

**Supporting Statement for Paperwork Reduction Act Submission
Part B**

**Study on Arsenic and Uranium in Bedrock Wells
of East Central Massachusetts
(MASSWELL)**

**OMB Control Number: 1028-NEW
Expiration Date: TBD**

B. Collections of Information Employing Statistical Methods

The agency should be prepared to justify its decision not to use statistical methods in any case where such methods might reduce burden or improve accuracy of results. When statistical methods are used, the following documentation should be included in the Supporting Statement to the extent that it applies to the methods proposed:

- 1. Describe (including a numerical estimate) the potential respondent universe and any sampling or other respondent selection method to be used. Data on the number of entities (e.g., establishments, State and local government units, households, or persons) in the universe covered by the collection and in the corresponding sample are to be provided in tabular form for the universe as a whole and for each of the strata in the proposed sample. Indicate expected response rates for the collection as a whole. If the collection had been conducted previously, include the actual response rate achieved during the last collection.**

Potential Respondent Universe and Sampling Selection Method

In the East Central Massachusetts study unit, drinking water is supplied from public and private sources. People living in large metropolitan areas and large cities and towns are generally connected to public supplies that come from surface-water reservoirs, stratified-drift aquifers, or bedrock aquifers. People living in rural communities and on the outskirts of metropolitan areas generally obtain their water from private wells drilled into the bedrock aquifers, with some private wells in stratified-drift aquifers.

The number of private bedrock wells in the east-central Massachusetts arsenic belt has been estimated at 50,000, determined by comparing public water distribution maps with town parcel maps. The Massachusetts Department of Environmental Protection (MDEP) maintains a database of private well owners (names and addresses) for the state of Massachusetts. We will use their database to sample potential respondents in our study area.

The respondent universe will be stratified based on location and proximity of bedrock wells in Essex, Middlesex, and Worcester counties. We will follow the sampling methods described by Scott (1990). To ensure that all units are represented, we will compare the distribution of the 82 different bedrock units represented in the study area (see attachment 1) to those of 50,000 potential wells in the area (Table 1).

Table 1. Bedrock well population and sample size in east central Massachusetts.

East Central Massachusetts Study Area	Estimated Number of Bedrock Wells in Study area	Potential Respondents	Estimate Response Rate
Essex County	16,000	320	255
Middlesex County	20,000	400	320
Worcester County	14,000	280	225
	50,000	1000	800

2. Describe the procedures for the collection of information including:

- * **Statistical methodology for stratification and sample selection,**
- * **Estimation procedure,**
- * **Degree of accuracy needed for the purpose described in the justification**
- * **Unusual problems requiring specialized sampling procedures, and**
- * **Any use of periodic (less frequent than annual) data collection cycles to reduce burden.**

Statistical methodology for sample selection:

To ensure that the wells chosen for this study are randomly distributed we will use a grid based computer program to produce equal area and random cells (Scott, 1990). The program will be used to subdivide the region into equal-area polygons, referred to as units. Within each unit, primary, secondary, and tertiary points will be randomly assigned by the computer software. Each well within approximately a one-mile radius of each primary point will be identified and randomly ordered. The wells will then be reviewed sequentially to determine if they are suitable for sampling. If none of the wells within a 1-mile radius of the primary point are determined to be adequate, wells around the secondary point will be identified and randomly ordered and so on.

Each point will be assigned a number and those locations will be used to approximate the corresponding address of the well owner in the MDEP database. We will contact the well owner, by mail, to determine their availability/willingness to participate in our study. If we receive a negative response, within 10 days of mailing the initial contact letter, we will follow the process described above to select a replacement.

Because arsenic and uranium concentrations vary among rock types by several orders of magnitude, we estimate that our sample area will be sufficient to indicate whether or not differences among rock types are statistically significant. One objective of the project is to determine if rock type can explain a substantial amount of the variance in the total data set. So we can not assess the degree of accuracy we will have before we have completed the sampling.

We believe that the current level of local community involvement, surrounding this topic, will assist in providing a high response rate. Concerns about possible elevated uranium and arsenic that naturally occur in some aquifers that provide drinking water to east central Massachusetts is being addressed by two state environmental agencies along with the assistance of the USGS.

We will adhere to follow-up procedures for mail surveys outlined in Dillman's Tailored Design Method (2007) to ensure an 80% response rate. Steps taken to maximize this response rate are described in question 3 below.

The survey instrument includes five fixed alternative questions, the instructions for conducting a water sample, and one question asking if they are willing to participate in a potential follow-up study. In part one, of the survey, the respondents will be asked four questions about their level of knowledge about the water in their home wells, knowledge of selected facts about the presence of naturally occurring elements in their drinking water, and one demographic question. The selected facts and technical terms have been developed in conjunction with USGS hydrologists, the Massachusetts Department of Environmental Protection (MDEP) and the Massachusetts Department of Public Health, Bureau of Environmental Health (MDPH/BEH). The format of the questions follows that of a recent study conducted in New Hampshire (<http://pubs.usgs.gov/fs/fs-051-03/>) where well owners collected water samples that were returned to the USGS using materials provided in sampling kits.

3. Describe methods to maximize response rates and to deal with issues of non-response. The accuracy and reliability of information collected must be shown to be adequate for intended uses. For collections based on sampling, a special justification must be provided for any collection that will not yield "reliable" data that can be generalized to the universe studied.

Following a modified *Tailored Design Method*, (Dillman 2007) we will employ the following steps: (1) a postcard (see attachment 1B) will be sent to each potential respondent explaining that an important survey will soon be sent to them. The purpose of the postcard is three-fold: (a) it gives the recipient an opportunity to decline participation; (b) it helps identify undeliverable addresses in the sample, and, therefore, reduces mailing costs; and (c) it helps increase the response rate by emphasizing the importance of the survey; (2) An initial mailing of the survey instrument will be sent, which will include a cover letter (see attachment 2B) explaining the importance of the survey, the survey instrument, water sampling kit, and self addressed return envelope; (3) a first follow-up postcard thank you note or reminder (see attachment 3B) will be sent one week after the initial survey mailing; (4) a second follow-up letter (see attachment 4B) will be mailed to all non-respondents three weeks after the initial mailing; (5) a third follow-up letter will be mailed to all non-respondents 7 weeks after the initial mailing (see attachment 5B); (6) if the response rate is less than 80%, a follow-up telephone call will be made to the remaining non-respondents asking them to participate in the survey.

These efforts are expected to yield a response rate of 80%.

4. Describe any tests of procedures or methods to be undertaken. Testing is encouraged as an effective means of refining collections of information to minimize burden and improve utility. Tests must be approved if they call for answers to identical questions from 10 or more respondents. A proposed test or set of tests may be submitted for approval separately or in combination with the main collection of information.

A survey instrument was reviewed by the three peer-reviewers listed in question 8 (Part A) and by a USGS Social Science Researcher (Fort Collins, CO) to ensure clarity and comprehension prior to this submission. It was subsequently revised based on their comments.

5. Provide the name and telephone number of individuals consulted on statistical aspects of the

design and the name of the agency unit, contractor(s), grantee(s), or other person(s) who will actually collect and/or analyze the information for the agency.

Statistical consultants:

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Collection and analysis agency:

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Attachment 1. Map of the east-central Massachusetts study area. The arsenic belt is indicated by the dark line outlines, and bedrock units are indicated by color.

