The Headwaters of Fourmile Run Assessment of Unsuitability for Mining

Submitted to:
Mountain Watershed Association

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Burgess Environmental Ltd.
24 Strathlorne Crescent SW
Calgary, Alberta, T3H 1M8
Telephone: (403) 466 9482
Email: burgessenv@shaw.ca

Author:
Gordon J. Johnson, M.Sc., P.Eng. (AB)

Burgess Environmental

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EXECUTIVE SUMMARY

This assessment considers whether the Headwaters of Fourmile Run should be considered Unsuitable for Mining (UFM) in accordance with Pennsylvania Laws. This assessment describes the following negative hydrogeologic and hydrologic impacts that would be caused by above ground coal mines, and/or the surface portion of an underground mine:

- degradation of water quality and quantity in streams affected by mining
- degradation of the quality and quantity of groundwater resources
- acid mine drainage (AMD)

These negative impacts are predicted with a high level of confidence because they have occurred in mined areas within, and adjacent to, the Headwaters of Fourmile Run. They will occur over a very long period of time, essentially indefinitely, and it is not feasible to reverse or effectively mitigate most of these negative impacts.

The Study Area, which is also referred to as the Headwaters of Fourmile Run in this report, is defined by the watershed boundaries north and west of Donegal, Pennsylvania, as shown in **Figure 1-1 and 1-2**. Most of the Study Area is located within the headwaters of the Fourmile Run watershed; however, the west edge of the Study Area is also located within the headwaters of the Jacobs Creek watershed. The Headwaters of Fourmile Run also abuts LCT Energy's (LCT) existing and proposed mine operations in the area, and contains LCT's proposed Rustic Ridge II mine development.

This assessment is based on review of the following information sources:

- publicly available information
- information provided by MWA, including its consultants
- a visit to the Study Area, including inspection of the proposed Study Area and nearby areas that have been affected by past mining operations
- information made available by LCT Energy in their applications for the proposed Rustic Ridge Mine and proposed expansions

The basis of this assessment is potential underground mining of the Lower Kittanning coal seam, with an above-ground access constructed in the west portion of the Study Area, where the coal seam is closest to the ground surface. The associated assessment of impacts generally conforms with the United Nations (2004) Environmental Impact Assessment (EIA) best practices, whereby the impacts are identified, and the significance of those impacts is determined in terms of

likelihood, magnitude, direction, duration, and whether those impacts could be reversed or mitigated.

This assessment concluded the following:

- AMD is likely to occur in seepages out of an abandoned and/or flooded mine
- flow loss would occur in the upper tributaries to Fourmile Run, and would be transferred to the upper tributaries to Jacobs Creek
- the quality of water would be adversely affected in the upper reaches of Jacobs Creek and Fourmile Run
- the quantity of groundwater would be reduced in the freshwater aquifers overlying the Lower Kittanning coal seam

These impacts are relevant to this assessment of unsuitability for mining, as required by Pennsylvania regulations, because they would result from activities occurring in the open pit mine and/or the above-ground portion of an underground mine.

Table E.1 summarizes the significance of the impacts and the opportunities to mitigate or reverse those impacts. Review of **Table E.1** indicates that there is a very high likelihood that these potential impacts would occur. The magnitude of most of the impacts is moderate to large, they are essentially permanent, and measures to mitigate or reverse these impacts, are either impractical or not feasible.

Table E.1

Summary of Impact Assessment

The Headwaters of Fourmile Run Impact Assessment Summary				
Potential Impact	**Likelihood**	**Magnitude**	**Duration**	**Mitigation, Reversibility**
Loss of Water in Fourmile Run	Definite	Moderate	Indefinite	None
Increase of Water in Jacobs Creek Trib.	Definite	High	Temporary	Transfer water to Fourmile
Water Quality Degradation in Jacobs Creek	Definite	Large – Mod.	Indefinite	Treatment during operation
Water Quality Degradation in Fourmile Run	Definite	Small	Indefinite	None
Reduced Groundwater Quantity	Definite	Moderate	Indefinite	None
Acid Mine Drainage	Likely	Large	Indefinite	Possible

These predicted impacts are also consistent with those that have been observed as a result of mining of the Kittanning coal seam in the vicinity of the Study Area, and particularly in the Indian Creek watershed. They are also consistent with the impacts predicted by PADEP in their technical evaluations of the nearby Indian Creek UFM Petition (PADER, 1995) and Rand Am mine application (Pennsylvania, 1997).

After mining, the degradation of water quality in streams occurs over a very long period of time, essentially indefinitely. Even with the implementation of water treatment, pollution in the form of high concentrations of manganese, iron, aluminum, and sulfate are likely to occur, also indefinitely, as is evidenced by the multitude of impaired streams in the vicinity of the Headwaters of Fourmile Creek. For example, the total daily maximum loading (TMDL) of iron and manganese is exceeded in much of the Loyalhanna Creek watershed, which includes Fourmile Run, and PADEP and the MWA continue to struggle to capture and treat impacted water from historical mines in the Indian Creek watershed, which is located immediately south of the Study Area.

The quality and seepage path of mine-affected water following closure is difficult to predict. The preferential flow path created by the mine could ultimately drain through the labyrinth of operating and closed underground coal mines to the south of the Study area, which would ultimately increase AMD in the former Melcroft mines that have impacted Indian Creek for over a century. Alternatively, it could result in discharge of mine-affected water and/or AMD to Fourmile Creek or Jacobs Creek.

The information reviewed as part of this assessment indicates that the Headwaters of Fourmile Run would be susceptible to the same risks and impacts. It is understood that this report may be used to support a Petition to designate the Headwaters of Fourmile Run Unsuitable for Mining that may be submitted by MWA.

1 INTRODUCTION

1.1 Background

Burgess Environmental Ltd. (Burgess) has been retained by the Mountain Watershed Association (MWA) to assist in evaluating whether the area near Donegal and north of the Pennsylvania Turn Pike (**Figures 1-1** and **1-2**) should be considered Unsuitable for Mining (UFM), in accordance with Pennsylvania State Laws. This assessment considers whether the Headwaters of Fourmile Run, should be considered Unsuitable for Mining, in accordance with Pennsylvania Laws. The Study Area, which is also referred to as the Headwaters of Fourmile Run in this report, is defined by the watershed boundaries north and west of Donegal, Pennsylvania, as shown in **Figure 1-1 and 1-2**. Most of the Study Area is located within the Fourmile Run watershed; however, the west edge of the Study Area is also located within the watershed of Jacobs Creek. The Headwaters of Fourmile Run also abuts LCT Energy's (LCT) existing and proposed mine operations in the area, and contains LCT's proposed Rustic Ridge II mine development.

Consistent with Pennsylvania law (see **Section 1.3**), this assessment considers the impacts to surface water and groundwater that would result from above ground coal mines, and/or the surface portion of an underground mine. It is understood that this report may be used to support a UFM Petition for the Headwaters of Fourmile Run that may be filed by MWA.

The Act 54 assessment of the impacts of coal mining in Pennsylvania comments on the need to balance the economic benefits realized by coal mining with the adverse impacts that it causes (University of Pittsburgh, 2014), which states, "*it is our difficult task as citizens of the Commonwealth to elect lawmakers that will determine the mix of laws and policies that provide energy, jobs, and economic well-being while taking into account the need to maintain healthy lives and a healthy environment for our children and the generations to come*."

1.2 Purpose and Scope

The objectives of this assessment are to evaluate the activities and impacts associated with the surface mining and/or the surface portion of underground mining in the Headwaters of Fourmile Run, and to determine whether this area is unsuitable for mining, in the context of the following:

- acid mine drainage (AMD)
- impact to surface waters courses, and specifically to the water quality and quantity in streams that may be affected by mining
- impacts to the groundwater resources

The questions addressed by this report are:

- What are the adverse impacts to surface water and groundwater that can reasonably be anticipated, should the Headwaters of Fourmile Run be developed for mining?
- Are the measures that can be implemented practically by mine operators expected to mitigate these adverse impacts?
- What are the expected durations of these adverse effects, having regard to the mitigating measures that are economically and technologically feasible to implement?

1.3 Basis of Assessment

The Headwaters of Fourmile Run is located within a region of Pennsylvania that has been subjected to extensive mining in the past, is current being mined, and/or is being considered for future mining. As such, much of the technical information included in this assessment has been obtained from the monitoring of former mines, the application information submitted for current and proposed mines, and PADEP's review of UFM petitions and mine applications that have been filed and evaluated for nearby areas. This is done to maximize the basis of information for this assessment, while respecting the premise of this assessment, which is that it applies to the Headwaters of Fourmile Run, and not a specific permit application or permit application boundary.

This assessment is based on the following:

- review of publicly available information
- review of information provided by MWA, including its consultants
- a visit to the Study Area, including inspection of the proposed Study Area and nearby areas that have been affected by past mining operations
- review of information made available by LCT (2021) Energy in their applications for the proposed Rustic Ridge 1 mine expansion to PADEP
- review of information made available by LCT (2023) Energy in their pre-application for the proposed Rustic Ridge 2 mine expansion to PADEP

Documents that provide the technical basis for this Assessment are also listed in the References section of this report.

Legend

Study Area

Headwaters of Fourmile Run

0 1 2 3 mi

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Assessment of Suitability for Mining
Donegal Township, Pennsylvania

Headwaters of Fourmile Run Location Map

BURGESS ENVIRONMENTAL

Map Scale: 1 : 30,000

PROJECT NUMBER:	ENVI-07
DATE:	2023-10-27
CREATED BY:	EJ
REV:	GJ

FIGURE NO.:

1-1

Legend

Study Area

Headwaters of Fourmile Run

StreamsCH93DesignatedUse2023_07

WBDHU12

Designated Use Streams of Interest

Fourmile Run

Jacobs Creek

7

0 1 2 3 mi

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MAP SOURCE: ESRI World Imagery

MAP PROJECTION: EPSG: 4269 - NAD83

PAPER SIZE ASSOCIATED WITH MAP SCALE: A3

Assessment of Suitability for Mining
Donegal Township, Pennsylvania

Plan View of Headwaters of Fourmile Run

BURGESS ENVIRONMENTAL

Map Scale: 1 : 30,000

PROJECT NUMBER:	ENVI-07
DATE:	2023-10-27
CREATED BY:	EJ
REV:	GJ

FIGURE NO.:

1-2

2 SITE DESCRIPTION

2.1 General

The Headwaters of Fourmile Run is located northwest of Donegal Pennsylvania, northeast of the Pennsylvania Turnpike, and east of Highway 2004 (**Figure 1-2**). The approximate 17 square mile surface area currently consists of a mixture of agricultural and natural forest lands. Over 90% of the Study Area is located in the watershed of Fourmile Run, and groundwater is an important source of water for the rural residences and farms. There are a number of rural residences within and surrounding the Study Area, but generally the population density is low. The Headwaters of Fourmile Run is defined by the watersheds of tributaries to Fourmile Run and Jacobs Creek.

2.2 Physiography and Drainage

General

The Headwaters of Fourmile Run is located in southeast Westmoreland County, within an area of rolling hills and rural development. The uplands within this area are primarily forest covered and undeveloped. Agricultural land use and rural residential developments are primarily located in the lowlands and within stream valleys, and on gently sloping hillsides.

Surface elevations vary between approximately 2,000 ft asl along the ridges, to approximately 1,700 ft asl within numerous surface drainages within and surrounding the Headwaters of Fourmile Run. Within the south and west portions of the area, water drains to the south and west, primarily to Tributary #37998, which in turn flows into Jacobs Creek, or directly into Jacobs Creek (LCT, 2023). Within the north and eastern portions of the area, water drains primarily to the northeast, and unnamed tributaries that flow into Fourmile Run, which ultimately confluences into Loyalhanna Creek. Based on a review of the surface topography of the Headwaters of Fourmile Run, more than 90% of the area is located in the Fourmile Run watershed, and less than 10% is located in the Jacobs Creek watershed (**Figure 2-1**).

Water quality information for Jacobs Creek and Fourmile Run were obtained from the following data sources and are summarized in the underlying sub-sections:

- Module 8.2 of the Rustic Ridge II Pre-application (**Figure 2-2**)
- the Pennsylvania (2023a) eMapPA on-line database
- data gathered and/or compiled by MWA
- US EPA (2023) on-line data
- US EPA (2010) assessment of the Kiskiminetas and Conemaugh watersheds to determine TMDLs for streams impaired by AMD

Relevant data extracted from these references are presented in **Appendix A**.

Jacobs Creek

Surface water monitoring by LCT (2023) for the Jacobs Creek watershed includes Tributary 37997 and Jacobs Creek upstream of its confluence with Tributary 37997 (**Figure 2-2**), and were collected in 2021 (**Appendix A**). AMD is emanating from at least one former mine in the Study Area that drains into Jacobs Creek. Review of these data indicates that flows at the Tributary 37997 and Jacobs Creek monitoring points varied between approximately 300 gpm to 1,000 gpm, and 800 gpm to 1,600 gpm, respectively, at the time of monitoring. Review of the water quality information indicates the following:

- pH is in the neutral range to slightly alkaline
- alkalinity varies from approximately 30 mg/L to 60 mg/L, with a median of approximately 45 mg/L
- concentrations of total iron were consistently below 0.4 mg/L and 1 mg/L in Tributary 37997 and Jacobs Creek, respectively, with median concentrations of 0.2 mg/L and 0.6 mg/L in Tributary 37997 and Jacobs Creek, respectively
- concentrations of total manganese were approximately 0.2 mg/L and 0.1 mg/l in Tributary 37997 and Jacobs Creek, respectively

The largest mine seepage into Jacobs Creek that was monitored by LCT is the Hoyman #1 Mine Discharge (**Appendix A**), following treatment to address AMD. Review of the monitoring data indicates seepage flows varied from 25 gpm to 225 gpm, the pH is near neutral (6.23 to 6.67), and concentrations of total iron (29 mg/L) and total manganese (7.5 mg/L) are high, and are consistent with AMD. The treated Hoyman #1 Mine Discharge flows into Jacobs Creek downstream of the two monitoring points described above.

Records accessed using the PADEP (2023a) eMapPA were also used to obtain water quality records for the upper tributaries to Jacobs Creek, to the west and south of the former Rodney Mine. Although the purpose and precise locations of the water sampling points is not clear, the data provide some additional insight into the chemistry of the water feeding the headwaters of Jacobs Creek. A summary of the extracted data is provided in **Appendix A**. Review of these data indicates the following:

- pH is in the neutral range to slightly alkaline
- alkalinity varies from approximately 14 mg/L to 110 mg/L, with a median of approximately 30 mg/L
- concentrations of total iron were typically below 1 mg/L, but were measured as high as 7 mg/L

- concentrations of total manganese were consistently below 0.3 mg/L, with a median concentration between 0.1 mg/L and 0.2 mg/L

The sampled water shows impacts from past mining operations in the headwaters of the Jacobs Creek watershed. Significant impact associated with AMD is evident in the treated Hoyman #1 Mine Discharge.

Surface water quality further downstream in Jacobs Creek has been established by sampling and testing where Jacobs Creek flows past Laurelville, which is located approximately 3 miles downstream of the Headwaters of Fourmile Run. Review of the results of the water quality testing for samples collected in 2022 and 2023 (**Appendix A**) indicates the following:

- pH is in the neutral range, varying from to 6.62 to 7.27
- water varies from fresh to slightly brackish, with total dissolved solids (TDS) concentrations varying from 309 mg/L to 567 mg/L
- alkalinity is high, varying from 420 mg/L to 1,050 mg/L, which indicates that Jacobs Creek has high natural buffering capacity
- iron and manganese concentrations are typically below 0.1 mg/L (higher measurements were made for one sample collected February 3, 2023)

The relatively high TDS and alkalinity measurements suggest that a large proportion of the water in Jacobs Creek at Laurelville is made up of groundwater discharging to Jacobs Creek.

Fourmile Run

Surface water monitoring by LCT (2023) for the Fourmile Run watershed included Tributaries 43605, 43587, 43597, and 43599 (**Figure 2-2**), and the data were collected in 2021 (**Appendix A**). Review of these data indicate that flows in Tributaries 43605, 43587, 43597, and 43599 varied between approximately 500 gpm to 1,100 gpm, 600 gpm to 1,800 gpm, 200 gpm to 1,200 gpm, and 50 gpm to 190 gpm, respectively, at the times of monitoring. Review of the water quality information indicates the following:

- pH is in the neutral range to slightly alkaline
- alkalinity varies from approximately 20 mg/L to 120 mg/L, with a median of approximately 50 mg/L
- concentrations of total iron and manganese indicate impacts to Tributaries 43605 and 43597 by mine seepage, as is evidenced by total iron concentrations as high as 4.4 mg/L and total manganese concentrations as high as 6.9 mg/L

Otherwise, mine-related impacts to water quality at these sampling points were relatively small. The sampling point at Tributary 43587 to Fourmile Run showed no signs of mine-related impacts, as well as the highest measured alkalinity. The samples from the other sampling points had more

variable concentrations of total iron and manganese, which may be indicative of impacts associated with former mines in the area.

LCT also monitored three low volume seepages from the Vasinko Mine (**Appendix A**), which drain into Tributary 43587. Review of the monitoring data indicates seepage flows varied below 5 gpm, near neutral pH (6.5 to 7.8), and high concentrations of total iron (up to 30+ mg/L) and total manganese (up to 2.6 mg/L).

Water quality data for the upper tributaries of Fourmile Run were also obtained from eMapPA Pennsylvania (2023). The sample points appear to have been located to the east and downstream of the former Rodney East mine. Although the purpose and precise locations of the water sampling points is not clear, the data provide some insight into the chemistry of the headwaters feeding Fourmile Run.

- pH is in the neutral range to slightly alkaline
- alkalinity varies over a significant range, and was measured as low as 8.2 mg/L
- concentrations of total iron vary between <0.3 mg/L and 3.1 mg/L, with the median value near the detection limit of 0.3 mg/L
- concentrations of total manganese were measured as high as 0.3 mg/L, but were typically below the detection limit of 0.05 mg/L

The water quality data indicate relatively small impacts from past mining operations and that Fourmile Run has more limited ability to neutralize acidity than Jacobs Creek.

2.3 Geology

Understanding the geology and hydrogeology of the Study Area is critical to understanding how mining can impact surface water and groundwater quality and quantity.

A generalize stratigraphic cross-section of the bedrock geology of the area is illustrated in **Figure 2-3**. The majority of the Headwaters of Fourmile Run is underlain by the Conemaugh Group, which consists of alternating beds of limestone, shale, and sandstone, with interbedded thin coal seams, and may be divided into the Casselman and Glenshaw Formations (USGS, 2023). The maximum thickness of the Conemaugh Group is approximately 300 feet, and is most prevalent in the uplands and eastern portions of the Study Area. The Conemaugh Group can be thin, and potentially absent, within the valleys along the southern and western boundaries of the Headwaters of Fourmile Run.

The Conemaugh Group is underlain by the Allegheny Group, which includes the Freeport, Kittanning, Vanport, and Clarion Formations. The Allegheny Group includes economically

significant coals in the upper Pennsylvanian sequence (Schultz, et al., 1999). The formation consists of sequences of coal, shale, limestone, sandstone, and clay. It contains six major coal zones, which, in stratigraphic order, are:

- Upper Freeport Coal
- Lower Freeport Coal
- Upper Kittanning Coal
- Middle Kittanning Coal
- Lower Kittanning Coal
- Brookville Coal

The Lower Kittanning coal seam is located approximately 200 feet below the top of the Allegheny Group, and is considered to be the most economically viable coal deposit in The Headwaters of Fourmile Run. The Lower Kittanning coal seam in the Headwaters of Fourmile Run, as it is currently referred to, is the same as the Middle Kittanning coal seam that is referred to in geological publications (Shaulis, 1985; Skema, 1988), and was extensively mined in the Indian Creek watershed further to the south.

2.4 Hydrogeology

General

Groundwater is found and used in the permeable, alluvium zones of larger water courses, and the coarser grained and fractured zones of the upper bedrock units within the Conemaugh and Allegheny Groups. Groundwater is recharged in the uplands and discharges to water courses in the lowlands. Groundwater provides much of the water in ephemeral streams during dry periods, particularly in the upper watersheds, as is the case in the proposed Rustic Ridge II mine area. Groundwater gradients are a subdued reflection of surface topography.

Groundwater above the Lower Kittanning coal seam is typically fresh and is generally potable, with occasionally elevated concentrations of iron and manganese, and potentially sulfate.

Alluvial Aquifers

Alluvium is generally permeable and where saturated will yield moderate to large quantities of water. Permeabilities and yield may also vary over short distances, depending on the interbedding of fine and coarse grained layers. There are no mapped, major alluvium deposits within the Headwaters of Fourmile Run, although minor deposits and aquifers may be present within the floodplains of Jacobs Creek and Fourmile Run, and where unnamed tributaries confluence with Jacobs Creek and Fourmile Run.

Water obtained from alluvial aquifers can be high in iron, manganese and total dissolved solids (TDS) (PADER, 1973).

Conemaugh Group

The highest yielding zones within the Conemaugh Group are the sandstone units. Well yields depend on the local permeability of the aquifer and whether or not the sandstones are drained. Groundwater flows within the pore spaces and the fractures of the sandstone. In the shale and limestone units, groundwater generally occupies the bedding and joint planes, particularly near the axes of folds.

Groundwater quality in the Conemaugh Group can be highly variable, with TDS varying from below 100 to over 700 mg/L. Dissolved iron concentrations can vary from less than 0.1 mg/L to over 20 mg/L (PADER, 1973).

Allegheny Group

Groundwater moves through fractures, joints, and pore spaces in the Allegheny Group. In the shale units, groundwater is contained in the joints and bedding plane fractures. The highest yielding units are the sandstone beds that are lenticular and continuous. Yields can vary considerably over short distances.

Based on limited data, groundwater in the Alleghany Group was determined to be high in hardness, TDS, chloride, and dissolved iron (PADER, 1973).

Groundwater Levels in the Headwaters of Fourmile Run

Generalized groundwater levels within the Headwaters of Fourmile Run are presented in two ways, as follows:

- **Figure 2-3** illustrates a schematic section of groundwater levels across a range of surface elevations, which are correlated approximately to the lithologic section. It shows a cross-section view of the groundwater surface elevations measured in piezometers included in the Module 8 pre-application materials for Rustic Ridge II (LCT, 2023, Exhibit 6.2), as well as the generalized well completion details. Review of **Figure 2-3** indicates that vertical groundwater flow is primarily downwards (especially in the uplands), which is as expected. The locations of some of these monitoring points within the Rustic Ridge mining area are shown on **Figure 2-2**.
- **Figure 2-4** illustrates the groundwater surface elevations in monitoring wells completed in the Lower Kittanning coal seam, in support of the Rustic Ridge II pre-application. Review of **Figure 2-4** indicates that groundwater is confined within the Lower Kittanning coal seam, and that groundwater flow within the Lower Kittanning coal seam is generally

to the east, which is consistent with the dip of the coal seam. There is no apparent natural point of discharge that could cause groundwater to flow to the east, through the Lower Kittanning coal seam. The nearest point of potential discharge of this groundwater to natural ground is located approximately 1 mile to the north, into Fourmile Creek. It is possible that groundwater in the Lower Kittanning coal seam is being drawn to nearby, underground coal mine to the south and east. If so, these groundwater levels and flows are transient and may be temporary. The operating Rustic Ridge Mine is located south of the Pennsylvania Turnpike, and southeast of the Headwaters of Fourmile Run.

The volume of groundwater in circulation can be estimated based on the average annual rate of groundwater recharge from precipitation. The mean annual recharge estimate for southeast Westmoreland County is between 12 and 14 inches per annum (Pennsylvania, 2010, **Figure 2-5**). This estimate can be used to calculate the proportion of total groundwater in circulation that would be drained by an underground mine.

Groundwater Quality

The Pre-application for the proposed Rustic Ridge II mine (LCT, 2023, Module 8) includes groundwater quality data for numerous groundwater supply wells in the Study Area (**Figure 2-2**). These data are summarized in **Table 2.1** and are present in full in **Appendix B**. Other water supply wells, which are not shown on the sample location map, have been sampled by LCT, and the results for those wells are similar to those shown in **Table 2.1**. Review of the results of the water well sampling indicates that pH is generally in the neutral range. The quality of groundwater in some wells was likely impacted by mining, as is evidenced by the variable concentrations of iron and manganese that have been measured.

Table 2.1

Summary of Water Quality from Well Samples (LCT, 2023)

Well Number		W541	W2132	W2142	W2147	W2160	W2181	W2221
Well Depth (feet)		400	340	100	350	310	60	430
Watershed		Fourmile	Fourmile	Jacobs	Fourmile	Jacobs	Jacobs	Fourmile
pH	High	8	6.7	7.2	7.3	7.8	7	7.1
	Median	7.3	6.3	7.1	7	7.6	6.7	6.4
	Low	7.1	6	6.8	7.7	7.5	6.1	6.3
Alkalinity (mg/L)	High	83	133	124	108	98	44	143
	Median	83	101	112	80	97	43	138
	Low	78	96	109	48	96	42	125
Iron (mg/L)	High	0.4	278	4.96	5	1.2	12	17
	Median	0.4	125	1.95	0.2	0.7	10	1.4
	Low	0.1	40	0.82	0.1	0.1	9	1
Manganese (mg/L)	High	0.06	5.5	0.18	0.4	0.09	0.6	1.2
	Median	0.01	2.9	0.15	0.07	0.01	0.6	0.3
	Low	0.01	2.2	0.06	0.02	<0.01	0.6	0.1

The Pre-application for the proposed Rustic Ridge II mine (LCT, 2023, Module 8) also includes groundwater quality data for numerous springs in the Study Area (**Figure 2-2**). These data are summarized in **Table 2.2** and are present in full in **Appendix B**. Review of the results of the spring sampling indicates that pH is generally in the neutral range. The quality of water indicates that some of the springs are likely impacted by mining, as is evidenced by the variable concentrations of iron and manganese that have been measured. Concentrations of aluminum are also elevated in wells that contain high concentrations of iron and manganese, which is additional evidence that these are mine-related impacts to groundwater quality. These data provide the most reliable basis for assessing the quality of groundwater discharging into the Headwaters of Fourmile Run.

Other springs, which are not shown on the sample location map, have been sampled by LCT, and the results of the sampling for those springs measured lower concentrations of iron and manganese compared to those summarized in **Table 2.2**.

Table 2.2

Summary of Water Quality from Spring Samples (LCT, 2023)

Well Number		S2021	S2022	S2023
Name		US 002	US 001	DS 001
Watershed		Jacobs	Jacobs	Jacobs
Flow (gpm)	High	56	47	56
	Median	47	39	56
	Low	47	37	37
pH	High	7.3	7.4	7.8
	Median	7.1	7.1	7.3
	Low	6.9	6.9	7.1
Alkalinity (mg/L)	High	57	54	51
	Median	--	--	--
	Low	46	43	42
Iron (mg/L)	High	3	2.3	1
	Median	--	--	--
	Low	1.4	1.2	0.5
Manganese (mg/L)	High	1.4	1.8	1.1
	Median	--	--	--
	Low	1	1.5	1

Groundwater Use

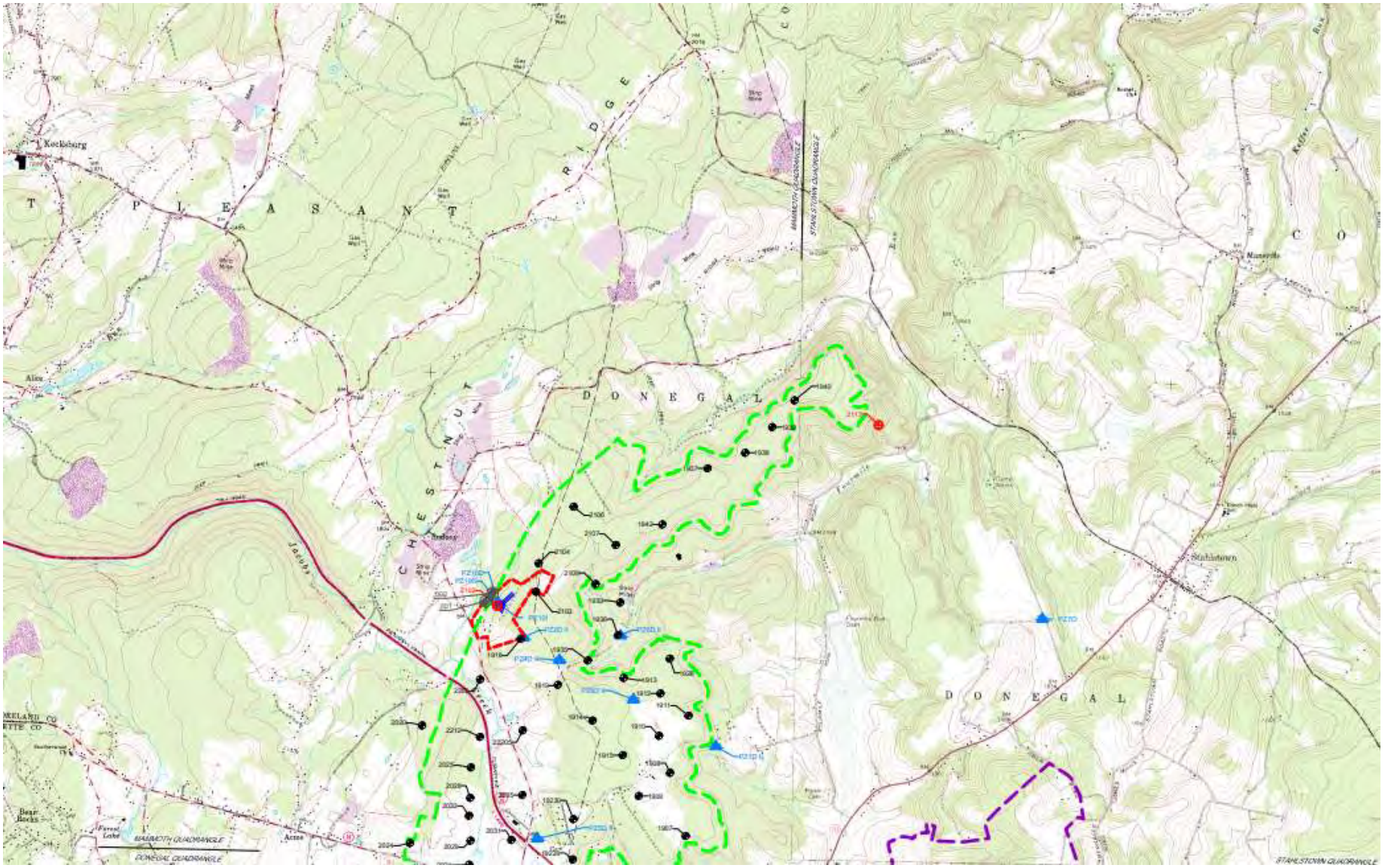
Groundwater is used to supply residences, agriculture, and industry throughout rural Pennsylvania, including throughout the Study Area. The applications submitted by LCT (2021, 2023, Modules 8) included the identification and sampling of private wells and springs used for domestic and/or agricultural purposes. Approximately 145 of these wells and springs are located within the Headwaters of Fourmile Run (**Figure 2-6**). It is further noted that not all of the private wells and springs are included in LCT's monitoring programs (MWA, 2023), and that this LCT database only accounts for approximately half of the surface area of the Headwaters of Fourmile Run. The actual number of wells and springs in the Headwaters of Fourmile Run that are used for domestic or agricultural water supply is expected to be much larger.

There are also approximately 51 wells (registered with PAGWIS) in the Headwater of Fourmile Run, more than half of which are identified as water supply wells (**Figure 2-6**). Many more unregistered wells could be present.

Based on this information, it is clear that groundwater is an important resource within the Headwaters of Fourmile Run, and is used extensively for domestic and agricultural water supply.

2.5 Historical and Current Mining in the Study Area

The footprints of historical open pit coal mine operations of the Middle Kittanning coal seam in the Study Area are illustrated on **Figure 2-7**. These mines are located along the west edge of the Study Area, where the Middle Kittanning coal seam, which it was called at the time (see **Section 2.3**), nears the ground surface of the valley associated with Tributary 37997 to Jacobs Creek. These mines included the Hoyman, Rodney, and Vacinko mines, which primarily produced coal from seams above the Middle Kittanning (now Lower Kittanning) coal seam. AMD and other water quality impacts associated with coal mining are evident from the seepages from these historical mines (see **Section 2.2**). **Figure 2-8** illustrates the active and proposed deep coal mines in area, which are operated by LCT and produce coal from the Lower Kittanning (then Middle Kittanning) coal seam.



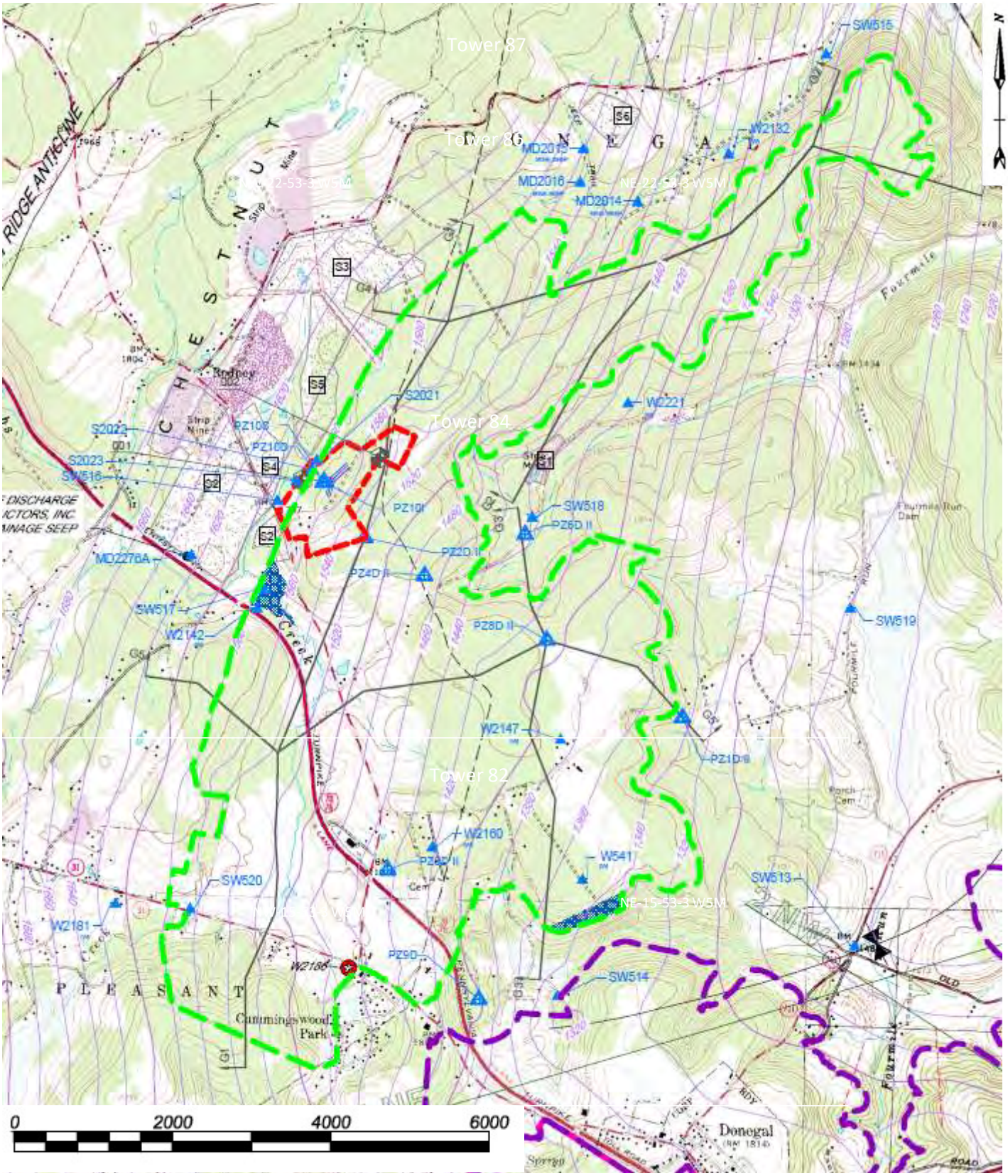
MOUNTAIN WATERSHED ASSOCIATION

Assessment of Fitness for Mining

Topography and Drainage

BURGESS ENVIRONMENTAL

Date: 12/15/2023	Scale:
Project No.: MOUN-01	Figure No.: **2-1**



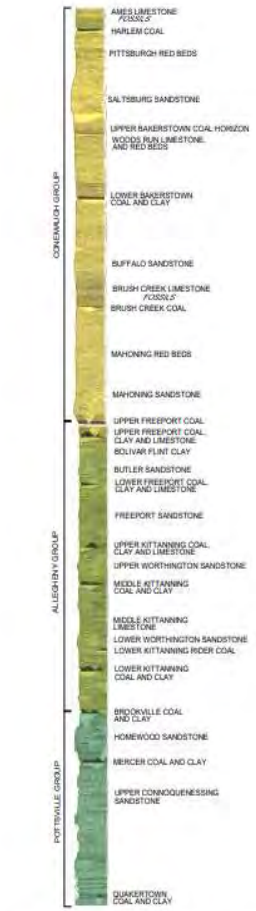
MOUNTAIN WATERSHED ASSOCIATION
Assessment of Fitness for Mining

LCT (2023) Water Quality Monitoring Locations

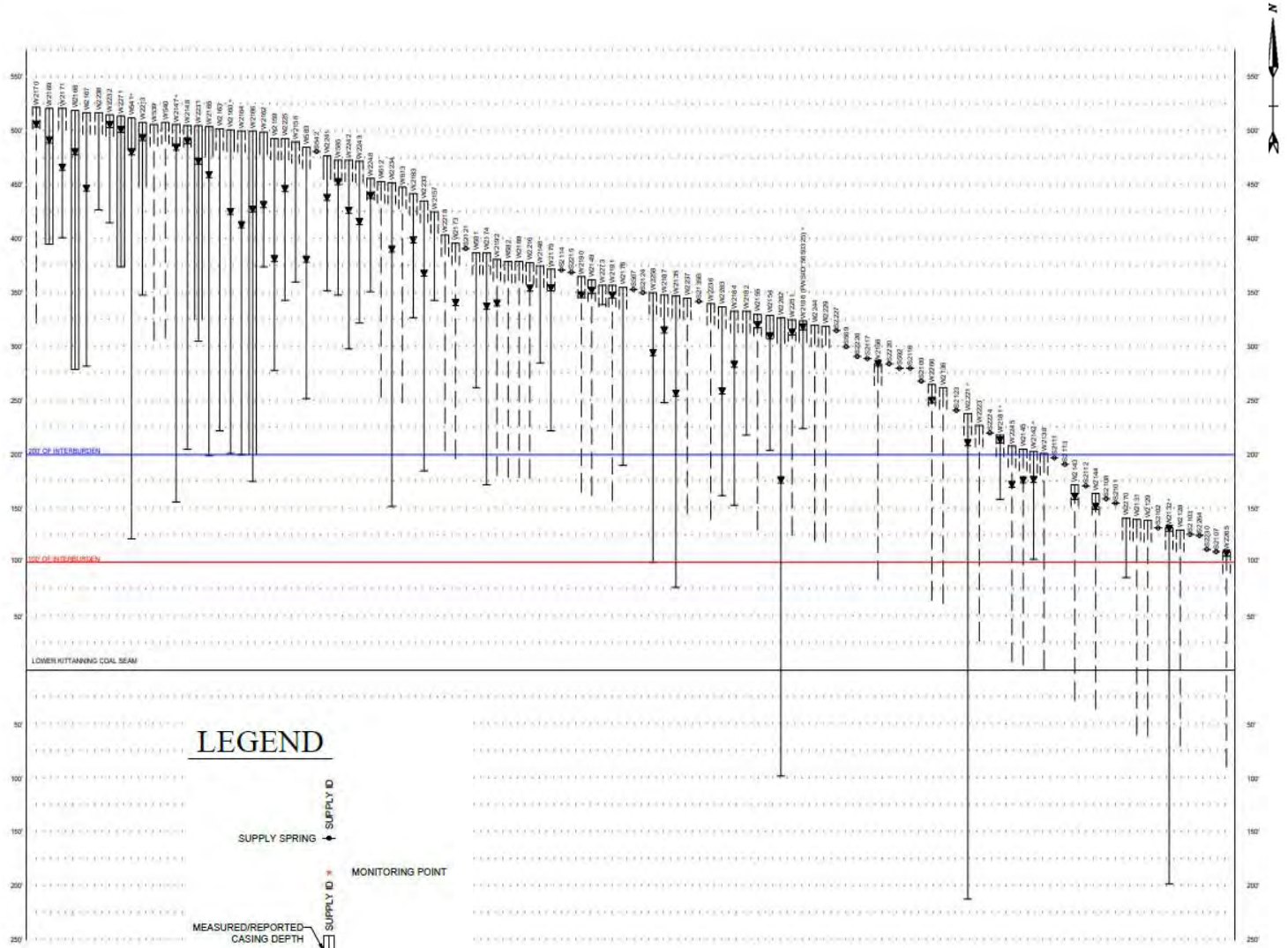
BURGESS ENVIRONMENTAL

Date:	Scale:
12/15/2023	
Project No.: MOUN-01	Figure No.: **2-2**

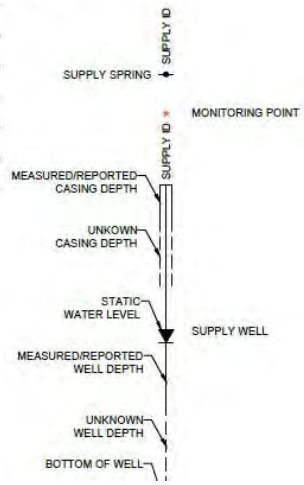
GENERALIZED STRATIGRAPHIC COLUMN



SOURCE: GEOLOGY AND MINERAL RESOURCES OF THE DONEGAL QUADRANGLE, PENNSYLVANIA, COMMONWEALTH OF PENNSYLVANIA TOPOGRAPHIC AND GEOLOGIC SURVEY (SHAFFNER, 1963).



LEGEND



MOUNTAIN WATERSHED ASSOCIATION

Assessment of Fitness for Mining

Hydrogeological Section (LCT, 2023, Ex8.3)

BURGESS ENVIRONMENTAL

Date: 12/15/2023	Scale:
Project No.: MOUN-01	Figure No.: **2-3**

PZ-10D
1743.76
2022-08-12

PZ-2D(II)
1730.35
2022-08-12

PZ-6D(II)
1641.62
2022-08-12

PZ-7D
1465.32
2022-08-12

PZ-4D(II)
1720.57
2022-08-12

PZ-8D(II)
1534.44
2022-08-12

PZ-1D(II)
1507.85
2022-08-12

PZ-5D(II)
1730.17
2022-08-12

PZ-9D
1679.76
2022-08-12

0 1 2 mi.

ID	Northing	Easting	GS Elev	BR Elev	T Screen E	B Screen E	Date	GW Elev
PZ-1D(II)	296209.255	1511769.958	1699.06	1699.06	1333.06	1337.06	2022-08-12	1507.85
PZ-2D(II)	299637.518	1505712.001	1975.415	1962.415	1529.415	1524.415	2022-08-12	1730.35
PZ-4D(II)	298917.758	1506852.231	1906.27	1906.27	1495.77	1490.77	2022-08-12	1720.57
PZ-5D(II)	293304.663	1506154.563	1819.67	1794.67	1452.67	1442.67	2022-08-12	1730.17
PZ-6D(II)	299701.375	1508770.373	1640.422	1634.422	1446.422	1436.422	2022-08-12	1641.62
PZ-7D	300222.623	1522059.262	1640.64	1634.64	1168.64	1158.64	2022-08-12	1465.32
PZ-8D(II)	297685.534	1509184.622	1900.64	1900.64	1427.64	1417.64	2022-08-12	1534.44
PZ-9D	290839.098	1507885.325	1744.06	1712.06	1411.06	1401.06	2022-08-12	1679.76
PZ-10D	300689.49	1504923.558	1801.03	1786.03	1592.03	1582.03	2022-08-12	1743.76

Legend

- Study Area
- Headwaters of Fourmile Run
- Watershed Boundary Dataset (HUC 12)
- Groundwater Wells (Lower Kittanning)
- CH93 Designated Use Streams (2023-07)
- USGS Elevation Contours (20 ft)

Designated Use Streams of Interest

- Fourmile Run
- Jacobs Creek

MAP SOURCE: ESRI World Imagery

MAP PROJECTION: EPSG: 4269 - NAD83

PAPER SIZE ASSOCIATED WITH MAP SCALE: A3

Assessment of Suitability for Mining
Donegal Township, Pennsylvania

Potentiometric Surface in Lower Kittanning Coal Seam

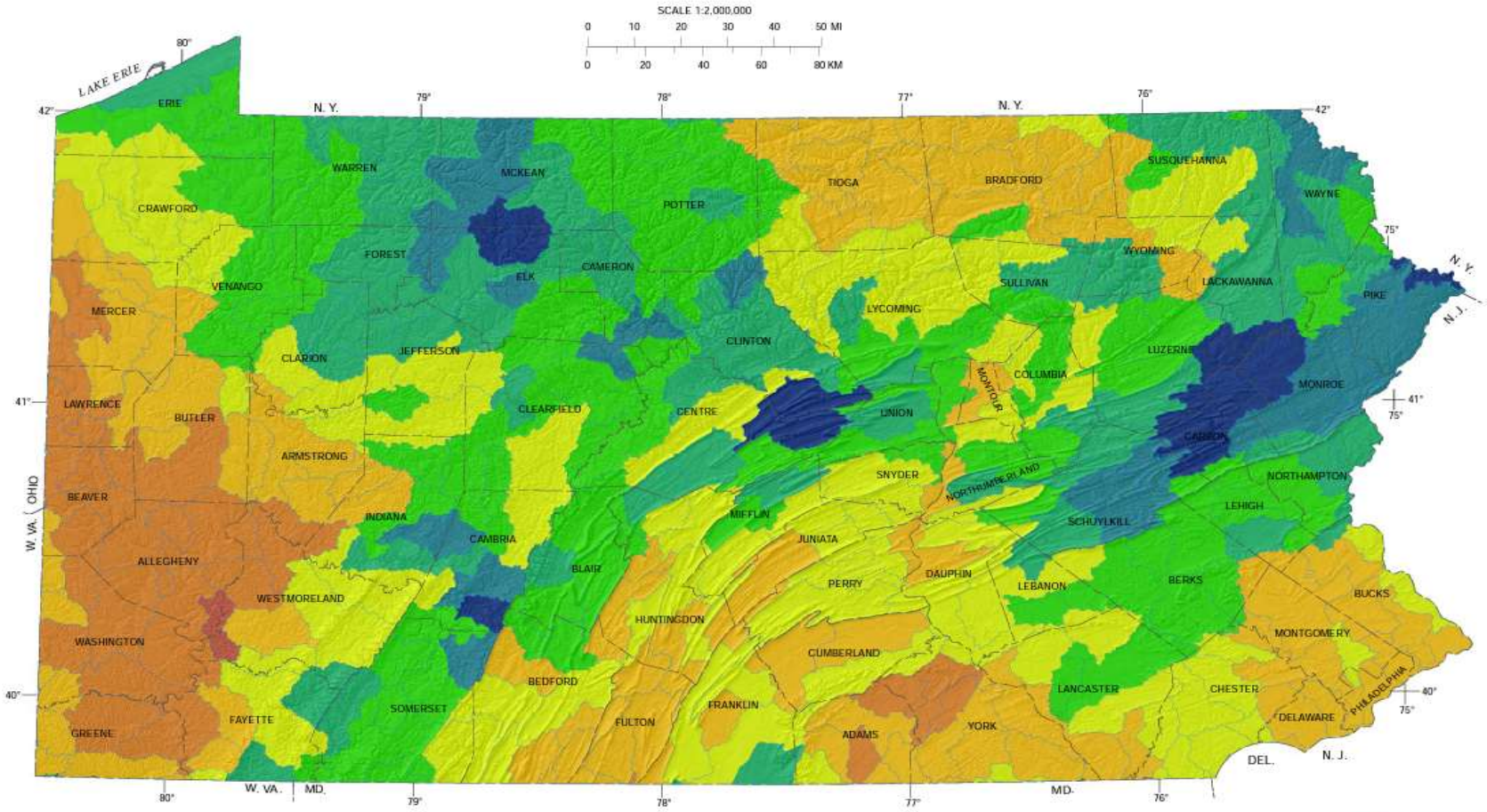
BURGESS ENVIRONMENTAL

Map Scale: 1 : 30,000

PROJECT NUMBER:	ENVI-07
DATE:	2023-10-27
CREATED BY:	EJ
REV:	GJ

FIGURE NO.: **2-4**

1971 – 2000



MEAN ANNUAL RECHARGE (INCHES)

7.31 - 8	10.01 - 12	14.01 - 16	18.01 - 20
8.01 - 10	12.01 - 14	16.01 - 18	20.01 - 22.21

Groundwater recharge data based on revised calculations from regression equation published in Risser and others, 2008a, pubs.usgs.gov/sir/2008/5185 (accessed November 20, 2009).

