



Andrew Haines  
Township Manager  
27 North Pennell Road  
Lima, PA 19037

February 17<sup>th</sup>, 2020

Dear Mr. Haines,

In relation to the Mariner East 2 project in Middletown Township, we are approaching pullback activities for the segment between the temporary workspaces at West Baltimore Pike Road and West of Lenni Road. We are requesting a waiver from Middletown Township's Ordinance 155-2 D establishing noise and specific prohibitions for construction - so we are able to continue working on pullback activities beyond the normal hours between 7 am and 9 pm listed under the ordinance.

The HDD 610 segment along Valley Road, approximately 1887 feet in length, is anticipated to be ready for pullback of the 20" Mariner East 2 pipeline on February 22, 2020. The pipe will be pulled with the HDD rig staged at the West Baltimore Pike workspace and the pipe section to be pulled staged west of Lenni Road.

Following the completion of the pilot hole and reaming passes, the pullback stage of the pipe installation consists of attaching the prefabricated pipe sections and pulling from the exit point back to the drill rig entry point. To increase the chances for a successful HDD installation, a continuous approach is industry standard practice and provides for the highest percentage of a successful pullback by limiting factors that could lead to a re-drill attempt as it is the most efficient method due to the fact that the integrity of the borehole is best maintained through uninterrupted work.

Anytime pullback operations are stopped for extended periods, there is a risk that it will not be possible to get the pipe moving again due to material packing off around the perimeter of the pullsection. We raise the concern that without the ability to install the pipe with a continuous pull, it increases the risk of having to re-start the horizontal drilling process over again due to potential degradation of the drilled hole.

Due to limited workspace for pullsection layout on the exit side, the pullsection cannot be fabricated in one long continuous segment, but rather will require 2 midwelds during pullback. Pullback operations are further complicated by the restrictive work hours under Middletown Township's ordinance.

There are several factors that will determine the duration of the continuous pullback activities. The scenarios below list the details and risks associated. Please note that the schedule and duration may change due to outside factors, including but not limited to the condition of the bore-hole or weather.



Scenario 1: Continuous pullback

The first scenario is the preferred and recommended path forward. With the ability to work continuously outside of 7 am – 9 pm the pullback will last approximately 15-16 hours if continuous operations are allowed.

Scenario 2: Non continuous pullback

If the crew must stop work at 9 pm each night and wait until 7 am the next morning to restart the pullback, there is a risk that pipe may become unmovable with the HDD rig in which case, we will use contingency measures such as a pneumatic hammer to help free the pull section. If none of the contingency measures are successful, then the pullback has failed and we must restart the HDD process all over again, which is estimated to take 75 days for the 20-inch pipeline in this section. This option poses a higher risk of a failed pull and is estimated to last approximately 2-3 days.

In anticipation of continuous pullback activities, we will work with the Township to identify and notify neighbors close to the entry and exit points where the work will take place. All Occupational Safety and Health Administration must be followed; however, we can take certain measures to mitigate noise and lighting will be directed away from residences in all drill entry and exit locations during non-daylight work.

I have attached the letter written by Professor Samuel T. Ariaratnam, Ph.D., P. E., P.Eng., F.ASCE., an independent expert on horizontal directional drills, on the need for uninterrupted pullback activities during this critical stage of pipeline installation.

I thank you for your time and consideration.

Sincerely,

A handwritten signature in black ink, appearing to read "R. Cummings".

Ronald Cummings  
Project Manager  
Energy Transfer  
3807 West Chester Pike  
Newtown Square, PA 19073

# **Ariaratnam Enterprises, Inc.**

13663 E. Geronimo Road  
Scottsdale, AZ 85259  
480-236-5085

February 14, 2020

Mr. Andrew Haines  
Township Manager  
Middletown Township  
27 N. Pennell Road  
P.O. Box 157  
Lima, PA 19037

**Subject:** Request for Ordinance Variance during Pipeline Pullback Operations for the Sunoco Pipeline, L.P. Mariner East 2 Project in Middletown Township, Delaware County

Dear Mr. Haines:

I was asked to write this letter on behalf of Sunoco Pipeline, L.P. (SPLP) regarding a request for ordinance variation to facilitate continuous construction activity during the pullback segments installed by Horizontal Directional Drilling (HDD).

My name is Dr. Samuel T. Ariaratnam. I am a Professor and Construction Engineering Program Chair in the Ira A. Fulton Schools of Engineering at Arizona State University. For the past twenty-two (22) years, I have been involved in education and research in HDD. I am currently assisting SPLP in various technical aspects regarding HDD operations on the Mariner East 2 pipeline projects. I regularly deliver industry courses on “HDD Good Practices” and am active in numerous industry professional associations serving in leadership positions with the American Society of Civil Engineers Pipelines Division (Chairman); International Society for Trenchless Technology (Past Chairman); and Distribution Contractors Association (HDD Committee). I am a co-author of the “Horizontal Directional Drilling Good Practices Guidelines”, which had its 4<sup>th</sup> Edition released in March 2017.

