.

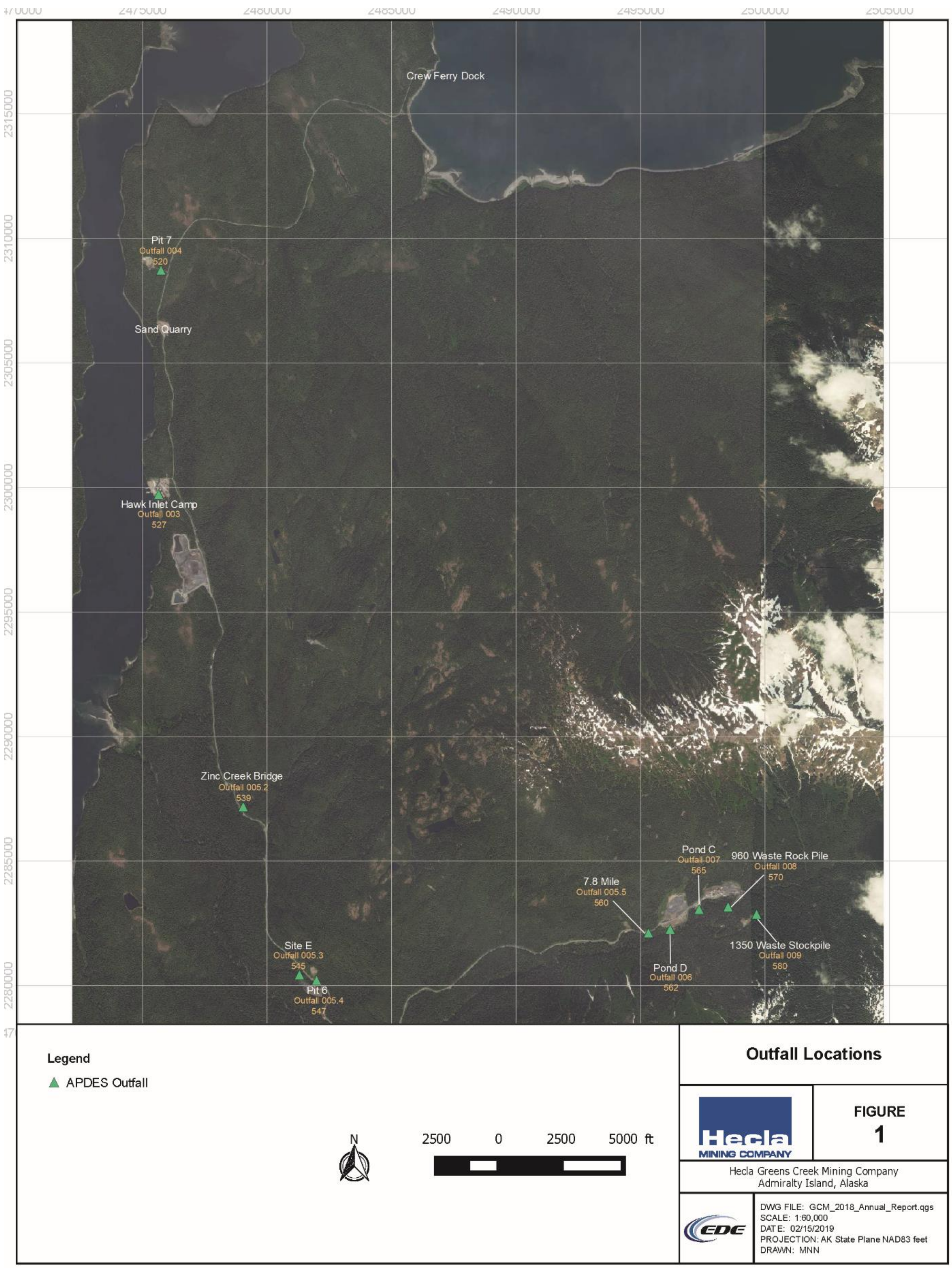
3.9. Storm Water Outfall 008 – 960 Site

Outfall 008 is the discharge location (Figure 8) for runoff from a former waste rock storage pile placed during development of the 920 mine portal. The majority of the waste rock was removed in 2005. The catchment area contributing runoff to the outfall is approximately 0.7 acres. Since removal of the waste rock material the water quality at the outfall has consistently met the AWQS for lead and zinc.

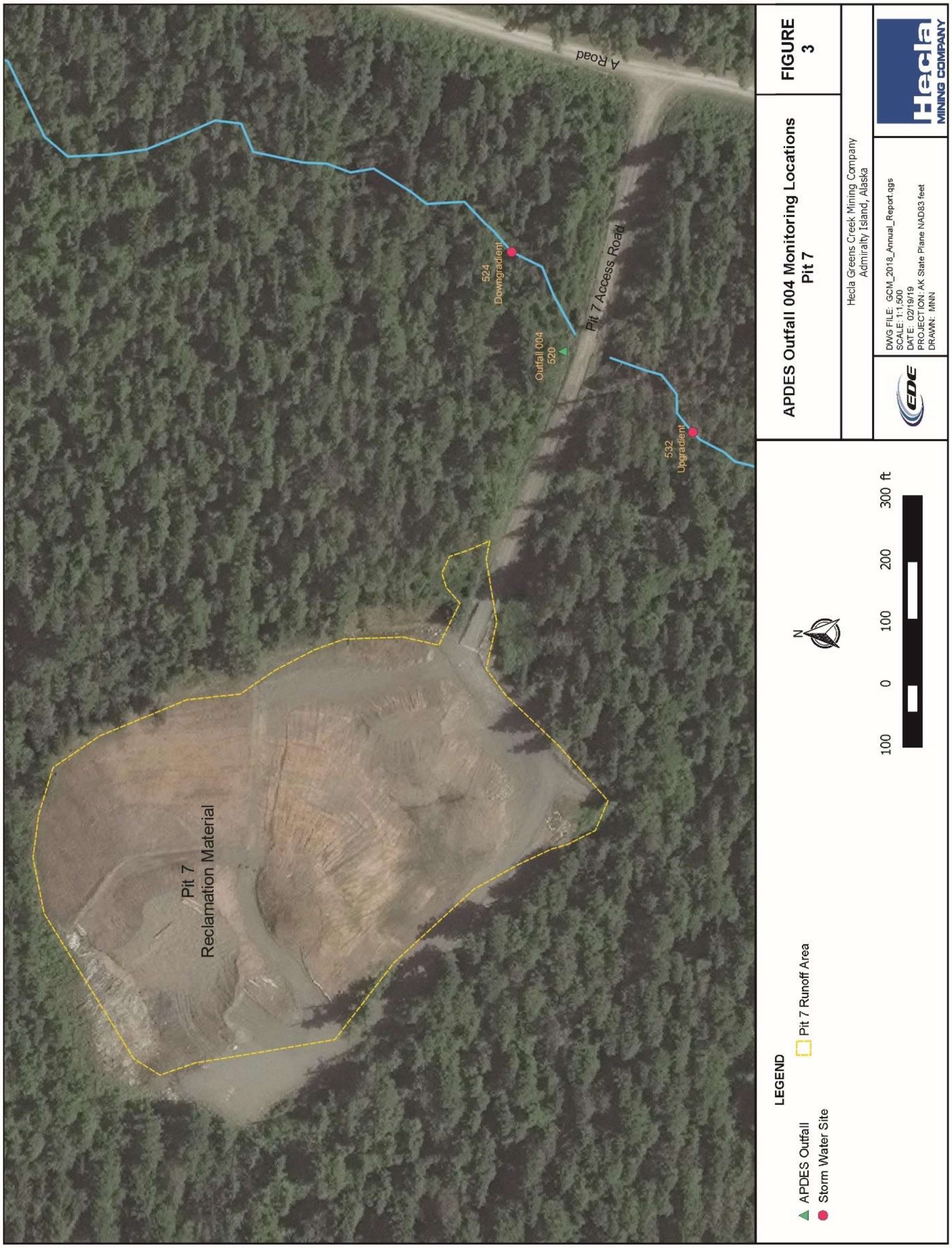
3.10. Storm Water Outfall 009 – 1350 Site

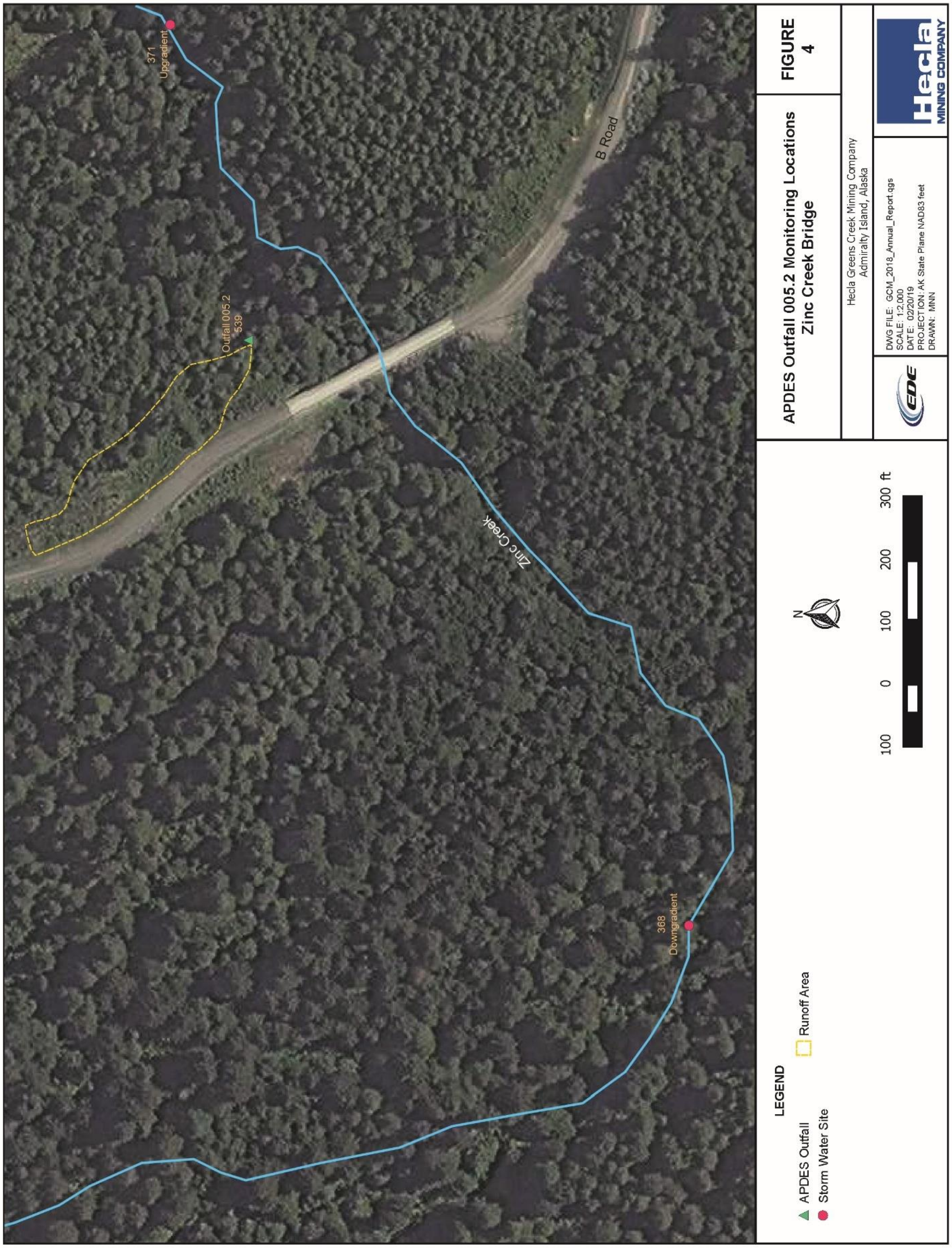
Outfall 009 monitors the runoff quality from an inactive waste rock pile that was placed during the development of the 1350 adit (Figure 9). Between 2005 and 2015, over 80 percent of the waste rock was removed for disposal in the underground mine. The catchment area contributing runoff to the outfall is approximately 3.3 acres in size. Receiving water monitoring is performed in Greens Creek at Site 48 (upstream) and Site 1 (downstream). Site 48, also sampled routinely as part of the FWMP, is located upstream of all mining activity and represents natural background quality for Greens Creek.

Zinc concentrations in the outfall samples collected during the reporting period exceeded AWQS. Zinc concentrations in the receiving water samples were well below standards indicating no substantial impact from the outfall.


