DPST-76-416

FIELD MANUAL FOR GROUND WATER RECONNAISSANCE

SAVANNAH RIVER LABORATORY
NATIONAL URANIUM RESOURCE EVALUATION PROGRAM

SAVANNAH RIVER LABORATORY
AIKEN, SOUTH CAROLINA 29801

PREPARED FOR THE U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION UNDER CONTRACT AT(07-2)-1

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ERDA OPEN FILES FIELD MANUAL FOR GROUND WATER RECONNAISSANCE

The Grand Junction (Colorado) Office, Energy Research and Development Administration (ERDA), has placed on open file a report entitled "Field Manual for Ground Water Reconnaissance."

The report, prepared by R. B. Ferguson, Van Price, and E. I. Baucom, of ERDA's Savannah River Laboratory (SRL), Aiken, South Carolina, is intended to direct and coordinate field operations, site selection, sample collection, and information codes for SRL's contribution to the National Uranium Resource Evaluation (NURE) program. SRL, operated for ERDA's Savannah River Operations Office by E. I. duPont de Nemours and Company, is responsible for completing a water and stream sediment survey in 25 states in the eastern United States as part of NURE.

NURE is an ongoing program of ERDA's Grand Junction Office which includes the development and compilation of geologic and other information with which to assess the magnitude and distribution of uranium resources and determine areas favorable for the occurrence of uranium in the United States.

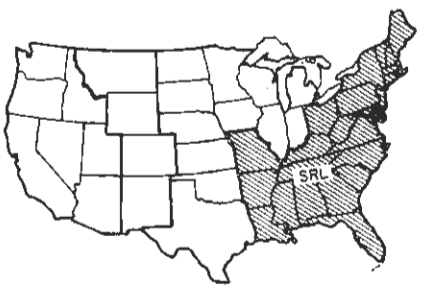
The 71-page report, GJBX-26(77) [SRL No. DPST-76-416], dated January 1977, has been placed on open file at the following locations.

FOREWORD

This manual is intended to direct and coordinate field operations, site selection, sample collection, and information codes for the Savannah River Laboratory (SRL) contribution to the National Uranium Resource Evaluation (NURE) program. The manual provides public relations information for field sampling teams as well as technical direction.

The NURE program was begun in the spring of 1973 to evaluate domestic uranium resources in the continental United States and to identify areas favorable for commercial exploration in response to the rapidly increasing national demand for uranium. The Grand Junction Office of the Energy Research and Development Administration (ERDA) is responsible for administering and coordinating NURE program efforts. Inputs to the NURE program come from ERDA prime contractors, ERDA-sponsored research and development, the uranium industry, U. S. Geological Survey (USGS), U. S. Bureau of Mines (BuMines), other government agencies, and independent sources.

In 1975, SRL accepted responsibility for hydrogeochemical and stream sediment reconnaissance surveys of twenty-five states in the eastern United States. Oak Ridge Gaseous Diffusion Plant (ORGDP), Los Alamos Scientific Laboratory (LASL), and Lawrence Livermore Laboratory (LLL) have accepted responsibility for similar reconnaissance surveys in the rest of the continental United States including Alaska.



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by

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INTRODUCTION

The Energy Research and Development Administration (ERDA) was created by Congress in January 1975 to consolidate various energy programs funded by the Federal Government. ERDA is conducting or funding research and development work in a number of fields including solar energy, wind energy, geothermal energy, nuclear fission, breeder reactors, and nuclear fusion. ERDA is also evaluating the United States reserves of fuels for energy sources and methods of containing or disposing of their wastes.

Current domestic uranium reserves fall far short of meeting requirements projected to the year 2000. An estimated eight-year lag occurs between discovery and production of uranium (Figure 1). To stimulate commercial uranium exploration, the Atomic Energy Commission (AEC) initiated the National Uranium Resource Evaluation (NURE) program in the spring of 1973. NURE is a comprehensive program to evaluate domestic uranium resources and to identify areas favorable for uranium exploration.

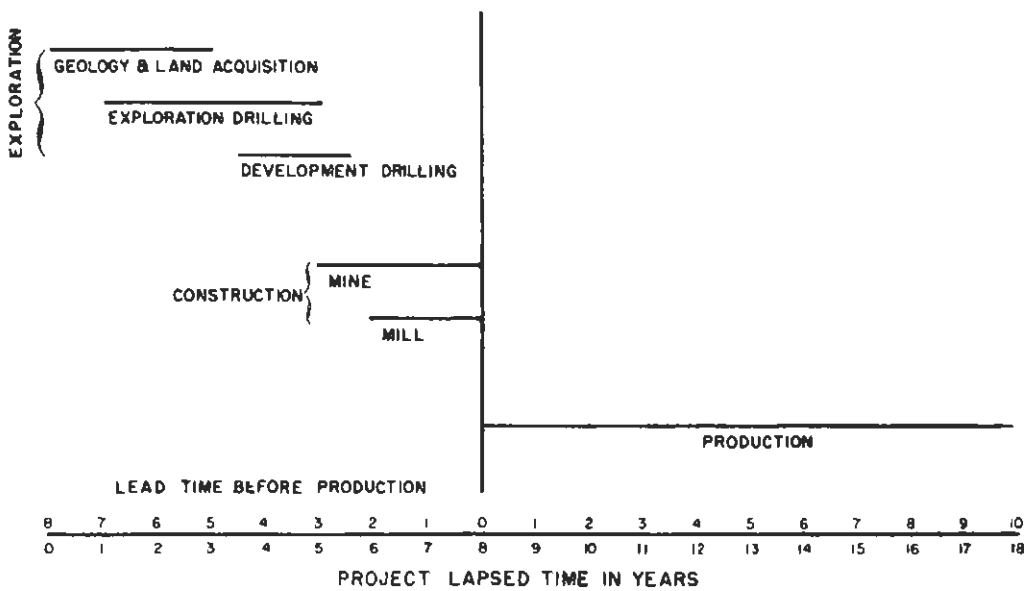

FIGURE 1. Typical Lead Time from Discovery to Production of Uranium

The overall objectives of the NURE program are:

- To achieve a preliminary evaluation, based on existing data, of domestic uranium resources and favorable exploration areas by January 1976.
- To conduct a more comprehensive evaluation of domestic uranium resources and favorable areas by October 1981.
- To develop new and improved procedures, equipment, and technology for uranium search and assessment.
- To disseminate information on new exploration concepts and technology, and to identify new areas favorable for uranium exploration at the earliest possible date through publications, open files, and seminars.

The Grand Junction Office of the Energy Research and Development Administration (ERDA-GJ) has completed the first objective* and is responsible for administering and coordinating efforts to meet the other objectives. Inputs to the NURE program come from ERDA prime contractors, ERDA-sponsored research and development, the uranium industry, U. S. Geological Survey (USGS), U. S. Bureau of Mines (BuMines), other government agencies, and independent sources.

There are seven major areas within the NURE program:

- Aerial radiometric reconnaissance.
- Hydrogeochemical and stream sediment reconnaissance.
- Surface geologic investigation projects.
- Geologic drilling projects.
- Remote sensing projects.
- Geophysical technology development.
- Low-grade (<500 ppm U) study project.

The Savannah River Laboratory (SRL), Oak Ridge Gaseous Diffusion Plant (ORGDP), Los Alamos Scientific Laboratory (LASL), and Lawrence Livermore Laboratory (LLL) have accepted responsibility for hydrogeochemical and stream sediment reconnaissance of the United States as shown in Figure 2. The objective of this

* The report was issued by the Grand Junction Office as document GJO-111(76).

portion of the program is to accomplish a systematic determination of the distribution of uranium in surface and underground waters and in stream sediments in the continental United States, including Alaska. The significance of the distribution of uranium in natural waters and stream sediments will be assessed as an indicator of favorable areas for the discovery of uranium deposits.

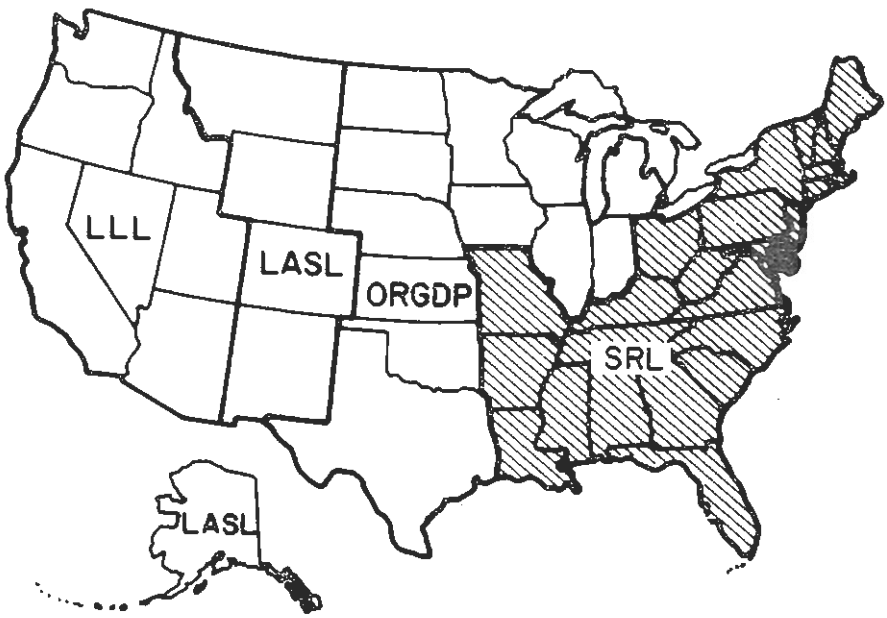

FIGURE 2. Areas of Responsibility for Hydrogeochemical Reconnaissance

The areas of responsibility are based on geologic provinces normalized to state boundaries (Figure 2). Assignments are based on geologic provinces because similar geochemical factors should control both the occurrence of uranium deposits and the hydrogeochemical expression of uranium. For administrative reasons, areas of responsibility are coincident with state boundaries.

The area of responsibility for SRL includes all of the Atlantic and Gulf Coastal Plain states except Texas, all of the Appalachian Highlands, most of the Interior Low Plateaus (Kentucky, Tennessee), and most of the Interior Highlands (Missouri, Arkansas).

Before entering the reconnaissance phase of the NURE program, SRL conducted an extensive development program (see References 1-6 for planning and progress reports). Techniques were developed to obtain great precision and accuracy for analyzing uranium concentrations from <0.020 parts per billion

(ppb) in natural waters to >600 parts per million (ppm) in rocks and sediments. Field orientation studies were conducted in a variety of geologic and geographic settings to develop technical and operational experience applicable to the reconnaissance program. Seasonal variability studies are in progress from South Carolina to Maine. Variability of sampling techniques was studied to ensure that a representative sample can be taken at a given site. Sampling instructions in this manual are derived in part from SRL experience and in part from standard geochemical sampling practices.

Samples collected in the NURE program will be archived for future study. Geochemical samples collected systematically over broad areas will constitute a significant national resource. Even though SRL will currently analyze samples only for uranium and geochemically related elements, every effort will be made to ensure the integrity of the samples for possible additional analyses in the future.

The NURE program is being conducted with public funds for the equal benefit of all Americans. Contractors participating in the NURE program have an obligation to protect the public interest. All samples, sample splits, duplicates, data, observations, and all other items of information obtained during the course of operation under a contract to participate in the SRL/NURE program are to be provided only to SRL. None are to be retained for private use or communicated to others without the prior written consent of SRL and ERDA.

All data, theories, speculations, and conclusions derived from operations under an SRL/NURE contract are the property of ERDA and are to be communicated only to SRL. The Grand Junction (Colorado) Office of ERDA will release data and reports simultaneously at a number of sites across the country as rapidly as these releases can be processed. SRL will notify individual land owners of results obtained on samples from their property at the time of the ERDA release, if their request for such information has been noted on a field data form. Field personnel may provide land owners with pH, conductivity, and alkalinity data. SRL will provide analytical data (Column 77 on Figure C-1) to land owners only when this is a specific requirement for access.

A number of individuals and companies, both domestic and foreign, are currently exploring for uranium in the eastern United States. The field supervisor should stress to his personnel that ANY information released may result in proprietary benefit not in the public interest. It should be stressed to individual land owners who inquire that a contractor's presence at a given site is in no way related to the presence or absence of a uranium deposit at that site, and that this sampling is part of a program to cover the entire nation.

FIELD OPERATIONS

A. LOGISTICS AND PUBLIC RELATIONS

1. Liaison with Public Officials

a. Notification

Prior to team operation in a given county, it is required that the field supervisor visit the county seat, present proper identification, and notify the county sheriff's office of the sampling program in that county. A few minutes spent in a public relations effort in various county offices could prove of immense benefit. Undoubtedly, door-to-door solicitation for samples will result in some citizen contact with local law enforcement officials.

b. Cooperation

In many small towns, the town engineer or other official may provide access to a municipal well. In some areas, the county health department or water commission may be able to provide lists of semi-public wells, such as those at factories, restaurants, drive-in theaters, housing developments, etc., which may be sampled without knocking on doors or at hours when domestic wells are not available for sampling. NOTE: Sampling personnel should be especially careful to follow instructions given below with regard to collecting <u>untreated</u> water only.

2. Access to Property

a. Private Property

Most NURE samples will be collected on private property. The land owner's permission must be obtained at every site. Care should be taken to avoid any damage to private property.

b. Military Bases

The commanding officer of each base enjoys a great deal of autonomy in controlling access to the base. The field supervisor should attempt to contact this person well in advance of any planned sampling on the base. Problems in gaining access should be reported promptly to SRL.

c. Forest Service Lands

The Forest Service of the United States Department of Agriculture manages, protects, and conducts research on many thousands of acres of timberland in the SRL area of responsibility. We have been assured the cooperation of the Forest Service in our program as long as our activities are no detriment to the forest environment or resources.

Any off-road sampling requires prior notification of the Forest Supervisor and contacts with District Rangers at the time of sampling. Since ground water sampling is done primarily at domestic or public wells, this aspect of the NURE field program will not require careful coordination with the Forest Service.

District Rangers may be of assistance in arranging contacts with private land owners and other persons having a proprietary interest in lands within the District. In addition, the U. S. Forest Service maintains wells and springs at campgrounds and picnic areas, the location of which may be most readily determined by inquiring at the District Ranger's office.

d. Indian Reservations, Parks, Wildlife Refuges, and Other Public Preserves

The field supervisor should contact the local agent, tribal representative, ranger, warden, or other official-in-charge several days prior to anticipated sampling. No problems in gaining access are anticipated.

