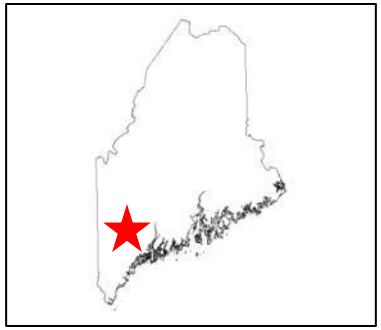
Geologic Site of the Month

January, 1999

# *Pipeline to the Ice Age*



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## Introduction

In 1998 geologists had the rare opportunity of examining a continuous trench excavation across southwestern Maine. This happened when the Portland Natural Gas Transmission System laid a pipeline from Westbrook through Cumberland and Oxford Counties to northern New Hampshire and Quebec.

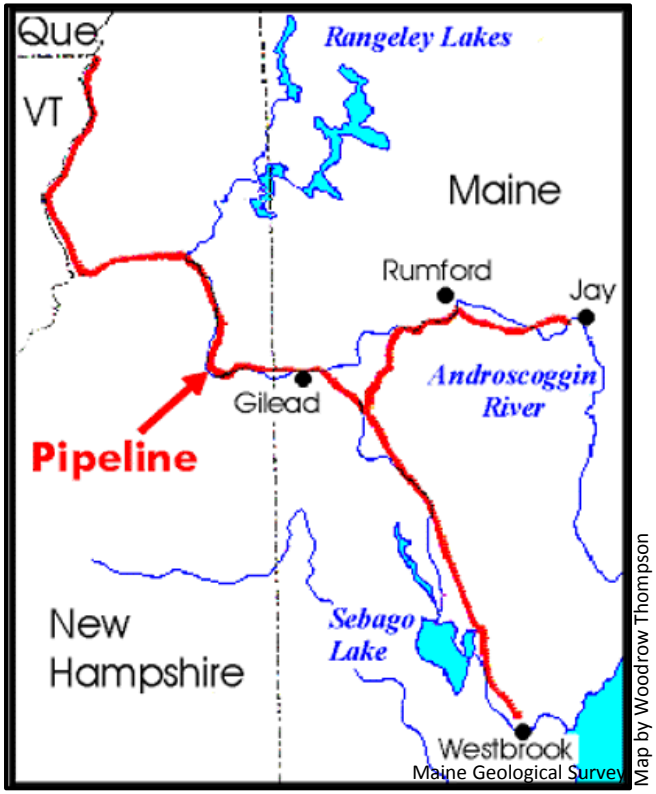


**Figure 1**. Map of the Pipeline and surrounding towns.

## Pipeline Construction

Heavy construction equipment and miles of pipe were assembled in several staging areas like the one shown in Figure 2. The project required elaborate environmental safeguards and machinery that could cross swamps and bore under rivers.

