### Description of Map Units

<table>
<thead>
<tr>
<th>Ordovician</th>
<th>Cambrian</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stone Point Shale</strong></td>
<td><em>Champlain Springs Formation</em></td>
</tr>
<tr>
<td><strong>Bascom Formation</strong></td>
<td>False dolomitic limestone with a &quot;plumbing&quot;</td>
</tr>
<tr>
<td><strong>Cutler Formation</strong></td>
<td>False dolomitic limestone with a &quot;plumbing&quot;</td>
</tr>
<tr>
<td><strong>Continental Shale</strong></td>
<td>False dolomitic limestone with a &quot;plumbing&quot;</td>
</tr>
<tr>
<td><strong>Ottawa Formation</strong></td>
<td>False dolomitic limestone with a &quot;plumbing&quot;</td>
</tr>
</tbody>
</table>

**Shale Corners Formation**
- Drilled and cored through the formation.
- Unillustrated member, black phyllitic shales, light brown weathering, dolomite layers.

**Cambrian**
- **Champlain Springs Formation**
  - Massive, gray, granular, tan weathering dolostone with a brecciated texture; breccia fragments may include gray dolostone.
  - Black calcareous shales with thin interlayers of gray limestone.

**Dehydration Front**
- Drilled and cored through the formation.
- Unillustrated member, black phyllitic shales, light brown weathering, dolomite layers.

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### Bedrock Geologic Map of the Colchester Quadrangle

Authors: Jonathan Kim and Peter Thompson (2001)

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**Geologic Map Symbols**

- **Trend Field (tracks of adjacent plates)**
- **Normal Fault (basement, up)***
- **Syncline**
- **Anticline**
- **Strike and Dip of Bedding (180)**
- **Lineament (18)**

**Geographic Symbols**

- **Surface Water**
  - Lake or Pond
  - Stream
  - Road
  - Interstate
  - U.S. Highway
  - Vermont State Highway
  - Town Highway
  - Other Road
  - Legal Trail

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**References**

Representative Lithologies in the Colchester Quadrangle

Authors: Jonathan Kim and Peter Thompson
Thrust

Gross Alpha Level in Bedrock Well \( \geq 15 \) pCi/liter (EPA MCL)(Vermont Dept. of Health data archives)

Based on the dip of this thrust, a buoy


Compilation of Radioactivity Data for the Colchester Quadrangle

Authors: Jonathan Kim and Peter Thompson (2001)

<table>
<thead>
<tr>
<th>Radioactivity Data</th>
<th>( \geq 15 ) pCi/liter (EPA MCL)(Vermont Dept. of Health data archives)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.U.R.E. &quot;Preferred&quot; airborne Uranium anomaly (Texas Instruments, 1975)</td>
<td></td>
</tr>
<tr>
<td>N.U.R.E &quot;Secondary&quot; airborne Uranium anomaly (Texas Instruments, 1975)</td>
<td></td>
</tr>
<tr>
<td>Ground-based radiometric anomaly area (Vanacek and Dorsey, 1983; McKeown, 1951)</td>
<td></td>
</tr>
<tr>
<td>Ground-based radioactivity reading ( &gt; 100 ) total counts/second (Kim and Thompson, 2002)</td>
<td></td>
</tr>
</tbody>
</table>

In the southeastern part of the Colchester Quadrangle, Ccs is folded into a south-plunging synclinal structure. In this structure, Ccs sits below the Shelburne Fm. (Os) and the Cutting Fm (Oc). It is possible that wells drilled in Oc or Os in the yellow buffer zone could unknowingly be drilled into Ccs.

Approximately 30% of bedrock wells tested in the Clarendon Springs Formation (Ccs) have groundwater with elevated naturally-occurring radioactivity. In addition to drilling directly in Ccs, other scenarios as shown below and on the map where Ccs could be permeated even though it was not on the ground surface.

Scenario A: Eastward Dip Buffer

Because the Clarendon Springs Fm. (Ccs) in the Colchester Quadrangle dips gently to the east, one must also consider that groundwater wells drilled in the adjacent Shelburne Com. Fm. (Oc) could penetrate Ccs if the well is attempted too close to the Muddy Brook Thrust. Based on the dip of this thrust, a buffer zone was drawn (orange), that delineates the approximate area of OCsk where a well \(< 1000 \) depth could hit Ccs.

Scenario B: South-Plunging Syncline Buffer

In the southeastern part of the Colchester Quadrangle, Ccs is folded into a south-plunging synclinal structure. In this structure, Ccs sits below the Shelburne Fm. (Os) and the Cutting Fm (Oc). It is possible that wells drilled in Oc or Os in the yellow buffer zone could unknowingly be drilled into Ccs.

Buffer Zones for the Clarendon Springs Formation

Vermont Geological Survey Open File Report VG01-1 Plate 3
steeply-dipping fractures (>60 degrees) are shown on rose diagrams. Plotted using GEOrient software (Holcombe, R., www.holcombe.net.au/software). Field Stations = red dots.

Frequency-Azimuth rose diagrams and equal area nets (poles to planes) for fractures from selected field stations or groupings of field stations in the Colchester Quadrangle. Only steeply-dipping fractures (>60 degrees) are shown on rose diagrams. Plotted using GEOrient software (Holcombe, R., www.holcombe.net.au/software). Field Stations = red dots.

Authors: Jonathan Kim and Peter Thompson

Map Produced: February 28, 2003
Selected Field Photos in the Colchester Quadrangle

Figure 1: Brecciated appearance of many Clarendon Springs Formation outcrops. Breccia fragments are more resistant to weathering than matrix. Note en echelon quartz veins.

Figure 2: Chert breccia in Clarendon Springs Formation dolostone.

Figure 3: Dolostone fragment breccia in uppermost Clarendon Springs Formation.

Figure 4: Chertite and black organic? fragment breccia. This piece of breccia was found to have elevated radioactivity in the field.

Figure 5: Breccias filling in cavities on either side of cross-bedded dolomitic sandstone layer.

Figure 6: Sand filling in irregularly shaped cavity (paleokarst) in dolostone. This feature can be seen on the left side of Figure 7.

Figure 7: Irregular surface (orange line) separating sands from underlying dolostone. This surface may represent a paleokarst. Area of Figure 6 on left side of photo.

Figure 8: Normal Fault at Malletts Creek in Danby Formation dolomitic sandstones. Fault plane is in shadow. Fault breccia underlies hammer.

Figure 9: Fault breccia underlies hammer with massive sandstone to left of fault.

Figure 10: Topography on top of a N 70 E trending bedrock ridge of Clarendon Springs Formation dolostone. Linear outcrop faces and depressions are the result of en echelon fracture weathering.

Figure 11: Topography on top of a N 70 E trending bedrock ridge of Clarendon Springs Formation dolostone. Linear outcrop faces and depressions are the result of en echelon fracture weathering.

Authors: Jonathan Kim and Peter Thompson