

## State Summary for Maine

Information on population density, use of domestic-water supply, land use, and distribution of the 11 selected contaminants (arsenic, atrazine, benzene, deethylatrazine (CIAT), manganese, nitrate (data for nitrate consists of analyses for nitrite plus nitrate, as N, by the laboratory), perchloroethene (PCE), radon, strontium, trichloroethene (TCE), and uranium) for domestic well data for Maine is shown in figures ME1–ME16. The percentage of samples greater than U.S. Environmental Protection Agency (USEPA) human-health benchmarks for National Water-Quality Assessment (NAWQA) Program major-aquifer studies that included Maine is given in table ME1. The areal extent of some NAWQA major-aquifer studies goes beyond the State boundary (fig. ME4). All data associated with a major-aquifer study are provided and are used in contaminant summaries even if the sampled well was located outside the State boundary. The “Selected References” section at the end of this summary lists previous Maine studies that are relevant to the 11 contaminants.

In Maine, the largest areas with the highest population density are located along the southern parts of the State (fig. ME1). No data are available for Maine on the percentage of the domestic (private) supply obtained from ground water, and only about 30 percent of the public supply is obtained from ground water. The population (by census-block group for 1990) using a domestic-water supply from ground water was greatest along the coast and in the southwestern part of the State (fig. ME2). Maine contains mostly forested land, although some agriculture does occur in the northeastern part of the State (fig. ME3).

Two major-aquifer studies in one principal aquifer (New York/New England crystalline-rock aquifers) included samples from domestic wells in Maine (fig. ME4). New York/New England crystalline rock aquifers are present in most of Maine (fig. ME4) and consist mostly of metamorphic and igneous rocks and are mostly confined aquifers (Olcott, 1995). The regolith and fractures in the bedrock serve as the primary areas of storage and well yields generally are only a few gallons per minute, although some well yields may exceed 500 gallons per minute (Olcott, 1995).

Water-quality data for 11 selected contaminants (table 2) in samples from domestic-water supplies were compiled and summarized. The concentrations relative to USEPA human-health benchmarks (table 2, fig. ME5) and the number of major-aquifer studies with concentrations greater than human-health benchmarks were both considered in evaluating the potential concern to human health. This analysis assumes that current USEPA benchmarks (U.S. Environmental Protection Agency, 2006) are the most relevant and accurate measure of human-health risk.

Radon, arsenic, uranium, and manganese had concentrations greater than USEPA human-health benchmarks (table ME1). Radon had the greatest potential human-health concern because it had the largest percentage of samples with concentrations greater than the human-health benchmark of 300 picocuries per liter (pCi/L). The necbsus1 major-aquifer study in the New York/New England crystalline-rock aquifers had 100 percent of the samples with radon concentrations greater than 300 pCi/L, which is the proposed Maximum Contaminant Level (MCL) for radon (table ME1); about 15 percent of the samples had radon concentrations greater than the alternative proposed MCL of 4,000 pCi/L. About

**Table ME1.** Percentage of samples with concentrations greater than U.S. Environmental Protection Agency human-health benchmarks for National Water-Quality Assessment (NAWQA) Program major-aquifer studies that included Maine.

| Study-Unit<br>code for<br>NAWQA<br>major-aquifer<br>study | Principal aquifer                              | Contaminant | Number of<br>samples | Percentage of<br>samples with<br>concentrations<br>greater than<br>human-health<br>benchmark |
|---|--|-------------|----------------------|--|
| necbsus1  | New York/New England crystalline-rock aquifers | Radon       | 26                   | <sup>1</sup> 100/15  |
| necbsus2  | New York/New England crystalline-rock aquifers | Radon       | 28                   | <sup>1</sup> 96/46   |
| necbsus1  | New York/New England crystalline-rock aquifers | Arsenic     | 28                   | 29   |
| necbsus2  | New York/New England crystalline-rock aquifers | Arsenic     | 30                   | 6.7  |
| necbsus2  | New York/New England crystalline-rock aquifers | Uranium     | 30                   | 10   |
| necbsus1  | New York/New England crystalline-rock aquifers | Manganese   | 28                   | 7.1  |
| necbsus2  | New York/New England crystalline-rock aquifers | Manganese   | 30                   | 6.7  |

<sup>1</sup>First number is the percentage greater than 300 picocuries per liter (proposed Maximum Contaminant Level), and second number is the percentage greater than 4,000 picocuries per liter (alternate proposed Maximum Contaminant Level).

96 percent of samples in the necbsus2 major-aquifer study in the New York/New England crystalline-rock aquifers had radon concentrations greater than 300 pCi/L, and about 46 percent of the samples had concentrations greater than 4,000 pCi/L (table ME1). Median radon concentrations in the New York/New England crystalline-rock aquifers ranged from 2,000 to 3,500 pCi/L in the two major-aquifer studies (fig. ME5). Radon-222 is a decay product of radium-226, and radon concentrations greater than the human-health benchmark are widespread and can be attributed to natural sources in the soil and rock material in Maine.

Arsenic also had some potential concern to human health. About 29 percent and 7 percent of the samples from two major-aquifer studies (necbsus1 and necbsus2) in the New York/New England crystalline-rock aquifers had arsenic concentrations greater than the human-health benchmark, which is the MCL of 10 micrograms per liter ( $\mu\text{g/L}$ ) (table ME1). Median arsenic concentrations in the necbsus1 major-aquifer study were within an order of magnitude of the human-health benchmark (fig. ME5). The necbsus1 major-aquifer study was designed to select wells from rock formations known to have arsenic, so the necbsus1 study was biased to look for arsenic (Sarah Flanagan, U.S. Geological Survey, written commun., 2007). Only a few additional samples with arsenic data were available from U.S. Geological Survey (USGS) State data (fig. ME6), and no additional samples had concentrations greater than the human-health benchmark.

Three samples (about 10 percent) from the necbsus2 major-aquifer study in the southwestern part of Maine had uranium concentrations greater than the human-health benchmark, which is the MCL of 30  $\mu\text{g/L}$  (table ME1, fig. ME16). These uranium concentrations greater than the human-health benchmark are coincident with aquifer rock type and probably are related to uranium-bearing minerals present in the bedrock.

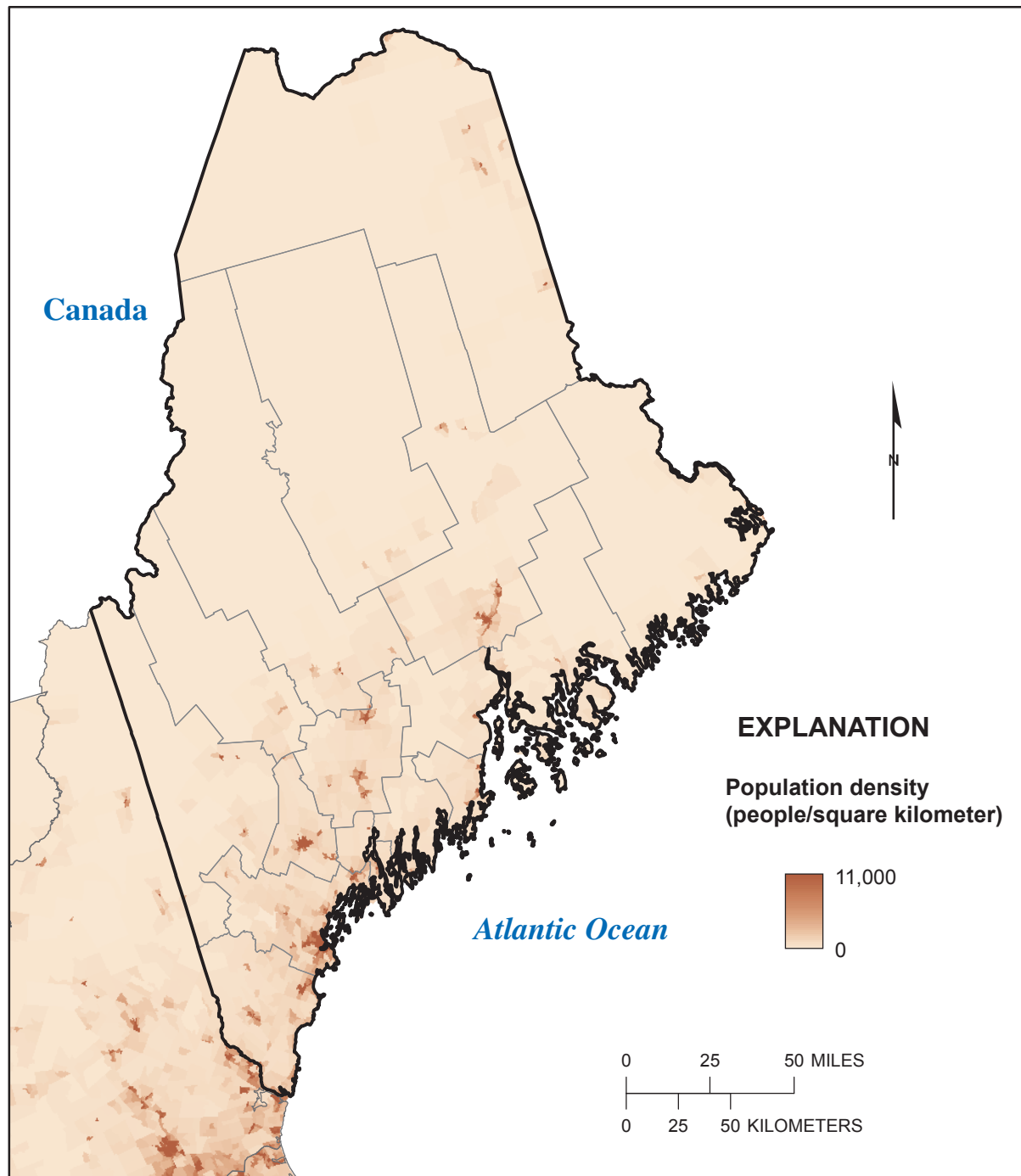
Manganese concentrations in two samples each (about 7 percent) from two major-aquifer studies (necbsus1 and necbsus2) in the New York/New England crystalline-rock aquifers were greater than the human-health benchmark (Lifetime Health Advisory (HA) of 300  $\mu\text{g/L}$ ) (table ME1). Only one of the samples collected in the State of Maine had manganese concentrations greater than the human-health benchmark (fig. ME10).