3. Identification

ERDA identification cards are to be issued to all sampling team personnel. A short brochure giving some highlights

of the NURE program has been prepared so that sampling teams will have something tangible to leave with property owners. In no case is false identification or misrepresentation of purpose to be used.

4. Rejection

Most land owners will be more than happy to cooperate and may volunteer much useful information. Some may forbid access to their property, and at least one will be downright hostile during the course of operation. LEAVE WHEN ASKED!

5. Team Numbers

Each field supervisor will assign team codes using SRL guidelines to his team and furnish SRL a list of the team members and codes. A team code consists of a letter designating the field supervisor and a number which is unique for each person or pair on a team.

EXAMPLE: Team KO7
Field Supervisor: King
Team Seven: J. Doe, M. Brown

6. Liaison with SRL

The field supervisor will contact SRL at least once weekly by telephone or messenger. SRL is to be apprised in advance of the general area being sampled and is to be given a motel or boarding house address and a telephone number where the field supervisor can be contacted at SRL initiative during any twenty-four-hour period.

The field supervisor is expected to be abreast of team activities at all times; under normal circumstances, SRL will communicate with field teams only through the supervisor.

Routine maintenance of equipment is the responsibility of the field supervisor. SRL will perform major repairs or replacements of equipment, but turn-around time may be on the order of several weeks. The field supervisor should try to detect failing instruments and anticipate needed repairs. It is suggested that a daily log of instrument checks be kept to aid in identifying failing meters or probes.

B. SAMPLING SITE SELECTION AND SITE OPERATIONS

1. Sampling Density

Orientation studies indicate than an adequate sampling density will vary with the complexity of the areal geology. A density of one sample per 5 to 10 square miles appears to be adequate to define most geologic features expected in such complex areas as the Appalachian Piedmont or Blue Ridge provinces. Densities as low as one sample per twenty square miles may be adequate to define uraniferous units in less complex areas. Insofar as practical, sampling density will be tailored to regional geology and will be specified by SRL on a county-by-county basis.

2. Site Selection Procedure

The procedure suggested for site selection is given in Appendix A.

3. Sample Collection

Detailed instructions for sample collection are given in Appendix B.

4. Coding of Field Data Forms

Detailed instructions for coding of field data forms are given in Appendix C.

C. RETURN OF SAMPLES TO SRL

The contractor is responsible for all samples until these are received by SRL in usable form. Payment will be made only for samples which are clearly labeled and which are accompanied by completed and correct data forms and collected sample maps.

1. Maps

Each sampling contractor will be furnished two or more sets of field maps, one of which is returned with the samples. Coordinates of sampling points will be measured directly from the map returned with each group of samples.

Maps must be clean, unfolded (rolled in protective tubes), and labeled with sampling sites precisely indicated as points within circles.

Care must be taken to assure that each site identifier is unique to only one sample. Two samples with the same identifier are both worthless.

2. Data Forms

Data forms, in a moisture-proof enclosure, must accompany samples. Detailed instructions for completing these forms are given in Appendix C.

3. Samples

Samples should be checked before shipping to assure that labels and lids are securely attached. It is recommended that labels be taped with transparent tape. Samples are to be bagged or boxed together by map unit (county) and shipped in secure cartons. Neatness in packaging will facilitate sample check-in at SRL and thereby facilitate payment.

4. Cartons

Each shipping carton should contain samples and forms from only one map unit. If multiple map units are shipped together, they must be separated or compartmentalized within cartons.

A packing list must be attached to the exterior of each carton shipped. The packing list should include: (a) a tabular listing of all samples, (b) any data forms enclosed, (c) any maps accompanying the shipment, and (d) the order number (AX number) of the contract. A duplicate packing list should be enclosed in the carton.

5. Shipping

Samples are to be delivered or shipped to SRL at approximately two(2)-week intervals. The recommended method of shipping is by motor freight to E. I. du Pont de Nemours and Company, 300/700 Receiving Department, Dunbarton, South Carolina. Air freight to Augusta, Georgia, via Delta or Eastern Air Lines has also been satisfactory. These air lines have no air freight forwarders.

APPENDIX A: SITE SELECTION PROCEDURES

This site selection procedure is to serve as a guideline for ground water sample site selection. The primary objective of site selection is to provide coverage which is (as nearly as possible) uniform, complete, and representative.

1. County road maintenance maps are generally available and provide the most up-to-date representation of rural road systems. Topographic maps, U. S. Forest Service maps, and other special maps will be useful in some areas and may be necessary where counties do not maintain roads. SRL will supply county road maps and lists of four-letter map designators.

2. A grid of some specified unit size (nominally 10 square miles; 3.16 miles per side) is ruled on the field map. A grid size will be specified by SRL wherever this size is different from 10 square miles.

3. In the field, the sampler selects a well or flowing spring as near the center of each grid unit as is practical. In some areas, rigid adherence to a grid system or following only the best roads may lead to a sampling bias against certain geologic units. For example, limestone or shale valleys may be sampled preferentially, and sandstone ridges may be under-represented. Because sandstone may provide a favorable host for uranium deposits, this bias could introduce serious errors in the evaluation of uranium potential in a sampling area.

   Sampling personnel must be relied upon to have sufficient judgment to avoid grossly biasing sampling by either over- or under-representing geologic units.

4. Occasionally, grid units may not provide a sampling site. The contractor must make a reasonable effort to secure samples representative of each grid unit and should strive diligently to leave no two adjacent units unsampled.

   Conversely, where rapidly changing geology so dictates, the sampling density may be increased locally at the sampler's option. Major deviation from the nominal sampling density must be approved by SRL before samples are collected.

5. As samples are taken, sites are numbered sequentially, i.e., no valid sample identifiers are to be skipped. Sampling location is to be marked in the field as the samples are collected.

APPENDIX B: SAMPLE COLLECTION

PART I. DAILY PREPARATION

Several tasks MUST be completed prior to each day's field work. These tasks are discussed in this section and are summarized in a checklist at the end of this appendix.

Sampling in the field will normally be done by one person. This person is responsible for collecting the ground water sample, performing field analyses (pH, temperature, conductivity, and alkalinity), pressure filtering the ground water sample, treating the filtered ground water with ion exchange resin, and performing record-keeping tasks. Field equipment will consist of a portable field laboratory packed in an instrument case (Figure B-1), a pressure filter in a carrying case (Figure B-2), an ion-exchange resin recovery case (Figure B-3), and an ion-exchange stirring case (Figure B-4).

Specific supplies, equipment, and instructions are summarized in Table B-1 and discussed below:

- *Maps and Data Forms* — Enough data forms should be kept in the lid of the instrument case to provide one for each site to be visited plus several spares. THESE MUST BE KEPT DRY. The SRL sampling site map(s) showing approximate sample site locations must also be readied for each day's work and stored in the instrument case or other suitable container. At the end of each day the EXACT sample site locations and site codes are transferred to a master map. Each map should be checked individually to see that all maps needed are present. Spare wooden (or mechanical) soft lead (No. 2B) pencils should also be carried in the instrument case.

- *Bromo-Cresol Green/Methyl Red Indicator* — A plastic dropping bottle of bromo-cresol green/methyl red indicator solution (hereafter called "indicator") is securely enclosed in a plastic bag and placed in the instrument case. A 125-ml Ehrlenmeyer flask is cleaned, condition-checked, and placed in the instrument case.

- *Acid Bottle (0.02N)* — A plastic dropping bottle full of 0.02N sulfuric acid is SECURELY CLOSED in a plastic bag and placed in the instrument case (Figure B-5).

- *Equipment Check* — The plastic bags in which the instruments are sealed should be checked daily for holes or leaks. The silica gel desiccant should be blue. The instruments generally are not dependable if they are operated in a damp environment. The conductivity meter and pH meter are shown in Figures B-6 and B-7, respectively. The pH meter, packaged in plastic to guard against moisture, is shown in Figure B-8.

  The batteries in the conductivity meter and pH meter should all be checked, using the procedures described later. Batteries found weak should be replaced by the FIELD SUPERVISOR only. The pH calibration should be checked in pH 4, 7, and 10 buffers EACH MORNING. The conductivity meter should be checked with 0.001M KCl solution EACH MORNING. The temperature circuit in the conductivity meter should be checked once a week against a standard thermometer. All instrument repairs should be done by the FIELD SUPERVISOR, who has been issued a manual for the instruments. The field supervisor must be thoroughly familiar with the manual and the instruments.

  The field instrument case should be emptied and cleaned daily, carefully removing the plastic foam protective liner each time. If any noticeable amount of dust or dirt have accumulated in or on the foam liner, it should be cleaned.

- *Pressure Filter* — A pressure filter (Figure B-9) consisting of a one-liter reservoir lined with polytetrafluoroethylene is supplied for filtering ground water samples. The filter is pressured to 40 psig with a fluorocarbon gas in small cans (Figure B-10). The fluorocarbon gas can is connected to the filter by a quick disconnect. General Electric Company (Schenectady, New York) *Nuclepore* 0.8 μm filters (142 mm diameter) are used as filter membranes.* In general, one liter of ground water can be filtered in one to two minutes.

- *Ion Exchange Resin* — A special, high-purity, mixed ion exchange resin (100-200 mesh) is packaged in 2-ounce polyethylene bottles (Figure B-11). This resin is VERY expensive and packaged in special clean areas. DO NOT OPEN a bottle until just before using. Special care should be taken to prevent dust from getting into the resin or into the filtered ground water. If contamination is suspected, then discard the contaminated resin or water.

- *Interchange Cap* — A special interchange cap has been designed to enable the liter bottle of ground water to be coupled to the 2-ounce bottle of ion exchange resin. The interchange cap (Figure B-12) allows resin to be added to the water sample without dust getting into the sample. The interchange cap is also used to transfer the resin back into the 2-ounce bottle (Figure B-13).

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* No endorsement either by E. I. du Pont de Nemours and Co. or by USERDA is intended by reference to brand names in this report. Other similar equipment or supplies may perform satisfactorily.

- *Ion Exchange Resin Recovery Case* — An ABS plastic case is provided to carry 28 one-liter bottles. After the ground water samples are collected, filtered, and treated with the ion exchange resin ("ion-exchanged"), the bottles are inverted in the carrying case to recover the resin. This is shown schematically in Figure B-14 and is pictured in Figure B-15.

- *Stirrer* — A 6-volt, direct-current stirrer and battery (Figure B-16) are provided to stir the ion exchange resin in the liter of ground water. The resin is stirred a minimum of 10 minutes. A special 6-volt battery charger is provided to recharge the battery each evening. A spare battery is also provided. A fully charged battery will provide more than 20 hours of stirring. In an emergency, a standard 6-volt lantern battery can be used.

- *Water Deionizer Columns* — A water deionizer, consisting of three columns, is provided to obtain deionized water for rinsing. The first column contains activated charcoal to remove organics and chlorine. The second and third columns contain mixed-bed, ion exchange resin to remove dissolved ions. Use drinking water as supply water for the columns. When the color changes on ~1/2 the length of the second column (indicating it is exhausted), then replace the first and second columns.