Hydrologic unit boundary

pennsylvania
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

USGS
science for a changing world

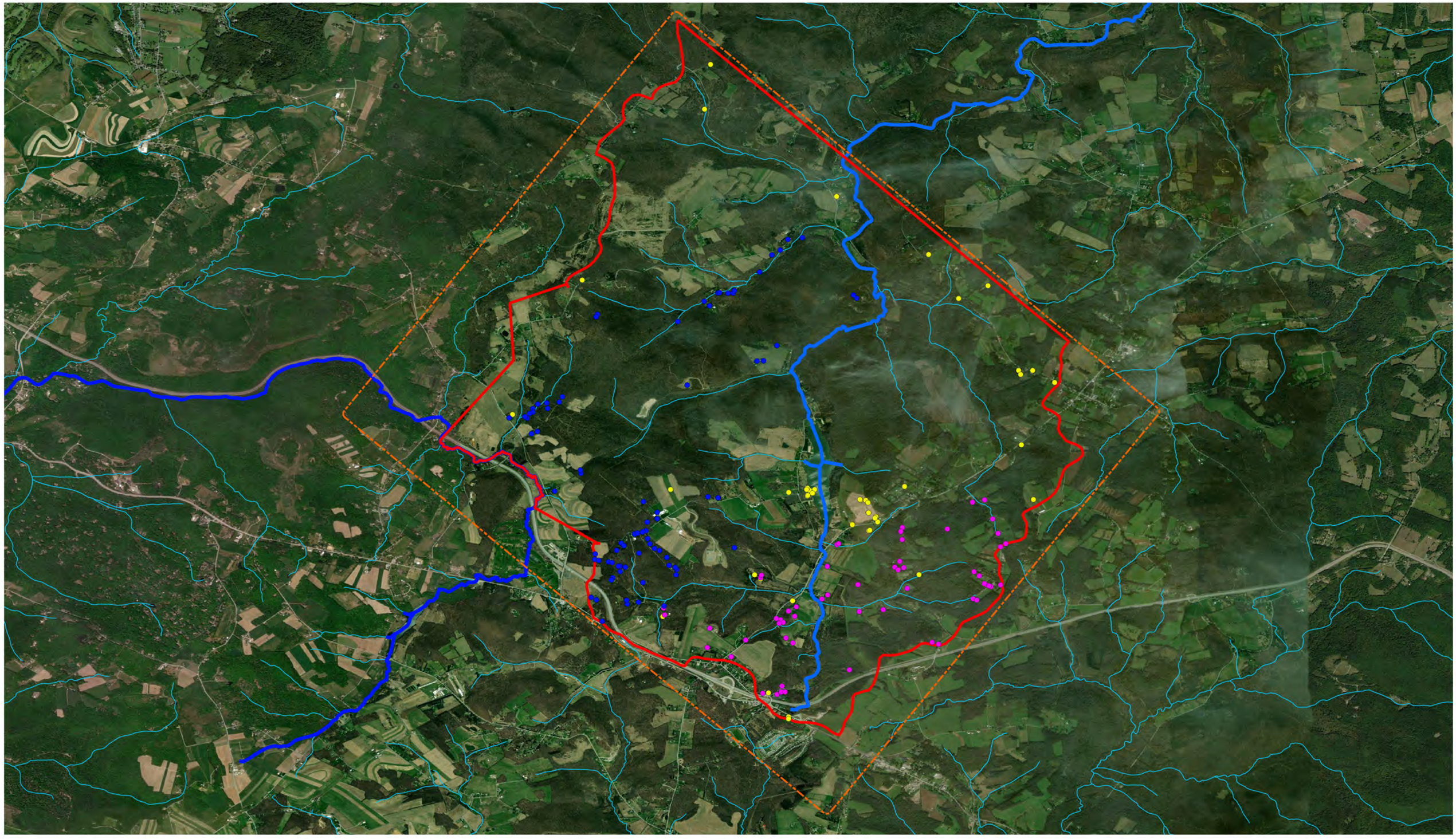
MOUNTAIN WATERSHED ASSOCIATION

Assessment of Fitness for Mining

Groundwater Recharge Estimates (USGS, 2010)

BURGESS ENVIRONMENTAL

Date: 12/15/2023	Scale:	
Project No.: MOUN-01	Figure No.: **2-5**	



Legend

- Study Area
- Headwaters of Fourmile Run

Designated Use Streams of Interest

- Fourmile Run
- Jacobs Creek

- CH93 Designated Use Streams (2023-07)
- Groundwater Use Location (Source: LCT, 2021)
- Groundwater Use Location (Source: LCT, 2023)
- Groundwater Use Location (Source: PDEP, 2023)

0 1 2 mi

MAP SOURCE: ESRI World Imagery

MAP PROJECTION: EPSG: 4269 - NAD83

PAPER SIZE ASSOCIATED WITH MAP SCALE: A3

Assessment of Suitability for Mining
Donegal Township, Pennsylvania

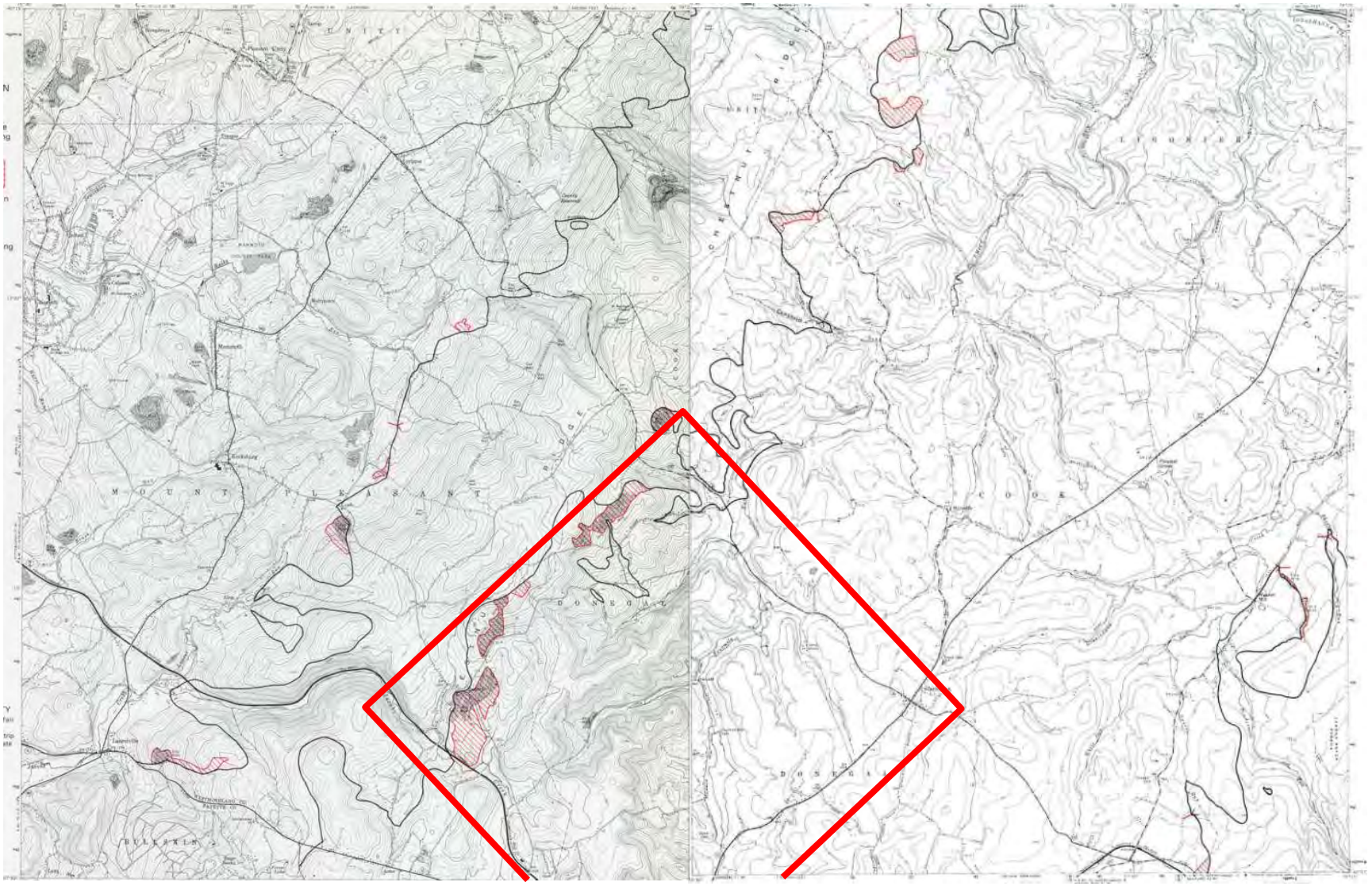
Groundwater Users in Donegal Township

BURGESS ENVIRONMENTAL

Map Scale: 1 : 30,000

PROJECT NUMBER:	ENVI-07
DATE:	2023-10-27
CREATED BY:	EJ
REV:	GJ

FIGURE NO.: **2-6**



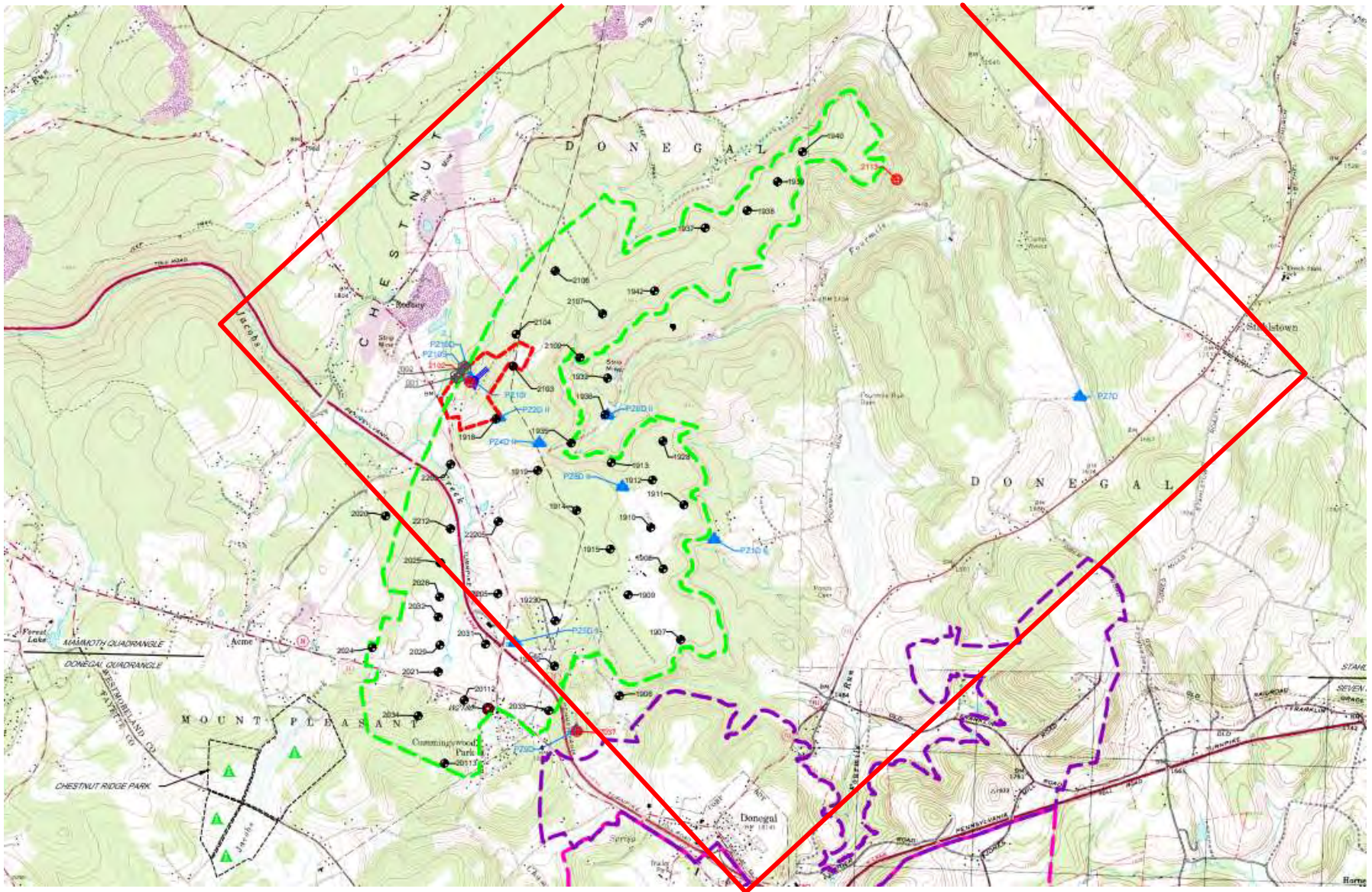
MOUNTAIN WATERSHED ASSOCIATION

Assessment of Fitness for Mining

Former Surface Coal Mines in Donegal Township

BURGESS ENVIRONMENTAL

Date: 12/15/2023	Scale:
Project No.: MOUN-01	Figure No.: **2-7**



Study Area Location

MOUNTAIN WATERSHED ASSOCIATION

Assessment of Fitness for Mining

Active and Proposed Deep Coal Mines in Donegal Township

BURGESS ENVIRONMENTAL

Date: 12/15/2023	Scale:	
Project No.: MOUN-01	Figure No.: **2-8**	

3 MINING

3.1 Mine Description

This section describes the likely development and impacts of a mine that would/could be developed in the Headwaters of Fourmile Run. The Lower Kittanning coal seam is the most economical coal seam underlying the area. **Figure 2-2** shows the elevation of this coal seam relative to the topography of the ground surface. Review of **Figure 2-2** indicates that the Lower Kittanning coal seam would be extracted using underground mining techniques; however, an underground mine still requires a surface mine pit to enable underground entry. The surface portion of an underground mine would be located where the Lower Kittanning coal seam is closest to the ground surface, which in the west side of the Study Area, adjacent to Tributary #37998 that is in the Jacobs Creek watershed. This also allows the coal to be mined in a down-dip direction, which is required by Pennsylvania regulations (PA regulation Title 25, Chapter 89 Underground Coal Mining, Subchapter B Operations, Section § 89.54).

The surface portion of the mine would typically include the mine access pit with mine entries, mine ventilation, supply yard, coal stockpile area, power substation, mine water treatment and discharge facilities, office/bathhouse, and laydown areas. Based on the information submitted by LCT (2023), the area of the surface component of the mine would likely approach, but not exceed, 100 acres.

Mobile vehicles would include typical mine earthworks equipment, haul trucks, front-end loaders for loading coal onto haul trucks, forklifts and/or telehandler for unloading supplies and equipment, and utility vehicles. Coal would typically be transported from the mine to its point of use or processing using road certified trucks.

The underground portion of the mine would cover a much larger area. Typically, continuous mining machines remove the coal from the coal face and load the coal onto conveyor belts that transport the coal from the active mine face to the surface mine area. Underground equipment also typically includes shuttle cars and/or continuous haulers, roof bolters, feed breakers, pumps, battery and diesel scoops, battery and diesel man trips, and rock dusters (LCT, 2023, Module 2).

3.2 Water Management

Water Quantity

Management of water is required for surface drainage in the surface component of the mine, as well as pumping, treating, and discharging groundwater from the underground component of the mine. These activities occur in the surface portion of the mine. The water would be treated to

comply with discharge criteria specified as part of a NPDES Permit(s). The volume of water that would be pumped from the mine is a function of the permeabilities of the overlying and underlying formations and the Lower Kittanning coal seam. LCT anticipates a pumping and discharge rate of 0.4 gpm per acre, which is based on a study of mine complexes in the region (Winters et al., 1999 and 2001).

It is noted that the studies by Winters et al that have been relied upon by LCT were geochemical studies of discharges from coal mines in the Irwin Basin, which is located approximately 10 miles west of the Headwaters of Fourmile Run. The purpose of Winters' study was not to quantify the rate of flow in these discharges, but rather to understand the water quality of discharges from coal mines in the Irwin Basin and from the Pittsburgh coal seam. The Lower Kittanning coal seam is in a totally different geological group, and the Headwaters of Fourmile Run is in a different geographic area.

The flows cited by the Winters (1999, 2001) were long term seepage rates following mine closure, and provide a reasonable estimate of post-mining seepage from a closed and flooded mine. These studies likely underestimate the volume of groundwater removed during mining because they would not account for dewatering of the coal seam.

Water Quality

The application information submitted by LCT provides a prediction of water quality for discharges that are based on its experience operating its Rustic Ridge Mine located south of the Pennsylvania Turn Pike. LCT's water quality prediction (LCT, 2023, Module 8) is summarized below and is based on limited operating experience as Rustic Ridge Mine only went into operation in approximately 2019.

- pH: 7.69
- Alkalinity: 109 mg/L
- Acidity: -95 mg/L
- Iron 0.07: mg/L
- Manganese: 0.04 mg/L
- Aluminum: 0.08 mg/L
- Sulfate: 44 mg/L

Based on other mining experience in the Study Area as well as in the Indian Creek watershed located immediately south of the Study Area, it is clear that more significant impacts to water quality will occur. The LCT application does not provide a prediction of water quality of seepage that would emanate from its mine, following closure; however, water quality information is provided for former mines in area (LCT, 2023, Module 8), as follows.

> "*Three (3) seeps located near the proposed mine plan area exhibited elevated levels of iron , manganese, and sulfate concentrations. Seeps MD2014 and MD2016 are located within the 1,000-foot offset and MD2015 located approximately 500 feet north of the 1,000-foot offset boundary. These seeps were observed to be rich in oxidized iron based on water discoloration during field observations. Water samples reported elevated iron, manganese, and sulfate concentrations ranging from 0.68 mg/L to 17.6 mg/L, 0.23mg/L to 2.57 mg/L, and 493 mg/L to 728 mg/L, respectively. Seep MD2015 is located within the reclaimed Patual Surface Mine (SMP No. 6579104) previously mined by Holliday Constructors, Inc. (Mine ID – S6 on Exhibit 8.2) on the Middle Kittanning, Lower Kittanning, and Clarion coal seams. Seeps MD2014 and MD2016 are located approximately 500 feet down gradient of the previous mined extents. Two (2) seeps located within or near the surface site boundary were observed to be rich in oxidized iron based on water discoloration during field observations*."

These high concentrations of iron, manganese, and sulfate are diagnostic of water quality impacts from coal mines and/or AMD. The quality of discharge water from closed coal mines is the primary focus of the studies completed by Winters (1999 and 2001), which were cited by LCT. Winters et al (2001) concluded that all major streams in his study area were affected by polluted mine drainage, and that this pollution varied from acidic, iron and aluminum contaminated water to alkaline, iron and sulfate contaminated water. **Table 3.1** summarizes the seepage water quality data reported by Winters et al (2001).

Table 3.1

Mine Seepage Water Quality (Winters et al, 2001)

Table 1. Geochemistry and strontium isotope composition of Irwin basin discharges. Location numbers are keyed to Figure 5.

	Location	Date	pH S.U.	HCO_3	Fe	Al	SO_4 ppm	Na	Si	Sr	$^{87}Sr/^{86}Sr$
1	Delmont #1	03/99	3.4	0	38.3	1.3	406	23	13.8	0.7	0.71253
		07/99	5.2	27	31.2	0.7	375	23	10.5	0.6	0.71260
2	Delmont #2	07/99	4.9	0	40.6	1.9	447	27	13.0	0.7	0.71254
3	Export	03/99	2.8	0	1.3	13.4	550	19	24.3	0.7	0.71243
		07/99	3.2	0	1.5	18.2	599	22	22.3	0.7	0.71240
4	Coal Run	03/99	5.8	148	16.0	0.2	298	83	8.6	1.5	0.71237
		07/99	6.2	181	18.7	0.2	305	91	6.0	1.1	0.71237
5	Irwin	03/99	6.0	133	70.4	0.1	715	125	12.7	1.6	0.71263
		07/99	6.0	161	62.1	0.2	589	137	10.7	1.2	0.71262
6	Guffey-Up	07/99	6.2	427	21.5	0.2	463	281	7.3	1.1	0.71220
7	Guffey-Low	03/99	6.3	315	22.0	0.1	456	235	8.5	1.4	0.71214
		07/99	6.0	234	23.6	0.1	284	133	7.1	1.2	0.71223
8	Lowber	03/99	6.1	405	78.3	0.1	1338	483	11.0	2.6	0.71257
		07/99	6.0	439	75.0	0.2	1315	426	9.5	1.9	n/a
9	Douglas Run	03/99	6.4	371	13.1	0.1	412	222	7.4	1.6	0.71222
		07/99	6.0	339	25.3	0.1	427	204	6.0	1.3	0.71223

The quality of water seeping out of existing operating and/or past coal mines was considered "*the best predictor of water quality effects of future mining*" (Pennsylvania, 1997) by an adjudication of PADEP's rejection of a mine application submitted by Rand Am, which was proposed to mine the same coal seam just south of the Study Area.

Hydraulic Connection to Mines to the South

Large underground coal mines (active and closed) are located to the south of the Study Area. If a mine developed in the Study Area were to connect to a mine to the south, then the mines would act as a single hydraulic entity (they would be hydraulically connected). Even if the mines were to be maintained separate, the Kittanning coal seam is considered a regional aquifer, which would provide a conduit for groundwater flow from a mine in the Study Area to the mines to the south.

3.3 Mine Related Impacts

General

The adverse impacts that are caused by coal mining in Pennsylvania have been recognized in Pennsylvania legislation since at least 1965 (see **Section 1.4**). In the early 1990s, Section 18.1 of the Bituminous Mine Subsidence and Land Conservation Act required PADEP to complete a regular (every five years) reporting of these impacts. While this legislation is focused on underground coal mining and the impacts associated with subsidence, the resulting reports provide a comprehensive technical accounting of many of the mine-related impacts that would be expected to occur in the Headwaters of Fourmile Run, should further mining occur.

The adverse impacts that are relevant to activities in the surface portion of a mine, which are described below and are addressed in greater detail in subsequent sections of this report, include the following:

- flow loss in streams and wetlands
- degradation of water quality in impacted streams
- reduction in the quantity and quality of groundwater
- AMD

These impacts are all relevant to this assessment because water management, treatment, and discharge occurs in the above-ground component of the mining operations. Most of these impacts will occur indefinitely and are not practical or feasible to reverse.

Acid Mine Drainage (AMD)

The coal mines of Pennsylvania are known to be susceptible to AMD. PADEP (1998) states that, *"(AMD), the single, largest water pollutant in the state, affects 2,400 miles of*

Pennsylvania streams". AMD is caused by surface and underground coal mining. Acidification results from the oxidation of pyritic minerals by sulphur oxidizing bacteria (Johnson and Hallberg, 2004). The acidification process for pyrite, which is the most common pyritic mineral, is summarized as follows:

$$FeS_2 + H_2O + 7/2O_2 \rightarrow Fe^{2+} + 2H^+ + 2SO_4^{2-}$$

The bio-oxidation of pyrite produces ferrous iron, hydrogen and sulphate ions that are dissolved in water. Arsenic is commonly associated with iron in pyrite and can be dissolved into water through the same biological oxidation process. Manganese is also commonly associated with AMD. Other heavy metals, which are naturally present in the rock and soils surrounding the coal mines, can also be dissolved into water under the low pH (acidic) conditions. The acidic water is toxic to most plant and soil organisms, and the heavy metals can be toxic to fish.

A study completed by Rose et al. (1982) indicates that the Lower Kittanning coal seam has the potential to be highly acid generating, which corroborates the water quality information presented by Winters (2001) and LCT (2023, Module 8). AMD is also prevalent in historical mines located to the south, in the Indian Creek watershed, and has also occurred in the Study Area (LCT, 2023).

In certain circumstances, the acidity associated with AMD can be neutralized by alkalinity that can occur naturally in the surface water of the receiving stream, the groundwater that mixes with the mine seepage, and/or the geological strata that contacts the mine seepage; however, this alkalinity "*does not remove metals, such as iron and manganese"* (Pennsylvania, 1997). Elevated concentrations of these metals remain in the treated discharges from the historical Hoyman Mine, which is located in the Headwaters of Fourmile Run, and from the historical mines in the Indian Creek watershed, to the south of the Study Area.

Flow Loss in Streams and Wetlands

Flow loss in streams and wetlands occurs as a result of diversions of surface water and groundwater that are required to enable coal mining. The impacts associated with flow loss in surface features have occurred throughout the coal mining regions of Pennsylvania (University of Pittsburgh, 2014). Water management in support of coal mining requires the removal and discharge of surface water and groundwater in the areas of active mining and mining support. This reduces the quantity of groundwater that replenishes streams and wetlands during periods of low precipitation, which is critical to the functioning of the aquatic and wetlands environments. This is most important in uplands regions, such as the Headwaters of Fourmile Run, where the effects associated with reduced groundwater discharge to streams are most acute. Conversely, flow gains occur where the mine water is discharged to the receiving stream.

Underground mining alters the hydrologic cycle in overlying areas. The hydrology of western, and particularly southwestern, Pennsylvania is dominated by interactions between the bedrock, which is composed of extensive strata of sedimentary rock, and the relatively rugged topography, which results from the incision of the surface water drainage network. This results in substantial groundwater aquifers that sustain surface water flow during periods without precipitation and provide drinking water for many residents of Pennsylvania living beyond public water distribution networks. Further, these aquifers interact with the surface water system in complicated hillslopes with numerous springs that are important for wildlife habitat and livestock watering (University of Pittsburgh, 2014, Section I.E.3).

Degradation of Water Quality

Degradation of water quality occurs as a result of exposing coal to atmospheric conditions and increasing flow through coal and coal waste, and is predicted to occur by PADEP's own analyses (PADER, 1995; PADEP, 1998). The Loyalhanna watershed, including segments of Fourmile Run, are already impaired (USEPA, 2023). Degradation of water quality can occur in the following ways:

- Deeper groundwater and groundwater in coal seams that have been mined are typically of poorer quality than near-surface groundwater and non-impacted surface water. The diversion of this deeper groundwater to streams can adversely impact water quality in the receiving stream.
- Coal mining can result in the diversion of surface water and groundwater through coal and coal refuse, which adversely impacts water quality in the receiving stream(s). This can occur as a result AMD, which is discussed separately below, or independent of AMD.
- Dewatering and drainage from active and/or closed coal mines can divert clean groundwater and surface water through mine spoil, which reduces the proportion of clean water that recharges streams, aquifers and wetlands.

These impacts are also documented by the Act 54 report (University of Pittsburgh, 2014, Executive Summary), which states "*for streams experiencing flow loss, certain mayfly taxa appear to be especially hard hit. Declines in water quality, including increases in conductivity and pH, also accompany mining-induced flow loss impacts*".

Impacts to Groundwater

Loss of groundwater supplies to local residents has also occurred south of the Study Area, as a result of the Rustic Ridge Mine and Melcroft area mines. The surface disturbances associated with mining have significant implications to groundwater resources, including the potential "loss" of wells accessing these aquifer (i.e. diminished water yields or water quality from these wells) and the potential loss of flow from springs along the hillslope (University of Pittsburgh, 2014, Section I.E.3). "*It should also be noted that room-and-pillar mining may also affect water supplies.*

The altered groundwater flow paths that can occur under specific conditions may impact the quantity and quality of water produced by wells and springs" (University of Pittsburgh, 2014, Section I.E.2). This occurs because the underground mine and the surface component of the underground mine create a preferential flow path, which can drain overlying aquifers, and divert otherwise unimpacted, fresh groundwater through coal, refuse, and mine workings.

Mining can also adversely affect groundwater quality. The 2008-2013 review (University of Pittsburgh, 2014, Section VI.F) states, "*in some cases these changes in hydrologic flow paths can result in interactions with other groundwater sources, such as chemically reduced groundwaters (i.e., high in soluble iron) that would impact water quality when mixing with existing groundwater. As a result, (mining) may diminish well production/water quantity at higher aquifers and diminish water quality in wells situated in lower aquifers*".

These negative impacts to water quality can continue indefinitely. This study goes on to states that, "*there was no significant relationship between time since mining and conductivity (F1,35 = 0.04, P =0.8401) or pH (F1,36 = 1.68, P = 0.20), indicating that water quality does not return to pre-mining levels following mining*" (University of Pittsburgh, 2014, Section VII.J.2).

These impacts have also been experienced locally. A water supply extension project was required south of the Study Area "*because the water quality of existing individual wells and springs have been degraded by mining or no longer provide sufficient quantities of water*" (PADER, 1995).

3.4 Designated Streams

Total Maximum Daily Loads (TMDLs) for impaired waterbodies were established in accordance with Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA) Water Quality Planning and Management Regulations (codified at Title 40 of the Code of Federal Regulations Part 130). "*A TMDL establishes the amount of a pollutant that a waterbody can assimilate without exceeding its water quality standard for that pollutant. TMDLs provide the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources to restore and maintain the quality of the state's water resources*" (US EPA, 2010). Stream reaches in the Kiskiminetas River watershed, which includes Loyalhanna Creek and Fourmile Run, were included in this assessment "*because of various impairments*" and "*to address metals, pH, and sediment impairments associated with abandoned mine drainage or discharge*" (US EPA, 2010). Based on water quality data collected by PADEP and modeling completed in support of this assessment, concentrations of these pollutants of concern exceeded the TDMLs for Loyalhanna Creek and Fourmile Run (**Figure 3-1**).

Four segments of Fourmile Run and Donegal Lake are classified as impaired by the US EPA (2023) My Waterway website, as is the upper reach of Loyalhanna Creek, downstream of Darlington, PA.

Of the total impaired waters in the Kiskiminetas River watershed, 59 percent of all impairments are attributed to AMD and its impacts (US EPA, 2010), which includes the impaired segments of Fourmile Run.

0 1 2 3 mi

Study Area

Headwaters of Fourmile Run

Watershed Boundary Dataset (HUC 12)

CH93 Designated Use Streams (2023-07)

Total Maximum Daily Load (2023-07)
Aluminum; Iron; Manganese; Metals; pH; Low ; Siltation ; Total Suspended Solids

Important Designated Use Streams

Fourmile Run

Jacobs Creek

Non-Attaining Designated Use Streams
Impaired Designated Use (Cause of Impairment)

Aquatic Life (ACID MINE DRAINAGE - METALS ; ACID MINE DRAINAGE - PH ; ACID MINE DRAINAGE - TOTAL DIS

Aquatic Life (ACID MINE DRAINAGE - METALS)

Aquatic Life (ACID MINE DRAINAGE - PH)

Aquatic Life (ACID MINE DRAINAGE - SILTATION ; ACID MINE DRAINAGE - FLOW REGIME MODIFICATION)

Aquatic Life (ACID MINE DRAINAGE - SILTATION ;

Aquatic Life (ACID MINE DRAINAGE - TOTAL DISSOLVED SOLIDS (TDS) ; REMOVAL OF RIPARIAN VEGETATION - S

Aquatic Life (AGRICULTURE - SILTATION)

Aquatic Life (DAM OR IMPOUNDMENT - ORGANIC ENRICHMENT ; AGRICULTURE - SILTATION)

Aquatic Life (ON-SITE TREATMENT SYSTEMS (SEPTIC SYSTEMS AND SIMILAR DECENTRALIZED SYSTEMS) - ORGANIC)

Recreational (SOURCE UNKNOWN - PATHOGENS)

MAP SOURCE: ESRI World Imagery

MAP PROJECTION: EPSG: 4269 - NAD83

PAPER SIZE ASSOCIATED WITH MAP SCALE: A3

Assessment of Suitability for Mining
Donegal Township, Pennsylvania

Designated Streams

BURGESS ENVIRONMENTAL

Map Scale: 1 : 40,000

PROJECT NUMBER:	ENVI-07
DATE:	2023-10-27
CREATED BY:	EJ
REV:	GJ

FIGURE NO.:

3-1

4 NEARBY ACID MINE DRAINAGE CASE HISTORIES

4.1 General

The following AMD case histories are summarized because they demonstrate that AMD is likely to occur, and they are located proximate to the Headwaters of Fourmile Run, and/or because they involved similar mine developments of the same coal seam:

- Hoyman Mine #1
- Melcroft Mine
- Kalp Mine
- Fulton Mine
- Gallentine Mine

The underlying subsections summarize the history of mine development, the nature, extent and persistence of the AMD, and the impacts to watersheds that have resulted from the AMD. Assessment of the history, operation and efficacy of the treatment facilities monitored and maintained by MWA in cooperation with PADEP is also provided at the end of this section. These experiences demonstrate the following:

- AMD is commonly associated with mining of the Lower/Middle Kittanning coal seam
- AMD has continued, unabated, for decades following closure of the mines
- treatment is only partly effective in mitigating the pollution associated with AMD

Figure 4-1 shows the currently active and historical mines in the area containing and surrounding the Study Area, which has been mined extensively.

4.2 Hoyman Mine #1

The abandoned and reclaimed Hoyman Mine is located at the south end of the Study Area, in Mount Pleasant Township. The Hoyman Mine was a surface mine, which covered an estimated area of 300 acres, and mined coal from the Upper and Lower Freemont coal seams (**Figure 4-1**). The permit for the Hoyman Mine was issued to Holliday Constructors, Inc., and the mine operator was Vipond & Vipond, Inc., which has been dissolved. Operation of the Hoyman Mine ceased prior to the mid-1980s and the mine was reclaimed. AMD associated with seepages from the mine were observed, and an engineered wetland was constructed to treat the AMD drainage prior to discharge into Jacobs Creek. A Consent Decree was issued by the Commonwealth of Pennsylvania in 1993 to fund operation of the treatment system (Pennsylvania, 1993).

The treated AMD discharge was monitored by LCT (2023) in support of the Rustic Ridge II Pre-application (see **Section 2.2**). Based on these data, the wetlands treatment system appears to be effective in neutralizing the pH (6.5) of the AMD, but the concentrations of iron (29 mg/L), manganese (7.5 mg/L), and sulfate (600 mg/L) in the treated AMD water remain high. Seepage volumes varied from 25 to 224 gpm during the three 2021 monitoring events. These data indicate that AMD has continued, unabated, for at least four decades after the Hoyman Mine was closed. While the passive treatment has been effective in neutralizing pH, it has not abated metals pollution associated with the seepage into Jacobs Creek.

The area of the former Hoyman Mine discharge was visited in October 2023, although the wetland itself was not accessible.

4.3 Melcroft Mine #3

Melcroft #3, which is located to the south of the Study Area, was the last operating mine in the Melcroft area, was a room and pillar operation that encompassed approximately 650 acres, and was officially closed in 1966. Prior to project implementation areas below a coal seam elevation of approximately 1470 feet in the #3 Mine were flooded. The Melcroft No. 3 Mine pool is the source of AMD pollution to Indian Creek. In addition, the Melcroft No. 3 Mine pool caused considerable property damage to a number of residences in the Village of Melcroft by flooding basements. Eight homes in the Village of Melcroft located along the downdip crop-line had significant AMD problems due to the 60 to 70 feet of up-dip mine pool head in the #3 Mine (PADEP, 2007).

PADEP and MWA cooperated to implement an AMD mitigation program for the Melcroft Mine #3 and Kalp (see **Section 4.4**) AMD seepages. Remediation efforts relied on in-seam directional drilling to facilitate control of the mine pools and collect the AMD. The AMD water was then pumped to an AMD treatment system. Construction costs exceeded $1 million; operating costs are lower (data accumulated by MWA) because these systems involve passive treatment; however, system re-builds are required periodically as neutralizing components are exhausted or caked in precipitates.

The former Melcroft Mine #3 discharges and Melcroft treatment facilities (**Figure 4.1**) were visited in October 2023. The process for water management and treatment of the Melcroft discharges includes the following:

- Influent mine water that includes: a horizontal well that intercepts the water in the mine pool and directs that mine water, by gravity, to the treatment system; a second discharge from the Melcroft Mine to the treatment system; and a flowing well that discharges water into the treatment system.

- Influent water is initially directed to a collection pond that equalizes flow and initiates the oxidation, precipitation, and settling of some metals (mainly iron).
- Flow from the collection pond is directed to vertical flow wetlands where flow is encouraged to seep through a limestone bed that neutralizes pH.
- Effluent from the vertical flow wetlands is directed to a settling pond where metals are precipitated from solution and settle to the bottom of the settling pond.
- Flow from the settling pond is directed to anaerobic wetlands that provide additional removal of metals through oxidation, settlement, and adsorption to organic matter.
- The final stage of treatment is manganese removal through a shallow limestone bed. Treated water is discharged into Champions Creek.

Assessment of the efficacy of this system is provided in **Section 4.7**.

4.4 **Melcroft No. 1 Mine** (Kalp Discharge)

The Melcroft #1 Mine, which is located to the south of the Study Area, was a 2,500 acre underground, room and pillar coal mine (**Figure 4-1**) that operated from the early 1900s through the 1930s, mining coal from the Middle Kittanning coal seam adjacent to the Champion Creek valley, upstream of its confluence into Indian Creek. The mine was reopened briefly in the 1950s. AMD impacts were prevalent in the early stages of mining, and in 1924 the Melcroft Coal Company was restrained from allowing AMD discharges into the upper Indian Creek Watershed by the Fayette County Court of Common Pleas (PADER, 1995). Approximately 2,300 acres of the mine complex were advanced in an up-dip direction and are free draining to a drift entry known as the Kalp opening. The surface elevation of the Kalp opening is 1,472 ft asl. Mine development extended down structure to elevation 1,415 ft asl resulting in a 200-acre mine pool situated along the downdip crop-line. The Kalp opening was the mine discharge location prior to project implementation and also the original starting point for the flume system.

The AMD negatively impacted the Indian Creek watershed, properties, and residences. The nature and extent of the AMD is summarized by PADEP (2005) as follows:

> "*The Kalp discharge is the largest AMD discharge in the Indian Creek Watershed. It is acidic, with elevated metals concentrations, producing approximately 40% of the total AMD pollution load in the watershed. Indian Creek receives 447 tons of acid, 128 tons of iron, and 20 tons of aluminum from the Kalp discharge every year, impacting the stream for a distance of approximately seven miles*."

Monitoring of the AMD from the Kalp discharge has occurred since 1980 (**Appendix C**). Review of the data indicate AMD flows can exceed 1,000 gpm, pH varies between 2.4 and 3.3, total iron

concentrations can exceed 100 mg/L, and total manganese concentrations vary between 2 mg/L and 3 mg/L. There has been no significant improvement in the quality or quantity of the AMD seepages from Melcroft Mine #1 since monitoring was initiated in 1980, and no significant improvement since AMD was first litigated in the 1920s.

The Kalp discharge and treatment facilities (**Figure 4.2**) were visited in October 2023. The process for water management and treatment of the Kalp discharge includes the following:

- Influent mine water flows from a horizontal well that intercepts the water in the mine pool and directs that mine water, by gravity, to the treatment system.
- Influent enters the treatment facility though a vertical limestone (up-flow) bed that provides initial pH neutralization.
- Effluent from the vertical limestone beds is directed to two settling ponds where metals are precipitated from solution and settle to the bottom of the settling ponds.
- Flow from the settling pond is directed to two vertical flow anaerobic wetlands that provide additional removal of metals through oxidation, settlement, and adsorption to organic matter.
- The final stage of treatment is additional settling in a retention pond. Treated water is discharged into Indian Creek.

Assessment of the efficacy of this system is provided in **Section 4.7**.

4.5 Fulton Mine

The Fulton mine, which is located to the south of the Study Area, started after 1961 and operated into the early 1970s, producing coal from the Middle Kittanning coal seam. It was located adjacent to the west edge of Melcroft No. 1 mine, and was relatively small. The discharge from the Fulton Mine flows from a closed secondary portal opening and up-dip crop-line discharge area located on the eastern hillside of the Poplar Run valley, approximately 200 ft east of Poplar Run and approximately 350 ft south-southeast and downstream from the confluence of Poplar Run and Newmyer Run. Seepages are acidic and contain elevated concentrations of iron, manganese and sulphate. A second seepage containing elevated aluminum concentrations flows into Newmyer Run, upstream of its confluence with Poplar Run. Neither seepage is treated, and it is difficult to measure the associated volume because there is no single, defined discharge point.

4.6 Gallentine

The Gallentine Project, which is located to the south of the Study Area, is a passive treatment system located on six acres of land between Indian Head and Normalville. It treats an acidic

discharge which formerly flowed into Indian Creek. The system was recently redesigned because within months of the completion of the original system a blow-out in the mine significantly altered the chemistry of the discharge, reducing treatment of the discharge to 50%. The redesigned system was completed in August of 2008 and consists of two vertical flow ponds and two settling basin.

The Gallentine discharge and treatment facilities (**Figure 4.3**) were visited in October 2023. The process for water management and treatment of the Gallentine discharge includes the following:

- Influent mine water flows from a mine portal and is directed, by gravity, to the treatment system.
- Influent enters the treatment facility though a vertical limestone (up-flow) bed that provides initial pH neutralization.
- Effluent from the vertical limestone beds is directed to a settling pond with limestone baffles where metals are precipitated from solution and settle to the bottom of the settling ponds.
- Flow from the settling pond is directed to two vertical flow anaerobic wetlands that provide additional removal of metals through oxidation, settlement, and adsorption to organic matter.
- Treated water is discharged into Indian Creek, upstream of Poplar Run.

Assessment of the efficacy of this system is provided in **Section 4.7**.

4.7 Assessment of Treatment Systems

General

The AMD seepages and treatment systems in the vicinity of Melcroft provide representative examples of the AMD management systems that are in place to identify, mitigate, and monitor the performance of these systems. These experiences also indicate that AMD continues for decades if not centuries after mine closure. Assessment of the efficacy of the following aspects of these AMD management systems is provided in the underlying sub-sections:

- identification and implementation of mitigating measures
- performance of the treatment
- long term reliability

Identification and Implementation

The primary discharges of AMD water into the Indian Creek watershed have been identified and addressed through the implementation of passive treatment. These discharges had a long

documented history of damaging the Indian Creek watershed, as well as private property and water supplies, before they were addressed.

A number of additional mine-impacted seepages are evident in the area and have not been addressed. The Fulton discharge (**Section 4.5**) is an example of a significant AMD discharge that has not been addressed, even though it is known to have been present since at least 1994. A nearby seepage is also having an adverse impact to the water quality and ecological health of Newmyer Run, and has not been addressed. Based on this experience, it is clear that the State ARD identification and mitigation system is not 100% effective and/or reliable.

Performance of the Treatment

Table 4.1 summarizes the results of the monitoring of the system influent and effluent for pH, iron, manganese, and aluminum, which are the primary indicators of AMD impact, for each of the AMD treatment facilities in the area. Complete summaries of the monitoring information for these facilities are presented in **Appendix C**. The data in **Table 4.1** and **Appendix C** were obtained from the brochures of treatment facilities prepared by MWA. Review of **Table 4.1** indicates the following:

Melcroft

- the system is effective in neutralizing pH and reducing aluminum concentration
- iron concentrations are reduced significantly, but iron removal efficiency varies
- manganese removal efficiencies are variable and typically poor

Kalp

- treatment efficacy is generally unreliable, with pH and aluminum, iron, and manganese concentrations approaching inlet concentration in numerous sampling events

Gallentine

- the system is effective in neutralizing pH and reducing aluminum concentrations
- iron and manganese concentrations are reduced significantly, but efficiency varies
- prior to 2012, removal efficiencies were poor

Table 4.1

AMD Treatment Monitoring (MWA, last 5 years)

Facility	pH	Aluminum (mg/L)	Iron (mg/L)	Manganese (mg/L)	Sulphate (mg/L)
Melcroft – Main Influent	3 to 6	1 to 8	7 to 45	3 to 4	370 to 430
Melcroft – New Kalp Influent	3 to 3.3	7 to 11	1 to 3	1.1 to 1.5	7 to 11
Melcroft – Well Influent	6.2 to 6.6	<0.5	55 to 70	8 to 9	600 to 750
Melcroft - Effluent	6.5 to 7	<0.5	<0.3 to 1.6	0.5 to 8	350 to 600
Kalp – Influent	3 to 3.5	5 to 7	6 to 18	1.1 to 1.5	300 to 600
Kalp - Effluent	4 to 7	<0.5 to 7	<0.3 to 7	0.1 to 1.8	<20 to 400
Gallentine – Influent	3 to 5	1 to 13	20 to 110	30 to 40	200 to 600
Gallentine – Effluent	7 to 7.5	<0.5	<0.3 to 20	0.1 to 2.6	330 to 400

Based on these data, the systems are not effective in removing all of the ARD pollutants to levels that would have pre-dated the mines in this area, and removal efficiencies vary significantly over time. Also, there are extended periods when the treatment would be classified as unreliable and poor.

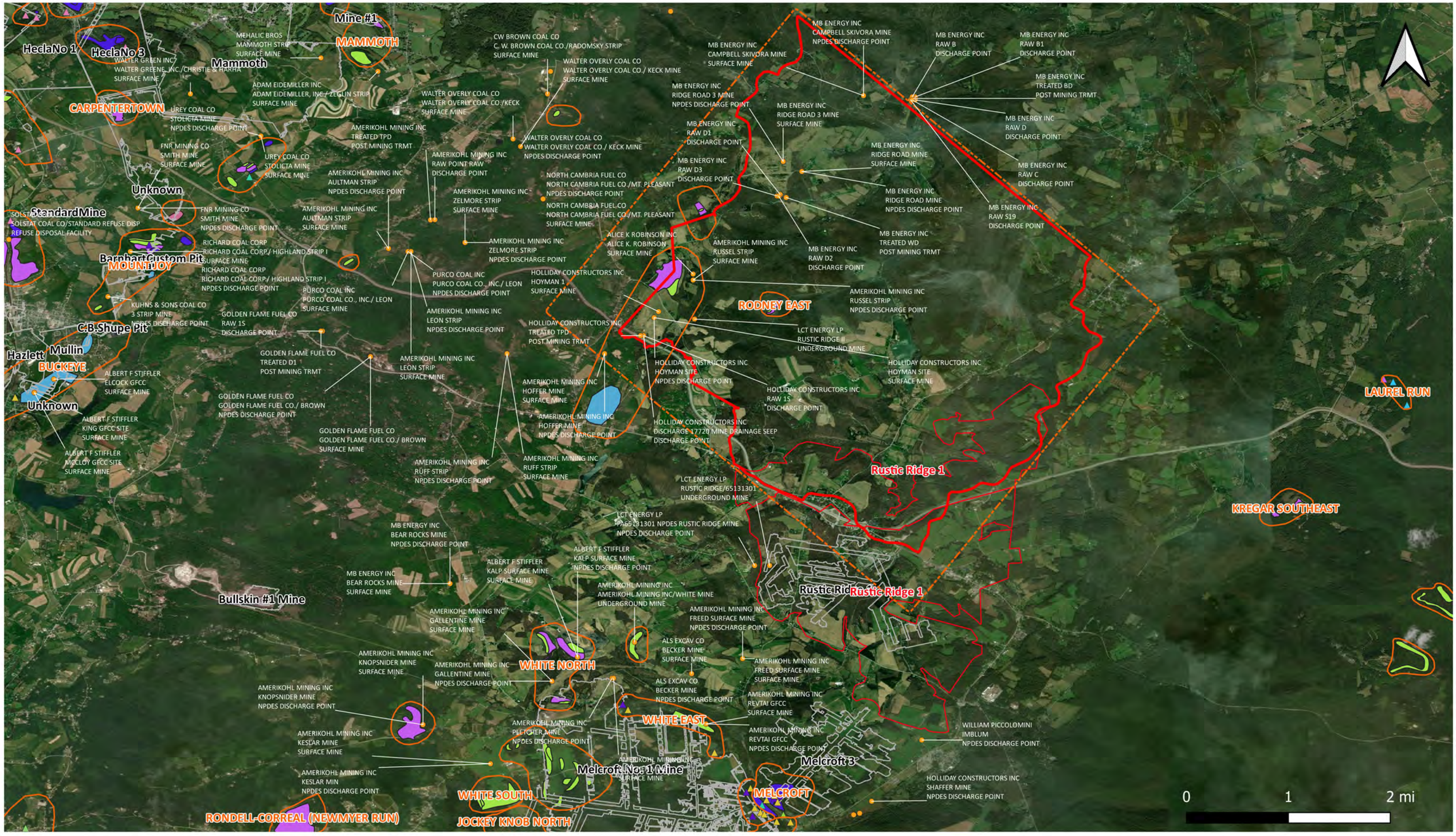
Long Term Efficacy

Whatever measures are put in place for AMD mitigation, it is critical that they are effective over the very long term. The AMD has been seeping out of the Melcroft Mine for more than a century and there is no sign of diminishing AMD in the Kalp discharge. Inspection of the AMD treatment system included evaluation of their operability relative to their intended designs. The following observations were made:

- The Melcroft treatment system requires significant maintenance. The influent flow meter is completely encased in iron precipitate, the baffle system in the sedimentation ponds is completely broken, and vertical flows in the engineered wetlands appear to be clogged.
- The Gallentine treatment is operating and functioning well; however, it was recently re-built because it had lapsed into a state of disrepair and malfunction.
- The Kalp system was also not operating as intended. The vertical flow beds appear to be clogged, preventing the upwards flow of at least some of the ARD through the limestone beds. The engineered wetland flow control systems also appeared to be clogged.

Based on discussions with MWA personnel, major reconstructions of Kalp and Melcroft are planned, and are proposed to be funded by the federal infrastructure bill. It is clear from the observations made during the Site inspections and the monitoring records of these facilities, that they cannot be relied upon to operate effectively over the anticipated duration of the AMD. This

experience demonstrates that water treatment that may be implemented by a mine operator and/or the State cannot be relied upon to be effective or to operate reliably over to the duration of AMD.



- Study Area
- Headwaters of Fourmile Run
- Coal Mining Operations (2023-07)
- Active Underground Permit Boundaries (2023-01)
- Abandoned Mine Lands Inventory Sites (2023-07)

Abandoned Mine Lands Inventory Polygons (2023-07)

- Coal Deep Mine
- Coal Surface Mine
- Refuse Pile
- Settling Basin
- Spoil Area
- Subsidence Area

Abandoned Mine Lands Inventory Points (2023-07)

- 03 Open Shaft/Mine Entry
- 14 AMD Discharge Area
- 31 Vertical Mine Shaft
- 33 Crop Fall or Subsidence Opening
- 60 Abandoned Structure
- 70 Untreated Discharge
- 72 Treated Discharge
- 73 Untreated Discharge
- 91 AMD ground saturation

MAP SOURCE: ESRI World Imagery

MAP PROJECTION: EPSG:4269 - NAD83

PAPER SIZE ASSOCIATED WITH MAP SCALE: A3

Assessment of Suitability for Mining
Donegal Township, Pennsylvania

Current and Historical Mines

BURGESS ENVIRONMENTAL

Map Scale: 1 : 40,000

PROJECT NUMBER:	ENVI-07
DATE:	2023-09-26
CREATED BY:	EJ
REV:	GJ

FIGURE NO.: **4-1**

5 IMPACT ASSESSMENT

5.1 General

This assessment of impacts predicted to be caused by mining generally conforms with the United Nations (2004) EIA best practices, whereby the scope of the assessment is identified and the significance of the potential impacts are determined for selected of criteria. The following predicted impacts from potential surface and underground mining in the Headwaters of Fourmile Run, as described in **Section 3**, were included in this assessment:

- flow loss in streams and wetlands
- degradation of water quality in streams
- reduction in the quantity and quality of groundwater
- AMD

The impacts associated with historical mining in the Study Area, and to the immediate south of the Study Area, as well as PADEP's (PADER, 1995) own analyses, indicate that these impacts can be predicted with a high degree of confidence. The significance of the predicted impacts are assessed in terms of the following criteria:

- Likelihood: the potential impacts is defined as 'definite', (>90% probability of occurrence); 'likely' (>50% probability of occurrence); possible (<50% probability of occurrence); or 'unlikely' (<10% probability of occurrence).
- Magnitude: the scale of the potential impact is compared to natural or pre-mining conditions. A potential impact is considered 'large' if the potential impact is comparable to the natural condition, 'significant' if the potential impact is on the order of 50% of the natural condition, 'moderate' if the potential impact is on the order of 25% of the natural condition, and 'small' if the potential impact is less than 10% of the natural condition.
- Direction: the potential impact can be positive (beneficial), negative (detrimental), or neutral. Only negative (detrimental) impacts are given consideration in this assessment.
- Duration: the potential impact can be 'temporary' typically meaning that it only occurs during the operating period of the mine; 'permanent' meaning that the potential impact is expected to occur in perpetuity or over the very long term; or 'reversible' meaning the potential impact can be reverse over time or through intervention.

Where reasonable to do so, potential impacts are assessed quantitatively. Where it is not possible or practical to do so, potential impacts are assessed qualitatively. The potential to effectively

mitigate or reverse potential impacts is also assessed in the context of mine best management practices and/or mitigating measures typically included in mine permit applications.

5.2 Flow Loss in Streams and Wetlands

General

Flow loss in the upper tributaries of Fourmile Run occurs as a result of the dewatering the coal bearing unit and surface mine, which increases the downwards seepage of fresh groundwater into those zones. These upper aquifers currently discharge to the upper reaches of the tributaries of Fourmile Run, which is a particularly important source of water during dry periods. During mining, these groundwater discharges to the Fourmile Run watershed are reduced because groundwater from the mine would be diverted to the Jacobs Creek watershed (see **Section 4.1**). It is relevant to this assessment, and a typical underground mine that could be developed in the Headwaters of Fourmile Run, because the mine seepage water would be diverted to the Jacobs Creek watershed from the Fourmile Run watershed (see **Section 3.3**) through the surface mine area (i.e., it is an activity that occurs in the surface mine area).

