SUNOCO PIPELINE
An ENERGY TRANSFER Company

535 Fritztown Road
Sinking Spring, PA 19608

May 21, 2019

Via Electronic Mail
Mr. Scott R. Williamson
Program Manager, Waterways & Wetlands Program
Pennsylvania Department of Environmental Protection
Southcentral Regional Office
909 Elmerton Avenue
Harrisburg, PA 17110-8200

Re: DEP School House Rd. HDD Re-Evaluation Report- Request for additional information
School House Road Crossing 16" Horizontal Directional Drill (S3-0091-16)
Permit No. E38-194
South Londonderry Township, Lebanon County

Dear Mr. Williamson:

In compliance with the Corrected Stipulated Order dated August 10, 2017, a Reevaluation Report on the above-referenced horizontal directional drill (HDD) was submitted to the Department on February 20, 2019. In a letter dated March 28, 2019, the Department is requesting further information. Please accept this letter as a response. Your requests are bolded below followed by Sunoco Pipeline, LP (SPLP) responses.

1. **As required by Paragraph 4. and 5. of the Environmental Hearing Board's August 10, 2017 Corrected Stipulated Order (Order), SPLP failed to fully utilize information gathered during the HDD of the 20-inch bore as part of the HDD Re-evaluation for the 16-inch pipeline. Please gather geologic and drilling information collected by various site personnel during the 20-inch bore that can be used to provide a summary confirmation of the geology at the site. This should include the full geologic profile from the drilling of the 20-inch HDD. The analysis should also evaluate how all of the available data has been used to minimize an IR from occurring as the proposed 16-inch pipeline intersects the zone around 30 feet below ground surface where SPLP has indicated the first IR occurred. The re-evaluation should also discuss and consider additional pre-cautions, such as casing-especially on the eastern side of the HDD path, that may prevent or further minimize the risks associated with potential inadvertent returns (IRs) on entry and exit activities of the HDD in the overburden.**

   This information should then be used to further describe why the chosen bore path for the 16-inch pipeline was determined and how such information has been used to minimize the potential for IRs to occur and as part of the discussion of construction alternatives, including why HDD activity is still the preferred and chosen methodology for pipeline construction at this location. Within the construction alternatives analysis, please provide an evaluation and discussion of other trenchless methodologies and why they are not a feasible alternative to HDD.

The inadvertent return (IR) information presented graphically on Figure 1 in Attachment 2 presents the plan and cross section views of IR events that occurred during 20-inch HDD operations. This figure presents the events occurring during these HDD operations in relation to the depth of profile and allows for correlation of actual drilling operations data collected during active drilling. SPLP utilized all the foregoing information obtained during drilling of the 20-inch HDD in our internal assessment and evaluation of the 16-inch HDD profile, and as required by paragraph 5 of the Corrected Stipulated Order, described and presented the results of this study in the HDD Reevaluation Report. Nevertheless, the Department has requested that SPLP provide additional details concerning the conditions associated this HDD location and the conclusion to proceed with an HDD for the 16-inch line at this location along a revised profile. In the interest of working cooperatively with the Department, the following information is provided in response to the Department's request.

SPLP reviewed the daily drilling reports, the geotechnical investigations, and the HDD Inspection Daily Reports, paying attention to interval/day in which an IR occurred. Specifically, the depth of the bit was compared to the geotechnical investigations to determine the competency of the material the pilot tool was advancing through when the IR occurred. Further, the annular pressure was reviewed to identify any sudden changes in pressure while the pilot tool was being advanced.

The root cause analysis for the IR that occurred at the end of the pilot phase of drilling, determined that the cause of the IR was the pilot bit passing through unconsolidated material and/or the unconsolidated material/bedrock interface. These materials typically have low integrity and lack the strength to prevent the migration of drilling fluids, but are strong enough to require the use of a mud motor to cut the material which requires the circulation of drilling fluid to operate the motor. It is challenging to prevent "punch out" IRs as stated in the Reevaluation Report. The only possible profile adjustment to minimize the potential for entry/exit IRs is maximizing the entry/exit angles, which has been done on the revised HDD profile.

By increasing the entry and exit angles, the redesigned 16-inch HDD will be advanced through the unconsolidated soils and weathered bedrock quicker and closer to the respective entry and exit points. This will minimize the distance the pilot bit and reamer will have to travel through the lower integrity material. If a "punch in/out" IR were to occur, it would occur in an upland area and within the limits of disturbance where it can be controlled quickly. Further, the overall depth of the profile has been increased from a maximum depth of 62 feet below ground surface (bgs) on the permitted 16-inch profile to 81 feet bgs on the redesigned 16-inch profile. These design changes, along with best management drilling practices, will be used to reduce the risk of IRs from occurring during the completion of the 16-inch HDD. Should an IR occur, the drilling contractor will immediately stop all drilling activities, begin to construct a containment structure around the IR to minimize the surficial area impacted and begin recovery operations. All necessary notifications and reports will be made. Following the completion of recovery efforts, and receiving restart authorization (if necessary), the drilling contractor will install a loss control material (LCM) plug at the interval in which the IR occurred and allow sufficient time for the plug to setup prior to resuming drilling and advancing the bore.

In the event the LCM plug is ineffective at sealing off the zone of loss, the use of surface casing will be considered, however casing cannot be used at an HDD exit point during the pilot phase of drilling;

therefore, this mitigation measure is not applicable to prevent a IR similar to the IR event during the drilling for installation of the 20-inch pipeline.