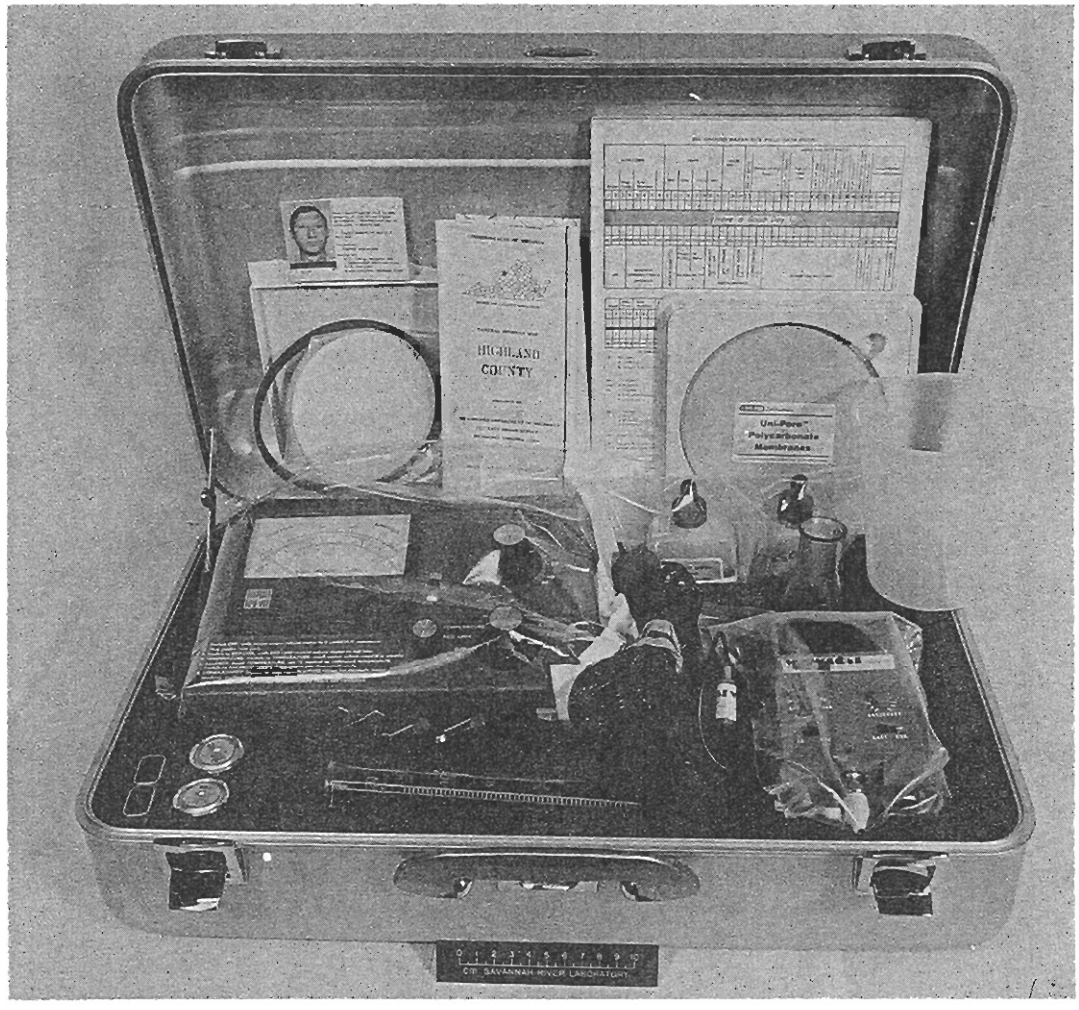


FIGURE B-1. Instrument Case Containing Portable Field Laboratory

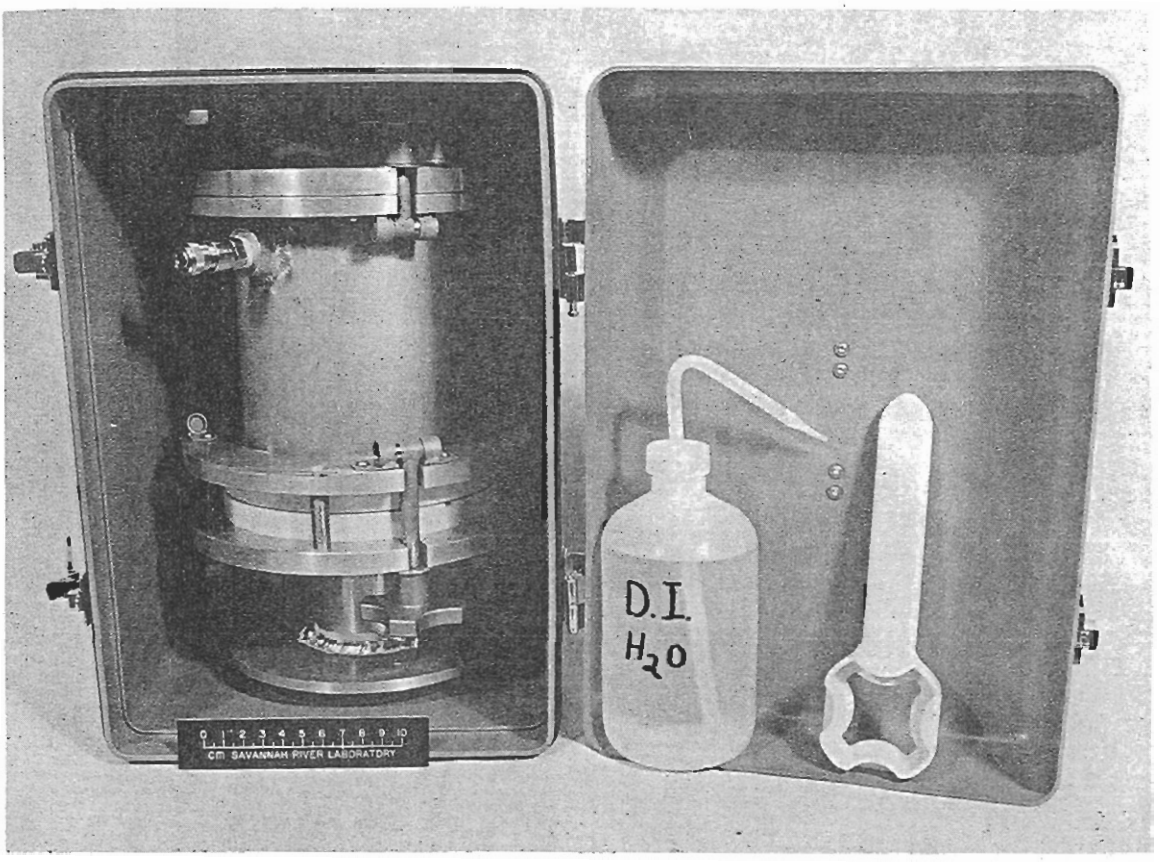


FIGURE B-2. Pressure Filter Assembly in Case

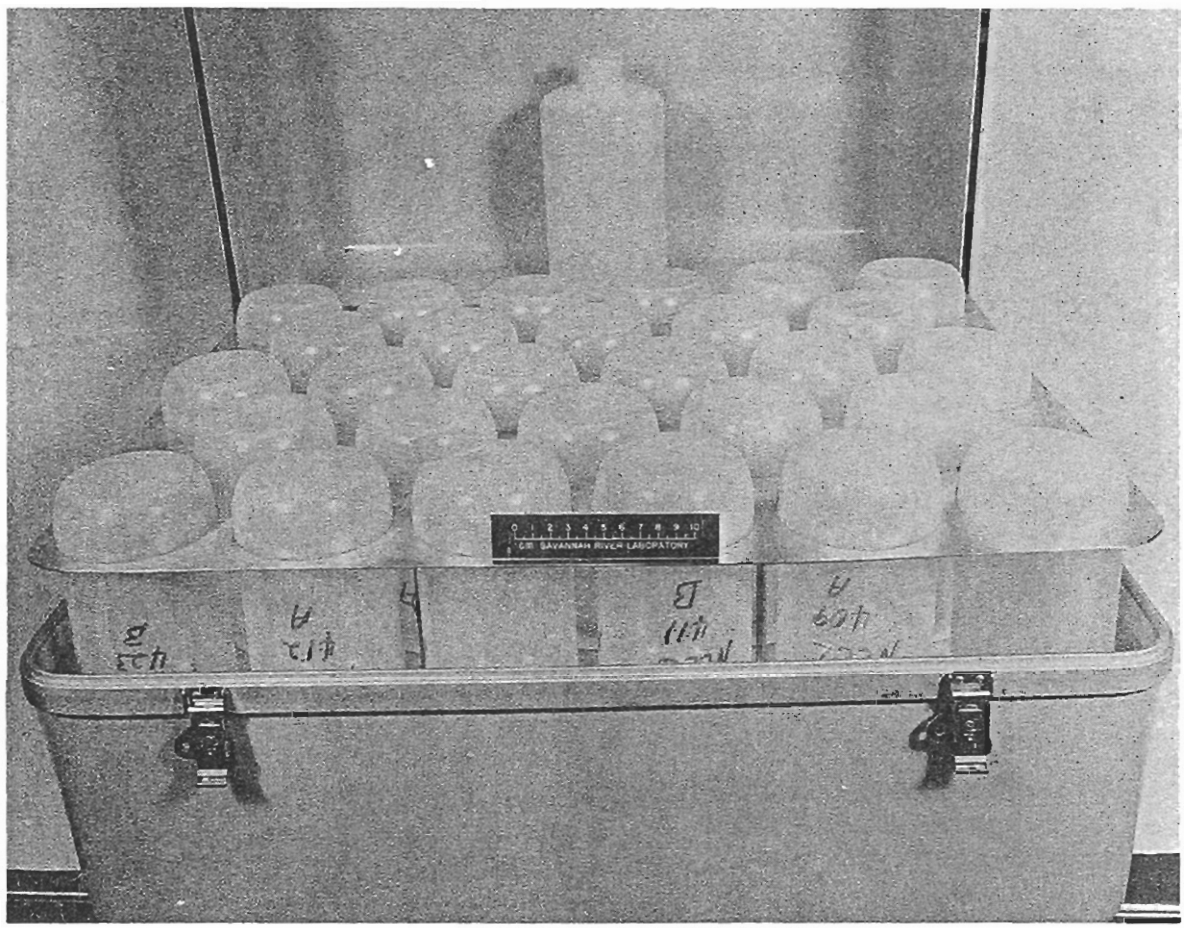


FIGURE B-3. Ion Exchange Resin Samples in Recovery Case

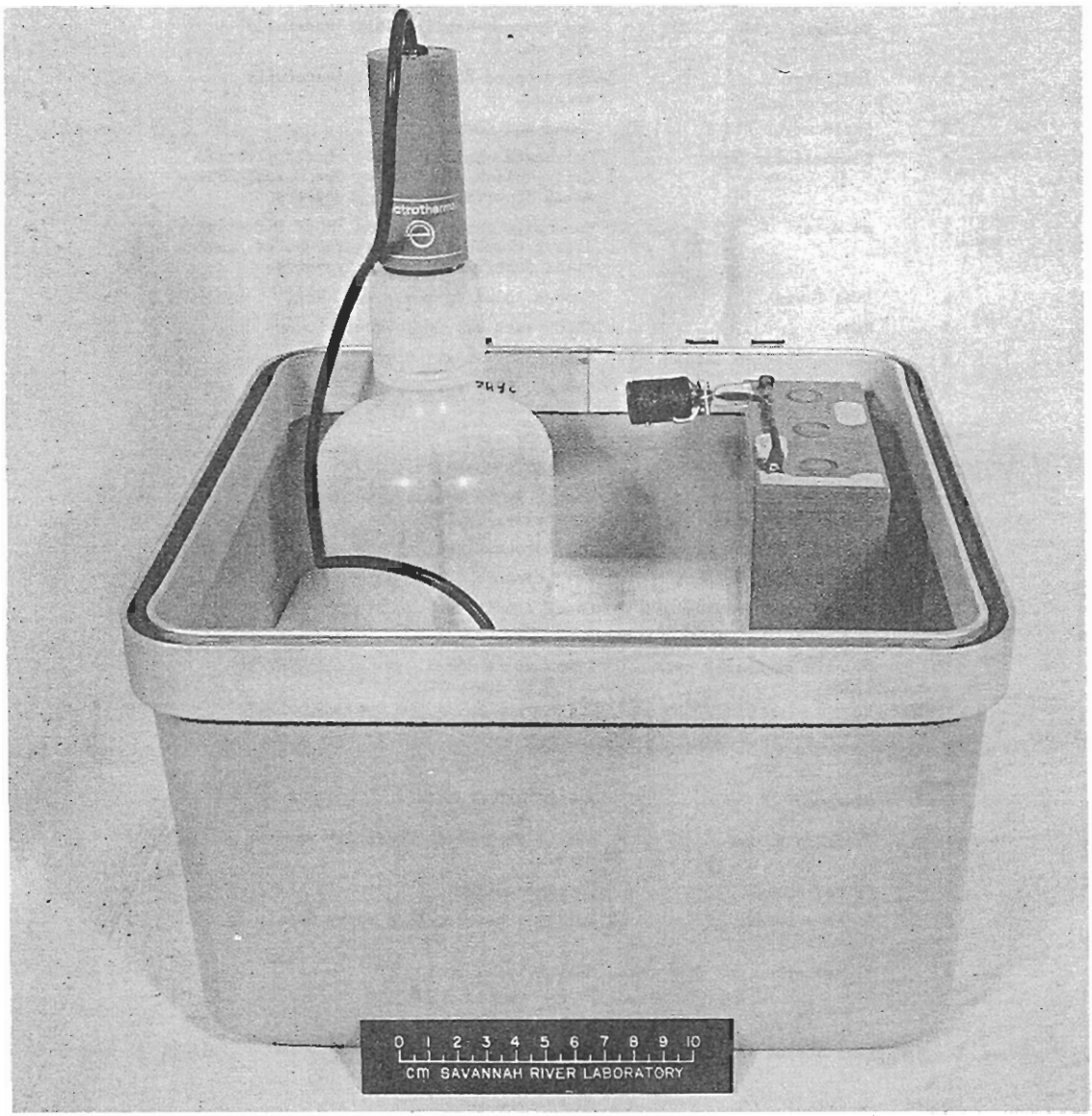


FIGURE B-4. Stirring Assembly and Case for Ion Exchange Resin Samples

TABLE 8-1

Daily Work and Equipment Checklist

A. Equipment Stored in Instrument Case

Item Number	*Equipment*	*Amount and Condition*
1	Sulfuric Acid, 0.02N	One dropper-bottle, full, carefully wrapped.
2	Indicator	One dropped-bottle, full, carefully wrapped.
3	Ehrlenmeyer Flask, 125 ml	Clean and inspect.
4	Conductivity Meter	Calibrate instrument and check batteries daily; check plastic bag for holes; call Field Supervisor for any repairs.
5	pH Meter	Calibrate instrument and check batteries daily; check plastic bag for holes; call Field Supervisor for any repairs.
6	Data Forms	Enough (plus spares); keep dry.
7	Maps	Check each map individually.
8	Identification Cards	Keep handy at all times.
9	Wooden or Mechanical Pencils (No. 2B)	Enough, plus spares.
10	Aluminum Case	Inspect, clean, and dry.
11	Paper Towels	Enough, plus spares.
12	*Nuclepore* 0.8 µm (142 mm) Filter Membranes	Enough (plus spares); handle very carefully.
13	Filter Membrane Tweezers	Check condition.
14	Spare Filter Support	Keep clean.
15	Spare Filter O-Ring	Check condition.
16	500-ml Plastic Beaker	Keep clean.
17	Plastic graduated cylinder	Clean and inspect.

B. Equipment Stored in Pressure Filter Case

Item Number	*Equipment*	*Amount and Condition*
1	Pressure Filter	Clean; dry; check condition very carefully.
2	Filter Wrench	Check condition.
3	Squeeze Bottle of Deionized Water	One full bottle; keep spare bottle in car.
4	Fluorocarbon gas pressure can	Enough, plus spare.

C. Equipment Stored in Ion-Exchange Resin Recovery Case

Item Number	*Equipment*	*Amount and Condition*
1	1-liter Plastic Bottles and Caps	28 bottles; clean; rinse with deionized water; shake dry; and cap.
2	Interchange Caps	28 caps; clean; rinse with deionized water; shake dry; store in clean plastic bags.
3	Bottle Holder	Check condition.

D. Equipment Stored in Ion Exchange Stirring Case

Item Number	*Equipment*	*Amount and Condition*
1	D.C. Stirrer and PTFE Coated Blade	Check condition; carry a spare.
2	6-volt Battery	Check for full charge; carry a spare.
3	2-liter Water Collection Plastic Bottle and Cap	Clean and cap.