Assessment

Likelihood. The reduction of seepages and groundwater recharge into the upper tributaries of Fourmile Run is definite because dewatering of the Lower Kittanning coal seam increases the downwards seepage of groundwater, which in turn reduces the proportion of groundwater in the upper aquifers that discharges and seeps into these tributaries. The hydraulic connection between the underground mine and the overlying freshwater aquifers is evidenced by the continued seepage of mine water from abandoned mines (see **Sections 2 and 4**).

This is further evidenced by the response of monitoring wells to dewatering and mining of the existing Rustic Ridge Mine (**Figure 5-1**). The three monitoring wells constructed in the nested location at the entry portal to the Rustic Ridge mine, southwest of Donegal, all responded at the same time to dewatering of the Lower Kittanning coal seam, which occurred in August 2018. Although the nature of the dewatering effort is not clear, the simultaneous response of the piezometers indicates that there is hydraulic connection.

The Rustic Ridge Mine has also caused subsidence and surface damage (LCT, 2021, Module 22), which LCT attributed to floor heave. Such events result in direct hydraulic connection with the surface, as well as bedrock aquifers that may be located proximate to the collapse (University of Pittsburgh, 2014).

Magnitude. The magnitude of this potential impact can be assessed by estimating the volume of groundwater that is diverted from the Fourmile Run watershed to the Jacobs Creek watershed, and comparing this reduction in flow to the measured and/or predicted flows in the unnamed

tributaries to Fourmile Run. The rate of diverted groundwater can be estimated by multiplying the normalized long term seepage out of an underground mine and multiplying that normalized seepage by the area of the mine that would otherwise drain towards Fourmile Run. The rate of diverted groundwater would then be compared to the measured (or predicted) rates of flow in the upper tributaries of Fourmile Run.

The normalized rate of seepage out of an underground mine of 0.4 gpm per acre has been estimated by Winters et al. (2001) and LCT (2023, Module 8). Assuming that half of the Study is mined and that 90% of this area would otherwise drain to the Fourmile Run watershed, the rate of groundwater diversion from the Fourmile Run watershed to the Jacobs Creek watershed is 810 gpm. This represents an upper bound estimate of the diversion because not all groundwater that seeps out of the mine would otherwise discharge to Fourmile Run. The 0.4 gpm per acre seepage rate has been used in this assessment because it was proposed by LCT and accepted by PADEP, and appears to be an accepted estimate in this area of Pennsylvania.

The magnitude of the impact of this diversion to flows in upper tributaries to Fourmile Run can be put into context by comparing the diversion to low flow levels measured at SW515 (600 gpm), SW518 (300 gpm), and SW519 (100 gpm) (see **Section 2.2**). While these monitoring points do not account for the entire area of the Headwaters of Fourmile Run where groundwater would discharge, they do account for approximately 50% of the lands that would drain and discharge to the Fourmile Run watershed; hence, the magnitude of the impact is on the order of 25% of these flows (flows in these upper tributaries to Fourmile Run would diminish by approximately 25% during low flow conditions).

Duration. The potential flow loss in Fourmile Run may be permanent as the mine will act as a preferential flow and seepage path for groundwater, in perpetuity. The onset of this impact occurs at the start of mining, and based on the groundwater monitoring completed by LCT (2023, Module 8) may have already be occurring as a result of operating the Rustic Ridge Mine (see **Section 2.4**).

Potential Mitigating Measures

In Burgess' experience, measures are not typically implemented to mitigate the diversion of water in closed, flooded, and/or abandoned mines. For example, there appear to be no mitigating measures proposed in LCT's application for the Rustic Ridge I expansion or the Rustic Ridge II Pre-application filings. Mitigating measures are also impractical to implement because they would require selective transfer of water to streams and wetlands, in perpetuity. Accordingly, this impact is not considered to be reversible.

Implications to Tributary 37998 of Jacobs Creek

The decrease in seepage flows to Fourmile Run will result in a corresponding increase in flow to the Jacobs Creek watershed. The following impact assessment criteria were determined for the increases in flow, assuming that the mine water is directed to Tributary 37998 of Jacobs Creek:

- consistent with flow loss to Fourmile Run, the flow increase in Tributary 37998 will definitely occur
- magnitude is high because the rate of mine discharge higher than measured flows in Tributary 37998
- duration is temporary as it will likely occur only over the duration of mining
- mitigative measures could include directing mine water directly to Jacobs Creek

Flows in the tributaries to Jacobs Creek, during normal flow conditions, would approximately double as a result of the mine discharge. The additional flows in this tributary would also exacerbate potential erosion during significant rainfall events.

5.3 Water Quality Impacts to Streams

General

Water quality impact to Tributary #37998 and Jacobs Creek occurs if mine water and seepage is discharged to a nearby stream. This occurs during the active mining stage, when mine water is treated and pumped out of the surface portion of the mine, and possibly during the post-closure period when seepages flow out of the closed and flooded mine due to the preferential groundwater flow paths created by the mine and surface access to the mine. Water quality impacts to Fourmile Run and its upper tributaries occurs as fresh groundwater, which would otherwise discharge into Fourmile Run, is diverted through the mine. As a result, Fourmile Run would lose the diluting effect of this fresh groundwater discharging to the watershed. It could also occur after mine closure if the preferential flow path for mine water is to Fourmile Run. The potential impacts are relevant to this assessment because the mine seepage water is discharged to the Jacobs Creek through the surface mine, during mining operations.

Sulfate, iron, manganese concentrations are used to assess the impact to surface water quality.

Assessment of Water Quality Impacts to Jacobs Creek and Nearby Streams

***Likelihood*.** Impact to the water quality in Jacobs Creek would definitely occur, as the quality of water discharged from an operating mine is poorer than that of a natural stream.

Magnitude. The volume of seepage water is estimated to be 900 gpm, using the same methodology as is described in **Section 5.2**. During mining, it is assumed that all of the seepage

water is discharged to Tributary #37998 through the surface access. Mine water could also seep out of the surface mine following active mining, if there is not a preferential groundwater flow path to Fourmile Run or the underground coal mines to the south.

The quality of the seepage water can be estimated using the quality of water seeping out of the former Patual coal mine, which was located in the Headwaters of Fourmile Run. "*These seeps were observed to be rich in oxidized iron based on water discoloration during field observations. Water samples reported elevated iron, manganese, and sulfate concentrations ranging from 0.68 mg/L to 17.6 mg/L, 0.23mg/L to 2.57 mg/L, and 493 mg/L to 728 mg/L, respectively*" (LCT, 2023, Module 8). It can also be estimated using the post-treatment water quality from the Hoyman Mine #1 (**Section 2.2**), which averaged concentrations of iron, manganese, and sulfate of 29 mg/L, 7.5 mg/L, and 570 mg/L, respectively. It can take years to decades for mine water chemistry and flow to stabilize after mining. Multiplying these concentrations by the estimated seepage rate of 900 gpm results in iron, manganese, and sulfate loadings to Jacobs Creek that far exceed the current loadings as measured at SW515 and SW517; hence, the magnitude of the impact to the upper reach of Jacobs Creek is large. Similar magnitude of impact would be predicted if the mine water discharge to Fourmile Run, or to the southeast, following mining.

Duration. The potential impact to water quality in Jacobs Creek would be permanent if the mine will act as a preferential flow and seepage path for groundwater, in perpetuity. The onset of this impact occurs at the start of mining, when water is first discharged into the watershed.

Assessment of Water Quality Impacts to Fourmile Run

***Likelihood*.** During mining, the loss of the diluting effect of seepages and groundwater recharge into the upper tributaries of Fourmile Run is definite because dewatering of the Lower Kittanning coal seam increases the downwards seepage of groundwater, which in turn reduces the proportion of fresh groundwater in the upper aquifers that discharges and seeps into these tributaries. After mining, this impact would continue in perpetuity if the mine water seeps to the south or out of the mine access.

Magnitude. During mining, impacts to water quality in the upper reaches of Fourmile Run are not anticipated to be as significant because the measured water quality in the groundwater is similar to that of the sampled tributaries to Fourmile Run (**Sections 2.2 and 2.4**). Accordingly, the magnitude of the potential impact to water quality in Fourmile Run is small. After mining, the water quality impacts would be larger if mine water discharges to Fourmile Run.

Duration. The loss of the diluting effect of groundwater recharge into Fourmile Run is permanent as the mine will act as a preferential flow and seepage path for groundwater, in perpetuity. The onset of this impact occurs at the start of mining, and based on the groundwater monitoring

completed by LCT (2023, Module 8) has already partially occurred as a result of operating the Rustic Ridge Mine (see **Section 2.4**).

Potential Mitigating Measures

Discharges to the Jacobs Creek watershed would be monitored over the life of the mine, and treatment implemented as required to comply with the conditions of a NPDES permit. There is no certainty that monitoring and treatment would be implemented following mine closure or that treatment would be effective in mitigating iron, manganese, or aluminum loadings to Jacobs Creek (see **Section 4.7**).

With regard to the potential impacts to Fourmile Run and in Burgess' experience, measures are not typically implemented to mitigate the impacts associated with diversion of freshwater away from a watershed. Mitigation is impractical because it would involve transfer of water across watersheds, in perpetuity. Further, there appear to be no mitigating measures proposed in LCT's application for the Rustic Ridge I expansion or the Rustic Ridge II Pre-application filings.

5.4 Impacts to Groundwater

General

Downwards seepage of fresh groundwater in the upper aquifers potentially occurs as a result of the dewatering the coal bearing unit and surface mine, which increases the downwards seepage of fresh groundwater into those zones (see **Section 5.2**). These upper aquifers are used as water supplies, and the quantity of available groundwater is reduced by the downwards seepage of groundwater into the mine. It is relevant to this assessment because the mine seepage discharges to the environment through the surface mine. The vast majority of water supply wells in the Study Area are completed above the Lower Kittanning coal seam (**Figure 2-3**), so there is potential for the quantity of water in these wells to be impacted by the mining.

Some groundwater supply wells have been completed below the Lower Kittanning coal seam (see **Figure 2-3**); hence, there is potential to impact to the quality of groundwater in these wells because impacted mine water could be drawn down into those lower wells.

Assessment of Impacts to Groundwater Quantity

***Likelihood*.** The reduction of fresh groundwater in the upper aquifers is definite because dewatering of the Lower Kittanning coal seam increases the downwards seepage of groundwater, which in turn reduces the quantity of groundwater in the upper aquifers that are used as water supplies.

Magnitude. The volume of seepage water is estimated to be 900 gpm, using the same methodology as is described in **Section 5.2**, and assuming that all of the mine seepage water of

0.4 gpm per acre originates in the upper aquifers. This would be considered an upper bound estimate because it is possible that mine seepage water does not originate entirely within the fresh aquifers overlying the Lower Kittanning coal seam.

The volume of freshwater in circulation in the near-surface aquifers can be estimated based on the estimated mean annual recharge of groundwater of approximately 13 inches per year (**Figure 2-6**). The average mine seepage rate of 0.4 gpm per acre equates to approximately 0.65 acre-feet per year (AFY), which indicates that approximately 60% of the recharged groundwater would be expected to discharge as mine seepage and is classified as a significant potential impact. Stated differently, approximately half of the fresh groundwater in the aquifers above the coal seam would be lost to mine-related seepage and discharge.

Duration. The potential reduction in groundwater in freshwater aquifers above the Lower Kittanning coal seam is permanent as the mine will act as a preferential flow and seepage path for groundwater, in perpetuity. The onset of this impact occurs at the start of mining, and based on the groundwater monitoring completed by LCT (2023, Module 8) has already partially occurred as a result of operating the Rustic Ridge Mine (see **Section 2.4**).

Potential Mitigating Measures

In Burgess' experience, measures are not typically implemented to mitigate the downwards seepage of fresh groundwater into the mine workings. Mitigation of groundwater impacts is impractical to implement, although the mining companies typically commit to providing alternate water supplies.

5.5 Acid Mine Drainage

General

"*Today there are over 5,500 miles of streams in the state with impaired water quality due to runoff from abandoned mines. Once pyrite (a naturally occurring mineral found alongside coal) is exposed to oxygen and water, the process of acid generation cannot be easily stopped. The acid runoff can continue for thousands of years until the pyritic material in the mine is deteriorated. It has been reported that there are mines from the Roman era that are still producing acid mine drainage nearly two thousand years after completion of the mine* (Pennsylvania, 2023b)". Pennsylvania (2023b) states that AMD is toxic to fish and invertebrates, and that "*the estimated cost to construct and operate all the needed facilities would run into the billions of dollars*".

Past assessments completed by PADEP (PADER, 1995) and the experience of historical mines in the Study Area and south of the Study Area indicate that AMD is likely to occur. While the LCT applications do not anticipate AMD from mines operating in the Lower Kittanning coal seam, this is based on limited analyses, as described below. There are many case histories of AMD from

nearby mines in the Lower (Middle) Kittanning, and this experience indicates that AMD is likely should mining occur in The Headwaters of Fourmile Run. Mining in a down-dip direction, as it required by Pennsylvania regulations regarding underground coal mines, will reduce but not eliminate the risk of AMD.

Assessment of AMD

Likelihood. Experience indicates that it is difficult to predict what mines may be susceptible to AMD because the AMD process is dependent on a range of naturally occurring conditions, which include the mineralogy of the ore and adjacent formation, exposure to oxygen and water, and the availability of neutralizing compounds in rock and water. These conditions can change significantly over the operating and closure period of a mine, and with distance. A mine that does not exhibit AMD during operation can start generating AMD after the mine is closed, and the degree of AMD can change overtime.

LCT (2023, Module 7) provides test results to evaluate the acid generating potential of the Lower Kittanning coal seam, as well as the overlying and underlying strata. **Table 5.1** summarizes these data. The strata is considered to have significant potential for AMD if the total sulfur content exceeds 0.5% and the neutralization potential (NP) is less than 30 tons per kilo-ton (kt/t). Review of these data indicate that the sulphur content exceeds 0.5% by a significant margin in all three layers, and that the NP <30 kt/t in two of the three strata. Samples for acid base accounting (ABA) testing appear to have been collected from only one boring.

These data indicate that AMD is likely to occur. These values are significantly different than the ABA results for the Rustic Ridge I Application (LCT, 2021, Module 7), which shows that sulphur content and NP can vary considerably over short distances.

Table 5.1

Acid Base Accounting (LCT, 2023, Module 7)

Strata Layer	Thickness (ft)	Sulfur (%)	Neutralization Potential (t/kt)
Roof Strata	1.0	1.23	32.6
Lower Kittanning Coal	>3.5	4.41	9.7
Floor Strata	1.0	2.04	15.9

Rose et al. (1982) also provides additional insight into the likelihood of AMD occurring in a mine extracting coal from the Lower Kittanning coal seam, in portions of Westmoreland and Cambria Counties. This study suggests that the AMD potential in the Lower Kittanning coal seam is high over approximately half of that study area.

The preferential flow path created by the mine could ultimately drain through the labyrinth of operating and closed underground coal mines to the south of the Study area, which would ultimately increase AMD in the former Melcroft mines that have impacted Indian Creek for over a century.

Magnitude. The impacts associated with AMD are large, as evidenced by the aforementioned statement from the Commonwealth of Pennsylvania, and the Case Histories summarized in **Section 4**.

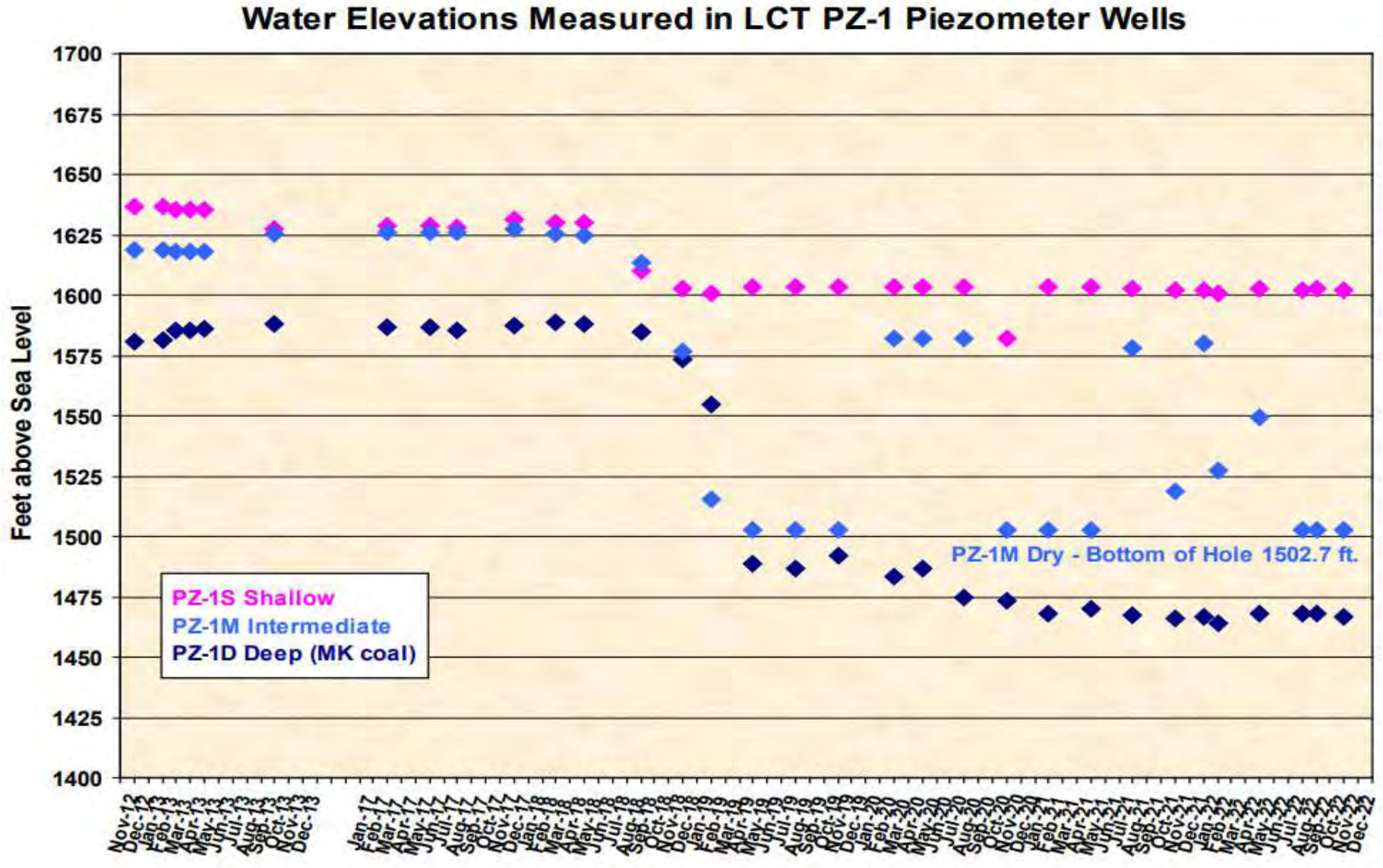
Duration. The duration of AMD is often extremely long, as is evidenced by the AMD of the Kalp discharge, which has been occurring for more than a century and is not diminishing. In this case, the timing of the potential onset of AMD is equally difficult to predict because it may take decades for the groundwater conditions to stabilize after mining is finished in the area and mines are flooded. AMD typically occurs for decades or centuries in instances where large mines produce AMD.

Potential Mitigating Measures

Mitigation of AMD can include one or more of the following actions:

- active chemical treatment and release
- passive treatment
- management in place by mitigating exposure to water and/or oxygen
- neutralization in place by the addition of limestone (calcium carbonate)

Most AMD sites involve some degree of active or passive treatment (see **Section 4**). Pennsylvania (2023b) states, "a*t this time, DEP's Bureau of Abandoned Mine Reclamation (BAMR) operates eight active facilities and 50 passive systems, while various non-governmental organizations such as watershed groups and conservation districts operate roughly 350 passive sites in the state*". Review of relevant AMD case histories (**Section 4**) indicate that regulatory actions are not always reliable, treatment is not 100% effective, and the systems used to treat AMD deteriorate over time. Accordingly, AMD mitigation is considered only partly effective.



Source: LCT, 2023

MOUNTAIN WATERSHED ASSOCIATION

Assessment of Fitness for Mining

Piezometric Response in Rustic Ridge Development Area

BURGESS ENVIRONMENTAL

Date:	Scale:
12/15/2023	
Project No.:	**Figure No.:**
MOUN-01	**5-1**

6 RELEVANT UNSUITABLE FOR MINING DETERMINATIONS AND ADJUDICATIONS

6.1 Overview

A number of UFM petitions filed in the area, and adjudications were reviewed to assist in assessing the impacts described in **Sections 4.3** and **5**. These petitions and adjudications are relevant to this assessment because they are located proximate to the Headwaters of Fourmile Run, and they considered mining of the same or a comparable coal seam, and include:

- Indian Creek Petition
- Laurel Run Watershed Petition
- Rand Am No. 4 Adjudication

The information contained in these petitions and adjudication confirm that the following impacts have occurred as a result of past mining and can be expected to occur if future mining in the area is permitted.

- surface and underground mines in the area are prone to AMD
- water quality in streams adjacent to active and abandoned mines is degraded
- the quantity of water is reduced in streams where groundwater is diverted away from that watershed
- the quality and/or quantity of groundwater resources are degraded as a result of mining

6.2 Petition 26949901 Indian Creek

Petition 26949901 for Indian Creek (Indian Creek Petition) is relevant to this assessment because the petition area was located just south of Donegal, and PADEP completed a thorough technical review of potential impacts, a number of which are similar to those being assessed in this report. The Indian Creek Petition was filed by MWA in 1994. MWA claimed that reclamation of the areas affected by mining was not feasible because of the geologic and hydrologic characteristics of the petition area. The Indian Creek Petition alleged that mining would cause AMD, which would destroy the remaining water supplies and would create additional pollution.

The petitions area covered 10,000 acres of the upper Indian Creek watershed, citing three former underground mines and two surface mines that were creating AMD and degrading stream quality. For the purpose of its review, PADER (1995) enlarged its study area to 49,871 acres. The PADER review confirmed that many of the former surface and underground coal mines in the area are acid generating. In response to a lawsuit filed by users of water in Indian Creek, a diversion system known as “the flume” was constructed to divert water to below the Indian Creek reservoir. The

capacity of the flume was exceeded by AMD from the mines and efforts to upgrade the Flume were not successful (**PADER, 1995**).

Assessment of springs not impacted by mining operations indicated that iron and manganese concentrations in the sampled water were low, with the median measured iron concentration <0.1 mg/L and the median manganese concentrations <0.02 mg/L (**PADER, 1995, Table 8**). Water supply and monitoring wells in the study area were also sampled, although it is not clear whether these wells were potentially impacted by past mining activities. Higher concentrations of iron were measured in most of these wells, which were loosely correlated to higher concentrations of sulfate and manganese, suggesting mine-related impacts to groundwater quality had occurred in these wells. **PADER (1995)** concluded that "*chemical analysis of water samples from PZ-4A and PZ-4B indicate elevated concentrations of iron and manganese, and elevated concentrations of sulfates were found . . . which is believed to be a groundwater discharge originating from the abandoned Melcroft No. 3 underground mine*".

PADER (1995) also sampled streams and mine discharges to understand the potential impacts to surface water quality. The sampling of the Upper Indian Creek watershed is considered most analogous to the Headwaters of Fourmile Run. Water quality in Upper Indian Creek indicated relatively clean water, with iron concentrations varying between 0.04 and 0.25 mg/L and manganese concentrations varying between 0.2 to 0.1 mg/L. In contrast, samples collected from discharges of former Kreger underground mine were acidic and contained iron and manganese concentrations of 4.91 mg/L and 1.1 mg/L, respectively. The samples from the Kalp surface mine indicated similar impacts; the seepage water was acidic, and contained iron and manganese concentrations up to 4.91 mg/L and 27.4 mg/L, respectively. High concentrations of aluminum were also elevated in seepages from both mines, which is also indicative of AMD.

PADER (1995) also acknowledged the adverse impact of AMD on biota, stating, "*acid mine drainage degrades both the physical habitat and water quality, severely limiting the diversity and abundance of macroinvertebrates, especially the EPT taxa".*

Notably, **PADER (1995)** concluded that "*abandoned Middle Kittanning underground coal mines capture a significant portion of the regional groundwater flow and direct it to discharge points"* and that this water "*is highly acidic with elevated concentrations of metals and sulfate"*. It further concluded that "*many surface mined areas . . . have resulted in production of acid mine drainage . . . containing elevated concentrations of metals and sulfate".* These data indicate that these same conditions are likely to occur in a mine developed in the Lower Kittanning coal seam in the Headwaters of Fourmile Run.

The UFM Petition was not granted, although the technical review appear to conclude that it should have been granted. PADER (1995) concluded that "*there is strong potential that underground mining would cause acid mine drainage problems"*, there was insufficient data to conclude that AMD would occur "*in all cases*". A mining application made in the UFM Petition area that was submitted jointly by Rand Am and Melcroft Coal (see **Section 6.4**) was denied.

6.3 Petition 11909901 Laurel Run Watershed

Petition 11909901 for the Laurel Run Watershed (Laurel Run Petition) was filed in January 1990 by the Committee to Preserve Rager Mountain. The Laurel Run Petition covers a 14.1 square mile area that is located approximately 30 miles northeast of the Headwaters of Fourmile Run and was designated UFM. This petition is relevant because it is located relatively close to Donegal and the issues raised in the Laurel Run Petition are similar to those addressed in this assessment for the Headwaters of Fourmile Run. Mining of the Lower Kittanning coal seam was also widespread in the Laurel Run study area. The petitioner alleged that it was not technically or economically feasible to reclaim a surface mine and that surface coal mining within the Laurel Run watershed would (amongst other concerns) adversely affect water quality, water supplies and the fishery.

The department determined that mining had the potential to impact public water supplies, Laurel Run is lightly buffered and has little or no alkalinity, surface and underground mines in the area produced AMD, and Laurel Run supported important trout species. The petition area covered a remote, 14.1 square mile area of the Laurel Run watershed, north of the City of Johnstown.

Numerous underground mines had been developed to exploit the Lower Kittanning coal seam, which is the seam most extensively mined in southern Cambria County. Several of these mines extended into the Laurel Run watershed. Approximately 60 acres of the study area had been affected by surface coal mining in the Laurel Run watershed.

PADER (1990) assessed the acid generating potential of the formations using the rules of thumb established by Brady and Hornberger, whereby overburden that contains greater than 0.5% sulfur and neutralizing potential (NP) less than 30 tons per thousand tons has significant potential to generate AMD. The overburden above the Lower Kittanning coal seam has a sulfur content varying between 0.02% to 2.58%, and NP less than 14.8, indicating significant potential for AMD (LCT, 2023).

The headwaters of Laurel Run would be most similar to the headwaters of Jacobs Creek and Fourmile Run. Concentrations of iron, manganese and sulfate averaged 0.24 mg/L, 0.16 mg/L and 25 mg/L, respectively. Aluminum concentrations above 1.25 mg/L were also measured. High concentrations of these parameters were measured in groundwater monitoring wells completed

in the Lower Kittanning coal seam. These data indicated that Laurel Run is lightly buffered, with generally low levels of alkalinity, below 20 mg/L.

The technical study concluded that "*changes in the hydrologic system that would cause increases in acidity in Laurel Run would have a significant potential to adversely affect, or possibly eliminate, the native trout population*" (PADER, 1990). This was primarily due to the low alkalinity (buffering capacity) of Laurel Run. The Laurel Run watershed was determined to be unsuitable for mining.

6.4 Rand Am No. 4 Adjudication

The information summarized in this section was extracted from an adjudication (Pennsylvania, 1997) of the Rand Am appeal of the denial of their application for the Rand Am No. 4 mine. The Rand Am No. 4 Mine would have been located over a 3,000 acre area in Westmoreland and Fayette Counties, just south of the Headwaters of Fourmile Run, and would have mined coal from the Middle Kittanning coal seam (Lower Kittanning as referred to by LCT). The application was a joint submission by Rand Am and Melcroft Coal, which had operated other mines in the Indian Creek watershed. The original application and appeal were also opposed by MWA. The case history is relevant to this assessment because the proposed mine was located immediately south of the Headwaters of Fourmile Run and would have mined the same coal seam.

The 1993 application was for a room and pillar underground mine, which would have required mine water to be pumped out throughout its operation. Undisturbed barriers of coal were to be maintained between the proposed Rand Am No. 4 mine and nearby abandoned underground coal mines to reduce groundwater and mine seepage between those mines.

The adjudication decision noted that "*many* (polluted) *discharges from old, abandoned mines exist in the vicinity of proposed Rand Am No. 4 mine. These acid mine discharges include the Kalp Discharge, Gdosky Discharge, other down-dip crop line seeps along Indian Creek, and discharges near or into Poplar Run, Little Champion Creek, and Champion Creek*" and that "*groundwater can move laterally within a geologic unit or vertically up or down between and through different units*".

The decision also noted that "*potential for* (polluted) *discharges from the proposed Rand Am No. 4 mine exists in the Champion Creek and Indian Creek Valleys*". It was also noted that the "*best predictor of the water quality effects of future mining is past mining in the area*" and that "*the posed Rand Am No.4 mine has the potential to create acid mine drainage*". The Melcroft No. 1 and 3 mines and the Fulton mine were cited as examples of nearby mines in the same coal seam that had resulted in polluted discharges to the watershed. Importantly, it was noted that "*naturally occurring alkalinity is not a remedy for the polluted water that Rand Am No. 4 would produce. Alkalinity does not remove metals, such as iron and manganese, from water*".

The Rand Am permit application and appeal were rejected because the barriers were considered inadequate and because the proposed mine would cause pollution. The decision concluded that "*it seems almost certain that mining of the Middle Kittanning Coal Seam in the proposed Rand Am No. 4 mine would produce pool water which would be acidic and contain elevated concentrations of iron and sulfate*". The Rand Am application was for an underground coal mine located immediately south of the Headwaters of Fourmile Run, and contemplated the same mine development and same hydrogeological and geological conditions as those present beneath the Headwaters of Fourmile Run.

7 CONCLUSIONS

This assessment of water-related impacts from further mining that could occur in the Headwaters of Fourmile Run indicates the following:

- it is likely that AMD would occur in seepages out of a closed and flooded mine
- flow loss would occur in the upper tributaries to Fourmile Run, and would be transferred to the upper tributaries to Jacobs Creek
- the quality of water would be adversely affected in the upper reaches of Jacobs Creek and Fourmile Run
- the quantity of groundwater would be reduced in the freshwater aquifers overlying the Lower Kittanning coal seam

These impacts are relevant to this UFM assessment, as required by Pennsylvania regulations, because these impacts would result from activities occurring in an open pit mine and/or the above-ground portion of an underground mine.

Table 7.1 summarizes the significance of the potential impacts and the potential opportunities to mitigate or reverse those impacts. Review of **Table 7.1** indicates that there is a very high likelihood that these potential impacts would occur. The magnitude of most of the potential impacts is moderate to large, the impacts are essentially permanent, and there are either no or limited opportunities to mitigate or reverse those impacts, should they occur.

Table 7.1

Summary of Impact Assessment

The Headwaters of Fourmile Run Impact Assessment Summary				
Potential Impact	**Likelihood**	**Magnitude**	**Duration**	**Mitigation, Reversibility**
Loss of Water in Fourmile Run	Definite	Moderate	Indefinite	None
Increase of Water in Jacobs Creek Trib.	Definite	High	Temporary	Transfer water to Fourmile
Water Quality Degradation in Jacobs Creek	Definite	Large – Mod.	Indefinite	Treatment during operation
Water Quality Degradation in Fourmile Run	Definite	Small	Indefinite	None
Reduced Groundwater Quantity	Definite	Moderate	Indefinite	None
Acid Mine Drainage	Likely	Large	Indefinite	Possible

These predicted impacts are consistent with those that have been observed as a result of mining of the Kittanning coal seam in the vicinity of the Study Area, and particularly in the Indian Creek watershed. The information reviewed as part of this assessment indicates that the Headwaters

of Fourmile Run would be susceptible to the same risks and impacts. Most of these negative impacts are not possible to reverse or mitigate, and many will occur essentially indefinitely.

These predicted impacts are also the same as those identified by PADEP in its review of past UFM Petitions, where the proposed mine developments and conditions are comparable to the Headwaters of Fourmile Run. On this basis, it is concluded that pollution of streams of Pennsylvania is likely to occur, which would appear to contravene aspects of the Pennsylvania Clean Streams Law (see **Section 1.3**).

8 REFERENCES

Johnson, D. B. and Hallberg, K. B., 2004. Acid Mine Drainage Remediation Options, A Review. University of Wales School of Business.

LCT, 2021. Rustic Ridge I Application.

LCT, 2023. Rustic Ridge II Pre-Application.

MWA, 2023. Supplemental Errors Found Within LCT's Permit Amendment Application Materials for the Expansion to the Rustic Ridge I Mine (Supplement to August 24th Letter). Letter to PADEP dated October 12, 2023.

PADEP, 1997. Technical Study for a Petition to Designate Areas Unsuitable for Mining Muddy Run Watershed Cambria County.

PADEP, 1998. Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania.

PADEP, 2007. The Kalp and Melcroft Abatement Projects. March 27, 2007.

PADER, 1990. A Petition to Declare Areas Unsuitable for Mining. Petition #11909901 Laurel Run Watershed. Volume 1 Technical Study. November 1990.

PADER, 1995. Technical Study Document for a Petition to Designate Areas Unsuitable for Mining. Petition 26949901 Indian Creek.

Pennsylvania, 1973. Summary Ground-Water Resources of Westmoreland County, Pennsylvania. Water Resource Report 37.

Pennsylvania, 1993. Consent Decree – Commonwealth of Pennsylvania versus Holiday Constructors, Inc. June 28, 1993.

Pennsylvania, 1997. EHB Docket No. 95-161-R Adjudication. Issued April 1, 1997.

Pennsylvania, 2010. Summary of Groundwater-Recharge Estimates for Pennsylvania. Water Resources Report 70.

Pennsylvania, 2021. Subchapter B. Operations. 25 Pa Chapter 89. July 29, 2021.

Pennsylvania, 2022a. Surface and Underground Coal Mining: General. 25 Pa Chapter 86 (411027) No. 577 Dec. 22.

Pennsylvania, 2022b. Surface Mining of Coal. 25 Pa Chapter 87, (411033) No. 577 Dec. 22.

Pennsylvania, 2023a. eMapPA. Accessed September 2023. https://www.depgis.state.pa.us/emappa/

Pennsylvania, 2023b. Acid Mine Drainage Treatment Facilities – Reversing Hundreds of Years of Pollution to Bring Pennsylvania's Streams and Rivers Back to Life. Accessed August 27, 2023. https://www.dep.pa.gov/OurCommonWealth/Pages/Article.aspx?post=92#:~:text=Today%20there%20are%20over%205%2C500,generation%20cannot%20be%20easily%20stopped.

Rose, A.W., Williams, E.G., and Parizek, R.R., 1982. Prediction of Acid Mine Drainage Potential from Coal Mines. West Virginia Mine Drainage Task Force.

Schaffner, 1963. Geology and Mineral Resources of the Donegal Quadrangle, Pennsylvania. Atlas No. 48.

Schultz, 1999. The Geology of Pennsylvania. DCNR Special Publication 1, 1999.

Shaulis, J. R., 1985. Coal Resources of Fayette County, Pennsylvania. Part. 1. Coal Crop lines, Mined-Out Areas, and Structure Contours, Pennsylvania Geological Survey, 4th Series, Mineral Resource Report M 91, 88 pages.

Skema, V. W., 1988. Coal Resources of Westmoreland County, Pennsylvania. Part. 1. Coal Crop lines, Mined-Out Areas, and Structure Contours, Pennsylvania Geological Survey, 4th Series, Mineral Resources Report M 94, 127 pages.

United Nations, 2004. Environmental Impact Assessment and Strategic Environmental Assessment: Towards an Integrated Approach.

US EPA, 2010. TMDLs for Streams Impaired by Acid Mine Drainage in the Kiskiminetas-Conemaugh River Watersheds, Pennsylvania. Prepared by Tetra-Tech. January 29, 2010.

USGS, 2023. Conemaugh Group. Accessed August 20, 2023. https://mrdata.usgs.gov/geology/state/sgmc-unit.php?unit=WVPAc%3B0.

University of Pittsburgh, 2014. The Effects of Subsidence Resulting from Underground Bituminous Coal Mining, 2008-2013. 4th Five-Year Report.

Winters, 1999. Winters, R.W., Capo, R.C., Weaver, T.J., Stafford, S.L., and Hedin, R.S., 1999. Geochemical and Hydrogeologic Evolution of Alkaline from Abandoned Coal Mines.

Winters, R.W., Capo, R.C., Weaver, T.J., Stafford, S.L., Hedin, R.S., and Stewart, B.W., 2001. Hydrologic and Geochemical Evolution of Deep Mine Discharges, Irwin Syncline, Pennsylvania.

9 CLOSURE

This report has been prepared exclusively for the use of Smith Butz Attorneys at Law and Mountain Watershed Association. The text contained herein presents documentation of the assessment of the Suitability for Mining of the Headwaters of Fourmile Run. This represents the opinion of Burgess Environmental Ltd. that is based on publicly available information and the experience of Burgess Environmental Ltd. Any use of this document by a Third Party without the expressed, written consent of Burgess Environmental Ltd. is expressly prohibited.

All information contained herein has been reviewed and interpreted by, or under the direct supervision of Gordon J. Johnson, P.Eng. (AB)

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Gordon J. Johnson, M.Sc., P. Eng. (AB)
President
Burgess Environmental Ltd.

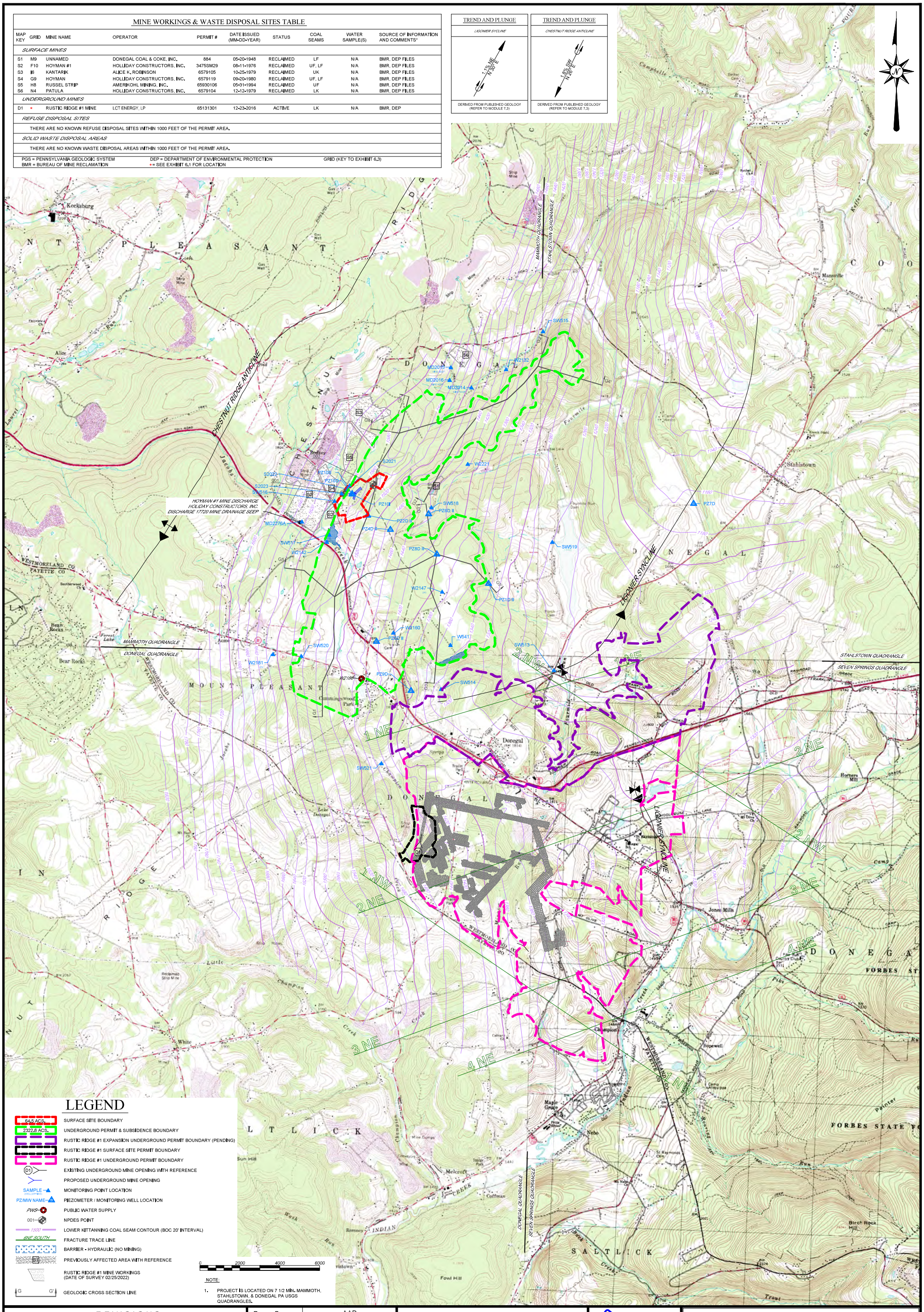
APPENDIX A
SURFACE WATER DATA

MINE WORKINGS & WASTE DISPOSAL SITES TABLE

MAP KEY	GRID	MINE NAME	OPERATOR	PERMIT #	DATE ISSUED (MM-DD-YEAR)	STATUS	COAL SEAMS	WATER SAMPLE(S)	SOURCE OF INFORMATION AND COMMENTS*
SURFACE MINES									
S1	M9	UNNAMED	DONEGAL COAL & COKE, INC.	884	05-20-1948	RECLAIMED	LF	N/A	BMR, DEP FILES
S2	F10	HOYMAN #1	HOLLIDAY CONSTRUCTORS, INC.	3475SM29	08-11-1976	RECLAIMED	UF, LF	N/A	BMR, DEP FILES
S3	I6	KANTARIK	ALICE K. ROBINSON	6579105	10-25-1979	RECLAIMED	UK	N/A	BMR, DEP FILES
S4	G9	HOYMAN	HOLLIDAY CONSTRUCTORS, INC.	6579119	09-20-1980	RECLAIMED	UF, LF	N/A	BMR, DEP FILES
S5	H8	RUSSEL STRIP	AMERIKOHL MINING, INC.	65930106	05-31-1994	RECLAIMED	UF	N/A	BMR, DEP FILES
S6	N4	PATULA	HOLLIDAY CONSTRUCTORS, INC.	6579104	12-12-1979	RECLAIMED	LK	N/A	BMR, DEP FILES
UNDERGROUND MINES									
D1	*	RUSTIC RIDGE #1 MINE	LCT ENERGY, LP	65131301	12-23-2016	ACTIVE	LK	N/A	BMR, DEP
REFUSE DISPOSAL SITES									
THERE ARE NO KNOWN REFUSE DISPOSAL SITES WITHIN 1000 FEET OF THE PERMIT AREA.									
SOLID WASTE DISPOSAL AREAS									
THERE ARE NO KNOWN WASTE DISPOSAL AREAS WITHIN 1000 FEET OF THE PERMIT AREA.									

PGS = PENNSYLVANIA GEOLOGIC SYSTEM
BMR = BUREAU OF MINE RECLAMATION
DEP = DEPARTMENT OF ENVIRONMENTAL PROTECTION
* = SEE EXHIBIT 6.1 FOR LOCATION
GRID (KEY TO EXHIBIT 6.3)

TREND AND PLUNGE	TREND AND PLUNGE
LIGONIER SYCLINE	*CHESTNUT RIDGE ANTICLINE*
1.1% NE N 30° E	1.9% SW N 26° E
DERIVED FROM PUBLISHED GEOLOGY (REFER TO MODULE 7.3)	DERIVED FROM PUBLISHED GEOLOGY (REFER TO MODULE 7.3)



LEGEND

- 64.5 ACS. — SURFACE SITE BOUNDARY
- 2322.6 ACS. — UNDERGROUND PERMIT & SUBSIDENCE BOUNDARY
- RUSTIC RIDGE #1 EXPANSION UNDERGROUND PERMIT BOUNDARY (PENDING)
- RUSTIC RIDGE #1 SURFACE SITE PERMIT BOUNDARY
- RUSTIC RIDGE #1 UNDERGROUND PERMIT BOUNDARY
- D1 — EXISTING UNDERGROUND MINE OPENING WITH REFERENCE
- PROPOSED UNDERGROUND MINE OPENING
- SAMPLE — MONITORING POINT LOCATION
- PZ/MW NAME — PIEZOMETER / MONITORING WELL LOCATION
- PWS — PUBLIC WATER SUPPLY
- 001 — NPDES POINT
- 1500 — LOWER KITTANNING COAL SEAM CONTOUR (BOC 20' INTERVAL)
- 6NE SOUTH — FRACTURE TRACE LINE
- BARRIER - HYDRAULIC (NO MINING)
- S3 — PREVIOUSLY AFFECTED AREA WITH REFERENCE
- RUSTIC RIDGE #1 MINE WORKINGS (DATE OF SURVEY 02/25/2022)
- G — G' — GEOLOGIC CROSS SECTION LINE

0 2000 4000 6000

NOTE:

1. PROJECT IS LOCATED ON 7 1/2 MIN. MAMMOTH, STAHLSTOWN, & DONEGAL PA USGS QUADRANGLES.

REVISIONS

No.	By	Date	Description

Drawn By:	AAB
Checked By:	SLH
Date:	08-26-2022
Scale:	1" = 2000'
Project No.:	0721-S220
File Name:	RUSTIC RIDGE II.DWG
Drawing:	1 of 1

Apex Companies, LLC
165 East Union St.,
Suite 100
Somerset, Pennsylvania 15501
Phone: (814) 443-3344
www.apexcos.com

PRE-APP

SIGN
OF APEX COMPANIES, LLC

EXHIBIT 8.2: HYDROLOGIC DATA MAP

RUSTIC RIDGE II

LOWER KITTANNING COAL SEAM
CMAP# PENDING MSHA ID # PENDING
MOUNT PLEASANT & DONEGAL TOWNSHIPS
WESTMORELAND COUNTY, PENNSYLVANIA

Sample Location	PF ID	Location	Date	pH	TDS	Alkalinity	Iron	Manganese
Rodney East	655713	Midstream	16-Jan-08	7.1	--	14.6	0.3	<0.01
Rodney East	655713	Midstream	26-Aug-13	7.1	52.0	30.2	1.3	0.2
Rodney East	655713	Midstream	25-May-10	7.3	66.0	25.4	0.6	<0.05
Rodney East	655713	Midstream	26-Aug-13	6.8	44.0	10.4	0.6	<0.05
Rodney East	655713	Downstream	26-Aug-13	7.3	56.0	28.2	0.4	<0.05
Rodney East	655713	Downstream	06-Feb-08	6.5	--	8.2	0.0	<0.01
	242404	Upstream	21-Mar-01	6.4	--	13.2	1.1	0.2
	242404	Upstream	09-Jul-02	6.0	--	248.0	<0.3	<0.05
	242404	Upstream	21-Mar-06	6.8	--	17.0	<0.3	<0.05
	242404	Upstream	28-Dec-06	7.0	--	16.4	<0.3	<0.05
	242404	Upstream	06-Nov-03	7.0	--	16.8	<0.3	<0.05
	242404	Upstream	02-Mar-03	7.3	--	51.2	<0.3	<0.05
	242404	Upstream	06-Nov-03	7.6	--	47.6	<0.3	<0.05
	242404	Upstream	13-Mar-01	6.8	--	26.0	3.1	0.3
	242404	Upstream	28-Dec-06	7.2	--	45.0	<0.3	<0.05
	1186030	Upstream	28-Dec-06	7.2	--	45.0	<0.3	<0.05

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator: LCT Energy, LP
Operation Name: Rustic Ridge #2
Permit No: Pending
Township: Donegal
County: Westmoreland

Monitoring Point I.D.: SW515
Latitude: 40° 10' 11.09" N and
Longitude: 79° 22' 28.63" W
Grid Coordinate: 2R
Surface Elevation: 1475 ft.

Description of Sample Point: DS Trib 43587 to Fourmile Run
Existing use(s)
Planned future use(s)
If sampling point is a well, when was it drilled:

Date Sampled	Flow (GPM) ~~or Static Water Elevation~~	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
07/21/2021	561	7.57	8.16	20.4	114	-99	0.10	0.02	<0.1	321	4	NA	NA	NA	779
08/11/2021	842	7.86	8.26	21.6	128	-114	0.09	0.02	<0.1	419	<2	NA	NA	NA	980
09/08/2021	785	7.55	8.18	19.2	92	-76	0.12	0.02	<0.1	265	3	NA	NA	NA	592
10/07/2021	1010	7.87	8.13	18.0	122	-110	0.07	0.02	<0.1	372	2	NA	NA	NA	893
11/04/2021	1795	7.89	7.87	9.0	63	-48	0.05	0.01	<0.1	109	<2	NA	NA	NA	412
12/01/2021	841	7.61	8.11	15.9	70	-53	0.05	0.01	<0.1	98	<2	NA	NA	NA	518

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator: LCT Energy, LP
Operation Name: Rustic Ridge #2
Permit No: Pending
Township: Donegal
County: Westmoreland

Monitoring Point I.D.: SW518
Latitude: 40° 08' 42.88" N and
Longitude: 79° 23' 38.69" W
Grid Coordinate: 10L
Surface Elevation: 1607 ft.