Crew Ferry Dock
Pit 7
Outfall 004
520
Sand Quarry
Hawk Inlet Camp
Outfall 003
527
Zinc Creek Bridge
Outfall 005.2
539
Pond C
Outfall 007
565
960 Waste Rock Pile
Outfall 008
570
7.8 Mile
Outfall 005.5
560
1350 Waste Stockpile
Outfall 009
580
Pond D
Outfall 006
562
Site E
Outfall 005.3
545
Pit 6
Outfall 005.4
547
Legend
APDES Outfall
N
2500 0 2500 5000 ft
Outfall Locations
FIGURE
1
Hecla
MINING COMPANY
Hecla Greens Creek Mining Company
Admiralty Island, Alaska
EDE
DWG FILE: GCM_2018_Annual_Report.qgs
SCALE: 1:60,000
DATE: 02/15/2019
PROJECTION: AK State Plane NAD83 feet
DRAWN: MNN


Concentrate Storage
Outfall 003
527
Hawk Inlet
529
LEGEND
APDES Outfall
Storm Water Site
Hawk Inlet Runoff Area
N
100 0 100 ft
APDES Outfall 003 Monitoring Locations Hawk Inlet
FIGURE 2
Hecla MINING COMPANY
Hecla Greens Creek Mining Company Admiralty Island, Alaska
EDE
DWG FILE: GCM_2018_Annual_Report.qgs
SCALE: 1:1,200
DATE: 02/19/19
PROJECTION: AK State Plane NAD83 feet
DRAWN: MNN


A Road
Pit 7 Access Road
524 Downgradient
Outfall 004 520
532 Upgradient
Pit 7 Reclamation Material
LEGEND
APDES Outfall
Storm Water Site
Pit 7 Runoff Area
N
100 0 100 200 300 ft
APDES Outfall 004 Monitoring Locations
Pit 7
FIGURE 3
Hecla Greens Creek Mining Company
Admiralty Island, Alaska
DWG FILE: GCM_2018_Annual_Report.qgs
SCALE: 1:1,500
DATE: 02/19/19
PROJECTION: AK State Plane NAD83 feet
DRAWN: MNN


371
Upgradient
B Road
Outfall 005.2
539
Zinc Creek
368
Downgradient
LEGEND
APDES Outfall
Storm Water Site
Runoff Area
N
100 0 100 200 300 ft
APDES Outfall 005.2 Monitoring Locations
Zinc Creek Bridge
FIGURE
4
Hecla Greens Creek Mining Company
Admiralty Island, Alaska
DWG FILE: GCM_2018_Annual_Report.qgs
SCALE: 1:2,000
DATE: 02/20/19
PROJECTION: AK State Plane NAD83 feet
DRAWN: MNN
EDE
Hecla
MINING COMPANY

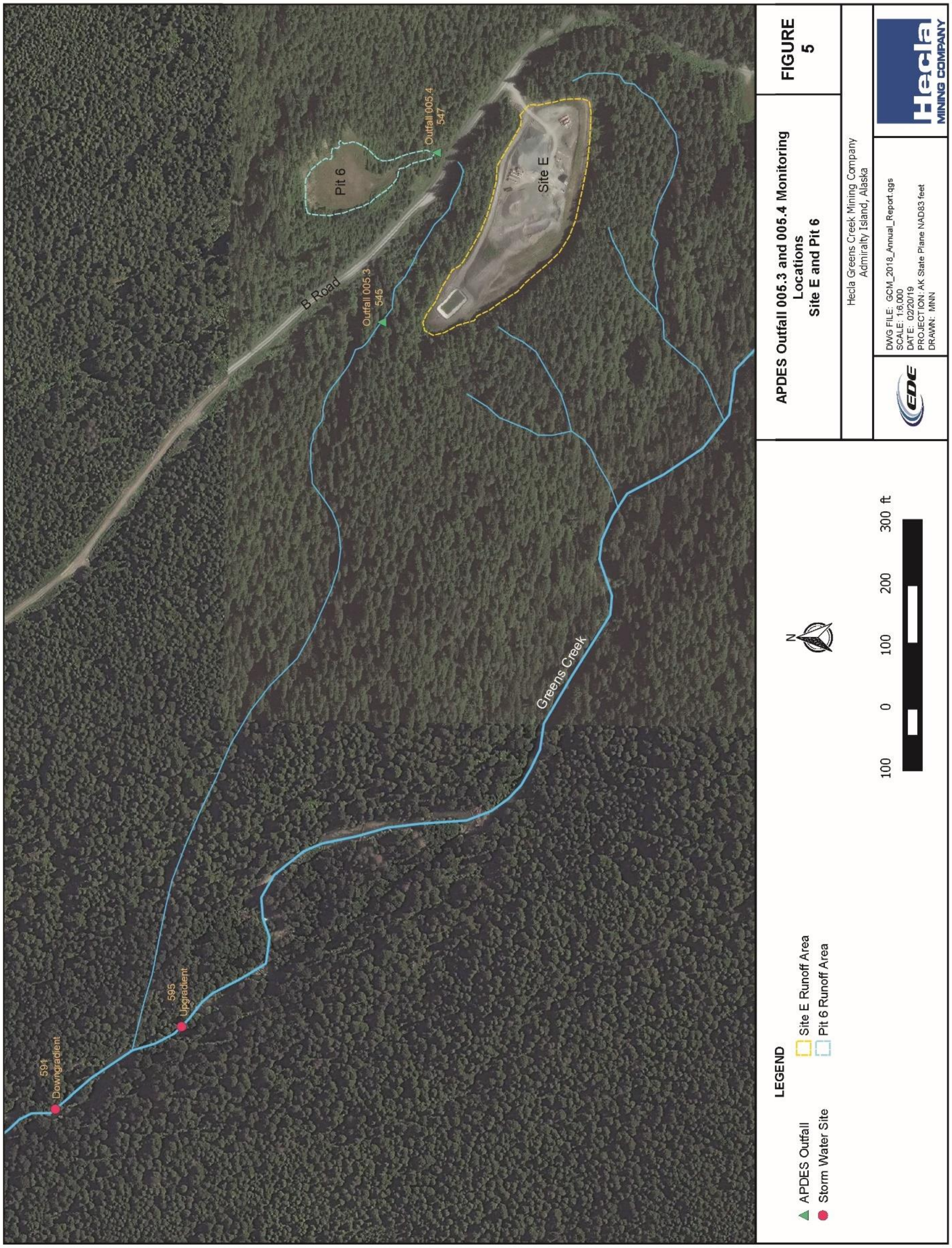


FIGURE 5
APDES Outfall 005.3 and 005.4 Monitoring Locations
Site E and Pit 6
Hecla Greens Creek Mining Company
Admiralty Island, Alaska
DWG FILE: GCM_2018_Annual_Report.qgs
SCALE: 1:6,000
DATE: 02/20/19
PROJECTION: AK State Plane NAD83 feet
DRAWN: MNN
Hecla MINING COMPANY
EDE
N
100 0 100 200 300 ft
LEGEND
APDES Outfall
Storm Water Site
Site E Runoff Area
Pit 6 Runoff Area
Pit 6
Site E
B Road
Outfall 005.4
547
Outfall 005.3
545
Greens Creek
595
Upgradient
591
Downgradient

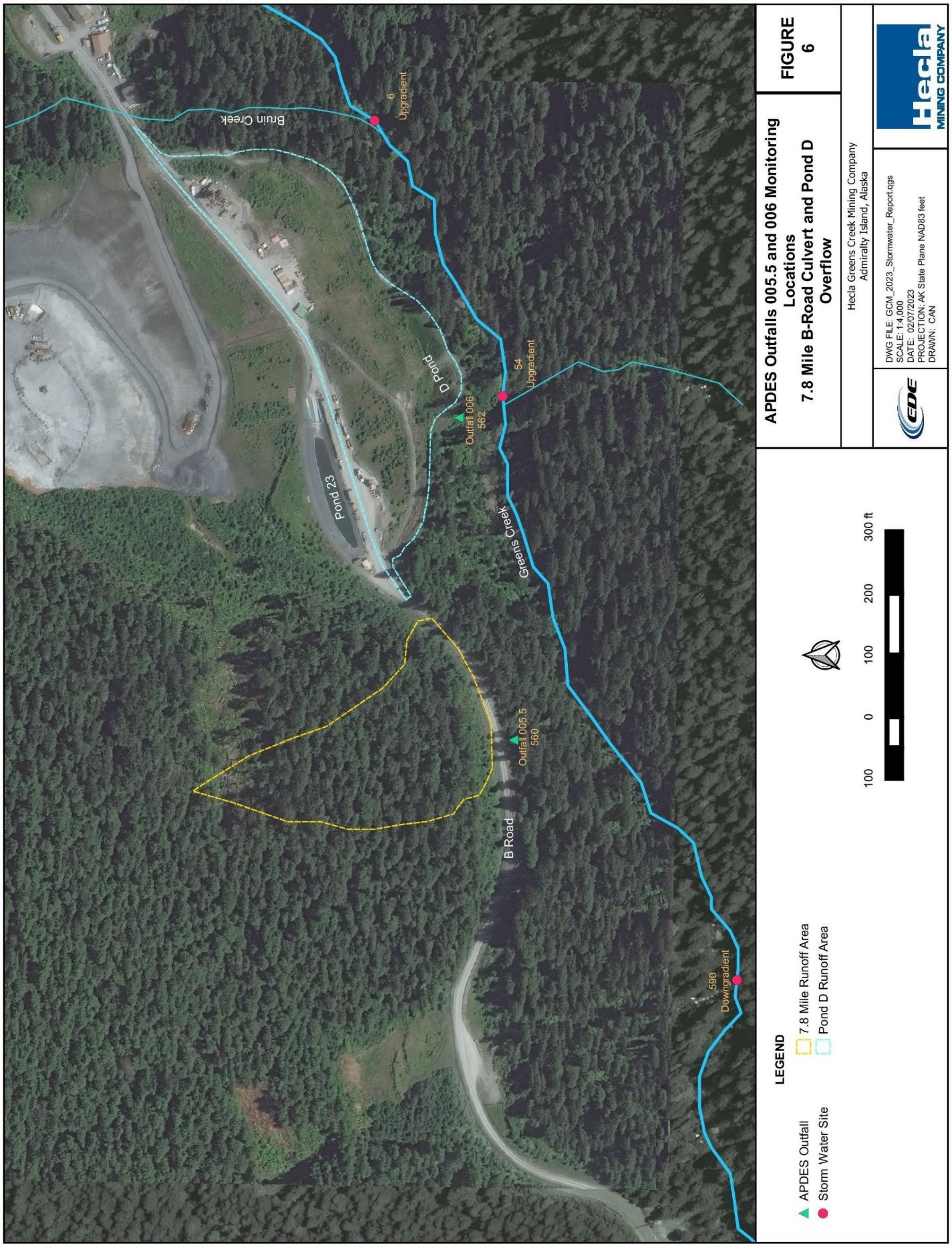


FIGURE 6
APDES Outfalls 005.5 and 006 Monitoring Locations
7.8 Mile B-Road Culvert and Pond D Overflow
Hecla Greens Creek Mining Company
Admiralty Island, Alaska
DWG FILE: GCM_2023_Stormwater_Report.qgs
SCALE: 1:4,000
DATE: 02/07/2023
PROJECTION: AK State Plane NAD83 feet
DRAWN: CAN
Hecla MINING COMPANY
LEGEND
APDES Outfall
Storm Water Site
7.8 Mile Runoff Area
Pond D Runoff Area
100 0 100 200 300 ft
Bruin Creek
6 Upgradient
D Pond
Pond 23
54 Upgradient
Outfall 006 562
Greens Creek
Outfall 005.5 560
B Road
590 Downgradient