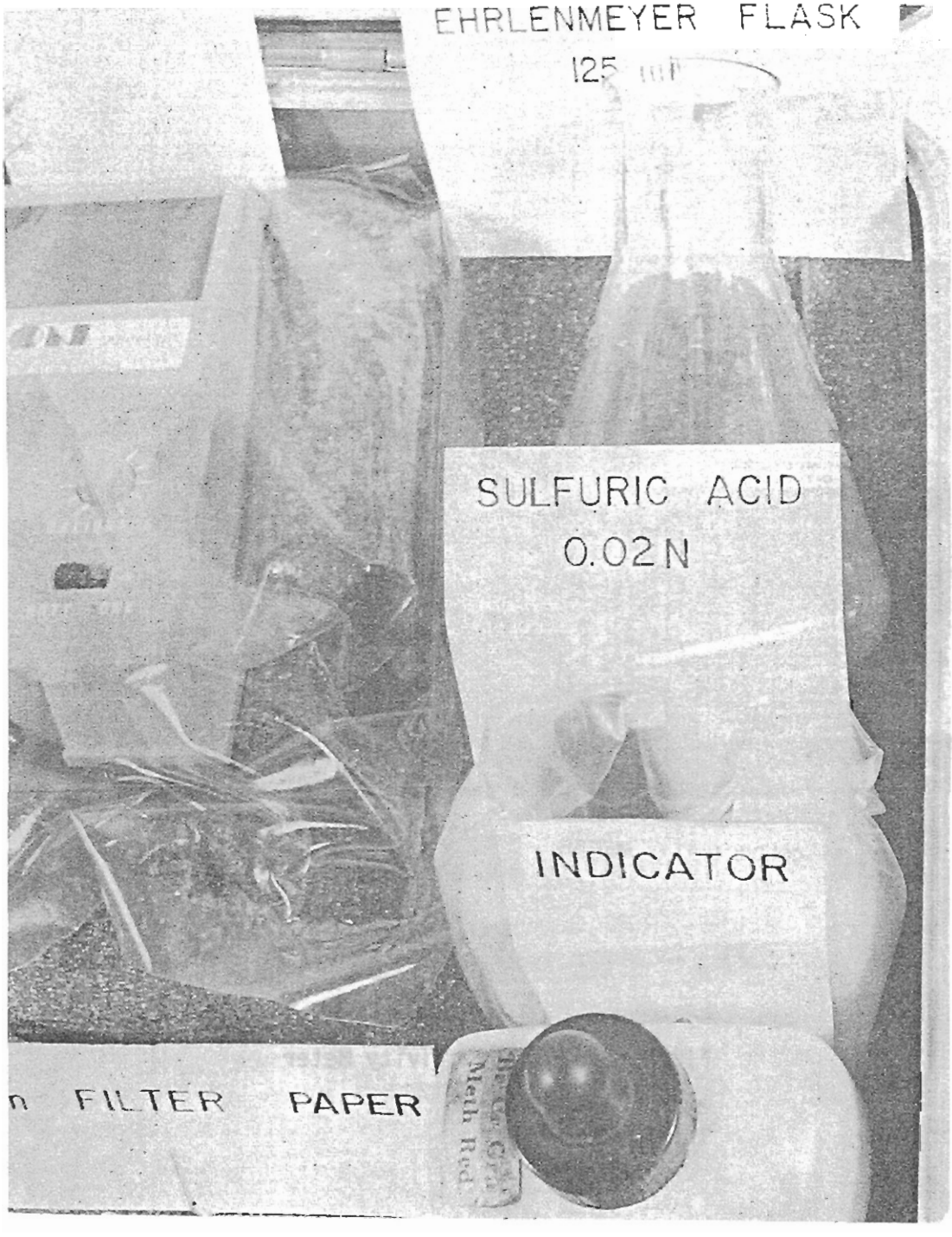


FIGURE B-5. Stowage of Acid Bottle in Instrument Case

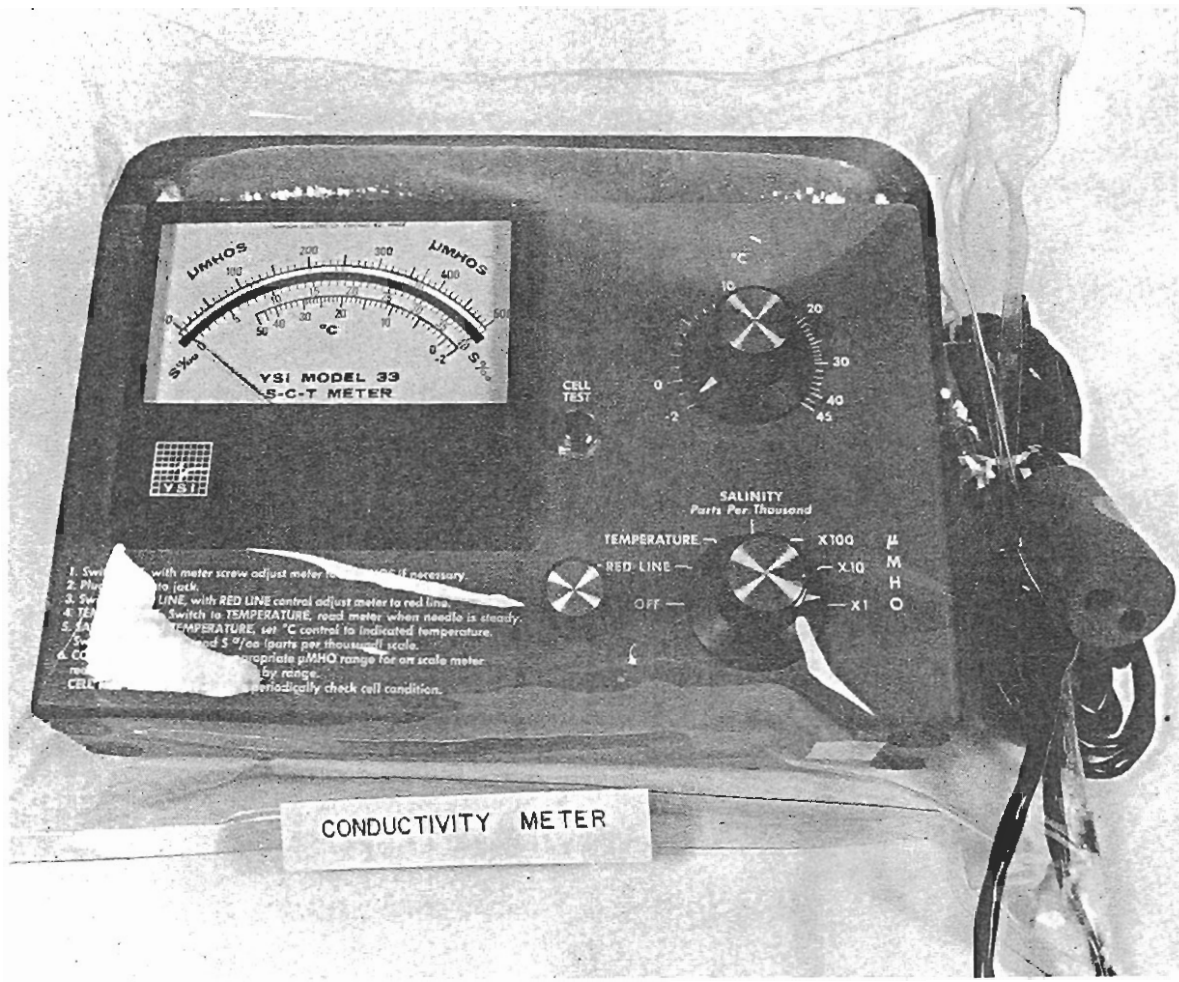


FIGURE B-6. Conductivity Meter

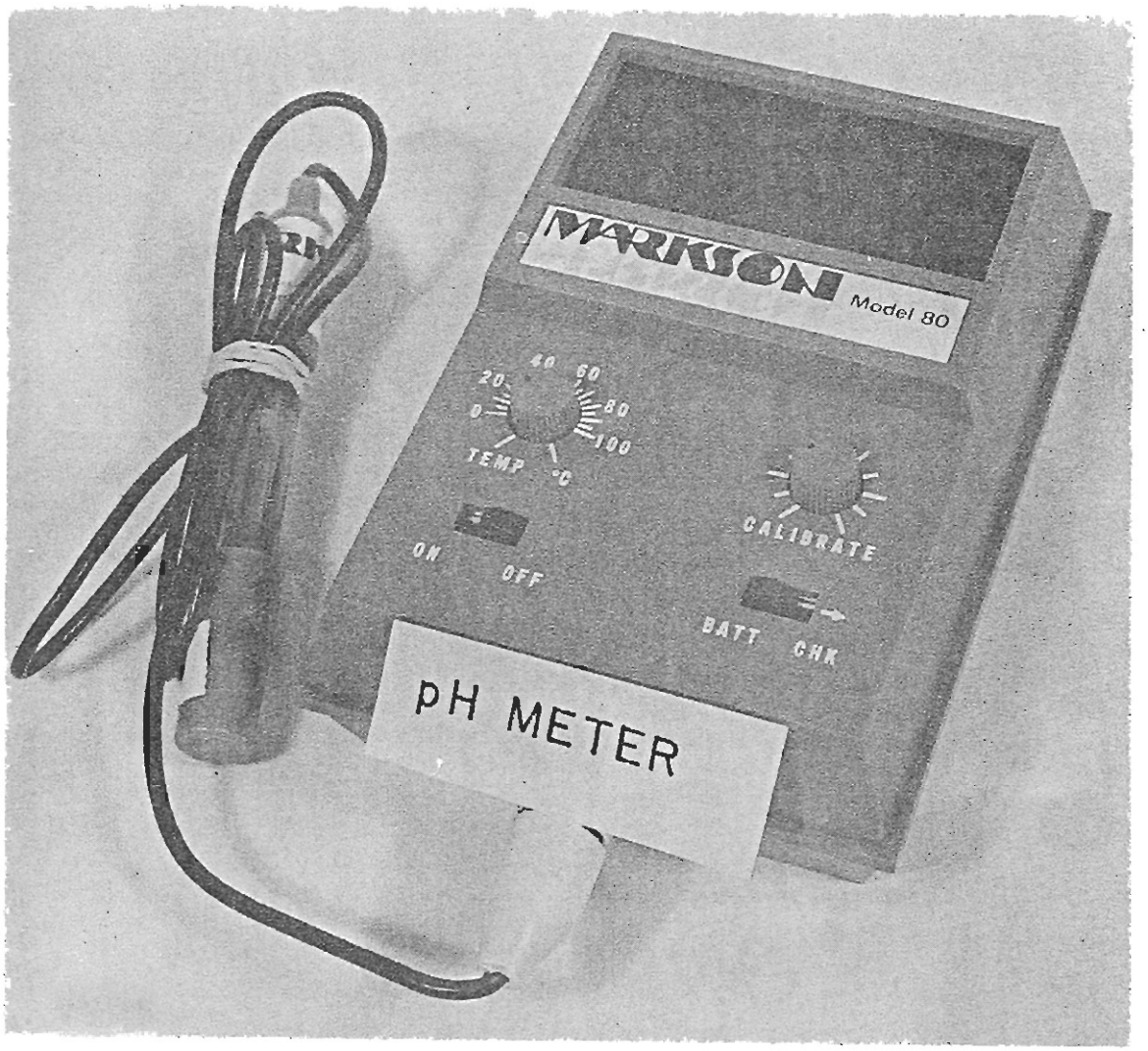


FIGURE B-7. pH Meter

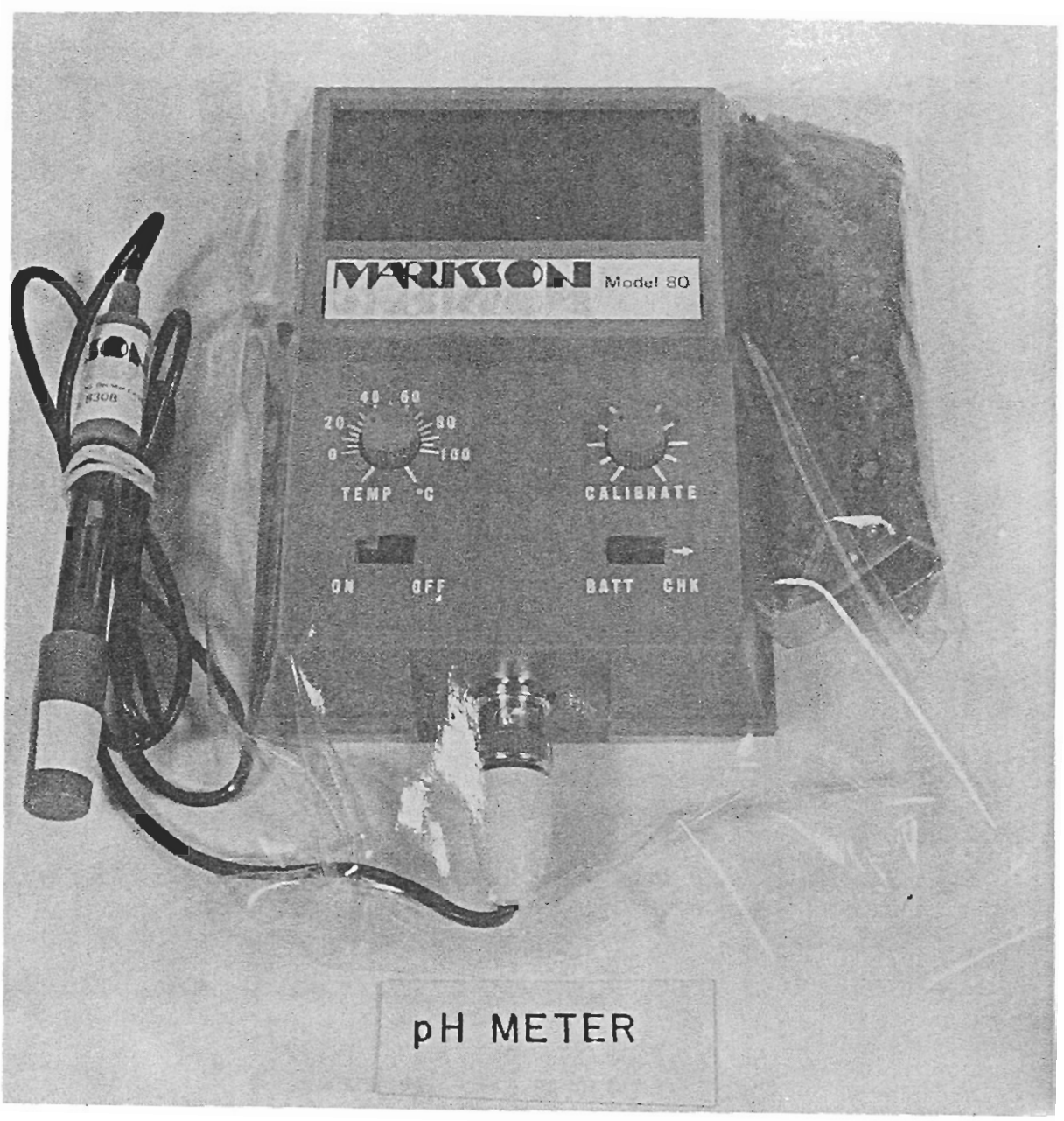


FIGURE B-8. Packaged pH Meter

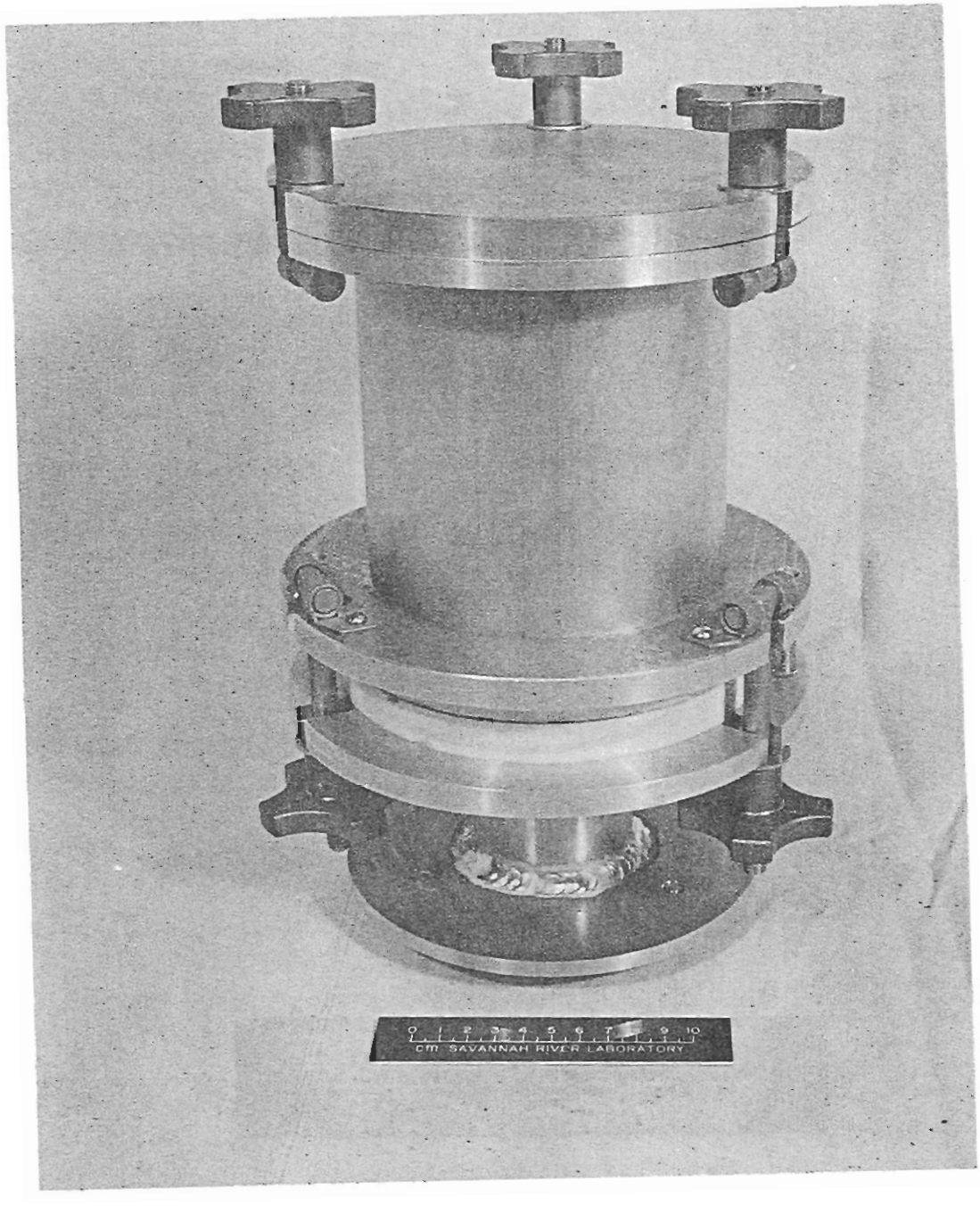