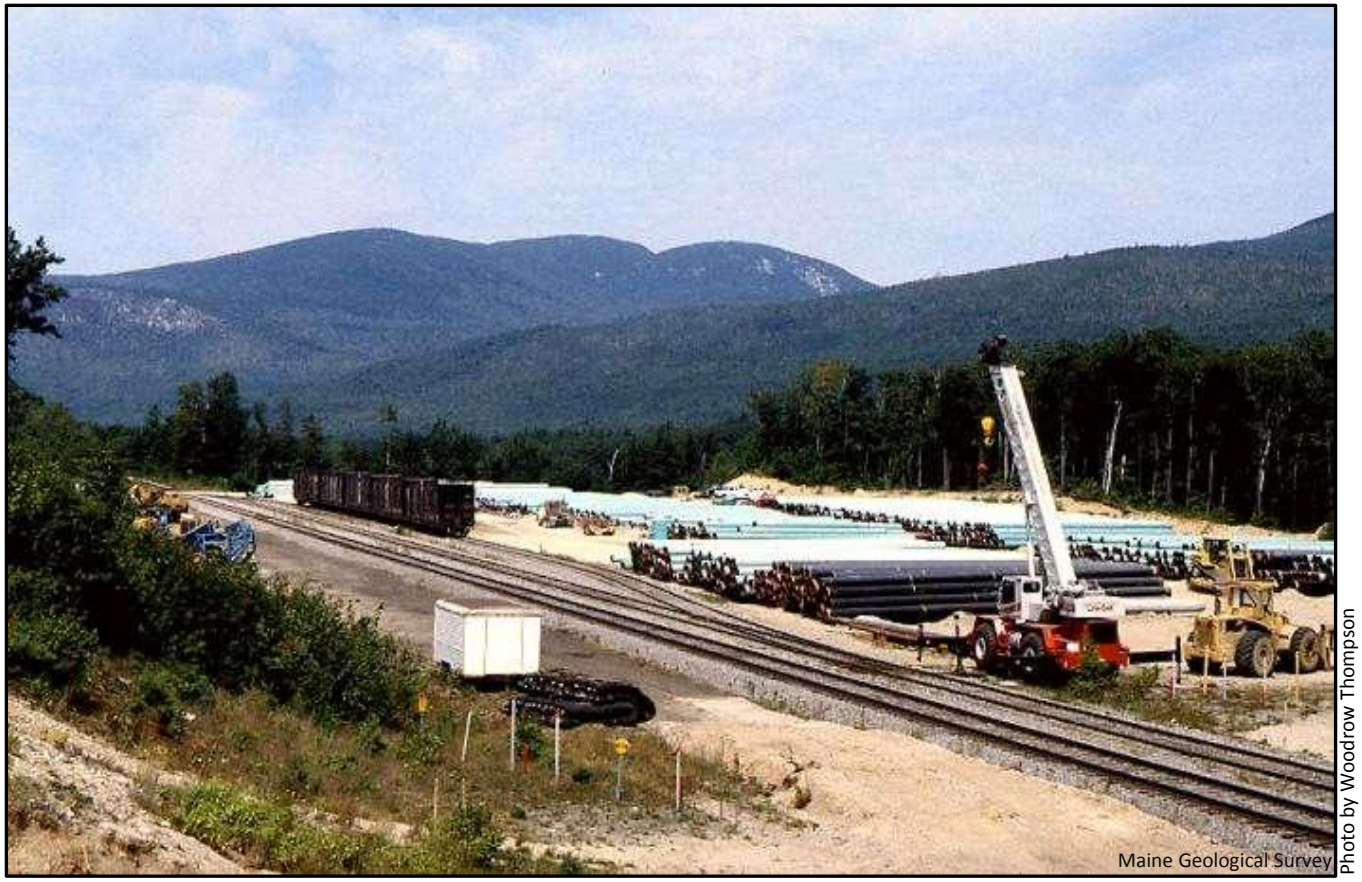


**Figure 2.** Construction staging area.

## Pipeline Construction

During spring and early summer, pipeline workers from around the country began digging sections of trench through the rugged terrain of the Oxford Hills region (Figure 3), braving rain, mud, and the worst mosquitoes in years. Staff from the Maine Geological Survey walked parts of the pipeline as work progressed, photographing and recording geologic features such as those described here. This account focuses on the "surficial geology" along the route, consisting of sand, gravel, and other earth materials left by the last glacial ice sheet about 25,000-12,000 years ago.


**Figure 3.** Trench for the pipeline revealing surficial geology.

## Pipeline Construction

The information obtained from the pipeline trench improves the detail of the Survey's geologic mapping and helps us to understand Maine's Ice Age past. The materials exposed in the trench had to be recorded quickly, though, during the short time each section was open. Large excavators dug the trench to a depth of 6 to 8 feet. Long stretches of the trench could not be examined closely because they immediately filled with water. This necessitated that several sections of pipe be welded together on top of the ground and then lowered into the trench all at once!


**Figure 4.** A fresh opening in glacial till. This stony material was released directly from melting glacial ice. Many large boulders had to be removed from the trench, as seen to the left of the excavator. The pool of water in the foreground resulted from digging below the water table.

## Bedrock Blasting

In some areas the trench had to be blasted through hundreds of feet of hard ledge, requiring the use of explosives. Many pipeline workers contracted mild cases of "rock fever," a contagious enthusiasm for picking up rocks, as they blasted through the granite veins in Oxford County's famous mineral belt (Figure 5). They sometimes asked me to identify odd rocks they had thrown into their trucks, or wanted to know where they could find a nice tourmaline gem to bring home for a Christmas present.


**Figure 5.** Rubble from blasting.

## Delta

Geological examination of the pipeline was timed to fall between digging the trench and installing the connected sections of pipe. Figure 6 shows this stage of construction where the pipeline crossed the top of a sandy gravel terrace along the Androscoggin River valley in Gilead. The gravel was left by streams from melting glacial ice, as they discharged their sediment load into a lake that once existed in this part of the valley ("glacial Lake Bethel"). This feature is called a delta.


**Figure 6.** Trench cutting through an ancient delta.

## Delta

A nearby section of the trench climbed a gully wall cut into the delta by a modern brook. Here, the deeper inner portion of the delta was revealed. Climbing up the trench showed flat sand beds deposited on the old lake floor, overlain by more steeply inclined beds deposited as the delta built out into the lake (Figure 7).


**Figure 7.** Cross-section of the delta revealing flat sand beds overlain by inclined beds.

## Glacial Till Revealed

One lesson learned from the pipeline exposures is that the glacial deposits are often much more complex than we would expect from looking at the ground surface (Figure 8). Walking across this area of Albany township before the pipeline was built, boulders on the ground surface might have suggested the presence of glacial till, but few other details could have been seen in the wooded terrain. However, the trench shows abrupt transitions from bedrock to glacial deposits. This is the opposite of the "normal" case, where bedrock outcrops on hills but is buried by glacial sediments in low areas!


**Figure 8.** Cross-section of the abrupt transition from bedrock (foreground) to glacial sand to glacial till on the hilltop.

## Morainal Till

Our tour stops at the New Hampshire border, where the pipeline trench crossed a ridge segment belonging to the Androscoggin Moraine system (Figure 9). This is an arcuate series of large till ridges deposited where a tongue of glacial ice plowed down the Androscoggin Valley from the White Mountains. The trench grazed the southern tip of one of these ridges, showing outwash sand overlying morainal till.


**Figure 9.** The trench cuts into a ridge revealing outwash sand overlying morainal till.

Acknowledgements

We thank the Portland Natural Gas Transmission System for granting permission to examine the pipeline trench during construction, and the many pipeline workers who were helpful and courteous throughout this study.