As mentioned in the Alternative Analysis section of the Reevaluation report, the HDD methodology was confirmed to be the preferred installation method because it avoids direct impacts to the land surface and occurring natural resources. Changing the installation technique to open-cut is not feasible at the same location because there is insufficient space to install the 16-inch product pipe due to the presence of existing SPLP pipelines. Moreover, while it may be feasible to utilize a conventional bore to install the 16-inch pipeline under Laurel Lane, it is not feasible to utilize a conventional auger bore under School House Road or stream A-51 due to the same space constraints that preclude the use of open-cut techniques at this location. Re-routing the pipeline is not a viable option because there are no existing utility corridors to the north or south. Any alternate route could require possible encroachments on private residential land, and would also require the clearing of a new "greenfield" corridor, with impacts to existing farmland, forested lands and stream crossings. Based on these factors, the HDD technique remains the best option for this location.

The only other possible construction methods not discussed in the Reevaluation Report include FlexBor, and Direct Pipe Bore.

SPLP contractors attempted three (3) FlexBors and partially completed two of these to replace HDDs on the Mariner Project. One FlexBor failed in the pilot phase and was replaced with a conventional auger bore under a highway and open cut construction. The two partially successful FlexBors completed the pilot phases, but both had difficulties completing the reaming phase. SPLP's analysis is that this technology is not perfected for larger diameter bore attempts. Therefore, SPLP did not include this method in alternatives analysis section of the Reevaluation Report.

The direct pipe bore method is also known as "microtunneling". This method of pipeline installation is a remote-controlled, continuously supported pipe jacking method. During the direct pipe installation, operations are managed by an operator in an above-ground control room alongside of the installation pit. Rock and soil cutting and removal occurs by drilling fluid injection through the cutting tool during rotation at the face of the bore, and the cuttings are forced into inlet holes in the crushing cone at the tool face for circulation to a recycling plant through a closed system. The entire operating system for this method of pipeline installation, including the cutting tool drive hydraulics, fluid injection, fluid return, and operating controls are enclosed inside the outside diameter bore pipe (or casing pipe) being installed. At the launching point/entry pit, the bore pipe is attached to a "jacking block" that hammers the bore pipe while the tool is cutting through the substrate or geology. The cutting tool face is marginally larger in diameter than the pipe it is attached to. As a result, there is minimal annulus space, which minimizes the potential for drilling fluid returns or the production of groundwater returning back to the point of entry.

While SPLP's construction contractors have successfully completed one (1) Direct Pipe Bore approximately 925 ft in extent on the Mariner Pipeline project, this HDD is 1,569 ft in length, which exceeds the limits of Direct Pipe bore technology. In addition, the elevation changes across the length of the profile do not permit the use of this technology, since a Direct Pipe Bore is limited to 4 degrees of

steering or less. Finally, there are no feasible entry-exit points subset within the length of this HDD to employ the Direct Pipe bore technology.

2. **Relating to the Analysis of well production zones and use of information obtained during construction of the 20-inch pipeline:**

   The re-evaluation report fails to include evaluation of the information and any data collected for the six private water supplies within 450 feet of the HDD. Additionally, the report does not explain how the redesign will greatly reduce the risk of IR's or protect water supplies, especially since it appears the redesign was done in November 2018 and the water supply information wasn't completed until February 2019. It is also unclear about whether any of the six water supplies are the same as any of the twelve water supplies within 0.5 miles that were identified from the PaGWIS database.

   Any private or public water supply data obtained within 450 feet or otherwise obtained in the vicinity of the 20-inch or proposed 16-inch HDD should be used and discussed as part of this HDD re-evaluation, specifically in the evaluation of the HDD's potential to impact the water supplies within 450 feet of the HDD. This data should include but not be limited to any applicable water supply sampling data and any water supply complaints that SPLP may have obtained and received for water supplies within 450 of the HDD or within the general vicinity during construction of the 20-inch pipeline. The results of the SPLP's water supply sampling program, investigation, disposition of a complaint, and any correlation or non-correlation to SPLP's construction activities should be evaluated and discussed in the HDD re-evaluation report and used to demonstrate that the proposed 16-inch HDD activity will minimize the potential for IR's and impacts to water supplies. Please revise the re-evaluation report to include this information.

In accordance with the Order, SPLP conducted a search for any water supply wells located within 450 feet of the School House Road HDD. A total of six water wells were identified and are represented on Attachment 3 of the Hydrogeologic Re-Evaluation Report. Water quality samples were collected from the identified locations prior to the initiation of HDD activities and during the completion of the 20-inch HDD. A review of the analytical results from the sampling events did not identify any changes, other than those associated with seasonal fluctuations. Based on these results, no impacts to groundwater quality have been identified or attributed to the installation of the School House Rd. 20-inch HDD. The Department is correct that the water supply well search was completed February 2019. SPLP completed the search at that time to provide the Department with up-to-date well data. While the redesign of this HDD was initially presented to SPLP in November 2018, the redesign was not finalized and submitted to the Department until SPLP reviewed the well data information in February 2019 and confirmed that the results did not alter the proposed redesign.

On May 7, 2018, a complaint was made regarding water quality impacts resulting from pipeline activities to the water well supplying the Shilling residence located at 323 School House Road, Londonderry Township, Lebanon County, Pennsylvania. The 20-inch HDD was completed on September 14, 2017,

