

Maine Geologic Facts and Localities
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Geology near the Augusta Civic Center



44° 20' 32.61" N, 69° 47' 54.47" W

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Introduction

Augusta has many generally accessible localities to examine many aspects of local geology. One such locality is within and around the large retail complex associated with the Augusta Civic Center. With many large parking lots, the area is accessible for viewing some interesting aspects of Maine's geology.

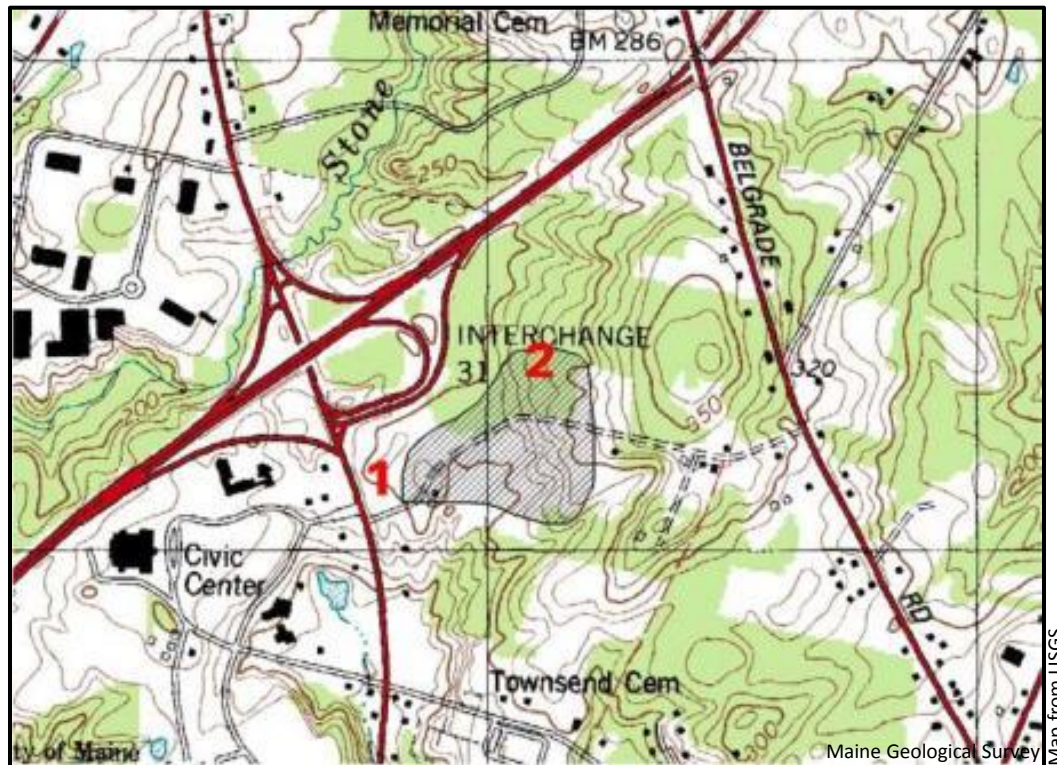


Figure 1. This map shows the general location of the retail complex (cross-hatched area) near the Augusta Civic Center. The USGS topographic map that this is part of has not been updated since the complex was built. Area 1 is the metamorphic rocks and Area 2 identifies the granite.

Introduction

For those who have been following these Site of the Month entries for the last few years, it should be no surprise to learn that most of the state is underlain with metamorphic rocks and igneous rocks that intrude them. Metamorphic rocks, of course, are those that originally were another kind of rock and were changed by pressure and temperature to become the rocks exposed at the surface today. [Gneiss](#) and [schist](#) are examples of metamorphic rocks common in Maine. Igneous rocks are those that form when molten lava (or magma) is injected into the crust where it cools or spills out on the surface of the earth. Igneous rocks that form from lavas cooled within the crust we collectively call intrusions, and those that form from lava on the surface we call volcanic rocks. [Granite](#) and [gabbro](#) are examples of intrusive igneous rocks common in Maine.



Metamorphic Rocks

Much of central interior Maine is underlain with metamorphic rocks that had their origins as sediments in a deep ocean basin about 430 million years ago. What began as layers of sand and mud in that basin has been metamorphosed through heat and pressure associated with a continental collision that produced the Appalachian Mountains 400 million years ago. The sand layers became gneiss (or in this example, granofels, which is like gneiss except it lacks banding) and the mud layers became schist. The forces of continental collision also folded the rocks so that they are now tilted on edge. At the outcrop shown in Figure 2 you can see the edges of the layers and that the lighter colored granofels layers stand up a little higher because they are more resistant to erosion. The darker schist layers erode more easily.



Photo by Robert Marwinney

Figure 2. The light colored bands in this outcrop are granofels which consists mostly of quartz and feldspar. The dark layers are schist. The layering runs northeast-southwest in this area of Maine. This is from Area 1 on the map.



Igneous Rocks

While there is great variety in the igneous rocks exposed throughout Maine, a primary type in the Augusta area is granite (Figure 3). Granite is an intrusive igneous rock. That is, a molten lava intruded into the crust at depth and cooled there to form solid rock. Eons of erosion have now exposed the granite at the surface. In this particular granite, the primary minerals quartz and feldspar are nearly equal in size, giving the granite a texture that geologists describe as equigranular (Figure 4). The granite here is also interesting because it contains two kinds of mica - the white mica is called muscovite and the black mica is called biotite. By mapping around the area, geologists have established that the granite cuts across the metamorphic rocks, indicating that the granite is younger. It's ~400 million years old.



Figure 3. Large wall of granite blasted out during the construction of the adjacent national home improvement outlet (Area 2). The vertical stripes on the outcrop are from drilling to set dynamite charges. The nearly horizontal fractures are natural and carry the groundwater in this area, as shown by the icicle developed along one.

Igneous Rock

Figure 4. This is a close-up of the granite, showing its equigranular texture. The gray minerals are quartz which makes up about 40-50% of the rock. The white mineral is feldspar which makes up another 40-50%. Biotite, the black flakes, and muscovite which does not show well in the photograph, make up 5-10% of the rock. Minor amounts of other minerals also occur in this rock.

Glaciation

Fast forward to about 1 million years ago. At that time, these outcrops were covered by the earth's greatest geological agent of erosion - glacial ice. The best evidence for this can be seen on the outcrop of metamorphic rocks. This outcrop shows striations that formed when rocks held in the bottom of the glacier scraped along the rock surface from northwest to southeast (Figure 5). Striations like this are common throughout Maine and are part of the evidence for the great Ice Age.



By Robert Marviny

Figure 5. Glacial striations on metamorphic rocks at Area 1. These show the movement of the glacier from north (upper left) to south (lower right).