For the entire Maine data set, atrazine (fig. ME7), benzene (fig. ME8), CIAT (fig. ME9), nitrate (fig. ME11), PCE (fig. ME12), strontium (fig. ME14), and TCE (fig. ME15) did not have concentrations larger than USEPA human-health benchmarks for either NAWQA or USGS State data. CIAT is a degradation product of atrazine and does not have a human-health benchmark; however, for this report, the MCL for atrazine is used as a benchmark for CIAT because their toxicities are considered equivalent.

## Selected References

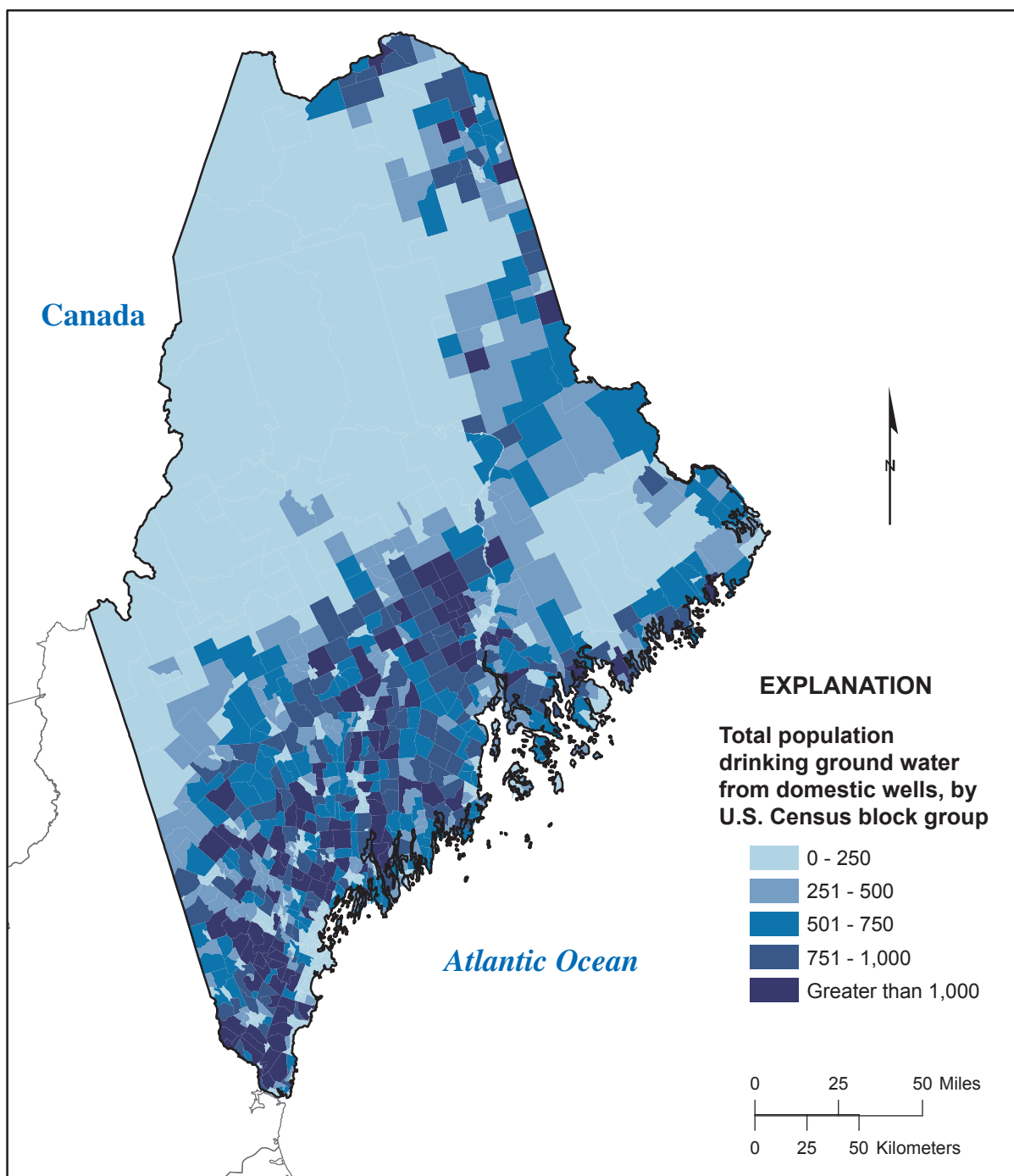
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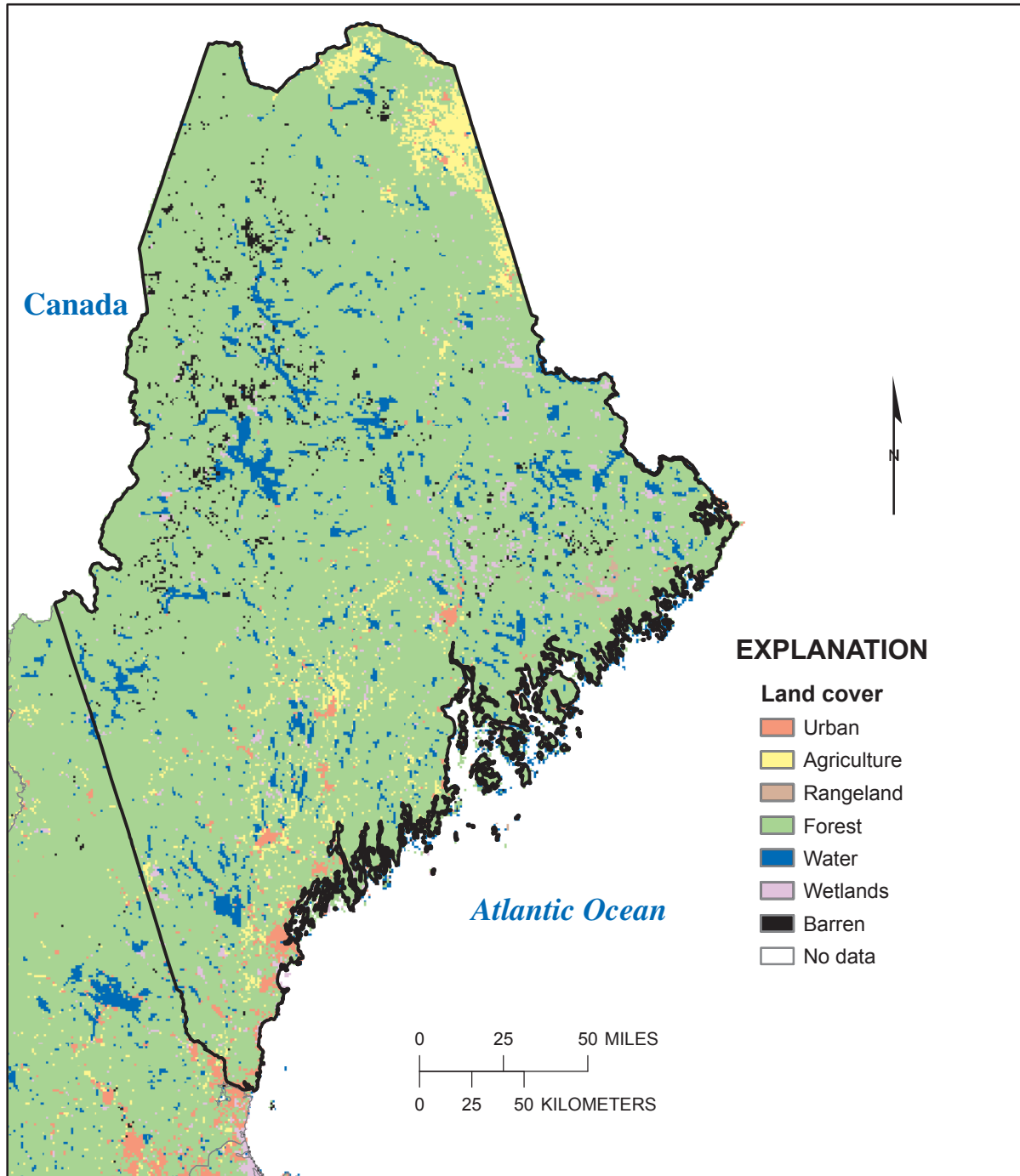
Base information from U.S. Geological Survey digital data, 1:2,000,000  
 Albers Equal-Area projection  
 Standard Parallels 29°30' and 45°30', central meridian -96°

**Figure ME1.** Population density for Maine and nearby States. (Data from Hitt, 2003.)



Base information from U.S. Geological Survey digital data, 1:2,000,000  
 Albers Equal-Area projection  
 Standard Parallels 29°30' and 45°30', central meridian -96°

**Figure ME2.** Population using domestic-water supply (from ground water) for Maine. (Data from 1990 U.S. Census block group, Kerie Hitt, U.S. Geological Survey, written commun., 1997.)

