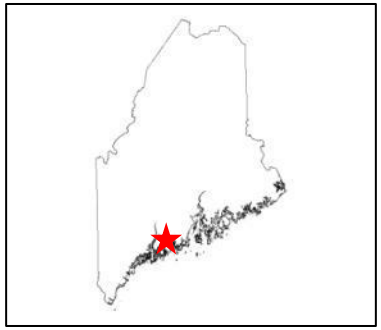
Maine Geologic Facts and Localities

July, 1998

Subsurface Geology of the Kennebec River



43° 54‘ 40.75“ N, 69° 48‘ 29.01“ W

Text by
Daniel B. Locke
Maine Geological Survey

Introduction

During 1996 and 1997, the Maine Department of Transportation directed the drilling of 78 test borings in order to collect the necessary geotechnical data for the design and construction of a new four-lane bridge spanning the Kennebec River between Bath and Woolwich along U.S. Route 1 (Figure 1).

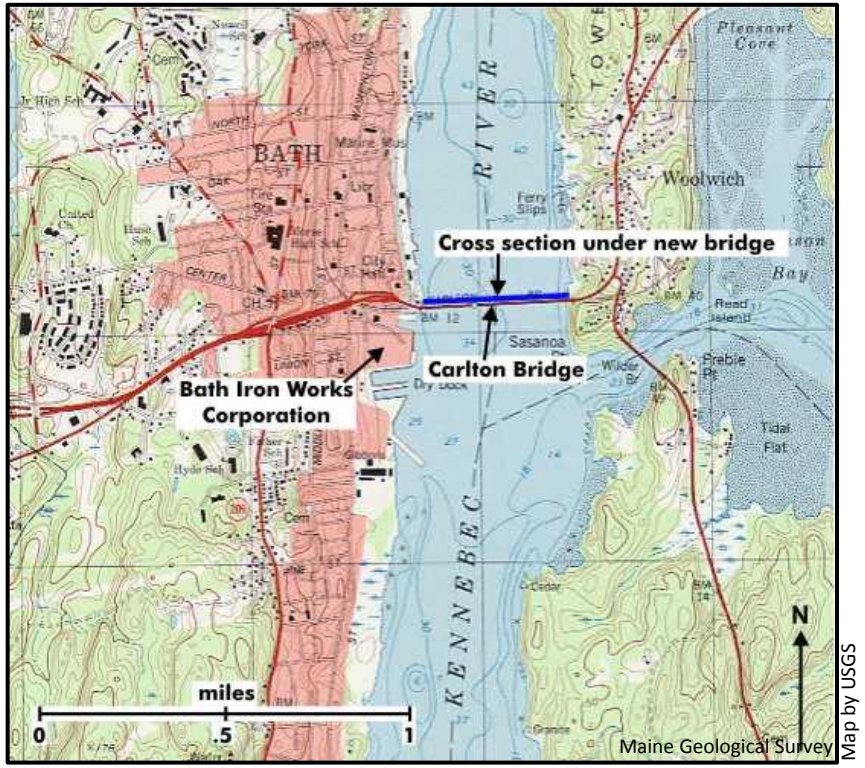


Figure 1. Location of the new four-lane bridge spanning the Kennebec River between Bath and Woolwich along U.S. Route 1.

Test Borings

These test borings were made both on land using truck-mounted drill rigs and in the river using drill rigs on barges. All test drilling was overseen by geotechnical engineers and geologists who kept detailed logs of each hole and collected sediment and bedrock samples for various geotechnical engineering analyses. The logs (written records) of these test borings also allow the geologist to construct cross sections depicting the composition and structure of the subsurface sediment and underlying bedrock. The map above shows the location of a cross section where the new Bath-Woolwich bridge is being built, approximately 150 feet (46 meters) north of the existing Bath-Woolwich bridge (known as the Carlton Bridge).

Test Borings

Of the 78 test boring logs, 16 were selected in order to construct a simplified cross section spanning 700 meters (Figure 2).