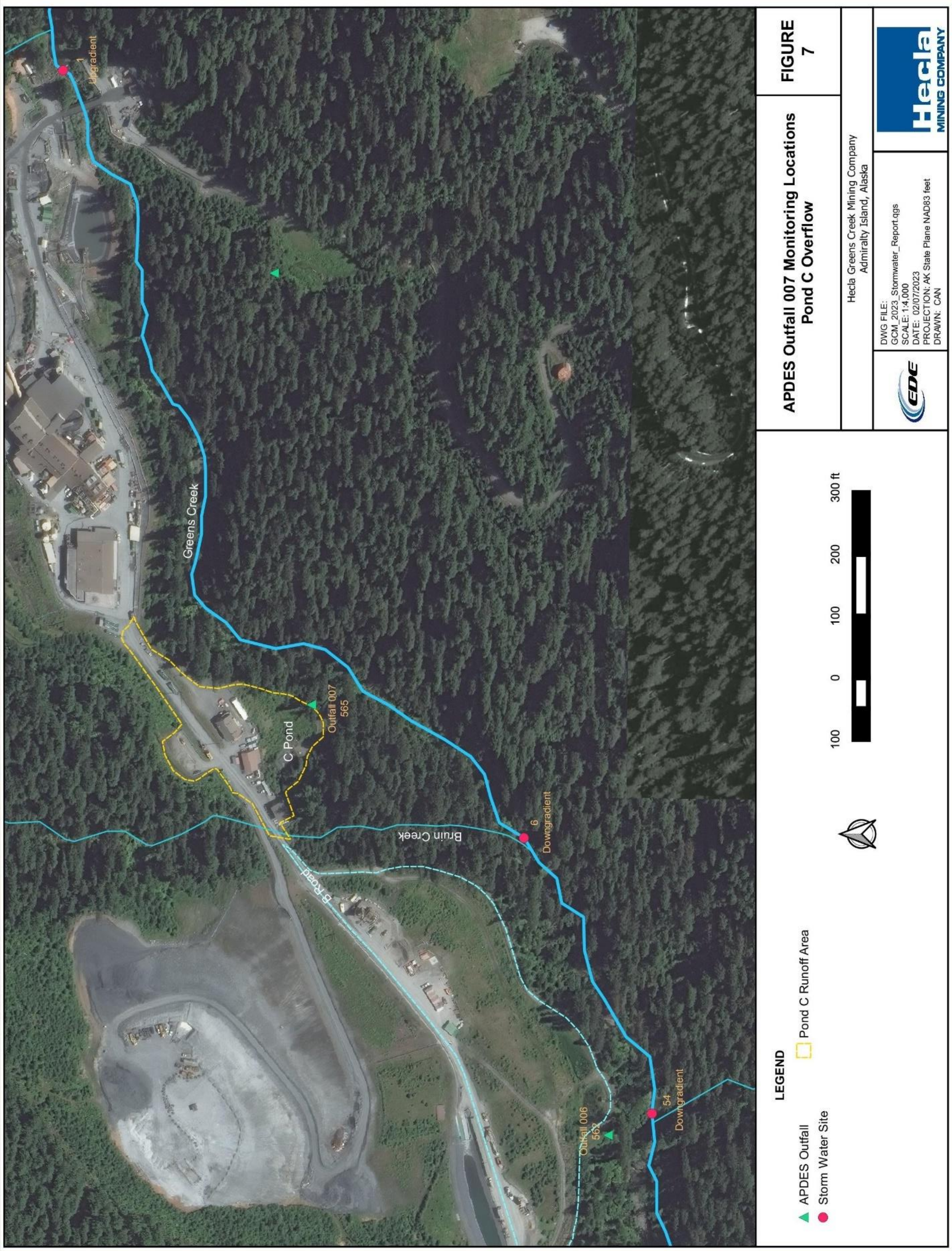


FIGURE 7
APDES Outfall 007 Monitoring Locations
Pond C Overflow
Hecla Greens Creek Mining Company
Admiralty Island, Alaska
DWG FILE: GCM_2023_Stormwater_Report.qgs
SCALE: 1:4,000
DATE: 02/07/2023
PROJECTION: AK State Plane NAD83 feet
DRAWN: CAN
Hecla MINING COMPANY
LEGEND
APDES Outfall
Storm Water Site
Pond C Runoff Area
100 0 100 200 300 ft
Greens Creek
Bruin Creek
B Road
C Pond
Outfall 007
565
Outfall 006
562
Upgradient
6
Downgradient
54
Downgradient

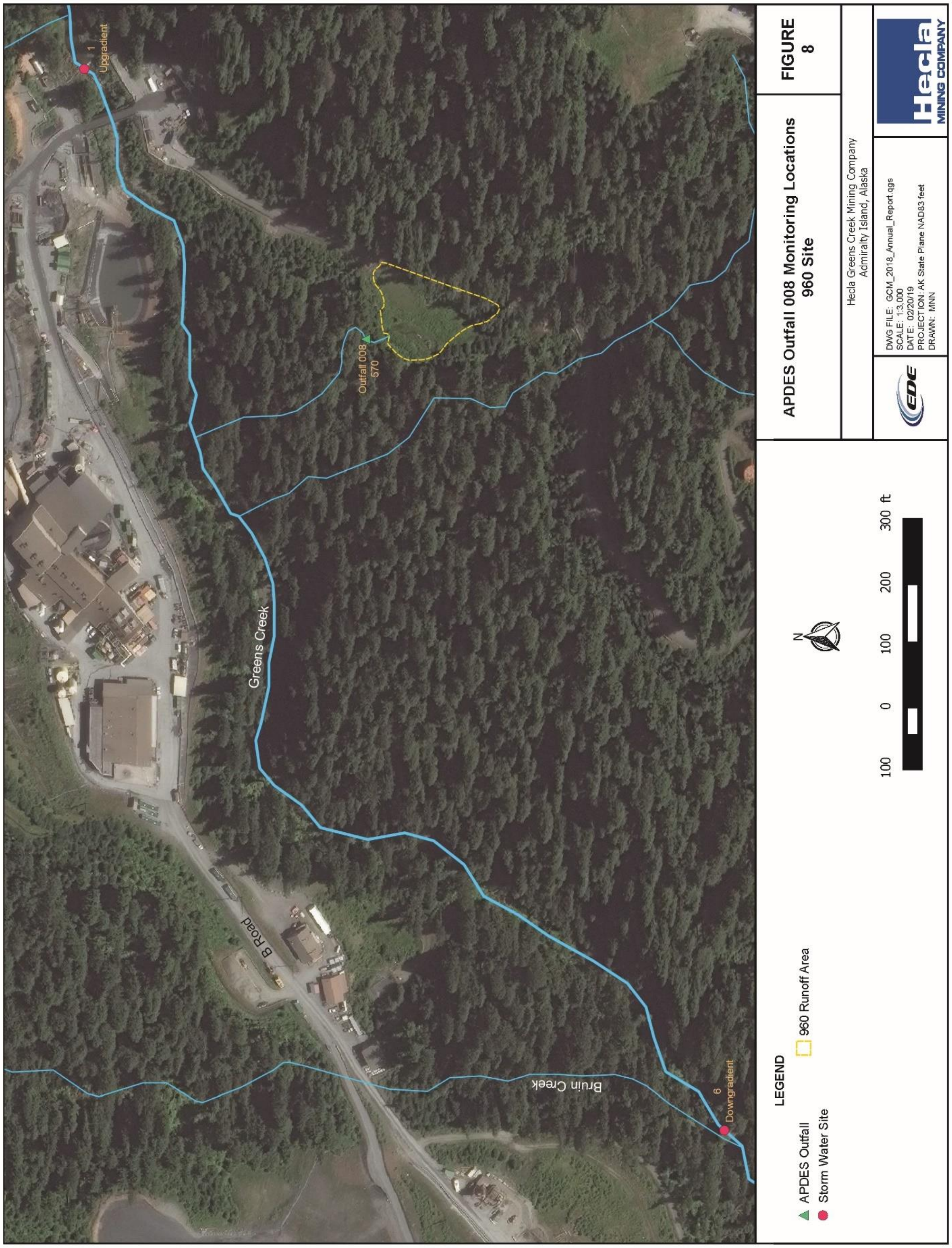


FIGURE
8
APDES Outfall 008 Monitoring Locations
960 Site
Hecla Greens Creek Mining Company
Admiralty Island, Alaska
DWG FILE: GCM_2018_Annual_Report.qgs
SCALE: 1:3,000
DATE: 02/20/19
PROJECTION: AK State Plane NAD83 feet
DRAWN: MNN
Hecla MINING COMPANY
EDE
LEGEND
APDES Outfall
Storm Water Site
960 Runoff Area
N
100 0 100 200 300 ft
1 Upgradient
Outfall 008 570
Greens Creek
B Road
Bruin Creek
6 Downgradient

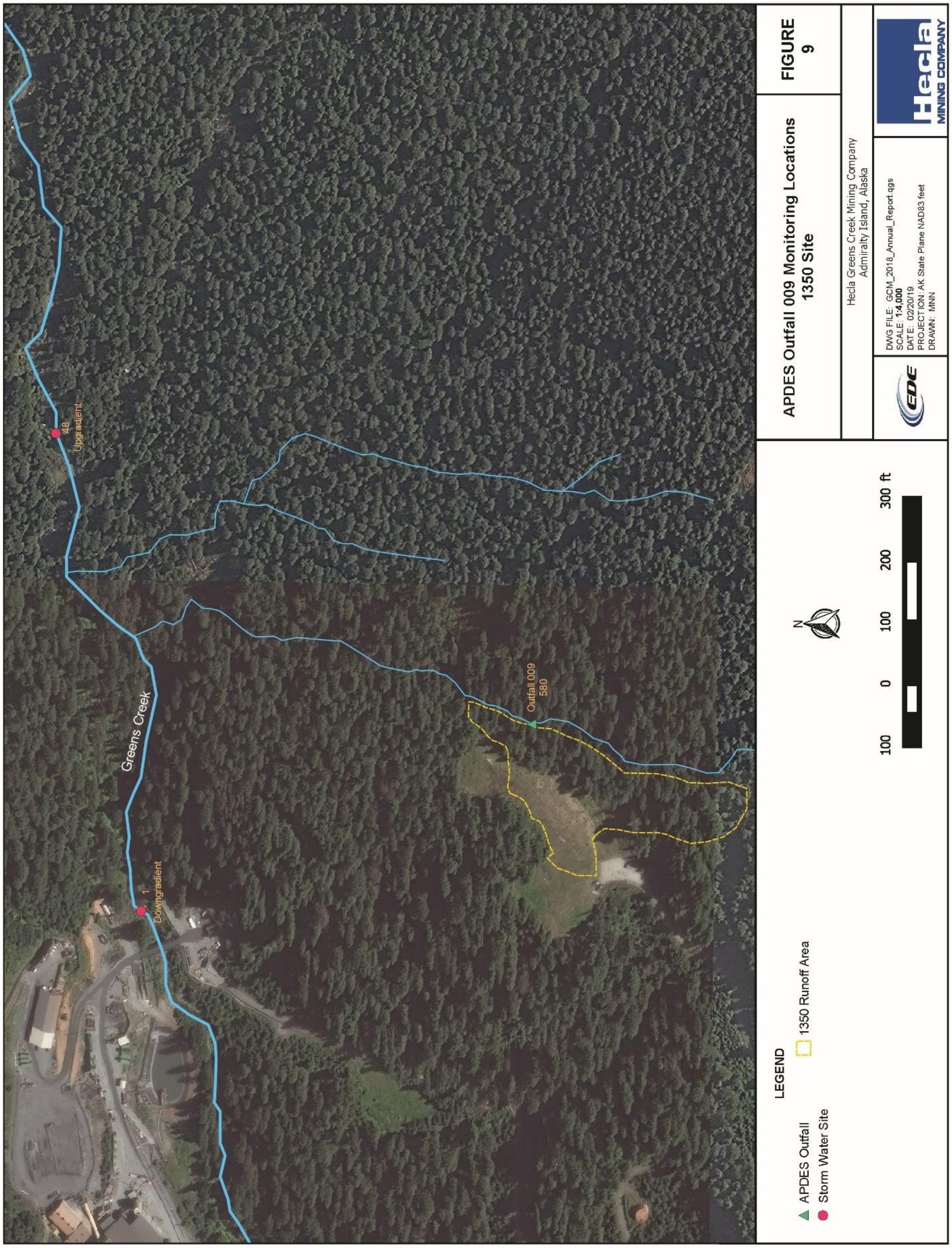
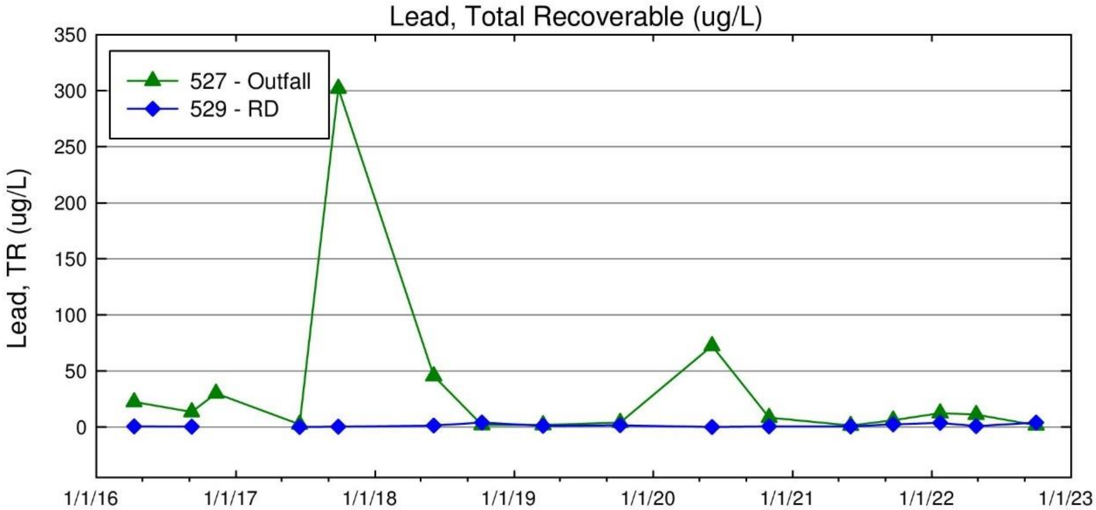
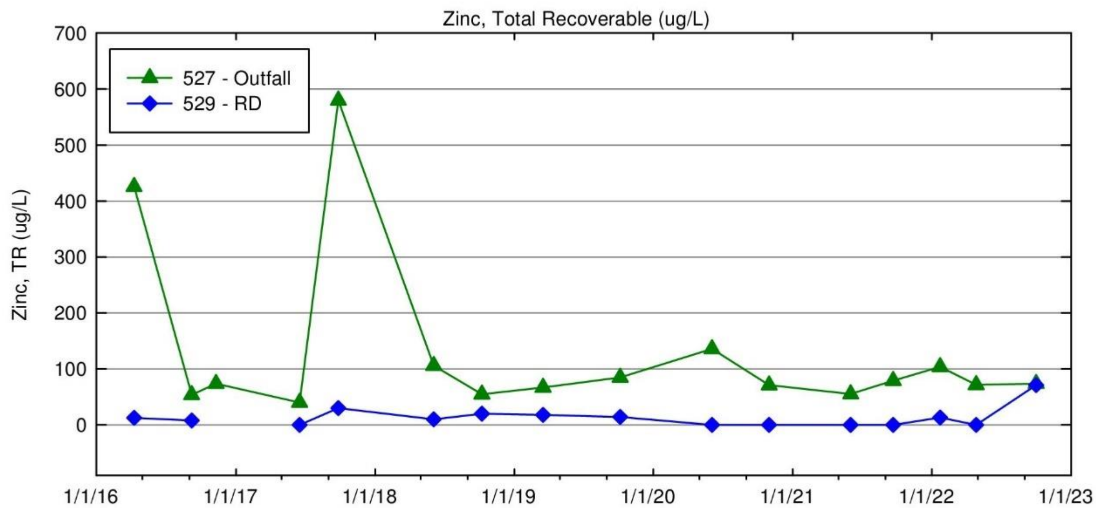