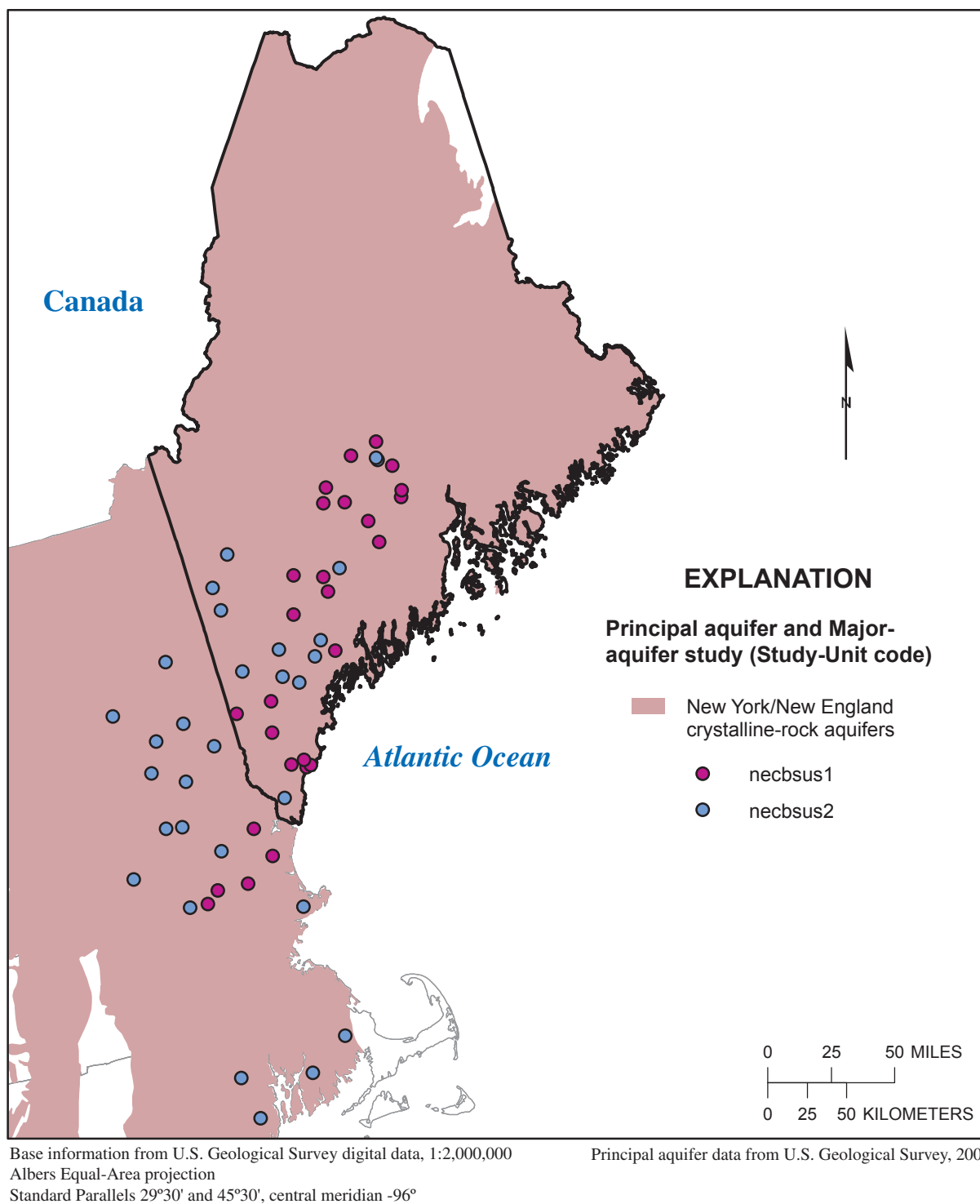


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Albers Equal-Area projection

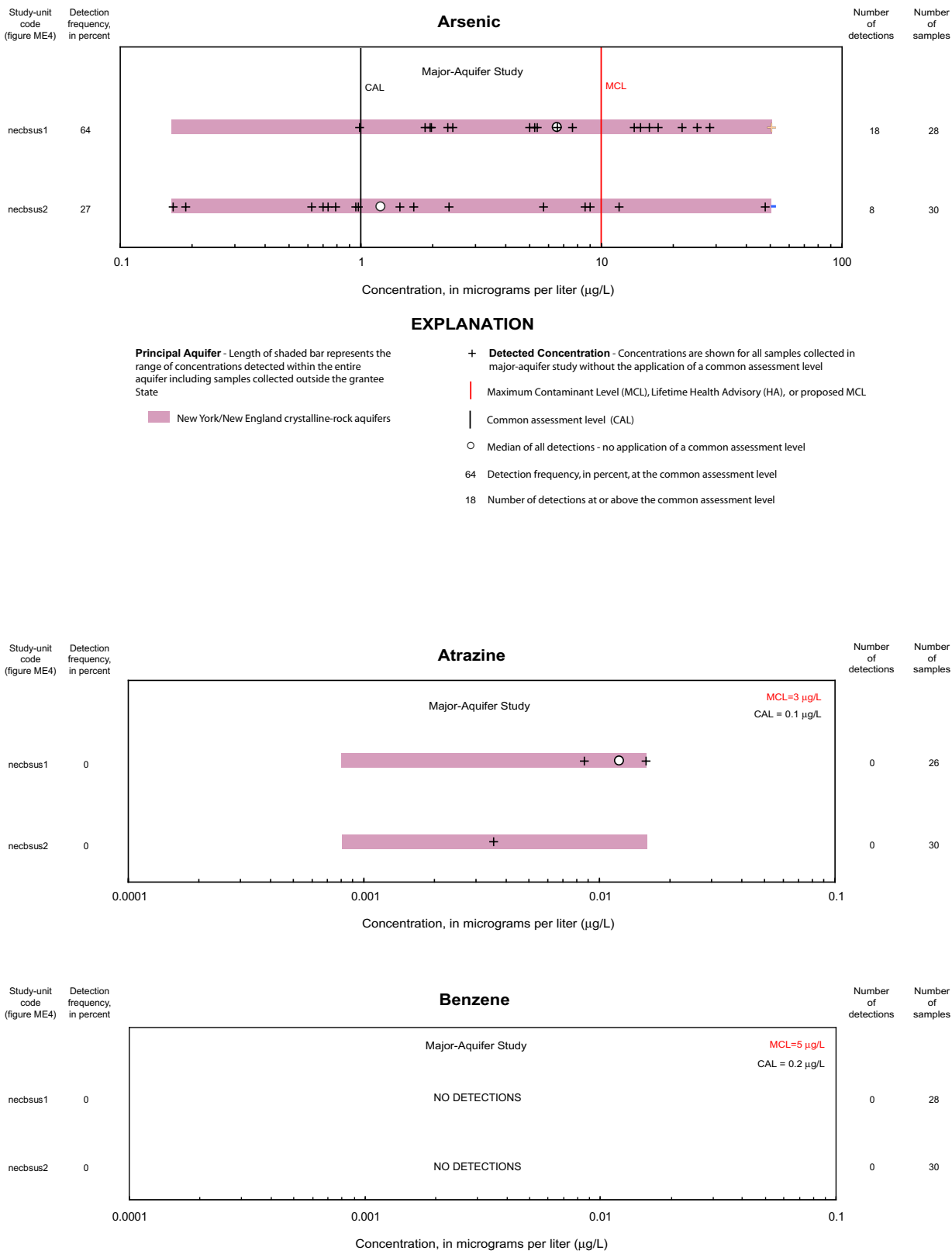
Standard Parallels 29°30' and 45°30', central meridian -96°

**Figure ME3.** Land use/land cover for Maine and nearby States. (Data from Naomi Nakagaki, U.S. Geological Survey, written commun., 2005.)



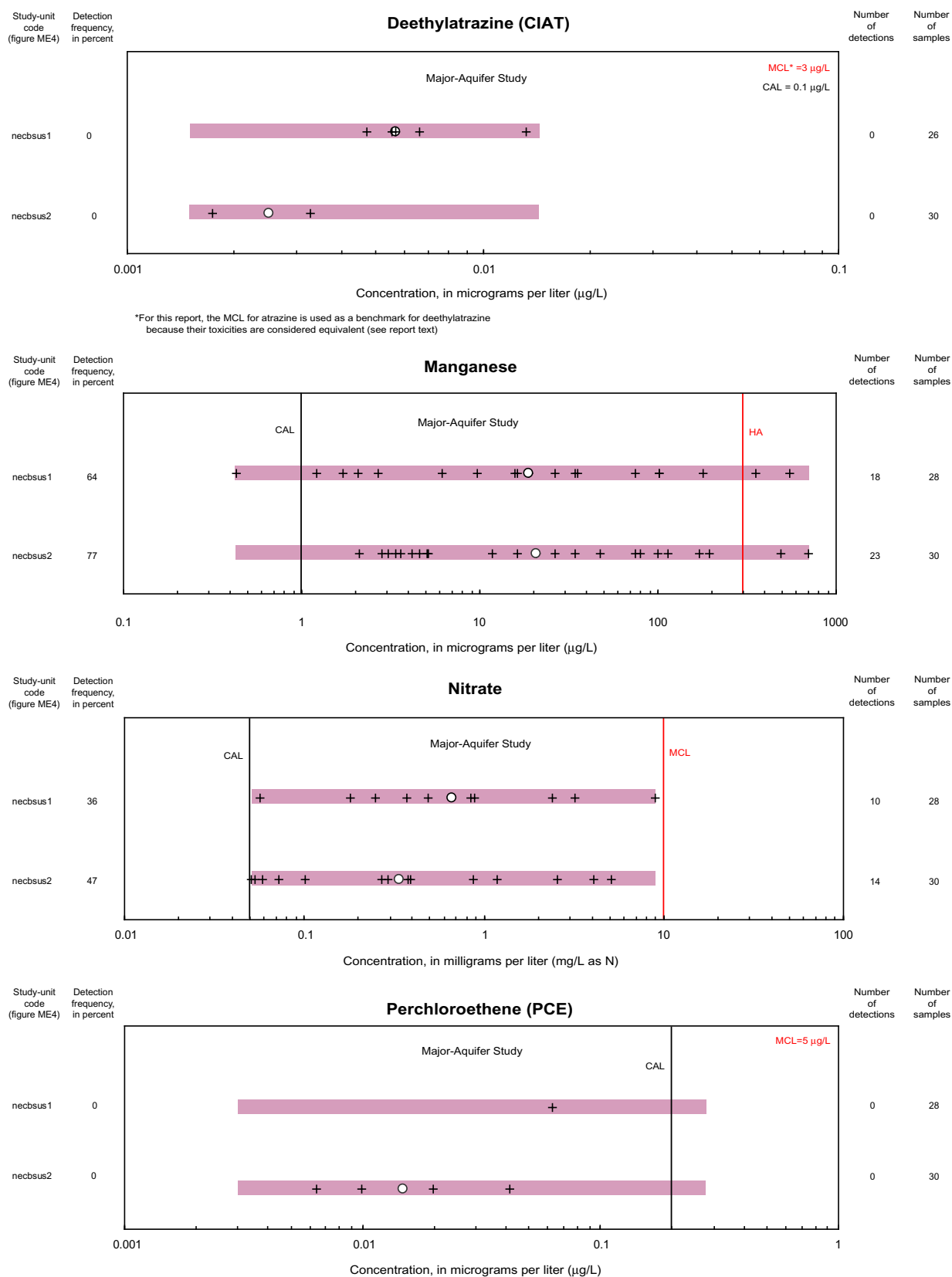
**Figure ME4.** Location of domestic wells sampled for National Water-Quality Assessment (NAWQA) major-aquifer studies that included Maine.



