

2016

Clyde Mine Discharge/Tenmile Creek Water Quality Final Report

November 01, 2016



pennsylvania
DEPARTMENT OF ENVIRONMENTAL
PROTECTION

**Commonwealth Of Pennsylvania
Bureau of Radiation Protection**

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Background

In follow-up to the Pennsylvania Department of Environmental Protection's (DEP) December 15, 2015, Tenmile Creek Sampling Summary Report (December 2015 Report), DEP's Bureau of Radiation Protection (BRP) and California District Mining Office staff performed additional water quality sampling at the Clyde Mine Treatment Facility (CMTF) and in Tenmile Creek in the vicinity of the CMTF, near Clarksville, Greene County.

The December 2015 Report provided the results of the initial sampling of water, sediment, aquatic vegetation, and fish collected at 12 locations on June 22 and 23, 2015, which were analyzed for both radiological and non-radiological constituents. The analysis did not indicate any elevated radiological levels within the sampled environmental media; the levels were consistent with expected naturally occurring background concentrations. Further, the analysis of the CMT sludge did not reveal any threat to the public's health and safety or the environment. Non-radiological results were also consistent with similar conditions associated with a flooded Pittsburgh seam underground coal mine in this area of Pennsylvania.

In the December 2015 Report the DEP stated that it would conduct additional sampling to establish a more robust data set. Following are the results of the additional sampling, which was conducted during three sampling events in 2016.

2016 Water Quality and Sludge Samples

Water quality and produced sludge samples were collected at the following five locations on January 20, April 19, and June 21, 2016:

1. CMTF – Raw water as it enters the CMTF from the mine pool;
2. CMTF – Treated water at the CMTF just before it is discharged to Tenmile Creek;
3. Above CMTF – Tenmile Creek approximately 75 yards upstream from the CMTF discharge location;
4. Downstream CMTF – Tenmile Creek immediately downstream of the discharge location;
and
5. CMTF – Sludge generated during the treatment process.

Stream flow recorded at the nearest United States Geological Service (USGS) stream gauge on South Fork Tenmile Creek located approximately 5 miles upstream of the sampling points indicated levels were below the historical monthly mean flow rates, but they were all within the historical high and low rates.

Laboratory Analyses

DEP's Bureau of Laboratories personnel conducted the radiological analyses using several analytical methods. All of these methods are approved by EPA for the determination of radium-226 and radium-228 in various media. These analytical methods are approved under the Code of Federal Regulations in Title 40, Chapter 1, Subchapter D, Parts 141.25 and 141.27¹. Water samples were analyzed using radiochemistry extraction methods. For radium-226 EPA method 903.1 was used, and for radium-228 the Brooks and Blanchard method was used. These methods were used for all four water samples and the CMTF sludge.

In addition, water samples were analyzed using EPA-approved methods for the same non-radiological parameters performed in June 2015. The Bureau of Laboratories staff tested for typical water quality parameters associated with coal mine drainage and the major cations and anions commonly found in groundwater in Pennsylvania.

Results

Radiological: The results of the radiological water sampling are compiled in Table 1. The radiological results from the three 2016 sampling events closely matched the results from June 2015. All of the water samples were indicative of normal environmental levels for these naturally occurring radioisotopes, and none of the results exceeded the EPA drinking water limit of 5 picocuries per liter (pCi/L) for combined radium-226 and radium-228. The sludge sample results were all similar to the June 2015 result for radium-226 and less than June 2015 for radium-228. A comparison of the radiological results is presented in Table 1.

Table 1

Clyde Mine Treatment Facility Radium Activity (pCi/L) Comparison of June 2015, January 2016, April 2016, and June 2016 Results								
Date	June 2015		January 2016		April 2016		June 2016	
Sampling Location	Ra-226	Ra-228	Ra-226	Ra-228	Ra-226	Ra-228	Ra-226	Ra-228
Above CMTF	0.082	<MDA	0.093	<MDA	0.08	<MDA	0.172	<MDA
CMTF—Raw Water	0.169	<MDA	0.131	<MDA	0.132	1.70	0.11	1.98
CMTF—Treated Water	0.155	<MDA	0.052	<MDA	0.047	<MDA	0.098	<MDA
Downstream CMTF	0.112	<MDA	<MDA	<MDA	0.061	<MDA	0.091	<MDA
CMTF—Sludge from Pit	1.31	19.5	1.92	15.8	1.59	7.62	1.49	9.29