FIGURE
9
APDES Outfall 009 Monitoring Locations
1350 Site
Hecla Greens Creek Mining Company
Admiralty Island, Alaska
DWG FILE: GCM_2018_Annual_Report.qgs
SCALE: 1:4,000
DATE: 02/20/19
PROJECTION: AK State Plane NAD83 feet
DRAWN: MNN
Hecla MINING COMPANY
EDE
LEGEND
APDES Outfall
Storm Water Site
1350 Runoff Area
N
100 0 100 200 300 ft
Greens Creek
48
Upgradient
1
Downgradient
Outfall 009
580

OUTFALL 003


Lead, Total Recoverable (ug/L)
Lead, TR (ug/L)
527 - Outfall
529 - RD
350
300
250
200
150
100
50
0
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23


Zinc, Total Recoverable (ug/L)
Zinc, TR (ug/L)
527 - Outfall
529 - RD
700
600
500
400
300
200
100
0
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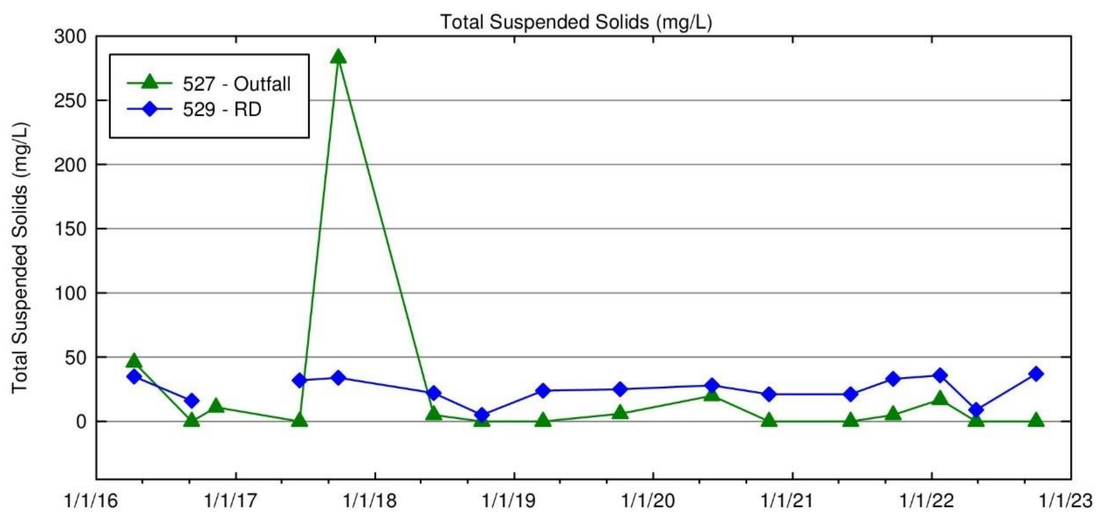
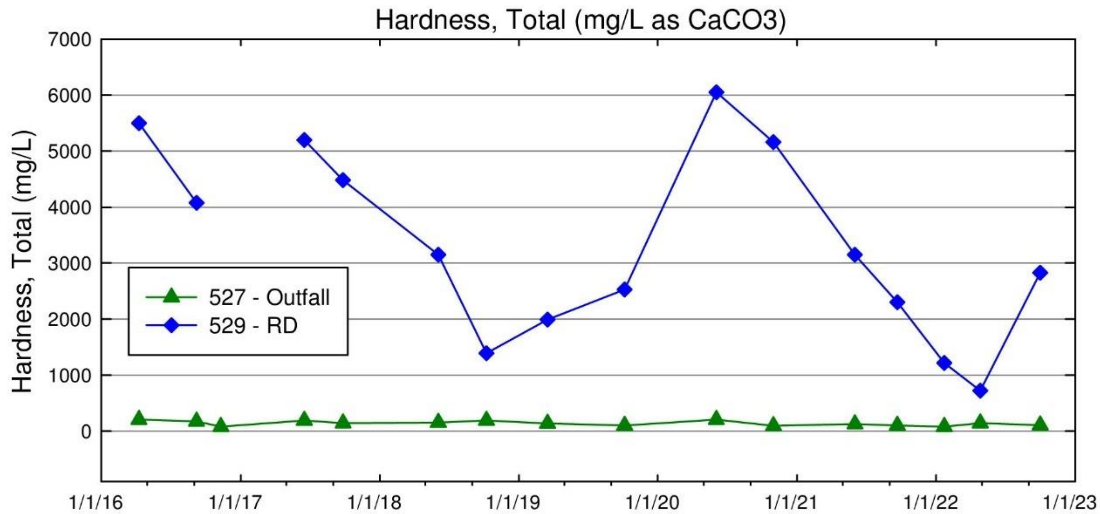
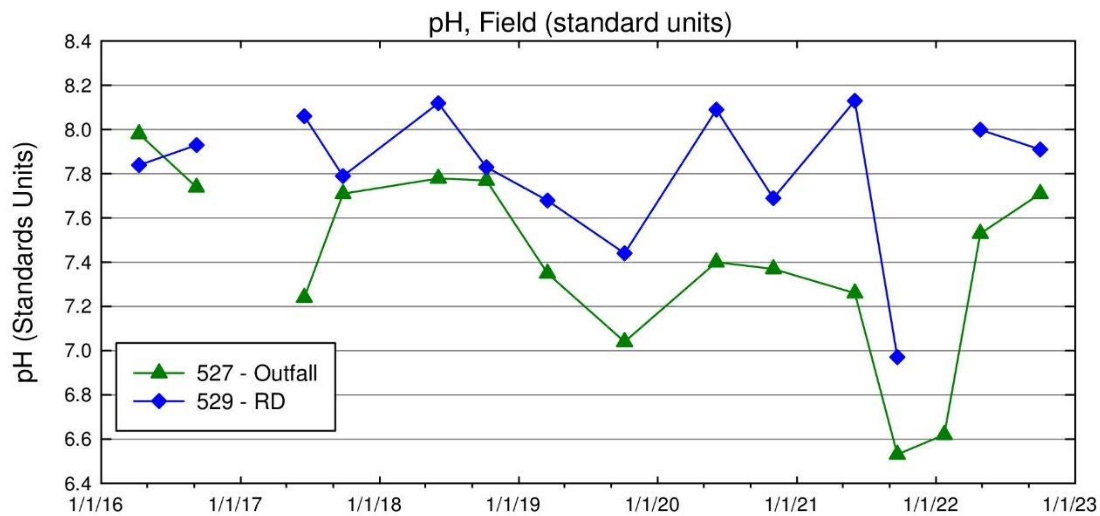
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23

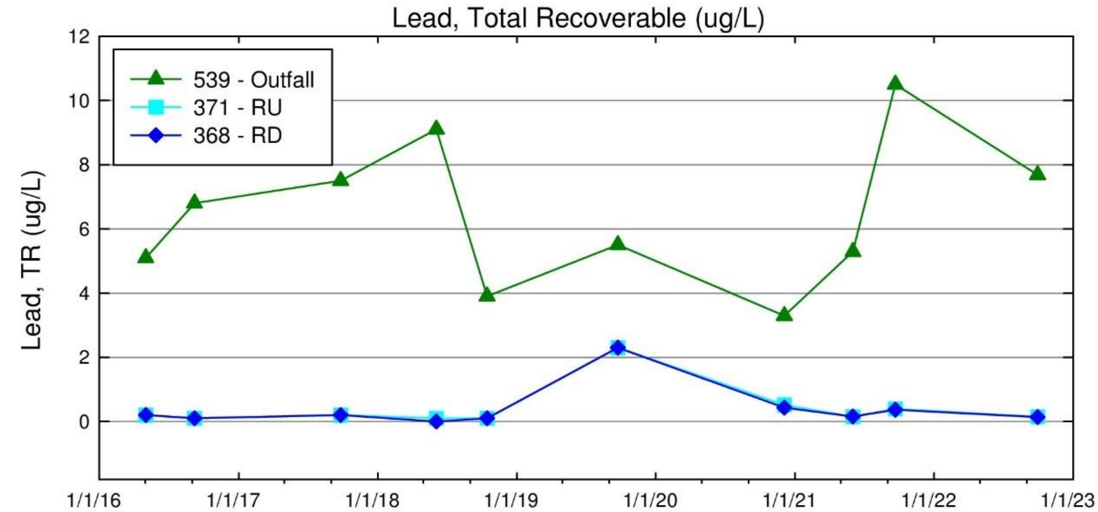

Total Suspended Solids (mg/L)
Total Suspended Solids (mg/L)
527 - Outfall
529 - RD
300
250
200
150
100
50
0
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23

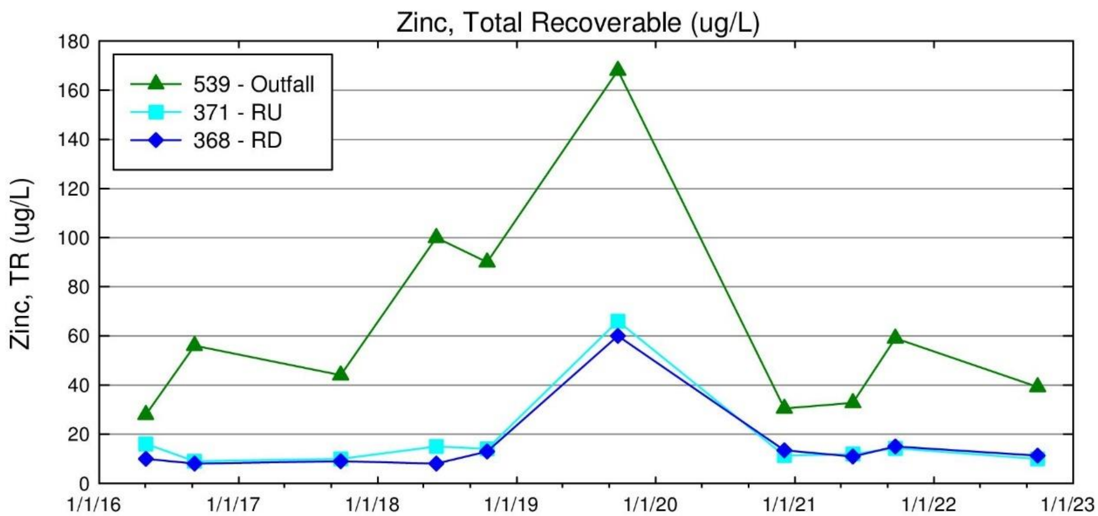
OUTFALL 003

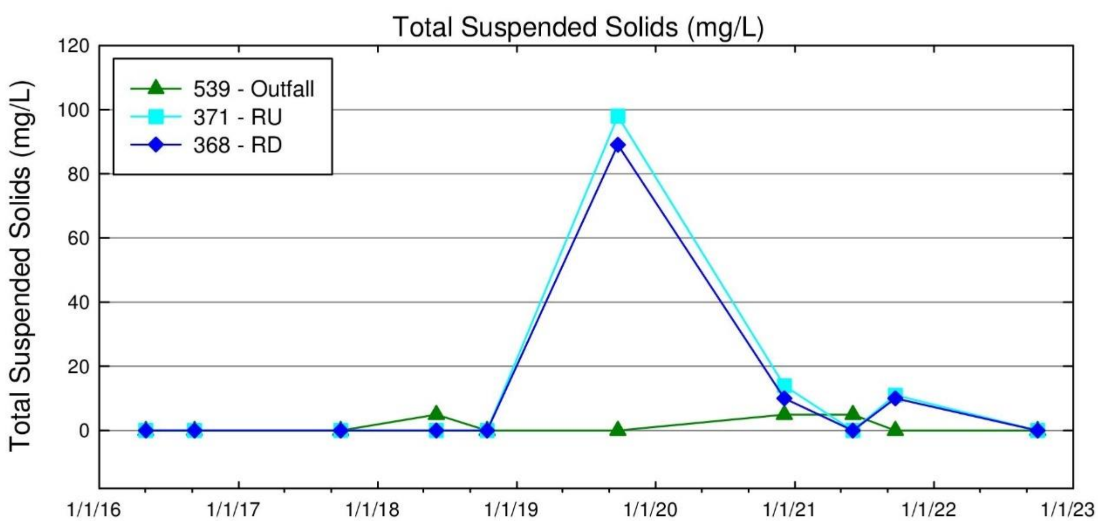

Hardness, Total (mg/L as CaCO3)
Hardness, Total (mg/L)
7000
6000
5000
4000
3000
2000
1000
0
527 - Outfall
529 - RD
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23


pH, Field (standard units)
pH (Standards Units)
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0
6.8
6.6
6.4
527 - Outfall
529 - RD
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23