and no drilling activity occurred during the eight months between the completion of the HDD and the water complaint. The complaint was based on an increase in cloudiness that Mr. Shilling observed while watering his garden on May 5th and 6th, 2018. Because the Schilling residence is located outside of the original 150 feet sampling radius, a pre-construction water sample was not collected from the well. Three post construction water quality samples, however, were collected (September 26, 2017, May 8, 2018 and May 30, 2018). All analyzed parameters were either not detected or detected at concentrations below any established SMCL's and PADEP Residential, Used Aquifer MSCs, except for iron and manganese. The elevated results for iron and manganese can be attributed to the turbidity levels observed during the sampling events. It was observed during each sampling event that turbidity and cloudiness increased with the lowering of the water column in the well during periods of prolonged pumping. Further evaluations conducted by a Pennsylvania Professional Geologist (PG) have concluded that the Shilling well was not impacted from the School House Road HDD activities. As discussed in the S3-0091 School House Road HDD Schilling Water Well Complaint Report (Report), that was prepared on July 30, 2018, the analytical results show no significant change in water quality between the three post construction water sampling events beyond anticipated variations in groundwater chemistry. Further, the presence of total coliform bacteria in a water sample alone is not an indicator of impacts related to HDD activities. If the well had been impacted by the completion of the 20-inch HDD, other water quality parameters (i.e., turbidity, total suspended solids, iron and manganese) would show an increase between the three construction sampling events. Mr. Shilling also reported that he had previously observed the cloudiness while watering his garden, even before the 20-inch HDD was started. Based on the similar analytical results between the three sampling events and the previous occurrence of the cloudiness during periods of prolonged pumping, it was concluded that the School House Road did not impact water quality at the Shillings' residence. The PA DEP has completed a review of the PG Report and concurred with the conclusion that the construction activities associated with the installation of the 20-inch HDD were not responsible for the cloudy water in the Shilling well. Summary tables containing the analytical results from the various water quality sampling events are attached.

3. Relating to the Analysis of geologic strength at profile depth and overall geologic and hydrogeologic report:

a. There is no analysis in the re-evaluation report specifically tying the revised drill path to any specific zones noted on the core boring logs, or why the revised 16-inch path was chosen. Three of the four core borings are not deep enough to analyze geologic strength at the proposed
16-inch pipeline depth. The fourth core boring is approximately 850 feet to the northeast of the HDD alignment. Additionally, weathered and very poor strength rock appears to be present at the 16-inch pipeline depth. Please provide an analysis that addresses the use of this data in designing the bore path and how it has been used to minimize the potential for IRs to occur or impacts to water supplies to occur.

As previously stated, SPLP reviewed the daily drilling reports, the geotechnical investigations, and the HDD Inspection Daily Reports. Specifically, the depth of the bit was compared to the geotechnical investigations to determine the material the pilot tool was advancing through at the time of the IR. The

competency of the bedrock was evaluated based on rock quality designation (RQD) values for each of the geotechnical borings completed in bedrock. The RQD values for the 20-inch profile were generally considered good, as supported by the occurrence of only one (1) IR as the pilot tool was advancing through the bedrock/weathered bedrock/unconsolidated material interface. Despite the generally good RDQ values, the 16-inch HDD profile was designed to intersect higher RQD values and avoid intervals of bedrock which contained multiple fractures or weathered intervals. Further, the annular and mud pressures were reviewed to identify areas of pressure changes which were utilized to approximate the competency of the bedrock. This information was then utilized to redesign the 16-inch profile to attempt to reduce the reoccurrence of IRs.

b. Provide an explanation and discussion of why no new core borings were performed as part of the 16-inch pipeline bore path design, especially in consideration that only one of the previous core borings was performed to a depth at or deeper than the depth of the proposed 16-inch bore path and that three of the four core borings were not near the proposed 16-inch pipeline depth.

Based on the absence of loss of circulation (LOC) or loss of returns (LOR) until the occurrence of the punch out IR on July 8, 2017, SPLP determined that additional geotechnical borings would have no value to the analysis of the IR event and redesign of the HDD profile. The "punch out" IR was not related to bedrock quality.

4. Given the close proximity of the proposed 16-inch bore path to the constructed 20-inch pipeline, please discuss and address any concern related to communication between the two bore paths and the potential for IRs or water supply impacts to occur from any potential communication.

There were no reported LOC or LOR during the completion of the 20-inch HDD until the occurrence of the "punch out" IR on July 8, 2017, while the pilot bit was passing through unconsolidated material immediately below the land surface. Based on this information, the HDD specialists deduced that the bedrock encountered by the 20-inch HDD was competent and the drilling fluid remained within the annulus. Since the redesigned 16-inch profile will be completed at a similar depth and in similar rock quality it is believed the bedrock encountered by the 16-inch profile will be as competent as that encountered during the 20-inch HDD installation. Since the 20-inch HDD did not experience an LOC or LOR, there would be no means for any drilling fluid to migrate from the 16-inch HDD to communicate with the 20-inch HDD. Additionally, the absence of any impacts to water quality resulting from the 20-inch HDD would indicate that the bedrock encountered by the completed HDD and the redesigned 16-inch HDD are competent and will likely not result in impacts to water supplies.

5. The SPLP Re-evaluation report (pg. 6) states: "During all drilling phases, the use of Loss Control Materials (LCMs) will be implemented upon detection of a Loss of Circulation (LOC) or indications of a potential IR are noted or an IR is observed. The use of LCMs, however, is less effective below 70 ft of the ground surface." Provide an explanation of the statement "The use of LCMs... is less effective below 70 ft of the ground surface".

Loss Control Materials (LCMs) interact with the drilling fluids to increase the "body" or bulk weight of the fluids, but do not create a solid. The increase in bulk weight minimizes the ability of the fluids to move through fractures and bedding plans in bedrock. However, since LCMs do not "solidify" the drilling fluids, the treated fluids can be moved by excessive pressure. As the depth of an HDD increases, the annular pressure to maintain returns to the entry and exit pits likewise increases. This increased pressure can then move the LCM treated fluids or result in untreated fluids penetrating through the treated fluids. The statement in the Reevaluation report simply presents the results of observations by our drilling specialists during HDDs on the Mariner Project.

SPLP submits that we have been, and are, in complete compliance with the agreed terms and analysis requirements of the Order, as agreed to by the Department, and that no further analysis is required for the Department to consent to the start of this HDD. SPLP requests that the Department approve the Reevaluation Report for the School House Road Crossing Horizontal Directional Drill (S3-0091) as soon as possible.

Sincerely,

Larry J. Gremminger, CWB
Vice-President – Environmental, Health & Safety
Energy Transfer Partners
Mariner East 2 Pipeline Project

Pertaining to the practice of geology and information conveyed.