¹ U.S. Government Publishing Office, Electronic Code of Federal Regulations, http://www.ecfr.gov/cgi-bin/text-idx?SID=adc28002836a6c9b208da4bc63206116&mc=true&tpl=/ecfrbrowse/Title40/40cfr141_main_02.tpl (December 8, 2015)

Non-Radiological: The results of the non-radiological water sampling are compiled in Table 2. After reviewing the non-radiological parameters of the raw and treated mine discharge samples, DEP's Bureau of Mining Programs personnel concluded that the analysis results from 2016 are comparable to those from June 2015 and within a normal range of fluctuation for these parameters that would be expected when sampling occurs at various times throughout the year.

Table 2

Clyde Mine Treatment Facility Non-Radiological Comparison of June 2015, January 2016, April 2016, and June 2016 Results																
Date	June 2015				January 2016				April 2016				June 2016			
Sampling Location	Above CMTF	CMTF-Raw	CMTF-Treated	Downstream CMTF	Above CMTF	CMTF-Raw	CMTF-Treated	Downstream CMTF	Above CMTF	CMTF-Raw	CMTF-Treated	Downstream CMTF	Above CMTF	CMTF-Raw	CMTF-Treated	Downstream CMTF
Lab pH (S.U.)	8.3	6.6	6.6	7.9	8.1	6.7	6.5	7.4	8.3	6.8	6.8	7.9	8.3	6.6	6.6	8.1
Specific Conductivity (µS/cm)	375	8570	8420	841	462	8550	8400	1505	470	8740	8660	1167	488	8780	8370	911
Alkalinity	129.4	548.0	290.0	133.2	141.2	560.0	321.0	158.2	150.0	551.2	356.0	163.6	165.0	613.4	376.0	172.6
Total Dissolved Solids	240	6992	6850	734	284	7200	7034	954	270	7386	7012	750	304	7376	7266	606
Total Suspended Solids	36	72	<5	26	<5	58	22	6	<5	106	22	6	16	54	22	10
Sulfate	38.84	3672.00	3714.00	220.00	55.52	3740.00	3708.00	468.00	58.05	3803.00	3720.00	322.00	61.62	3768.00	3630.00	219.00
Chloride	15.18	656.00	698.00	48.35	28.37	726.00	742.00	106.00	25.98	830.00	812.00	83.90	23.85	851.00	812.00	58.20
Bromide	0.037	4.457	4.482	0.235	0.053	4.986	5.298	0.624	0.056	3.815	5.086	0.416	0.290	<0.025	0.036	0.043
Ammonia, Total as Nitrogen	<0.02	2.240	2.120	0.130	<0.02	2.240	2.180	0.250	0.020	2.240	2.220	0.170	0.030	2.300	2.150	0.120
Total Nitrate/Nitrite Nitrogen	0.500	<0.05	<0.05	0.480	0.710	<0.05	<0.05	0.650	<0.05	<0.05	<0.05	<0.05	0.450	<0.05	<0.05	0.450
Total Phosphorous as P	0.070	0.042	<0.010	0.074	0.026	0.047	0.012	0.033	0.015	0.043	<0.01	0.015	0.051	0.048	0.010	0.048
Calcium	51.2	279.0	275.0	60.8	57.2	287.0	287.0	81.2	61.3	308.0	317.0	73.5	63.9	269.6	263.5	73.6
Magnesium	6.744	99.300	99.100	12.500	9.460	104.000	108.000	20.200	10.800	116.000	123.000	17.500	11.800	103.200	103.000	16.500
Sodium	15.7	1760.0	1760.0	107.0	26.9	1770.0	1740.0	236.0	30.2	2000.0	2040.0	169.0	25.9	1970.0	1980.0	118.0
Iron	1.043	164.000	2.397	1.143	0.246	170.000	1.464	0.595	0.277	165.000	1.372	0.317	0.530	137.400	1.666	0.522
Manganese	0.070	2.689	2.444	0.195	0.038	2.690	2.511	0.369	0.040	2.529	2.287	0.192	0.066	2.337	2.258	0.160
Aluminum	0.530	<0.20	<0.20	0.526	<0.20	<0.20	<0.20	<0.20	0.250	<0.20	<0.2	<0.2	0.477	3.270	<0.2	0.399
Arsenic	<0.003	0.018	<0.015	<0.003	<0.003	0.016	0.006	<0.003	<0.003	0.011	<0.003	<0.003	<0.003	0.013	0.003	<0.003
Barium	0.063	0.012	<0.010	0.059	0.059	0.012	<0.010	0.052	0.067	<0.01	<0.01	0.058	0.075	0.011	<0.01	0.070
Boron	<0.200	0.288	0.304	<0.200	<0.200	0.342	0.324	<0.200	<0.2	<0.2	0.316	<0.200	<0.2	0.223	0.310	<0.200
Lithium	<0.025	0.147	0.140	<0.025	<0.025	0.107	0.103	<0.025	<0.025	<0.025	0.101	<0.025	<0.025	0.116	0.115	<0.025
Molybdenum	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.070	<0.07	<0.070	<0.07	<0.070	<0.07	<0.07	<0.07
Selenium	<0.0070	<0.0350	<0.0350	<0.0070	<0.0070	0.012	0.011	<0.0070	<0.007	<0.007	0.008	<0.007	<0.007	0.011	0.010	<0.007
Strontium	0.181	6.656	5.991	0.485	0.246	6.491	6.108	0.948	0.270	6.898	6.152	0.688	0.308	6.382	6.124	0.570
Uranium	<0.002	<0.002	<0.002	<0.002	0.0003	0.0014	0.0005	0.0003	<0.002	<0.002	<0.002	<0.002	0.0006	0.0012	0.0003	0.0006
Zinc	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	0.012
Hardness, Calculated	156	1107	1096	203	182	1146	1162	286	198	1248	1299	256	208	1099	1083	252
Osmotic Pressure (MOS/KG)	3	133	126	11	6	141	135	20	6	144	137	16	6	142	136	12
Biochemical Oxygen Demand - 5 Day	0.8	9.6	0.8	0.9	1.2	4.3	1.0	1.6	1.5	5.6	0.6	1.5	<0.20	12.8	<0.20	<0.20