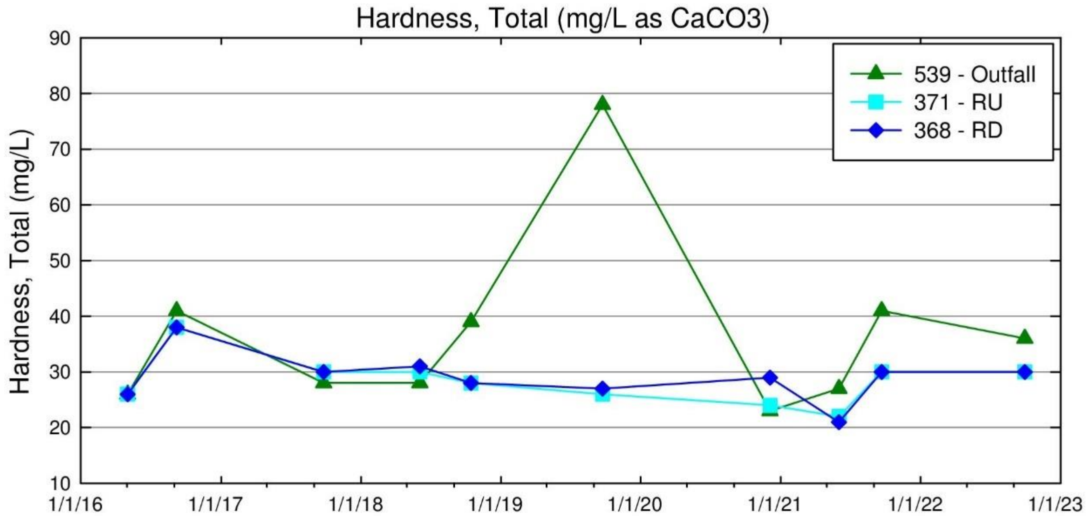
OUTFALL 005.2

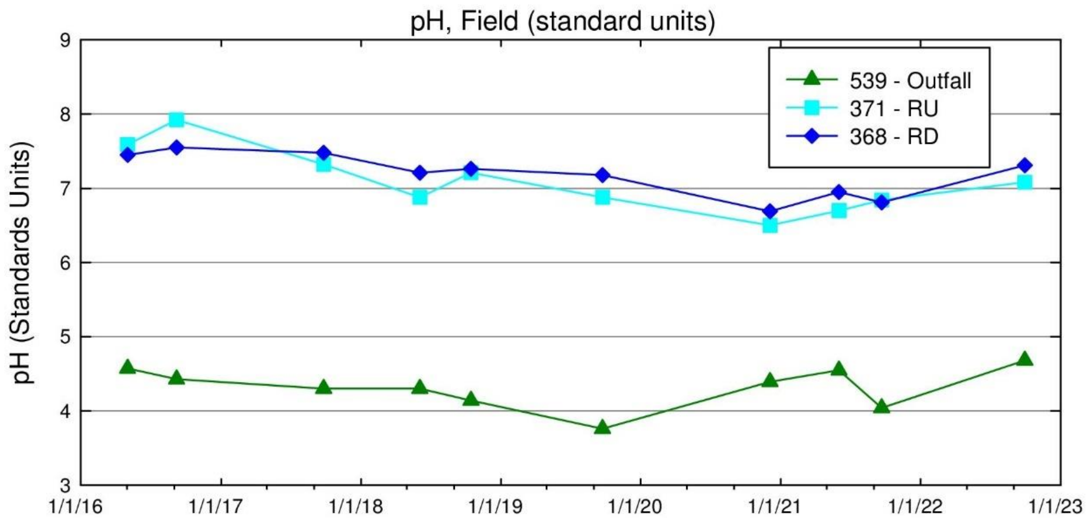




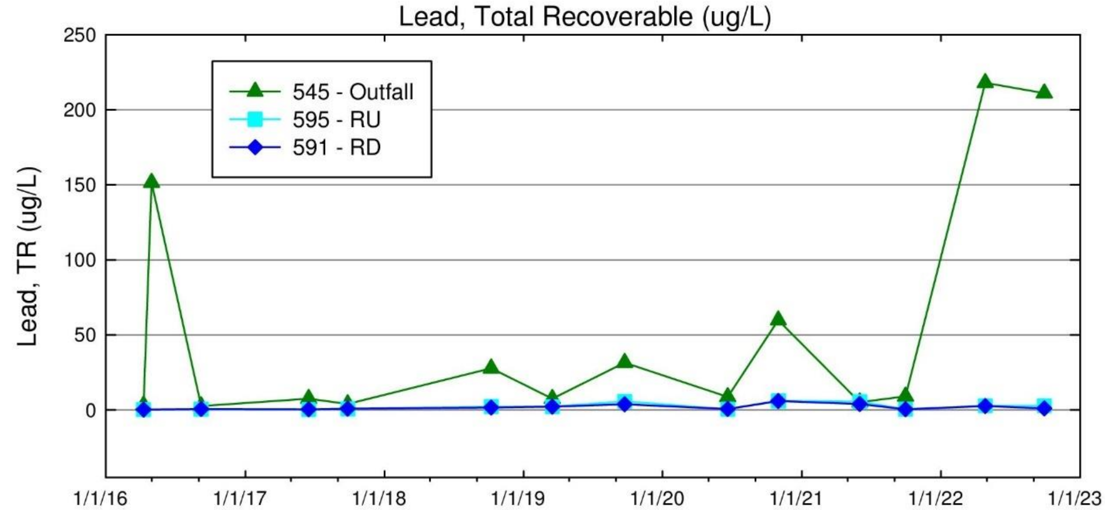


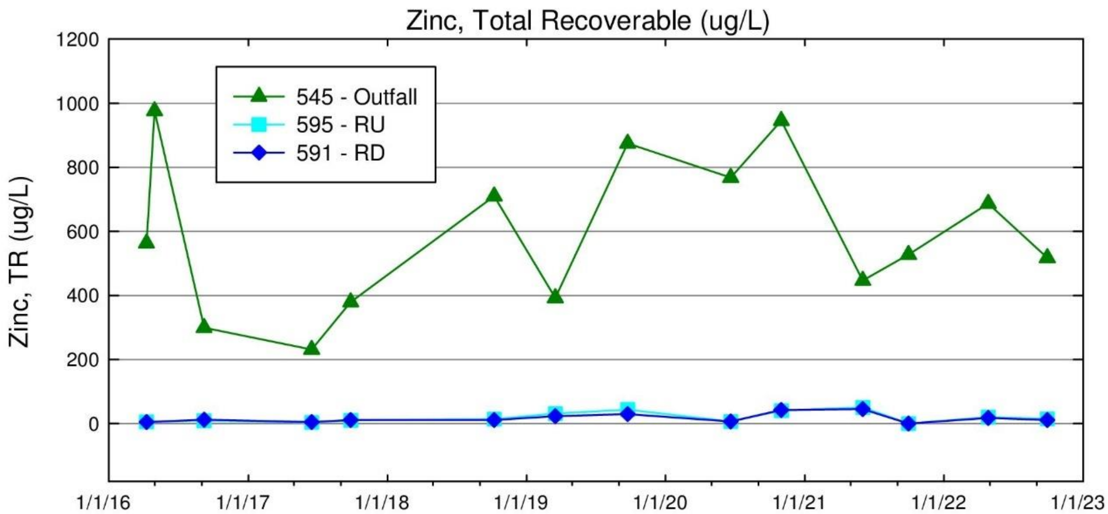
OUTFALL 005.2

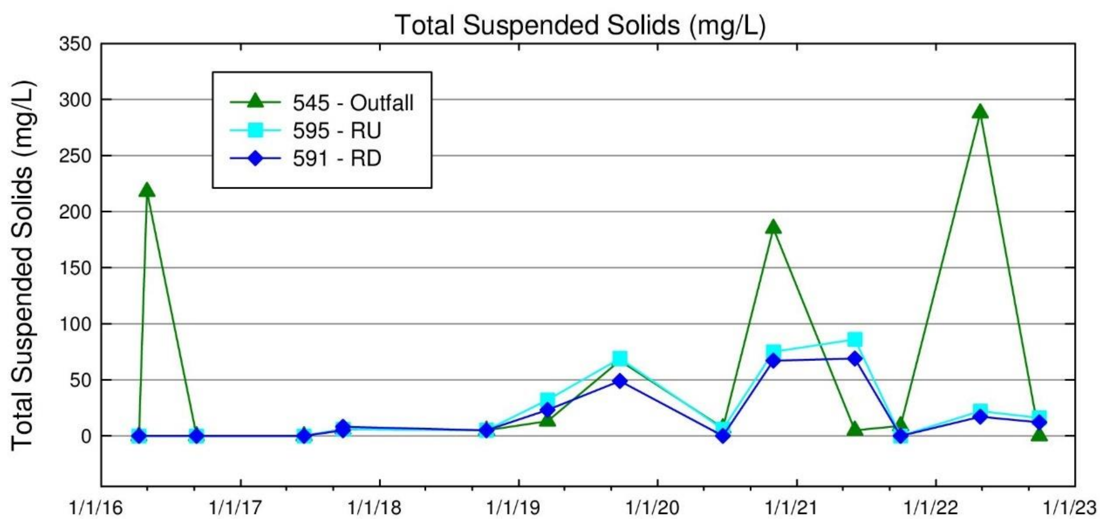




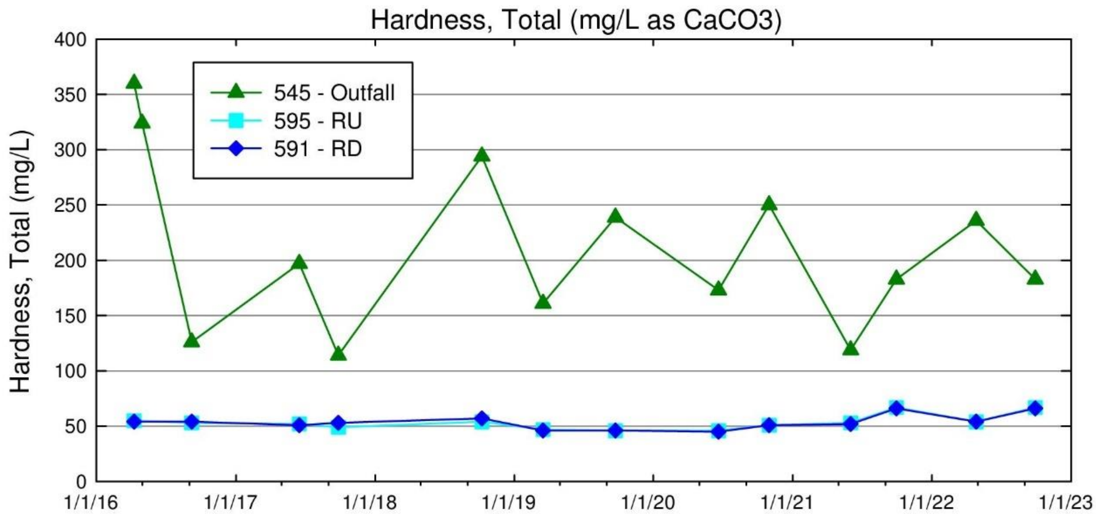
OUTFALL 005.3

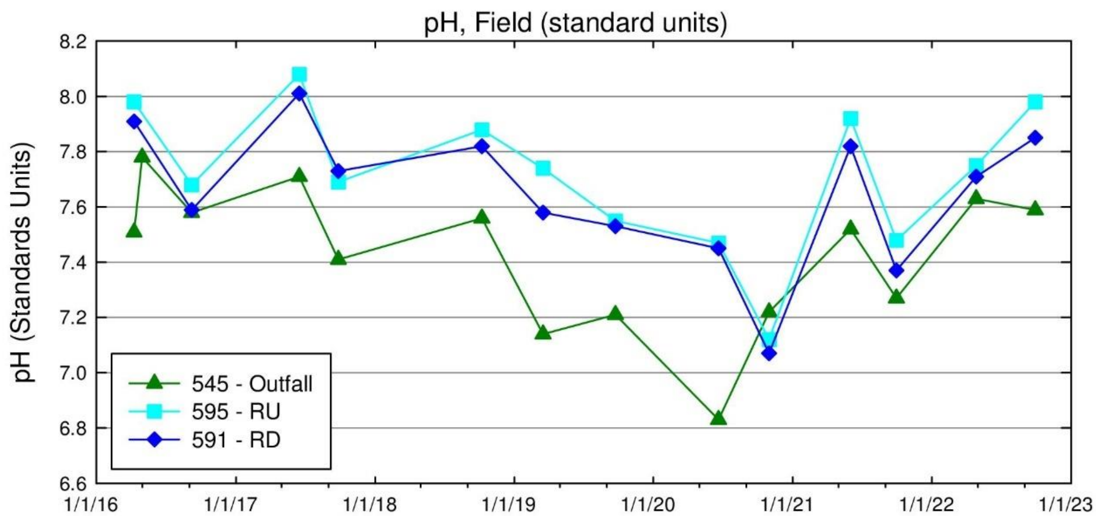




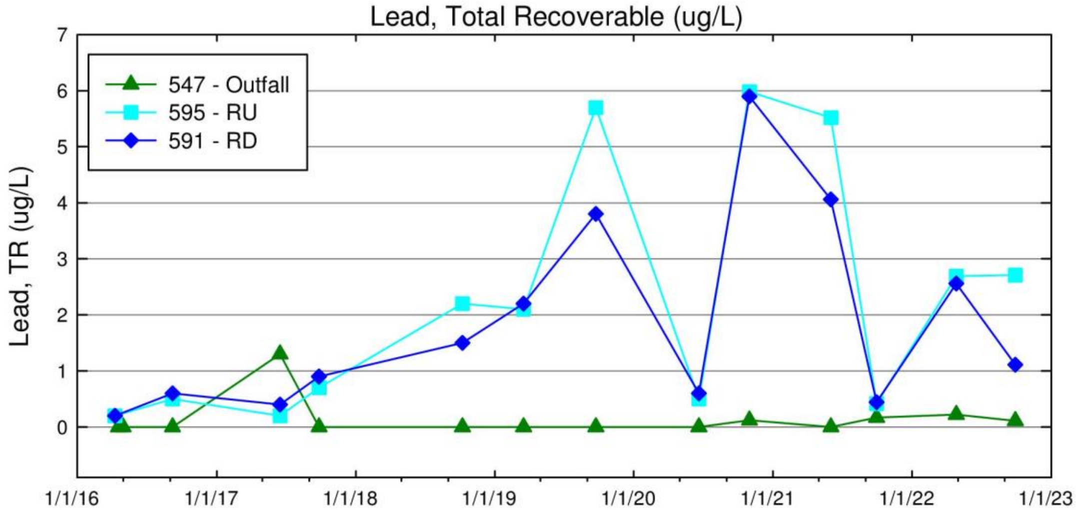


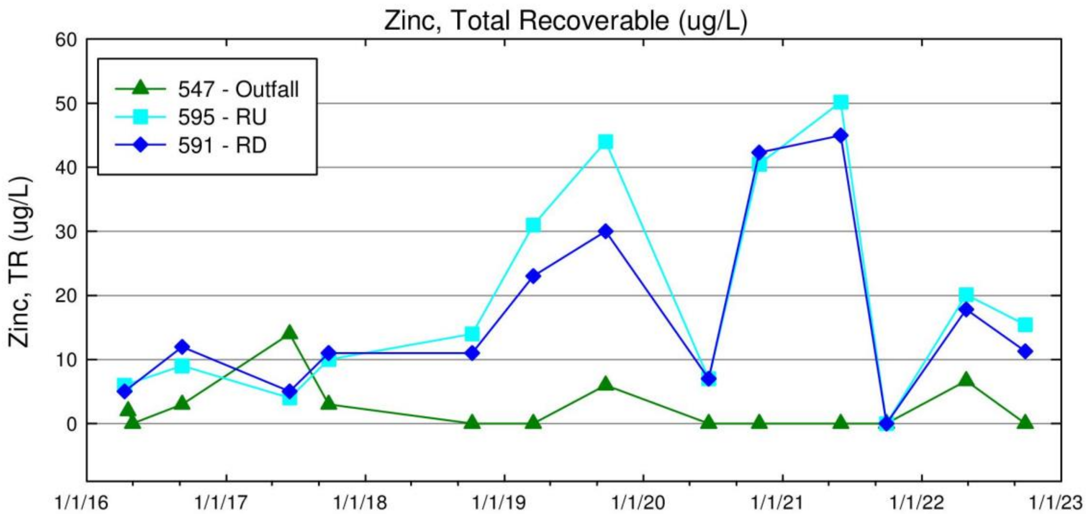
OUTFALL 005.3

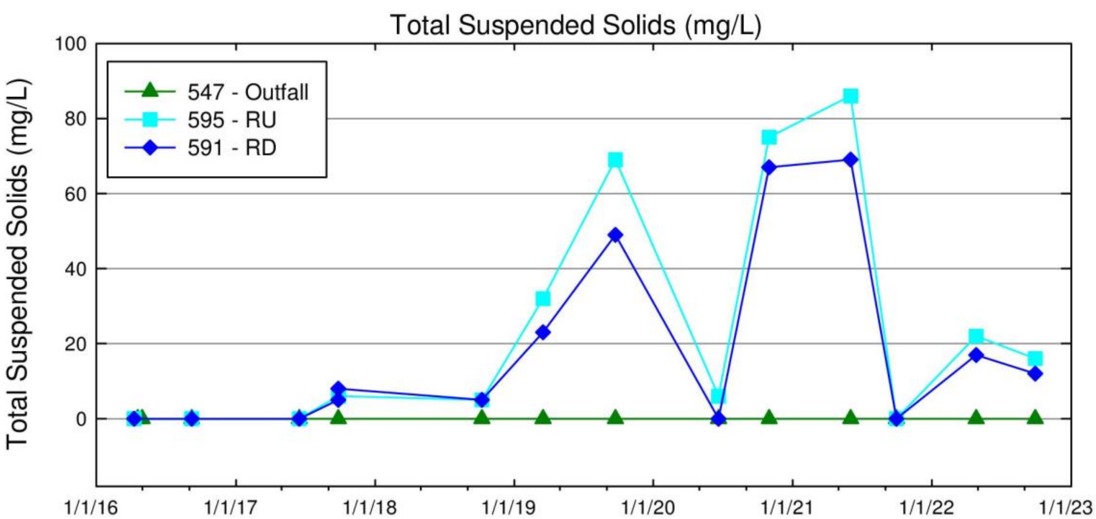




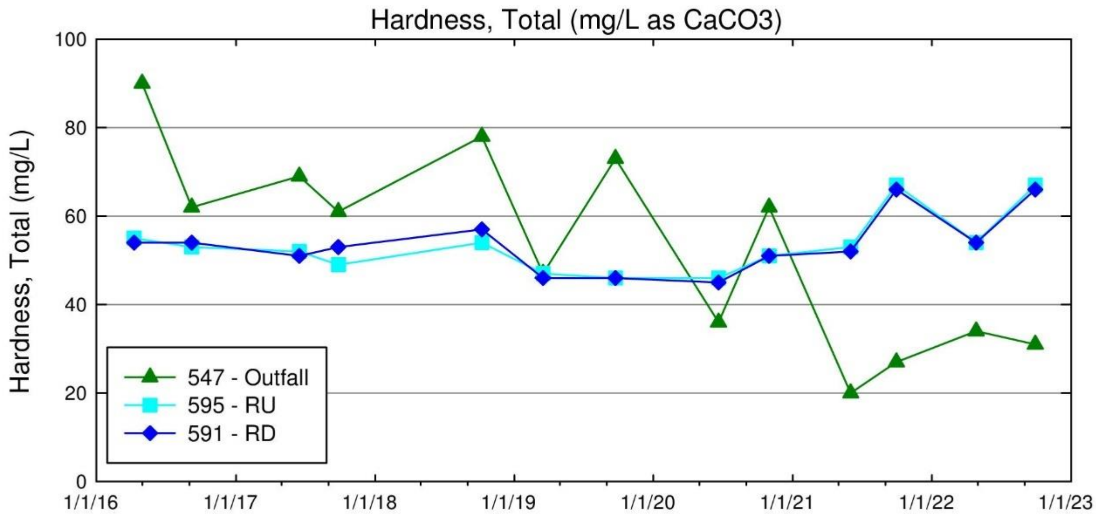
OUTFALL 005.4

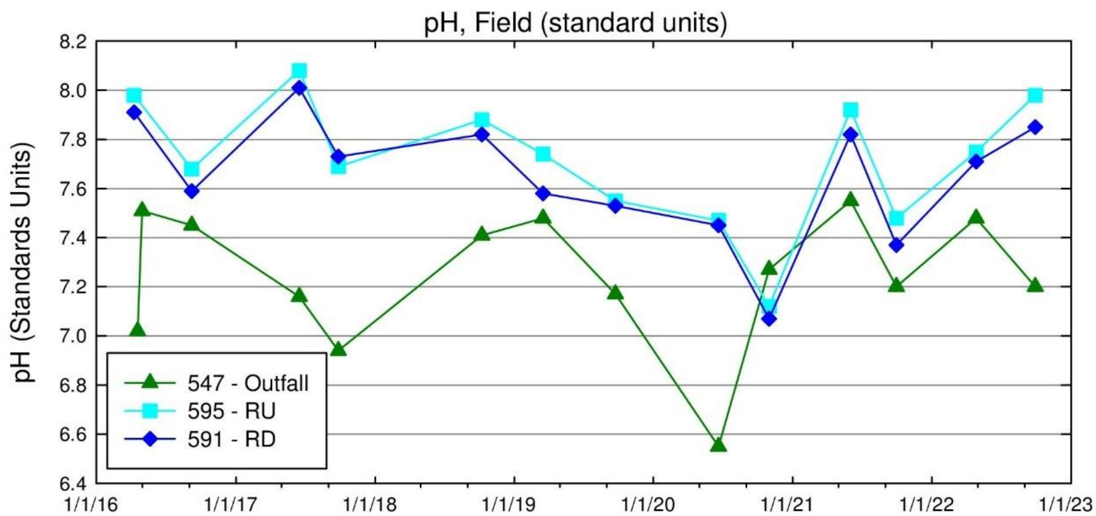




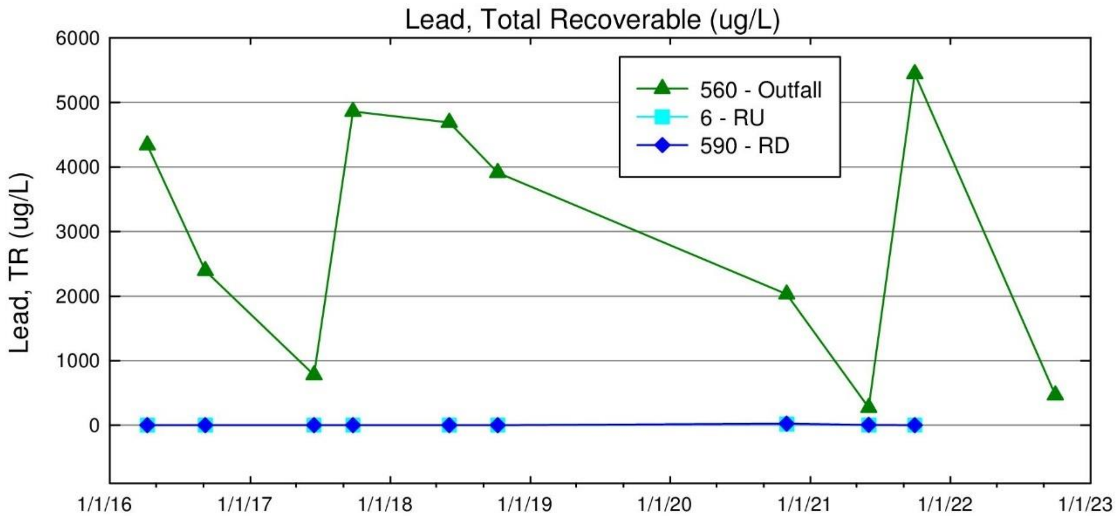


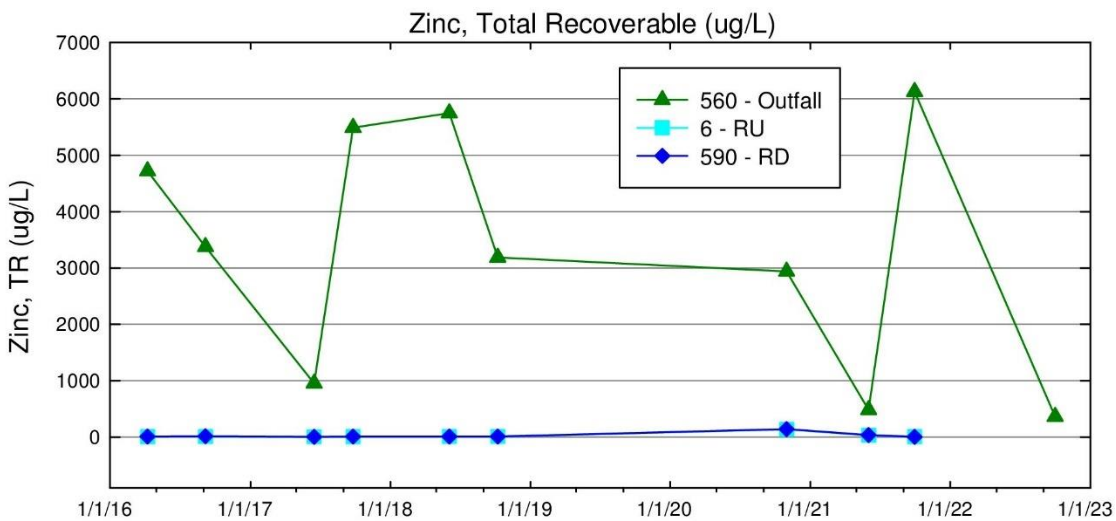
OUTFALL 005.4

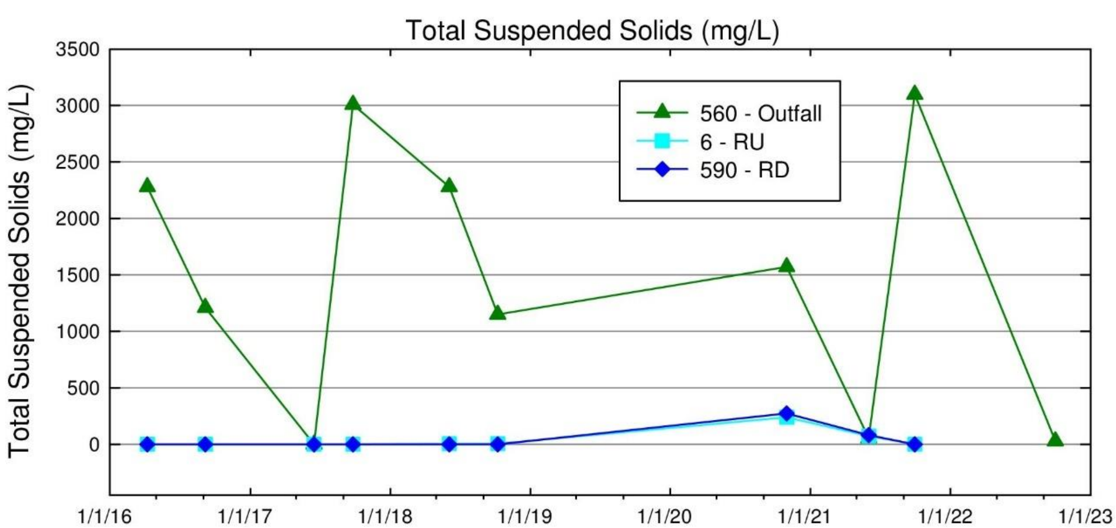