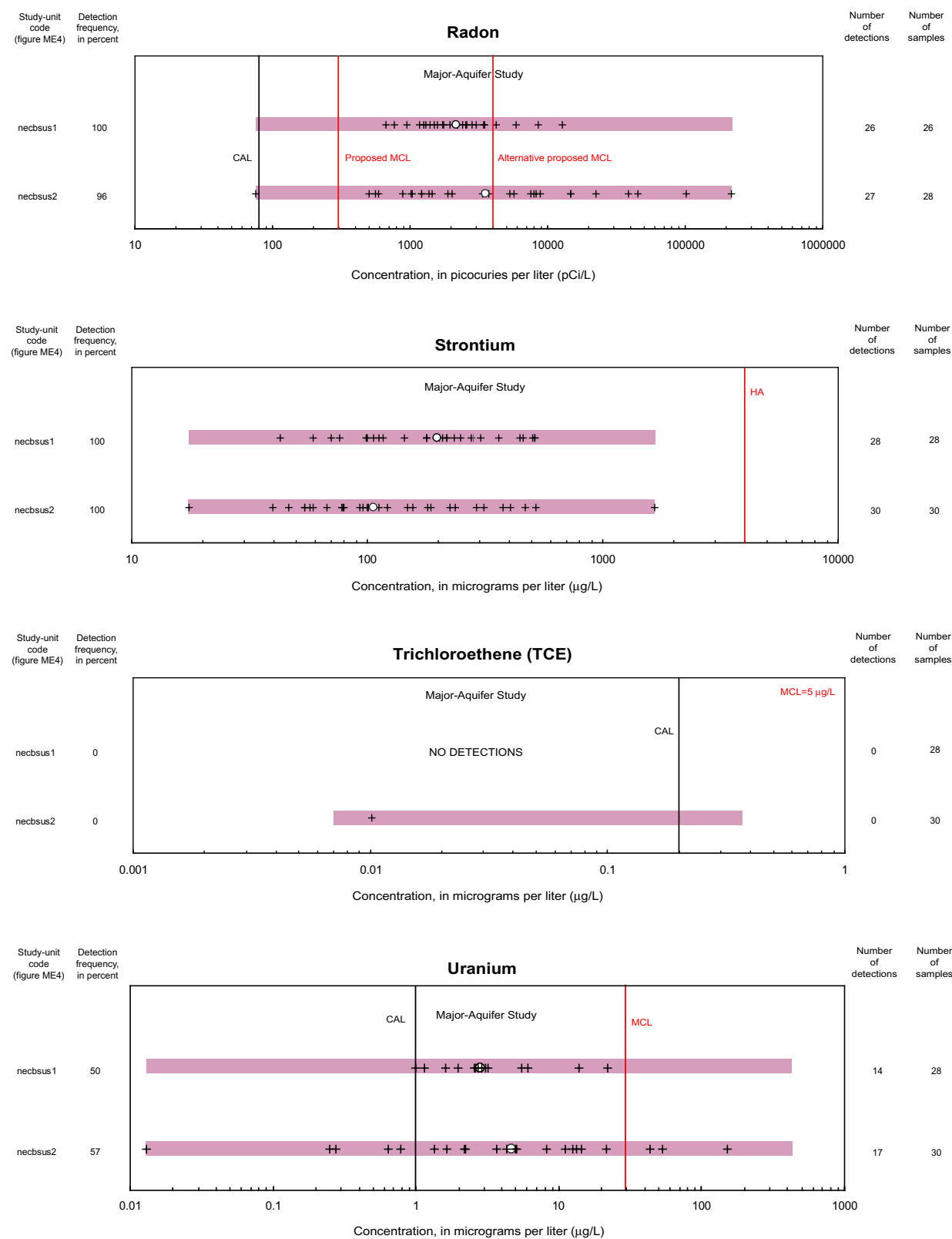


**Figure ME5.** Statistical summary for 11 selected contaminants by major-aquifer study using domestic-well data from National Water-Quality Assessment (NAWQA) studies for Maine (includes studies for which at least 10 analyses were available).

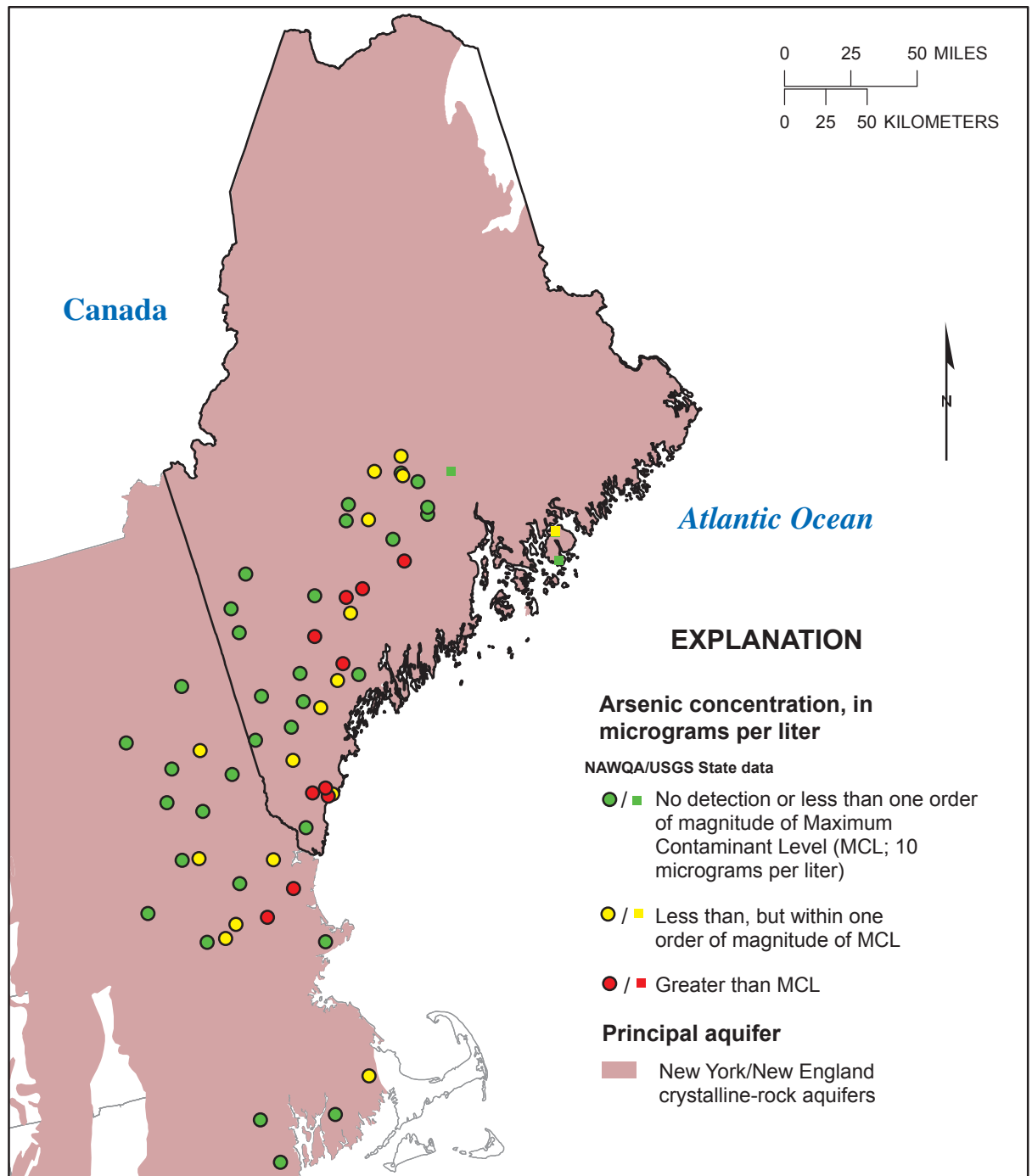




**Figure ME5.** Statistical summary for 11 selected contaminants by major-aquifer study using domestic-well data from National Water-Quality Assessment (NAWQA) studies for Maine (includes studies for which at least 10 analyses were available).—Continued.