Douglas J. Hess, P.G.
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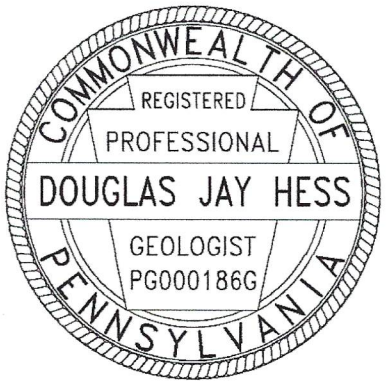
Skelly and Loy, Inc.
Director of Groundwater and Site Characterization
Geo-Environmental Services

5/21/2019
Date



Carpenter Water Sample Analytical Results Summary

Parcel ID: 31-2291801-337496-0000 (95 Laurel Lane)
Well Location Map ID: WL-05042017-604-01

Parameter	Units	Sample Date: 05/04/2017 Sample I.D.: 05042017-604-01	Sample Date: 07/19/2017 Sample I.D.: 07192017-604-01	Sample Date: 12/18/2017 Sample I.D.: 12182017-628-01	PA DEP Drinking Water MCL/SMCL
Coliform, fecal	col/100ml	NA	NA	<1	-
E. Coli	MPN/100ml	NA	NA	<1	-
Coliform, total	MPN/100ml	NA	NA	<1	-
Dissolved Solids	mg/l	266	261	255	500
Suspended Solids	mg/l	ND	ND	ND	-
Hardness (colorimetric) as CACO3	mg/l	178	166	172	-
Turbidity	NTU	0.134	0.764	ND	-
Alkalinity	mg/l	112	111	111	-
pH	SU	7.89	8.03	7.71	-
Specific Conductance	umhos/cm	388	395	397	-
Bromide	mg/l	ND	ND	ND	-
Chloride	mg/l	3.32	3.12	4.72	250
Sulfate	mg/l	74.9	75.5	74.1	250
Barium	mg/l	0.0426	0.0406	0.0439	2
Calcium	mg/l	49.7	44.7	45.0	-
Iron	mg/l	ND	ND	ND	0.3
Magnesium	mg/l	15.1	13.6	14.3	-
Manganese	mg/l	ND	ND	0.0119	0.05
Potassium	mg/l	1.29	1.23	1.83	-
Sodium	mg/l	10.4	16.2	10.2	-
Methane	mg/l	0.0164	ND	ND	-
Ethane	mg/l	ND	ND	ND	-
Ethene	mg/l	ND	ND	ND	-
Propane	mg/l	ND	ND	ND	-
Benzene	mg/l	ND	ND	ND	0.005
Toluene	mg/l	ND	ND	ND	1
Ethylbenzene	mg/l	ND	ND	ND	0.7
Total Xylenes	mg/l	ND	ND	ND	10
Residual Bentonite	-	NA	NA	NA	-

20-inch HDD construction dates: June 29, 2017 through September 14, 2017
16-inch HDD construction dates: Awaiting PA DEP authorization to start

Notes:
1. MCL - Maximum Primary Contaminant Level
2. SMCL - Maximum Secondary Contaminant Level
3. NA - Not Analyzed
4. ND - Not Detected
5. col/100ml - colonies per 100 milliliters
6. MPN/100ml - most probable number per 100 milliliters
7. mg/l - milligrams per liter
8. NTU - nephelometric turbidity units
9. SU - standard units
10. umhos/cm - micro ohms per centimeter

Zelko Water Sample Analytical Results Summary

Parcel ID: 31-2292299-337214-0000 (93 Laurel Lane)
Well Location Map ID: WL-04142017-520-03

Parameter	Units	Sample Date: 04/14/2017 Sample I.D.: 04142017-520-03	Sample Date: 07/19/2017 Sample I.D.: 07192017-604-03	PA DEP Drinking Water MCL/SMCL
Coliform, fecal	col/100ml	NA	NA	-
E. Coli	MPN/100ml	NA	NA	-
Coliform, total	MPN/100ml	NA	NA	-
Dissolved Solids	mg/l	168	154	500
Suspended Solids	mg/l	3.50	5.10	-
Hardness (colorimetric) as CACO3	mg/l	107	108	-
Turbidity	NTU	7.25	8.21	-
Alkalinity	mg/l	99.4	106	-
pH	SU	7.73	7.67	-
Specific Conductance	umhos/cm	221	225	-
Bromide	mg/l	ND	ND	-
Chloride	mg/l	1.71	1.38	250
Sulfate	mg/l	ND	5.05	250
Barium	mg/l	0.0584	0.0623	2
Calcium	mg/l	30.7	32.8	-
Iron	mg/l	**1.77**	**2.04**	0.3
Magnesium	mg/l	4.97	5.31	-
Manganese	mg/l	0.0112	0.0384	0.05
Potassium	mg/l	1.90	1.86	-
Sodium	mg/l	7.52	7.21	-
Methane	mg/l	ND	ND	-
Ethane	mg/l	ND	ND	-
Ethene	mg/l	ND	ND	-
Propane	mg/l	ND	ND	-
Benzene	mg/l	ND	ND	0.005
Toluene	mg/l	ND	ND	1
Ethylbenzene	mg/l	ND	ND	0.7
Total Xylenes	mg/l	ND	ND	10
Residual Bentonite	-	NA	NA	-

20-inch HDD construction dates: June 29, 2017 through September 14, 2017
16-inch HDD construction dates: Awaiting PA DEP authorization to start

Notes:
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9. SU - standard units
10. umhos/cm - micro ohms per centimeter

Concentrations that are bolded and highlighted exceed or are equivalent to their respective PA DEP MCL/SMCL

Lehr Water Sample Analytical Results Summary

Parcel ID: 31-2292318-338371-0000 (13 Field Lane)
Well Location Map ID: WL-04202017-604-02