Description of Sample Point: DS Trib 43597 to Fourmile Run
Existing use(s)
Planned future use(s)
If sampling point is a well, when was it drilled:

Date Sampled	Flow (GPM) ~~or Static Water Elevation~~	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
07/21/2021	299	7.87	7.58	20.2	38	-22	0.22	0.03	0.20	6	6	NA	NA	NA	105
08/10/2021	150	6.76	7.47	24.5	92	-78	4.41	6.88	<0.1	<25	8	NA	NA	NA	358
09/08/2021	499	7.67	7.71	19.9	55	-36	1.26	0.93	<0.1	9	8	NA	NA	NA	314
10/07/2021	873	7.43	7.54	18.1	65	-52	0.62	0.51	<0.01	8	4	NA	NA	NA	381
11/04/2021	1246	7.69	7.57	10.0	54	-40	0.25	0.09	<0.1	7	2	NA	NA	NA	348
12/01/2021	299	7.72	7.68	10.7	49	-37	0.30	0.09	<0.1	9	4	NA	NA	NA	347

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator:	LCT Energy, LP	Monitoring Point I.D.:	SW519	Description of Sample Point:	DS Trib 43599 to Fourmile Run
Operation Name:	Rustic Ridge #2	Latitude:	40° 08' 26.82" N and		
Permit No:	Pending	Longitude:	79° 22' 20.22" W	Existing use(s)	
Township:	Donegal	Grid Coordinate:	*NA	Planned future use(s)	
County:	Westmoreland	Surface Elevation:	1470 ft.	If sampling point is a well, when was it drilled:	

Date Sampled	Flow (GPM) ~~or Static Water Elevation~~	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
07/21/2021	50	6.98	7.47	21.6	45	-28	0.24	0.04	<0.1	6	5	NA	NA	NA	128
08/10/2021	75	7.07	7.46	23.8	67	-53	0.56	0.43	0.2	<5	12	NA	NA	NA	265
09/08/2021	125	7.15	7.65	20.6	34	-18	0.28	0.05	0.2	10	16	NA	NA	NA	96
10/07/2021	99	7.59	7.61	19.6	49	-36	0.30	0.06	0.1	5	4	NA	NA	NA	124
11/04/2021	187	7.84	7.20	11.5	30	-16	0.11	0.04	<0.1	8	4	NA	NA	NA	96
12/01/2021	93	7.28	7.70	11.5	27	-9	0.19	0.04	<0.1	8	4	NA	NA	NA	95

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator:	LCT Energy, LP	Monitoring Point I.D.:	MD2014		Description of Sample Point:	Vasinko, Mine Seep	
Operation Name:	Rustic Ridge #2	Latitude:	40°09'42.62"	N and			
Permit No:	Pending	Longitude:	79°23'14.24"	W	Existing use(s)	None	
Township:	Donegal	Grid Coordinate:	4N		Planned future use(s)	None	
County:	Westmoreland	Surface Elevation:	1608	ft.	If sampling point is a well, when was it drilled:	N/A	

Date Sampled	Flow (GPM) ~~or Static Water Elevation~~	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
10/07/2021	<1	6.94	7.17	18.4	238	-228	17.6	2.57	<0.1	728	34	NA	NA	NA	1520
12/22/2021	Sheet Flow	6.74	7.03	12.6	135	-122	9.72	1.26	<0.1	394	14	NA	NA	NA	955
08/05/2022	3	6.56	7.05	17.3	211	-205	13.70	2.33	<0.1	778	38	NA	NA	NA	1280

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator:	LCT Energy, LP	Monitoring Point I.D.:	MD2015		Description of Sample Point:	Vasinko, Mine Seep	
Operation Name:	Rustic Ridge #2	Latitude:	40°09'52.43"	N and			
Permit No:	Pending	Longitude:	79°23'27.80"	W	Existing use(s)	None	
Township:	Donegal	Grid Coordinate:	*NA		Planned future use(s)	None	
County:	Westmoreland	Surface Elevation:	1711	ft.	If sampling point is a well, when was it drilled:	N/A	

Date Sampled	Flow (GPM) ~~or Static Water Elevation~~	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
10/07/2021	<1	6.45	6.71	18.2	224	-212	14.4	1.38	<0.1	614	24	NA	NA	NA	1350
12/22/2021	Sheet Flow	6.96	7.82	11.8	222	-213	9.39	1.42	<0.1	589	18	NA	NA	NA	1380
08/05/2022	4	6.64	7.46	16.8	262	-253	37.20	1.52	0.60	438	16	NA	NA	NA	1300

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator:	LCT Energy, LP	Monitoring Point I.D.:	MD2016		Description of Sample Point:	Vasinko, Mine Seep	
Operation Name:	Rustic Ridge #2	Latitude:	40°09'46.12"	N and			
Permit No:	Pending	Longitude:	79°23'28.43"	W	Existing use(s)	None	
Township:	Donegal	Grid Coordinate:	4M		Planned future use(s)	None	
County:	Westmoreland	Surface Elevation:	1684	ft.	If sampling point is a well, when was it drilled:	N/A	

Date Sampled	Flow (GPM) ~~or Static Water Elevation~~	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
10/07/2021	<1	7.77	8.13	20.1	268	-253	0.68	0.23	<0.1	493	2	NA	NA	NA	1320
12/22/2021	Sheet Flow	7.13	8.06	9.2	259	-218	2.87	0.36	<0.1	447	12	NA	NA	NA	1300
08/05/2022	2	6.72	7.64	17.9	220	-206	23.70	1.32	<0.1	501	30	NA	NA	NA	1440

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator:	LCT Energy, LP	Monitoring Point I.D.:	MD2276A		Description of Sample Point:	Hoyman #1 Mine Treatment Facility	
Operation Name:	Rustic Ridge #2	Latitude:	40° 08' 34.55"	N and	Pond; Inlet Jets		
Permit No:	Pending	Longitude:	79° 25' 02.13"	W	Existing use(s)	Treatment Facility	
Township:	Donegal	Grid Coordinate:	11E		Planned future use(s)	Same	
County:	Westmoreland	Surface Elevation:	1789	ft.	If sampling point is a well, when was it drilled:	N/A	

Date Sampled	Flow (GPM) ~~or Static Water Elevation~~	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
06/22/2022	25.0	6.45	6.57	21.0	278	-266	29.20	7.58	<0.1	534	46	NA	NA	NA	1740
07/20/2022	75.0	6.67	6.72	21.4	286	-275	28.80	7.30	<0.1	613	17	NA	NA	NA	1690
08/19/2022	224.0	6.23		18.0											

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator: LCT Energy, LP
Operation Name: Rustic Ridge #2
Permit No: Pending
Township: Mt. Pleasant
County: Westmoreland

Monitoring Point I.D.: SW516
Latitude: 40° 08' 45.13" N and
Longitude: 79° 24' 41.29" W
Grid Coordinate: 10H
Surface Elevation: 1770 ft.

Description of Sample Point: DS Trib 37997 to Jacobs Creek
Existing use(s)
Planned future use(s)
If sampling point is a well, when was it drilled:

Date Sampled	Flow (GPM) ~~or Static Water Elevation~~	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
07/21/2021	299	7.39	7.68	20.2	50	-35	0.22	0.18	0.1	117	4	NA	NA	NA	386
08/10/2021	250	7.41	7.55	22.1	44	-30	0.39	0.22	0.1	256	7	NA	NA	NA	592
09/08/2021	499	7.78	7.70	20.1	37	-20	0.18	0.21	<0.1	59	<2	NA	NA	NA	238
10/07/2021	698	7.70	7.69	19.1	54	-39	0.09	0.12	<0.1	119	<2	NA	NA	NA	396
11/04/2021	997	7.73	7.32	8.4	30	-12	0.11	0.18	<0.1	32	2	NA	NA	NA	168
12/01/2021	748	7.09	7.52	8.7	31	-19	0.10	0.23	<0.1	57	8	NA	NA	NA	217

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator: LCT Energy, LP
Operation Name: Rustic Ridge #2
Permit No: Pending
Township: Mt. Pleasant
County: Westmoreland

Monitoring Point I.D.: SW517
Latitude: 40° 08' 28.34" N and
Longitude: 79° 24' 44.15" W
Grid Coordinate: 12G
Surface Elevation: 1750 ft.

Description of Sample Point: Downstream Jacobs Creek (37868)
Existing use(s)
Planned future use(s)
If sampling point is a well, when was it drilled:

Date Sampled	Flow (GPM) ~~or Static Water Elevation~~	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
07/21/2021	798	7.58	7.71	20.9	56	-39	0.69	0.09	<0.1	<5	5	NA	NA	NA	419
08/10/2021	872	7.25	7.78	21.4	61	-46	0.86	0.18	0.1	<5	9	NA	NA	NA	523
09/08/2021	1197	7.63	7.84	19.6	50	-35	0.60	0.08	<0.1	6	5	NA	NA	NA	290
10/07/2021	1197	7.61	7.78	20.2	58	-44	0.59	0.07	<0.1	5	2	NA	NA	NA	423
11/04/2021	1346	7.58	7.52	9.4	43	-28	0.40	0.09	<0.1	7	3	NA	NA	NA	273
12/01/2021	1595	7.86	7.60	12.1	38	-19	0.39	0.11	<0.1	6	2	NA	NA	NA	301

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

APPENDIX B
GROUNDWATER DATA

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator:	LCT Energy, LP	Monitoring Point I.D.:	S2021		Description of Sample Point:	US Outfall 002	
Operation Name:	Rustic Ridge #2	Latitude:	40°08'52.93"	N and			
Permit No:	Pending	Longitude:	79°24'32.85"	W	Existing use(s)	Monitoring	
Township:	Donegal	Grid Coordinate:	9H		Planned future use(s)	Same	
County:	Westmoreland	Surface Elevation:	1793	ft.	If sampling point is a well, when was it drilled:	N/A	

Date Sampled	Flow (GPM) ~~or Static Water Elevation~~	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
07/12/2022	56	7.13	7.03	20.0	46	-31	2.98	1.41	0.30	173	22	NA	NA	NA	445
07/29/2022	47	7.32	7.21	19.3	57	-45	1.38	0.96	0.10	106	4	NA	NA	NA	402
08/15/2022	47	6.93		16.7								NA	NA	NA	

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator:	LCT Energy, LP	Monitoring Point I.D.:	S2022		Description of Sample Point:	DS Outfall 002/US Outfall 001	
Operation Name:	Rustic Ridge #2	Latitude:	40°08'51.18"	N and			
Permit No:	Pending	Longitude:	79°24'32.85"	W	Existing use(s)	Monitoring	
Township:	Donegal	Grid Coordinate:	10H		Planned future use(s)	Same	
County:	Westmoreland	Surface Elevation:	1782	ft.	If sampling point is a well, when was it drilled:	N/A	

Date Sampled	Flow (GPM) ~~or Static Water Elevation~~	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
07/12/2022	47	7.08	7.08	20.6	43	-31	2.29	1.77	0.20	279	13	NA	NA	NA	552
07/29/2022	37	7.40	7.20	19.3	54	-40	1.16	1.52	<0.10	179	6	NA	NA	NA	484
08/15/2022	39	6.93		16.6								NA	NA	NA	

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator:	LCT Energy, LP	Monitoring Point I.D.:	S2023		Description of Sample Point:	DS Outfall 001	
Operation Name:	Rustic Ridge #2	Latitude:	40°08'48.93"	N and			
Permit No:	Pending	Longitude:	79°24'36.81"	W	Existing use(s)	Monitoring	
Township:	Donegal	Grid Coordinate:	10H		Planned future use(s)	Same	
County:	Westmoreland	Surface Elevation:	1772	ft.	If sampling point is a well, when was it drilled:	N/A	

Date Sampled	Flow (GPM) ~~or Static Water Elevation~~	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
07/12/2022	56	7.28	7.43	21.2	42	-27	1.02	1.14	0.30	225	12	NA	NA	NA	558
07/29/2022	56	7.75	7.50	19.8	51	-39	0.46	0.99	<0.10	148	2	NA	NA	NA	470
08/15/2022	37	7.05		17.0								NA	NA	NA	

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator: LCT Energy, LP
Operation Name: Rustic Ridge #2
Permit No: Pending
Township: Donegal
County: Westmoreland

Monitoring Point I.D.: W541
Latitude: 40° 07' 34.70" N and
Longitude: 79° 23' 24.71" W
Grid Coordinate: 17M
Surface Elevation: 1864 ft.

Description of Sample Point: L. Nudo, Well
Existing use(s) Domestic
Planned future use(s) Same
If sampling point is a well, when was it drilled: Unknown

Date Sampled	~~Flow (GPM) or~~ Static Water Elevation	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
05/19/2021	1837.9	7.32	7.67	18.6	78	-70	0.417	<0.0124	0.0856	2.07	9.6	NA	NA	NA	160
09/01/2021	1829.8	8.01	7.91	20.0	83	-71	0.41	0.06	<0.1	<5	10	NA	NA	NA	173
08/09/2022	1823.2	7.17	8.03	23.8	83	-72	0.13	0.01	<0.1	<5	17	NA	NA	NA	175

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator:	LCT Energy, LP	Monitoring Point I.D.:	W2132		Description of Sample Point:	D. Crosby, Well	
Operation Name:	Rustic Ridge #2	Latitude:	40°09'51.94"	N and			
Permit No:	Pending	Longitude:	79°22'52.13"	W	Existing use(s)	Domestic	
Township:	Donegal	Grid Coordinate:	4P		Planned future use(s)	Same	
County:	Westmoreland	Surface Elevation:	1550	ft.	If sampling point is a well, when was it drilled:	1995	

Date Sampled	~~Flow (GPM) or~~ Static Water Elevation	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
09/03/2021	Not hooked up - no sample														
12/08/2021	1547.0	6.28	6.72	7.6	96	-84	125.00	2.92	1.10	541	248	NA	NA	NA	1330
04/28/2022	1545.2	6.28	6.21	11.4	109	-100	75.70	2.49	0.10	623	82	NA	NA	NA	1310
06/28/2022	1547.3	6.69	6.36	18.9	133	-94	278.00	5.48	6.40	386	43	NA	NA	NA	1240
07/29/2022	1547.5	6.56	6.77	16.5	101	-90	39.70	2.20	<0.10	595	66	NA	NA	NA	1230
08/08/2022	1547.3	6.04	7.23	21.7	101	-91	173.00	4.44	6.30	619	114	NA	NA	NA	1180

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator:	LCT Energy, LP	Monitoring Point I.D.:	W2142		Description of Sample Point:	C. McKetta, Well	
Operation Name:	Rustic Ridge #2	Latitude:	40°08'24.75"	N and			
Permit No:	Pending	Longitude:	79°24'45.74"	W	Existing use(s)	Domestic	
Township:	Mt. Pleasant	Grid Coordinate:	12G		Planned future use(s)	Same	
County:	Westmoreland	Surface Elevation:	1779	ft.	If sampling point is a well, when was it drilled:	1978	

Date Sampled	~~Flow (GPM) or~~ Static Water Elevation	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
07/29/2021	1750.9	6.81	7.62	17.3	109	-95	1.95	0.15	<0.1	5	2	NA	NA	NA	1820
12/03/2021	1750.1	7.11	7.50	13.4	112	-98	4.96	0.18	<0.1	6	9	NA	NA	NA	2120
07/06/2022	1750.9	7.02	7.90	23.6	124	-110	0.82	0.06	<0.1	<5	<2	NA	NA	NA	746
08/19/2022	1757.6	7.24		22.5											

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator: LCT Energy, LP
Operation Name: Rustic Ridge #2
Permit No: Pending
Township: Donegal
County: Westmoreland

Monitoring Point I.D.: W2147
Latitude: 40°08'01.09" N and
Longitude: 79°23'30.70" W
Grid Coordinate: 15M
Surface Elevation: 1893 ft.

Description of Sample Point: Leeper Family Trust, Well
Existing use(s) Domestic; Husbandry
Planned future use(s) Same
If sampling point is a well, when was it drilled: 1997

Date Sampled	~~Flow (GPM) or~~ Static Water Elevation	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
09/21/2021	1872.2	7.24	6.65	19.2	59	-41	4.97	0.42	10.8	6	183	NA	NA	NA	190
12/07/2021	1869.2	6.81	6.67	8.8	48	-38	0.09	0.09	0.30	5	7	NA	NA	NA	145
07/06/2022	1862.4	6.67	7.94	22.0	108	-95	0.39	0.05	0.50	<5	10	NA	NA	NA	226
08/09/2022	1865.7	7.27	8.11	23.0	100	-87	0.13	0.02	0.10	<5	<2	NA	NA	NA	209

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator:	LCT Energy, LP	Monitoring Point I.D.:	W2160		Description of Sample Point:	J. Chrisner, Well	
Operation Name:	Rustic Ridge #2	Latitude:	40°07'40.39"	N and			
Permit No:	Pending	Longitude:	79°24'01.71"	W	Existing use(s)	Domestic	
Township:	Mt. Pleasant	Grid Coordinate:	17J		Planned future use(s)	Same	
County:	Westmoreland	Surface Elevation:	1923	ft.	If sampling point is a well, when was it drilled:	2000	

Date Sampled	~~Flow (GPM) or~~ Static Water Elevation	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
07/28/2021	1848.4	6.28	7.51	20.8	96	-85	1.04	0.02	<0.1	6	11	NA	NA	NA	259
12/06/2021	1844.7	7.36	7.70	17.8	98	-85	0.07	<0.01	<0.1	9	<2	NA	NA	NA	267
6/27/2022	1849.0	6.97	7.53	22.3	98	-84	0.20	<0.01	<0.1	9	<2	NA	NA	NA	244
07/29/2022	1841.0	7.84	7.77	17.3	96	-81	1.17	0.09	<0.10	9	4	NA	NA	NA	245

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator: LCT Energy, LP
Operation Name: Rustic Ridge #2
Permit No: Pending
Township: Mt. Pleasant
County: Westmoreland

Monitoring Point I.D.: W2181
Latitude: 40°07'28.63" N and
Longitude: 79°25'19.14" W
Grid Coordinate: 18D
Surface Elevation: 1826 ft.

Description of Sample Point: J. Holomshek, Well
Existing use(s) Domestic
Planned future use(s) Same
If sampling point is a well, when was it drilled: 1990

Date Sampled	~~Flow (GPM) or~~ Static Water Elevation	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
07/29/2021	1818.9	6.12	6.94	18.9	44	-27	12.20	0.63	<0.1	10	23	NA	NA	NA	208
12/03/2021	ND	6.68	6.78	14.0	42	-30	9.63	0.61	<0.1	<5	18	NA	NA	NA	208
07/12/2022	ND	6.96	6.73	22.3	43	-27	9.33	0.58	<0.1	33	16	NA	NA	NA	205

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

FORM 8.13A
☐ BACKGROUND or ☒ MONITORING REPORT
(Check appropriate block)

Operator:	LCT Energy, LP	Monitoring Point I.D.:	W2221		Description of Sample Point:	R. Phillips, Well	
Operation Name:	Rustic Ridge #2	Latitude:	40°09'04.68"	N and			
Permit No:	Pending	Longitude:	79°23'15.72"	W	Existing use(s)	Domestic	
Township:	Donegal	Grid Coordinate:	8N		Planned future use(s)	Same	
County:	Westmoreland	Surface Elevation:	1664	ft.	If sampling point is a well, when was it drilled:	2009	

Date Sampled	~~Flow (GPM) or~~ Static Water Elevation	Field pH	Laboratory pH	Temperature (°C)	Alkalinity mg/l	Acidity mg/l	Iron mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l	Suspended Solids mg/l	Total Dissolved Solids (mg/l)	Osmotic Pressure	Chlorides	Spec. Cond. (m-mho)
07/30/2021	1627.8	6.43	7.55	19.2	129	-118	17.1	1.21	<0.1	<5	39	NA	NA	NA	1590
12/01/2021	1633.7	7.05	7.32	13.5	140	-123	1.41	0.17	<0.1	6	<2	NA	NA	NA	1300
06/28/2022	ND	6.27	7.54	15.7	137	-124	0.96	0.06	<0.1	<5	2	NA	NA	NA	1260
08/08/2022	ND	6.34	7.45	21.1	143	-130	1.32	0.49	<0.1	<5	<2	NA	NA	NA	1260

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Comments: NA=Not applicable; ND=Not Determined; TLTG=Too Large to Gauge

APPENDIX C
ACID MINE DRAINAGE DATA

Champion Creek – Deep Mine Water Quality Monitoring Locations

Long Route: (once a quarter)

1. **Sampling Point 21 (800) –**
   - Durstine Road off Route 711 near the Mountain Pine Campgrounds
   - Indian Creek approximately 25 ft upstream of Durstine Road (T733) bridge crossing, approximately 1500 ft south of Westmoreland-Fayette County Line.

2. **Sampling Point 17 (SP17) –**
   - Along County Line Road, on right hand side near mile marker 120 and before Kalp Road.
   - Unnamed tributary to Indian Creek flowing from the northwest, approximately 100 ft upstream of County Line Road bridge crossing

3. **Sampling Point 15 (SP15) –**
   - Mt. Olive Road
   - Unnamed tributary to Indian Creek flowing from the Northwest, just upstream of Mt. Olive Road (T307) bridge crossing.

4. **Sampling Point 13 (SP13) –**
   - Along Route 31, near the intersection at 711. Across from Sarnelli's market.
   - Unnamed tributary to Indian Creek flowing from the northwest, approximately 300 ft upstream of Route 31 Bridge crossing near intersection with Route 711.

5. **Sampling Point 32 (SP 32) –**
   - 208 Thompson Road
   - Champion Creek, approximately 50 feet downstream of bridge crossing on Thompson Road.

6. **Sampling Point 35 (801) –**
   - Siesky's
   - Champion Creek 75ft upstream of County Line Road (SR1058) bridge crossing

7. **Sampling Point T35 (SP T35) –**
   - Tributary that comes into Champion Creek. Approximately 100 yards back in the field across from Sieskys.

8. **Sampling Point 38 (SP 38) –**
   - Power Station
   - Champion Creek just upstream of (SR1050) bridge crossing, approximately 1100 feet southwest of Westmoreland-Fayette County Line.

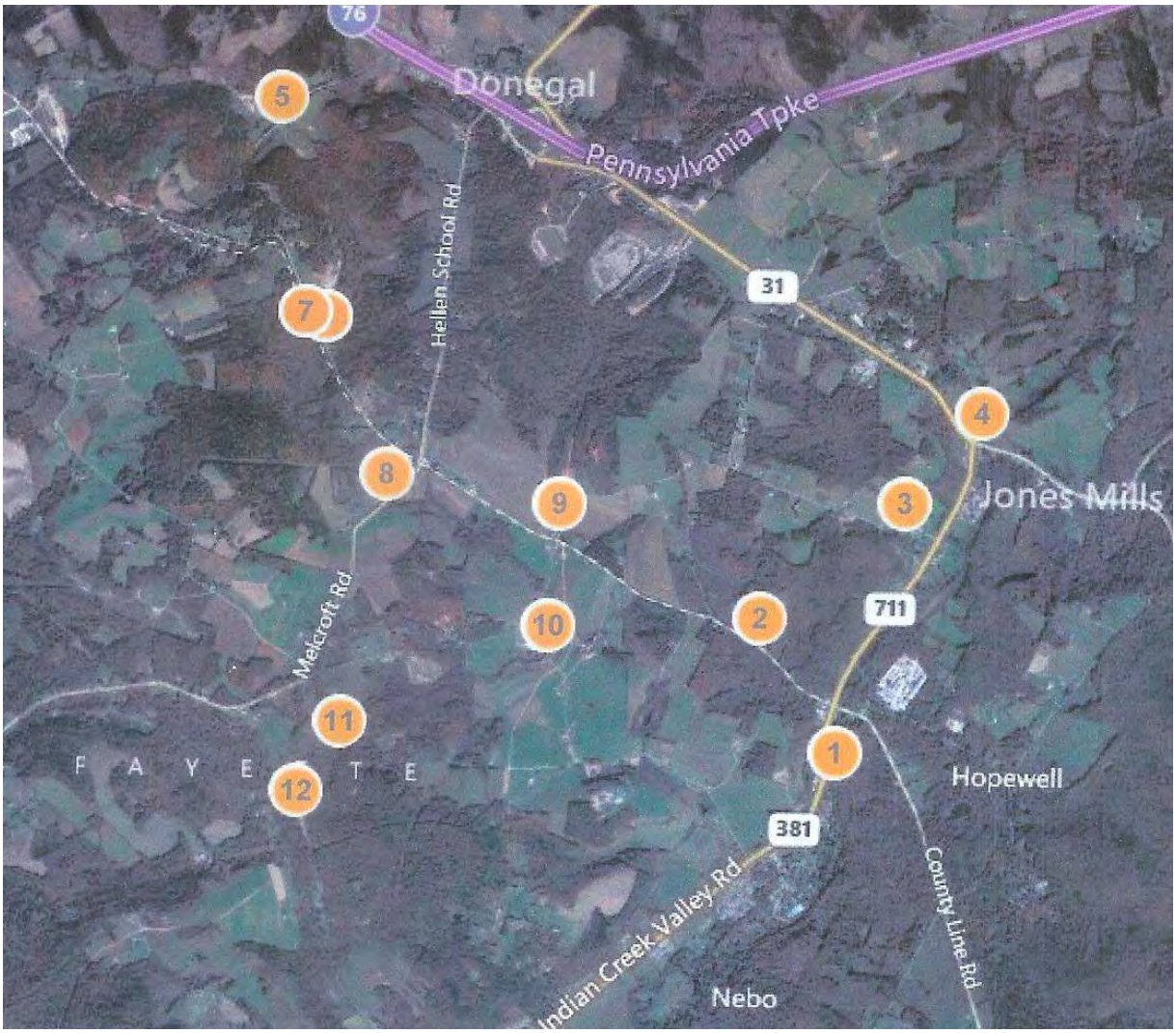
9. **Sampling Point 41 (802) –**
   - Minnow Run approximately 25 ft upstream of Mt. View Road (T307) Bridge crossing, approximately 200 feet north of the Westmoreland-Fayette County Line.

Champion Creek – Deep Mine Water Quality Monitoring Locations

10. **Sampling Point 42 (803) –**
    - Howards farm
    - Champion Creek approximately 25 feet upstream of the Reddawg Road (T722) culvert crossing, approximately 2000 ft upstream from confluence with Little Champion Creek.

11. **Sampling Point 44 (SP 44) –**
    - Champion Creek approximately 50 feet upstream of the Kibe Road (T729) culvert crossing, approximately 2000 ft upstream from the confluence with Little Champion Creek.

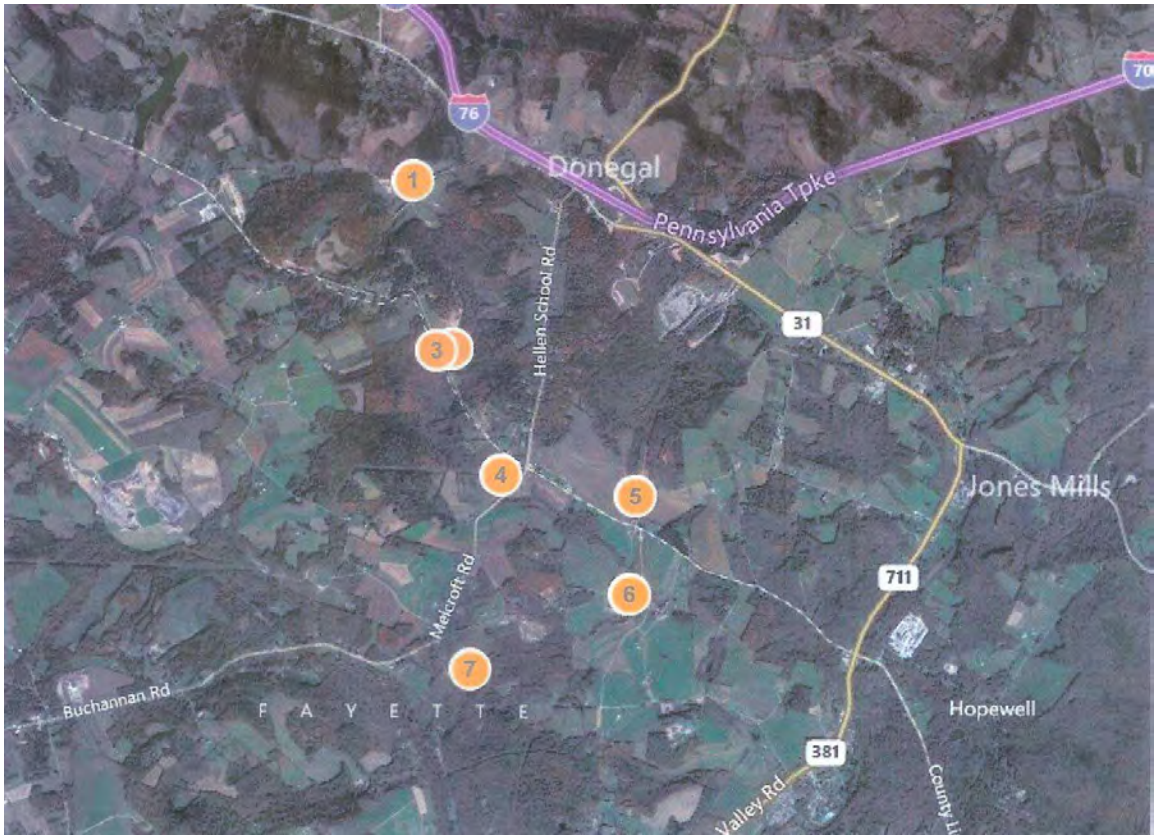
12. **Sampling Point 45 (804) –**
    - Champion Creek approximately 25 feet above the confluence of Champion Creek and Little Champion Creek, near the intersection of Albright Road (T729) and Melcroft Road (SR1007).



Champion Creek – Deep Mine Water Quality Monitoring Locations

Short Route: (monthly)

1. **Sampling Point 32 (SP 32) – Thompson Road**
   - Champion Creek, approximately 50 feet downstream of bridge crossing on Thompson Road.
2. **Sampling Point 35 (SP35) – Siesky's**
   - Champion Creek 75ft upstream of County Line Road (SR1058) bridge crossing
3. **Sampling Point T35 (SP T35) – Tributary Across from Siesky's**
   - Tributary that comes into Champion Creek. Approximately 100 yards back in the field across from Sieskys.
4. **Sampling Point 38 (SP 38) – Power Station**
   - Champion Creek just upstream of (SR1050) bridge crossing, approximately 1100 feet southwest of Westmoreland-Fayette County Line.
5. **Sampling Point 41 (SP 41) – Minnow Run**
   - Minnow Run approximately 25 ft upstream of Mt. View Road (T307) Bridge crossing, approximately 200 feet north of the Westmoreland-Fayette County Line.
6. **Sampling Point 42 (SP 42) – Howard's Farm**
   - Champion Creek approximately 25 feet upstream of the Reddawg Road (T722) culvert crossing, approximately 2000 ft upstream from confluence with Little Champion Creek.
7. **Sampling Point 44 (SP 44) – Kibe Road**
   - Champion Creek approximately 50 feet upstream of the Kibe Road (T729) culvert crossing, approximately 2000 ft upstream from the confluence with Little Champion Creek.



Fulton Discharge Monitoring Results

Location	date_colected	alk (mg/l)	al (mg/l) total	ca (mg/l) total	fe+2 (mg/l) total	fe (mg/l) total	mg (mg/l) total	mn (mg/l) total	ph (ph units)	spcon (umhos/cm)	Total Acidity CaCO3	tds (mg/l)	so4 (mg/l)	tss (mg/l)
Fulton Discharge	2001-03-29	0	<0.2	83.1	12.3	18.4	33.6	4.73	3.6		42		324	64
Fulton Discharge	2001-04-30	12	<0.2	77.5	39.5	46.2	32.9	5.05	5.9		82		295	10
Fulton Discharge	2001-06-05	0	<0.2	80.5	27.71	30.2	32.8	5.45	3.9		61.6		316.5	22
Fulton Discharge	2001-07-02	0	<0.2	80.7	36.02	37.2	35.2	5.53	3.4		96.4		261.3	48
Fulton Discharge	2001-08-01	0	<0.2	79.8	35.15	42.5	34.5	5.1	3.7		105.4		313.4	44
Fulton Discharge	2001-09-17	0	<0.2	85.6	43.99	66.6	36.2	4.88	3.8		85.2		242	36
Fulton Discharge	2001-10-07	3	<0.2	84.6	39.28	39.1	36.2	5.39	5.3		0.083		110	22
Fulton Discharge	2002-04-24	0	<0.2	75.7	18.61	26.8	29	4.01	4.1		62.6		288	60
Fulton Discharge	2002-06-27	20	<0.2	97.1	39.16	66.3	40.3	5.07	5.8		105.2		379	20
Fulton Discharge	2002-09-03	1.4	<0.2	89.5	1.14	72.5	36.8	5.69	4.7		113.8		403	150
Fulton Discharge	2003-03-18	0	<0.2	77.6	8.38	17.2	26.8	3.72	4.1		50.4		345.6	<2
Fulton Discharge	2005-12-05	33.6	<0.2	68.9	38.58	41.1	5.14	0.108	6.2		88.8		359.2	20
Fulton Discharge	2008-01-22	14.2	<0.2	58.6	38.2	37.5	24.3	3.632	6.1		27.8		204	<2
Fulton Discharge	2009-03-12	6.2	0.459	61.7	15.91	16.8	25.5	3.336	6.4		4.4		142.4	8
Fulton Discharge	2009-06-16	0	0.2	68	25.26	29.6	26.6	3.85	4.2		50		281.9	14
Fulton Discharge	2009-09-10	27.6	1.45	82.5	0.38	0.695	34.4	1.98	7.2		-17.2		356.2	5
Fulton Discharge	2010-05-06	14.6	0.698	25.3	0.14	0.408	8.783	6.06	6.8		-4.6		76	8
Fulton Discharge	2011-02-14	6.4	<0.2	45.6	6.66	7.825	17.7	2.49	6		20.4		181.3	6
Fulton Discharge	2011-05-10	6	<0.2	54.52	13.3	16.49	21.14	2.727	5.7	623	23		225.6	12
Fulton Discharge	2011-08-02	9	<0.2	57.4	23.24	27.1	22.8	3.197	5.8	626	38.8		265.3	<5
Fulton Discharge	2011-11-01	3	<0.2	40.1	11.71	15	15.3	2.043	6.1	517	32.8		170.9	26
Fulton Discharge	2012-02-06	8.8	<0.2	50.8	23.77	49.9	19.1	2.674	5.8		40		240.1	130
Fulton Discharge	2013-02-11	11.2	<0.2	41.1	2.89	4.668	11.1	0.686	6.4		2		89.4	<5
Fulton Discharge	2013-06-25	33.2	<0.5			37.795		2.871	6.1		29.2	494	228.8	74
Fulton Discharge	2013-10-16	0	<0.5			4.641		9.172	3.5		88.2	1200	77.5	<5
Fulton Discharge	2014-03-06	21.2	<0.5		19.36	18.82		3.062	6.3		51.8	426	278.3	<5
Fulton Discharge	2014-05-08	6	<0.5		17.38	17.183		3.112	5.8		29.6	416	288.5	14
Fulton Discharge	2014-08-26	33.4	<0.5		32.12	38.106		3.585	6.4		44.8	454	314.8	14
Fulton Discharge	2014-11-12	11	< 0.5		19.72	20.06		3.15	6.1		33.2	396	269.3	10
Fulton Discharge	2015-04-06	1.4	<0.5		10.221	9.751		2.76	2.9		621.2	1898	1273.3	<5
Fulton Discharge	2015-07-22	29	<0.5		33.241	39.472		3.686	6.3		51	438	361.8	28
Fulton Discharge	2016-03-01	18	<0.5		19.306	19.126		2.798	6.2		27.8	392	270	16
Fulton Discharge	2016-06-22	40.8	<0.5		36.717	32.299		2.848	6.4		44.8	472	275.1	6
Fulton Discharge	2016-09-01	14.4	<0.5		33.164	35.904		3.443	5.8		46.2	410	270	<5
Fulton Discharge	2016-12-14	24.8	<0.5		23.585	24.267		3.042	6.4		40	364	263.7	<5
Fulton Discharge	2017-01-25	30.8	<.05		21.887	19.087		2.148	6.3		21.2	376	<20	<5
Fulton Discharge	2017-04-25	34.8	<0.5		28.267	27.008		2.803	6.2		28.2	402	236	10
Fulton Discharge	2017-08-29	29.4	<0.5		30.042	35.033		3.129	6.2		42.6	420	246.9	6
Fulton Discharge	2017-10-31	33.6	<0.5		21.888	21.023		2.34	6.2		24	332	188.5	10
Fulton Discharge	2018-01-11	32.4	<0.5		26.681	24.89		2.826	6.2		81.8	374	234.4	<5
Fulton Discharge	2018-05-29	25.8	<0.5		29.218	28.783		2.872	6.3		34.6	384	228.8	10
Fulton Discharge	2018-10-17	9.4	<0.5		26.43	25.368		2.38	5.8		27	368	252.4	14
Fulton Discharge	2019-06-11	31.6	<0.3	47.1		31.8	18.4	2.95	6.1	515	30.6	1422	221.1	6
Fulton Discharge	2019-07-24	41.2	<0.3	51.33		36.5	20.11	3.282	6.3	533	34.2	408	289.2	<5
Fulton Discharge	2019-08-06	14.4	<0.3	54.12		36.09	20.34	3.308	5.7	531	36.6	424	262.7	10
Fulton Discharge	2019-09-24	39.6	<0.3	51.5		37.6	20.1	3.1	6.2	523	38	444	261.3	<5
Fulton Discharge	1.15.2019	18.4	<0.3	47.2		29.8	19.1	2.92	6.2	529	28.4	368	224.5	28
Fulton Discharge	11.20.2018	22	<0.2	42.38		17.91	16.99	2.506	6.3	470	24	322	198.4	<5
Fulton Discharge	12.11.2018	20	<0.3	49.8		23.4	20.4	3.04	6.4	538	27.6	380	227.1	8
Fulton Discharge	2.19.2019	31.6	<0.3	46.6		22.9	18.3	2.91	6.3	502	27	348	210.4	<5
Fulton Discharge	3.11.2019	32	<0.3	46.2		25	18	2.81	6.1	517	25	360	211.7	8
Fulton Discharge	4.17.2019	28.4	<0.3	44		23.2	17.4	2.56	6.2	516	27.2	364	201.6	6
Fulton Discharge	5.16.2019	15.8	<0.3	40.75		24.36	16.47	2.563	6.1	499	23.6	374	198.4	<5
Fulton Discharge	2019-10-24	23.2	<0.3	56.1		37.4	22.1	3.43	5.9	550	51	380	224.9	40
Fulton Discharge	2019-11-06	17	<0.3	50.9		22.6	20.5	3.12	6	496	37.8	382	218.8	10
Fulton Discharge	2020-01-14	21.4	<0.3	47.5		23.5	18.3	2.69	6.1	465	21.6	324	200	<5
Fulton Discharge	2020-02-25	12.8	<0.3	45.62		25.35	18.08	2.793	5.9	496	34	372	206.5	12
Fulton Discharge	2020-10-21	16.4	<0.3	53.4		31.9	21.3	3.18	6	486	39.6	356	227.3	16
Fulton Discharge	2021-02-04	8	<0.3	51.6		32	20.9	3.02	5.3	505	31.8	326	217.6	<5
Fulton Discharge	2021-06-16	36.2	<0.3	48.23		43.69	19.82	3.071	6.2	481	26.8	370	218.6	<5
Fulton Discharge	2021-10-18	25.2	<0.3	52.4		31.4	20.3	3.21	6	492	37.2	398	435.6	<5
Fulton Discharge	2022-06-02	18.6	<0.3	45.2	26.6	19	2.79	207.8	5.8	491	31	346	76	
Fulton Discharge	2022-09-26	0.6	<0.3	22.04		0.37	6.34	0.138	8	211	-22.8		54.9	<20
Fulton Discharge	2022-12-05	24.2	<0.3	44.37		28.46	18.04	2.71	6.1	460	25.6		192.4	34
Fulton Discharge	2023-01-12	22.4	<0.3	46.4		25.9	18	2.61	6.1	462	24		189.1	42
Fulton Discharge	2023-02-27	14.6	<0.3	44.5		33.4	17.8	2.671	5.6	481	26.2		184.4	42
Fulton Discharge	2023-05-22	22.6	<0.5		24.95	31.671		3.051	5.6		30.2	340	197.1	39
Fulton Discharge	2023-07-06	19.2	<0.5		25.028	32.073		2.742	5.6		25.2	364	187	40

Gallentine Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)
GAL BLOWOUT	09-03-02	0	15.1	101.08	103	42.9	651.6	3.4	313.6		6
GAL SWAMP	11-23-98	0	2.09	66.66	75.3	32.8	449	3.7	140		<2
GALDOWN	03-12-09	40.8	0.2	7.49	13.5	29.4	417.8	7	-30.8		18
GALDOWN	06-16-09	6.4	0.2	9.28	13.5	28.2	347.9	6.3	24		18
GALDOWN	09-10-09	78	0.2	0.18	0.284	30.8	447	7.3	-65.8		5
GALDOWN	05-06-10	71.2	0.2	0.15	0.51	29	387.2	7.2	-59.4		5
GALDOWN	02-14-11	134	<0.2	1.83	2.765	25.7	381.8	6.9	-126.8		12
GALDOWN	05-10-11	84	<0.2	6.19	6.842	28.6	453.3	7.1	-73.2		18
GALDOWN	08-02-11	142.2	<0.2	3.44	10	26.4	386.7	7.3	-114.6		130
GALDOWN	11-01-11	51.2	<0.2	12.54	14.7	22.9	379.7	7	-41.4		12
GALDOWN	02-06-12	71.4	<0.2	4.29	4.944	23.5	429.8	6.9	-64.6		8
GALDOWN	08-20-12	71	<0.2	11.02	12.6	24.2	375.2	7.2	-64.2		22
GALDOWN	02-11-13	86.2	<0.2	5.94	6.008	24.4	435.9	7.1	-77.6		10
GALDOWN	05-30-13	76.4	<0.5	6.81	7.355		360	7.2	-61	674	16
GALDOWN	03-27-14	73.2	<0.5	2.41	2.363		359.4	7.3	-24.8	704	<5
GALDOWN	07-30-14	79.4	0.745	4.56	5.092	1.286	420.4	6.9	-64.4	682	12
GALDOWN	10-08-14	77.4	< 0.5	7.31	7.546	1.326	405.4	7	-58	692	50
GALDOWN	04-01-15	74.8	<0.5	1.041	1.15	1.703	500.7	7.3	-54.4	714	8
GALDOWN	07-22-15	83.4	<0.5	4.626	7.316	1.674	405.8	7.4	-22.2	694	40
GALDOWN	03-01-16	89	<0.5	1.1	1.313	1.246	425.6	7.4	-72	664	<5
GALDOWN	10-12-16	57.6	<0.5	7.644	11.465	1.098	452.5	6.9	-34	614	36
GALDOWN	03-30-17	87.4	<0.5	2.916	3.361	1.617	742.2	7.3	-65.4	686	<5
GALDOWN	07-10-17	102.8	<0.5	10.855	11.458	1.399	719.1	7	-69.8	736	26
GALDOWN	10-03-17	85.6	<0.5	11.991	11.552	1.302	413.7	7	-62.8	740	14
GALDOWN	12-11-17	110.2	<0.5	1.069	9.128	0.96	435.6	7.4	-89.8	726	20
GALDOWN	04-11-18	64.2	<0.5	0.294	<0.3	1.162	395.7	7.3	-43	648	6
GALDOWN	05-22-18	80.6	<0.5	10.076	9.544	1.658	357.6	7	-63	676	8
GALDOWN	09-24-18	129.2	0.515	30.238	31.542	1.065	384.1	6.8	-83.2	710	34
GALDOWN	11-20-18	110.6	<0.5	1.594	1.692	0.884	366.2	7.8	-95.2	682	6
GALDOWN	02-11-19	109.2	<0.5	0.115	<0.3	0.443	323.4	7.4	-90.8	634	<5
GALDOWN	05-30-19	103.6	<0.5	2.478	3.19	1.915	322.5	7.2	-85	612	<5
GALDOWN	08-05-19	104	<0.5	17.81	84.687	1.002	351.8	7	-75.6	554	200
GALDOWN	11-05-19	86.2	<0.5	11.834	12.202	0.33	376.5	6.9	-60.8	664	36
GALDOWN	01-19-21	105.2	<0.5	1.916	2.834	0.394	330.6	7.3	-85.4	614	16
GALDOWN	09-15-21	95.6	<0.5	0.807	3.137	0.797	772.3	7.2	-82	666	12
GALDOWN	03-22-22	91.6	<0.5	4.591	4.711	2.144	408.6	7		748	<20
GALDOWN	06-13-22	101.4	<0.5	0.112	3.341	0.955	340.5	7.4	-82.4	628	<20
GALDOWN	09-19-22	122.6	<0.5	0.214	1.051	0.378	352.1	7.9	-99.4	666	<20
GALDOWN	12-12-22	152.6	<0.5	0.096	<0.3	0.265	338.3	7.1	-125	708	<20
GALDOWN	03-02-23	111.8	<0.5	0.056	0.424	0.096	338	7.4	-82.4	642	<20
GALDOWN	05-11-23	132.4	<0.5	0	24.985	1.471	342.1	7.7	-108.4	712	<20
GALIC	05-08-00	0	7.26	3.3	25.7	36.3	441	3	166		<2
GALIC	06-12-00	0	5.7	2.58	22.5	31.9	317	3.1	152		14
GALIN	06-17-98	0	4.92	66.66	79.6		425	4.1	150		
GALIN	06-17-98	0	8.38	48.45	64.3		465	3.3	194		
GALIN	07-23-98	0	4.3	66.66	77.3		323	4.4	166		<2
GALIN	08-19-98	1.4	3.34	82.82	74.3	40.9	398	4.6	168		20
GALIN	10-22-98	4	2.25	86.86	90.3	33.2	654.2	4.9	146		4
GALIN	11-23-98	6	2.09	80.8	86.4	31.8	446	5.1	144		<2
GALIN	12-22-98	6.6	2.05	85.85	85.9	33.1	573	5.1	152		38
GALIN	01-19-99	6	1.98	77.77	80.1	30.8	389	5.1	140		<2
GALIN	01-22-99	3.4	3.1	75.75	85.8	32.5	1010	4.8	158		<2
GALIN	03-03-99	3.6	3.41	32.13	77.5	29.7	384	4.9	154		<2
GALIN	03-24-99	2.6	4.43	78.78	79.2	34.5	474	4.7	164		18
GALIN	05-03-99	0	7.79	76.76	79.4	31.6	446	4	180		<2
GALIN	06-02-99	0	5.87	78.78	87.5	33.3	394	4.2	170		<2
GALIN	07-09-99	0	4.83	82.82	82.1	33	206	4.5	160		4
GALIN	08-12-99	2.6	3.87	73.73	82.4	31.3	538	4.7	150		32
GALIN	09-08-99	3.8	3.45	77.77	81.3	33.7	455.7	4.8	156		32
GALIN	01-11-00	1.4	4	77.77	85.3	33.3	436	4.6	176		14
GALIN	04-06-00	0	5.99	76.76	84.4	34	445	4.5	164		8
GALIN	05-08-00	0	7.76	75.75	83.6	35.3	503	4	178		<2
GALIN	06-12-00	0	6.14	69.69	83.7	34.1	367	4.3	172		4
GALIN	07-17-00	0	5.99	69.69	74.9	31.8	436	4.2	166		4
GALIN	09-17-01	9	0.207	21.91	19.2	24.5	254	5.4	54.4		10
GALIN	11-18-01	0	0.462	12.17	14.7	30	367	3.7	72.2		6

Gallentine Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)
GALIN	04-24-02	0	0.382		17.9	29.6	353	3.5	76.8		142
GALIN	06-27-02	0	0.575	0.15	8.62	34.9	401	3.3	82.8		30
GALIN	09-03-02	0	1.29	7.39	27.8	42.9	532.3	3.1	135.2		12
GALIN	03-27-03	0	1.4	34.9	42.3	36	405.7	3.3	144.6		12
GALIN	01-03-05	5.6	12.3	144.75	135		659.8	4.2	330		4
GALIN	06-13-05	0	12.9	117.1	117	35.9	444.1	3.7	304.6		14
GALIN	12-05-05	0	4.03	81.99	90	31.6	582.3	3.6	221.4		18
GALIN	06-08-06	0	8.348	96.08	98.5	29.6	476.4	3.6	236.4		6
GALIN	08-22-06	0	6.94	102.04	104	31.9	574.4	3.6	234		<2
GALIN	09-19-06	0	6.86	100.95	140	30.2	472.1	3.4	239.2		30
GALIN	12-21-06	<0	6.55	101.84	112	30.6	428.3	4.4	252		8
GALIN	03-12-07	0	11.7	110.69	118.5	33.5	524.9	4.1	267.6		14
GALIN	05-07-07	0	9.216	90.14	98	31.2	534.2	3.8	265.4		2
GALIN	01-22-08	0	9.358	93.31	105	28.9	78.8	4	231.6		4
GALOUT	03-29-01	0	6.48	64.5	81.7	31.3	386	4	160		34
GALOUT	09-17-01	14	0.298	26.79	24.1	25.6	213	5.5	58.6		62
GALOUT	11-18-01	192	1.17	1.59	6.6	38.1	458	8.3	0		168
GALOUT	04-24-02	106	0.224		0.742	24.4	286	8.5	0		34
GALOUT	06-27-02	90	<0.2	2.05	0.305	213	212	7.1	0		8
GALOUT	09-03-02	64	0.356	0.14	1.17	22.3	306.9	7.3	0		8
GALOUT	03-27-03	75.6	<0.2	0.12	0.842	35	441.9	6.8	0		18
GALOUT	01-03-05	0	6.7	3.23	29.3		506.2	3	189.4		<3
GALOUT	06-08-06	0	8.982	11.82	30.1	30.3	443.5	2.9	207		2
GALOUT	08-22-06	0	8.39	1.19	21.1	33.2	603.9	2.8	216		<2
GALOUT	09-19-06	0	6.97	2.15	19.9	29.1	452.8	2.8	194.6		<2
GALOUT	12-21-06	0	6.2	32.41	55.2	30.6	394.7	3.1	206.8		<2
GALOUT	03-12-07	0	8.784	59.62	73.1		508.8	3.2	234		10
GALOUT	05-07-07	0	11.6	28.65	47.1	30	501.5	3	239.4		2
GALOUT	01-22-08	0	4.532	13.48	17.6	20.5	327.1	3.2	102.8		<2
GALOUT	03-12-09	110	0.2	0.15	0.341	28.2	424.2	7.8	-94.4		12
GALOUT	06-16-09	86.2	0.469	41.37	45.2	25.1	333.2	7.3	-69		16
GALOUT	09-10-09	78.6	0.2	0.18	0.324	30.7	435.6	7.4	-68.8		5
GALOUT	09-23-09	83.2	0.2	0.16	0.217	30.5	445.8	7.7	-75.2		5
GALOUT	04-08-10	82.4	0.5	0.28	1.49			7.8	-63.6	792	5
GALOUT	05-06-10	73.8	0.2	0.33	1.017	29	400.2	7.2	-62.2		5
GALOUT	02-14-11	136.8	<0.2	0.18	1.858	25.1	385.7	7	-127.8		18
GALOUT	05-10-11	79.6	<0.2	0.15	2.694	28.76	458.1	7.3	-73.8		8
GALOUT	08-02-11	114.4	5.2	3.54	7.304	21.9	288.5	7.5	-94		66
GALOUT	11-01-11	51.4	<0.2	0.16	4.532	23.3	371.2	7.2	-37		<5
GALOUT	02-06-12	72.2	<0.2	0.15	3.59	23.1	384.4	7.1	-70.6		10
GALOUT	08-20-12	75.6	<0.2	0.11	0.658	23.7	337.3	7.9	-73		<5
GALOUT	05-30-13	74.6	<0.5	0.11	1.642		354	8	-64.8	660	8
GALOUT	02-11-13	92	<0.2	2.63	3.79	23.4	376.4	7.2	-73.4		10
GALOUT	03-27-14	75.4	<0.5	0.07	0.406						
GALOUT	07-30-14	85	<0.5	0.7	0.323	1.075	426.7	7.1	-71.6	684	10
GALOUT	10-08-14	75	< 0.5	0.07	0.516	0.313	437.9	7.2	-62	694	16
GALOUT	04-01-15	73	<0.5	0.089	0.417	1.165	524.8	7.4	-53.6	712	<5
GALOUT	07-22-15	88	<0.5	0.146	1.524	1.942	371	7.6	-56.4	676	<5
GALOUT	03-01-16	89.2	<0.5	0.097	0.492	1.062	387.6	7.7	-73.6	650	<5
GALOUT	10-12-16	56.4	<0.5	0.77	1.041	0.924	519.5	7.2	-39.6	760	14
GALOUT	03-30-17	82.8	<0.5	0.214	1.518	1.588	728.7	7.5	-63.6	660	10
GALOUT	07-10-17	94.8	<0.5	0.153	1.15	1.697	713.4	72	-81.4	738	<5
GALOUT	10-03-17	90.2	<0.5	0.11	1.284	0.685	414.5	7.4	-75	750	6
GALOUT	12-11-17	116.8	<0.5	0.35	0.729	0.945	417.8	7.5	-99.2	744	<5
GALOUT	04-11-18	64.4	<0.5	0.1	<0.3	0.982	374.5	7.5	-48.8	636	<5
GALOUT	05-22-18	84	<0.5	1.863	4.53	1.759	352.2	7.2	-60.2	654	10
GALOUT	09-24-18	104.4	<0.5	0.281	1.692	2.638	384.8	7.5	-86.4	734	<5
GALOUT	11-20-18	103.8	<0.5	0.575	1.264	0.873	393.3	7.9	-90.2	676	<5
GALOUT	02-11-19	105	<0.5	0.065	<0.3	0.424	333	7.2	-88.2	650	<5
GALOUT	05-30-19	107.2	<0.5	0.254	1.63	1.83	317.1	7.6	-90	824	<5
GALOUT	08-05-19	101.4	<0.5	0.11	0.641	0.536	347.4	7.4	-83.4	668	<5
GALOUT	11-05-19	83	<0.5	0.36	2.193	0.245	362	7.4	-69.2	618	12
GALOUT	01-19-21	105	<0.5	0.931	1.667	0.516	402.7	7.3	-87.6	606	<5
GALOUT	06-02-21	138.2	<0.5	0.181	1.926	0.728	341	8	-144.2	622	8
GALOUT	09-15-21	94.8	<0.5	0.109	1.255	0.662	701.2	7.4	-83	674	12
GALOUT	03-22-22	89.8	<0.5	0.41	24.225	1.955	410.4	7.2		724	<20
GALOUT	06-14-22	107.2	<0.5	0.199	3.064	1.055	342.7	7.3	-84.2	686	<20
GALOUT	12-12-22	150.4	<0.5	0.072	<0.3	0.222	331.4	7.4	-124	684	<20