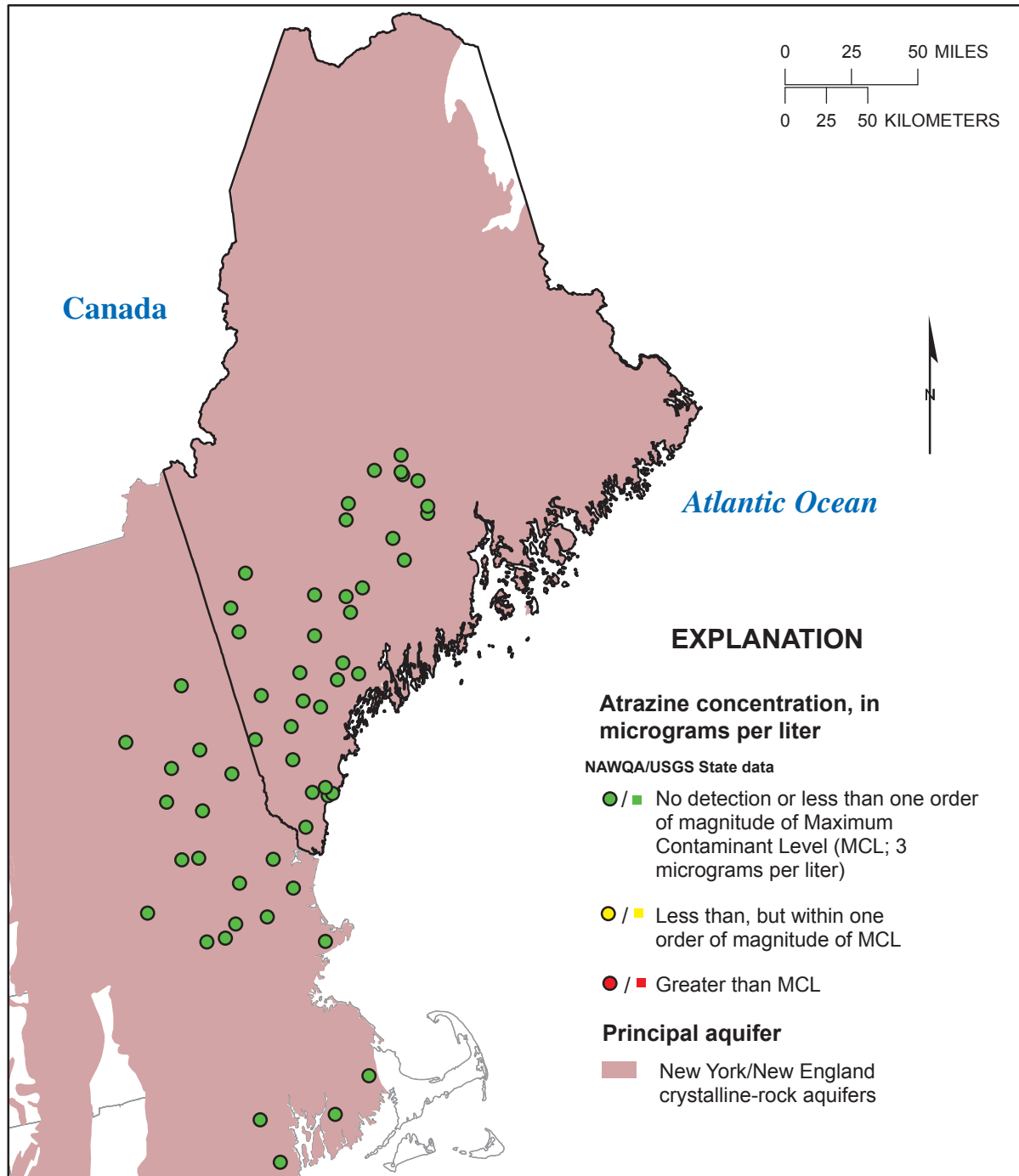
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Base information from U.S. Geological Survey digital data, 1:2,000,000  
 Albers Equal-Area projection  
 Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

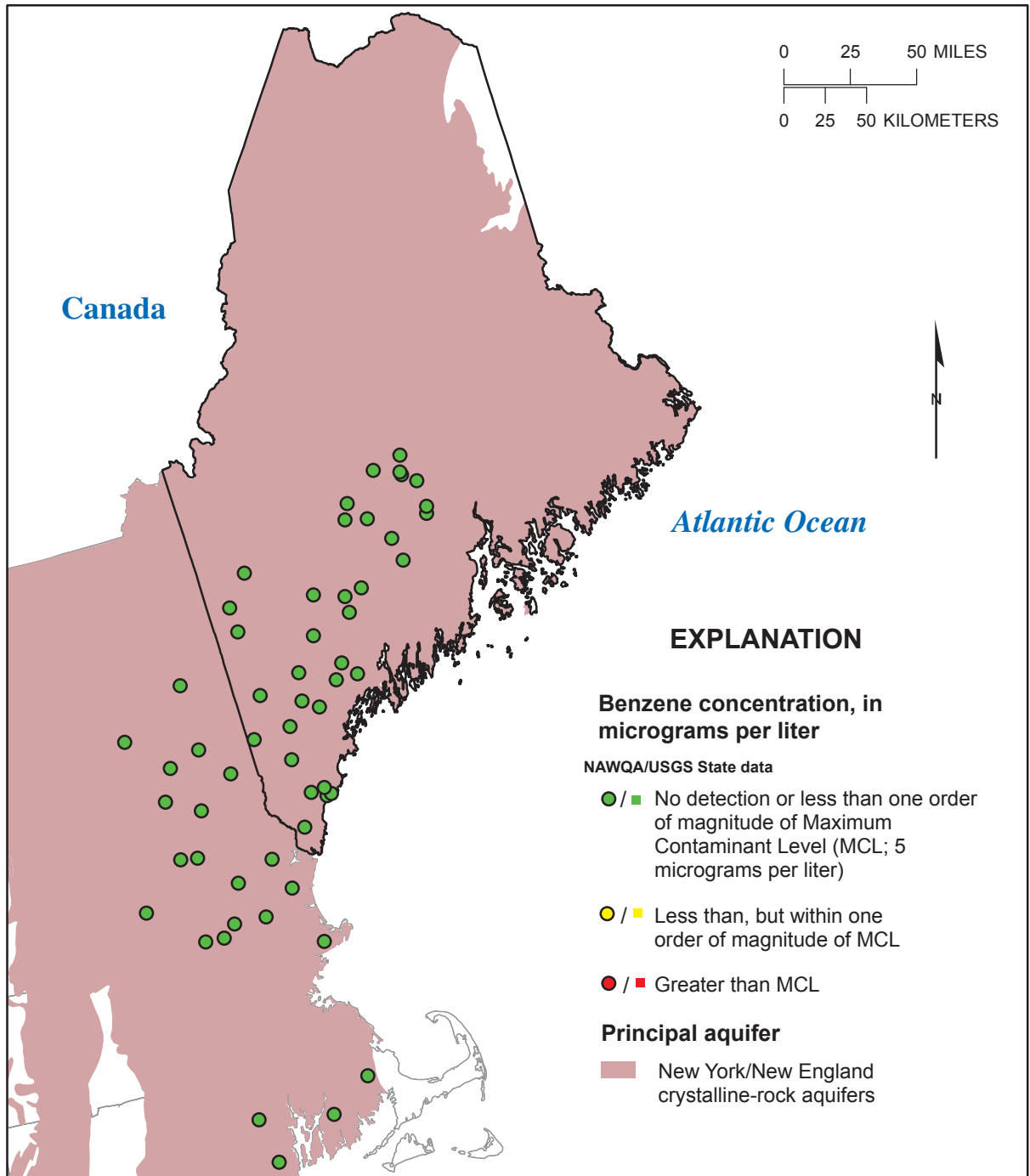
**Figure ME6.** Concentration of arsenic in samples from domestic wells in Maine and nearby States (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



Base information from U.S. Geological Survey digital data, 1:2,000,000  
 Albers Equal-Area projection  
 Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

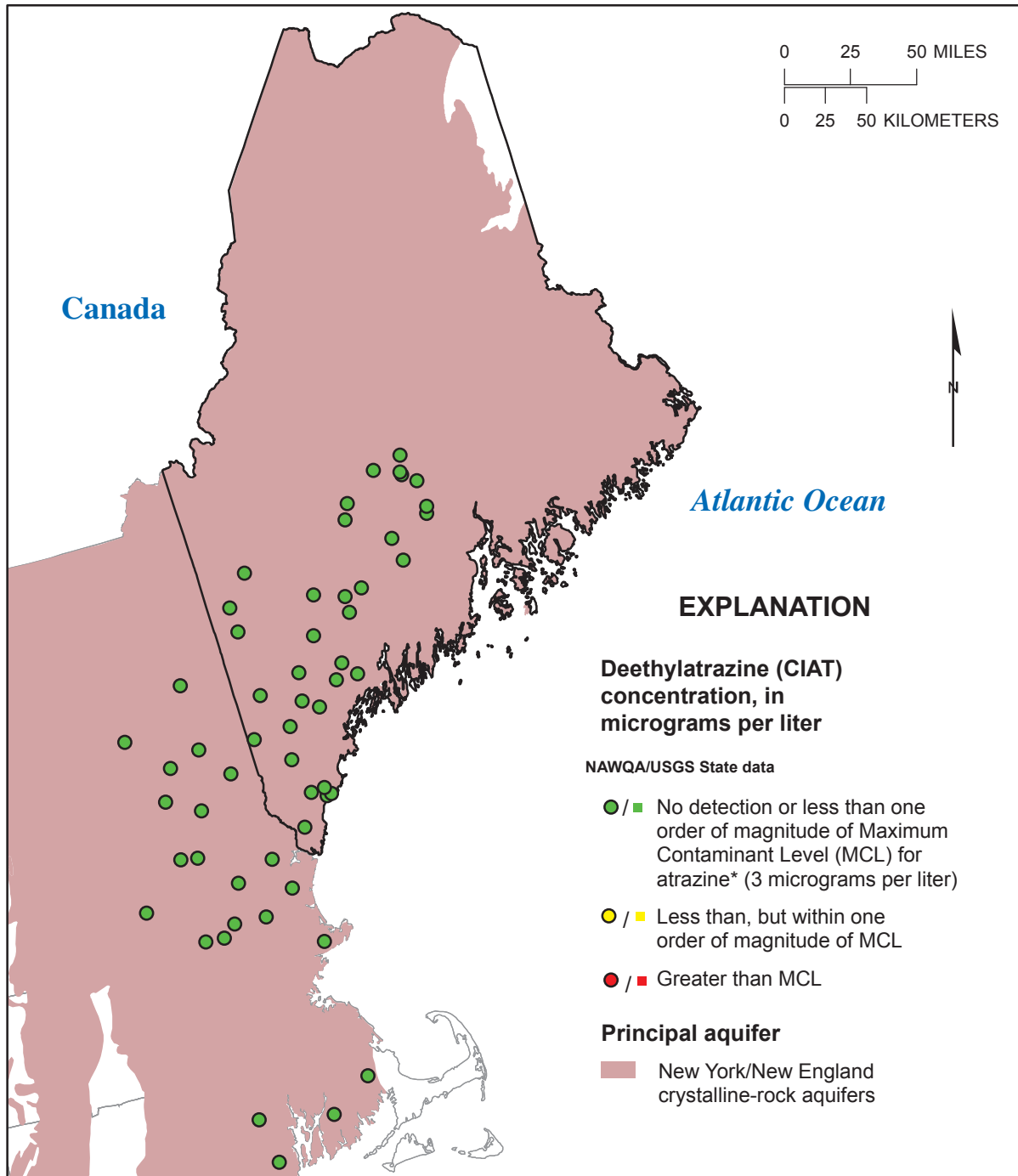
**Figure ME7.** Concentration of atrazine in samples from domestic wells in Maine and nearby States (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



Base information from U.S. Geological Survey digital data, 1:2,000,000  
 Albers Equal-Area projection  
 Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

**Figure ME8.** Concentration of benzene in samples from domestic wells in Maine and nearby States (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).