Parameter	Units	Sample Date: 04/20/2017 Sample I.D.: 04202017-604-02	Sample Date: 07/20/2017 Sample I.D.: 07202017-604-01	PA DEP Drinking Water MCL/SMCL
Coliform, fecal	col/100ml	NA	NA	-
E. Coli	MPN/100ml	NA	NA	-
Coliform, total	MPN/100ml	NA	NA	-
Dissolved Solids	mg/l	223	250	500
Suspended Solids	mg/l	ND	ND	-
Hardness (colorimetric) as CACO3	mg/l	140	153	-
Turbidity	NTU	0.159	0.186	-
Alkalinity	mg/l	55.7	56.5	-
pH	SU	7.02	6.66	-
Specific Conductance	umhos/cm	334	369	-
Bromide	mg/l	ND	ND	-
Chloride	mg/l	10.5	9.96	250
Sulfate	mg/l	50.1	61.4	250
Barium	mg/l	0.0670	0.0708	2
Calcium	mg/l	40.6	44.1	-
Iron	mg/l	ND	ND	0.3
Magnesium	mg/l	9.85	10.9	-
Manganese	mg/l	ND	ND	0.05
Potassium	mg/l	1.31	2.21	-
Sodium	mg/l	9.51	9.88	-
Methane	mg/l	ND	ND	-
Ethane	mg/l	ND	ND	-
Ethene	mg/l	ND	ND	-
Propane	mg/l	ND	ND	-
Benzene	mg/l	ND	ND	0.005
Toluene	mg/l	ND	ND	1
Ethylbenzene	mg/l	ND	ND	0.7
Total Xylenes	mg/l	ND	ND	10
Residual Bentonite	-	NA	NA	-

20-inch HDD construction dates: June 29, 2017 through September 14, 2017
16-inch HDD construction dates: Awaiting PA DEP authorization to start

Notes:
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4. ND - Not Detected
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6. MPN/100ml - most probable number per 100 milliliters
7. mg/l - milligrams per liter
8. NTU - nephelometric turbidity units
9. SU - standard units
10. umhos/cm - micro ohms per centimeter

Swartz Water Sample Analytical Results Summary

Parcel ID: 31-2292670-338393-0000 (13 Field Land)
Well Location Map ID: WL-09202017-611-02

Parameter	Units	Sample Date: 09/20/2017 Sample I.D.: 09202017-611-02	PA DEP Drinking Water MCL/SMCL
Coliform, fecal	col/100ml	<1	-
E. Coli	MPN/100ml	<1	-
Coliform, total	MPN/100ml	579	-
Dissolved Solids	mg/l	297	500
Suspended Solids	mg/l	ND	-
Hardness (colorimetric) as CACO3	mg/l	198	-
Turbidity	NTU	4.09	-
Alkalinity	mg/l	112	-
pH	SU	7.31	-
Specific Conductance	umhos/cm	464	-
Bromide	mg/l	ND	-
Chloride	mg/l	9.65	250
Sulfate	mg/l	86.1	250
Barium	mg/l	0.0448	2
Calcium	mg/l	56.9	-
Iron	mg/l	**0.639**	0.3
Magnesium	mg/l	14.4	-
Manganese	mg/l	ND	0.05
Potassium	mg/l	1.14	-
Sodium	mg/l	9.51	-
Methane	mg/l	ND	-
Ethane	mg/l	ND	-
Ethene	mg/l	ND	-
Propane	mg/l	ND	-
Benzene	mg/l	ND	0.005
Toluene	mg/l	ND	1
Ethylbenzene	mg/l	ND	0.7
Total Xylenes	mg/l	ND	10
Residual Bentonite	-	NA	-

20-inch HDD construction dates: June 29, 2017 through September 14, 2017
16-inch HDD construction dates: Awaiting PA DEP authorization to start

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7. mg/l - milligrams per liter
8. NTU - nephelometric turbidity units
9. SU - standard units
10. umhos/cm - micro ohms per centimeter

Concentrations that are bolded exceed or are equivalent to their respective PA DEP MCL/SMCL

O'Shea Water Sample Analytical Results Summary

Parcel ID: 31-2292726-337708-0000 (85 Hunters Lane)
Well Location Map ID: WL-04202017-604-01

Parameter	Units	Sample Date: 04/20/2017 Sample I.D.: 04202017-604-01	Sample Date: 07/19/2017 Sample I.D.: 07192017-604-02	PA DEP Drinking Water MCL/SMCL
Coliform, fecal	col/100ml	NA	NA	-
E. Coli	MPN/100ml	NA	NA	-
Coliform, total	MPN/100ml	NA	NA	-
Dissolved Solids	mg/l	306	310	500
Suspended Solids	mg/l	ND	ND	-
Hardness (colorimetric) as CACO3	mg/l	185	188	-
Turbidity	NTU	0.134	0.322	-
Alkalinity	mg/l	88.3	88.9	-
pH	SU	8.53	7.36	-
Specific Conductance	umhos/cm	451	462	-
Bromide	mg/l	ND	ND	-
Chloride	mg/l	23.4	22.5	250
Sulfate	mg/l	91.8	84.4	250
Barium	mg/l	0.0475	0.0464	2
Calcium	mg/l	54.9	54.0	-
Iron	mg/l	ND	ND	0.3
Magnesium	mg/l	14.1	14.1	-
Manganese	mg/l	ND	ND	0.05
Potassium	mg/l	1.85	1.73	-
Sodium	mg/l	14.4	14.3	-
Methane	mg/l	ND	ND	-
Ethane	mg/l	ND	ND	-
Ethene	mg/l	ND	ND	-
Propane	mg/l	ND	ND	-
Benzene	mg/l	ND	ND	0.005
Toluene	mg/l	ND	ND	1
Ethylbenzene	mg/l	ND	ND	0.7
Total Xylenes	mg/l	ND	ND	10
Residual Bentonite	-	NA	NA	-