HDD is a trenchless construction method capable of installing a wide range of underground utilities including water, wastewater, telecommunication, electrical, natural gas, and petroleum products with minimal disruption to surface activities. Installation of product pipe using HDD is performed in two or three stages. The main two stages are the “pilot bore” and the “pullback”. A middle stage, called the pre-ream, involves pullback of a reamer (without product pipe) to gradually enlarge the pilot bore in several passes. Pre-reaming is typically performed for installations involving installation of larger pipes, generally 12-inch (300mm) or larger. The HDD rig provides the torque, thrust, and pullback force required to drive the drill string. The drill drive assembly resides on a carriage that travels under hydraulic power along the frame of the drill rig. During the pilot bore, the drill string is launched from the surface and the pilot bore proceeds downward at an angle until the required depth is reached. Then, the path of the bore is gradually brought to the horizontal and the bore head is steered to the designated exit point where it is brought to the surface along a curved bore path. A directional monitoring device, located near the head of the drill string, is used to track the position of the drill head.

After the pilot string breaks the surface at the exit location, the bit is removed from the drill string and replaced with a reamer. As a rule of thumb, the final reamer is sized at 1.5 times the outside diameter of the product pipe up to 24-inch (600mm) as is followed by SPLP. For product pipe larger than 24-inch (600mm), the reamer would be the outside diameter plus 12-inch (300mm). The pilot hole is then reamed, enlarging the hole to the desired diameter while simultaneously pulling back the product pipe behind the reamer. During the boring process, drilling fluid is injected under pressure ahead of the advancing bit. Drilling fluid is composed of a carrier fluid (typically water) and solids (clay or polymer). On the Mariner East 2 project, SPLP is using water, non-toxic bentonite clay and PADEP-approved additives. The carrier fluid carries the solids down the borehole creating a “mud cake” along the perimeter of the borehole, thereby stabilizing the borehole and reducing friction during the pullback operation. Drilling fluids also function as coolant for the electronics at the drill head, suspension and transport of drill cuttings to the surface, and to reduce the shear strength of the soil to enable easier displacement during the pullback operation. During the drilling process, the bore path is tracked by interpreting signals sent by electronic sensors located near the drill head. At any stage along the drilling path, the operator may obtain information regarding the position, depth, and orientation of the drilling tool, therefore allowing the navigation of the drill head to its target. SPLP follows these best industry practices in the HDD installation process for the Mariner East 2 project, by using these electronic sensors in tracking the drilling head using this equipment.

Longer pipeline installations and/or those requiring pre-welding of smaller pipe sections due to space restrictions, generally require pullback times that exceed normal working hours. It is not prudent industry practice to cease a pullback operation once it has commenced. As outlined in relevant industry literature including the “Horizontal Directional Drilling Good Practices Guidelines, 4<sup>th</sup> Edition”, *“pullback should be completed without interruption, to reduce the risk of bore collapse and becoming stuck in the bore”* (Bennett and Ariaratnam, 2017). The HDD Guidelines further state that, *“delays in pullback can result in over-stressing the pipe, or a failed pullback attempt.”* I agree with the assessment of Larry Gremminger (letter to Bruce Clark dated 2/20/18) that failure to complete pullback in a continuous operation results in a high risk to the completion of a pipeline. Drilling fluid used in the HDD operations has thixotropic properties, which means that it begins to solidify once it stops moving (i.e. flowing) through the borehole (Ariaratnam and Beljan, 2005). If pullback is stopped mid-installation, the drilling fluid sets up (or solidifies) around the pipeline and increases in shear strength over time. Therefore, continuous operation is of utmost importance when pullback is performed.

I hope that this letter provides you with pertinent information to grant ordinance variance during pipeline pullback operations for SPLP on a case-by-case basis. If you have any questions, please do not hesitate to contact me at (480) 236-5085 (M) or sariaratnam@yahoo.com.

Cordially yours,



Samuel T. Ariaratnam, Ph.D., P. E., P.Eng., F.ASCE  
President, Ariaratnam Enterprises, Inc.

## REFERENCES

Ariaratnam, S.T. and I.J. Beljan (2005), "Post-Construction Evaluation of HDD Installations", *Practice Periodical on Structural Design and Construction*, ASCE, May, Vol. 10, No. 2, pp. 115-126.

Bennett, R.D., and S.T. Ariaratnam (2017), *Horizontal Directional Drilling Good Practices Guidelines* 4<sup>th</sup> Edition, NASTT, Cleveland, OH, ISBN 1-928984-17-7, 300 pp.