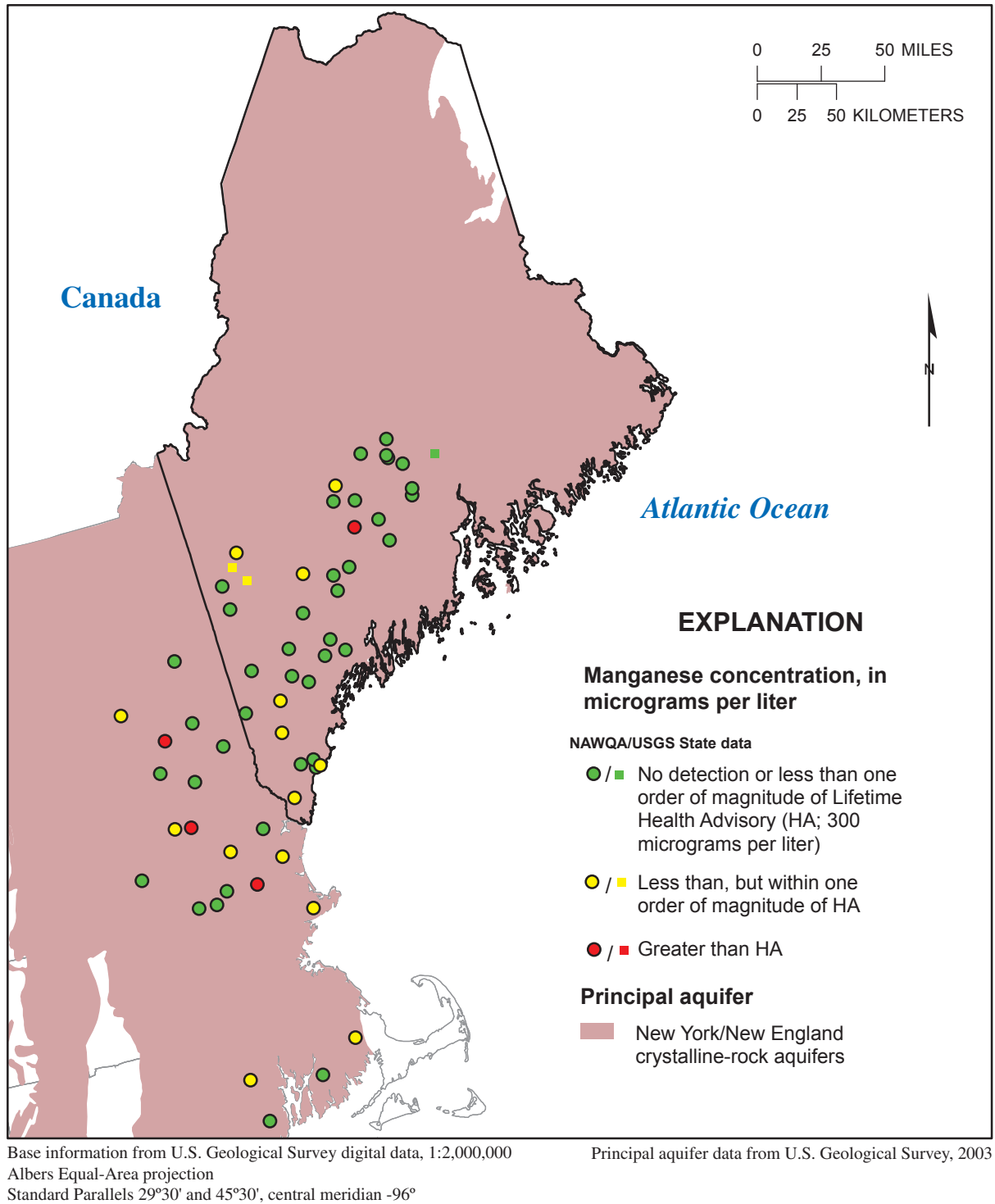


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Principal aquifer data from U.S. Geological Survey, 2003

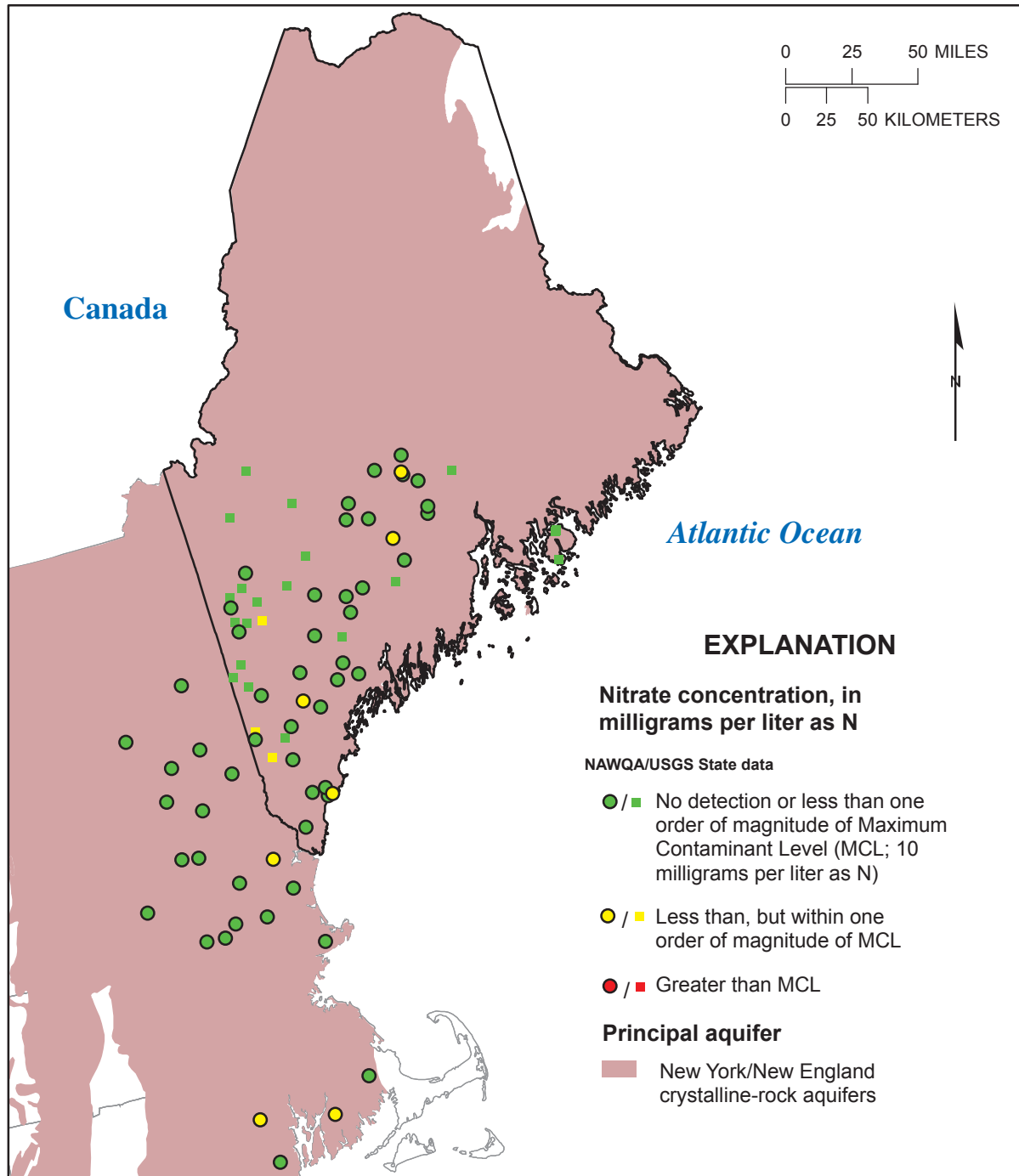
\* For this report, the MCL for atrazine is used as benchmark for deethylatrazine because their toxicities are considered equivalent (see report text).

**Figure ME9.** Concentration of deethylatrazine (CIAT) in samples from domestic wells in Maine and nearby States (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



**Figure ME10.** Concentration of manganese in samples from domestic wells in Maine and nearby States (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).