FIGURE B-9. Pressure Filter Assembly

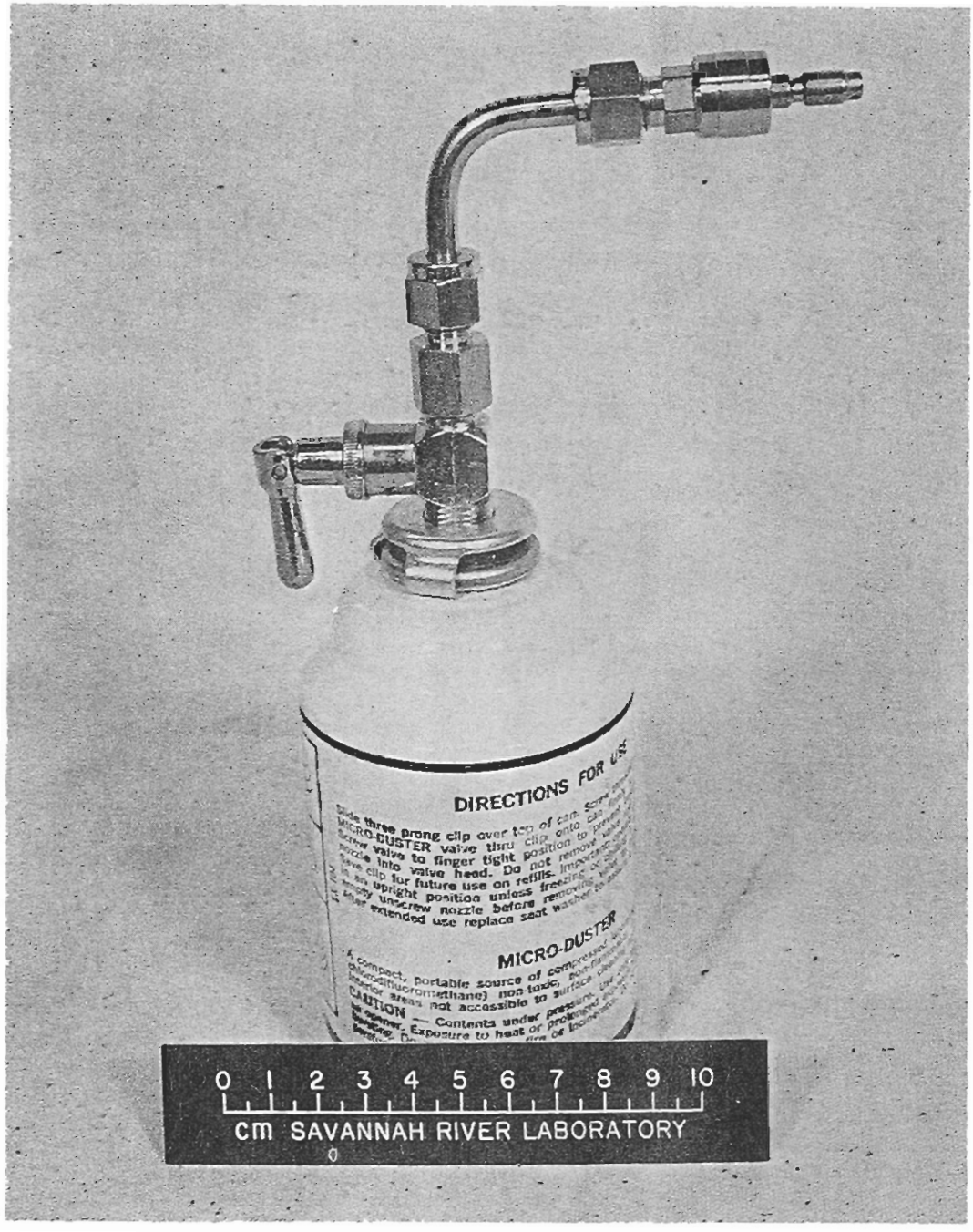


FIGURE B-10. Gas Pressurizing Assembly

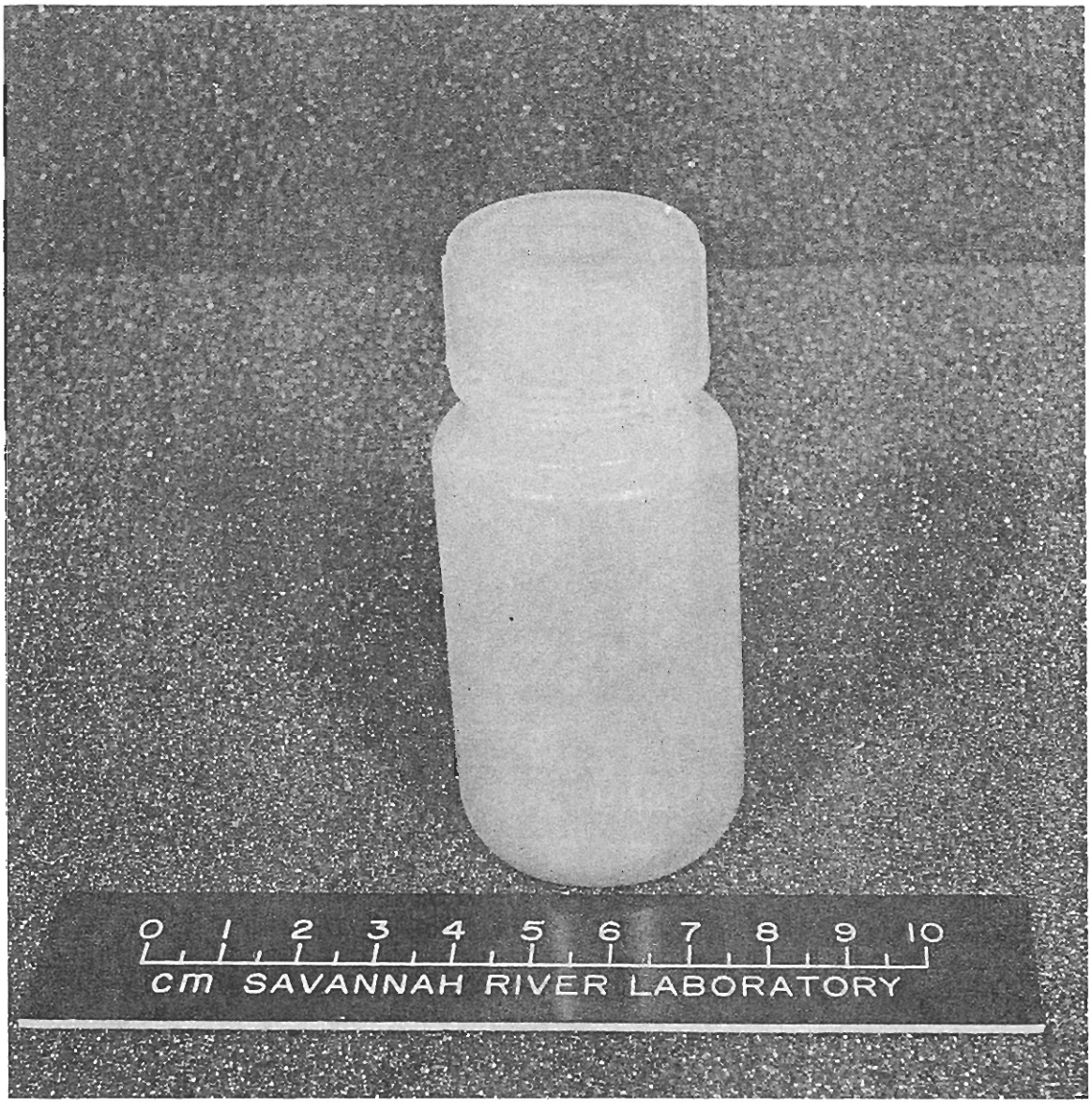


FIGURE B-11. Bottle Containing Ion Exchange Resin

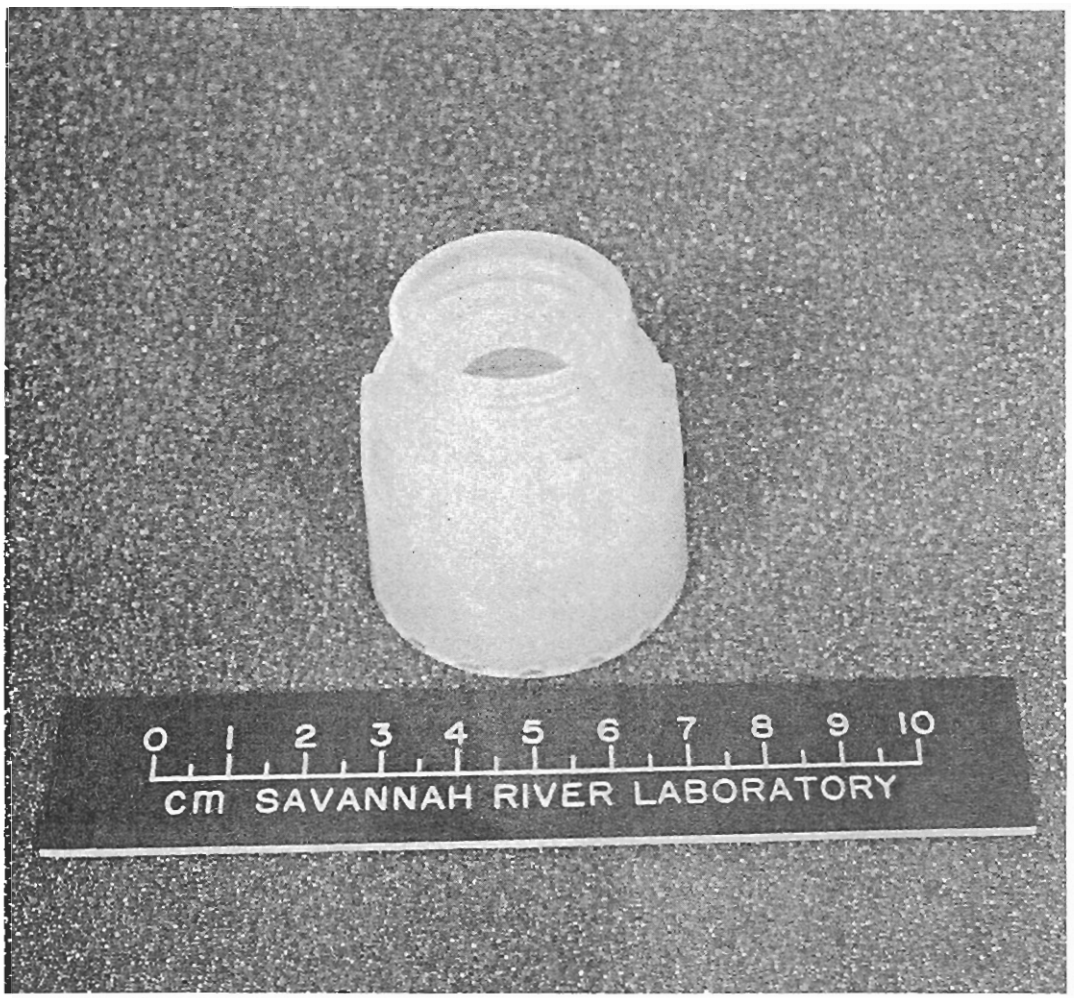


FIGURE B-12. Interchange Cap for Ion-Exchange Resin Bottle