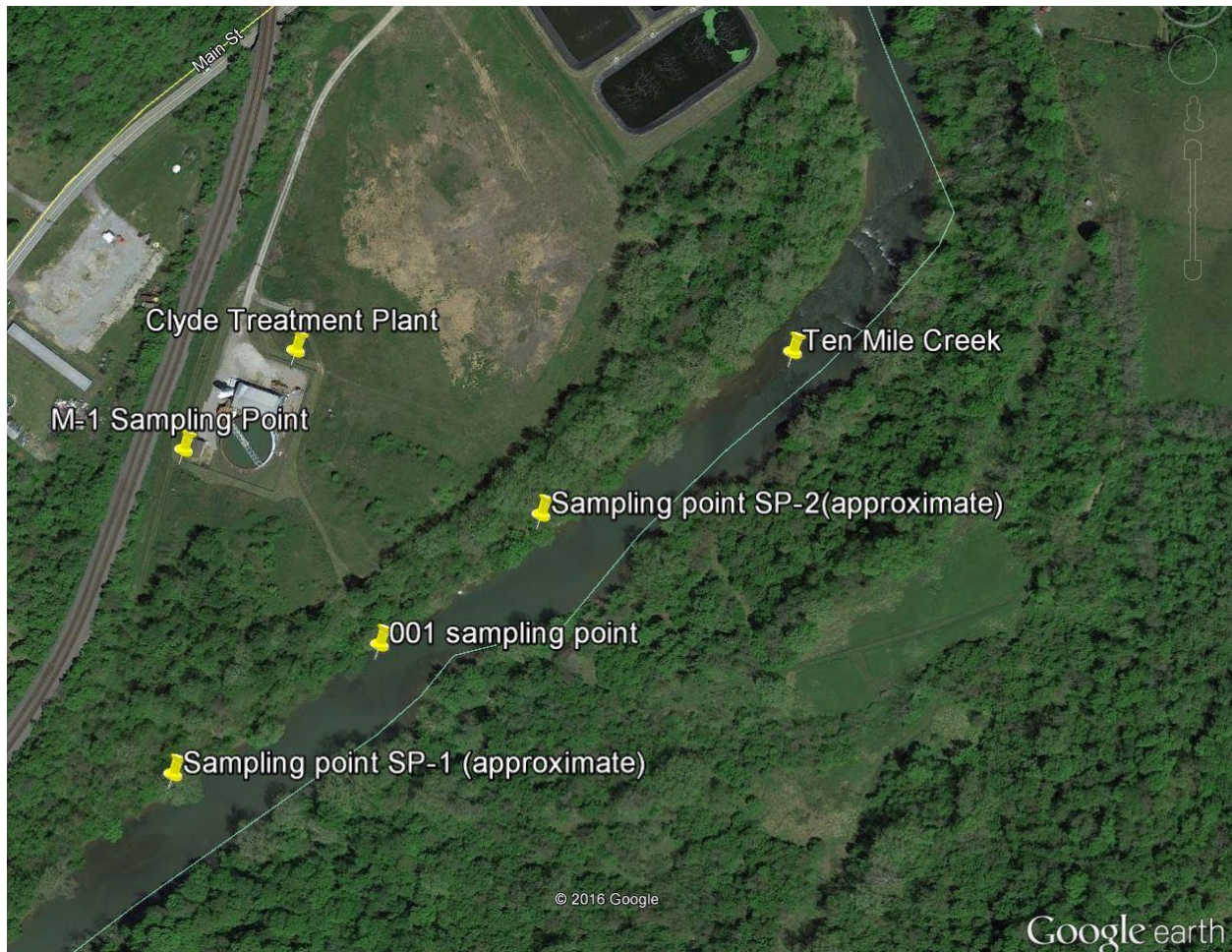
Note: Units in milligrams per liter (mg/L) unless otherwise noted.