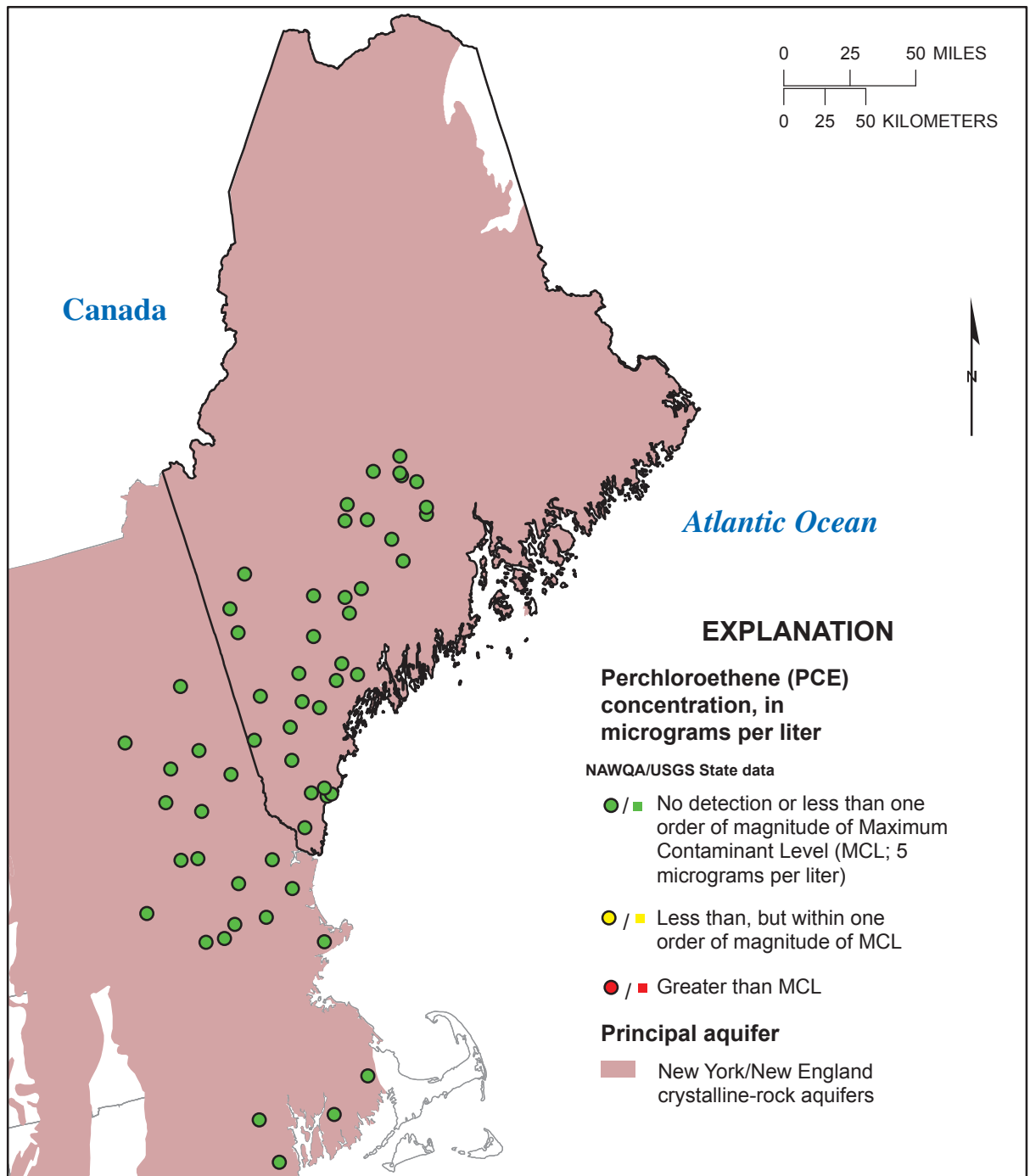




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 Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

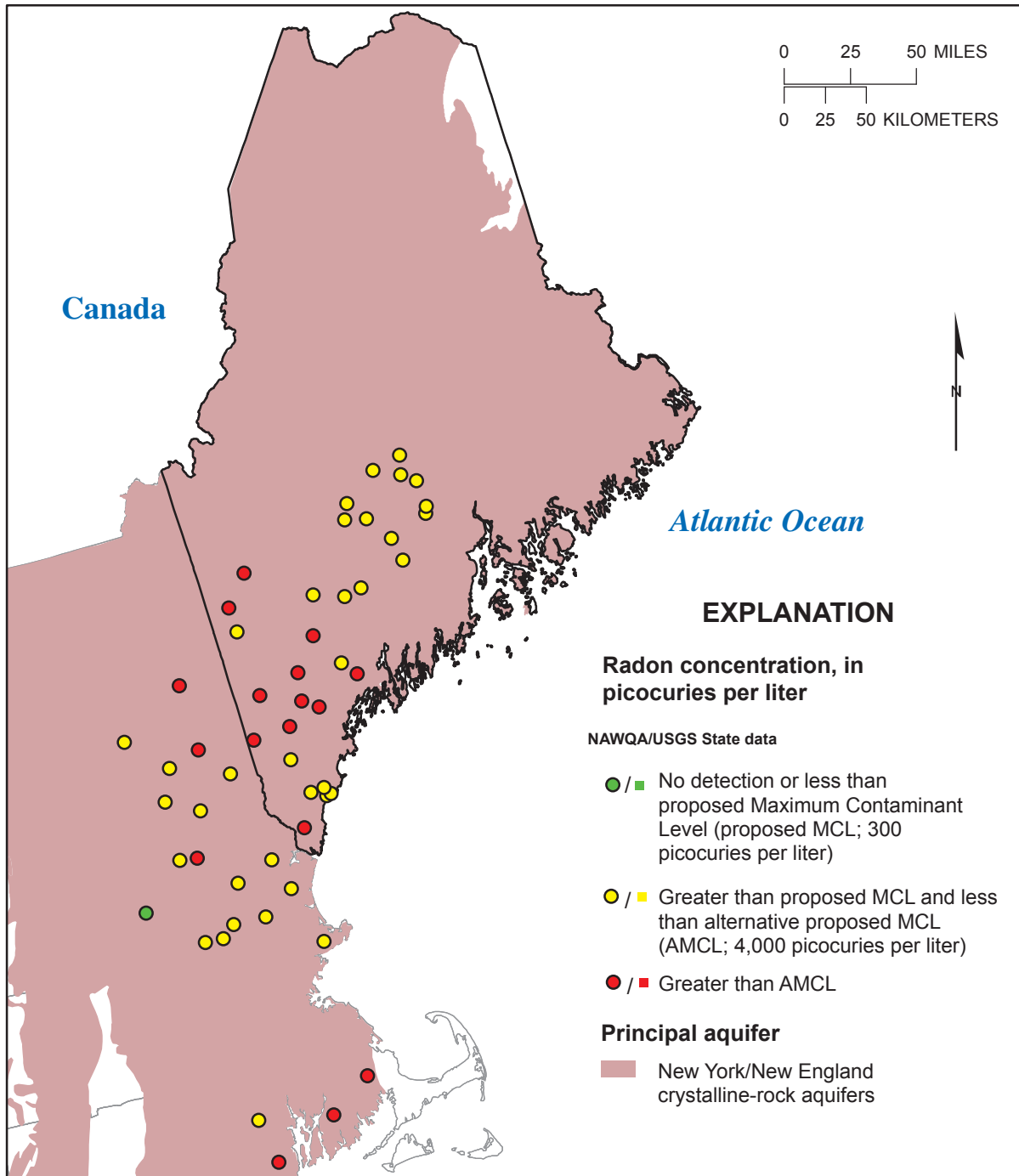
**Figure ME11.** Concentration of nitrate in samples from domestic wells in Maine and nearby States (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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Principal aquifer data from U.S. Geological Survey, 2003

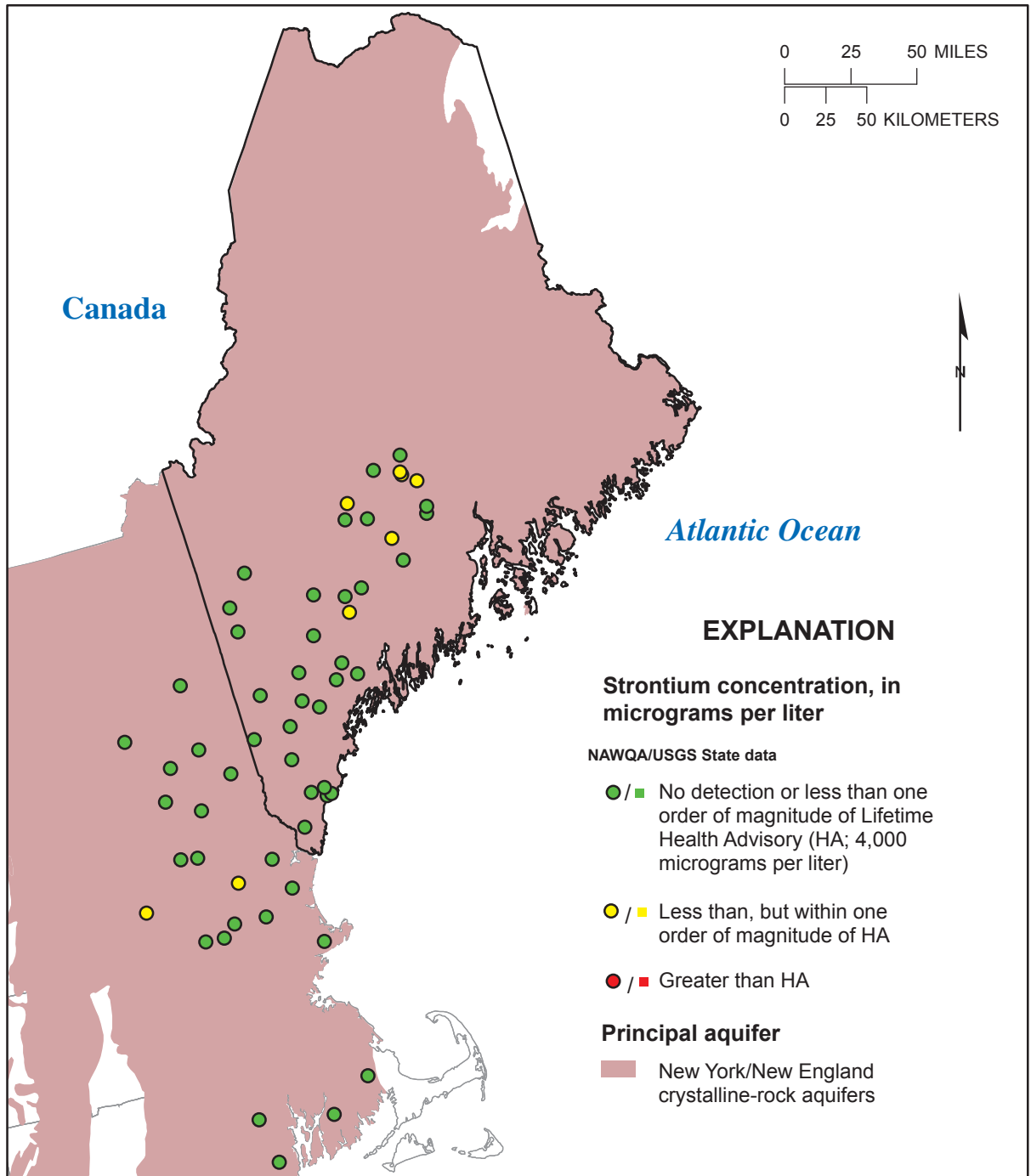
**Figure ME12.** Concentration of perchloroethene (PCE) in samples from domestic wells in Maine and nearby States (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