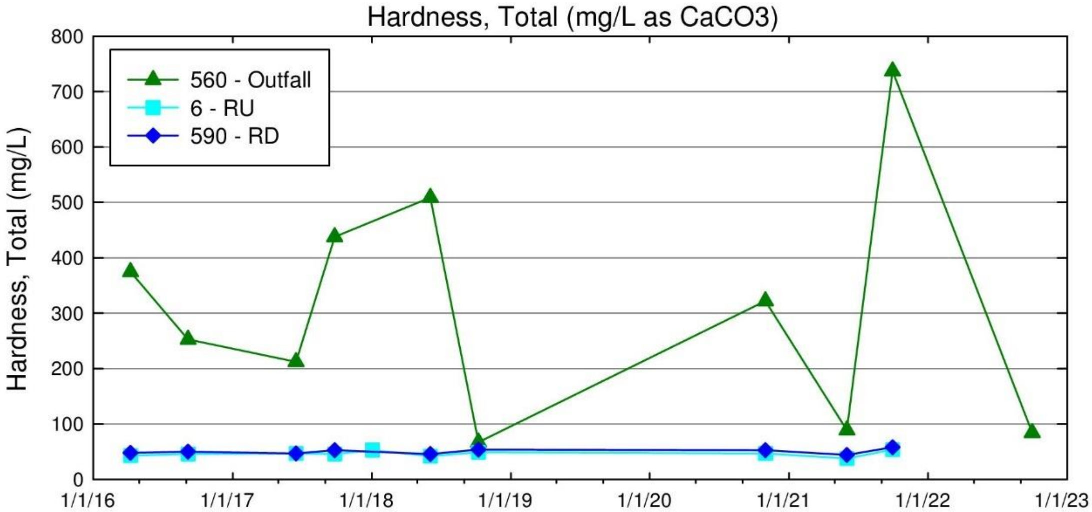
OUTFALL 005.5

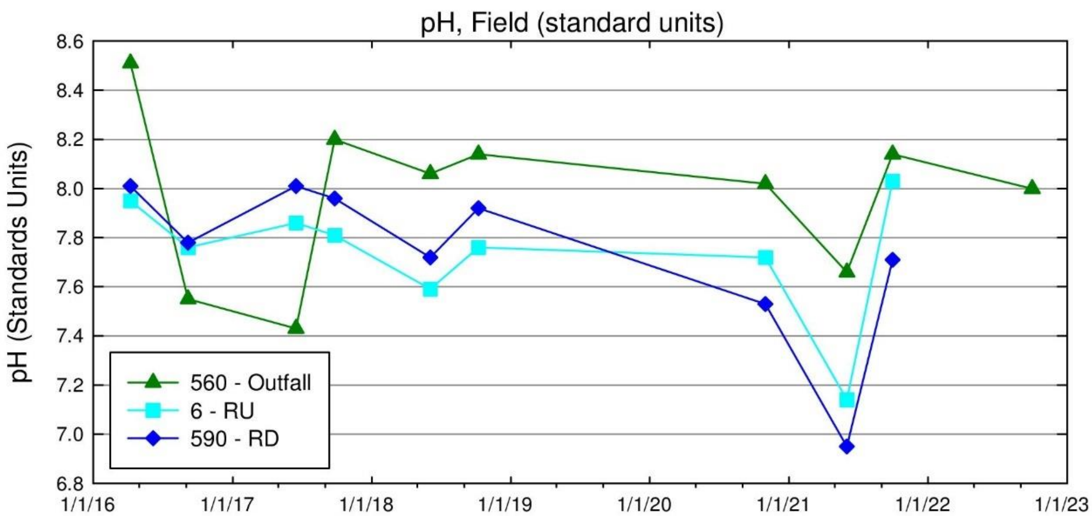




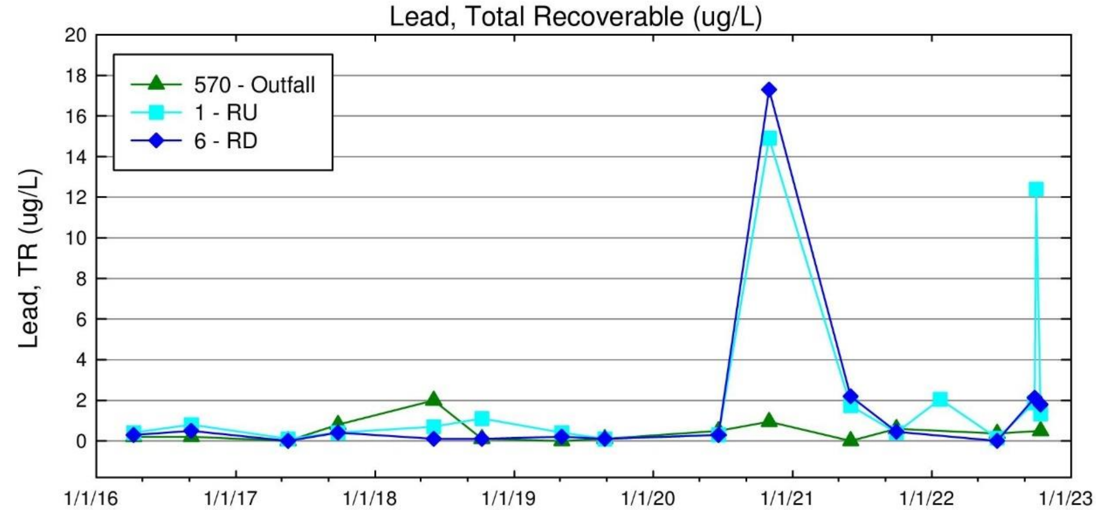


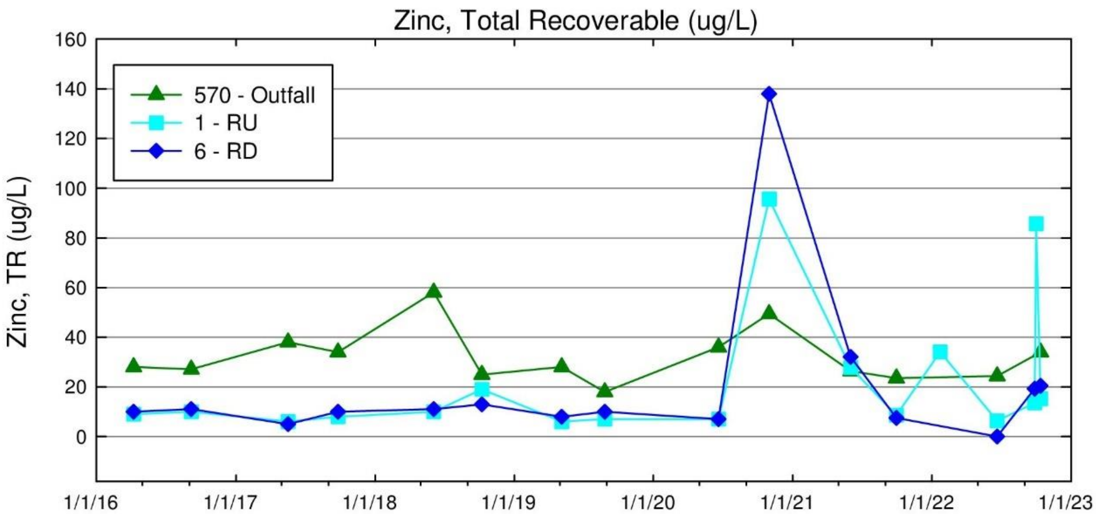
OUTFALL 005.5

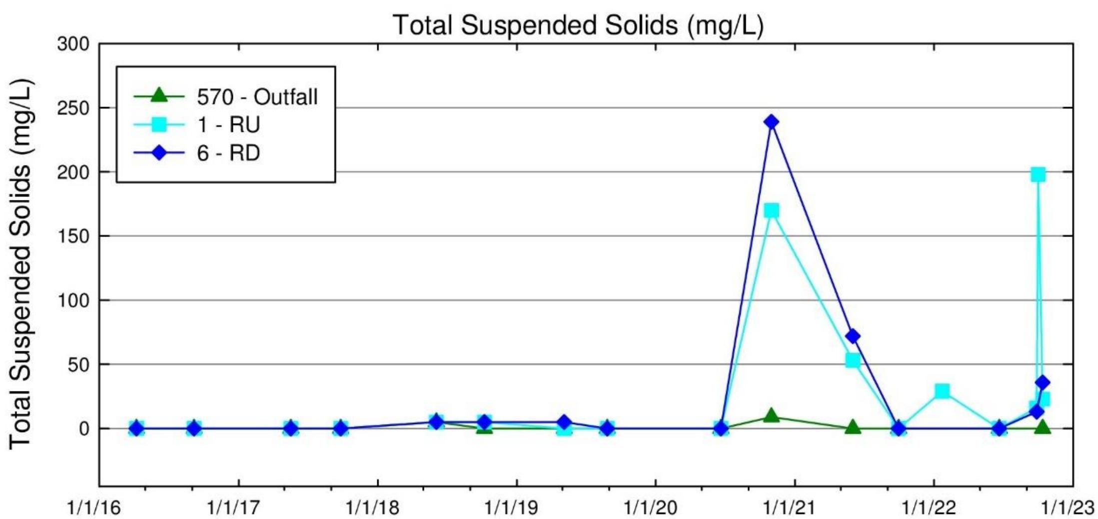




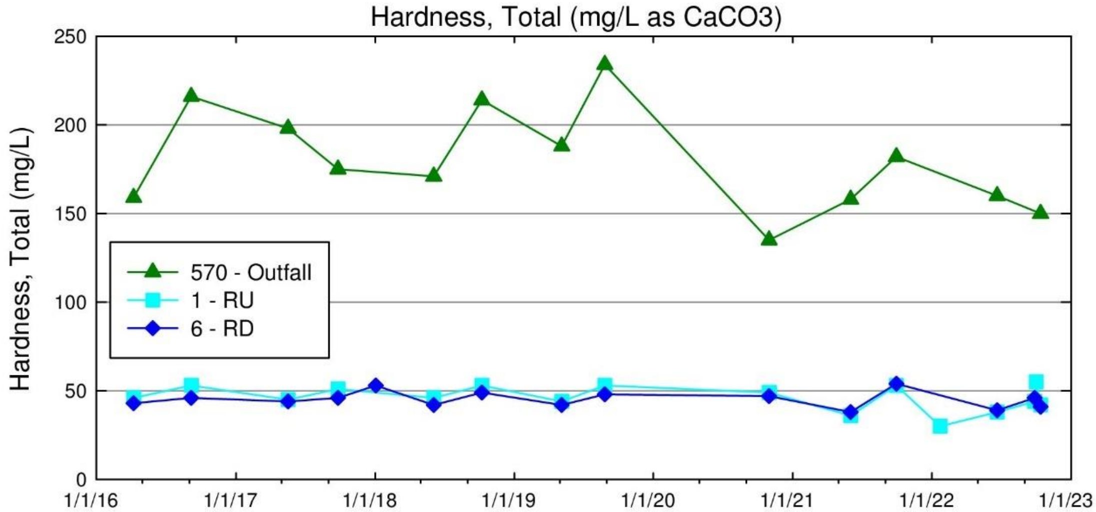
OUTFALL 008

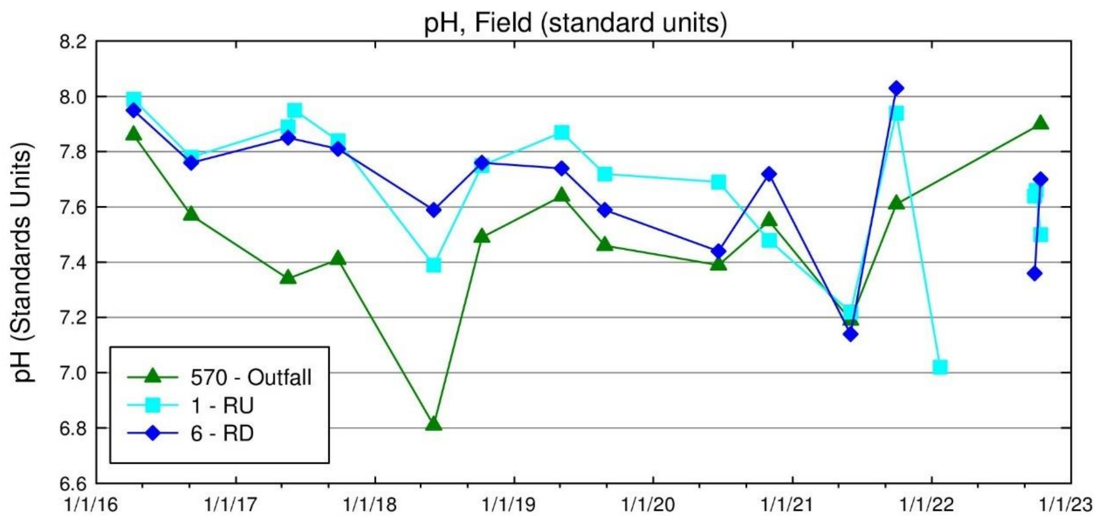

Lead, Total Recoverable (ug/L)
Lead, TR (ug/L)
570 - Outfall
1 - RU
6 - RD
0
2
4
6
8
10
12
14
16
18
20
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23


Zinc, Total Recoverable (ug/L)
Zinc, TR (ug/L)
570 - Outfall
1 - RU
6 - RD
0
20
40
60
80
100
120
140
160
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23

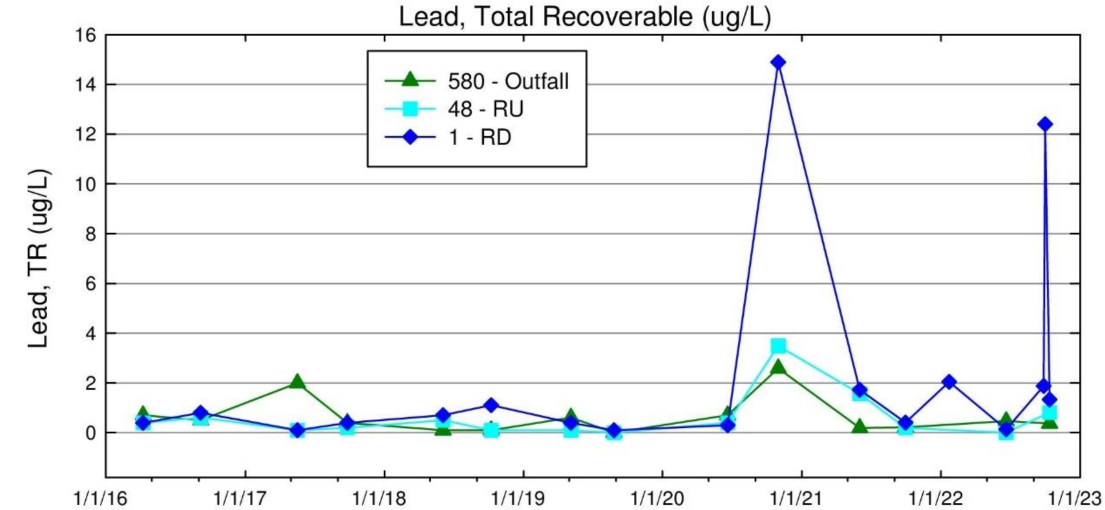

Total Suspended Solids (mg/L)