20-inch HDD construction dates: June 29, 2017 through September 14, 2017
16-inch HDD construction dates: Awaiting PA DEP authorization to start

Notes:
1. MCL - Maximum Primary Contaminant Level
2. SMCL - Maximum Secondary Contaminant Level
3. NA - Not Analyzed
4. ND - Not Detected
5. col/100ml - colonies per 100 milliliters
6. MPN/100ml - most probable number per 100 milliliters
7. mg/l - milligrams per liter
8. NTU - nephelometric turbidity units
9. SU - standard units
10. umhos/cm - micro ohms per centimeter

Sayder Water Sample Analytical Results Summary

Parcel ID: 31-2293106-337777-0000 (321 Schoolhouse Road)
Well Location Map ID: WL-01102017-551-01

Parameter	Units	Sample Date: 01/10/2017 Sample I.D.: 01102017-551-01	Sample Date: 07/20/2017 Sample I.D.: 07202017-604-04	PA DEP Drinking Water MCL/SMCL
Coliform, fecal	col/100ml	NA	NA	-
E. Coli	MPN/100ml	NA	NA	-
Coliform, total	MPN/100ml	NA	NA	-
Dissolved Solids	mg/l	220	243	500
Suspended Solids	mg/l	4.00	ND	-
Hardness (colorimetric) as CACO3	mg/l	144	140	-
Turbidity	NTU	7.07	1.35	-
Alkalinity	mg/l	84.1	93.6	-
pH	SU	8.02	8.03	-
Specific Conductance	umhos/cm	311	310	-
Bromide	mg/l	ND	ND	-
Chloride	mg/l	3.30	3.34	250
Sulfate	mg/l	40.0	40.7	250
Barium	mg/l	0.0672	0.0656	2
Calcium	mg/l	10.5	41.9	-
Iron	mg/l	**1.25**	0.215	0.3
Magnesium	mg/l	8.26	8.95	-
Manganese	mg/l	0.0130	ND	0.05
Potassium	mg/l	1.16	2.69	-
Sodium	mg/l	7.94	8.44	-
Methane	mg/l	ND	ND	-
Ethane	mg/l	ND	ND	-
Ethene	mg/l	ND	ND	-
Propane	mg/l	ND	ND	-
Benzene	mg/l	ND	ND	0.005
Toluene	mg/l	ND	ND	1
Ethylbenzene	mg/l	ND	ND	0.7
Total Xylenes	mg/l	ND	ND	10
Residual Bentonite	-	NA	NA	-

20-inch HDD construction dates: June 29, 2017 through September 14, 2017
16-inch HDD construction dates: Awaiting PA DEP authorization to start

Notes:
1. MCL - Maximum Primary Contaminant Level
2. SMCL - Maximum Secondary Contaminant Level
3. NA - Not Analyzed
4. ND - Not Detected
5. col/100ml - colonies per 100 milliliters
6. MPN/100ml - most probable number per 100 milliliters
7. mg/l - milligrams per liter
8. NTU - nephelometric turbidity units
9. SU - standard units
10. umhos/cm - micro ohms per centimeter

Concentrations that are bolded exceed or are equivalent to their respective PA DEP MCL/SMCL

Shilling Water Sample Analytical Results Summary

Parcel ID: 31-2293144-337491-0000 (323 School House Road)
Well Location Map ID: WL-09262017-629-01

Parameter	Units	Sample Date: 09/26/2017 Sample I.D.: 09262017-629-01	Sample Date: 05/08/2018 Sample I.D.: 05082018-551-02	Sample Date: 05/30/2018 Sample I.D.: 05302018-551-02	PA DEP Drinking Water MCL/SMCL
Coliform, fecal	col/100ml	<1	<2	<1	-
E. Coli	MPN/100ml	<1	<1	<1	-
Coliform, total	MPN/100ml	5.20	13.4	157	-
Dissolved Solids	mg/l	200	189	175	500
Suspended Solids	mg/l	6.50	27.0	5.00	-
Hardness (colorimetric) as CACO3	mg/l	125	131	122	-
Turbidity	NTU	46.9	157	50.7	-
Alkalinity	mg/l	94.0	106	93.2	-
pH	SU	7.60	7.59	7.68	-
Specific Conductance	umhos/cm	286	284	290	-
Bromide	mg/l	ND	ND	ND	-
Chloride	mg/l	3.25	3.51	3.25	250
Sulfate	mg/l	35.8	24.2	31.2	250
Barium	mg/l	0.0844	0.106	0.0739	2
Calcium	mg/l	40.3	38.2	37.6	-
Iron	mg/l	**6.40**	**16.8**	**4.92**	0.3
Magnesium	mg/l	8.04	7.19	6.96	-
Manganese	mg/l	**0.147**	**0.457**	**0.190**	0.05
Potassium	mg/l	1.54	1.97	1.65	-
Sodium	mg/l	8.38	8.23	9.81	-
Methane	mg/l	0.0242	0.0821	0.0444	-
Ethane	mg/l	ND	ND	ND	-
Ethene	mg/l	ND	ND	ND	-
Propane	mg/l	ND	ND	ND	-
Benzene	mg/l	ND	ND	ND	0.005
Toluene	mg/l	ND	ND	ND	1
Ethylbenzene	mg/l	ND	ND	ND	0.7
Total Xylenes	mg/l	ND	ND	ND	10
Residual Bentonite	-	NA	ND	NA	-

20-inch HDD construction dates: June 29, 2017 through September 14, 2017
16-inch HDD construction dates: Awaiting PA DEP authorization to start

Notes:
1. MCL - Maximum Primary Contaminant Level
2. SMCL - Maximum Secondary Contaminant Level
3. NA - Not Analyzed
4. ND - Not Detected
5. col/100ml - colonies per 100 milliliters
6. MPN/100ml - most probable number per 100 milliliters
7. mg/l - milligrams per liter
8. NTU - nephelometric turbidity units
9. SU - standard units
10. umhos/cm - micro ohms per centimeter