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 Albers Equal-Area projection  
 Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

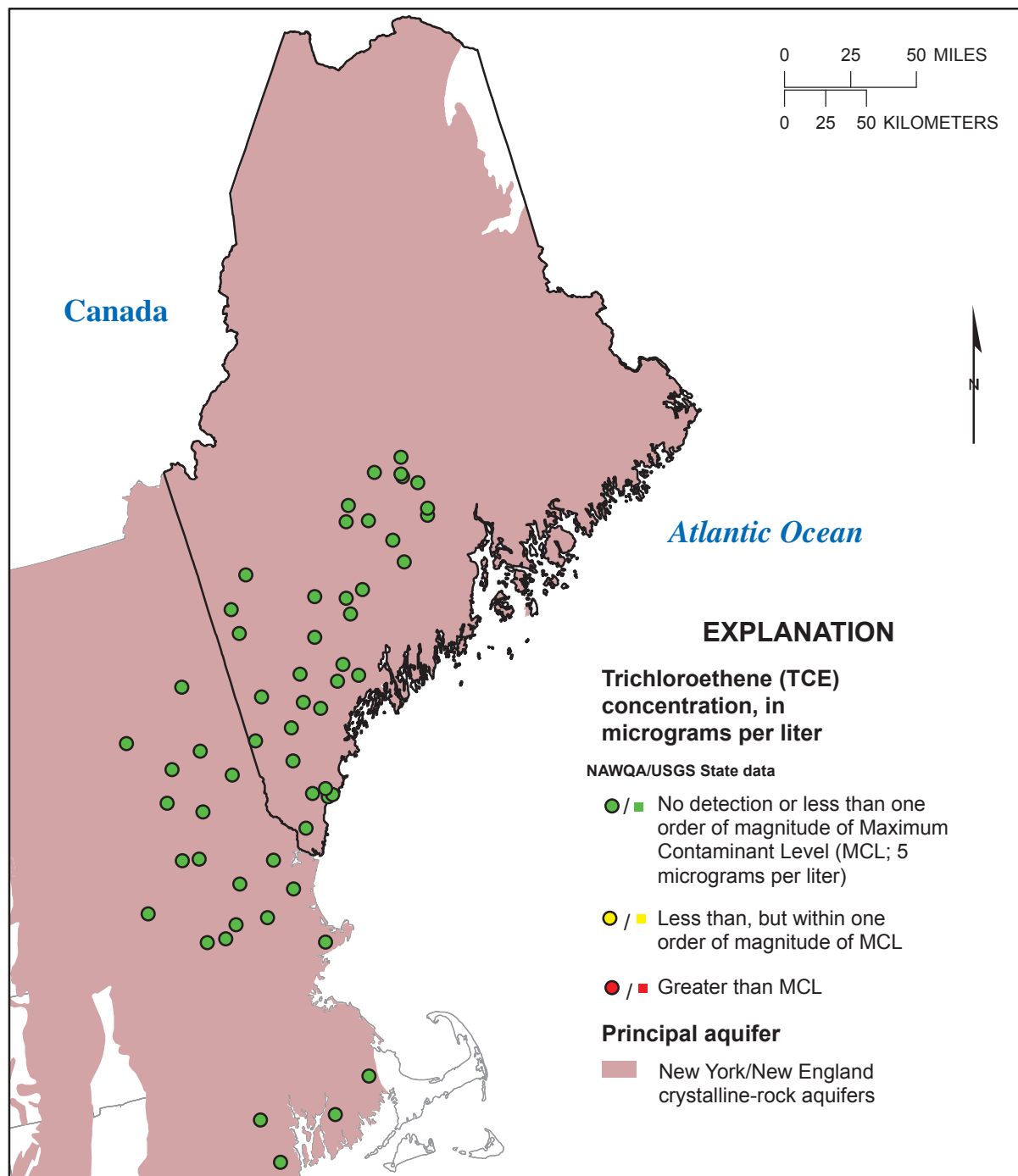
**Figure ME13.** Concentration of radon in samples from domestic wells in Maine and nearby States (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



Base information from U.S. Geological Survey digital data, 1:2,000,000  
 Albers Equal-Area projection  
 Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

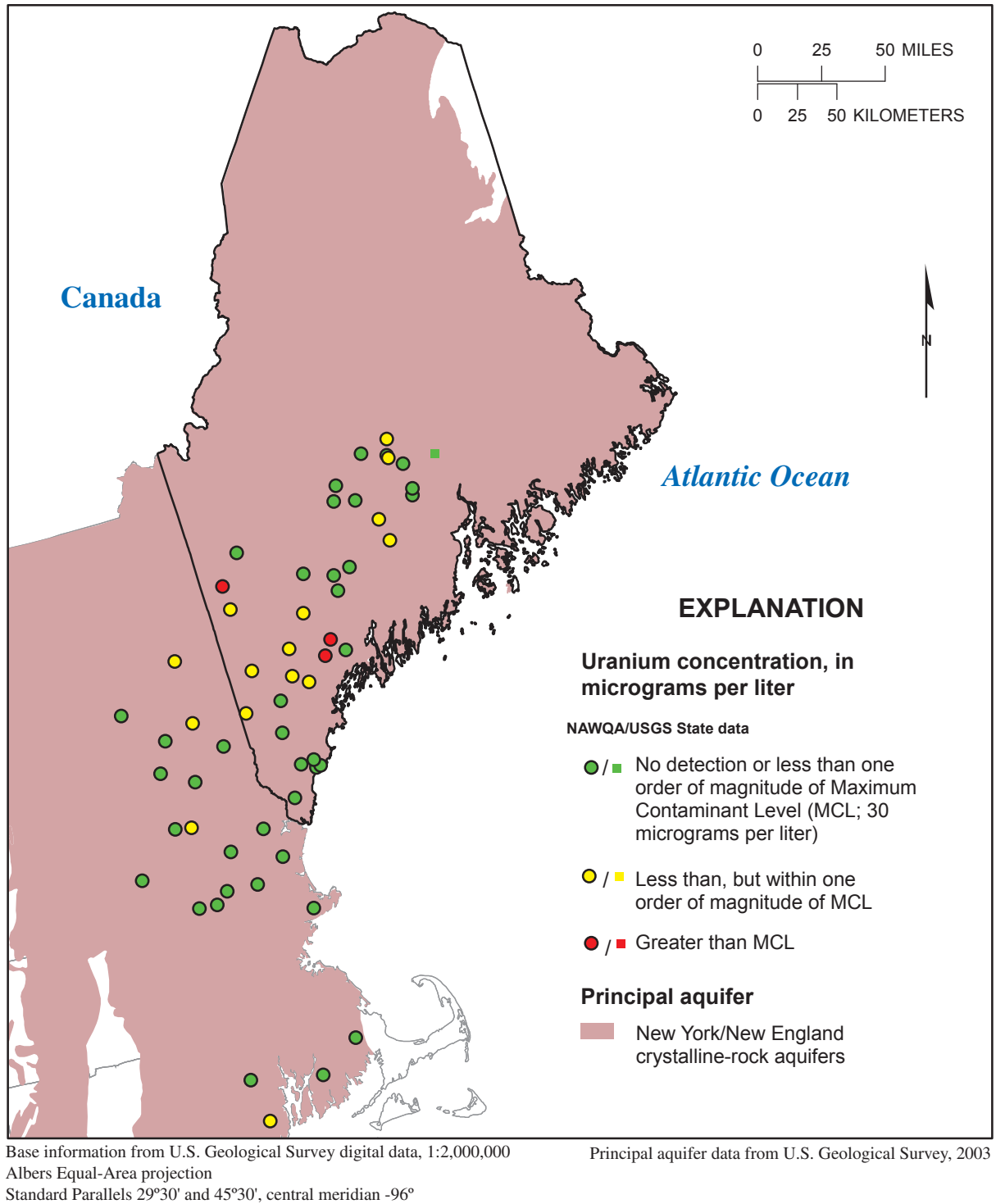
**Figure ME14.** Concentration of strontium in samples from domestic wells in Maine and nearby States (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



Base information from U.S. Geological Survey digital data, 1:2,000,000  
 Albers Equal-Area projection  
 Standard Parallels 29°30' and 45°30', central meridian -96°

Principal aquifer data from U.S. Geological Survey, 2003

**Figure ME15.** Concentration of trichloroethene (TCE) in samples from domestic wells in Maine and nearby States (from National Water-Quality Assessment (NAWQA) studies. No additional data were available from U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).



**Figure ME16.** Concentration of uranium in samples from domestic wells in Maine and nearby States (from National Water-Quality Assessment (NAWQA) studies and U.S. Geological Survey (USGS) State data in the National Water Information System (NWIS)).