Gallentine Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)
GALOUT	03-02-23	116	<0.5	<0.05	0.385	0.104	335.4	7.5	-87.6	658	<20
GALSED	06-16-09	17	0.2	33.09	41.6	26.8	347.9	6.2	23.6		34
GALSED	09-10-09	29.8	0.2	22.74	28.2	29.6	69.2	6.4	17.2		14
GALSED	05-06-10	16.2	0.231	34.34	49	30.3	428.5	6.1	40.6		12
GALSED	02-14-11	83.4	<0.2	40.52	44.8	26.1	39731	6.6	-4.8		22
GALSED	05-10-11	30.8	<0.2	24.78	47.3	28.58	463.8	6.5	44		24
GALSED	08-02-11	14.4	<0.2	0.41	1.871	23.7	371.4	6.7	-5.6		<5
GALSED	11-01-11		<0.2	15.42	20.5	24.1	378.4	6.6	-18.8		14
GALSED	02-06-12	36.6	0.212	27.99	33	23.2	408.2	6.4	12.2		24
GALSED	08-20-12	13	<0.2	8.24	18.2	24	391.8	6.6	-3.2		18
GALSED	05-30-13	31.8	<0.5	23.6	28.065		383.1	6.5	5.2	654	24
GALSED	02-11-13	54.8	0.782	40.42	37.7	21.8	352	6.6	14		16
GALSED	03-27-14	27.8	<0.5	23.42	23.791		399.9	6.5	14.4	638	24
GALSED	07-30-14	34	<0.5	18.42	19.998	1.146	399.5	6.4	8.8	646	18
GALSED	10-08-14	33.6	< 0.5	9.74	13.701	1.282	278.6	6.6	-2.6	638	22
GALSED	04-01-15	31	<0.5	30.389	30.524	1.394	491.4	6.4	38.8	716	18
GALSED	07-22-15	23.8	<0.5	36.869	44.351	1.521	365.2	6.3	106.4	666	8
GALSED	03-01-16	42.8	<0.5	23.614	27.624	1.388	417.9	6.7	21	652	8
GALSED	10-12-16	40.6	<0.5	15.907	25.021	1.226	449.2	6.7	-2.2	666	44
GALSED	03-30-17	41.2	0.705	37.35	42.112	1.459	710.7	6.5	48.2	682	8
GALSED	07-10-17	103.4	0.502	21.736	20.899	1.094	631.4	6.9	-74	740	34
GALSED	10-03-17	32.6	<0.5	26.761	28.233	1.208	400.4	6.5	33.6	668	12
GALSED	12-11-17	65.4	<0.5	15.076	15.456	1.429	458.9	6.9	-30.2	684	12
GALSED	04-11-18	20.2	0.625	23.377	24.58	1.303	385	6.2	43.8	646	10
GALSED	05-22-18	27.2	<0.5	20.625	21.505	1.217	415.3	6.2	25.6	574	<5
GALSED	09-24-18	92.2	<0.5	0.131	2.944	0.529	321.9	7.4	-81	596	<5
GALSED	11-20-18	52.6	0.639	27.274	24.634	1.313	372.1	6.7	-23.4	660	16
GALSED	02-11-19	63.6	1.128	23.52	27.772	1.34	337.9	6.6	-8.8	604	24
GALSED	05-30-19	49	<0.5	6.103	9.872	0.857	261.8	6.6	-26.2	498	16
GALSED	08-05-19	59.6	<0.5	12.65	14.718	1.095	354.5	6.6	-29	636	18
GALSED	12-09-19	83.6	<0.5	4.33	11.509	1.228	335	7	-68.4	654	28
GALSED	01-19-21	70.6	<0.5	10.728	12.772	1.189	378.2	6.8	-44.2	612	14
GALSED	09-15-21	60.4	2.541	14.303	19.69	1.67	861.6	6.6	-22.4	664	14
GALSED	03-22-22	41.4	<0.5	34.574	38.019	1.642		414.9		676	20
GALSED	06-13-22	51.6	<0.5	14.155	17.887	1.288	341.3	6.4	-19.8	568	<20
GALSED	09-19-22	61.2	<0.5	3.879	8.136	1.352	366.1	7		610	22
GALSED	12-12-22	121.2	<0.5	9.299	13.214	1.334	348.3	6.8	-75.8	664	24
GALSED	03-02-23	29.4	0.774	30.614	43.063	1.454	350.6	6	8.8	604	46
GALSED	05-11-23	57	<0.5	0	25.38	1.494	339.4	6.3	-28	640	40
GALSW	04-06-00	0	6.05	26.52	43.8	31.7	491	3.2	160		8
GALSW	06-12-00	0	6.12	20.4	41.6	32.6	306	3.2	152		10
GALUP	03-12-09	52.6	0.685	52.36	53.4	29.1	426.8	6.3	-19.6		40
GALUP	06-16-09	42.6	1.93	64.06	66.5	27.2	350.3	6.2	42.4		36
GALUP	09-10-09	52.2	1.27	62.86	69.5	29.4	428.4	6.3	25.8		44
GALUP	05-06-10	34.6	1.666	66.38	77.4	29.9	438.8	6.1	40.8		24
GALUP	02-14-11	101.4	0.791	62.22	64.6	25.5	408.7	6.6	-5.4		62
GALUP	05-10-11	69	2.452	55.49	72.59	28.61	425.2	6.5	46.8		44
GALUP	08-02-11	109.8	<0.2	26.05	41.2	26.1	410.3	6.7	-92.4		56
GALUP	11-01-11	37.2	0.712	48.41	53.3	23.9	383	6.2	-19.4		34
GALUP	02-06-12	70.6	1.999	49.34	50.4	23.8	510	6.4	8		22
GALUP	08-20-12	42	0.68	50.39	52.2	24.2	380.8	6.5	9.2		36
GALUP	02-11-13	74.8	1.616	46.96	44	23	371.9	6.6	8.4		16
GALUP	05-30-13	59	1.219	51.62	50.887		389.8	6.5	24.4	686	24
GALUP	03-27-14	76.2	0.719	35.74	32.463		465.7	6.6	-31.4	658	26
GALUP	07-30-14	74	1.12	44.95	41.955	1.171	393.4	6.5	6.4	694	36
GALUP	10-08-14	99.2	0.803	40.08	42.402	1.404	369.9	6.6	-34.8	660	70
GALUP	04-01-15	78.2	0.967	40.381	37.717	1.37	498.3	6.6	1	740	24
GALUP	07-22-15	51.4	2.122	38.229	35.606	1.207	353.2	6.6	44.2	674	26
GALUP	03-01-16	68.2	0.708	29.832	33.641	1.42	432.2	6.8	-14.4	702	22
GALUP	10-12-16	141.8	<0.5	5.268	6.543	0.659	461.4	7.6	-113.2	710	34
GALUP	03-30-17	78.6	<0.5	28.544	32.413	1.53	792	6.8	32.2	694	28
GALUP	07-10-17	166.8	<0.5	0.365	1.592	0.256	622.3	7.7	-135.8	798	14
GALUP	10-03-17	139.4	<0.5	0.297	4.328	0.351	408.5	7.9	-121.8	806	48
GALUP	12-11-17	79.4	1.52	25.769	24.343	1.337	409.8	6.8	-37	696	38
GALUP	04-11-18	52.6	2.023	22.573	22.536	1.274	402.1	6.6	18.03	662	16
GALUP	05-22-18	88.6	<0.5	14.905	14.089	11.19	358.7	7	-63.4	580	20

Gallentine Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)
GALUP	09-24-18	142.4	<0.5	24.769	24.121	1.403	369.9	6.9	-95	676	22
GALUP	11-20-18	56	1.497	34.412	25.758	1.32	362.6	6.7	-26	642	22
GALUP	02-11-19	65.6	1.893	26.536	26.506	1.332	333.5	6.6	-5.6	624	18
GALUP	05-30-19	89.8	<0.5	10.732	12.958	0.675	253.7	6.8	-68.4	478	22
GALUP	05-30-19	127	<0.5	13.675	12.966	0.649	366.7	7	-108.6	736	24
GALUP	11-05-19	147.4	0.584	3.981	18.011	0.536	325.5	7.9	-130.8	692	30
GALUP	01-19-21	80.4	<0.5	16.3	16.116	1.127	384.4	6.9	-51.2	600	24
GALUP	06-02-21	76.8	1.213	45.189	47.314	1.904	456.4	6.4	-30.6	650	30
GALUP	09-15-21	98	0.879	53.349	58.767	1.626	864.4	6.5	-7.2	678	42
GALUP	03-22-22	94.2	1.234	58.961	60.33	1.661	407.1	6.5		728	<20
GALUP	06-14-22	36.2	1.154	14.98	49.625	1.355	352.8	6.4	-10.8	622	64
GALUP	09-19-22	74.8	0.653	47.924	54.262	1.452	367.6	6.5	-32.2	668	44
GALUP	12-12-22	87.2	<0.5	51.514	48.879	1.446	352.8	6.6	-53.8	652	78
GALUP	03-02-23	39.4	1.065	54.294	58.529	1.457	369.3	6	22	646	34
GALUP	05-11-23	75.6	1.485	47.846	52.618	1.483	328.8	6.1	-3	662	70

KALP


Hopewell Rd
Indian Creek Valley Rd
711
Kalpdbraw
SB1
VFP1
VFP2
IC4
VFP3
SB2
Mitwet 2
Indian Creek Valley Trail
Combout
Mitwet 1
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Kalp Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	final_flow
KALPDBRAW	2006-03-21	0	14.4	46.3	50.6	2.08	620.5	3.3	226		3	
KALPDBRAW	2006-03-31	0	43.2	287.63	243	2.74	1113.2	3.3	836		12	
KALPDBRAW	2006-04-03	0	39.6	244.46	211	2.62	1243	3	753.8		3	
KALPDBRAW	2006-04-12	0	53	27.67	243.8	2.92	1424.8	4	893.6		3	1,000
KALPDBRAW	2006-04-18	0	41	302.36	250	2.89	1367	4	827		8	1,000
KALPDBRAW	2006-04-27	0	49.5	257.82	290	3.66	1209.4	3.2	792.4		3	
KALPDBRAW	2006-05-01	0	33.7	207.78	190	2.84	981.2	3.2	628		4	
KALPDBRAW	2006-05-05	0	29.3	202.93	182	2.7	1142	3.2	612		10	
KALPDBRAW	2006-05-11	0	23.5	178.59	161	2.6	1083.2	3.2	569.6		3	390
KALPDBRAW	2006-05-18	0	24.54	161.35	149.1	2.601	964.3	3.1	500		3	
KALPDBRAW	2006-05-24	0	21.7	152.5	130	2.23	965.3	3	475		8	
KALPDBRAW	2006-05-31	0	19.5	128.03	121	2.39	843.6	3.1	430.6		4	
KALPDBRAW	2006-06-05	0	17.2	124.36	96.1	1.81	966.5	3.1	412		<3	
KALPDBRAW	2006-06-05	0	17.2	124.36	96.1	1.81	966.5	3.1	412		3	
KALPDBRAW	2006-06-09	0	17.3	119.28	107	2.14	846.8	3.1	407.8		10	
KALPDBRAW	2006-06-16	0	16.5	114.29	98.2	2.05	797.9	3	419		18	
KALPDBRAW	2006-06-30	0	15.2	105.46	90	1.89	930.3	2.9	383		12	
KALPDBRAW	2006-07-12	0	15.5	96.1	94.3	2.21	805.1	3	366.6		3	
KALPDBRAW	2006-07-18	0	16.4	90.65	103.5	2.27	730.9	3	340		10	364
KALPDBRAW	2006-07-28	0	14.2	85.7	83.4	2.02	755.3	3	345		6	
KALPDBRAW	2006-08-07	0	13.8	81.86	82.5	2.18	820.7	3	353.4		3	
KALPDBRAW	2006-08-18	0	13.7	85.98	79.1	1.83	888.2	2.9	335.6		10	
KALPDBRAW	2006-09-22	0	12.8	90.96	87.1	1.99	907.1	2.9	360		18	
KALPDBRAW	2006-10-20	0	15.863	72.63	100.301	2.485	802.6	3.1	335.6		3	246
KALPDBRAW	2006-11-03	0	14.2	59.3	82.6	2.276	779.5	3	305.2		10	262
KALPDBRAW	2007-01-19	0	11.7	32.69	64.7	2.105	682	3.1	269.6		12	375
KALPDBRAW	2007-03-08	0	11.7	14.86	45.4	1.9	582.4	3	255		20	450
KALPDBRAW	2007-04-25	0	11.5	15.77	40.2	1.81	624.6	3.1	224		2	600
KALPDBRAW	2007-05-16	0	13.1	29.04	50.7	1.826	604.5	3.1	244.6		2	1,000
KALPDBRAW	2007-06-22	0	13.7	58.67	75.9	1.97	806.8	3	318		18	
KALPDBRAW	2007-08-08	0	12.6	31.16	68.8	2.02	602.9	3.1	271.6		12	
KALPDBRAW	2007-09-27	0	11.8	29.12	61.8	2.069	619.9	3.1	262.2		20	
KALPDBRAW	2007-12-27	0	11.9	8.04	41.1	1.893	521.5	3	239.8		2	200
KALPDBRAW	2008-01-24	0	10.8	2.7	29.8	1.993	477.7	3	192.6		6	
KALPDBRAW	2008-03-12	0	11.5	2.91	28.8	1.681	618.3	3	199.2		2	
KALPDBRAW	2008-06-24											
KALPDBRAW	2008-12-30	0	10.3	26.63	64	1.73	535.2	2.8	213		5	
KALPDBRAW	2009-03-05	0	9.497	3.18	23.27	1.719	590.8	3	180.4		5	
KALPDBRAW	2009-04-10	0	10.07	1.69	17.7	1.928	480.3	3	164		5	
KALPDBRAW	2009-05-18	0	9.992	2.51	18.5	1.829	482.2	3	167.6		5	75
KALPDBRAW	2009-07-17	0	8.563	10.55	35.2	1.774	428.1	3	188.4		6	
KALPDBRAW	2009-10-28	0	9.82	7.97	34	1.84	522.9	3.1	202.2	970		
KALPDBRAW	2010-02-04	0	8.812	1.2	15.6	1.658	449.4	3.1	156.2	824	5	35
KALPDBRAW	2010-04-08	0	9.94		11	1.717	470.5	3.1	152.6		5	
KALPDBRAW	2010-12-29	0	9.99	16.9	19.9	2.108	581.8	3	180.6			
KALPDBRAW	2011-03-09	0	9.89	0.75	8.089	1.691	466.3	3.1	137	816	<5	
KALPDBRAW	2011-05-23	0	7.491	0.71	6.271	1.36	477	3.2	114.2	850	<5	
KALPDBRAW	2011-11-02	0	8.742	1.59	11	1.636	482.8	3.2	135.4	790	<5	
KALPDBRAW	2012-02-15	0	8.838	1.35	8.161	1.684	415.4	3.3	106.4			
KALPDBRAW	2012-05-16	0	8.175	5.68	13.1	1.687	456	8.6	124.4			
KALPDBRAW	2012-08-22	0	20.2	25.99	56.7	2.014	621.7	3.1	284.2			
KALPDBRAW	2012-12-05	0	8.211	0.71	10.8	1.619	496.6	3.1	119			
KALPDBRAW	2013-07-15	0	10.614	10.75	34.463	1.736	530.1	3.2	169.8	1046	<5	
KALPDBRAW	2013-09-17	0	7.934		28.03	1.463	427.2	3.2	154.6	824	<5	
KALPDBRAW	2014-03-05	0	5.776	0.46	6.791	1.31	447	3.2	97	716	<5	
KALPDBRAW	2014-07-01	0	6.094	1.51	8.951	1.231	478.7	3.2	110.2	720	<5	
KALPDBRAW	2014-09-16	0	8.54	13.83	37.988	1.627	653.6	3.2	172.6	890	10	
KALPDBRAW	2014-12-15	0	8.289	3.13	18.903	1.835	547.7	3.4	112	880	18	
KALPDBRAW	2015-03-10	0	4.617	0.24	3.361	1.516	414.3	4.3	43.4	602	<5	
KALPDBRAW	2015-05-20	0	4.957	0.785	6.144	1.464	512.2	4.1	89.4	730	26	
KALPDBRAW	2015-06-16	1	4.514	1.239	6.724	1.387	429.3	4.8	85.8	748	46	
KALPDBRAW	2015-09-01	0	8.625	2.419	12.056	1.539	578.3	3.2	119.6	780	<5	
KALPDBRAW	2016-02-23	0	6.797	0.475	8.269	1.4	524	3.2	105.6	696	14	
KALPDBRAW	2016-06-23	0	6.893	3.653	10.078	1.258	563.7	3.2	95	850	<5	
KALPDBRAW	2016-09-15	0	9.076	4.881	27.617	1.52	630.3	3.1	184	862	<5	
KALPDBRAW	2017-02-22	0	6.698	1.619	6.969	1.347	702.6	3.3	98.6	650	<5	
KALPDBRAW	2017-05-30	No sample										0
KALPDBRAW	2017-09-26	0	8.458	5.53	17.786	1.407	536.6	3.1	146.4	1610	<5	
KALPDBRAW	2017-11-29	No sample										0
KALPDBRAW	2018-02-20	0	6.071	3.126	8.542	1.19	393.3	3.2	105.8	638	<5	
KALPDBRAW	2018-06-25	61	3.123	1.573	1.787	1.089	447	5.9	-39.4	798	12	
KALPDBRAW	2018-09-24	0	7.196	7.205	15.703	1.304	451.9	3.3	117.8	826	<5	
KALPDBRAW	2018-12-17	0	5.343	5.499	8.322	1.191	412.3	3.5	83.8	662	<5	
KALPDBRAW	2019-06-18	0	5.431	6.031	9.86	1.184	471.5	3.4	88.4	756	<5	
KALPDBRAW	2019-08-27	0	7.022	11.246	18.605	1.253	438.8	3.2	122.6	784	<5	
KALPDBRAW	2020-01-09	0	5.645	5.607	1.235	1.235	411.9	3.2	114.6	650	12	
KALPDBRAW	2020-02-19	0	3.8	8.545	10.298	1.072	378.7	3.6	73.2	682	<5	
KALPDBRAW	2020-12-19	0	7.165	5.183	17.338	1.461	589.9	3.1	134.6	760	<5	
KALPDBRAW	2021-01-19	0	6.71	6.201	14.755	1.377	472.9	3.2	110.8	664	<5	
KALPDBRAW	2021-02-25	0	6.769	5.669	13.202	1.294	417.1	3.3	107.6	698	8	
KALPDBRAW	2021-06-29	0	6.402	5.496	12.71	1.26	988	3.3	101.2	724	6	
KALPDBRAW	2021-08-09	0	7.293	5.724	14.603	1.319	1.106	3.2	119.2	738	<5	
KALPDBRAW	2021-09-27	0	7.033	4.758	14.777	1.398	803.9	3.2	113.4	772	14	

Kalp Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	final_flow
KALPDBRAW	2021-11-09	0	7.185	4.311	16.22	1.379	387.8	3.2	134.4	718	<20	
KALPDBRAW	2022-02-28	0	5.878	2.159	7.661	1.117	375.1	3.3		644	<20	
KALPDBRAW	2022-05-11	0	4846	2.824	6.406	1.08	359.9	3.4	81	608	<20	
KALPDBRAW	2022-07-05	0	5.866	4.554	10.696	1.338	407	3.3	90	716	<20	
KALPDBRAW	2022-09-12	0	7.164	2.904	14.936	1.337	411.1	3.2		842	<20	
KALPDBRAW	2022-11-28	0	6.233	2.68	13.025	1.269	430	3.3	117.8	696	<20	
KALPDBRAW	2022-12-21	0	6.794	2.718	13.409	1.359	425.5	3.2	118.4	720	<20	
KALPDBRAW	2023-01-24	0	5.427	2.05	9.888	1.226	308.7	3.4	91	626	<20	
KALPDBRAW	2023-04-27	0	5.322	1.957	6.361	1.21	518.9	3.4	76.2	672	<20	
KALPDBRAW	2023-07-24	0	7.404	5.202	14.307	1.436	447.1	3.3	112.8	852	<20	
VFW1	2007-12-27	0	7.649	1.86	15.2	2.008	599.7	3.5	93.2		22	180
VFW1	2008-01-24	0	8.811	1.15	12.7	2.192	548.5	3.5	79.2		32	
VFW1	2008-03-12	0	9.078	1.56	18.7	1.801	509.9	3.3	122.8		16	
VFW1	2008-06-24	0	8.036	12.5	27.4	1.872	476.1	3.2	144		18	
VFW1	2008-10-01	0	8.68	3.74	28.3	1.93	608.4	3.1	138.2		14	
VFW1	2008-12-30	0	8.31	2.2	17.3	1.77	403.2	3.2	47.4		5	
VFW1	2009-03-05	0	8.458	1.33	15.81	1.73	589.6	3.1	132.6		5	
VFW1	2009-04-10	0	8.797	1.15	12.6	1.875	522.6	3.3	109.2		18	
VFW1	2009-05-18	0	8.601		14.1	1.735	444.9	3.2	126.6		6	
VFW1	2009-07-17	0	6.891	6.95	22.4	1.915	476.9	3.1	109.2		42	
VFW1	2009-09-03	0	7.694	2.58	22	1.92	533.3	3.1	116.6		34	
VFW1	2009-10-28	0	10.5	1.89	25.1	1.97	588.4	3.2	134.8	946		
VFW1	2010-02-04	0	8.625	0.82	14.4	1.701	494.1	3.2	142	846	5	
VFW1	2010-04-08	0	8.279	0.66	6.97	1.619	510.4	3.4	96		8	
VFW1	2010-12-29	0	8.8	0.86	14.5	1.943	588.8	3.2				
VFW1	2011-03-09	0	8.38	0.52	6.181	1.546	493.2	3.3	106.2	812	<5	
VFW1	2011-05-23	0	7.083	0.9	4.801	1.446	503.9	3.6	74.4	814	10	
VFW1	2011-05-23	0	7.083	0.9	4.801	1.446	503.9	3.6	74.4	814	10	
VFW1	2011-11-02	0	8.434	0.82	8.658	1.737	579.9	3.3	105.8	800	8	
VFW1	2012-02-15	0	6.802	0.68	5.402	1.602	451.5	3.5	72.8			
VFW1	2012-05-16	0	7.399	3.42	7.95	1.974	475.4	8.4	77.8			
VFW1	2012-08-22	0	19.2	17.02	46.6	2.001	644.4	3.1	256.4			
VFW1	2012-12-05	0	7.947	1.01	13.2	1.57	494.2	3.2	112			
VFW1	2013-07-15	0	9.595	5.39	26.404	1.749	550.2	3.1	137.6	1010	26	
VFW1	2013-09-17	0	7.371		20.57	1.492	426	3.2	125.6	840	10	
VFW1	2014-03-05	0	5.426	1.29	5.871	1.312	487	3.4	62	728	8	
VFW1	2014-07-01	0	6.246	1.56	5.991	1.352	517	3.3	89	740	<5	
VFW1	2014-09-16	0	8.277	9.19	28.25	1.64	591.5	3.2	162.4	870	<5	
VFW1	2014-12-15	0	7.33	2.34	14.246	1.762	578.4	3.5	93.2	872	24	
VFW1	2015-03-10	1.2	4.234	0.17	2.914	1.483	436.4	5	29.4	724	14	
VFW1	2015-05-20	0	4.769	0.489	3.894	1.451	452.6	4.5	78.4	752	14	
VFW1	2015-06-16	0	5.38	0.67	5.049	1.534	560.5	4.3	89.8	822	18	
VFW1	2015-09-01	0	8.44	0.663	1.73	2.502	565.6	3.5	84.4	738	12	
VFW1	2016-02-23	3.6	5.142	0.513	3.738	1.435	523.1	4.1	46.2	720	16	
VFW1	2016-06-23	4.4	5.607	1.009	5.267	1.29	553.1	4.2	39.8	784	24	
VFW1	2016-09-15											
VFW1	2017-02-22	0	5.623	0.766	4.113	1.237	552.2	3.7	60.2	642	>5	
VFW1	2017-05-30	7.8	5.076	1.378	3.113	1.178	436.2	4.4	35.8	692	8	
VFW1	2017-09-26	0	7.089	3.21	12.565	1.258	526.9	3.4	86.4	774	12	
VFW1	2017-11-29	0	6.567	1.533	8.286	1.302	457.8	3.4	86.2	722	8	
VFW1	2018-02-20	0	4.946	1.247	4.825	1.078	395.3	3.7	61	630	10	
VFW1	2018-06-25	9.8	5.29	3.089	6.602	1.051	433.2	4.5	38.8	790	10	
VFW1	2018-09-24	0	6.754	5.537	13.213	1.286	521.1	3.4	97.8	744	10	
VFW1	2018-12-17	0.8	4.604	3.245	5.703	1.121	429	3.9	54.6	674	12	
VFW1	2019-03-13	0	4.307	2.558	4.948	1.103	398	3.8	53	652	10	
VFW1	2019-06-18	0	5.021	3.799	7.582	1.141	465.8	3.6	58.2	766	8	
VFW1	2019-08-27	0	6.338	6.322	14.743	1.255	473.6	3.2	108.2	774	14	
VFW1	2020-01-09	0	5.265	3.999	8.888	1.191	408.1	3.4	89.4	658	12	
VFW1	2020-02-19	5	3.497	6.572	8.854	1.07	422	4.1	50.8	662	10	
VFW1	2020-11-17	0	7.762	4.167	17.437	1.492	498	3.1	130	784	18	
VFW1	2020-12-29	0	6.878	4.85	15.276	1.454	576.2	3.1	112.8	782	16	
VFW1	2021-01-19	0	6.613	5.361	13.501	1.397	430	3.2	103	694	<5	
VFW1	2021-02-25	0	6.868	5.682	12.996	1.323	422.6	3.3	98.6	702	8	
VFW1	2021-06-29	0	6.059	5.252	11.225	1.257	1131	3.4	88.2	718	14	
VFW1	2021-08-09	0	7.348	5.172	13.771	1.38	1.115	3.2	110.2	746	10	
VFW1	2021-09-27	0	7.074	4.451	14.725	1.386	589.2	3.2	115.2	734	14	
VFW1	2021-11-09	0	7.66	3.612	15.754	1.542	410.3	3.3	111.4	708	<20	
VFW1	2022-02-28	0	5.975	2.255	6.958	1.224	371.2	3.3		644	<20	
VFW1	2022-05-11	0	4.703	2.972	6.414	1.052	370.2	3.4	76	566	<20	
VFW1	2022-07-05	0	5.963	4.287	10.8	1.283	404.8	3.4	86.6	726	<20	
VFW1	2022-09-12	0	6.745	2.906	13.235	1.312	427.9	3.2		776	<20	
VFW1	2022-11-28	0	6.301	2.177	14.928	1.289	436.7	3.3	105	692	<20	
VFW1	2022-12-21	0	6.157	2.662	11.629	1.284	437.6	3.3	109.8	734	<20	
VFW1	2023-01-24	0	5.355	1.771	9.393	1.231	316.9	3.4	89	614	<20	
VFW1	2023-04-27	9.2	4.415	2.1	6.759	1.366	489.3	4.8	27.4	678	24	
VFW1	2023-07-24	0	7.24	4.387	12.468	1.424	463.7	3.3	101.4	856	<20	
SB1	2007-12-27	0	7.391	0.57	9.26	2.015	603.5	3.5	90.2		14	
SB1	2008-01-24	0	8.185	0.64	8.212	2.077	560.5	3.6	70.4		22	
SB1	2008-03-12	0	8.702	0.8	16.1	1.744	563	3.3	121.4		18	
SB1	2008-06-24	0	7.944	5.82	25.6	1.831	492.3	3.2	147.6		16	
SB1	2008-10-01	0	8.26	1.24	23.4	1.9	671.5	3.1	134.4		12	

Kalp Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	final_flow
SB1	2008-12-30	0	8.27	0.89	16.7	1.77	420.3	3.2	131.6		5	
SB1	2009-03-05	0	9.053	1.09	16.56	1.75	590.7	3.1	141.6		5	
SB1	2009-04-10	0	8.743	0.94	10.5	1.896	527.3	3.3	101.6		18	
SB1	2009-05-18	0	9.267		11.3	1.876	439.6	3.2	125.2		5	
SB1	2009-07-17	0	7.287	2.22	13.1	1.939	473.8	3.1	114		10	
SB1	2009-09-03	0	7.932	0.95	14.5	1.94	506.7	3	123.8		8	
SB1	2009-10-28	0	10.7	0.94	19.8	1.95	542.8	3.2	126.4	902		
SB1	2010-02-04	0	8.462	0.74	15.5	1.688	485.2	3.2	140.6	848	5	
SB1	2010-04-08	0	8.374	0.51	5.955	1.655	493.5	3.4	102.6		5	
SB1	2010-12-29	0	9.26	0.72	14	1.926	594.5	3.2				
SB1	2010-12-29	0	7.959	0.61	5.834	1.508	496	3.3	102.6	826	<5	
SB1	2011-05-23	0	7.053	1.18	2.899	1.425	511.9	3.6	75.4	814	<5	
SB1	2011-11-02	0	8.15	0.55	7.648	1.686	589.8	3.3	101.6	756	<5	
SB1	2012-02-15	0	6.457	0.75	4.878	1.518	457.3	3.6	67.2			
SB1	2012-05-16	0	5.376	1.69	2.891	1.762	454	3.4	75.4			
SB1	2012-08-22	0	18.9	4.49	41.4	2.007	631.2	3.1	254.4			
SB1	2012-12-05	0	7.83	1.03	9.87	1.59	502.5	3.2	111.4			
SB1	2013-07-15	0	10.089	2.2	14.397	1.909	526.2	3.1	122	996	10	
SB1	2013-09-17		7.333		14.759	1.478	421.5	3.2	120.6	844	8	
SB1	2014-03-05	0	5.216	1.38	5.234	1.294	524.7	3.5	61.8	650	12	
SB1	2014-07-01	0	6.528	1.1	5.447	1.464	515.6	3.3	87.2	750	6	
SB1	2014-09-16	0	8.26	2.92	23.334	1.654	482.9	3.1	156.2	870	10	
SB1	2014-12-15	0	5.85	1	6.779	1.778	560	3.7	64.4	784	16	
SB1	2015-03-10	0	3.64	0.106	1.13	1.449	415.2	4.9	23.2	696	10	
SB1	2015-05-20	0	4.82	0.176	1.784	10496	445.2	4.5	81	730	10	
SB1	2015-06-16	0	5.62	0.344	2.126	1.479	505.5	3.8	98.2	762	14	
SB1	2015-09-01	0	7.562	1.111	3.388	1.625	524.3	3.5	79	772	8	
SB1	2016-02-23	3	5.62	0.228	1.536	1.527	513.7	4.1	43.2	72.8	26	
SB1	2016-06-23	0	5.906	0.661	2.326	1.332	516.2	3.7	47.4	758	8	
SB1	2016-09-15	0	8.218	1.422	5.054	1.647	645.6	3.2	115.4	856	<5	
SB1	2017-02-22	0	5.615	0.398	3.114	1.225	703.2	3.6	61.4	662	<5	
SB1	2017-05-30	1	5.117	0.691	3.272	1.157	426.3	4	41.6	670	<5	
SB1	2017-09-26	0	7.498	1.349	7.681	1.302	533.1	3.2	106.6	778	<5	
SB1	2017-11-29	0	6.54	1.198	7.202	1.288	485.5	3.4	91.6	722	6	
SB1	2018-02-20	0	5.315	0.992	5.685	1.133	429.2	3.5	68.6	624	10	
SB1	2018-06-25	0	5.552	1.556	4.262	1.097	429.9	3.6	69	744	<5	
SB1	2018-09-24	0	6.746	2.869	12.905	1.279	490.2	3.3	92.4	800	6	
SB1	2018-12-17	0	4.705	1.769	5.057	1.132	411.9	3.8	51	632	<5	
SB1	2019-03-13	0	4.303	2.086	4.769	1.097	402.2	3.7	52.6	652	66	
SB1	2019-06-18	0	5.111	2.556	8.104	1.154	422.2	3.5	61.8	748	10	
SB1	2019-08-27	0	6.133	2.04	7.352	1.224	474.1	3.2	102.4	760	<5	
SB1	2020-01-09	0	5.415	3.109	8.588	1.219	412.5	3.3	94	638	10	
SB1	2020-02-19	0	3.675	4.445	7.827	1.092	386	3.8	56.8	676	14	
SB1	2020-11-17	0	7.702	2.785	15.709	1.496	499.4	3	141	762	8	
SB1	2021-01-19	0	6.648	3.405	12.753	1.387	456.3	3.2	102.6	706	<5	
SB1	2021-02-25	0	6.634	3.61	11.422	1.307	426.1	3.3	99	708	6	
SB1	2021-06-29	0	6.024	1.453	6.023	1.292	726.1	3.3	86	716	8	
SB1	2021-08-09	0	7.277	1.152	10.564	1.39	1.164	3.2	107.8	724	10	
SB1	2021-11-09	0	6.679	1.463	11.793	1.334	400.1	3.3	113	718	<20	
SB1	2022-02-28	0	6.045	2.084	7.46	1.227	382.5	3.3		640	<20	
SB1	2022-05-11	0	4.723	2.255	5.604	1.062	368.5	3.4	78.8	590	<20	
SB1	2022-07-05	0	5.869	2.333	7.594	1.29	400.6	3.3	79.4	706	<20	0
SB1	2022-09-12	0	7.163	1.726	10.358	1.399	417.2	3.2		800	<20	
SB1	2022-11-28	0	6.138	2.092	10.663	1.287	433	3.3	110	690	<20	
SB1	2023-01-24	0	5.274	1.049	9.22	1.196	315.2	3.3	92.4	616	<20	
SB1	2023-04-27	4.8	3.287	0.623	1.97	1.357	504.7	4.2	31.6	706	<20	
SB1	2023-07-24	0	7.147	1.385	5.408	1.448	448.3	3.2	96.2	834	<20	
VFW2	2007-12-27	53	0.419	0.17	0.401	1.503	600.5	7.5	-32.6		4	120
VFW2	2008-01-24	60.8	0.607	0.07	0.202	2.344	614.6	7.2	-50.2		8	
VFW2	2008-03-12	32.2	2.793	0.13	1.001	1.955	681.8	6.5	-14		14	
VFW2	2008-06-24	61.4	3.021	2.83	4.263	2.139	417.5	6.8	-45		26	
VFW2	2008-10-01	46.8	3.64	0.42	1.63	2.03	706.4	6.4	-32.8		24	
VFW2	2008-12-30	23	3.83	0.18	2.08	1.7	405	6.2	-11.6		20	
VFW2	2009-03-05	0.8	5.95	0.72	5.782	1.687	588.1	5.1	20.2		26	
VFW2	2009-04-10	13.8	3.902	0.43	1.135	1.738	564.7	6.1	0.8		22	
VFW2	2009-05-18	14.6	4.348		4.972	1.838	442.1	6.3	2.4		22	
VFW2	2009-07-17	47.4	2.128	14.63	14.5	2.44	552.7	6.4	-37.2		36	
VFW2	2009-09-03	24.2	4.154	8.72	10.9	2.16	519.3	6.2	-2		16	
VFW2	2009-10-28	0	6.21	3.16	5.21	1.91	630.8	4.3	53.6	952		
VFW2	2010-02-04	0	6.222	2.18	4.772	1.772	514.5	4.3	51	828	5	
VFW2	2010-04-08	39.6	2.434	2.8	3.483	1.702	579.2	7	-25.2		10	
VFW2	2010-12-29	0.4	6.605	0.31	2.151	1.575	616.9	4.9				
VFW2	2011-03-09	31.2	2.508	1.38	2.194	1.31	483.5	6.4	-18.4	818	16	
VFW2	2011-11-02	0	5.655	2.99	3.764	1.688	603.1	4.9	28.4	794	18	
VFW2	2012-02-15	1.8	4.674	0.48	1.827	1.414	489.1	5.1	13.2			
VFW2	2012-05-16	0	6.487	1.35	4.271	1.855	454.7	3.4	73.4			
VFW2	2012-08-22	0	15	4.17	24.4	2.054	614.2	3.3	142.8			53.9
VFW2	2012-12-05	0	6.803	3.2	19	1.497	490	3.7	49.4			53.9
VFW2	2013-07-15	0	9.349	1.05	7.321	1.813	527.7	3	126.8	1012	12	
VFW2	2013-09-17	22.4	5.287		8.406	1.621	383.5	5.5	26.4	830	26	
VFW2	2014-03-05	2.2	4.02	4.67	8.738	1.269	457.7	4.8	36.6	762	22	
VFW2	2014-07-01	159.4	<0.5	31.98	32.987	1.704	613.6	6.6	-120.6	1024	156	

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VFW2	2014-12-15	558.6	0.702	55.98	53.464	1.852	1953.7	7.2	-147.6	4824	34	
VFW2	2015-03-10	152.8	<0.5	0.993	0.841	0.878	346.6	7.5	-100.4	732	<5	
VFW2	2015-05-20	88.8	0.986	0.689	0.559	1.586	428	6.8	5.6	764	14	53.9
VFW2	2015-06-16	71.6	0.915	4.775	4.288	1.392	476.8	6.4	-3	722	22	53.9
VFW2	2015-09-01	180.4	<0.5	4.56	4.142	1.836	427.9	6.9	-91.4	884	22	26.93
VFW2	2016-02-23	50.6	1.775	0.772	0.712	1.637	480.3	6.7	-28.4	752	28	67.3
VFW2	2016-06-23	39.4	3.697	1.39	1.524	1.37	527.2	6.1	-21.2	780	24	53.9
VFW2	2016-09-15	73.2	5.097	2.878	3.66	1.789	600.7	6.2	-28.6	886	28	
VFW2	2017-02-22	56	1.5	1.706	1.992	1.391	458.5	7	-32.8	716	<5	-85.3
VFW2	2017-05-30	137.8	1.334	3.27	2.983	1.314	432.8	6.8	-119.2	800	6	107.7
VFW2	2017-09-26	79.8	4.086	2.51	3.74	1.509	519.7	6.1	-51.8	882	8	85.3
VFW2	2017-11-29	11.6	4.544	1.029	2.171	1.347	451.6	5.2	21.8	748	10	53.9
VFW2	2018-02-20	17.4	2.978	1.104	1.19	1.203	403.1	5.4	11.8	638	10	753.9
VFW2	2018-06-25	134.2	1.246	22.207	26.08	1.247	427.8	6.6	-88.4	790	42	
VFW2	2018-09-24	143.4	15.107	23.637	22.877	1.426	510.8	6.8	-93.4	860	58	
VFW2	2018-12-17	33.6	2.651	0.132	0.693	1.019	397.6	6.4	-6.6	674	18	
VFW2	2019-03-13	12.4	3.578	0.15	0.979	0.909	407.6	5.5	18	672	16	
VFW2	2019-08-27	84.2	2.68	1.057	2.304	1.168	479.3	6.3	-64	856	20	53.9
VFW2	2020-01-09	8	4.07	0.642	1.783	1.16	419.6	4.6	48.2	632	<5	
VFW2	2020-02-19	18.8	2.024	0.757	1.57	0.861	402.4	5.8	6	672	20	53.9
VFW2	2020-11-17	26.2	7.993	9.731	22.095	1.581	497.6	5.9	19.6	776	42	
VFW2	2020-12-29	61.6	1.972	8.478	10.468	1.552	529.9	6.4	-32.2	802	24	
VFW2	2021-01-19	54.4	1.692	5.578	6.017	1.537	471.9	6.7	-29.6	728	<5	
VFW2	2021-02-25	68.2	1.524	4.711	5.086	1.536	451.1	6.6	-54	790	14	
VFW2	2021-06-29	113.8	<0.5	23.538	30.252	1.778	939.1	6.6	-74	774	56	
VFW2	2021-08-09	104.8	<0.5	19.462	18.468	1.921	1082	7	-83	842	26	
VFW2	2021-09-27	54.4	1.959	21.154	21.891	1.683	466.3	6.3	-4.2	788	18	
VFW2	2021-11-09	51	0.672	15.473	14.728	1.472	439.1	6.6	-21	752	<20	
VFW2	02/29/22	85.8	<0.5	6.434	8.579	1.239	368	6.7		674	20	
VFW2	5-11-22	0	4.695	1.385	3.808	1.069	364.1	3.4	77.6	572	<20	
VFW2	7-6-22	0	6.229	1.34	5.115	1.279	400.1	3.3	79.6	744	<20	
VFW2	2022-09-12	31.6	3.298	1.096	3.49	0.768	672.2	6		1160	26	
VFW2	2022-11-28	0	5.958	1.79	6.923	1.178	417.9	3.3	100	664	<20	
VFW2	2022-12-21	0	6.186	2.754	8.108	1.251	427.7	3.4	17.38	692	<20	
VFW2	2023-01-24	0	5.262	1.275	7.084	1.184	303.3	3.3	87.6	600	<20	
VFW2	2023-04-27	0	4.802	0.35	2.399	1.294	474.4	3.4	65	686	<20	
VFW2	2023-07-24	14.4	47.16	4.023	32.969	1.323	455.9	5.9	15.6	806	102	
VFW3	2007-12-27	65.2	0.714	0.56	0.613	1.343	544.9	7.4	-41.4		2	60
VFW3	2008-01-24	65.2	0.661	0.47	0.737	2.063	626.2	7.2	-53		12	
VFW3	2008-03-12	57.2	1.546	0.1	0.37	2.479	637.4	7	-36.6		12	
VFW3	2008-06-24	47.2	3.534	5.95	7.312	2.015	484	6.6	-26.2		34	
VFW3	2008-10-01	59.2	2.66	2	3.21	2.14	705.3	6.6	-50.4		24	
VFW3	2008-12-30	29.8	3.46	0.19	1.89	1.83	437	6.4	-17.4		18	
VFW3	2009-03-05	52.4	2.519	0.3	1.233	2.083	603.3	6.8	-39		24	
VFW3	2009-04-10	27.4	3.968	0.25	1.927	1.871	566	6.4	-11.4		20	
VFW3	2009-05-18	25.8	3.877		3.362	1.839	446.6	6.5	-7		28	
VFW3	2009-07-17	45.2	2.737	7.49	8.005	2.078	522.4	6.6	-33.8		26	
VFW3	2009-09-03	1.8	5.105	4.23	5.272	1.987	532.6	5.2	17.4		8	
VFW3	2009-10-28	0	6.06	2.54	4	1.98	630.2	4.2	50.8	960		
VFW3	2010-02-04	0	6.715	0.34	2.482	2.143	526.6	4.8	31.2	836	8	
VFW3	2010-04-08	58	1.336	2.96	4.482	1.795	573	7.2	-45		10	
VFW3	2010-12-29	30.8	4.45	0.47	1.216	1.789	6.7.6	6.1				
VFW3	2011-03-09	6.2	3.765	0.3	1.171	1.371	493	5.7	7.2	822	8	
VFW3	2011-05-23	82.8	0.913	0.74	0.825	1.06	526.2	7	-78.4	938	8	
VFW3	2011-11-02	0.6	4.992	0.21	0.601	1.317	610.4	5	18.6	816	12	
VFW3	2012-02-15	15.2	4.589	0.22	1.353	1.013	477.8	6	-6.4			
VFW3	2012-05-16	0	6.958	1.61	3.374	1.798	468.6	3.4	75.6			
VFW3	2012-08-22	22	8.319	3.45	5.17	2.488	624.7	6	2			139.1
VFW3	2012-12-05	0	4.498	0.29	1.67	0.986	495.3	4.7	24.4			116.7
VFW3	2013-07-15	1.8	6.098	4.51	5.942	2.426	557	5	13.8	1024	62	
VFW3	2013-09-17	0	5.442		4.356	2.02	426.8	5	27.2	856	22	
VFW3	2014-03-05	4.2	3.661	1.22	1.582	1.151	528.4	5.1	13.6	742	16	
VFW3	2014-07-01	78	1.354	4.81	18.414	5.754	454.5	6.6	-54.8	748	32	
VFW3	2014-12-15	97.6	1.965	5.03	5.083	2.2	597.9	7	51.2	1016	18	
VFW3	2015-03-10	71.6	1.471	1.919	1.567	1.43	372.3	7	-42.6	100.4	8	
VFW3	2015-05-20	82.8	1.343	2.267	2.051	2.292	411.7	6.8	12.2	736	14	53.9
VFW3	2015-06-16	10	2.126	2.192	2.13	1.529	465.1	5.6	21.8	704	<5	76.3
VFW3	2015-09-01	13.4	60	2.177	2.332	1.799	552.7	5	25.4	790	12	139.1
VFW3	2016-02-23	10	3.619	0.402	0.443	1.519	466.2	5.1	27.2	684	24	139.1
VFW3	2016-06-23	17	3.918	0.838	0.992	1.456	507.5	5.4	4	750	24	98.7
VFW3	2016-09-15	16.4	6.618	2.056	2.996	1.918	573.3	5	36	854	28	
VFW3	2017-02-22	27.4	2.825	1.784	2.196	1.451	465.8	6.1	-3.6	716	<5	
VFW3	2017-05-30	116.2	1.439	2.811	2.961	1.366	428.6	6.6	-101.6	770	12	170.6
VFW3	2017-09-26	88.6	3.429	3.074	4.687	1.566	523.1	6.2	-57.6	870	8	273.8
VFW3	2017-11-29	11.2	4.776	1.221	2.118	1.35	449.4	5.1	27.4	778	12	53.9
VFW3	2018-02-20	74.8	2.285	7.395	14.753	1.084	333.6	6.7	-39.2	598	6	753.9
VFW3	2018-06-25	72.2	2.533	2.368	2.381	1.155	481	6.2	-42.4	820	12	
VFW3	2018-09-24	136	2.06	13.874	14.951	1.42	535.2	6.9	98.4	840	20	
VFW3	2018-12-17	26.6	2.77	1.274	2.363	1.217	398.6	6.2	0.8	696	10	
VFW3	2019-03-13	10.4	3.822	1.098	6.629	1.093	404.7	5	21.6	656	10	
VFW3	2019-06-18	0	5.061	0.656	2.628	1.153	413.6	3.5	58.4	732	6	
VFW3	2019-08-27	51	3.833	2.423	3.731	1.33	444.9	5.9	-27.2	818	16	

