

Horizontal Directional Drilling

What is Horizontal Directional Drilling?

Horizontal directional drilling (HDD) is a steerable, trenchless method of installing underground pipe in an arc along a prescribed bore path. This construction method is used to install pipelines underneath waterways, wetlands, culturally sensitive areas, congested neighborhoods and roads. The use of this method greatly minimizes surface disturbance and reduces environmental impact during construction.

Installation of a pipeline by HDD is generally accomplished in three stages. The first consists of directionally drilling a small-diameter pilot hole along a designed directional path. The second involves enlarging this pilot hole to a diameter suitable for installation of the pipeline. While the pilot hole is being drilled and enlarged to the appropriate diameter, skilled and trained pipeliners string, or lay out, the pipe to weld the pipe sections together. Once the hole is drilled to the appropriate size, the welded pipeline is installed by connecting to a swivel and pulling the pipe back through the enlarged hole.

Environmental Benefits of HDD

For Mariner East 2, the use of approximately 800 drills/bores well below the surface (20-180 feet) will reduce the total wetland area impacted by construction from 118 acres to 36. Less than half an acre of wetlands, the approximate size of an NHL hockey rink, will be permanently converted from its original state. This total is divided among 19 wetlands

over 12 counties. In addition, HDD allows the pipeline to bypass culturally sensitive areas and avoid traffic disruption, and it further protects the pipeline from third-party damage.

Inadvertent Returns

Horizontal directional drilling (HDD) is a safe, commonly used technology; however, there are challenges associated with this construction method because of varying geology along the project footprint.

When using HDD, there is the possibility of having what is commonly referred to as an inadvertent return. An inadvertent return occurs when drilling mud seeps to the surface due to geology and soil qualities that create pathways along the bore path for the mud to escape. In other words, there may be an existing crack in the bedrock where the water-bentonite mix can escape.

How Do We Respond to an Inadvertent Return?

In accordance with Pennsylvania Department of Environmental Protection (DEP) regulations, Sunoco Logistics is required to have response plans in place at all designated HDD locations to contain the drilling mud that flows to the surface in the event of an inadvertent return. Under this comprehensive plan, we will contain, remove and recycle any drilling mud that escapes during HDD activities, in close coordination with the DEP.

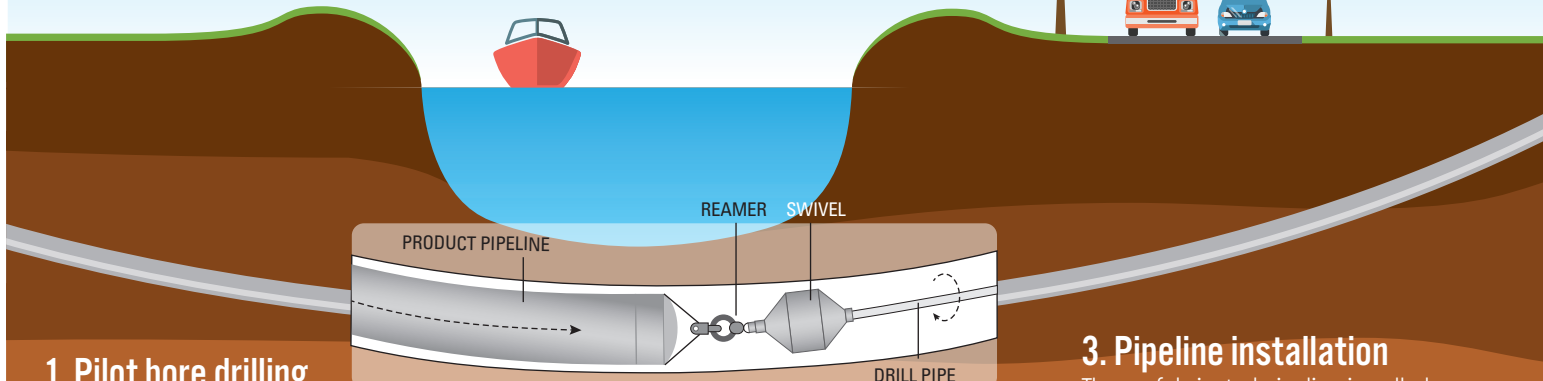
Bentonite Clay

Bentonite is a naturally occurring, nontoxic clay. The directional drilling of pipelines involves using a nonhazardous drilling mud that consists of water and bentonite. Any additive used in the bentonite clay mix must comply with the **NSF/ANSI 60** standard for potable water.