Concentrations that are bolded exceed or are equivalent to their respective PA DEP MCL/SMCL

Ebright Water Sample Analytical Results Summary

Parcel ID: 31-2293321-338782-000 (270 Schoolhouse Road)
Well Location Map ID: WL-02072019-604-01

Parameter	Units	Sample Date: 02/07/2019 Sample I.D.: 02072019-604-01	PA DEP Drinking Water MCL/SMCL
Coliform, fecal	col/100ml	<1	-
E. Coli	MPN/100ml	<1	-
Coliform, total	MPN/100ml	<1	-
Dissolved Solids	mg/l	225	500
Suspended Solids	mg/l	ND	-
Hardness (colorimetric) as CACO3	mg/l	137	-
Turbidity	NTU	3.56	-
Alkalinity	mg/l	89.3	-
pH	SU	8.12	-
Specific Conductance	umhos/cm	338	-
Bromide	mg/l	ND	-
Chloride	mg/l	1.80	250
Sulfate	mg/l	66.0	250
Barium	mg/l	0.0914	2
Calcium	mg/l	42.4	-
Iron	mg/l	0.254	0.3
Magnesium	mg/l	13.1	-
Manganese	mg/l	ND	0.05
Potassium	mg/l	1.06	-
Sodium	mg/l	9.33	-
Methane	mg/l	ND	-
Ethane	mg/l	ND	-
Ethene	mg/l	ND	-
Propane	mg/l	ND	-
Benzene	mg/l	ND	0.005
Toluene	mg/l	ND	1
Ethylbenzene	mg/l	ND	0.7
Total Xylenes	mg/l	ND	10
Residual Bentonite	-	NA	-

20-inch HDD construction dates: June 29, 2017 through September 14, 2017
16-inch HDD construction dates: Awaiting PA DEP authorization to start

Notes:
1. MCL - Maximum Primary Contaminant Level
2. SMCL - Maximum Secondary Contaminant Level
3. NA - Not Analyzed
4. ND - Not Detected
5. col/100ml - colonies per 100 milliliters
6. MPN/100ml - most probable number per 100 milliliters
7. mg/l - milligrams per liter
8. NTU - nephelometric turbidity units
9. SU - standard units
10. umhos/cm - micro ohms per centimeter

Hughes Water Sample Analytical Results Summary

Parcel ID: 31-2243328-337405-0000 (282 Schoolhouse Road)
Well Location Map ID: WL-08252017-475-01

Parameter	Units	Sample Date: 08/25/2017 Sample I.D.: 08252017-475-01	PA DEP Drinking Water MCL/SMCL
Coliform, fecal	col/100ml	<1	-
E. Coli	MPN/100ml	<1	-
Coliform, total	MPN/100ml	<1	-
Dissolved Solids	mg/l	148	500
Suspended Solids	mg/l	ND	-
Hardness (colorimetric) as CACO3	mg/l	74.5	-
Turbidity	NTU	0.900	-
Alkalinity	mg/l	57.8	-
pH	SU	6.46	-
Specific Conductance	umhos/cm	199	-
Bromide	mg/l	ND	-
Chloride	mg/l	4.23	250
Sulfate	mg/l	8.28	250
Barium	mg/l	0.0408	2
Calcium	mg/l	20.8	-
Iron	mg/l	**0.221**	0.3
Magnesium	mg/l	4.56	-
Manganese	mg/l	ND	0.05
Potassium	mg/l	1.77	-
Sodium	mg/l	7.93	-
Methane	mg/l	0.0129	-
Ethane	mg/l	ND	-
Ethene	mg/l	ND	-
Propane	mg/l	ND	-
Benzene	mg/l	ND	0.005
Toluene	mg/l	ND	1
Ethylbenzene	mg/l	ND	0.7
Total Xylenes	mg/l	ND	10
Residual Bentonite	-	NA	-

20-inch HDD construction dates: June 29, 2017 through September 14, 2017
16-inch HDD construction dates: Awaiting PA DEP authorization to start

Notes:
1. MCL - Maximum Primary Contaminant Level
2. SMCL - Maximum Secondary Contaminant Level
3. NA - Not Analyzed
4. ND - Not Detected
5. col/100ml - colonies per 100 milliliters
6. MPN/100ml - most probable number per 100 milliliters
7. mg/l - milligrams per liter
8. NTU - nephelometric turbidity units
9. SU - standard units
10. umhos/cm - micro ohms per centimeter

Concentrations that are bolded exceed or are equivalent to their respective PA DEP MCL/SMCL

Wolfgang Water Sample Analytical Results Summary

Parcel ID: 31-2293344-338286-0000 (274 Schoolhouse Road)
Well Location Map ID: WL-0502017-475-01

Parameter	Units	Sample Date: 05/02/2017 Sample I.D.: 05022017-475-01	Sample Date: 07/20/2017 Sample I.D.: 07202017-604-02	PA DEP Drinking Water MCL/SMCL
Coliform, fecal	col/100ml	NA	NA	-
E. Coli	MPN/100ml	NA	NA	-
Coliform, total	MPN/100ml	NA	NA	-
Dissolved Solids	mg/l	252	245	500
Suspended Solids	mg/l	ND	ND	-
Hardness (colorimetric) as CACO3	mg/l	171	164	-
Turbidity	NTU	2.36	3.48	-
Alkalinity	mg/l	84.6	94.7	-
pH	SU	7.93	8.10	-
Specific Conductance	umhos/cm	362	356	-
Bromide	mg/l	ND	ND	-
Chloride	mg/l	2.71	2.85	250
Sulfate	mg/l	73.2	71.2	250
Barium	mg/l	0.0444	0.0448	2
Calcium	mg/l	42.2	45.6	-
Iron	mg/l	**0.396**	**0.372**	0.3
Magnesium	mg/l	12.3	12.6	-
Manganese	mg/l	ND	ND	0.05
Potassium	mg/l	1.19	1.37	-
Sodium	mg/l	8.46	8.76	-
Methane	mg/l	ND	ND	-
Ethane	mg/l	ND	ND	-
Ethene	mg/l	ND	ND	-
Propane	mg/l	ND	ND	-
Benzene	mg/l	ND	ND	0.005
Toluene	mg/l	ND	ND	1
Ethylbenzene	mg/l	ND	ND	0.7
Total Xylenes	mg/l	ND	ND	10
Residual Bentonite	-	NA	NA	-