Kalp Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	final_flow
VFW3	2020-01-09	0	5.121	0.818	4.447	1.179	424.6	3.5	75	648	10	
VFW3	2020-02-19	12.4	2.382	0.298	0.688	1.01	393.6	5.4	16	688	18	
VFW3	2020-11-17	19.6	4.008	4.083	4.485	1.478	500.1	5.7	6.4	764	22	
VFW3	2020-12-29	11.2	3.826	1.885	2.709	1.282	559.9	5.2	20.2	742	24	
VFW3	2021-01-19	11.2	3.866	1.171	2.164	1.234	469.3	4.9	17.2	708	8	
VFW3	2021-02-25	9	3.976	0.607	1.412	1.104	466.6	5.2	14.2	700	16	
VFW3	2021-06-29	74.8	<0.5	15.014	15.139	1.68	677.9	6.6	-43	768	32	
VFW3	2021-08-09	72.2	1.76	10.773	10.721	1.629	1214	6.8	-50.6	798	18	
VFW3	2021-11-09	18.2	3.416	8.204	8.25	1.347	454.4	6.3	17.6	734	<20	
VFW3	2022-02-28	0	6.136	2.054	5.497	1.233	367.3	3.3		630	<20	
VFW3	2022-05-11	0	4.67	1.002	2.762	1.058	360.1	3.3	73	576	<20	
VFW3	2022-07-06	0	5.851	0.746	3.493	1.278	398.3	3.2	90.4	1030	<20	
VFW3	2022-09-12	0	4.37	0.875	2.439	0.979	283.7	3.3		530	50	
VFW3	2022-11-28	0	6.001	2.016	8.201	1.212	418.2	3.3	100.2	662	<20	
VFW3	2022-12-21	0	6.402	2.326	10.583	1.279	433.7	3.3	102	692	28	
VFW3	2023-01-24	0	5.322	1.153	6.157	1.16	292.6	3.2	84	554	<20	
VFW3	2023-04-27	0	4.482	0.54	2.759	1.247	515.5	3.4	63.4	678	<20	
VFW3	2023-07-24	0	6.736	0.957	2.452	1.363	427.3	3.2	87.2	830	<20	
SB2	2007-12-27	71.8	0.446	0.43	1.198	1.639	658.7	7.7	-45.8		10	180
SB2	2008-01-24	52.6	0.766	0.15	1.01	2.13	595.1	7.1	-38.8		18	
SB2	2008-03-12	23.4	0.579	1.19	1.479	2.796	633.6	6.6	-0.8		4	
SB2	2008-06-24	51	0.615	0.16	1.294	2.121	485.1	6.8	-31.4		10	
SB2	2008-10-01	59.6	0.319	0.12	0.501	1.9	717.8	7.1	-50.6		6	
SB2	2008-12-30	22.4	0.931	0.1	0.485	1.79	424.4	6.8	-11.6		10	
SB2	2009-03-05	29.2	0.884	0.26	0.832	1.841	576.1	6.9	-20.2		10	
SB2	2009-04-10	27.6	0.63	0.13	0.216	1.964	575.6	7	-16.4		10	
SB2	2009-05-18	24.2	0.279		0.653	1.739	443.8	7	-11.8		5	
SB2	2009-07-17	44.4	0.2	0.09	0.357	1.323	517.5	7.4	-38.2		5	
SB2	2009-09-03	17	0.2	0.1	0.124	2.311	510.7	6.7	-13.4		5	
SB2	2009-10-28	0	6.11	0.24	1.16	2.04	575.1	4.4	43.8	960		
SB2	2010-02-04	0	4.969	0.47	1.516	2.106	506.9	4.7	31.6	822	5	
SB2	2010-04-08	41.6	0.22	0.35	0.843	1.78	541.8	7.4	-28.2		5	
SB2	2010-12-29	6.4	1.687	0.29	0.473	1.695	612	6.12				
SB2	2011-03-09	10.2	1.068	0.41	1.811	1.249	464.3	6.4	-1	822	<5	
SB2	2011-05-23	66.2	0.284	0.14	0.617	1.217	489.2	7.4	-59.2	916	<5	
SB2	2011-11-02	1.6	1.043	0.51	0.614	1.397	598	5.8	10.4	808	<5	
SB2	2012-02-15	9.6	0.907	0.16	0.282	1.09	474.5	6.2	-3.8			
SB2	2012-05-16	27.2	0.513	0.2	3.776	1.409	485.7	6.9	-20.8			
SB2	2012-08-22	0	6.942	0.11	0.569	2.292	571.2	4.4	49.8			
SB2	2012-12-05	0	5.168	0.61	1.165	1.12	497.2	4	42.2			
SB2	2013-07-15	5	5.698	1.88	10.811	2.066	572	5.8	-2	5	40	
SB2	2013-09-17	4.2	1.483		2.492	1.713	442.7	5.4	23.6	792	18	
SB2	2014-03-05	27.2	0.813	0.59	1.077	1.32	450.6	6.5	-28.2	748	8	
SB2	2014-07-01	71.4	0.688	0.16	0.499	1.155	523.2	6.6	-55	798	<5	
SB2	2014-09-16	51.6	0.818	0.79	3.228	1.385	535	6.8	-34.6	948	20	
SB2	2014-12-15	70.6	1.346	2.38	5.789	2.126	638.6	6.6	-23.6	1042	22	
SB2	2015-03-10	0	2.412	0.298	1.651	1.304	403.5	4.7	24.8	746	18	
SB2	2015-05-20	35.6	1.056	0.389	0.775	1.89	413.3	6.2	18	732	18	211
SB2	2015-06-16	0	2.578	0.336	1.284	1.575	387.2	4.8	56.2	700	<5	
SB2	2015-09-01	3.6	5.189	0.313	1.077	1.769	536.3	4.1	68.8	748	12	
SB2	2016-02-23	3.8	4.417	0.384	1.067	1.602	513.6	4.1	48.6	6.98	18	0
SB2	2016-06-23	0	4.269	0.438	1.042	1.363	485.5	3.6	50	770	8	
SB2	2016-09-15											
SB2	2017-02-22	3.6	4.11	0.52	2.194	1.391	389.3	4.1	38.2	648	<5	471.3
SB2	2017-05-30	95	<0.5	0.04	<0.3	0.868	421.6	7.4	-77.2	756	<5	184
SB2	2017-09-26	82.6	<0.5	0.208	0.457	1.757	514.5	6.4	-57.2	866	0	
SB2	2017-11-29	10.4	1.839	0.509	0.943	1.374	450.9	5.5	19.8	730	8	592.5
SB2	2018-02-20	12.8	1.882	0.545	0.744	1.554	402.5	5.4	14.6	542	14	332.1
SB2	2018-06-25	69.6	<0.5	0.128	0.373	1.153	390	6.4	-54.8	776	<5	
SB2	2018-09-24	46.4	<0.5	0.158	0.643	1.655	554.6	6.4	-30.8	798	<5	
SB2	2018-12-17	22	1.132	0.38	0.705	1.097	397.5	6.4	1.2	694	8	
SB2	2019-03-13	13.8	1.615	0.449	0.76	1.079	402	6	5.8	664	14	
SB2	2019-06-18	49.4	<0.5	0.195	0.44	1.22	411	6.6	-40.2	748	<5	
SB2	2019-08-27	74	<0.5	0.061	<0.3	0.95	451.5	6.7	-58.6	792	<5	
SB2	2020-01-09	8.2	2.029	1.037	1.879	1.223	419.7	5.2	21.2	664	14	
SB2	2020-02-19	14.2	1.321	0.76	1.391	0.996	389.9	5.7	11.4	680	12	
SB2	2020-11-17	7.4	2.384	0.59	1.155	1.63	499	4.9	23.4	764	14	
SB2	2020-12-29	53.2	<0.5	0.724	0.921	0.329	93.4	6.6	-38.4	244	<5	
SB2	2021-01-19	10.2	1.966	0.751	1.309	1.44	418.5	4.8	14.4	674	<5	
SB2	2021-02-25	7.2	3.593	0.523	1.502	1.32	415.8	4.7	28.4	694	10	
SB2	2021-06-29	29	1.623	4.872	5.905	1.633	718.8	6	-1.8	734	16	
SB2	2021-08-09	37	0.907	3.203	3.474	1.64	1149	6.6	-17.2	762	10	
SB2	2021-09-27	15.4	<0.5	3.299	3.399	1.573	897	6	9.4	800	<5	
SB2	2021-11-09	8.6	3.697	2.904	3.814	1.46	425	4.8	38.2	734	<20	
SB2	2022-02-28	7.4	2.463	1.312	2.335	1.042	361.3	4.6		630	<20	
SB2	2022-05-11	10.2	1.362	1.282	1.857	1.211	383.5	5	18.29	588	<20	
SB2	2022-07-05	13.2	0.882	1.107	2.227	1.364	432.3	5.6	6.6	710	<20	
SB2	2022-09-12	0	5.192	0.13	1.703	1.346	447.2	3.9		806	<20	
SB2	2022-11-28	2.6	4.081	1.54	3.128	1.308	443.7	3.9	51.2	668	<20	
SB2	2022-12-21	0	4.726	1.555	4.091	1.344	461.6	3.7	61.4	726	<20	
SB2	2023-01-24	0	5.334	1.285	5.301	1.232	314.7	3.6	69.8	602	<20	
SB2	2023-04-27	0	5.534	1.034	9.18	1.256	495.3	3.6	61.6	674	36	

Kalp Water Quality Monitoring

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SB2	2023-07-24	7	7.024	1.399	18.77	1.417	444.4	4.7	20.4	784	<20	
COMBOUT	2008-01-24	0	10.3	3.38	26.5	1.93	490.9	3.1	181.2		6	
COMBOUT	2008-03-12	0	2.455	0.71	5.322	1.94	639.3	4.4	36.8		18	
COMBOUT	2008-06-24	51	0.576	0.24	1.437	2.088	494.4	7	-32.2		12	
COMBOUT	2008-10-01	60.4	0.244	0.12	0.506	1.9	721.4	7.3	-52.2		10	
COMBOUT	2008-12-30	23.6	0.864	0.14	0.508	1.74	421.7	6.8	-13.6		6	
COMBOUT	2009-03-05	0	4.993	0.99	12.8	1.872	566.1	3.5	63.2		18	
COMBOUT	2009-04-10	0.4	2.467	0.59	4.085	2.001	578.5	5.1	19.4		10	
COMBOUT	2009-05-18	0	4.35		8.393	1.857	426.6	3.5	60.8		12	
COMBOUT	2009-07-17	9	1.632	1.28	5.137	1.417	512.2	6.6	0.2		16	
COMBOUT	2009-09-03	20	0.2	0.12	0.207	2.213	524.4	6.9	-16		5	
COMBOUT	2009-10-28	0	5.51	0.24	1.02	1.89	555.3	4.7	32	894		
COMBOUT	2010-02-04	0	6.495	0.6	5.037	2.09	496.6	3.7	57.6	830	6	
COMBOUT	2010-04-08	0	4.599	0.69	4.951	1.717	517.2	4	47.4		5	
COMBOUT	2010-12-29	42.4	0.473	2.5	2.706	1.258	295.8	6.7				
COMBOUT	2011-03-09	0	2.689	0.48	1.596	1.343	462	4.9	22	784	<5	
COMBOUT	2011-05-23	0	4.121	0.42	2.954	1.345	468.9	4.9	21.2	830	10	
COMBOUT	2011-11-02	0	3.708	0.77	3.154	1.459	579.5	3.7	50	752	6	
COMBOUT	2012-02-15	0	3.608	0.49	2.185	1.269	446.1	3.9	38.2			
COMBOUT	2012-05-16	0	3.184	0.78	2.97	1.383	455.3	4.2	29.2			
COMBOUT	2012-08-22	0	6.848	0.18	0.554	2.23	570	4.5	51			
COMBOUT	2012-12-05	0	6.561	0.57	1.351	1.503	438.1	4.1	38.6			
COMBOUT	2013-07-15	80.6	<0.5	0.3	1.477	2.298	147	7.1	-78.6	392	<5	
COMBOUT	2013-09-17	116.4	<0.5		7.654	9.255	311.1	6.8	-42.4	708	12	
COMBOUT	2014-03-05	44.6	<0.5	0.57	0.764	0.679	228.2	7.2	-51.8	342	6	
COMBOUT	2014-07-01	65.4	<0.5	0.37	0.554	1.207	469.7	6.6	-50.8	776	<5	
COMBOUT	2014-09-16	56.4	<0.5	1.08	1.602	1.608	64.3	7	-41.2	956	<5	
COMBOUT	2014-12-15	76.6	1.137	1.71	4.795	2.133	564.2	6.7	-30.8	1020	14	
COMBOUT	2015-03-10	1.2	3.074	0.726	2.74	1.239	353.5	5	21.8	616	28	
COMBOUT	2015-06-16	1	2.585	0.346	1.417	1.513	412	5	52.6	640	<5	
COMBOUT	2015-09-01	6	5.179	0.421	1.632	1.762	499.8	4.4	61.4	782	18	
COMBOUT	2016-02-23	30.4	<0.5	0.497	0.678	0.468	196.4	6.9	-17.8	310	6	
COMBOUT	2016-06-23	7.4	4.167	0.916	1.327	1.574	593.8	4.6	29.4	752	6	
COMBOUT	2016-09-15	9.4	5.222	1.759	3.882	1.854	592.5	4.7	54	826	20	
COMBOUT	2017-02-22	4.8	4.201	0.375	1.8	1.416	404.7	4.3	36.4	664	<5	
COMBOUT	2017-05-30	90.2	<0.5	0.107	0.304	0.769	398.9	7.4	-78.4	598	<5	
COMBOUT	2017-09-26	84.8	<0.5	0.232	0.447	1.561	518.3	6.6	-65.2	840	6	
COMBOUT	2017-11-29	11.2	0.993	0.358	0.665	1.27	437.1	5.7	11.6	736	<5	
COMBOUT	2018-02-20	14.4	1.562	0.374	0.648	1.314	306.3	5.6	8.8	510	16	
COMBOUT	2018-06-25	69	<0.5	0.159	<0.3	1.155	404	6.4	-53.8	772	<5	
COMBOUT	2018-09-24	50.6	<0.5	0.39	0.621	1.692	541.5	6.6	-36.6	658	6	
COMBOUT	2018-12-17	27.6	0.516	0.346	0.586	0.852	315.2	6.7	-0.6	550	<5	
COMBOUT	2019-03-13	14.6	1.184	0.401	0.734	1.051	396.1	6	6	640	14	
COMBOUT	2019-06-18	51.2	<0.5	0.185	0.463	1.183	416.9	6.6	-43.6	762	8	
COMBOUT	2019-08-27	53.4	1	0.205	0.423	1.128	453.1	6.6	-38	810	8	
COMBOUT	2020-01-09	8.4	1.945	1.03	1.902	1.219	411.7	5.4	30.4	648	24	
COMBOUT	2020-02-19	16.2	1.174	0.633	1.202	0.957	370.5	5.9	7.4	628	14	
COMBOUT	2020-11-17	8.8	2.14	0.578	1.099	1.567	485.1	5	17.6	778	14	
COMBOUT	2020-12-29	39.4	<0.5	0.919	1.107	0.672	234.5	6.6	-23	398	10	
COMBOUT	2021-01-19	24.4	1.106	1.066	1.889	1.123	326	6.4	-9.6	550	10	
COMBOUT	2021-02-25	7.8	2.774	0.41	1.095	1.079	376.1	5	18	580	6	
COMBOUT	2021-06-29	27.2	1.577	4.537	5.661	1.671	825.9	6	-1	746	22	
COMBOUT	2021-08-09	37.4	1.317	2.927	4.141	1.715	454.4	6.8	-20	776	18	
COMBOUT	2021-11-09	8.8	3.611	2.716	3.853	1.386	420.2	4.9	35	702	<20	
COMBOUT	2022-02-28	7.4	2.354	1.267	2.188	1.013	340.6	4.9		598	<20	
COMBOUT	2022-05-11	1.2	3.492	0.919	1.761	1.137	357.8	4	38	556	<20	
COMBOUT	3033-07-05	13.8	1.169	1.433	2.592	1.439	422.3	5.7	8.4	708	<20	
COMBOUT	2022-09-12	4	4.983	0.166	1.695	1.424	436.6	4.1		780	<20	
COMBOUT	2022-11-28	8	3.309	1.105	2.038	1.157	397.2	18.59	39.4	606	<20	
COMBOUT	2022-12-21	9.6	0.774	0.307	0.472	0.622	182.1	6	11.6	324	<20	
COMBOUT	2023-01-24	0	4.83	1.147	4.618	1.114	287.5	3.4	61.4	554	<20	
COMBOUT	2023-04-27	0	4.678	0.511	2.292	1.25	411.9	3.6	54.6	664	<20	
COMBOUT	2023-07-24	0	3.889	0.633	1.897	1.436	431.4	3.8	33	796	<20	
MITWET1	2007-12-27	5.8	0.34	0.11	0.521	0.085	23.1	6.8	2.6		26	200
MITWET1	2008-01-24	2.6	0.301	0.17	0.508	0.199	41.8	6.2	1.4		10	
MITWET1	2008-03-12	3.6	0.2	0.08	0.184	0.082	24.6	6.7	4		6	
MITWET1	2008-06-24	82.4	0.2	0.03	0.376	2.518	255.2	7.5	-66.6		6	
MITWET1	2008-10-01	6.2	0.481	0.83	1.32	1.48	232.7	6.5	3		16	
MITWET1	2008-12-30	5	0.2	0.06	0.206	0.156	26.4	6.6	-2.2		5	
MITWET1	2009-03-05	4.6	0.2	0.1	0.209	0.153	30.6	6.7	-2.2		6	
MITWET1	2009-04-10	5	0.2	0.06	0.218	0.169	29.1	6.7	17		5	
MITWET1	2009-05-18	8.4	0.255		0.56	0.125	40.2	6.8	1.6		22	
MITWET1	2009-07-17	15.6	0.313	0.17	0.898	1.408	218.5	7	-12		20	
MITWET1	2009-09-03	8.4	0.317	0.06	0.045	1.528	207.7	6.9	-4		6	
MITWET1	2009-10-28	11	0.28	0.12	0.414	0.209	43.5	6.9	-7.6	114		
MITWET1	2010-02-04	3.6	0.321	0.81	1.309	0.267	40.7	6.5	4.2	98	10	
MITWET1	2010-04-08	0	1.652	0.22	0.526	0.43	96.1	4.9	16.6		5	
MITWET1	2010-12-29	6	0.2	0.24	0.317	0.298	62	6.4				
MITWET1	2011-03-09	0.4	0.841	0.09	0.14	0.205	63.1	5.3	5.2	136	6	
MITWET1	2011-05-23	0	1.089	0.22	0.545	0.274	85.5	5	12.4	192	20	
MITWET1	2012-02-15	0	2.993	14.9	4.002	0.75	162.9	3.6	44.6			

Kalp Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	final_flow
MITWET1	2012-05-16	86.8	<0.02	0.13	0.78	0.512	18.9	7.7	-85.8			
MITWET1	2012-08-22	0	3.799	0.62	4.21	1.619	258.3	4.5	20.4			
MITWET1	2012-12-05	4.6	0.385	0.16	0.342	0.211	42	6.9	-12			
MITWET1	2013-07-15	10.4	<0.5	0.26	0.519	0.219	34.4	6.9	-0.4	116	32	
MITWET1	2013-09-17	44.2	<0.5		0.982	0.49	66.6	7.1	-23	180	10	
MITWET1	2014-03-05	8.8	<0.5	0.07	<0.3	0.079	100.6	6.9	-25	96	<5	
MITWET1	2014-07-01	0	3.597	0.26	0.529	2.166	339.9	4.7	29.4	506	8	
MITWET1	2014-12-15	94.2	0.862	0.81	3.752	2.27	593.3	7.1	-70	1130	<5	
MITWET1	2015-03-10	7.8	<0.5	0.067	<0.03	0.283	65.6	6.5	-7.2	150	<5	
MITWET1	2015-05-20	0	5.769	0.097	<0.03	2.289	316.3	4.7	66	542	12	53.9
MITWET1	2015-06-16	12.2	<.5	0.254	0.624	1.132	117.7	6.2	35.8	316	<5	
MITWET1	2015-09-01	0	8.44	0.663	1.73	2.502	565.6	3.5	79	772	8	
MITWET1	2016-02-23	7.8	1.638	0.095	<0.3	0.858	199.4	5	10.4	374	<5	
MITWET1	2016-06-23	0	6.135	0.638	1.421	1.815	408.9	3.5	80.2	652	<5	
MITWET1	2016-09-15	33.8	<0.5	0.935	3.515	0.417	221.7	7	6.6	430	54	
MITWET1	2017-02-22	2.8	4.651	0.564	1.08	1.489	281.6	4	41	444	<5	
MITWET1	2017-05-30	0	3.084	1.685	4.615	1.031	310.9	3.3	48.2	506	<5	
MITWET1	2017-09-26	8.2	3.729	0.863	2.368	1.196	266	5.3	12.8	422	8	233.4
MITWET1	2017-11-29	15.8	1.044	0.467	1.536	0.458	122	6.3	5.6	234	14	116.7
MITWET1	2018-02-20	10.6	0.819	0.27	0.364	0.44	117.2	6	10	224	<5	
MITWET1	2018-06-25	1.2	2.175	1.259	2.055	0.954	209.2	4	32.8	414	<5	
MITWET1	2018-09-24	31.6	0.564	0.756	4.034	0.659	125.8	6.6	-16.6	262	12	
MITWET1	2018-12-17	0	2.529	0.45	2.677	0.875	240.8	3.4	56.8	412	<5	
MITWET1	2019-03-13	0	3.086	0.807	3.853	1.087	278.9	3.3	57	466	6	
MITWET1	2019-06-18	3	1.999	1.102	1.748	1.238	268.7	4.1	18.4	452	<5	
MITWET1	2019-08-27	24	<0.5	0.96	1.915	0.831	163.8	6.2	-7.8	330	8	
MITWET1	2020-01-09	15.4	<0.5	0.149	<0.3	1.165	391.5	6.2	4.2	616	6	53.9
MITWET1	2020-02-19	5.8	1.064	0.293	0.508	0.591	143.7	4.9	14.4	278	10	
MITWET1	2020-11-17	5.8	0.747	0.844	1.22	0.953	208.9	5.3	13	348	20	
MITWET1	2020-12-29	10.8	<0.5	0.2	0.356	0.457	108.3	6	3.8	208	6	
MITWET1	2021-01-19	6	2.737	0.67	1.122	1.198	258	4.2	30.2	446	<5	
MITWET1	2021-02-25	6.4	2.708	0.068	<0.3	3.241	375.3	4.7	20	618	6	
MITWET1	2021-06-29	0	3.618	0.592	2.415	1.38	747.4	3.3	70.8	586	<5	
MITWET1	2021-08-09	0	4.374	0.46	1.525	1.717	1037	3.4	62.8	598	<5	
MITWET1	2021-09-27	27.8	<0.5	5.406	7.47	7.804	505	6	-4.6	530	12	
MITWET1	2021-11-09	7.2	2.984	0.598	1.001	1.134	236.8	4.7	29.4	440	<20	
MITWET1	2022-02-28	0	2.718	0.549	0.982	0.632	165.1	3.8		300	<20	
MITWET1	2022-05-11	0	2.452	1.002	2.077	0.904	264.9	3.4	50.4	412	<20	
MITWET1	2022-07-05	0	2.357	1.079	2.469	1.329	307.1	3.5	51	544	<20	
MITWET1	2022-09-12	11.6	0.067	0.067	0.533	1.032	226.5	5.7		460	<20	
MITWET1	2022-11-28	20.2	<0.5	0.119	<0.3	0.435	128.8	6.4	-1.4	250	<20	
MITWET1	2022-12-21	13	<0.5	<0.05	<0.3	<0.05	<20.0	6.4	3	<20	<20	
MITWET1	2023-01-24	10.6	<0.5	0.1	<0.3	0.274	68	6.1	6.4	128	<20	
MITWET1	2023-04-27	0	3.809	0.821	3.056	1.333	410.1	3.4	68.4	588	<20	
MITWET1	2023-07-24	3	2.928	0.344	2.121	1.604	282.9	4.1	27.6	582	23	
MITWET2	2007-12-27	73.8	0.445	0.39	1.345	1.61	574.1	7.5	-44.2		12	
MITWET2	2008-01-24	52	0.456	0.16	0.54	1.729	596.6	7.1	-38.8		14	
MITWET2	2008-06-24	11	0.2	0.22	0.832	0.308	63.4	7	1.4		12	
MITWET2	2008-10-01	26.4	0.2	0.16	0.462	1.59	573.3	6.8	-17		5	
MITWET2	2008-12-30	46.2	0.235	0.1	0.612	1.84	212.6	7	-35.8		30	
MITWET2	2009-03-05	33.2	0.223	0.07	0.295	2.965	216.7	6.9	-26.6		5	
MITWET2	2009-04-10	56	0.2	0.1	0.277	1.216	241.1	7.2	-44.8		5	
MITWET2	2009-05-18	68.8	0.2		0.814	1.574	199.6	7.4	-58.4		5	
MITWET2	2009-07-17	120.4	0.2	0.32	0.876	5.411	230.8	7.8	-108.6		6	
MITWET2	2009-09-03	65.6	0.2	0.16	0.583	3.445	230.5	7.2	-59.4		5	
MITWET2	2009-10-28	62.2	0.2	0.05	0.026	0.046	149.3	7.4	-51.8	282		
MITWET2	2010-02-04	83.2	0.2	1.48	1.317	4.152	387.1	7.2	-69.4	698	6	
MITWET2	2010-04-08	84.6	0.2	0.2	1.006	4.178	240.6	7.5	-70.8		5	
MITWET2	2010-12-29	4.8	0.563	0.04	0.02	1.9	612.2	5.7				
MITWET2	2011-03-09	30.4	<0.2	0.04	0.024	<0.01	73	7	-23.6	152	<5	
MITWET2	2011-05-23	102.6	<0.2	0.12	0.285	1.239	52.1	7.7	-94	226	6	
MITWET2	2012-05-16	55.2	0.463	1.56	1.4	2.5	459.3	6.8	-51.8			
MITWET2	2012-12-05	29.8	<0.2	0.07	0.442	0.296	88.2	6.9	-38.2			
MITWET2	2013-07-15	5.6	0.65	0.04	0.753	2.309	545.8	5.8	6.2		12	
MITWET2	2013-09-17	2.4	<0.5		<0.3	1.89	467.6	5.6	19	836	<5	
MITWET2	2014-03-05	24.6	<0.5	<0.5	0.02	1.262	469	6.5	-18.4	708	6	
MITWET2	2014-07-01	28.4	<0.5	0.02	<0.3	1.36	524	6.1	-15.4	794	6	
MITWET2	2014-09-16	51.8	<0.5	0.06	<0.3	0.598	519.6	7	-39.4	940	8	
MITWET2	2014-12-15	8	<0.5	0.31	0.645	0.603	138.1	6.4	-4.2	278	<5	
MITWET2	2015-03-10	4.2	0.813	0.049	<0.3	1.744	0.379	5.6	7	654	<5	
MITWET2	2015-05-20	41.4	<0.5	0.286	0.489	4.282	428.1	6.8	-3.8	694	8	
MITWET2	2015-06-16	2.2	1.809	0.491	0.936	4.415	396.5	5.4	46.8	666	6	116.7
MITWET2	2015-09-01	8.8	26.88	0.629	0.729	2.401	616.8	4.9	44.8	936	6	62.8
MITWET2	2016-02-23	4	4.257	0.074	<0.3	1.619	504.4	4.2	40	692	<5	390.5
MITWET2	2016-06-23	0	4.124	0.214	0.442	1.518	506.8	3.7	50.4	776	<5	300.7
MITWET2	2016-09-15	2.4	4.224	0.118	<0.3	1.81	693.9	4	57.8	836	<5	
MITWET2	2017-02-22	6.6	3.67	0.79	<0.3	1.514	456.3	4.4	26.6	674	<5	53.9
MITWET2	2017-05-30	81.4	<0.5	0.122	0.327	0.474	430.4	7.3	-62.6	1056	<5	233.4
MITWET2	2017-09-26	82.8	<0.5	0.282	0.504	0.906	524.2	7.2	-67.4	870	<5	53.9
MITWET2	2017-11-29	9	0.97	0.16	0.359	1.418	450.1	5.3	15.6	754	<5	116.7
MITWET2	2018-02-20	20.2	<0.5	0.076	<0.3	0.922	364.4	6.4	-3.4	502	<5	116.7
MITWET2	2018-06-25	62.4	<0.5	0.169	0.32	0.473	379.2	7	-48.8	782	10	

Kalp Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	final_flow
MITWET2	2018-09-24	45.8	<0.5	0.177	<0.3	0.302	454	6.9	-33.2	780	<5	
MITWET2	2018-12-17	16.6	<0.5	0.07	<0.3	0.944	404.2	6.2	0.6	668	<5	
MITWET2	2019-03-13	11.2	<0.5	0.188	<0.3	642	394.3	6.1	1.4	654	<5	
MITWET2	2019-06-18	52.6	<0.5	0.609	0.794	2.138	360.8	7	-47.2	646	<5	
MITWET2	2019-08-27	0	6.193	0.413	1.532	2.515	402	3.6	71.2	694	<5	53.9
MITWET2	2020-01-09	7.6	1.88	0.782	3.219	0.693	138.5	5.7	15.6	218	12	592.5
MITWET2	2020-02-19	13.8	<0.5	0.118	<0.3	0.869	95.3	6	-2	176	<5	53.9
MITWET2	2020-11-17	4.4	2.746	0.664	1.781	3.671	492.1	4.4	28.8	766	12	
MITWET2	2020-12-29	7.4	1.436	0.1	<0.3	1.688	508.7	4.6	11.8	772	<5	
MITWET2	2021-01-19	9.2	1.391	0.036	<0.3	1.57	466.8	4.9	14	676	<5	
MITWET2	2021-06-29	6.8	<0.5	0.258	0.424	5.109	1066	4.5	12.2	722	<5	
MITWET2	2021-08-09	33.2	<0..5	12.185	12.54	10.232	1.162	6.6	-6	772	22	
MITWET2	2021-09-27	0	3.172	0.345	0.978	1.369	412.6	3.8	42.2	534	<5	
MITWET2	2021-11-09	12	<0.5	0.75	0.844	1.277	397.9	6	7.4	668	<20	
MITWET2	02-28-22	8.6	0.754	0.05	<0.3	1.651	337.8	5.3		590	<20	
MITWET2	05-11-22	2	2.648	0.087	0.328	2.342	351.7	4	30.2	540	<20	
MITWET2	07-05-22	17.8	<0.5	0.166	<0.3	1.959	399.7	6.1	3	670	<20	
MITWET2	2022-09-12	27.4	<0.5	1.842	3.784	5.537	296.4	6.2		452	50	
MITWET2	2022-11-28	28.8	4.432	1.357	15.541	1.68	194.8	6.4	4	324	66	
MITWET2	2023-01-24	25.4	0.525	0.08	1.214	0.455	108.9	6.4	-7.8	254	20	
MITWET2	2023-04-27	36.2	2.32	71.71	13.7	0.303	255.7	5.2	226.6	404	3090	
MITWET2	2023-07-24	135.6	<0.5	8.246	11.487	3.081	87	7	-116.2	316	24	
Kalp Discharge	2002-06-27	0	6.88	50.38	63.9	1.85	433	3.3	87.6		10	
Kalp Discharge	2002-09-03	0	5.15	90.17	83.2	1.59	585	3.2	259.6		<2	
Kalp Discharge	2003-03-18	0	6.96	28.04	48.5	1.89	581	3.2	192.6		<2	
Kalp Discharge	2006-01-19	0	5.71	29.18	44.5	1.45	508.6	3.1	184		6	
Kalp Discharge	2006-03-22	0	6.16	26.19	34.3	1.27	444.8	3.3	140		4	
Kalp Discharge	2006-06-08	32.8	0.478	0.08	0.419	0.016	<20	7.8	-26.6		14	
Kalp Discharge	2006-08-22	0	1.29	12.17	25.2	1.93	439.2	3.1	106.6		<2	
KDIC	1998-08-19	0	8.54	66.66	69.3	1.93	476	3.3	232		<2	
KDIC	1998-10-22	0	10.2	76.76	93.2	2.26	707.2	3.2	246		32	
KDIC	1998-11-23	0	10	70.7	89.8	2.19	549	3.3	250		<2	
KDIC	1998-12-22	0	10.5	83.83	99.9	2.22	779	3.2	290		62	
KDIC	1999-01-19	0	10.4	60.6	73.7	2.1	505	3.2	240		<2	
KDIC	1999-03-03	0	10.1	45.39	61.1	2.09	462	3.2	220		<2	
KDIC	1999-03-24	0	9.05	43.35	53.8	1.88	454	3.3	194		10	
KDIC	1999-05-03	0	8.79	34.17	46	1.96	471	3.2	170		<2	
KDIC	1999-06-02	0	7.84	39.27	49.1	1.74	512	3.2	196		<2	
KDIC	1999-07-09	0	9.01	51.51	69.6	2.03	349.14	3.2	100		4	
KDIC	1999-08-12	0	9.68	46.92	66	2.1	462	3.2	210		10	
KDIC	1999-09-08	0	9.71	89.89	76.7	2.08	741.2	3.2	100		36	
KDIC	1999-11-22	0	9.55	54.54	84.6	2.09	588	3.2	250		4	
KDIC	2000-01-11	0	11	51.51	78.4	2.16	442	3.1	222		54	
KDIC	2000-04-06	0	9.32	1.44	54	2.09	412	3.2	182		10	
KDIC	2000-05-08	0	8.34	39.27	54.8	2.04	453	3.3	166		6	
KDIC	2000-06-12	0	7.86	14.28	57.4	1.97	399	3.3	184		<2	
KDIC	2000-07-17	0	7.37	51.51	66.2	1.79	507	3.3	192		6	
KDIC	2001-03-29	0	8.17	24.5	52.1	1.82	450	3.2	176		24	
KDIC	2001-07-02	0	8.76	54.86	68.2	1.81	387.3	3.2	224		4	
KDIC	2001-09-17	0	5.82	95.9	92.6	1.67	463	3.1	263.2		22	
KDIC	2002-04-24	0	6.97		53.1	1.82	421	3.2	202.4		<2	
KALPDS	2022-02-28	22.4					21.9	6.8		102	<20	


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Melcroft Water Quality Monitoring												
project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	final_flow
CHAMPUS	03-09-11	24.8	<0.2	0.05	0.211	0.062	34.9	7.5	-20.2	144	<5	
CHAMPUS	05-23-11	43.2	<0.2	0.05	0.273	0.076	58.8	7.5	-35.8	<5	<5	
CHAMPUS	11-02-11	33.6	<0.2	0.05	0.191	0.069	39	7.4	-29.8	122	<5	
CHAMPUS	02-15-12	47.8	<0.5	0.04	<.3	0.119	54.2	7.7	-38.4	318	6	
CHAMPUS	08-22-12	93.4	0.246	0.05	0.623	0.128	100.7	8.2	-97.8			
CHAMPUS	02-12-13	23	0.26	0.06	0.352	0.063	28.2	7.4	-18.4			
CHAMPUS	05-30-13	65	<0.5		<.3	0.088	65.9	7.9	-58.2		8	
CHAMPUS	12-03-13	41.4	<0.5	0.04	<.3	<0.05	39.6	7.4	-21.4	136	6	
CHAMPUS	03-27-14	48	<0.5	0.04	<0.3	0.074	107.8	7.7	-27.6	266	<5	
CHAMPUS	07-30-14	67.4	2.479	0.1	0.662	0.93	155.2	8.2	-55.6	228	<5	
CHAMPUS	10-08-14	103.6	< 0.5	0.07	< 0.3	< 0.05	122.4	8	-88.8	404	< 5	
CHAMPUS	03-16-15	29	<0.5	0.044	0.53	0.056	87.6	7.2	-22.2	112	<5	
CHAMPUS	07-23-15	80.8	<0.5	0.068	<0.3	0.053	173.2	8.2	-55	320	<5	
CHAMPUS	10-22-15	117.2	<0.5	0.08	<0.3	<0.05	214.7	8.1	-47.6	488	6	
CHAMPUS	02-23-16	34.8	<0.5	0.04	<0.3	0.06	45.9	7.7	-32.2	144	6	
CHAMPUS	06-20-16	94.8	<0.5	0.046	<0.3	0.056	152.1	8.2	-77.4	324	<5	
CHAMPUS	09-15-16	111.2	<0.5	0.049	<0.3	<0.05	160.7	8.4	-81	404	<5	
CHAMPUS	02-22-17	54	<0.5	0.053	<0.3	<0.05	84.2	7.9	-41	124	<5	
CHAMPUS	05-15-17	42.6	<0.5	0.049	<0.3	<0.05	51.4	7.9	-34.8	152	20	
CHAMPUS	09-26-17	111.4	<0.5	0.061	<0.3	<0.05	165.8	8.2	-86	374	<5	
CHAMPUS	11-20-17	35	0.675	0.092	0.787	0.056	30.3	7.6	-29.6	112	6	
CHAMPUS	02-20-18	31.6	<0.5	0.061	0.466	<0.05	39.8	7.5	-20.6	124	8	
CHAMPUS	06-25-18	55.8	<0.5	0.062	0.398	<0.05	46	8	-43.4	166	8	
CHAMPUS	09-04-18	117.4	<0.5	0.053	<0.3	<0.05	138.1	8.3	-105.8	412	8	
CHAMPUS	12-10-18	57.8	<0.5	0.05	<0.3	0.077	63.3	7.7	-47.6	180	6	
CHAMPUS	03-13-19	43.8	<0.5	0.024	<0.3	<0.05	48.3	7.8	-28.8	152	<5	
CHAMPUS	01-09-20	46.6	<0.5	0.028	<0.3	<0.05	48.7	7.6	-31	148	6	
CHAMPUS	12-10-20	46.6	<0.5	0.03	<0.3	<0.05	49.7	6.8	-34.6	154	<5	
CHAMPUS	03-30-21	40	<0.5	0.05	<0.3	<0.05	37.8	6.9	-26.6	124	<5	
CHAMPUS	05-26-21	78.2	<0.5	0.068	<0.3	<0.05	90.9	7.6	-66.4	234	<5	
CHAMPUS	03-17-22	44.2						7		178	<20	
CHAMPUS	06-07-22	70.8	<0.5	0.076	0.402	0.118	77.9	7.3	-56.8	250	<20	
CHAMPUS	10-27-22	114.2	<0.5	0.088	<0.3	<0.05	113.9	8	-93.4		<20	
CHAMPUS	2-2-23	50.2	<0.5	<0.05	0.36	0.059	47.6	6.9	-36	194	<20	
CHAMPUS	4-19-23	75.8	<0.5	<0.05	0.408	<0.05	65	7.6	-57.6	216	<20	<
CHAMPUS	7-11-23	78.8	<0.5	0.063	<0.3	<0.05	56.5	7.7	-61.4	216	<20	
3PONDINL	03-09-11	1.8	4.727	44.04	52.5	5.07	539.2	4.9	139.2	938	18	
3PONDINL	05-23-11	9.2	4.174	53.1	57	4.848	556.6	5.5	128	922	32	
3PONDINL	11-02-11	56	3.736	98.29	99	6.733	622	6.2	139	966	16	131
3PONDINL	02-15-12	58	3.452	101.18	100	6.194	559.6	6.1	135.2			610
3PONDINL	08-22-12	54	<0.2	72.7	77.2	3.8	449.2	6.3	54.4			248
3PONDINL	02-12-13	45.4	2.863	87.83	89.6	5.549	498.1	6.2	113			799
3PONDINL	05-30-13	73.8	3.301		90.7	5.901	496	6.2	104.2	914	16	621
3PONDINL	12-03-13	92.4	3.722	74.12	70.604	5.248	486	6.3	46.6	824	16	424
3PONDINL	03-27-14	88	1.747	90.13	81.953	4.684	443.8	6.2	98.8	852	6	13
3PONDINL	07-30-14	91.2	<0.5	76.98	69.941	3.21	467.5	6.4	52.6	758	<5	578
3PONDINL	10-08-14	88.8	1.991	57.76	61.964	4.276	402.3	6.5	24.6	742	20	17
3PONDINL	03-16-15	64.4	2.364	79.214	76.947	4.868	486.6	6.1	80.8	778	12	540
3PONDINL	07-23-15	74.4	1.899	92.31	96.29	5.224	491.2	6.3	86	838	44	597
3PONDINL	10-22-15	109.2	<0.05	52.82	47.212	2.763	386.1	6.3	17	602	<5	154
3PONDINL	02-23-16	88	2.312	73.544	76.615	4.743	522.6	6.2	95	652	40	95
3PONDINL	06-20-16	83.2	1.598	83.845	87.307	4.414	508.6	6.2	99.6	2966	8	436
3PONDINL	09-15-16	108.6	<0.5	58.609	60.809	3.044	440	6.4	45.2	702	710	
3PONDINL	02-22-17	82.8	1.851	90.559	80.291	4.622	525.9	6.1	94	820	<5	
3PONDINL	05-15-17	68.2	2.391	82.295	81.466	4.955	484.7	6.3	79.4	816	14	
3PONDINL	09-26-17	103.8	0.587	63.842	61.057	3.412	474.7	6.4	38.6	684	16	
3PONDINL	11-20-17	74	3.071	73.981	69.135	5.029	876.1	6	-73.8	772	22	
3PONDINL	02-20-18	63.4	2.126	72.623	66.136	4.222	409.6	6.3	97.4	712	10	
3PONDINL	06-25-18	72.2	2.697	83.392	83.38	5.056	478.9	6.2	104	800	20	
3PONDINL	09-04-18	88.4	1.769	75.078	77.359	4.592	434.5	6.2	68.2	780	20	
3PONDINL	12-10-18	77.2	1.918	83.418	80.388	4.704	441.6	6	93.8	778	18	
3PONDINL	03-13-19	76.2	2.118	78.591	79.75	4.691	434.2	6	96.6	788	6	
3PONDINL	01-09-20	85.6	1.992	82.411	75.614	4.887	447.4	6.3	84	754	16	
3PONDINL	12-10-20	12.6	14.608	99.181	93.122	13.571	634.5	4.7	188	1074	<5	
3PONDINL	03-30-21	73.2	2.563	75.387	71.629	4.844	408.9	6.1	94.4	732	16	
3PONDINL	05-26-21	45.2	1.846	75.625	75.789	4.541	599.5	6.1	79.6	772	10	
3PONDINL	03-17-22	12.4					396.8	5.6		668	<20	
3PONDINL	6-6-22	82.4	1.952	74.181	76.471	4.735	426.2	6.2	98.2	768	<20	
3PONDINL	10-27-22	13.6	5.42	15.041	20	3.06	397.1	5.1	51.8		24	

Melcroft Water Quality Monitoring												
project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	final_flow
3PONDINL	2-2-22	87.8	2.022	69.601	75.134	4.757	435.2	6.1	76.4	732	<20	
3PONDINL	4-19-23	69.8	2.994	75.938	82.656	5.478	432.2	6.1	103.8	764	<20	
3PONDINL	7-11-23	78.6	3.414	65.434	71.21	5.658	434.1	6	80.6	844	39	
NEWKALP	03-09-11	0	8.009	0.3	3.953	1.463	381.2	3.1	123.6	676	<5	
NEWKALP	05-23-11	0	8.84	0.51	3.537	1.558	411.7	3.1	118.6	738	<5	
NEWKALP	11-02-11	0	10.4	0.3	4.034	1.629	479.1	3.1	132.2	674	<5	
NEWKALP	02-15-12	0	8.49	0.16	3.185	1.525	354.7	3.2	106			
NEWKALP	08-22-12	0	10.2	0.26	4.066	1.72	444.5	3.1	125.2			
NEWKALP	02-12-13	0	6.796	0.16	2.026	1.451	418.6	3.2	195			60
NEWKALP	05-30-13	0	9.329		3.51	1.615	408.8	3.1	114.1	788	<5	
NEWKALP	12-03-13	0	9.529	0.56	3.769	1.585	466.6	3.1	110	744	<5	40
NEWKALP	03-27-14	0	7.414	0.18	2.686	1.345	420.6	3.2	98.4	632	<5	
NEWKALP	07-30-14	0	7.971	0.42	3.06	1.457	441.4	3.2	111	666	<5	30
NEWKALP	10-08-14	0	9.429	0.31	3.476	1.65	464.5	3.1	129	722	< 5	40
NEWKALP	03-16-15	0	7.439	0.278	2.811	1.262	440.2	3.2	95.4	586	<5	
NEWKALP	07-23-15	0	7.134	0.627	3.234	1.356	322	3.2	84	1394	8	40
NEWKALP	10-22-15	0	9.931	0.0902	4.354	1.633	418.9	3	122	706	<5	60
NEWKALP	02-23-16	0	8.516	0.386	3.17	1.379	468.3	3.1	114.6	606	<5	40
NEWKALP	06-20-16	0	8.238	0.654	2.976	1.369	384.5	3.1	99.4	3016	<5	24
NEWKALP	09-15-16	0	10.149	1.221	4.853	1.627	484.5	3.1	141.2	784	<5	50
NEWKALP	02-22-17	0	8.111	0.555	2.782	1.26	381.8	3.2	106.8	574	<5	30
NEWKALP	05-15-17	0	6.83	0.534	2.077	1.231	393.8	3.3	82.8	638	<5	60
NEWKALP	09-26-17	0	9.128	0.385	2.467	1.444	477.5	3.1	117.8	674	6	36
NEWKALP	11-20-17	0	8.921	0.402	2.414	1.338	786.9	3.1	96.2	626	6	30
NEWKALP	02-20-18	0	6.658	0.288	2	1.077	341.9	3.2	99.6	518	<5	45
NEWKALP	06-25-18	0	7.415	0.671	2.127	1.209	325	3.2	100.8	672	<5	
NEWKALP	09-04-18	0	9.066	0.785	2.612	1.463	425.7	3.2	106.2	736	<5	36
NEWKALP	12-10-18											
NEWKALP	03-13-19	0	6.846	0.157	1.31	1.2	361.1	3.2	89.8	606	<5	
NEWKALP	01-09-20	0	6.828	0.214	1.468	1.156	348.5	3.2	100.2	544	6	
NEWKALP	12-10-20	0	11.477	0.232	3.146	1.625	448.2	3	127.6	734	<5	
NEWKALP	03-30-21	0	8.005	0.135	0.999	1.294	341.4	3.1	105.4	574	<5	
NEWKALP	05-26-21	0	7.543	0.128	0.954	1.257	324.9	3.2	98	588	<5	
NEWKALP	03-17-22	0					331.2	3.1		566	<20	
NEWKALP	06-07-22	0	7.175	0.124	0.858	1.206	322.3	3.2	98	596	<20	
NEWKALP	10-27-22	0	9.61	0.165	2.72	1.45	406.9	3	135.4		<20	102
NEWKALP	02-02-23	0	6.467	0.113	0.979	1.132	302.5	3.2	94.2	542	<20	36
NEWKALP	04-19-23	0	7.629	0.194	0.998	1.314	324	3.2	101	580	<20	
NEWKALP	07-11-23	0	8.298	0.256	0.946	1.308	352.2	3.1	107.4	744	<20	
VFP1IN	03-09-11	0	4.954	31.58	41.8	4.724	481.7	3.5	124	812	24	
VFP1IN	05-23-11	0	5.5	2.22	22.6	3.914	467.2	3.2	111.6	824	26	
VFP1IN	11-02-11	0	6.74	18.78	30.5	3.981	524.8	3.4	116.4	726	<5	
VFP1IN	02-15-12	0	4.931	28.5	33.1	3.725	403.2	3.6	108.8			
VFP1IN	08-22-12	0	6.844	1.93	13.3	2.857	451.5	3.2	119.4			
VFP1IN	02-12-13	0	2.376	42.15	45.4	3.629	467.6	4.8	101			
VFP1IN	05-30-13	0	6.909		27.966	3.562	439.7	3.7	96	784	6	
VFP1IN	12-03-13	0	7.172		19.34	2.965	470.4	3.6	83.2	742	<5	
VFP1IN	03-27-14	1.2	1.81	46.07	40.211	3.333		5.2	100.4	776	<5	
VFP1IN	07-30-14	0	5.237	2	7.911	2.434	443.9	3.3	91.8	672	<5	
VFP1IN	10-08-14	0	6.94	0.6	6.553	2.514	447.2	3.3	94.2	842	6	
VFP1IN	03-16-15	1.6	1.513	42.935	47.171	3.635	539	5.4	82.4	684	6	
VFP1IN	07-23-15	0	3.633	6.177	1.471	4.106	391.6	3.3	75	662	26	
VFP1IN	02-23-16	20.2	1.091	45.396	45.945	3.936	505.6	6	79.2	700	14	
VFP1IN	06-20-16	0	4.536	1.818	10.974	3.72	449.5	3.2	78.6	2326	10	
VFP1IN	02-22-17	11.2	4.486	43.075	43.224	3.753	473.5	5.2	92	716	<5	
VFP1IN	05-15-17	0	3.029	1.659	5.66	3.385	411.9	3.5	52.4	632	<5	
VFP1IN	09-26-17	0	5.5	1.901	5.591	3.145	491.6	3.2	84.4	670	8	
VFP1IN	11-20-17	0.8	3.53	21.194	22.287	3.6	801.7	3.9	63.6	672	<5	
VFP1IN	02-20-18	24.4	1.23	43.766	44.426	3.608	457.4	6.1	94	138	<5	
VFP1IN	06-25-18	0	3.787	2.128	15.582	3.56	356	3.4	71.2	670	20	
VFP1IN	09-04-18	0	6.174	0.977	5.337	3.283	398.8	3.2	91.8	700	6	
VFP1IN	12-10-18	16.2	1.495	1.495	47.624	3.768	421.3	5.6	94.6	730	8	
VFP1IN	03-13-19	17.6	1.856	46.609	48.63	3.504	403.2	6	92.4	660	8	
VFP1IN	01-09-20	0	2.533	21.475	22.15	3.866	407.2	3.8	80	616	10	
VFP1IN	12-10-20	0.8	8.748	20.487	22.973	4.269	448.2	3.9	100.6	794	<5	
VFP1IN	03-30-21	8	2.53	35.394	35.347	3.398	376.3	5	92.8	644	10	
VFP1IN	05-26-21	0	2.702	32.881	34.059	3.402	387.5	3.8	85.6	678	6	
VFP1IN	03-17-22	10.6					394.9	5.3		632	<20	