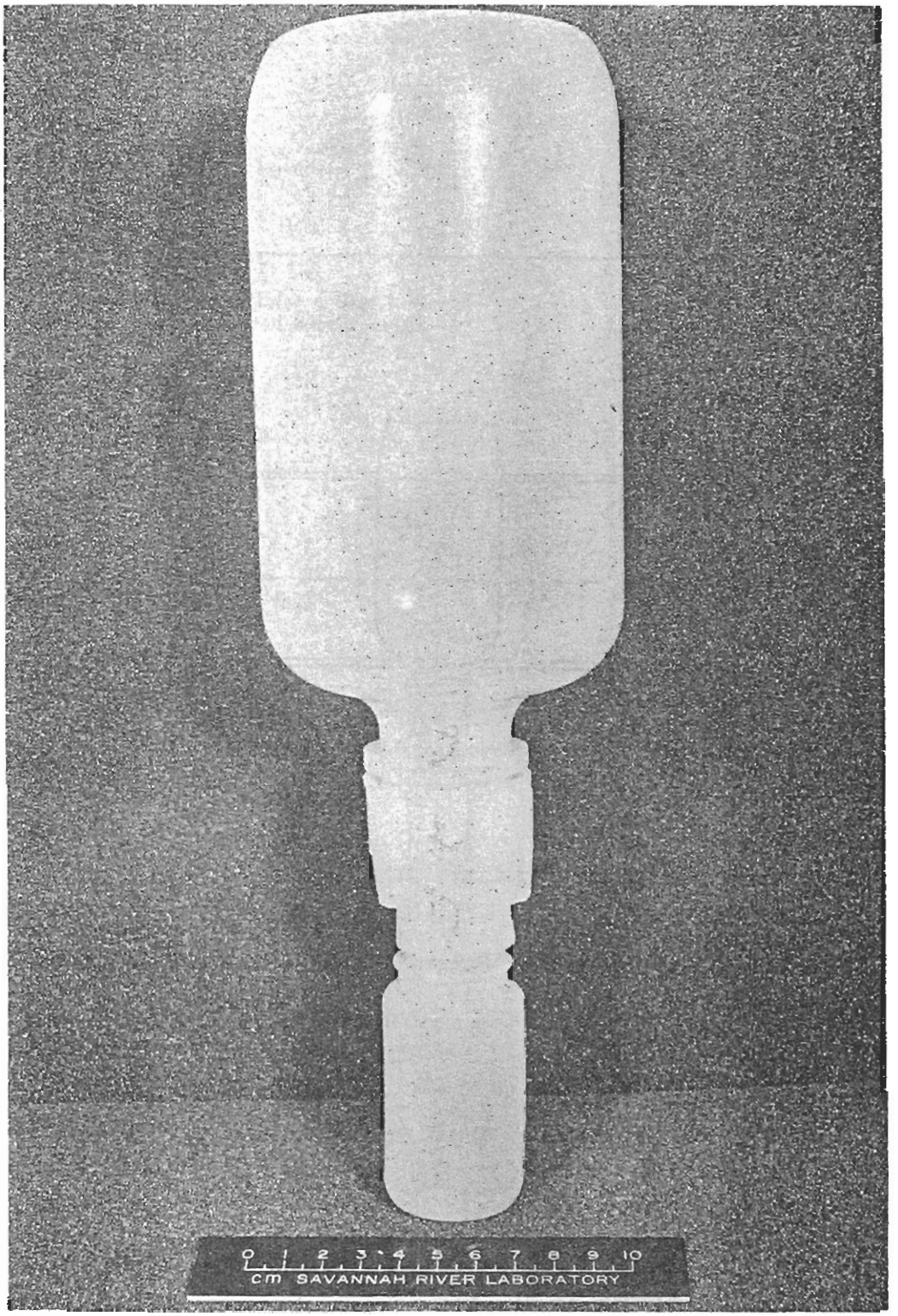


FIGURE B-13. Assembly for Transfer of Ion Exchange Resin

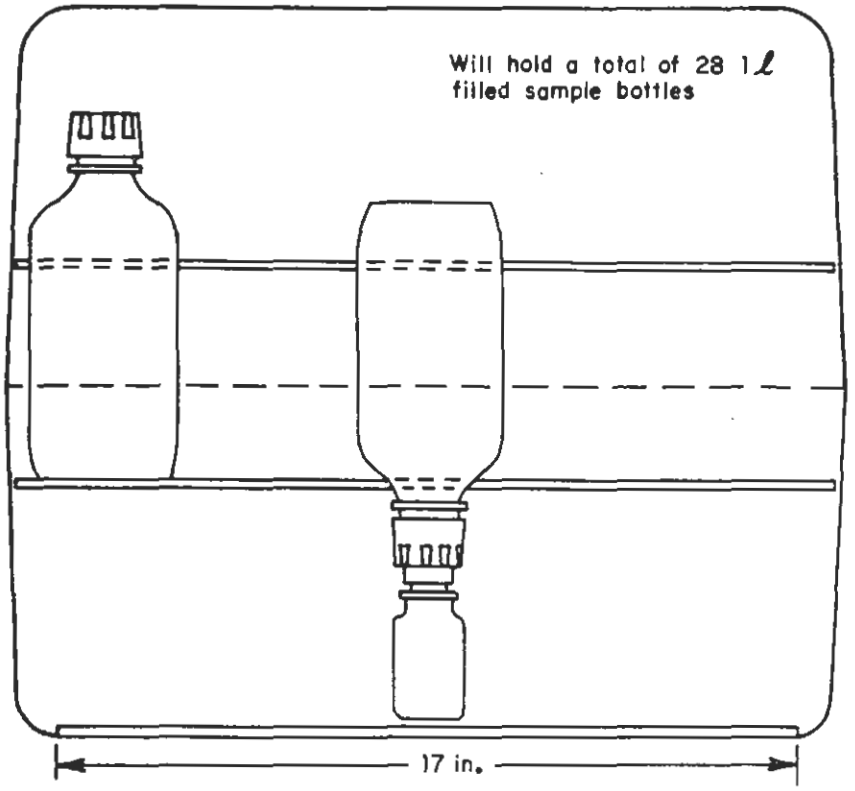


FIGURE B-14. Cross-Section of Carrier for Ion Exchange Resin Bottles

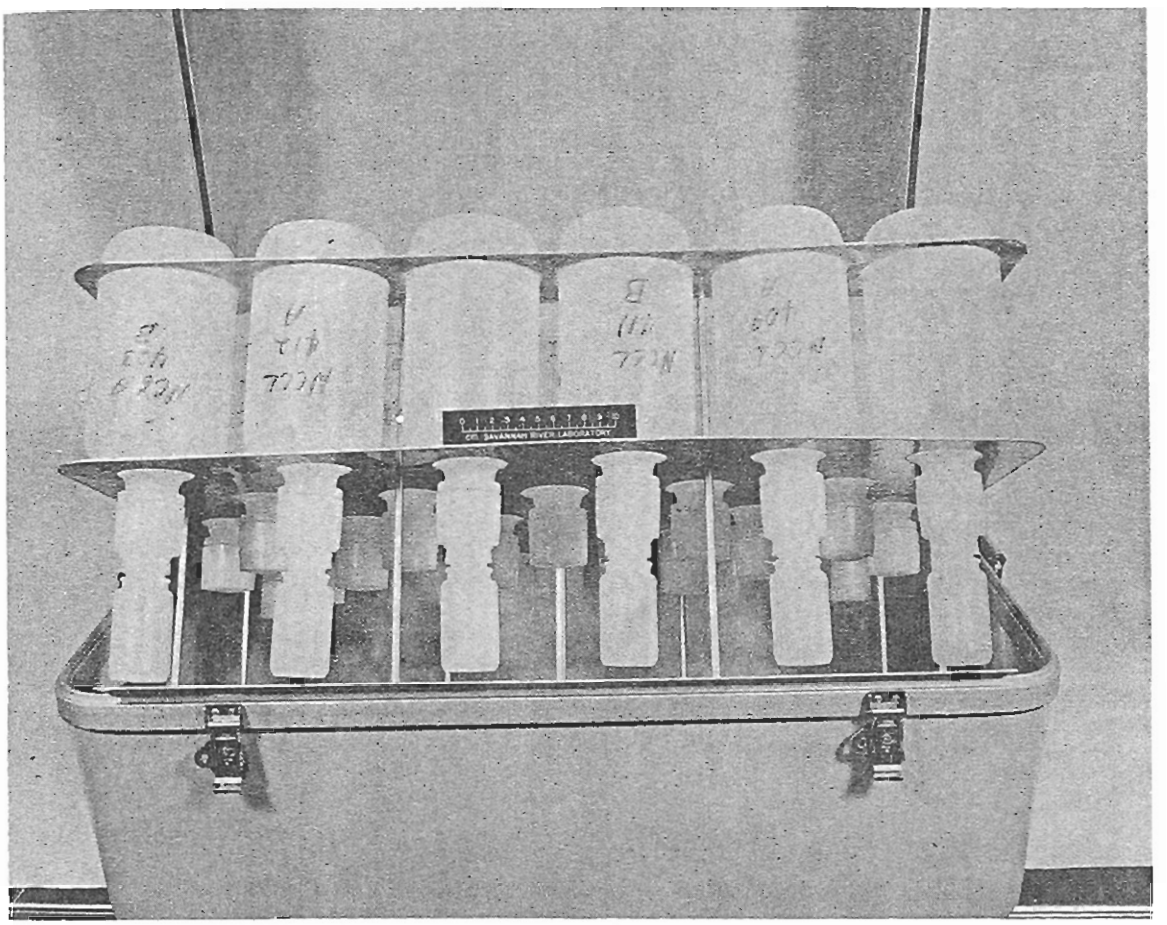
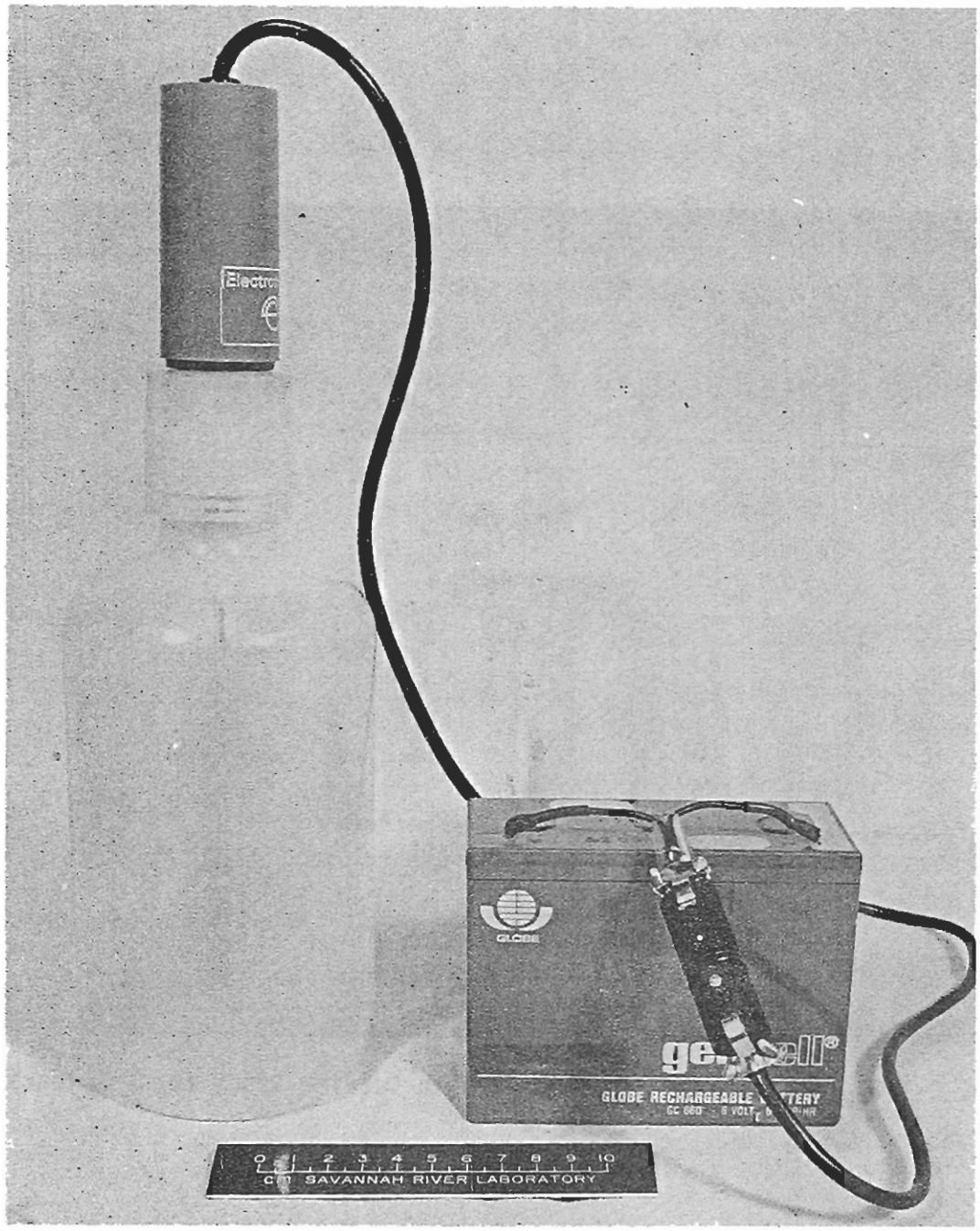
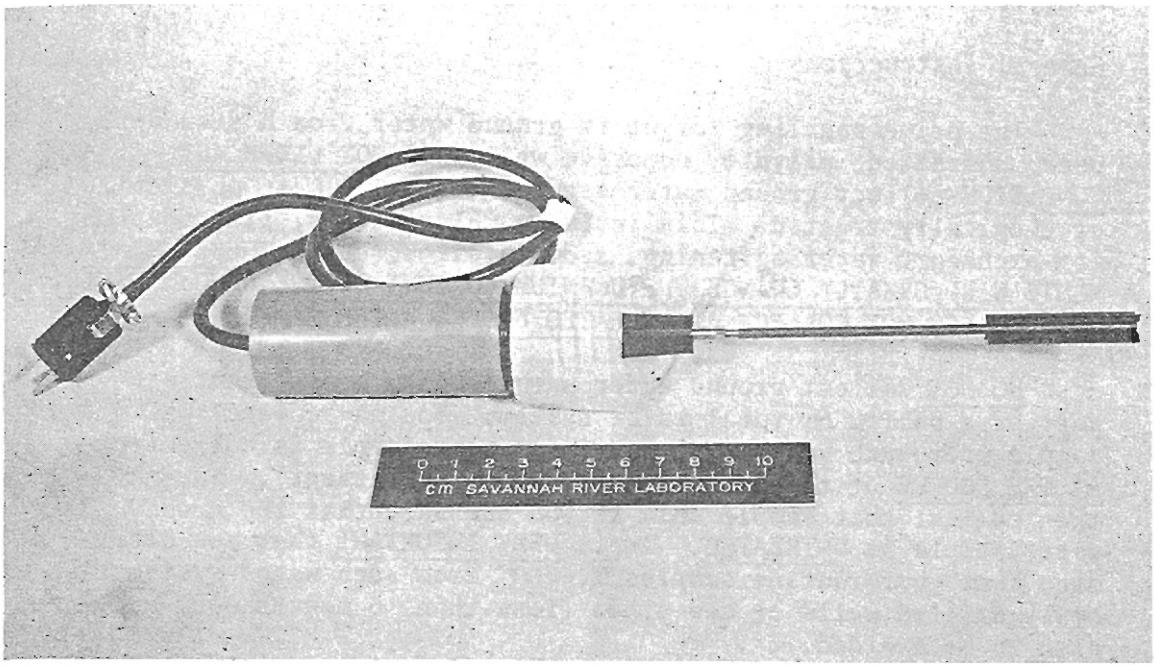