20-inch HDD construction dates: June 29, 2017 through September 14, 2017
16-inch HDD construction dates: Awaiting PA DEP authorization to start

Notes:
1. MCL - Maximum Primary Contaminant Level
2. SMCL - Maximum Secondary Contaminant Level
3. NA - Not Analyzed
4. ND - Not Detected
5. col/100ml - colonies per 100 milliliters
6. MPN/100ml - most probable number per 100 milliliters
7. mg/l - milligrams per liter
8. NTU - nephelometric turbidity units
9. SU - standard units
10. umhos/cm - micro ohms per centimeter

Concentrations that are bolded exceed or are equivalent to their respective PA DEP MCL/SMCL

Klimovsky Water Sample Analytical Results Summary

Parcel ID: 31-2293395-338539-0000 (272 Schoolhouse Road)
Well Location Map ID: WL-09052017-610-02

Parameter	Units	Sample Date: 09/05/2017 Sample I.D.: 09052017-610-02	PA DEP Drinking Water MCL/SMCL
Coliform, fecal	col/100ml	<1	-
E. Coli	MPN/100ml	<1	-
Coliform, total	MPN/100ml	18.9	-
Dissolved Solids	mg/l	195	500
Suspended Solids	mg/l	ND	-
Hardness (colorimetric) as CACO3	mg/l	124	-
Turbidity	NTU	0.470	-
Alkalinity	mg/l	96.7	-
pH	SU	8.05	-
Specific Conductance	umhos/cm	274	-
Bromide	mg/l	ND	-
Chloride	mg/l	1.77	250
Sulfate	mg/l	39.7	250
Barium	mg/l	0.110	2
Calcium	mg/l	31.2	-
Iron	mg/l	ND	0.3
Magnesium	mg/l	10.5	-
Manganese	mg/l	ND	0.05
Potassium	mg/l	ND	-
Sodium	mg/l	8.23	-
Methane	mg/l	ND	-
Ethane	mg/l	ND	-
Ethene	mg/l	ND	-
Propane	mg/l	ND	-
Benzene	mg/l	ND	0.005
Toluene	mg/l	ND	1
Ethylbenzene	mg/l	ND	0.7
Total Xylenes	mg/l	ND	10
Residual Bentonite	-	NA	-

20-inch HDD construction dates: June 29, 2017 through September 14, 2017
16-inch HDD construction dates: Awaiting PA DEP authorization to start

Notes:
1. MCL - Maximum Primary Contaminant Level
2. SMCL - Maximum Secondary Contaminant Level
3. NA - Not Analyzed
4. ND - Not Detected
5. col/100ml - colonies per 100 milliliters
6. MPN/100ml - most probable number per 100 milliliters
7. mg/l - milligrams per liter
8. NTU - nephelometric turbidity units
9. SU - standard units
10. umhos/cm - micro ohms per centimeter

Kreider Water Sample Analytical Results Summary

Parcel ID: 31-2294792-338707-0000 (100 Chestnut Hill Road)
Well Location Map ID: SP-04142017-520-02

Parameter	Units	Sample Date: 04/14/2017 Sample I.D.: 04142017-520-02	Sample Date: 07/20/2017 Sample I.D.: 07202017-604-03	PA DEP Drinking Water MCL/SMCL
Coliform, fecal	col/100ml	NA	NA	-
E. Coli	MPN/100ml	NA	NA	-
Coliform, total	MPN/100ml	NA	NA	-
Dissolved Solids	mg/l	209	202	500
Suspended Solids	mg/l	ND	ND	-
Hardness (colorimetric) as CACO3	mg/l	91.8	96.2	-
Turbidity	NTU	0.175	0.196	-
Alkalinity	mg/l	28.9	29.3	-
pH	SU	6.11	6.01	-
Specific Conductance	umhos/cm	264	269	-
Bromide	mg/l	ND	ND	-
Chloride	mg/l	17.0	17.8	250
Sulfate	mg/l	13.7	14.7	250
Barium	mg/l	0.132	0.148	2
Calcium	mg/l	19.2	20.0	-
Iron	mg/l	ND	ND	0.3
Magnesium	mg/l	9.53	10.3	-
Manganese	mg/l	ND	ND	0.05
Potassium	mg/l	2.24	3.40	-
Sodium	mg/l	12.0	9.80	-
Methane	mg/l	ND	ND	-
Ethane	mg/l	ND	ND	-
Ethene	mg/l	ND	ND	-
Propane	mg/l	ND	ND	-
Benzene	mg/l	ND	ND	0.005
Toluene	mg/l	ND	ND	1
Ethylbenzene	mg/l	ND	ND	0.7
Total Xylenes	mg/l	ND	ND	10
Residual Bentonite	-	NA	NA	-

20-inch HDD construction dates: June 29, 2017 through September 14, 2017
16-inch HDD construction dates: Awaiting PA DEP authorization to start

Notes:
1. MCL - Maximum Primary Contaminant Level
2. SMCL - Maximum Secondary Contaminant Level
3. NA - Not Analyzed
4. ND - Not Detected
5. col/100ml - colonies per 100 milliliters
6. MPN/100ml - most probable number per 100 milliliters
7. mg/l - milligrams per liter
8. NTU - nephelometric turbidity units
9. SU - standard units
10. umhos/cm - micro ohms per centimeter