Melcroft Water Quality Monitoring												
project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	final_flow
VFP1IN	10-27-22	0	7.07	4.737	8.69	2.93	425.3	3.5	86.2		<20	
VFP1IN	02-02-23	15	1.17	34.652	39.019	3.512	393.1	5.8	79	638	<20	
VFP1IN	04-19-23	0	4.693	7.913	16.142	3.461	363.6	3.4	84.8	618	20	
VFP1IN	07-11-23	0	6.337	1.428	7.356	3.064	376.5	3.3	88.6	730	<20	
VFP2IN	03-09-11	0	5.474	21.91	33.3	4.542	484	3.4	119.6	808	12	
VFP2IN	05-23-11	0	5.448	1.65	20.3	3.769	472.4	3.2	108	812	22	
VFP2IN	11-02-11	0	7.129	15.05	4.679	3.736	492.1	3.3	124	726	<5	
VFP2IN	02-15-12	0	4.743	31.3	35.7	3.938	403.1	3.6	107.6			
VFP2IN	08-22-12	0	7.091	1.5	13.7	2.97	439.2	3.1	119.8			
VFP2IN	02-12-13	0	2.568	40.52	43.9	3.627	458.3	4.7	99.2			
VFP2IN	05-30-13	0	6.817		27.297	3.517	432.3	3.7	95.6	742	6	
VFP2IN	03-27-14	1.8	1.754	47.8	43.084	3.578	522.4	5.3	99.8	768	<5	
VFP2IN	07-30-14	0	5.331	2	7.951	2.444	449	3.3	86.8	654	<5	
VFP2IN	10-08-14	0	6.839	0.57	6.618	2.512	455.7	3.3	95.4	686	6	
VFP2IN	03-16-15	2.4	1.633	44.668	45.272	3.902	540.1	5.4	81.8	704	<5	
VFP2IN	07-23-15	0	4.079	5.702	16.147	4.585	378.2	3.3	76.6	718	22	
VFP2IN	02-23-16	16.4	1.366	42.239	42.134	3.776	512.5	5.7	90.4	702	10	
VFP2IN	06-20-16	0	4.35	1.611	11.242	3.765	435.3	3.2	79	686	12	
VFP2IN	09-15-16	0	7.222	1.087	7.827	3.048	473.7	3.2	128	720	<5	
VFP2IN	02-22-17	14.6	1.276	45.614	46.819	3.883	484.9	5.6	96	724	<5	
VFP2IN	05-15-17	0	3.627	16.971	21.561	3.622	424.5	3.6	76.2	674	8	
VFP2IN	09-26-17	0	5.287	2.311	6.901	3.172	468.2	3.3	78.8	666	<5	
VFP2IN	11-20-17	1	3.598	21.574	22.71	3.621	803.2	3.9	77.6	668	6	
VFP2IN	02-20-18	15.4	1.271	38.726	38.01	3.298	408.6	5.5	90.2	602	14	
VFP2IN	06-25-18	0	3.587	2.24	7.116	3.553	361.5	3.4	56.4	678	10	
VFP2IN	09-04-18	0	6.14	0.927	5.927	3.508	427.2	3.2	88.6	416	<5	
VFP2IN	12-10-18	9.6	1.586	42.12	42.641	3.654	416.6	5.2	89.2	694	10	
VFP2IN	03-13-19	12.6	1.096	41.109	42.892	3.468	396.4	5.8	82.4	644	<5	
VFP2IN	01-09-20	9	2.435	32.702	32.426	3.588	397.8	4.8	84.6	624	16	
VFP2IN	12-10-20	0	8.324	7.808	10.185	3.432	419.9	3.6	85.8	692	<5	
VFP2IN	03-30-21	6.6	1.904	29.023	27.9	3.276	371.6	4.7	84.4	650	8	
VFP2IN	05-26-21	0	3.205	1.072	7.323	3.522	367.1	3.3	70.8	646	12	
VFP2IN	03-17-22	13.4	1.58	41.69	39.113	3.247	395.1	5.6		646	<20	
VFP2IN	10-27-22	0	7.3	4.219	8.09	2.96	422.1	3.4	86.4		<20	
VFP2IN	02-02-23	14	1.37	34.884	40.69	3.638	396.5	5.7	76.6	634	<20	
VFP2IN	04-19-23	0	4.911	5.455	13.202	3.283	362	3.4	85.4	614	<20	
VFP1OUT	03-09-11	55.2	0.758	3.64	4.781	2.942	484.4	6.9	35.8	894	18	
VFP1OUT	05-23-11	82	0.537	3.66	3.335	3.056	474.8	7.1	-54.2	874	18	
VFP1OUT	11-02-11	28	2.365	0.83	1.847	2.864	559.7	6.5	-15.6	746	14	
VFP1OUT	02-15-12	25	1.752	2.09	3.154	3.595	434.7	6.4	-11.2			
VFP1OUT	05-16-12	55.2	1.149	1.56	1.4	2.5	459.3	6.8	-51.8			
VFP1OUT	08-22-12	75.8	0.214	2.4	2.197	4.852	443.4	7.2	-67.8			
VFP1OUT	02-12-13	26	1.177	0.88	2.883	3.489	448.2	6.5	-13.6			
VFP1OUT	05-30-13	63.4	1.051		6.051	3.227	472.6	6.8	-53	794	8	
VFP1OUT	12-03-13	44.8	2.547	0.51	2.547	2.289	452	6.4	-13.2	760	8	53.9
VFP1OUT	03-27-14	33.4	1.093	0.05	0.873	2.909	520.2	6.3	-7.6	266	<5	
VFP1OUT	07-30-14	85.4	1.592	16.76	21.34	2.58	533.5	6.8	-46.6	760	28	53.9
VFP1OUT	10-08-14	51.6	1.921	3.01	3.272	2.503	478.8	6.9	-27.6	762	< 5	53.9
VFP1OUT	03-16-15	35.4	1.15	0.259	0.467	2.559	463.9	6.4	-24.8	606	<5	
VFP1OUT	07-23-15	45.6	1.496	2.474	2.677	3.256	449.1	6.7	-10.6	712	24	98.7
VFP1OUT	02-23-16	33.2	1.692	0.359	0.437	2.907	455.2	6	-2.4	668	6	67.3
VFP1OUT	06-20-16	47.2	1.394	7.315	8.545	3.752	514.3	6.4	-3	768	22	
VFP1OUT	09-15-16											0
VFP1OUT	02-22-17	7.6	1.98	0.781	1.957	3.638	469.9	4.5	28	658	<5	53.9
VFP1OUT	05-15-17	15	1.631	1.553	1.962	3.119	441.3	6	3.4	678	10	53.9
VFP1OUT	09-26-17	17	3.613	2.506	5.133	2.813	443.5	5.6	9	674	14	
VFP1OUT	11-20-17	16.6	3.18	3.786	4.444	2.792	783.5	5.7	10.4	622	10	<53.9
VFP1OUT	02-20-18	17.6	1.744	2.637	5.157	2.829	397.2	5.6	20.2	556	28	53.9
VFP1OUT	06-25-18	54.6	0.695	1.187	1.66	2.644	379.2	7	-38.2	1204	8	
VFP1OUT	09-04-18	141.8	2.453	9.876	24.105	5.028	583	7	-119.8	822	58	
VFP1OUT	12-10-18	47.4	0.887	7.653	10.279	2.064	409.9	6.5	-17.4	676	14	
VFP1OUT	03-13-19	66.6	0.682	0.112	0.492	1.515	1.6716	6.7	-50.4	674	<5	
VFP1OUT	01-09-20	49.8	3.311	0.333	2.567	2.398	387.4	6.6	-33.2	648	<5	53.9
VFP1OUT	12-10-20	56.4	2.234	0.934	1.566	1.264	401	6.4	-38.2	684	<5	
VFP1OUT	03-30-21	88.6	<0.5	1.553	1.685	2.165	415.5	6.9	-67.4	688	6	
VFP1OUT	05-26-21	61.2	<0.5	5.658	5.874	3.517	400.6	7	-45.2	726	10	
VFP1OUT	04-19-23	34.8	<0.5	6.39	8.425	3.47	432.2	6.2	-1.4	726	<20	

Melcroft Water Quality Monitoring												
project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	final_flow
VFP2OUT	03-09-11	71.2	0.388	1.57	1.514	2.72	473.1	7.1	-57	912	6	
VFP2OUT	05-23-11	90.4	0.418	2.81	2.634	3.644	455.4	7.1	-71	836	10	
VFP2OUT	11-02-11	11	2.813	1.16	2.003	2.802	524.5	6.1	-1.6	726	<5	
VFP2OUT	02-15-12	10.6	2.208	3.78	4.869	3.32	452.9	5.8	6.4			
VFP2OUT	08-22-12	76.4	0.341	2.9	2.97	3.436	421.3	7.1	-65.8			
VFP2OUT	02-12-13	29.2	1.153	2.31	3.02	3.274	449.7	6.7	-16.2			
VFP2OUT	05-30-13	70	0.528		2.48	2.372	427.8	7	-63.2	824	10	
VFP2OUT	12-03-13	67	1.215	0.77	0.881	2.533	506.7	6.8	-42.8	778	<5	53.9
VFP2OUT	03-27-14	61	0.629	1.29	1.286	2.894	476	6.9	-29	738	12	
VFP2OUT	07-30-14	66.4	<0.5	2.6	2.491	1.945	428.8	7.1	-48.6	706	6	67.3
VFP2OUT	10-08-14	70	0.659	3.98	4.58	2.304	441.9	7.1	-51.6	772	< 5	53.9
VFP2OUT	03-16-15	75.4	0.809	0.699	0.98	2.339	427.4	6.7	-62.4	594	8	
VFP2OUT	07-23-15	69.6	1.02	3.542	4.281	2.832	430.3	7.1	-30	678	26	53.9
VFP2OUT	02-23-16	54.8	1.445	0.661	1.068	2.863	484.6	6.2	-26.8	714	12	67.3
VFP2OUT	06-20-16	52.2	1.883	2.396	4.304	2.971	552.9	6.7	-29.2	738	8	53.9
VFP2OUT	09-15-16	51	<0.5	0.051	<0.3	0.123	115	7.8	-19.6	260	<5	
VFP2OUT	02-22-17	17	1.621	0.528	1.267	3.088	451.7	5.6	3.6	664	<5	67.3
VFP2OUT	05-15-17	25.4	1.582	0.784	1.23	2.985	435.5	6	-9.8	678	14	53.9
VFP2OUT	09-26-17	57.6	0.968	3.703	5.008	2.274	450.4	6.6	-33.4	694	16	<53.9
VFP2OUT	11-20-17	29	4.445	1.198	7.402	2.649	810.9	6.3	-5.4	676	6	53
VFP2OUT	02-20-18	64	0.835	1.125	1.614	2.6	384	6.6	-38.8	610	10	53.9
VFP2OUT	06-25-18	56.4	<0.5	0.563	1.055	2.175	380.8	7	-39.6	710	<5	
VFP2OUT	09-04-18	60	0.942	3.215	4.042	2.495	856.5	6.8	-42.2	722	10	
VFP2OUT	12-10-18	43	1.018	1.975	3.052	1.998	403.3	6.5	-23	676	6	
VFP2OUT	03-13-19	80.6	4.006	0.415	9.273	1.298	391.9	6.9	-64.8	684	10	
VFP2OUT	01-09-20	92.2	2.143	0.31	4.221	1.38	392.9	7.2	-74.2	694	22	
VFP2OUT	12-10-20	68	1.165	0.275	1.111	0.91	412	6.5	-57.6	742	24	
VFP2OUT	03-30-21	115.8	<0.5	0.179	0.304	0.593	382.8	7.2	-104.8	742	6	
VFP2OUT	05-26-21	87	<0.5	3.631	3.852	3.832	393.9	7.4	-75	680	8	
VFP2OUT	03-17-22	3.6					377.3	4.1		634	<20	
VFP2OUT	10-27-22	166.6	<0.5	0.115	1.02	4.01	487.1	7.2	-146.6		<20	
VFP2OUT	02-02-23	132	<0.5	<0.05	0.95	0.15	486.6	6.9	-112.4	846	<20	
VFP2OUT	04-19-23	33.2	0.526	5.494	7.476	3.487	428.2	6.2	-1.2	718	<20	
WELL	03-09-11	209.6	<0.2	5.52	5.247	1.786	299.3	7	-194.8	790	<5	
WELL	05-23-11	165.6	<0.2	13.6	13.8	3.097	487.7	7	-153.8	984	14	
WELL	11-02-11	148.8	<0.2	25.48	27.1	4.334	633	6.7	-109	1054	18	
WELL	02-15-12	158	<0.2	35.26	33.7	4.913	606.6	6.7	-89.4			
WELL	05-16-12	127	<0.2	44.57	43.3	5.59	643.4	6.7	-85.2			
WELL	08-22-12	143.2	<0.2	38.35	39.7	5.394	549.1	6.7	-80.8			
WELL	02-12-13	114.2	<0.2	44.79	42.8	6.102	601.4	6.6	-67.2			12 gpm
WELL	05-30-13	142.4	<0.5		49.757	6.773	628	6.7	-68.4	1128	8	
WELL	03-27-14	159.2	<0.5	52.15	44.689	6.097	621.2	6.7	-114.4	1108	<5	
WELL	07-30-14	159.6	<0.5	51.43	47.695	6.201	661	6.6	-45.8	1122	<5	
WELL	10-08-14	158	< 0.5	46.38	48.423	6.311	571.2	6.6	-61	1062	16	9
WELL	03-16-15	152.6	<0.5	51.251	48.86	6.183	628.4	6.5	-59.8	1052	34	
WELL	07-23-15	152.6	<0.5	0.409	0.388	2.037	444.8	7	-51	740	5	30
WELL	02-23-16	163.6	<0.5	51.863	50.858	6.471	652.9	6.6	-22	1014	18	12
WELL	06-20-16	141.6	<0.5	54.519	58.327	7.239	1035	6.6	-18.4	1118	<5	12
WELL	09-15-16	158.2	<0.5	53.827	52.526	6.55	731.6	6.6	1.8	1074	28	9
WELL	02-22-17	111.8	<0.5	54.645	56.207	7.568	645.6	6.4	-35.4	1084	<5	12
WELL	05-15-17	152	<0.5	65.259	59.261	7.831	688.8	6.5	-13.8	1148	26	15
WELL	09-26-17	114.2	<0.5	58.93	58.908	7.885	716.7	6.5	-5.8	1096	<5	6
WELL	11-20-17	114.2	<0.5	54.618	53.59	7.146	578.7	6.5	-22.6	1120	16	
WELL	02-20-18	141.4	<0.5	63.588	56.177	7.446	626	6.5	0	1138	14	15
WELL	06-25-18	144.8	<0.5	71.447	67.79	8.31	627.5	6.5	1.4	1204	28	
WELL	09-04-18	100.4	<0.5	64.667	65.031	8.088	718.9	6.4	-7.4	1154	30	10.4
WELL	12-10-18	138.4	<0.5	68.792	68.82	8.732	641.7	6.5	-0.6	1222	28	
WELL	03-13-19	143.4	<0.5	72.559	69.162	8.77	705.1	6.6	12.2	720	34	
WELL	01-09-20	133.4	<0.5	64.408	60.519	7.978	624.3	6.6	-25.6	1060	30	13
WELL	12-10-20	121.8	<0.5	57.956	55.832	7.751	676	6.3	-18.4	1080	36	
WELL	03-30-21	101	<0.5	65.775	57.46	7.823	656.4	6.4	1.6	1114	6	
WELL	05-26-21	47.2	<0.5	65.37	63.892	8.464	746.8	6.4	-9.8	1116	40	
WELL	03-17-22	61.4					604.3	6.3		1178	<20	
WELL	2022-10-27	63.4	<0.5	58.613	59.9	7.79	593.2	6.5	-20.4	984	62	66
WELL	2023-02-02	50.8	<0.5	61.483	64.361	8.559	609.2	6.4	-4.6	1042	<20	48
WELL	2023-04-19	116.4	<0.5	66.744	69.443	9.272	650.2	6.2	14.8	1094	42	
WELL	2023-07-11	47.8	<0.5	59.61	66.423	8.913	618.1	6.2	-5	1164	72	
SPOUT	03-09-11	33.6	0.904	0.37	1.387	2.91	491.7	6.7	-16.4	842	14	

Melcroft Water Quality Monitoring												
project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	final_flow
SPOUT	05-23-11	946	0.894	0.43	1.114	3.23	470	7.4	-45.6	588	16	
SPOUT	11-02-11	20.8	0.476	0.1	0.46	2.82	545	6.8	-9	750	<5	
SPOUT	02-15-12	24.8	0.57	4.06	4.96	3.776	459.6	6.6	-7.6			
SPOUT	05-16-12	46.8	0.23	0.1	0.821	2.846	472.9	7.2	-46.2			
SPOUT	08-22-12	57.8	<0.2	0.07	1.086	1.787	458.8	7.4	-55.6			
SPOUT	02-12-13	26.4	0.893	3.34	4.324	3.628	451.4	6.8	-12.4			
SPOUT	05-30-13	56.6	0.777		4.796	2.328	508.5	7.6	-47.4	826	26	
SPOUT	12-03-13	173.8	<0.5	46.35	46.263	6.157	571.8	6.6	-34.2	1086	12	
SPOUT	03-27-14	46.8	<0.5	0.78	1.622	3.284	493.6	7.3	-22.2	768	<5	
SPOUT	07-30-14	63.6	<0.5	0.05	<0.3	1.519	517.8	7.6	-47.6	752	12	
SPOUT	10-08-14	60.4	< 0.5	0.02	< 0.3	0.123	483.5	7.4	-47.8	794	36	
SPOUT	03-16-15	60.8	<0.5	0.107	0.942	3.962	434.9	6.8	-40.6	646	<5	
SPOUT	07-23-15	47	<0.5	0.027	<0.3	1.941	477.6	7.5	-12	686	18	
SPOUT	02-23-16	39.6	<0.5	2.404	2.388	4.311	478.4	6.6	-26.2	694	<5	
SPOUT	06-20-16	38.6	<0.5	0.026	<0.3	3.81	471.8	7.5	-24.8	756	<5	
SPOUT	09-15-16	46	<0.5	0.04	0.411	0.395	462.1	7.1	-18	756	6	
SPOUT	02-22-17	11	2.274	2.72	13.5	5.446	581.3	5.8	11	706	14	
SPOUT	05-15-17	10.4	0.566	0.573	1.418	3.843	439.8	6	3.2	806	22	
SPOUT	09-26-17	33.4	<0.5	0.033	<0.3	1.736	484.2	7.2	-18.2	712	<5	
SPOUT	11-20-17	11.2	0.516	1.185	1.623	3.456	860.3	5.8	6.6	682	<5	
SPOUT	02-20-18	18.8	0.688	9.291	10.126	3.659	363.8	64	24.4	568	8	
SPOUT	06-25-18	36.4	<0.500	0.038	<0.3	2.659	429.5	7.4	-22.6	712	10	
SPOUT	09-04-18	47.8	<0.5	0.021	<0.3	0.394	466.6	7.2	-36.2	700	<5	
SPOUT	12-10-18	9.8	0.768	8.556	9.303	4.043	430	5.3	24.6	702	10	
SPOUT	03-13-19	9.2	0.534	11.809	12.41	3.999	3.652	5.2	33.4	684	16	
SPOUT	01-09-20	13.6	0.664	8.71	8.679	4.092	416.3	5.8	24.4	684	14	
SPOUT	12-10-20	34.8	<0.5	2.789	3.495	2.476	446.9	6.3	-13.6	750	12	
SPOUT	03-30-21	12.6	<0.5	10.567	10.86	3.75	380.8	5.9	24.6	658	<5	
SPOUT	05-26-21	24	<0.5	0.081	1.462	4.161	403.8	6.6	-6.2	694	6	
SPOUT	03-17-22	12	<0.500	7.95	8.966	3.255	393.7	5.9		666	<20	
AW1OUT	03-09-11	42.4	0.518	0.27	0.831	2.611	461.5	7.3	-26.8	840	10	
AW1OUT	05-23-11	97.2	0.355	1.73	1.511	2.729	446.7	7.4	-77.2	910	14	
AW1OUT	11-02-11	32	<0.2	0.8	0.061	1.758	480.6	7	-24	764	<5	
AW1OUT	02-15-12	21.2	<0.2	0.24	0.383	3.348	451.8	6.7	-13.6			
AW1OUT	05-16-12	58.8	<0.2	0.33	0.648	2.976	460.5	6.9	-55.6			
AW1OUT	08-22-12	67.6	<0.2	0.17	0.358	1.739	468.6	7.2	-62.8			
AW1OUT	02-12-13	23.8	<0.2	0.03	0.057	2.681	441.6	6.8	-16.4			
AW1OUT	05-30-13	73.6	<0.5		<0.3	4.423	462.9	7.3	-62.8	808	6	
AW1OUT	12-03-13	54.8	<0.5	0.05	<0.3	0.571	457.6	6.9	-36.4	754	<5	
AW1OUT	03-27-14	44	<0.5	0.05	<0.3	1.904	495.3	7.2	-25.4	768	<5	
AW1OUT	07-30-14	75.6	<0.5	0.43	0.405	1.634	502.2	7.1	-59	752	6	
AW1OUT	10-08-14	70	< 0.5	0.17	< 0.3	0.882	489.2	7	-57	782	< 5	
AW1OUT	03-16-15	61.6	<0.5	0.59	0.352	3.602	430.9	7	-42.6	662	<5	
AW1OUT	07-23-15	55.6	<0.5	0.167	<0.3	0.747	449.8	7	-21.6	698	6	
AW1OUT	02-23-16	37.4	<0.5	0.188	0.36	2.981	463.7	7	-27	674	<5	
AW1OUT	06-20-16	50	<0.5	0.082	<0.3	2.293	514.5	7.2	-35.4	746	<5	
AW1OUT	09-15-16	56.8	<0.5	0.129	<0.3	0.779	517.8	7	-28.6	612	22	
AW1OUT	02-22-17	167.8	<0.5	0.318	0.526	4.507	449.8	6.3	2.8	710	<5	
AW1OUT	05-15-17	14.6	<0.5	0.176	1.356	4.034	441.7	6.5	-2.8	658	26	
AW1OUT	09-26-17	41	<0.5	0.071	<0.3	0.223	487.8	7.1	-20.4	734	8	
AW1OUT	11-20-17	13.6	<0.5	0.032	<0.3	2.467	933.1	6.2	-7.2	660	<5	
AW1OUT	02-20-18	10.2	<0.5	0.317	0.369	3.314	359.2	5.8	7.8	576	<5	
AW1OUT	06-25-18	37.4	<0.5	0.07	<0.3	0.504	382.9	7	-21.4	708	12	
AW1OUT	09-04-18	60.2	<0.5	0.095	<0.3	0.408	450.7	7.4	-47	702	6	
AW1OUT	12-10-18	8.2	0.575	0.855	1.206	4.12	420.4	5	6	692	8	
AW1OUT	03-13-19	2.4	0.581	0.725	1.609	4.025	403.6	4	25	468	18	
AW1OUT	01-09-20	9.8	0.518	0.947	1.388	4.172	416.8	5.1	14.4	652	10	
AW1OUT	12-10-20	36.8	<0.5	0.155	<0.300	1.649	433.2	6.4	-17.6	728	<5	
AW1OUT	03-30-21	7	<0.5	0.748	1.508	4.445	382.5	4.7	13.6	638	<5	
AW1OUT	05-26-21	23.2	<0.5	0.113	0.371	4.77	403.9	6.7	-10.8	694	<5	
AW1OUT	03-17-22	8					395.7	5.1		652	<20	
AW1OUT	06-06-22	58	<0.5	0.151	1.107	2.012	424.9	7	-42	750	<20	
AW1OUT	10-27-22	40.2	<0.5	0.173	0.36	1.36	469.3	6.8	-20.6		<20	
AW1OUT	02-02-23	14.6	<0.5	1.19	1.85	3.564	388.3	6.1	2	624	<20	
AW1OUT	04-19-23	26.4	<0.5	0.153	0.699	2.837	406.9	6.2	-4.2	682	<20	
AW1OUT	07-11-23	61.2	<0.5	0.202	0.776	2.44	412.2	6.6	-40.4	724	<20	
AW2OUT	03-09-11	49.8	0.416	0.28	0.689	2.472	464.1	7.5	-35.6	848	<5	
AW2OUT	05-23-11	109	0.297	1.58	1.523	2.616	467.1	7.6	-83.2	288	10	

Melcroft Water Quality Monitoring												
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AW2OUT	11-02-11	46.6	<0.2	0.11	0.103	1.409	542.6	7.2	-38	780	<5	
AW2OUT	02-15-12	25.4	<0.2	0.05	0.081	2.851	461.5	6.9	-18.8			
AW2OUT	05-16-12	76.2	<0.2	0.64	0.579	3.574	452.4	7	-71			
AW2OUT	08-22-12	90.6	<0.2	0.19	0.213	2.083	473.2	7.2	-87.6			
AW2OUT	05-30-13	89	<0.5	0.32	0.347	3.515	484	7.4	-84.6	808	<5	
AW2OUT	02-12-13	24.8	<0.2	0.03	0.043	1.92	424.1	6.8	-19.4			
AW2OUT	12-03-13	53.6	<0.5	0.02	<0.3	<0.05	39.6	7.4	-43.2	136	6	
AW2OUT	03-27-14	46.4	<0.05	0.03	<0.3	0.687	502.8	7.2	-26.6	1146	<5	
AW2OUT	07-30-14	96.8	<0.5	0.41	0.307	2.28	496.2	7.1	-74	752	6	
AW2OUT	10-08-14	89.8	< 0.5	0.3	< 0.3	1.127	454.6	7	-69	760	< 5	
AW2OUT	03-16-15	58.4	<0.5	0.57	<0.3	3.243	422.5	7.1	-41.8	630	<5	
AW2OUT	07-23-15	77.8	<0.5	0.409	0.388	2.037	444.8	7	-51	740	5	
AW2OUT	02-23-16	40.8	<0.5	0.077	<0.3	2.643	460.6	7.2	-28.4	680	6	
AW2OUT	06-20-16	62.6	<0.5	0.31	0.311	4.468	648.8	7.2	-54.4	760	<5	
AW2OUT	09-15-16	84.8	<0.5	0.324	<0.3	0.946	527.5	7	-57.4	806	14	
AW2OUT	02-22-17	20.4	<0.5	0.101	<0.3	4.395	468.8	6.6	-6	712	<5	
AW2OUT	05-15-17	23	<0.5	0.153	<0.3	4.384	441.4	6.7	-11.4	684	20	
AW2OUT	09-26-17	52.2	<0.5	0.307	<0.3	0.388	493.5	7.1	-28.6	742	<5	
AW2OUT	11-20-17	14.6	<0.5	0.36	<0.3	2.086	889.7	6.3	-5.4	676	6	
AW2OUT	02-20-18	13.8	<0.5	0.057	<0.3	3.286	345	6.2	2.8	540	6	
AW2OUT	06-25-18	46.8	<0.5	0.135	<0.3	0.697	392.3	7	-31.4	730	<5	
AW2OUT	09-04-18	72.2	<0.5	0.225	<0.3	0.932	702.8	7.4	-59.2	766	<5	
AW2OUT	12-10-18	10.8	<0.5	0.128	<0.3	4.19	552.2	5.6	5.6	722	10	
AW2OUT	03-13-19	5.6	0.516	0.424	0.971	4.267	410.3	4.3	20.4	662	10	
AW2OUT	01-09-20	11	<0.5	0.186	0.901	4.611	419.8	5.6	11.8	664	20	
AW2OUT	12-10-20	38	<0.5	0.025	<0.300	0.506	430.4	6.4	-22.2	710	<5	
AW2OUT	03-30-21	11.4	<0.5	0.124	0.708	4.516	369.8	6	4.4	620	<5	
AW2OUT	05-26-21	27.2	<0.5	0.174	0.59	3.703	393	6.7	-10.6	664	<5	
AW2OUT	03-17-22	11.6					381.5	6		654	<20	
AW2OUT	6/622	59.4	<0.5	0.056	0.369	2.04	404.5	7	-44.2	682	<20	
AW2OUT	10-27-22		<0.5	0.08	0.3	1.59						
AW2OUT	2-2-23	16.8	<0.5	0.582	1.548	4.627	417.7	6.2	2.4	676	<20	
AW2OUT	4-19-23	30.6	<0.5	0.145	0.912	3.256	411.8	6.6	-9	668	<20	
AW2OUT	7-11-23	69	<0.5	<0.05	<0.3	2.289	396.3	6.9	-49.4	700	<20	
3SYSOUT	03-09-11	52.2	<0.2	0.16	8.7	2.512	494.3	7.4	-40.8	820	<5	
3SYSOUT	05-23-11	117	<0.2	1.75	1.81	2.844	452.7	7.6	-95	898	16	
3SYSOUT	11-02-11	54.6	<0.2	0.07	0.049	0.411	538.5	7.3	-43.6	794	<5	
3SYSOUT	02-15-12	27.6	<0.2	0.03	0.055	2.2	499.2	7	-24			
3SYSOUT	05-16-12	87.2	<0.2	1.38	1.34	7.146	453.7	7.2	-79			
3SYSOUT	05-30-13	99.4	<0.5	0.86	0.669	5.316	440.8	7.4	-86.8	804	6	
3SYSOUT	08-22-12	108.6	<0.2	0.29	0.227	2.287	447.9	7.4	-99.6			
3SYSOUT	02-12-13	43.4	<0.2	<0.02	<0.02	0.531	434.1	7.3	-36.8			
3SYSOUT	12-03-13	66.4	<0.5	0.04	<0.3	0.085	448.1	7.3	-57.6	748	6	
3SYSOUT	03-27-14	49.4	<0.5	0.03	<0.3	0.33	496.1	7.4	-32.8	770	<5	
3SYSOUT	07-30-14	95.2	<0.5	0.2	0.561	2.66	452.2	7.3	-75.2	744	<5	
3SYSOUT	10-08-14	99.2	< 0.5	0.22	< 0.3	1.105	444	7.2	-81.4	792	< 5	
3SYSOUT	03-16-15	62	<0.5	0.038	<0.3	1.588	393	7.2	-48.4	632	<5	
3SYSOUT	07-23-15	79.6	<0.5	0.365	0.45	3.358	473.7	7.1	-55.8	714	36	
3SYSOUT	02-23-16	51.6	<0.5	0.045	<0.3	0.665	41.7	7.3	-41	674	6	
3SYSOUT	06-20-16	78	<0.5	0.947	1.226	8.229	594.3	7.5	-55.6	794	<5	
3SYSOUT	09-15-16	102.2	<0.5	0.18	<0.3	1.186	469.4	7.3	-77	810	6	
3SYSOUT	02-22-17	53	<0.5	0.037	<0.3	0.476	454.7	7.4	-36.4	734	<5	
3SYSOUT	05-15-17	46.4	<0.5	0.108	0.337	1.583	443.3	7.2	-36.2	714	20	
3SYSOUT	09-26-17	95.4	<0.5	0.452	0.581	1.409	494.8	7.7	-63.6	748	<5	
3SYSOUT	11-20-17	33.2	<0.5	0.032	<0.3	0.427	752.9	7.2	-28	658	<5	
3SYSOUT	02-20-18	35.4	<0.5	0.028	<0.3	1.118	345.2	7.2	-23	540	<5	
3SYSOUT	06-25-18	79.4	<0.5	0.226	<0.3	3.664	383.7	7.4	-64.2	732	<5	
3SYSOUT	09-04-18	106.6	<0.5	0.659	0.604	2.43	465.9	7.5	-88.4	794	12	
3SYSOUT	12-10-18	20.4	<0.5	0.027	<0.3	2.436	653.8	6.6	-9.6	708	8	
3SYSOUT	03-13-19	14	<0.5	0.166	0.404	3.113	410.3	6.1	7.6	654	<5	
3SYSOUT	01-09-20	27.4	<0.5	0.066	<0.3	1.965	413.2	6.9	-8.6	630	10	
3SYSOUT	12-10-20	44.8	<0.5	0.025	<0.3	0.234	424.4	6.6	-28.2	746	<5	
3SYSOUT	03-30-21	29.6	<0.5	0.087	0.628	2.241	374.2	6.5	-16.2	642	<5	
3SYSOUT	03-17-22	31.2	<0.5	0.092	<0.3	2.944	381.6	6.6		654	<20	
3SYSOUT	06-06-22	74.4	<0.5	0.359	0.688	6.41	387.7	7.2	-56.4	690	<20	
3SYSOUT	10-27-22	63.6	<0.5	0.133	0.302	1.34	455.7	7.4	-41.2		<20	
3SYSOUT	02-02-23	21.2	<0.5	0.314	1.62	4.138	406.3	6.4	-2.6	654	<20	
3SYSOUT	04-19-23	30.8	<0.5	0.073	0.589	2.514	402.9	6.5	-7	694	<20	
3SYSOUT	07-11-23	91.6	<0.5	0.404	0.803	6.703	0.385	7	-70.6	586	26	

Melcroft Water Quality Monitoring												
project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	final_flow
CHAMPDS	03-09-11	24.2	0.245	0.1	26.4	0.122	51.2	7.2	-13.6	112	<5	
CHAMPDS	05-23-11	42	0.249	0.09	0.29	0.169	74.1	7.6	-35.6	214	<5	
CHAMPDS	11-02-11	33	<0.2	0.07	0.174	0.108	51.8	7.4	-30	132	<5	
CHAMPDS	02-15-12	44.4	<0.5	0.1	0.475	0.26	84.9	7.5	-33	340	16	
CHAMPDS	05-16-12	41.2	<0.5	<0.01	1.34	0.2	52.9	7.6	-27.8	170	8	
CHAMPDS	08-22-12	82.4	0.322	0.08	0.345	0.412	144.6	8.1	-76.8			
CHAMPDS	05-30-13	62.8	<0.5		0.345	0.314	81.6	7.8	-61		6	
CHAMPDS	02-12-13	22	0.287	0.06	0.335	0.109	36.4	7.4	-16			
CHAMPDS	12-03-13	41	<0.5	0.06	<0.30	0.075	43.4	7.3	-20	148	6	
CHAMPDS	03-27-14	47.4	<0.5	0.05	<0.3	0.095	118.5	7.6	-29.4	260	<5	
CHAMPDS	07-30-14	65.6	<0.5	0.09	0.303	0.152	91.1	7.9	-50.2	246	<5	
CHAMPDS	10-08-14	97.8	< 0.5	0.12	< 0.3	0.141	109.1	7.8	-85.8	436	6	
CHAMPDS	03-16-15	58.4	<0.5	0.057	<0.3	3.243	422.5	7.1	-41.8	630	<5	
CHAMPDS	07-23-15	78.2	<0.5	0.56	0.304	0.187	160.2	8	-44.8	316	62	
CHAMPDS	02-23-16	34.8	<0.5	0.041	<0.3	0.066	47	76	-28	120	<5	
CHAMPDS	06-20-16	86.4	0.879	0.056	<0.3	0.398	538.5	8	-71	340	<5	
CHAMPDS	09-15-16	102.8	<0.5	0.064	<0.3	0.163	242	8.2	-77.8	300	<5	
CHAMPDS	02-22-17	53.6	<0.5	0.045	<0.3	0.08	90.4	7.7	-39.8	226	<5	
CHAMPDS	05-15-17	41.6	<0.5	0.043	<0.3	0.072	55.9	7.7	-33.8	160	20	
CHAMPDS	09-26-17	104.8	<0.5	0.078	<0.3	0.156	193.3	8	-76.4	732	<5	
CHAMPDS	11-20-17	33.4	<0.5	0.049	0.313	0.053	32.4	7.4	-31.4	114	6	
CHAMPDS	02-20-18	32.2	<0.5	0.057	0.471	0.054	40	7.6	-18.4	128	<5	
CHAMPDS	06-25-18	52.8	<0.5	0.062	0.394	0.065	51	7.8	-41.6	186	6	
CHAMPDS	09-04-18	106.2	<0.5	0.053	<0.3	0.192	162.7	8	-92.6	440	10	
CHAMPDS	12-10-18	56.4	<0.5	0.05	<0.3	0.109	67.9	7.7	-46.4	204	<5	
CHAMPDS	03-13-19	432	<0.5	0.045	<0.3	0.09	54	7.6	-27.2	152	6	
CHAMPDS	01-09-20	45	<0.5	0.028	<0.3	0.068	51.9	7.6	-30.4	152	<5	
CHAMPDS	12-10-20	45.4	<0.5	0.042	<0.3	0.072	52.5	6.7	-32.6	160	<5	
CHAMPDS	03-30-21	38.6	<0.5	0.053	<0.3	<0.05	41.8	7	-26	128	<5	
CHAMPDS	05-26-21	71	<0.5	0.059	<0.3	0.126	97.6	7.5	-59.2	258	<5	
CHAMPDS	03-17-22	43.8	<0.5	0.05	<0.3	0.052	46.6	6.9		184	<20	
CHAMPDS	06-07-33	75.6	<0.5	0.077	0.354	0.168	81.4	7.6	-57.4	270	<20	
CHAMPDS	10-27-22	104.8	<0.5	0.07	<0.3	0.135	135.5	7.8	-84.4		<20	
CHAMPDS	02-02-23	49	<0.5	0.06	0.477	0.148	55.4	6.9	-23.4	208	<20	
CHAMPDS	04-19-23	71.4	<0.5	<0.05	0.43	0.102	76.1	7.4	-52.4	230	<20	
CHAMPDS	07-11-23	73.6	<0.5	0.083	<0.3	0.092	66.5	7.5	-56	238	<20	

SAGAMORE TREATMENT SYSTEM

Sagamore Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	flow (gpm)
Sag by airshaft	2000-01-11	26	0.2	0.04	0.238	0.193	38	6.5	0		4	
Sag by wier	2000-01-11	0	34.9	112	122	2430	402	3.2	454		46	
SAG1	1998-06-17	42	<0.2	11.97	14.5	0.384	93	6.1	0			
SAG1	1998-07-23	46	<0.2	13.86	14.6	0.376	110	6.1	0		6	
SAG1	1998-08-19	42	<0.2	12.81	12.8	0.382	114	6.1	0		<2	
SAG1	1998-10-22	36	<0.2	11.13	12.2	0.428	140	6	0		<2	
SAG1	1998-11-23	38	<0.2	9.66	11.6	0.398	192	6.1	0		<2	
SAG1	1998-12-22	36	<0.2	9.35	10	0.386	148.2	6	0		34	
SAG1	1999-01-19	42	<0.2	13.44	15.7	0.376	134	6.1	0		8	
SAG1	1999-03-03	42	<0.2	13.65	14.7	0.426	127	6.2	0			
SAG1	1999-03-24	44	<0.2	17.43	17	0.376	156	6.2	0		14	
SAG1	1999-05-03	44	<0.2	15.33	16.7	0.454	146	6.1	0		8	
SAG1	1999-06-02	42	<0.2	14.28	14.5	0.381	160	6.1	0		<2	
SAG1	1999-07-09	46	<0.2	15.75	17.2	0.444	134.28	6.1	0		6	
SAG1	1999-08-12	46	<0.2	13.23	16.4	0.413	197	6	0		34	
SAG1	1999-09-08	48	<0.2	13.68	16.1	0.399	146	6	0		30	
SAG1	1999-11-22	40	<0.2	12.18	14.2	0.43	512	6.1	0		4	
SAG1	2000-01-11	0	53.3	54.54	163	3.81	795	2.9	672		18	
SAG1	2000-04-06	42	<0.2	14.91	15.9	0.399	123	6.1	0		4	
SAG1	2000-05-08	7.6	<0.2	0.05	0.168	0.039	29	6.2	0.8		<2	
SAG1	2000-06-12	0	0.605	0.47	0.728	0.289	50	3.6	30		48	
SAG1	2000-07-17	0	2.94	5.94	16.1	0.648	74	3.6	38		20	
SAG1	2001-08-09	24	<0.2	0.12	0.69	0.256	63.2	6.4	19		<2	
SAG2	1998-06-17	0	0.357	0.33	0.673	0.137	38	4.4	11.4			
SAG2	1998-07-23	0	4.17	4.98	7.59	0.801	141	3.3	84		<2	
SAG2	1998-08-19	0	3.08	4.62	6.59	0.683	93	3.4	64		<2	
SAG2	1998-12-22	0	3.34	0.38	0.743	0.621	104	3.9	32		14	
SAG2	1999-01-19	1.2	0.41	0.07	0.185	0.077	179	4.7	4.4		<2	
SAG2	1999-03-03	2.6	0.431	0.13	0.356	0.064	24	5	2			
SAG2	1999-03-24	3.2	0.238	0.17	0.635	0.049	26	5.3	0.6		<2	
SAG2	1999-05-03	2	<0.2	0.06	0.154	0.06	32	4.9	0		<2	
SAG2	1999-08-12	0	167	265	480	8.99	1980	3	1982		40	
SAG2	1999-09-08	0	169	225	529	9.62	2.888	2.9	2058		<2	
SAG2	1999-11-22	0	179	420	820	12.7	2.69	2.9	2248		4	
SAG2	2000-01-11	0	47.5	1.01	48.1	3.2	484	2.8	470		58	
SAG2	2000-04-06	0	0.654	0.26	0.83	0.122	36	4	12.6		<2	
SAG2	2000-05-08	0	0.725	0.28	0.595	0.233	55	3.6	26		<2	
SAG2	2000-06-12	10.6	18.5	0.07	3.61	19.7	42	6.4	0		<2	
SAG2	2000-07-17	0	1.34	0.53	1.76	0.837	65	3.7	30		<2	
SAG2	2001-08-09	30	0.223	0.08	0.872	0.338	9	6.6	0		4	
SAG2	2009-06-02	0	0.848	1.02	1.6	0.267	60	3.9	22		<2	
SAG3	2001-08-09	24	<0.2	0.12	0.717	0.268	64.5	6.5	0		6	
SAGALD	2001-01-08	8.4	5.45	4.03	10.3	7.54	127	5.6	8.4		294	
SAGALD	2001-04-30	3	<0.2	0.03	0.333	0.338	97.4	5.3	8.6		<2	
SAGALD	2001-06-05	5.8	<0.2	0.02	0.188	0.403	80.1	5.8	0		6	
SAGALD	2001-07-02	16.2	<0.2	<.02	0.13	0.122	69.4	6.2	0		10	
SAGALD	2001-08-01	24	<0.2	0.02	0.108	0.047	80.1	6.2	11.2		10	
SAGALD	2001-09-17	11.8	<0.2	0.04	0.86	0.079	79.1	6.1	16.6		18	
SAGALD	2001-10-07	16.4	0.272	105.59	107	3.74	407	5.5	178.6		40	
SAGALD	2001-11-18	5.4	0.702	143.68	147	3.85	593	5.1	274.6		20	
SAGALD	2002-04-24	10.8	<0.2	<.02	0.511	0.971	220	5.9	12.4		16	
SAGALD	2002-06-27	22	0.261	0.11	0.708	1.3	221	6.1	12.4		6	
SAGALD	2008-05-05	15.4	0.2	0.06	0.194	0.119	29.5	7.1	-6		10	
SAGALD	2009-03-12	9.8	0.4	0.06	0.16	0.199	27.3	6.8	-4.6		5	
SAGALD	2009-06-16	0	42.3	67.62	94.4	2.54	529.1	2.9	444.6		46	
SAGALD	2010-05-06	14.4	0.962	0.26	1.948	0.155	19.3	6.7	-4.4		24	
SAGALD	2011-02-14	7	0.356	0.3	0.711	0.165	34.5	6.7	-2.4		12	
SAGALD	2011-05-10	12.2	0.212	0.12	0.67	0.277	21.3	6.9	-7.6		14	
SAGALD	2011-08-02	35	<0.2	0.92	1.625	0.437	30.9	7	-21.4		12	
SAGALD	2011-08-02	35	<0.2	0.92	1.625	0.437	30.9	7	-21.4		12	
SAGALD	2011-11-01	15.4	<0.2	0.04	0.186	0.02	19.7	7	-22		<5	
SAGALD	2012-02-06	14.4	<0.2	0.04	0.353	0.258	30.7	6.9	-15.2		8	
SAGALD	2012-08-20	0	7.753	6	611	7.015	299.2	3.8	151		1648	
SAGALD	2012-12-05	0	142	312.76	397	6.917	2211.8	3	1628.8		16	
SAGALD	2013-04-03	0	20.4	32.2	44.1	0.935	327.8	3.3	224.8		18	
SAGALD	2013-07-15	23.2	<.5	0.04	<.300	<.05	<20	7.6	-17.8	66	22	
SAGALD	2013-09-17	0	2.687		3.404	1.555	94.4	3.9	28.6	190	6	
SAGALD	2014-03-05	0	6.278	8.72	10.588	1.003	181.6	3.6	82.2	288	12	
SAGALD	2014-07-01	28.8	3.146	10.69	59.856	2.112	75.8	6.3	1.8	142	436	
SAGALD	2014-09-16	64.2	0.975	27.48	30.109	4.239	160.1	6.6	-1.4	268	22	0.125

Sagamore Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	flow (gpm)
SAGALD	2014-10-23	21.2	0.985	18.15	19.663	1.888	140.9	5.9	33.6	244	<5	0.5
SAGALD	2014-11-12	1.4	1.772	18.36	18.217	1.289	126.9	5.1	46.8	244	< 5	0.5
SAGALD	2014-12-15	1	1.515	6.17	6.549	0.492	94.8	5.1	24.8	156	8	0.28
SAGALD	2015-04-01	29.2	<0.5	0.033	0.56	<0.05	82.9	7.3	-17	50	20	25-30
SAGALD	2015-05-20	0	54.997	246.247	265.89	4.738	1189	4.2	877.4	1984	22	
SAGALD	2015-07-23	25.4	<0.5	0.599	1.777	0.081	<20	7.1	31.6	56	70	
SAGALD	2015-09-01	0	171.115	656.005	>300	8.726	3424	3.3	1971.6	4952	8	0.75
SAGALD	2015-10-20	0	187.79	585.262	>300	8.63	3.123	3.2	2120	4814	70	1
SAGALD	2016-03-01	0	200.9	642.602	>300	8.13	3.458	3.1	2152.6	4810	18	40
SAGALD	2016-10-12	0	274.66	541.322	>300	8.765	4605	2.9	2554.2	5444	28	
SAGALD	2017-01-25	0	275.7	542.23	>300	6.698	3001	3	2703	5496	16	
SAGALD	2017-06-22	0	192.77	478.813	>300	6.868	2673	3	2129	4126	14	
SAGALD	2017-10-03	0	>500	1170.136	>300	12.491	6634	2.7	5458	10934	40	
SAGALD	2017-12-11	0	>500	1,113.70	>300	12.437	7602	2.7	6049.8	11290	28	
SAGALD	2018-04-11	0	>500	1,374.05	>300	12.974	7949	2.6	6774.8	12568	48	
SAGALD	2018-05-22	0	>500	1,555.88	>300	13.433	7.697	2.6	7141.8	12972	<5	
SAGALD	2018-06-19	0	341.62	586.34	>300	7.661	4378	2.8	3380.6	6812	48	
SAGALD	2018-11-20	9.2	12.784	34.74	39.49	2.404	249.1	4.6	133.8	396	62	
SAGALD	2019-02-11	0	26.611	49.59	64.625	1.961	370	3.6	266.4	594	70	
SAGALD	2019-03-14	5.6	14.349	35.14	41.146	1.678	263.2	4.3	153.4	412	12	
SAGALD	2019-04-08	7.4	4.585	11.54	12.199	1.528	129.9	4.7	47.8	234	<5	
SAGALD	2019-05-30	16.6	2.078	14.09	13.501	1.688	100.5	5.8	27	202	14	
SAGALD	2019-07-10	39	2.076	24.39	26.969	2.126	100.8	6.3	23.6	196	24	
SAGALD	2019-08-05	38.4	3.105	23.32	25.677	2.224	152.4	6.2	26	444	16	
SAGALD	2019-10-17	5	4.403	21.35	21.759	1.374	197	4.2	76	320	<5	
SAGALD	2019-11-06	0.2	4.457	19.48	18.839	1.122	181.3	3.9	89	296	34	
SAGALD	2020-01-23	3.4	2.757	7.17	7.157	1.061	102	4.2	40.6	190	<5	
SAGALD	2020-11-17	0	221.232	571.60	>300	8.163	3328	3	2563	4772	22	
SAGALD	2020-12-21	0	161.281	426.39	>300	6.412	2183	3	1733.4	3644	10	
SAGALD	2021-02-22	0	19.49	17.41	24.313	1.348	307.5	3.1	223.6	444	<5	
SAGALD	2021-04-27	0	17.56	24.35	27.579	1.527	313.1	3.2	195.4	510	6	
SAGALD	2021-08-03	11.4	4.805	35.18	38.386	3.1	405.5	4.9	89.4	310	22	
SAGALD	2022-02-28	0	2.486	4.49	4.807	1.364	125	3.8		196	<20	
SAGALD	2022-02-28	20	1.05	13.95	16.811	2.039	106.4	6	33	210	<20	
SAGALD	2022-11-28	0	3.079	7.75	9.553	0.848	134.2	3.6	58.4	218	<20	
SAGALD	2023-04-27	0	2.99	139.24	6.48	0.13	955	3.2	725.8	1500	26	
SAGALD	2023-07-24	0	14.224	29.22	33.598	2.209	262.6	3.3	181	588	21	
SAGDITCH	2001-06-05	9.6	0.794	1.04	1.41	0.579	38.3	6.3	0		<2	
SAGDITCH	2001-07-02	16.6	26.8	<.02	400	7.7	40	6.3	39.8		10	
SAGDITCH	2001-08-01	0	6.06	5.41	24.5	1.94	120.9	4.5	58.2		80	
SAGDITCH	2001-09-17	0	2.69	9.87	54.1	9.74	326	3.3	81.8		120	
SAGDITCH	2001-10-07	0	17.9	43.02	235	21.3	361	3.6	138		786	
SAGDITCH	2001-11-18	82	149	19.25	3660	53.6	66.9	6.5	0		12540	
SAGDITCH	2002-04-24	28	0.354	0.05	0.651	0.272	24.1	6.4	29.4		<2	
SAGDITCH	2002-06-27	40	0.565	1.7	5.38	2.11	23.3	6.5	0		112	
SAGDITCH	2003-07-23	0	111	240	410	8.31	1.785.4	3.1	1402.4		<2	
SAGDITCH	2003-08-04	0	64.5	59	135	4.076	826.3	3	669.2		4	
SAGDITCH	2005-01-03	34.2	<0.5	2.960*	1.34	0.168	54.5	6.9	19.6		<3	
SAGDITCH	2005-03-10	32.6	<0.5	35.82	28.6	3.26	249.1	6.2	44.8		<3	
SAGDITCH	2005-04-11	23.8	0.557	0.09	1.4	0.113	32.2	6.5	28.2		8	
SAGDITCH	2005-09-13	0.6	<0.2	0.48	0.781	1.09	87.1	5.5	43.2		4	
SAGDITCH	2005-12-05	5	<0.2	0.04	0.037		53.1	5.8	13			
SAGDITCH	2006-03-22	10.4	<0.5	0.03	<0.300	<0.05	62.7	5.7	2.4		<3	
SAGDITCH	2006-06-08	7.6	<0.2	0.29	0.387	0.248	29.4	6.2	-2.6		4	
SAGDITCH	2006-09-19	0	67.6	111.52	160	3.96	965.7	3	787.2		<2	
SAGDITCH	2006-12-21	8.4	1.244	0.08	0.441	0.311	53.1	6.5	29.4		2	
SAGDITCH	2007-03-12	3.4	0.36	0.03	0.092	0.1	33	6.1	1		6	
SAGDITCH	2007-05-07	10.2	0.345	0.39	1.195	0.534	31.5	6.4	36.6		4	
SAGDITCH	2008-01-22	10.2	0.2		0.304	0.061	54.4	6.5	-7.6		2	
SAGDITCH	2008-05-05	20.6	0.2	0.12	0.595	0.384	59.4	7	-10.2		10	
SAGDITCH	2009-03-12	8	0.316	0.11	1.888	0.329	53.6	6.5	-0.4		30	
SAGDITCH	2009-06-16	0	59.6	102.44	136	3.4	800.6	3	623.2		20	
SAGDITCH	2009-09-10	0	5.4	49.82	58.3	3.91	268.1	3.2	166.8		12	
SAGDITCH	2010-05-06	17.6	0.308	0.17	0.614	0.249	25.9	6.7	-4.8		5	
SAGDITCH	2011-02-14	8.6	0.219	0.3	0.575	0.125	32.2	6.2	-6		<5	
SAGDITCH	2011-05-10	7.6	<0.2	0.21	0.157	0.038	31.3	6.2	-5.2		20	
SAGDITCH	2011-11-01	10.2	0.68	0.26	1.364	0.083	<15	6.7	-4		14	
SAGDITCH	2012-02-06	7.4	1.566	0.25	7.142	1.566			16.2			
SAGDITCH	2012-08-20	70	49.6	309.22	543	7.59	20	6.9	110.6		1920	
SAGDITCH	2012-12-05	21.6	21.9	2.15	98.2	8.13	23	6.7	56.6		2044	
SAGDITCH	2013-04-03	21.1	0.329	<0.02	0.77	0.03	21.1	6.7	-0.8		110	
SAGDITCH	2013-07-15	21.6	2.612	0.89	9.9	1.785	20.7	6.7	5.2		224	