Future Monitoring

DEP's New Stanton District Mining Office conducts monthly inspections at the CMTF, which includes water quality monitoring when the treatment plant is operating. In addition to these monthly facility inspections, aerial inspections are conducted on a quarterly basis to visually monitor Tenmile Creek in the vicinity of the CMTF.

The water quality monitoring program consists of monitoring points at the CMTF and at nearby points both above and below the discharge points. Figure 1 shows an aerial photo with the approximate locations of the sampling areas.

Figure 1



Sampling Locations and Frequencies:

Sampling Point-1 (SP-1): This location is a short distance above the discharge point from CMTF into Tenmile Creek. This location is approximately the same as the “Above CMTF” location of the additional sampling described in this report and is sampled quarterly.

Sampling Point-2 (SP-2): This location is a short distance below the discharge point from CMTF into Tenmile Creek. This location is approximately the same as the “Below CMTF” location of the additional sampling described in this report and is sampled quarterly.

001: This location for the routine sampling is at the discharge point from CMTF into Tenmile Creek. For the non-routine sampling this is the where the “CMTF—Treated Water” enters Tenmile Creek. This location is sampled monthly.

M-1: This sample is the same as the “CMTF—Raw Water.” This is the raw and untreated water from the mine pool. This sample is collected once or twice per year depending upon the operations of the CMTF.

Sampling Parameters:

All four routine locations are monitored for the following water quality parameters: pH, total alkalinity, total acidity, total iron, total manganese, total aluminum, total sulfate and total suspended solids.

Additionally, 001 at the outfall from the treatment plant is monitored for total dissolved solids. The amount of flow (in gallons per minute) discharging from the treatment plant is also monitored during water sample collection.

Conclusions

Based on the results acquired during the sampling events in 2015 and 2016, DEP will discontinue non-routine sampling of the CMTF and Tenmile Creek. However, routine monitoring and inspections will continue. The sampling events conducted in 2016 were designed to provide additional data regarding any impacts of the CMTF on Tenmile Creek. The laboratory analysis from 2016 did not show any meaningful changes from the June 2015 samples. A review of the past routine monitoring of non-radiological parameters shows results similar to those obtained in the additional sampling events in 2015 and 2016. The radiological samples are within expected naturally occurring background values, and the non-radiological results are also consistent with similar conditions associated with a flooded Pittsburgh seam underground coal mine in this area of Pennsylvania.