FIGURE B-15. Ion Exchange Resin Bottles in Carrier Ready for Transporting



a. Assembled Unit

FIGURE B-16. Power Supply and D.C. Stirrer Assembly



b. Stirrer

c. Power Supply

FIGURE B-16. Continued

PART II. OUTLINE AND SEQUENCE OF FIELD PROCEDURES

General Instructions

The prime sampling target is ground water from a frequently used, untreated, private, domestic well. DO NOT UNDER ANY CONDITION collect ground water samples that have been physically or chemically treated. This includes chlorination, fluoridation, ion-exchange, water softening, sedimentation, etc. THESE TREATMENTS WILL GREATLY CHANGE THE URANIUM CONTENT OF THE GROUND WATER. Repeat: DO NOT COLLECT ANY TREATED GROUND WATER SAMPLES.

DO NOT collect ground water samples from houses that are part of a public or rural water system. You may collect ONE sample from each water system only if that sample is collected AT THE SOURCE of the water system (before treatment). You may then collect that sample only if you are sure that the ground water sample is UNTREATED. It is VERY IMPORTANT that you determine that your routine samples are NOT from such water systems. Newly drilled wells or new pipes (less than ~6 months old) are also to be avoided.

Sample validity is crucial. While SRL has check points and will resample a significant number of sites, the integrity of individual samplers must be relied upon in this program. Please make every effort to ensure that the samples you collect are correctly located, treated, and labeled.

Take care to see that land owners' misgivings or questions are satisfied. We may want to come back. Public relations are the contractor's responsibility. A handout explaining the NURE program is available and can be left with the land owner.

A primary concern throughout the sampling program will be respect for the land owner's property and wishes. This includes obtaining permission for access, respecting any restrictions, and generally exhibiting a courteous and careful manner.

Normal Field Procedures

Sampling Procedures (Summarized in Table B-2)

Sample Site Approach

Carrying only the two-liter plastic collection bottle, ask permission to obtain a ground water sample at the site. Ask if the sample comes from a water system. (If it does, ask if a nearby home can provide a well sample; THEN LEAVE and try a

different site.) Use your Identification Card to identify yourself as an official member of a NURE sampling team.

TABLE B-2

Sampling Procedure Checklist

A.	**At the Sampling Site**	
1.	Stirring Ion Exchange Resin Mixture	Stop stirring the ion exchange resin mixture from the previous site when arriving at new site. Cap 1-liter bottle with 2-ounce resin recovery bottle and place upside-down in ion exchange resin recovery case.
2.	Sample Site Approach	Obtain permission for access.
3.	Water Collection	Collect 2 liters of ground water in plastic bottle after letting water run for 2 to 3 minutes.
4.	Data Form Site Description	Obtain necessary site descriptions and well information.
5a.	Water Filtration	Filter 1 liter of ground water at vehicle.
5b.	Conductivity-Temperature Measurements[a]	Measure temperature of unfiltered water; measure conductivity of unfiltered water.
6.	Ion Exchange	Add ion exchange resin to filtered ground water and start stirrer.
7.	pH Measurement	Measure pH of unfiltered water.
8.	Alkalinity Titration	Titrate 50 ml of unfiltered ground water with 0.02N H_2SO_4 solution until pink color of indicator is reached.
9.	Data Form Completion	Complete all entries.
10.	Field Map	Enter and label site accurately.
11.	Clean-up and Storage	Return equipment to case; remove all debris; police area.
B.	**At the End of the Day**	
1.	Ion Exchange Resin Recovery	Recover the resin into the properly labeled 2-ounce bottles and package for shipment to SRL.
2.	Master Map Preparation	Transfer the site locations from the daily working maps to a clean, unfolded, master map.
3.	Form Check	Check each form and resin bottle for accuracy, legibility, etc.
4.	Instrument Care	Check condition of drying agent. Check for moisture in instrument case, leave open in room overnight.

a. Measure temperature and conductivity on a portion of water while filtration is in progress.

Water Collection

Allow the water to flow for 2 to 3 minutes (check using a watch) before collecting the sample. Rinse the two-liter collection bottles 2 to 3 times with the flowing water and collect a 2-liter sample. Recap the bottle. If the well owner objects to the proposed length of time water is allowed to flow, leave and select an alternate site where pipes can be thoroughly flushed before sampling.

Data Form Site Description

While allowing the water to flow, ask the necessary questions needed to fill out the ground water field form. BE CERTAIN TO OBTAIN A CORRECT ADDRESS. Any followup of anomalous samples will depend on this address. (The address will not be published.)

Water Filtration

Carry the two-liter ground water sample back to your vehicle. Set up the pressure filter on top of its carrying case (Figure B-17) and rinse the filter support with deionized water. Using tweezers, place a new filter membrane in the filter (Figure B-18). Place a clean 1-liter bottle inside the carrying case under the filter (Figure B-19). Remove the filter top and pour in ∿1100 ml of water (Figure B-20). The remaining unfiltered ground water (∿1 liter) will be analyzed as described in the following sections. Replace the top and pressurize the filter with the can of fluorocarbon gas (Figure B-21). After filtering the water, remove the liter of filtered water and place the filter inside the carrying case. Proceed as described below.

Conductivity — Temperature Measurement

Place the conductivity probe into the beaker of unfiltered ground water (Figure B-22). The probe should be completely submerged in water and suspended about 2 inches above the bottom center of the beaker. Metal objects should be kept at least 6