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project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	flow (gpm)
SAGDITCH	2014-03-05	10.6	<0.5	0.03	<0.3	<0.05	118.4	6.6	-16.6	82	6	
SAGDITCH	2014-07-01	20.6	<0.5	0.04	0.479	<0.05	29.6	6.6	-10.6	62	<5	
SAGDITCH	2014-09-16	35.4	<0.5	0.12	0.341	<0.5	91.2	7.2	-24	72	6	
SAGDITCH	2014-10-23	33.8	<0.5	0.7	<0.3	<0.05	26.4	7.2	-21	82	<5	
SAGDITCH	2014-11-12	37.8	< 0.5	0.04	< 0.3	< 0.05	29.2	7.3	-16.8	92	< 5	
SAGDITCH	2014-12-15	27	<0.5	<0.03	<0.3	<0.05	32.5	6.7	-12.4	80	<5	
SAGDITCH	2015-04-01	10.6	<0.5	0.029	<0.3	<0.05	22.7	6.8	-9.8	56	<5	
SAGDITCH	2015-05-20	21.2	<0.5	0.037	<0.3	<0.05	26.9	6.6	1.8	62	8	1.5
SAGDITCH	2015-07-23	25.4	<0.5	0.045	<0.3	<0.05	21.8	6.7	10.6	66	<5	
SAGDITCH	2015-09-01	29.8	<0.5	0.38	1.704	0.196	30.9	6.6	23.8	88	34	
SAGDITCH	2015-10-20	31.8	<0.5	0.14	0.331	<0.05	32.4	7.2	-24.8	100	<5	
SAGDITCH	2016-03-01	18.4	<0.5	0.031	<0.3	0.067	23.4	6.5	-4.6	80	<5	
SAGDITCH	2016-10-12	28.6	<0.5	0.231	1.727	<0.05	33.7	6.7	-2.8	84	16	
SAGDITCH	2017-01-25	17.6	<0.5	0.047	0.522	<0.05	42.6	6.6	3.8	70	14	
SAGDITCH	2017-06-22	No sample										0
SAGDITCH	2017-10-03	No sample										0
SAGDITCH	2017-12-11	No sample										0
SAGDITCH	2018-04-11	10.4	8.775	0.543	21.943	0.748	37.8	5.8	10.6	76	28	
SAGDITCH	2018-05-22	13.6	<0.5	0.221	1.804	0.1	32	6.3	2	70	14	
SAGDITCH	2018-11-20	16.2	0.847	0.149	1.82	0.174	27.4	6.6	0.4	74	54	
SAGDITCH	2019-02-11	13.2	<0.5	0.036	0.583	0.057	34.4	6.3	1	80	12	
SAGDITCH	2019-03-14	10.8	<0.5	0.031	0.595	<0.05	27.9	6.1	4.6	62	40	
SAGDITCH	2019-04-08	13.4	1.895	0.082	4.311	0.309	22	6.5	2.4	48	66	
SAGDITCH	2019-05-30	16.6	0.604	0.198	1.469	0.256	34.9	6.5	-3.4	92	14	
SAGDITCH	2019-10-17	39.8	1.094	0.708	3.814	0.077	35.2	7	-19.2	92	308	
SAGDITCH	2020-12-21	22.8	<0.5	0.038	<0.3	<0.05	20.1	6.2	-8	56	<5	
SAGDITCH	2021-04-27	14	<0.5	0.058	0.533	0.205	21.4	6.6	-7	60	22	
SAGDITCH	2022-02-28	11.6	<0.5	0.052	0.457	0.249	67.1	6.1		130	22	
SAGDITCH	2022-11-28	36.6	1.388	0.324	9.91	1.001	22.2	6.8	-8.6	60	74	
SAGDITCH	2023-04-27	24.4	15.866	4.826	97.095	2.118	22	6	84.8	60	1040	
SAGDITCH	2023-07-24	21.4	<0.5	0.155	23.683	0.267	33	6.4	-8.4	92	27	
SAGLARGE	2001-01-08	44	<0.2	12	15.2	0.389	120	6.3	0		6	
SAGLARGE	2001-04-30	54	<0.2	16.1	18.3	0.438	129	6.3	0		<2	
SAGLARGE	2001-07-02	44	<0.2	14.29	17.3	0.39	146.1	6.3	16.4		8	
SAGLARGE	2001-08-01	52	<0.2	16.68	18.4	0.456	145.5	6.2	19.6		4	
SAGLARGE	2001-09-17	50	<0.2	19.04	18.1	0.421	131	6.2	13.4		<2	
SAGLARGE	2001-10-07	50	<0.2	18.69	18.7	0.444	29.6	6.2	15		14	
SAGLARGE	2001-11-18	50	<0.2	15.2	16.1	0.412	127	6.3	12.8		4	
SAGLARGE	2002-04-24	48	<0.2	14.42	18	0.403	138	6.3	13.2		12	
SAGLARGE	2002-06-27	58	<0.2	16.38	19.3	423	126	6.2	16.6		16	
SAGLARGE	2002-09-03	52	<0.2	16.2	17.6	0.461	140	6.2	25.8		<2	
SAGLARGE	2003-03-27	54	<0.2	19.3	19.6	0.441	125.2	6.2	23.8		6	
SAGLARGE	2003-07-22	57	<0.2	13.48	19.1	0.415	144.8	6.2	15		12	
SAGLARGE	2003-08-04	54.8	<0.2	10.17	17	0.459	129.1	6.3	8		8	
SAGLARGE	2005-01-03	48	<0.5	14.45	13.7	0.416	131.8	6.4	18.6		<3	
SAGLARGE	2005-03-10	52.6	<0.5	14.04	12.3	0.325	130	6.3	17.2		<3	
SAGLARGE	2005-04-11	52.8	<0.5	14	13.7	0.369	140.5	6.5	23		4	
SAGLARGE	2005-06-13	39.4	<0.2	12.35	14.7	0.433	119.7	6.2	16.8		6	
SAGLARGE	2005-09-13	41	<0.2	13	13.8	0.428	122.4	6.2	23.6		<2	
SAGLARGE	2005-12-05	46.4	<0.2	14.47	16.2		143.7	6.2	28.4			
SAGLARGE	2006-01-19	49.4	<0.5	12.53	12.7	0.418	140.3	6.2	22.8		<3	
SAGLARGE	2006-03-22	55.2	<0.5	15.38	16.7	0.41	143.3	6.3	-2.2		8	
SAGLARGE	2006-06-08	25.4	<0.2	0.11	0.731	0.29	106.1	7.2	-18		4	
SAGLARGE	2006-08-22	42.4	<0.2	18.28	19.2	0.442	129.4	6.3	-21.4		<2	
SAGLARGE	2006-09-19	39.4	<0.2	17.47	22.9	0.404	111.8	6.2	-21.6		10	
SAGLARGE	2006-12-21	47	<0.2	14.87	14.9	0.397	133.7	6.5	20.2		4	
SAGLARGE	2007-03-12	54.2	<0.2	15.05	16	0.367	115.6	6.4	-13.8		12	
SAGLARGE	2007-05-07	41.4	<0.2	11.8	13	0.419	130	6.6	24.6		2	
SAGLARGE	2008-01-22	42.2	0.2	11.34	13.2	0.401	118.7	6.4	-18.4		2	
SAGLARGE	2008-08-18	40.8	0.2	0.05	0.281	0.062	108.5	6.4	-23.4		14	
SAGLARGE	2009-03-12	35.4	0.2	15.62	16.8	0.421	107.7	6.5	-17.4		5	
SAGLARGE	2009-06-16	42	0.2	15.12	16.9	0.409	119.6	6.4	-43.6		14	
SAGLARGE	2009-09-10	56	0.2	14.78	18.5	0.442	105.5	6.4	-23.8		10	
SAGLARGE	2010-05-06	38.8	0.2	11.08	14.6	0.404	110.5	6.3	-15.4		5	
SAGLARGE	2011-02-14	46.6	<0.2	3.17	11	0.375	114.9	6.5	-23.6		<5	
SAGLARGE	2011-05-10	47.8	<0.2	12.46	15.35	0.391	122.1	6.8	-21		6	
SAGLARGE	2011-08-02	46.4	<0.2	13.94	16.2	0.375	113.8	6.4	-14.2		14	
SAGLARGE	2011-11-01	36.6	<0.2	11.8	13.7	0.428	112.5	6.5	-31		<5	
SAGLARGE	2012-02-06	45.8	<0.2	12.76	15.5	0.38	119.6	6.5	-28.6		10	
SAGLARGE	2012-08-20	37.8	<0.2	14.84	17.1	0.426	105.8	6.7	-27.4		<5	
SAGLARGE	2012-12-05	50.2	<0.2	15.1	16.2	0.394	124	6.7	-33.4		14	60
SAGLARGE	2013-04-03	51.2	<0.2	10.56	15.6	0.354	102	6.6	-26.4		6	

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SAGLARGE	2013-07-15	66.2	<0.5	13.32	13.229	0.382	132	6.4	-30.6	284	<5	
SAGLARGE	2013-09-17	74.6	<0.5	16.165		0.381	120	6.6	-10.4	250	10	
SAGLARGE	2014-03-05	62.4	<0.5	12.82	12.09	0.339	162.5	6.7	-15.2	254	<5	
SAGLARGE	2014-07-01	63.4	<0.5	13.56	14.019	0.377	107	6.4	-28.4	250	6	60
SAGLARGE	2014-09-16	62.8	<0.5	12.42	13.734	0.388	285.6	6.6	-22.6	226	8	20
SAGLARGE	2014-10-23	68	<0.5	14.5	16.132	0.415	113.2	6.7	-28.6	244	<5	40
SAGLARGE	2014-11-12	69	< 0.5	15.06	16.531	0.414	197.5	6.6	-21.2	242	16	45
SAGLARGE	2014-12-15	68.6	<0.5	14.06	14.622	0.384	123.2	6.5	-21.8	234	10	60
SAGLARGE	2015-04-01	60	<0.5	14.04	14.109	0.367	140	6.6	-27.4	248	<5	60
SAGLARGE	2015-05-20	66	<0.5	15.012	15.515	0.396	136.3	6.4	-10.4	254	<5	79
SAGLARGE	2015-07-23	65	<0.5	15.735	15.006	0.367	141.2	6.7	-1	256	10	60
SAGLARGE	2015-09-01	67.6	<0.5	17.307	18.86	0.405	168.5	6.4	-8	266	12	
SAGLARGE	2015-10-20	63.6	<0.5	14.138	15.358	0.409	116.2	6.7	9.4	260	12	60
SAGLARGE	2016-03-01	61.4	<0.5	12.415	12.865	0.346	138.8	6.5	-25.8	234	<5	120
SAGLARGE	2016-10-12	62.6	<0.5	11.858	16.127	0.432	116.1	6.6	-19.4	256	10	
SAGLARGE	2017-01-25	57.4	<0.5	10.776	9.886	0.266	172.1	6.6	-26	202	<5	
SAGLARGE	2017-06-22	61.6	<0.5	14.343	16.097	0.413	120.7	6.6	-32.6	254	<5	60
SAGLARGE	2017-10-03	63.2	<0.5	15.272	16.114	0.388	134.8	6.7	-26	258	<5	80
SAGLARGE	2017-12-11	70.2	<0.5	15.761	14.736	0.367	183.1	6.5	-30	236	<5	60
SAGLARGE	2018-04-11	64.8	1.918	10.819	11.795	0.34	112.3	6.4	-31	220	6	80
SAGLARGE	2018-05-22	65.6	<0.5	13.541	12.65	0.334	112.6	6.6	-32.6	234	<5	24
SAGLARGE	2018-11-20	55	<0.5	11.69	12.062	0.332	108.9	6.8	-34	212	10	
SAGLARGE	2019-02-11	58.6	<0.5	13.191	13.877	0.359	107	6.4	-27.8	586	<5	120
SAGLARGE	2019-03-14	66.2	<0.5	14.115	14.53	0.37	121.4	6.3	-30	222	<5	
SAGLARGE	2019-04-08	61	<0.5	12.283	13.445	0.358	100.6	6.5	-33.6	216	6	60
SAGLARGE	2019-05-30	64.2	<0.5	11.88	12.496	0.311	97.1	6.3	-35.2	240	12	90
SAGLARGE	2019-07-10	71.2	<0.50	14.394	14.143	0.366	118.7	6.3	-36.6	252	<5	
SAGLARGE	2019-08-05	69.4	<0.5	15.834	19.12	0.389	144.8	6.3	-34.6	232	18	60
SAGLARGE	2019-10-17	72.8	<0.5	14.622	14.767	0.393	117.6	6.4	-34.6	248	<5	60
SAGLARGE	2019-11-06	64.8	<0.5	14.266	14.235	0.39	122.3	6.4	-28.4	246	8	48
SAGLARGE	2020-01-23	46.6	<0.5	0.028	<0.3	<0.05	<20	7.4	-36	96	<5	3.3
SAGLARGE	2020-11-17	52.4	<0.5	15.96	15.782	0.413	150.6	6.4	-29	262	<5	
SAGLARGE	2020-12-21	64.4	<0.5	14.953	17.188	0.4	114	6.4	-29.4	236	8	
SAGLARGE	2021-02-22	57.6	<0.5	12.828	13.055	0.363	104.6	6.6	-31.8	188	<5	
SAGLARGE	2021-04-27	61.4	<0.5	13.932	14.702	0.373	104.6	6.6	-36.8	232	<5	72
SAGLARGE	2021-08-03	76	<0.5	15.238	17.016	0.418	295.9	6.3	-35.6	238	8	32
SAGLARGE	2021-09-22	74	<0.5	14.754	16.4	0.406	146	6.5	-31	250	6	60
SAGLARGE	2022-02-28	62.6	<0.5	11.239	12.814	0.339	100.6	6.4		218	<20	
SAGLARGE	2022-07-05	74.2	<0.5	14.035	15.765	0.403	111.6	6.5	-33.2	224	<20	
SAGLARGE	2022-11-29	73	<0.5	15.513	15.84	0.374	107.7	6.5	-25	202	<20	
SAGLARGE	2022-12-21	66.6	<0.5	14.992	15.683	0.389	101.1	6.6	-36.6	216	20	
SAGLARGE	2023-01-24	65	<0.5	13.219	14.1	0.36	99.5	6	-28.4	188	<20	96
SAGLARGE	2023-04-27	60.6	<0.5	13.859	17.325	416	118	6.1	-37.6	224	<20	
SAGLARGE	2023-07-24	57.6	<0.5	13.789	16.559	0.42	104.7	6.3	-37.8	262	20	
SAGOUT	2001-01-08	36	<0.2	4.98	6.44	0.522	8	6.6	0		8	
SAGOUT	2001-06-05	28	<0.2	0.09	1.75	0.469	111	6.7	0		<1	
SAGOUT	2001-07-02	32	<0.2	0.08	1.41	0.347	98.9	6.7	0		<2	
SAGOUT	2001-08-01	32	<0.2	0.08	0.897	0.241	124	6.5	0		6	
SAGOUT	2001-09-17	26	<0.2	0.08	1.38	0.288	137	6.9	0		<2	
SAGOUT	2001-10-07	26	<0.2	0.07	1.15	0.24	100.4	6.8	0		20	
SAGOUT	2001-11-18	28	<0.2	0.15	1.71	0.314	134	6.8	0		<2	
SAGOUT	2002-04-24	28	<0.2	0.17	2.05	0.418	107	6.6	0		<2	
SAGOUT	2002-06-27	38	<0.2	0.2	1.53	0.393	118	6.5	0		10	
SAGOUT	2002-09-03	28	<0.2	0.14	0.705	0.117	127	6.9	0		<2	
SAGOUT	2003-03-27	3.8	0.716	0.41	2.31	2.71	111.6	5.6	54		8	
SAGOUT	2003-07-22	0	25.3	77.07	101	7.06	651.9	4.3	316		54	
SAGOUT	2003-08-04	0	10.38	0.32	1.241	3.517	281.8	3.6	93.4		4	
SAGOUT	2005-01-03	28.2	<0.5	1.12	2.24	0.765	126.1	6.7	19.4		<3	
SAGOUT	2005-04-11	33.6	<0.5	0.36	2.86	0.636	124.2	6.6	19		<3	
SAGOUT	2005-06-13	27.8	<0.2	0.07	0.614	0.619	115.1	6.8	-6.6		4	
SAGOUT	2005-09-13	25.2	<0.2	0.03	0.211	0.067	120.7	6.7	-13.2		<2	
SAGOUT	2005-12-05	21	0.209	0.11	0.999		131.5	6.6	27.6			
SAGOUT	2006-03-22	29.2	<0.5	0.57	1.9	0.466	134.7	6.8	-0.4		<3	
SAGOUT	2006-06-08	26.4	<0.2	0.06	0.575	0.231	106.8	7.2	-16.4		6	
SAGOUT	2006-08-22	31.2	<0.2	0.03	0.124	0.05	121.2	7.2	-28.8		<2	
SAGOUT	2006-09-19	0	4.9	0.22	0.869	1.68	204.8	4	41.4		4	
SAGOUT	2006-12-21	24.6	<0.2	0.32	1.25	0.444	119.6	7.1	22.6		<2	
SAGOUT	2007-03-12	27.8	<0.2	1.38	2.493	0.565	112.6	7	-19.2		10	
SAGOUT	2007-05-07	24.8	<0.2	0.12	1.322	0.459	121.1	7.3	13.2		<2	
SAGOUT	2008-01-22	24.2	<0.2	1.49	2.53	0.505	129.2	7	-17.8		<2	
SAGOUT	2008-05-05	28	0.2	0.16	1.76	0.431	123.4	7.1	-17.4		6	
SAGOUT	2008-08-18	31.6	0.2	14.1	16.2	0.429	110.4	7.2	-26.8		5	

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project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	flow (gpm)
SAGOUT	2009-03-12	25.2	0.2	0.27	1.262	0.567	110.7	7.1	-17.8		5	
SAGOUT	2009-06-16	31.8	0.2	0.14	2.07	0.521	111.5	7.1	-25.2		16	
SAGOUT	2009-09-10	35	0.2	0.07	0.319	0.056	106.2	7.1	-30		6	
SAGOUT	2010-05-06	30.6	0.2	0.07	0.86	0.596	103.7	6.8	-23.6		5	
SAGOUT	2011-02-14	28.8	<0.2	0.09	2.087	0.498	92.8	6.9	-20		<5	
SAGOUT	2011-05-10	28.4	<0.2	0.14	1.444	0.391	115.7	7.1	-22.8		<5	
SAGOUT	2011-08-02	33.8	<0.2	0.05	0.233	0.109	103.7	7	-18.8		<5	
SAGOUT	2011-11-01	32.4	<0.2	0.12	0.657	0.219	99.3	7.2	-40.2		<5	
SAGOUT	2012-02-06	31.2	<0.2	1.08	2.779	0.54	104.2	7	-27		10	
SAGOUT	2012-08-20	37.8	<0.2	0.04	0.253	0.147	101.3	7.5	-41		<5	
SAGOUT	2012-12-05	25.2	0.938	0.1	1.826	0.555	125.4	7	-24.4		14	13.5
SAGOUT	2013-04-03	30.8	<0.2	0.29	1.992	0.652	92.5	7.3	-33.2		<5	
SAGOUT	2013-07-15	38.6	<0.5	0.06	0.367	0.354	100.9	7.1	-33.8	230	<5	
SAGOUT	2013-09-17	48.2	<0.5		0.335	0.449	88.8	7.3	-25.6	176	<5	
SAGOUT	2014-03-05	42.8	<0.5	1.96	2.458	0.467	104.7	7	-14.4	182	14	
SAGOUT	2014-07-01	41.6	<0.5	0.06	0.513	0.352	107.4	7	-30.8	224	<5	
SAGOUT	2014-09-16	40.4	<0.5	0.04	<0.3	0.08	112.4	7.3	-31.4	208	8	
SAGOUT	2014-10-23	41	<0.5	0.04	<0.3	0.051	107.7	7.2	-25.8	210	<5	
SAGOUT	2014-11-12	40.8	< 0.5	0.05	0.403	0.067	96.7	7.3	-28.4	212	8	
SAGOUT	2015-12-15	39.2	<0.5	0.26	0.73	0.236	95.1	7.1	0.24	184	10	
SAGOUT	2015-04-01	36	<0.5	1.383	2.75	0.483	153.9	7	-28.2	210	<5	
SAGOUT	2015-05-20	42.6	<0.5	0.072	1.267	0.525	115.2	6.9	-8.4	220	<5	
SAGOUT	2015-07-23	43	<0.5	0.063	0.667	0.317	116.9	7.2	-5.4	198	<5	
SAGOUT	2015-09-01	40.8	<0.5	0.031	0.307	0.115	147.4	7	-14.4	252	<5	
SAGOUT	2015-10-20	40.4	<0.5	0.034	<0.3	0.051	96.2	7.3	-15.6	254	<5	
SAGOUT	2016-03-01	35.8	<0.5	0.602	1.818	0.535	96.4	7.1	-22.2	192	<5	
SAGOUT	2016-10-12	51.2	<0.5	0.607	4.637	0.422	110.9	7.2	-17	232	18	
SAGOUT	2017-01-25	39.2	<0.5	0.704	1.799	0.289	332.7	7	-26.6	186	<5	
SAGOUT	2017-06-22	46	<0.5	0.09	0.453	0.337	89	7.2	-36.4	3986	<5	
SAGOUT	2017-10-03	47.4	<0.5	0.131	0.676	0.142	125.9	7.2	-34	232	<5	
SAGOUT	2017-12-11	41.2	<0.5	0.145	1.056	0.276	131.1	7.2	-28.2	200	>5	
SAGOUT	2018-04-11	42.2	<0.5	0.553	1.924	0.499	131.6	7	-30.4	184	6	
SAGOUT	2018-05-22	44	<0.5	0.315	1.445	0.57	95.3	7.1	-32.2	188	8	
SAGOUT	2018-11-20	48	<0.5	0.338	2.67	0.358	0.358	7.4	-33	188	6	
SAGOUT	2019-02-11	37.8	<0.5	0.481	2.557	0.408	76.8	6.9	-22.2	166	24	
SAGOUT	2019-03-14	43	<0.5	1.046	2.778	0.373	127.9	7	-29.8	190	<5	
SAGOUT	2019-04-08	42.2	<0.5	0.194	1.792	0.324	98.9	7.2	-31.4	198	<5	
SAGOUT	2019-05-30	45.2	<0.5	0.074	0.794	0.318	85.6	6.9	-32.8	204	6	
SAGOUT	2019-07-10	51.8	<0.5	0.061	0.489	0.494	102.9	6.8	-34.2	206	<5	
SAGOUT	2019-08-05	52	<0.5	0.084	0.31	0.348	129.2	6.8	-41	224	<5	
SAGOUT	2019-10-17	45.2	<0.5	0.049	0.401	0.096	118.3	7.1	-32.8	222	<5	
SAGOUT	2019-11-05	42.6	<0.5	0.075	0.688	0.127	113.6	7.2	-28.6	228	6	
SAGOUT	2020-01-23	36.4	<0.5	0.076	0.521	0.295	57.5	7.3	-21.6	138	<5	
SAGOUT	2020-11-17	39.4	<0.5	0.084	0.756	0.175	137.8	6.8	-21.6	220	6	
SAGOUT	2020-12-21	39.2	<0.5	0.698	1.807	0.392	101.7	6.6	-24	194	<5	
SAGOUT	2021-02-22	38	<0.5	0.496	1.195	0.455	93.8	6.8	-27.4	140	<5	
SAGOUT	2021-04-27	46.4	<0.5	0.181	1.877	0.485	89.8	7.2	-34.2	202	<5	
SAGOUT	2021-08-03	50.6	<0.5	<0.05	<0.3	0.191	244	6.6	-37.2	210	<5	
SAGOUT	2021-09-22	49.6	<0.5	<0.05	<0.3	0.079	111.7	7.1	-32	218	<5	
SAGOUT	2022-02-28	40.2	<0.5	0.254	2.088	0.397	91.8	6.8		176	20	
SAGOUT	2022-07-05	51.6	<0.5	<0.05	0.385	0.238	98.3	6.8	-33.8	218	<20	
SAGOUT	2022-11-28	50.4	<0.5	0.103	0.546	0.115	88.4	6.9	-30.8	160	<20	
SAGOUT	2023-01-24	46.2	<0.5	0.098	1.28	0.589	85.4	6.6	-27.6	166	<20	
SAGOUT	2023-04-27	51.2	<0.5	0.054	1.355	0.804	103.4	6.4	-35.2	204	<20	
SAGOUT	2023-07-24	51.6	<0.5	0.073	0.462	0.293	95.7	6.8	-39.4	228	<20	
SAGSMALL	2001-01-08	5.2	13.7	58.5	65.6	2.31	301	4.9	136		40	
SAGSMALL	2001-06-05	42	<0.2	1.26	1.53	1.06	50.1	6.6	0		<2	
SAGSMALL	2001-07-02	186	<0.2	0.5	1.57	0.299	110	7.1	0		6	
SAGSMALL	2001-08-01	5	<0.2	0.29	0.318	0.47	67.3	6.5	0		6	
SAGSMALL	2001-09-17	60	<0.2	0.02	0.157	0.149	60	7	0		8	
SAGSMALL	2001-10-07	42	<0.2	0.11	0.384	0.914	86.3	6.9	0		<2	
SAGSMALL	2002-02-24	38	<0.2	0.76	0.959	0.917	49.1	6.5	0		<2	
SAGSMALL	2002-04-24	48	0.459	0.56	0.758	1.34	90.8	6.6	0		6	
SAGSMALL	2002-06-27	60	<0.2	2.91	2.77	1.94	63.4	6.5	0		14	
SAGSMALL	2002-09-03	42	<0.2	0.05	0.073	0.098	44.3	7.3	0		<2	
SAGSMALL	2003-03-27	33	<0.2	<.02	0.342	0.548	52.4	6.4	17.4		6	
SAGSMALL	2003-07-22	57.6	<0.2	1.4	1.91	1.73	73.1	6.5	0		<2	
SAGSMALL	2003-08-04	50.4	<0.2	0.6	1.113	1.24	64.7	6.6	0		<2	
SAGSMALL	2005-01-03	44.8	0.553		0.421	0.284	77.2	6.6	5.4		<3	
SAGSMALL	2005-04-11	43.4	<0.5	4.11	5.07	1.53	84.1	6.8	18		<3	
SAGSMALL	2005-06-13	28.6	<0.2	1.17	3.57	0.699	112.6	6.3	11		6	
SAGSMALL	2005-09-13	30.4	<0.2	0.32	1.57	0.323	86.1	6.6	1.2		4	

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project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	flow (gpm)
SAGSMALL	2005-12-05	33	<0.2	0.48	0.512	0.811	67.8	6.5	13.2		28	
SAGSMALL	2006-03-22	34.6	<0.5	4.12	6.52	0.411	132	6.6	-5.6		6	
SAGSMALL	2006-06-08	49	<0.2	17.65	18.9	0.38	123.9	6.4	-12.6		2	
SAGSMALL	2006-09-19	32	<0.2	0.14	1.487	0.325	108.5	6.6	-20.6		<2	
SAGSMALL	2006-12-21	30.2	<0.2	4.81	5.541	0.401	114.5	6.8	21.2		8	
SAGSMALL	2007-03-12	34.8	<0.2	5.28	6.893	0.377	99.5	6.9	-20.2		12	
SAGSMALL	2007-05-07	25.2	<0.2	0.99	3.697	0.438	121.1	7	20.4		6	
SAGSMALL	2008-01-22	31.6	0.2	4.89	6.534	0.405	126.2	6.8	-19.4		2	
SAGSMALL	2009-03-12	26.4	0.474	3.3	5.347	0.633	101.9	6.9	-19.4		6	
SAGSMALL	2009-06-16	32.4	0.2	0.68	2.26	0.371	108.3	6.6	-25.8		10	
SAGSMALL	2009-09-10	33	0.2	0.23	1.5	0.26	106.5	6.4	-25.2		5	
SAGSMALL	2010-05-06	31.4	0.2		2.52	0.403	104.9	6.6	-19.8		5	
SAGSMALL	2011-02-14	32.8	<0.2	1.57	4.334	0.379	103.2	6.9	-24.4		<5	
SAGSMALL	2011-05-10	30	<0.2	1.97	3.657	0.4	114.8	6.8	-21.4		<5	
SAGSMALL	2011-08-02	34.6	<0.2	0.56	1.32	0.327	105.1	6.6	-17.4		<5	
SAGSMALL	2011-11-01	34.6	<0.2	1.52	2.657	0.338	98.9	7	-34.4		<5	
SAGSMALL	2012-02-06	14.8	<0.2	0.24	0.468	0.303	25.4	6.7	9.6		2.764	
SAGSMALL	2012-08-20	48.4	<0.2	0.09	0.579	0.641	32.6	7.7	-50.8		<5	
SAGSMALL	2012-12-05	30.6	<0.2	0.2	0.43	0.289	33.4	7.1	-37		8	6
SAGSMALL	2013-04-03	13.2	<0.2	0.1	0.224	0.261	31.6	6.7	-23.4		6	
SAGSMALL	2013-07-15	38.6	<0.5	0.18	<.3	0.278	21.3	6.7	-23	29.4	<5	
SAGSMALL	2013-09-17	33.2	<0.5		0.639	0.951	42.3	7	-25	114	<5	
SAGSMALL	2014-03-05	28	<0.5	0.35	0.35	0.276	89.2	6.8	1.8	118	<5	
SAGSMALL	2014-07-01	49.2	<0.5	1.08	11.392	1.702	45.36	6.8	-34.4	124	12	2
SAGSMALL	2014-09-16	52.6	<0.5	0.03	<0.3	0.212	28.4	7.7	-42	100	<5	1
SAGSMALL	2014-10-23	55.6	<0.5	0.12	0.391	0.252	32.3	7.6	-20.8	108	<5	2
SAGSMALL	2014-11-12	52	< 0.5	0.21	0.427	0.23	38.4	7.3	-39.6	106	< 5	2
SAGSMALL	2014-12-15	30	<0.5	0.12	<0.3	0.111	47.8	6.6	-13	208	<5	6
SAGSMALL	2015-04-01	34.8	<0.5	0.144	0.31	0.148	35.5	7	-23.4	92	<5	6
SAGSMALL	2015-05-20	39	<0.5	0.109	<0.3	0.346	42	6.9	-4.8	100	<5	5
SAGSMALL	2015-07-23	41.4	<0.5	0.122	<0.3	0.461	84.4	7.1	1.4	128	6	5
SAGSMALL	2015-09-01	51	<0.5	0.02	<0.3	0.194	39.6	7.2	-26.4	120	<5	1
SAGSMALL	2015-10-20	51.8	<0.5	0.038	<.3	0.18	37.7	7.8	-14.6	128	<5	1
SAGSMALL	2016-03-01	19	<0.5	0.06	<0.3	0.05	36.3	6.7	-7.6	90	<5	18
SAGSMALL	2017-01-25	22.4	<0.5	0.069	<0.3	0.058	51.1	6.8	-12	100	<5	12
SAGSMALL	2017-06-22	44.8	<0.5	0.21	0.49	0.858	38.8	7	-35.4	114	<5	3
SAGSMALL	2017-10-03	45.6	<0.5	0.404	8.839	1.192	31.9	7.3	-32	110	12	4
SAGSMALL	2017-12-11	24.4	<0.5	0.556	0.798	0.241	36.9	6.7	-10.6	80	<5	6
SAGSMALL	2018-04-11	26	<0.5	0.424	0.513	0.482	42.2	6.6	-14	106	<5	6.7
SAGSMALL	2018-05-22	35.8	<0.5	0.562	0.706	0.641	32.6	6.9	-22.2	90	<5	7.5
SAGSMALL	2018-11-20	30.8	<0.5	0.427	0.54	0.386	35.3	7.3	-17.8	106	<5	
SAGSMALL	2019-02-11	25.4	<0.5	0.69	0.994	0.581	39.2	6.5	-5.2	86	<5	6
SAGSMALL	2019-03-14	28.4	<0.5	1.153	2.931	0.919	44.4	6.4	1.2	104	<5	
SAGSMALL	2019-04-08	21.2	<0.5	0.249	0.57	0.199	<20	6.7	-8.6	62	<5	12
SAGSMALL	2019-05-30	30.4	<0.5	0.618	1.153	0.482	<20	6.5	-15.6	78	10	12
SAGSMALL	2019-07-10	46.8	<0.5	0.824	1.107	1.26	35.2	6.7	-33.2	102	<5	
SAGSMALL	2019-08-05	48.8	<0.5	0.453	1.715	1.213	88.7	6.9	-34.6	120	8	
SAGSMALL	2019-10-17	41	<0.5	0.157	1.004	0.235	48.4	7.3	-16.6	116	16	1
SAGSMALL	2019-11-05	30.8	<0.5	0.19	0.412	0.162	30.2	6.9	-11	94	<5	1.6
SAGSMALL	2020-01-23	18.2	<0.5	0.099	<0.3	0.056	29.5	6.7	-5.2	86	8	11
SAGSMALL	2020-11-17	23.6	<0.5	0.099	<0.3	<0.05	38.8	6.6	-10.2	96	6	
SAGSMALL	2020-12-21	21.8	<0.5	0.061	<0.3	<0.05	26.9	6.4	-13	70	<5	
SAGSMALL	2021-02-22	16.6	<0.5	0.077	<0.3	<0.05	27.7	6.6	-6.8	38	<5	
SAGSMALL	2021-04-27	22.8	<0.5	0.054	<0.3	0.06	25.7	6.8	-15.8	76	<5	
SAGSMALL	2021-08-03	43.2	<0.5	0.187	0.615	0.515	29.6	6.6	-31.2	80	<5	26
SAGSMALL	2021-09-22	45.4	<0.5	0.639	1.921	0.5	21.5	7.1	-25.4	92	<5	2
SAGSMALL	2022-02-28	23.8	<0.5	0.143	0.3	0.201	47.8	6.5		96	<20	
SAGSMALL	2022-07-05	44.2	<0.5	0.26	0.774	0.679	24.6	7	-23.6	76	<20	
SAGSMALL	2022-11-28	34.6	<0.5	0.194	0.369	0.077	23.3	6.7	-15.2	58	<20	
SAGSMALL	2022-12-21	29.6	<0.5	0.132	<0.3	0.118	27	6.7	-16.2	76	<20	
SAGSMALL	2023-01-24	23.8	<0.5	0.121	<0.3	0.176	39.9	6.4	-6.8	76	<20	54
SAGSMALL	2023-04-27	33.8	<0.5	0.228	0.436	0.525	33.8	6.2	-17.6	88	<20	
SAGSMALL	2023-07-24	32.6	<0.5	0.165	<0.3	0.222	31.1	6.5	-18.6	104	<20	
SAGUP	2014-09-16	97	<0.5	0.14	0.834	0.33	119.1	7.8	-80.6	236	14	0
SAGUP	2014-10-23	5.6	<0.5	0.05	<0.3	5.961	206.3	6	2.8	330	<5	1
SAGUP	2014-11-12	4.6	< 0.5	0.03	< 0.3	1.378	158.4	5.9	0.8	272	6	0.25
SAGUP	2014-12-15	20.4	<0.5	0.05	<0.3	0.789	91.8	6.3	-5.2	152	<5	2
SAGUP	2015-04-01	14	<0.5	0.035	<0.3	<0.05	97.4	6.8	-3.4	98	<5	4.5
SAGUP	2015-05-20	66.4	<0.5	0.262	1.281	6.09	95	7	-23.6	194	14	
SAGUP	2015-07-23	52.8	<0.5	0.061	<0.3	1.817	29.3	6.4	-14.2	108	6	
SAGUP	2015-09-01	123.2	<0.5	0.077	<0.3	1.739	267.3	7.6	-67.8	508	10	
SAGUP	2015-10-20	46.2	<0.5	0.128	<.3	0.335	279.7	7	-36.8	502	<5	

Sagamore Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	flow (gpm)
SAGUP	2016-03-01	16.8	<0.5	0.039	<0.3	0.06	31.1	6.7	-6.6	86	<5	
SAGUP	2016-10-12	16	0.568	1.742	3.178	1.324	174.7	6	14.4	288	12	
SAGUP	2017-01-25	17.2	<0.5	0.041	<0.3	0.077	34.1	6.5	-1.2	62	<5	
SAGUP	2017-06-22	69	<0.5	1.183	2.264	7.881	96.3	6.8	-44	210	<5	
SAGUP	2017-10-03	No sample										0
SAGUP	2017-12-11	54.8	<0.5	0.66	1.336	6.81	101.1	65	-35.8	180	<5	
SAGUP	2018-04-11	21.2	0.626	0.075	0.892	0.366	22.8	6.1	-7.8	78	10	
SAGUP	2018-05-22	47.6	1.194	0.315	1.903	1.617	<20.0	6.8	-30.8	100	12	
SAGUP	2018-11-20	14	864	6.829	7.938	2.372	57.8	5.9	8.8	108	18	
SAGUP	2019-02-11	17.2	1.821	0.106	4.028	0.528	<20	6.6	1.8	72	36	
SAGUP	2019-03-14	28	0.542	0.845	2.036	3.174	32.7	6.1	-13.6	85	<5	
SAGUP	2019-04-08	31	<0.5	1.329	3.411	4.972	53.4	6.4	-16.6	118	10	
SAGUP	2019-05-30	35.6	2.572	0.686	4.044	1.328	<20	6.4	-13.4	118	40	
SAGUP	2019-07-10	56.4	<0.5	0.277	3.642	1.526	21.2	6.7	-38	104	10	
SAGUP	2019-08-05	88.6	1.464	8.307	18.976	4.73	26.9	6.7	-67.2	146	94	
SAGUP	2019-10-17	24.6	<0.5	5.404	6.702	2.408	112	6	-6	182	8	
SAGUP	2019-11-05	17.2	<0.5	1.121	2.899	1.956	94.3	6.1	3.4	172	70	
SAGUP	2020-01-23	No sample										
SAGUP	2020-11-17	8.6	<0.5	0.045	<0.3	0.955	180.9	5.8	8.4	240	30	
SAGUP	2020-12-21	12	<0.5	0.127	0.523	0.307	67.4	6	3	128	34	
SAGUP	2021-02-22	13.2	<0.5	0.074	0.306	0.078	40.2	6.4	-3.2	66	<5	
SAGUP	2021-04-27	23.8	<0.5	0.153	0.569	0.79	50.8	6.6	-12.8	128	<5	
SAGUP	2022-02-28	16.2	2.449	0.06	1.371	0.071	<20	6.2		62	24	
SAGUP	2022-07-05	104.2	1.656	6.877	5.4931	7.84	<20	6.9	-51.2	152	330	
SAGUP	2022-11-28	26.4	0.716	0.179	0.811	0.334	57.8	6.4	-5.2	110	<20	
SAGUP	2023-01-24	26.4	7.381	0.221	15.294	2.864	<20	6.2	20.6	72	516	
SAGUP	2023-04-27	36	4.789	0.782	15.388	2.622	33.3	6.2	-6	104	318	
SAGUP	2023-07-24	55.4	<0.5	0.556	2.718	2.979	38.5	6.6	-40.2	156	60	
SAGDOWN1	2014-09-16	0	0.523	3.33	3.907	3.758	133	4.3	20.4	282	10	0.025
SAGDOWN1	2014-10-23	0	0.537	1.18	1.486	3.916	184.1	4.7	16.6	264	<5	2.25
SAGDOWN1	2014-11-12	0	0.999	0.054	0.874	1.694	146.1	4.4	16.4	236	10	1.25
SAGDOWN1	2015-12-15	7	<0.5	0.18	0.414	0.498	93.9	6.3	0.8	130	<5	25.7
SAGDOWN1	2015-04-01	7.8	0.727	0.171	2.552	0.122	101.4	6.8	-2	80	38	30
SAGDOWN1	2015-05-20	0	4.319	16.649	48.826	3.193	134	4.8	80.4	250	18	
SAGDOWN1	2015-07-23	0	23.993	64.9	83.454	2.011	392.8	3.6	251.2	662	22	
SAGDOWN1	2015-09-01	0	145.576	427.13	>300	9.525	2.93	2.8	1713.6	4050	28	
SAGDOWN1	2015-10-20	0	172.58	462.203	>300	8.874	2880	3.1	1919.4	4802	36	
SAGDOWN1	2016-03-01	5.8	9.613	23.605	30.239	0.573	172.8	4.4	107.4	280	10	
SAGDOWN1	2016-10-12	0	128.971	229.556	>300	6.388	2113	3	1537.8	3196	20	
SAGDOWN1	2017-01-25	7.6	4.532	7.831	9.078	0.228	70.2	4.7	49.2	128	<5	
SAGDOWN1	2017-06-22	0	181.77	368.326	>300	7.112	2090	2.9	1971	3842	18	
SAGDOWN1	2017-10-03	0	475.69	920.986	>300	12.152	7.338	2.6	4938.8	10012	108	
SAGDOWN1	2017-12-11	0	191.51	325.165	>300	4.314	2180	3	1876.4	3348	8	
SAGDOWN1	2018-04-11	0	102.077	191.231	189.69	2.318	1298	3.1	1034.2	1974	20	
SAGDOWN1	2018-05-22	0	106.013	218.23	208.34	2.637	1.164	3.2	1.053	1988	20	
SAGDOWN1	2018-11-20	10.6	1.154	1.455	2.523	0.31	32.4	6.4	5.4	64	20	
SAGDOWN1	2019-02-11	11.6	<0.5	0.034	0.467	<0.05	<20.0	6.7	3.4	28	10	
SAGDOWN1	2019-03-14	5.4	3.459	3.121	14.087	0.372	49.9	5	18.4	76	30	
SAGDOWN1	2019-04-08	5.8	0.86	1.934	3.172	0.534	56.5	4.8	11.2	94	24	
SAGDOWN1	2019-05-30	13.4	0.786	2.915	4.256	0.364	30.7	6.2	1.6	86	42	
SAGDOWN1	2019-07-10	24.8	<0.5	0.112	0.901	<0.5	<20	6.7	-11.4	52	<5	
SAGDOWN1	2019-10-17	0	2.205	7.793	17.587	1.109	118.7	3.5	60.2	196	8	
SAGDOWN1	2019-11-05	0	2.766	2.275	8.676	1.176	124	3.3	53.8	220	60	
SAGDOWN1	2020-01-23	12	<0.5	0.155	0.335	<0.05	<20	6.5	0.4	52	<5	
SAGDOWN1	2020-11-17	0	173.918	365.102	>300	6.798	2470	2.8	1893	3706	14	
SAGDOWN1	2020-12-21	0	35.108	76.459	85.066	1.62	566.2	3.2	411.6	766	22	
SAGDOWN1	2021-02-22	4.2	1.998	0.329	1.641	0.217	42.6	4.3	15.2	32	12	
SAGDOWN1	2021-08-03	0	3.41	16.406	25.582	2.522	402.8	3	131.8	340	6	
SAGDOWN1	2022-02-28	15.2	<0.5	0.155	0.596	0.16	24.1	6.2		58	<20	
SAGDOWN1	2022-07-05	0	1.42	7.267	18.329	1.811	99.5	3.5	54.8	206	298	
SAGDOWN1	2022-11-28	20.2	8.769	1.411	13.395	0.508	31.7	6.4	10.2	60	92	
SAGDOWN1	2022-12-21	43	7.361	1.704	25.519	0.505	37.6	6	201	88	7680	
SAGDOWN1	2023-01-24	7.8	8.738	23.013	25.4	0.654	121.7	4.5	105	222	24	
SAGDOWN1	2023-04-27	0	57.01	47.744	95.294	2.908	682.4	3	575.4	1192	31	
SAGDOWN1	2023-07-24	0	4.543	0.983	18.647	1.002	89.3	3.2	60.4	204	68	
SAGDOWN2	2014-09-16	82.4	<0.5	0.3	0.466	0.065	28.7	7.7	-69.8	120	10	0.33
SAGDOWN2	2014-10-23	81.2	<0.5	0.13	<0.3	<0.05	34.4	7.7	-66.2	116	<5	1.125
SAGDOWN2	2014-11-12	72.8	< 0.5	0.15	< 0.3	< 0.05	< 20	7.6	-58.2	112	< 5	1.25
SAGDOWN2	2014-12-15	20.2	<0.5	0.03	<.300	<0.05	<20	6.8	-6.6	50	<5	37.5
SAGDOWN2	2015-04-01	21.6	<0.5	0.036	<0.3	<0.05	<20	7	-8.2	54	<5	18
SAGDOWN2	2015-05-20	34.2	<0.5	0.66	<0.3	<0.05	20.1	7.3	0.8	22	<5	

Sagamore Water Quality Monitoring

project mp	date_colected	alk (mg/l)	al (mg/l)	fe+2 (mg/l)	fe (mg/l)	mn (mg/l)	so4 (mg/l)	ph (ph units)	hot a (mg/l)	tds (mg/l)	tss (mg/l)	flow (gpm)
SAGDOWN2	2015-07-23	31.4	<0.5	0.081	<0.3	<0.05	108.4	7	7.2	58	<5	16
SAGDOWN2	2015-09-01	73.6	<0.5	4.183	4.168	0.215	31	7.4	-31	124	<5	
SAGDOWN2	2015-10-20	80.8	0.529	2.029	1.772	<0.05	37.2	7.7	-73.2	146	<5	0
SAGDOWN2	2016-03-01	14.4	<0.5	0.248	0.421	<0.05	<0.02	6.7	-0.6	50	<5	
SAGDOWN2	2016-10-12	0	164.04	283.008	>300	6.388	2113	3	1537.8	3196	20	
SAGDOWN2	2017-01-25	14.4	<0.5	<0.02	<0.3	<0.05	21.4	6.5	-5.4	42	<5	
SAGDOWN2	2017-06-22	21.6	1.021	0.452	3.969	0.179	39.3	6.5	0	82	60	
SAGDOWN2	2017-10-03	No sample										0
SAGDOWN2	2017-12-11	17.6	0.907	0.569	1.544	0.05	<20	6.8	9.8	46	376	
SAGDOWN2	2018-04-11	0	17.112	33.436	64.787	0.39	200.8	3.8	165.4	298	36	
SAGDOWN2	2018-05-22	1.4	18.282	36.477	38.132	0.482	212.7	4	179.4	330	22	
SAGDOWN2	2018-11-20	13.8	<0.5	0.193	0.416	<0.05	<0.02	6.8	-2	46	10	
SAGDOWN2	2019-02-11	11	<0.5	0.147	0.736	<0.05	<20.0	6.7	2.8	42	12	
SAGDOWN2	2019-03-14	12.8	<0.5	0.033	<0.3	<0.05	<20	6.7	-0.2	36	<5	
SAGDOWN2	2019-04-08	17.4	<0.5	0.044	<0.3	<0.05	<20	6.9	-7	40	14	
SAGDOWN2	2019-05-30	20.4	<0.5	0.051	<0.3	<0.05	<20	6.6	-10.4	60	<5	
SAGDOWN2	2019-07-10	9	0.616	7.476	10.819	0.842	63.4	5.7	19.8	126	16	
SAGDOWN2	2019-08-05	20	<0.5	7.593	7.791	0.76	104.4	6.3	8.8	128	10	
SAGDOWN2	2020-01-23	11.8	<0.5	0.026	0.757	<0.05	<20	6.5	-2.8	48	<5	
SAGDOWN2	2020-11-17	3.4	13.172	19.105	31.318	0.629	251.9	4.1	140.8	344	42	
SAGDOWN2	2020-12-21	18.8	<0.5	<0.02	<0.3	<0.05	<20	6.4	-6.8	48	<5	
SAGDOWN2	2021-02-22	13	<0.5	<0.02	<0.3	<0.05	<20	6.5	-9.2	<5	<5	
SAGDOWN2	2022-02-28	16.2	<0.5	<0.05	<0.3	<0.05	<20	6.3		42	<20	
SAGDOWN2	2022-11-29	34.2	<0.5	0.25	0.749	0.107	<20	6.8	-13.8	48	<20	
SAGDOWN2	2022-12-21	30	1.216	0.329	2.17	0.06	<20	6.6	46.6	48	700	
SAGDOWN2	2023-01-24	10.8	0.848	1.397	1.933	0.065	<20	6.1	11.4	38	<20	
SAGDOWN2	2023-04-27	0	33.625	26.298	54.553	1.761	495.1	3.1	338.8	700	21	
SAGDOWN2	2023-07-24	20.4	<0.5	0.226	0.571	0.115	23.7	6.5	-5.4	70	<20	
SAGWEIR	2014-10-23	0	<0.5	0.05	<0.3	0.407	117.6	4.5	11.2	156	6	0.5
SAGWEIR	2014-11-12	0	0.591	0.04	0.454	0.346	95.3	4.5	14.6	152	< 5	n/a
SAGWEIR	2014-12-15	9.8	<0.5	0.03	<0.3	0.111	30.5	6.8	-3	70	<5	40
SAGWEIR	2015-04-01	23.2	<0.5	0.079	0.73	<0.05	23.7	7	-11.8	58	<5	60
SAGWEIR	2015-05-20	20.4	0.637	2.525	3.208	0.74	53.2	7	44.4	96	10	
SAGWEIR	2015-07-23	0.4	4.06	10.089	12.955	0.36	77.3	5.4	42.4	134	48	
SAGWEIR	2015-09-01	0	111.476	20.051	138.875	7.977	2144	2.6	1101.4	2672	18	
SAGWEIR	2015-10-20											
SAGWEIR	2016-03-01	7	3.674	8.743	10.76	0.223	72.8	4.8	40.6	130	6	
SAGWEIR	2016-10-12	56.4	113.45	0.077	1.041	0.924	519.5	7.2	-39.6	760	14	
SAGWEIR	2017-01-25	8	1.846	2.861	3.304	0.112	36.6	5	17.4	80	<5	
SAGWEIR	2017-06-22	0	95.888	164.106	197.83	3.955	1201	2.9	1971	3842	18	
SAGWEIR	2017-10-03	0	329.64	519.617	>300	8.804	3410	2.8	2676.2	5574	20	0
SAGWEIR	2017-12-11	0	54.232	96.115	96.518	1.445	712.7	3.3	583.8	1010	12	102.87
SAGWEIR	2018-04-11	0	15.538	32.187	30.454	0.37	200.6	3.8	157	278	16	166.05
SAGWEIR	2018-05-22	0	19.215	36.406	37.011	0.504	221.2	3.8	185.2	374	20	158.14
SAGWEIR	2018-06-19	0	233.11	354.404	>300	6.701	2956	3	2382	4842	74	
SAGWEIR	2018-11-20	12.2	<0.5	0.287	2.572	0.353	<0.020	6.7	1.6	48	22	
SAGWEIR	2019-02-11	11.4	<0.5	0.145	0.71	<0.05	<0.02	6.6	5	36	18	
SAGWEIR	2019-03-14	11.4	<0.5	0.196	0.43	<0.05	<20	6.8	1.6	40	<5	
SAGWEIR	2019-04-08	14.6	<0.5	0.17	0.42	0.166	29.6	6.8	0.2	60	<5	16.5
SAGWEIR	2019-05-30	16.2	0.535	0.278	1.105	0.06	<20	6.7	-4.2	64	<5	
SAGWEIR	2019-07-10	19.8	0.664	0.31	4.757	0.151	27.8	6.8	-5.4	60	<5	
SAGWEIR	2019-08-05	0	<0.5	6.086	6.408	0.498	115.2	3.8	33	130	<5	
SAGWEIR	2019-10-17	0	1.743	1.098	2.288	1.045	112.6	3.8	35.2	184	<5	1
SAGWEIR	2019-11-05	0	2.367	0.546	1.227	0.708	96	3.8	26.8	162	6	
SAGWEIR	2020-11-17	0	144.207	119	265.31	5.749	1880	2.7	1441.4	2918	26	2.99
SAGWEIR	2020-12-21	0	10.104	11.496	14.873	0.473	140.7	3.4	115.8	234	<5	
SAGWEIR	2021-02-22	6.8	1.015	0.177	0.786	0.077	24.5	6	2.4	<5	6	
SAGWEIR	2021-04-27	13.6	<0.5	0.129	0.7	0.062	<20.0	6.8	-3.8	52	10	
SAGWEIR	2022-02-28	15.4	<0.5	<0.05	<0.3	<0.05	<20.0	6.3		44	<20	
SAGWEIR	2022-11-28	23.8	0.837	0.171	1.696	0.112	28.1	6.6	-4	54	<20	
SAGWEIR	2022-12-21	20.4	<0.5	<0.05	<0.3	0.05	<20.0	6.5	-4.2	62	<20	
SAGWEIR	2023-01-24	11	0.763	1.397	1.776	0.069	<20.0	6.2	11.4	40	<20	
SAGWEIR	2023-04-27	0	27.74	19.862	39.452	1.439	399.9	3.1	283.6	608	<20	
SAGWEIR	2023-07-24	13.4	<0.5	0.171	0.582	0.157	30	6.3	-1.6	78	<20	
ROUGE2	2018-06-19	0	256.77	442.377	>300	6.216	3464	3	2681.2	5396	<5	