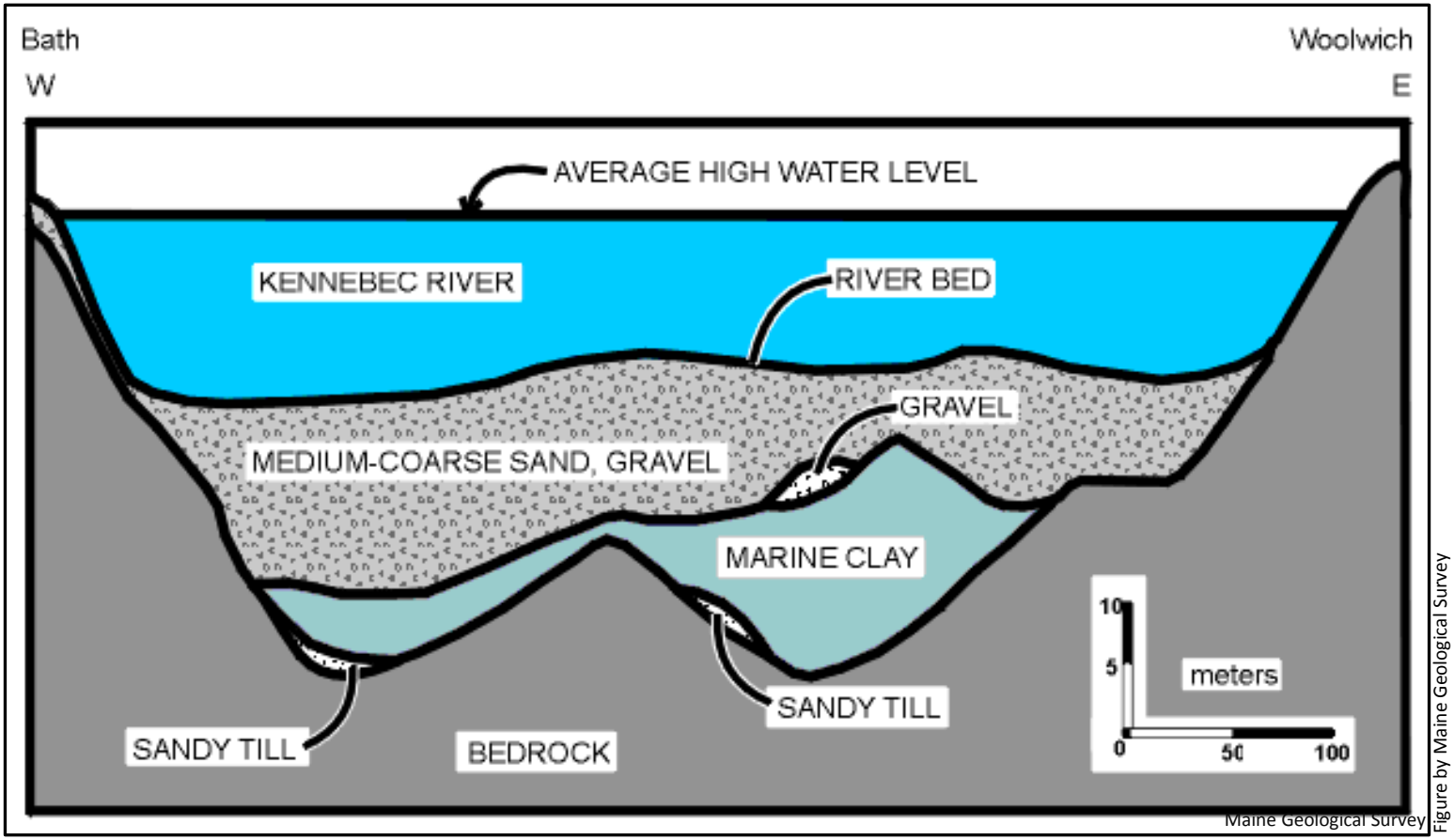


Figure 2. Cross section of the sampled area.

Cross-section of Kennebec River Geology

In order to emphasize the elevation changes in the sediment layers, the vertical scale has been exaggerated in comparison to the horizontal scale as shown by the scale bars on the figure. Water depths along the section range from 0 to approximately 49 feet (15 meters). The river bed primarily consists of medium to coarse sand with some gravel, reaching thicknesses up to 46 feet (14 meters). This alluvial or river-worked sand and gravel also contains the remains of logs and various wood fragments both at the top of the unit and at depth. Many of these logs are very likely remnants of times past when logs were driven down the river to mills or simply the remains of trees that floated down the river naturally during periods of flooding. It is possible, however, that some of the wood fragments, particularly those that are deeply buried by as much as 39 feet (12 meters) of sediment, might be remnants of trees that became inundated by rising river levels when the drainage of what is now known as Moosehead Lake changed from the Penobscot River to the Kennebec River. This shift of drainage likely occurred between 7000 and 8000 years ago (G. A. Balco, 1996, Postglacial land and lake levels, Moosehead Lake, Maine: M.S. thesis, University of Maine, Orono, Maine, 153 p.). No samples of the wood from the Bath site have been dated to test this theory.

Under the sand unit, silty clay of marine origin reaches thicknesses of as much as 15 meters (49 feet). This unit, known as the Presumpscot Formation, was formed by the settling of fine-grained sediment (rock flour) from glacial meltwater that entered the ocean between 13,300 and 12,700 years ago in the waning stages of the last Ice Age. Shells and shell fragments of marine mollusks were found in some samples of this clay. Under the marine clay, some isolated pockets of sandy glacial till were encountered along the section. Glacial till, which is typically a heterogeneous mixture of sand, silt, clay, and stones, but may be predominantly composed of sand in some cases, was deposited directly by the glacier.

Cross-section of Kennebec River Geology

Beneath the clay and till, Ordovician to Cambrian age (443-545 million year old) bedrock of the Cape Elizabeth Formation was encountered and cored using diamond drilling equipment. The formation, variable in composition, contains metamorphic rocks such as muscovite-biotite schist and biotite gneiss.

Bridge construction borings provide a "window to the subsurface" to the geologist that often is not available by any other means. The Maine Geological Survey routinely utilizes test drilling data associated with bridge, dam, and other construction projects in combination with surface information gathered by geologists to produce maps of surficial geology, surficial materials, and sand gravel aquifers.

The Survey wishes to acknowledge the Maine Department of Transportation for providing copies of their many drilling logs for the Bath-Woolwich Bridge Project without which this website would not have been possible.