



## Diluents: transporting light hydrocarbon resources

The Enbridge pipeline system has transported a variety of liquid petroleum products, including light hydrocarbons, for years. One class of light hydrocarbons, referred to as “diluents,” are similar in nature to white gas or camping fuel used in a lantern or portable stove. Simply defined, diluent is a light hydrocarbon mixture used to blend with heavy crude petroleum to reduce its viscosity to make it more fluid (“thinner”) and efficient to transport by pipeline. Diluent can come from refineries or natural gas production wells.

Generally, some of the light hydrocarbons produced by refineries that also process crude oil into gasoline, jet fuel, diesel fuel and other petroleum products are referred to as diluent. And, while still a diluent, the light hydrocarbon liquid product that occurs at well sites from condensation during natural gas production also is referred to as condensate. Enbridge transports both in our pipelines.

In essence, some of the lighter hydrocarbons Enbridge transports are recycled or recovered from crude oil or other oil and gas production and used to dilute heavier crudes. Then, at a refinery, diluents in the heavy crude can be re-processed and be reused as diluents or become part of other light hydrocarbon resources such as gasoline, jet fuel, mineral spirits and other products we use every day.

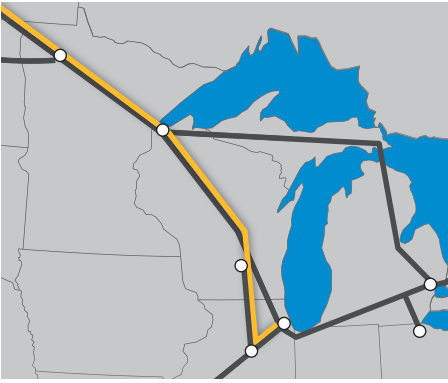
### **Exposure health effects are similar to other petroleum products**

The toxicity and potential health effects from exposure to diluents are similar to other petroleum products. During normal operations, the liquid petroleum Enbridge transports is contained within the pipeline system and there are no hazards to those who live and work along the pipelines transporting diluent. As with gasoline and other petroleum products, diluent should be properly handled and contained.

### **There is no risk of ignition when contained**

All hydrocarbons transported in Enbridge pipelines are flammable. Just like gasoline stored by many Americans in their garage, that is stored at the local gas station, or crude oil in large storage tanks, diluent requires two conditions to ignite: the presence of an ignition source, and being released in a narrowly-defined concentration with the surrounding air. When contained in a closed pipeline system, the petroleum hydrocarbons are mixed with little or no air, and therefore have no opportunity for ignition.





### Enbridge expanded infrastructure

While Enbridge has been transporting light hydrocarbons and natural gas liquids for decades, in 2010 a new dedicated pipeline was constructed to transport a steady supply of diluent. This new pipeline runs generally parallel to existing Enbridge crude oil pipelines and transports diluent from the refining areas near Chicago north through several states and provinces to western Canada where heavy crude oil and bitumen is produced and needs diluting to be transported long distances through pipelines.

This new pipeline was designed, built, and installed using modern specifications and quality materials. Like all Enbridge pipelines, it is monitored 24-hours a day and undergoes routine inspections and testing.

### Hazards of diluent if released

Pipeline safety and reliable delivery are Enbridge's top priorities. We invest in quality design and construction, safe operations, routine maintenance, inspection and employee training all to prevent accidents. Hazardous levels of vapors are not released from closed pipeline systems nor within facilities during normal operations. In the unlikely event of a release, like all hydrocarbons, an immediate priority is to contain the release, detect vapors with special monitoring equipment and prevent breathing hazards to emergency responders. Enbridge workers and emergency personnel have the equipment and training to check levels of hydrocarbons in the air, use appropriate personal protective equipment, and work with local emergency services to keep the public safe. Enbridge also maintains a Public Awareness Program to educate nearby landowners, tenants, and local emergency responders about how to react in the unlikely event of a release.

Since diluent is composed of lighter end hydrocarbons, it tends to disperse and evaporate quickly if released into the atmosphere, similar to the natural gas liquids we transport.

The potential environmental effects of a release or leak of diluents are strongly influenced by the specifics of the release including volume, location, season, permeability of the soils, the connection to affected waterways, and cleanup actions taken. Emergency response preparedness, resources, environmental sensitivities, and emergency access locations have been specifically identified for Enbridge's diluent pipeline.

### Preventing corrosion

All of the products we transport, including diluent, must meet strict pipeline quality specifications posted with the Federal Energy Regulatory Commission to be transported in our pipelines. Specifications are exacting and limit the amount of water, temperature, sulfur, salt, sediment or other components received into the pipeline system. Keep in mind that petroleum is often used as a lubricant and not, in itself, corrosive.

Enbridge uses many tools to monitor, prevent, and if detected, mitigate common causes of corrosion including:

- Lab testing to ensure product quality.
- Employing pipeline operations and flow procedures to prevent water drop out or other corrosion conditions.
- Using tools inside the pipe clean impurities that can lead to corrosion where there is internal risk.
- Adding corrosion inhibitors.
- Using biocides that kill corrosion-inducing microorganisms.
- Applying cathodic protection and external coatings that protect against external corrosion.

All of our pipelines have built-in safety measures to promote the safe delivery of all of the products Enbridge transports. Our pipeline system is a safe and reliable way to transport vital energy resources.

Enbridge carries secure and reliable North American petroleum to refinery markets to be made into products used by Americans every day. Diluent makes it possible to transport growing supplies of heavy crude petroleum resources in western Canada.