Bentonite is common in a variety of household products that we use every day such as wine, sugar, honey, creams and lotions, baby powders and hand soaps. It can be used as a natural remedy for bee stings, an essential ingredient for food-grade face masks and a treatment for diaper rash.



The Horizontal Directional Drilling method to install pipelines involves three stages:



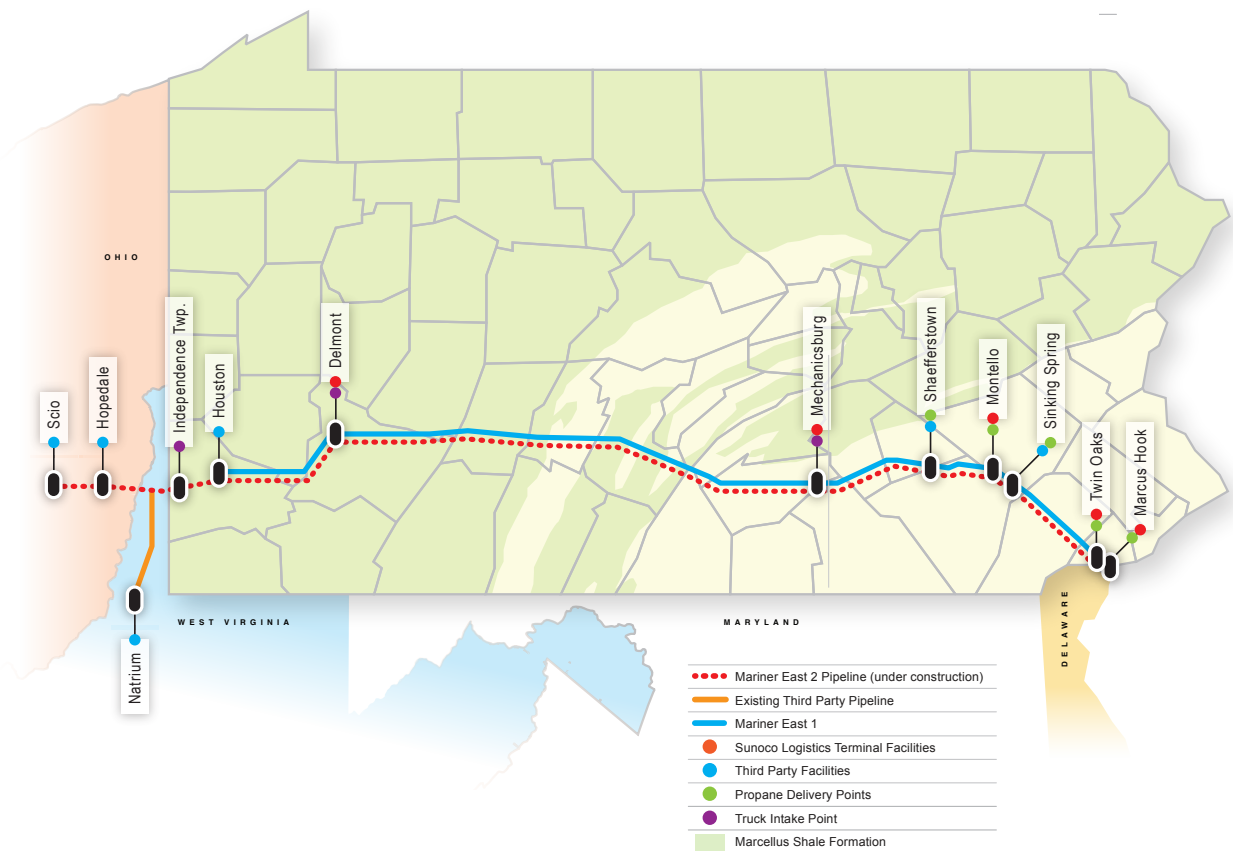
1. Pilot bore drilling

A computer-controlled drilling bit is steered along the planned route

2. Reaming – A reamer replaces the drill bit, enlarging the bore hole diameter. During this stage, soil is removed hydraulically and mechanically. Water and bentonite or other additives are used during hydraulic excavation.

3. Pipeline installation

The prefabricated pipeline is pulled back from the exit point into the cleaned bore hole to the entry point, completing installation.



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