Total Suspended Solids (mg/L)
570 - Outfall
1 - RU
6 - RD
0
50
100
150
200
250
300
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23

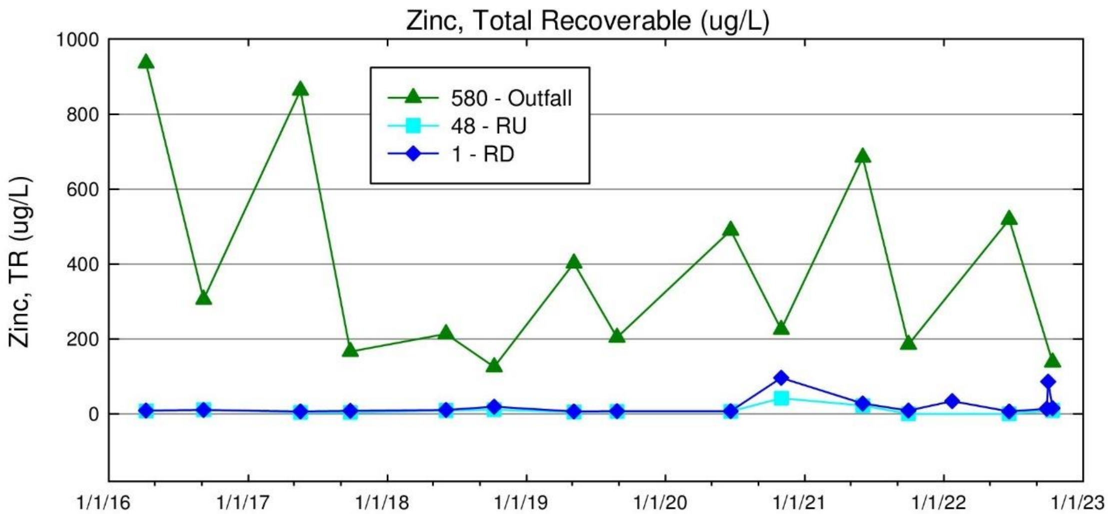
OUTFALL 008

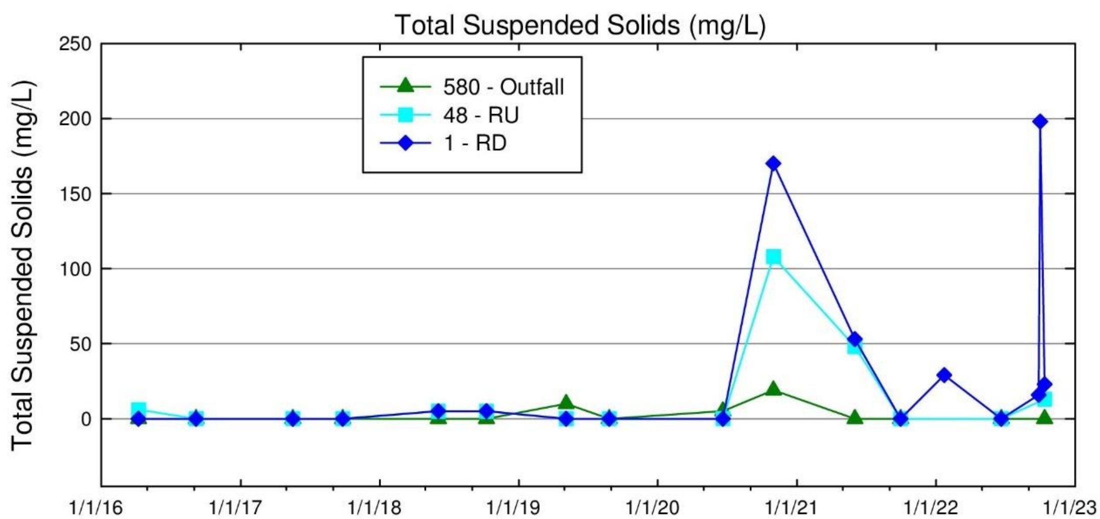

Hardness, Total (mg/L as CaCO3)
Hardness, Total (mg/L)
250
200
150
100
50
0
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23
570 - Outfall
1 - RU
6 - RD


pH, Field (standard units)
pH (Standards Units)
8.2
8.0
7.8
7.6
7.4
7.2
7.0
6.8
6.6
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23
570 - Outfall
1 - RU
6 - RD

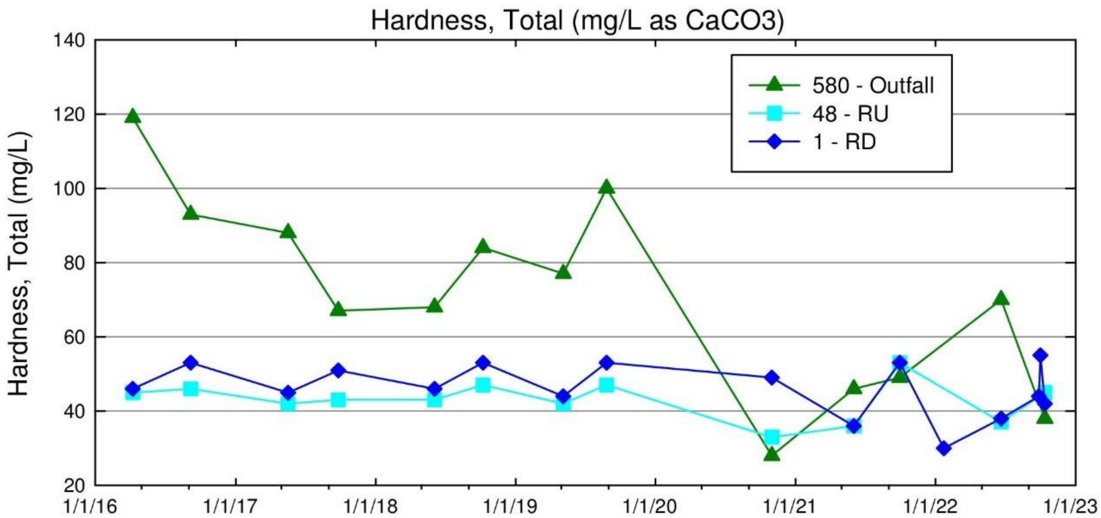
OUTFALL 009

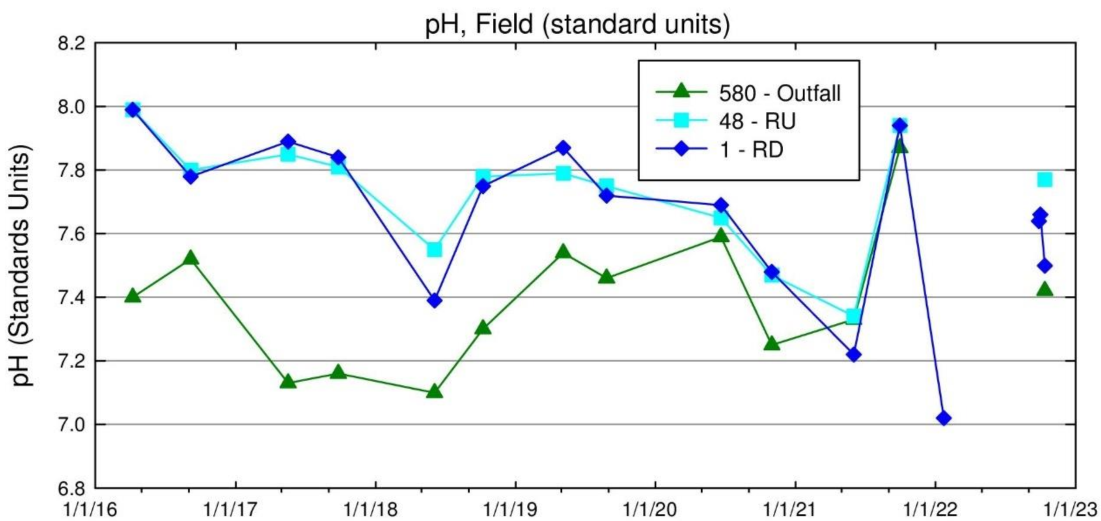

Lead, Total Recoverable (ug/L)
580 - Outfall
48 - RU
1 - RD
Lead, TR (ug/L)
16
14
12
10
8
6
4
2
0
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23


Zinc, Total Recoverable (ug/L)
580 - Outfall
48 - RU
1 - RD
Zinc, TR (ug/L)
1000
800
600
400
200
0
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23


Total Suspended Solids (mg/L)
580 - Outfall
48 - RU
1 - RD
Total Suspended Solids (mg/L)
250
200
150
100
50
0
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23

OUTFALL 009


Hardness, Total (mg/L as CaCO3)
Hardness, Total (mg/L)
580 - Outfall
48 - RU
1 - RD
140
120
100
80
60
40
20
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23


pH, Field (standard units)
pH (Standards Units)
580 - Outfall
48 - RU
1 - RD
8.2
8.0
7.8
7.6
7.4
7.2
7.0
6.8
1/1/16
1/1/17
1/1/18
1/1/19
1/1/20
1/1/21
1/1/22
1/1/23