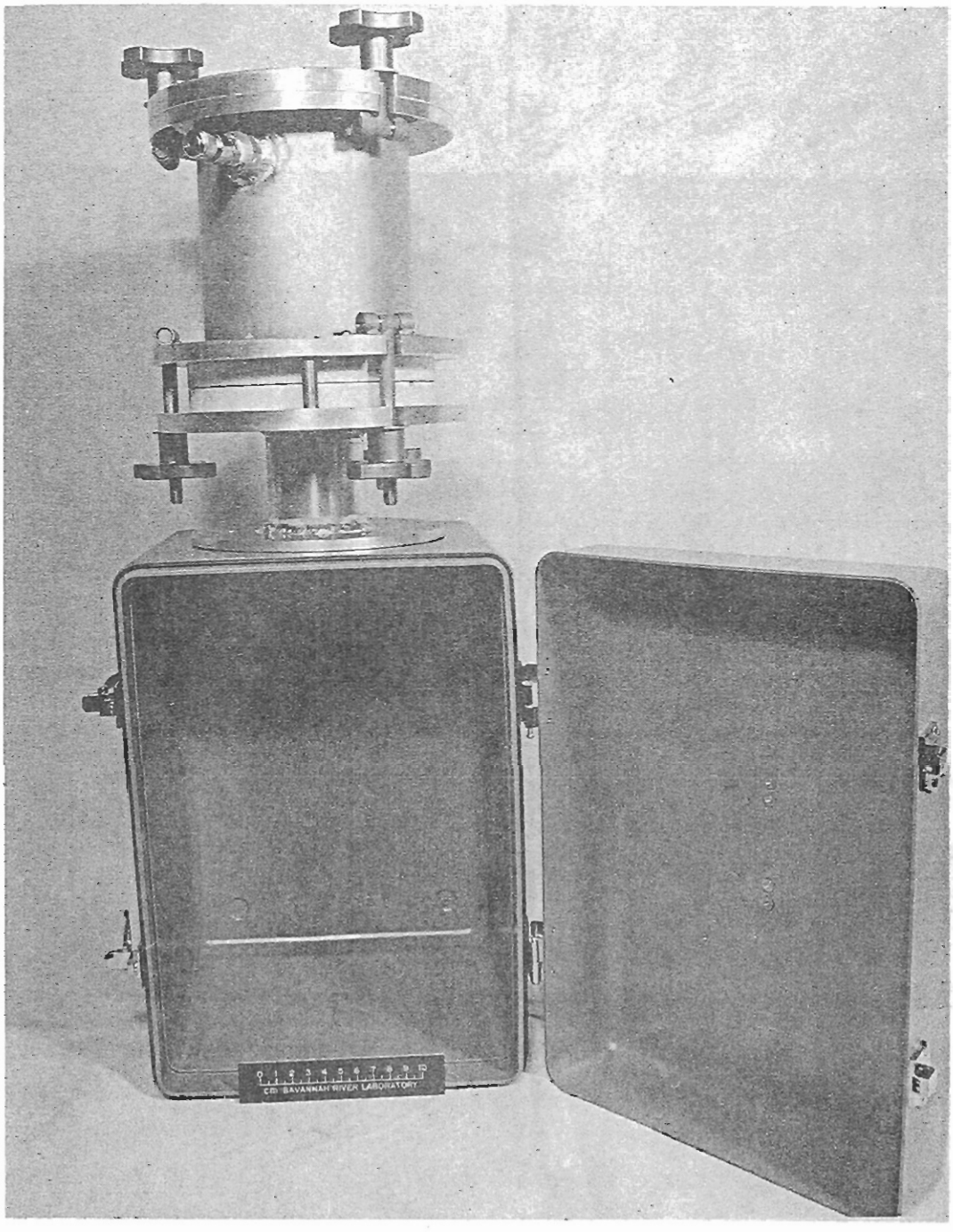


FIGURE B-17. Assembled Pressure Filter

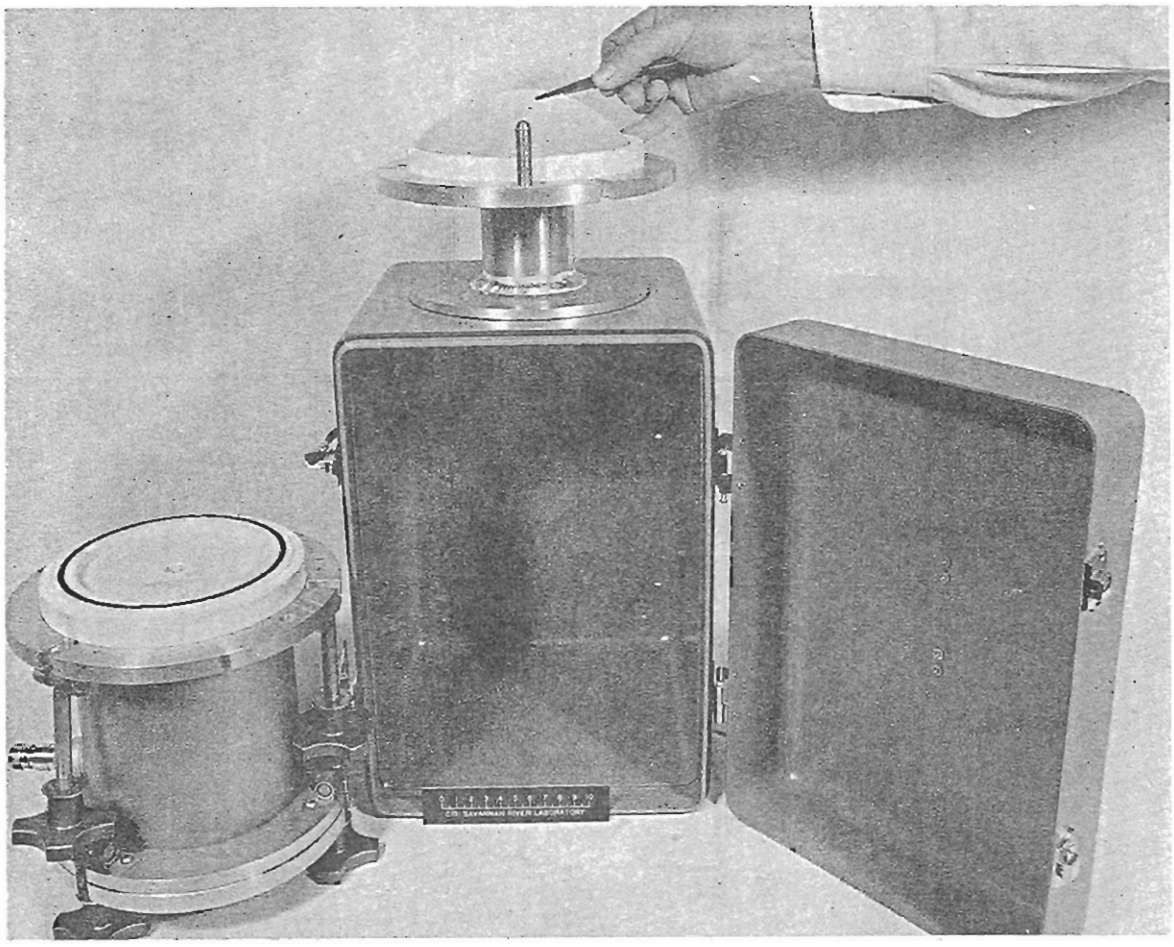


FIGURE B-18. Replacing Filter Membrane in Pressurized Filter Assembly

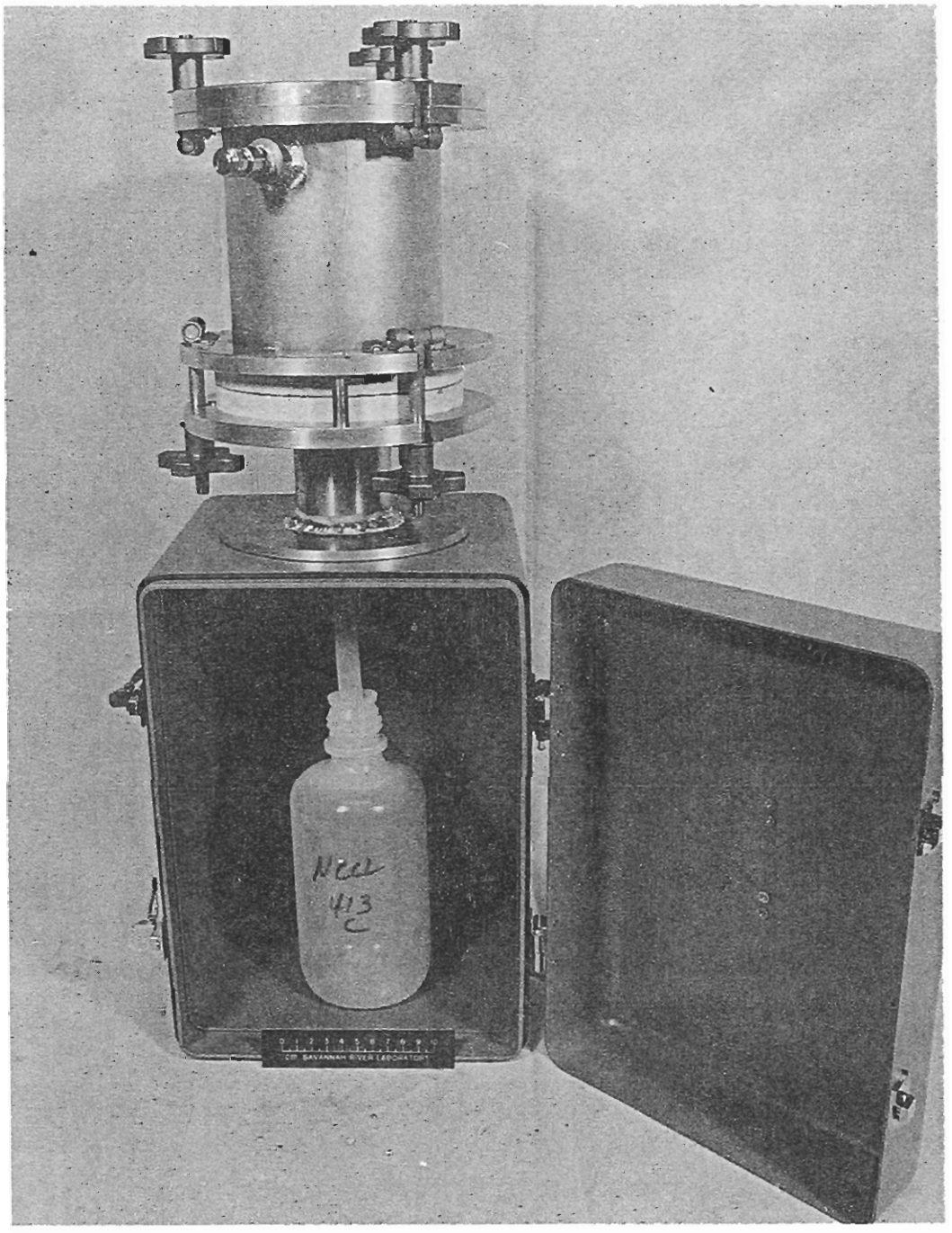


FIGURE B-19. A 1-Liter Collection Bottle in Place Under Filter

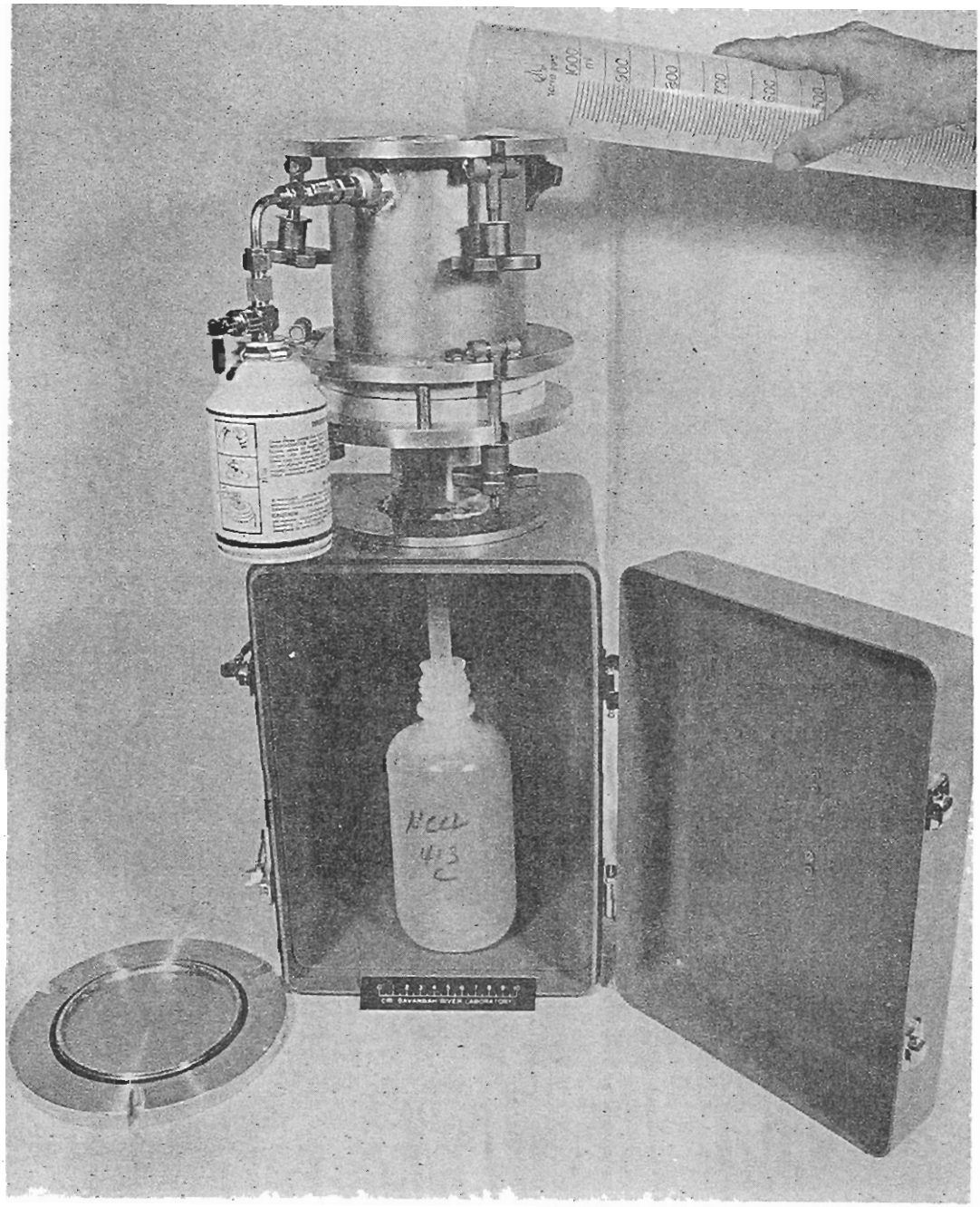


FIGURE B-20. Ground Water Sample Being Poured in Filter Reservoir

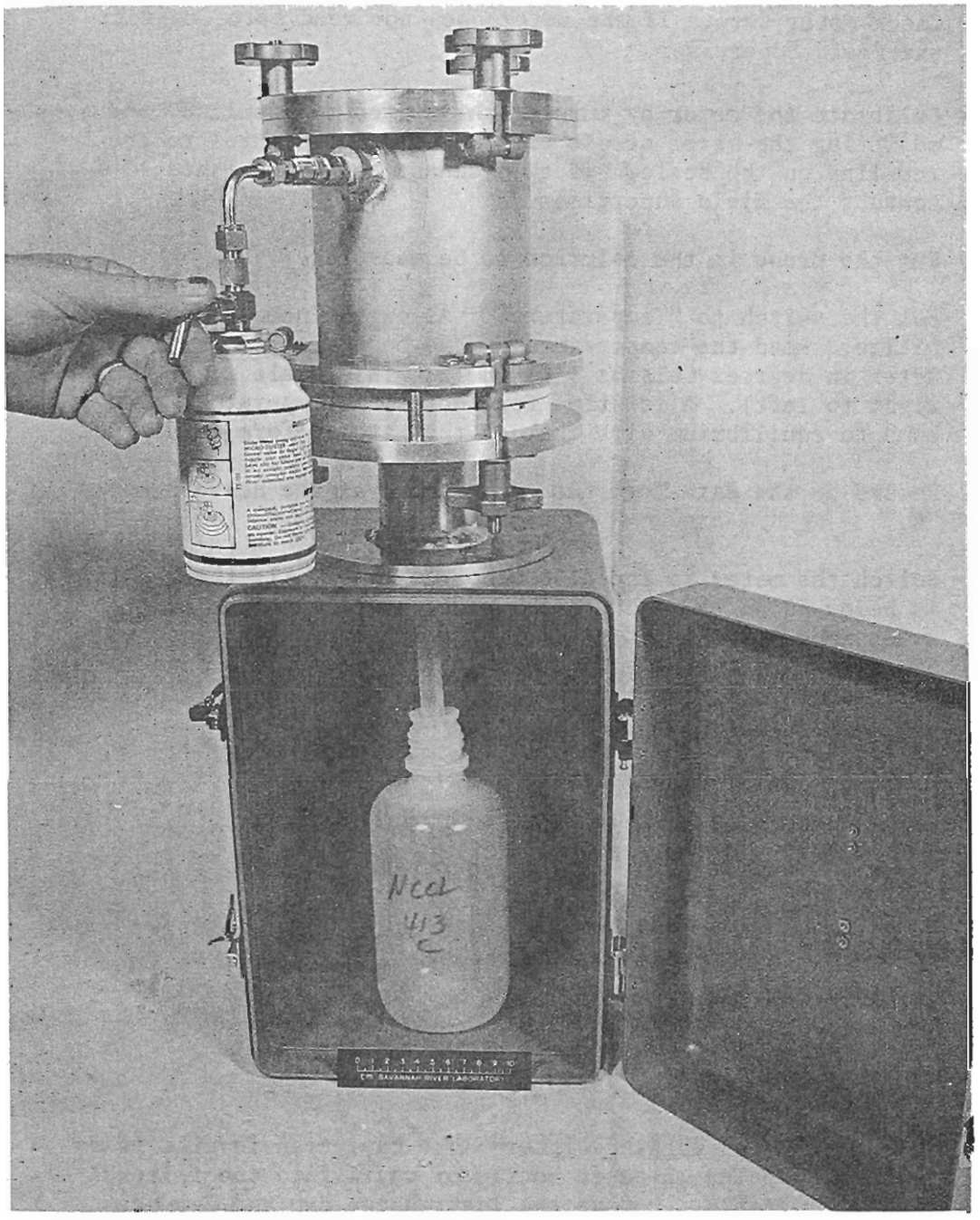


FIGURE B-21. Filtration Apparatus in Operation

inches away from the probe. Measure the temperature and conductivity as described below:*

- Check meter zero. If the meter does not read zero, contact the Field Supervisor.

- Calibrate the meter by turning the switch to "Redline" and adjusting the meter needle with the redline control to the red line on the scale. If this cannot be accomplished, contact the field supervisor.

- Put the probe in the solution to be measured.

- Set the switch to "Temperature." Allow the needle to stabilize. Read the temperature on the bottom scale of the meter in degrees Celsius (°C). (NOTE: This scale reads from right to left). Allow time for the probe temperature to come to equilibrium with that of the water before reading.

- Record on the data form the temperature as the nearest whole °C.

- Switch the meter to the X100 µmhos/cm range. If the reading is below 50 on the 0-500 meter scale, switch to the next lower range (X10 µmhos/cm). If the reading is still below 50, switch to the next lower range (X1 µmhos/cm). Read the meter scale and multiply that reading by the range (X100, etc.). The answer is the reading in µmhos/cm.

  EXAMPLE: Meter Reading: 247
  Scale: X10
  Answer: 2470 µmhos/cm

- Record on the data form the specific conductance in µmhos/cm.

- TURN THE INSTRUMENT OFF.

Water Ion Exchange

Using the ion exchange interchange cap, transfer the resin from a new, labeled, 2-ounce bottle of resin into the filtered ground water sample. Remove the interchange cap and 2-ounce bottle (keep it clean). Place the 6-volt stirrer into the ground water-resin mixture and stir the mixture until the next site is

* These instructions apply to the Yellow Springs Instruments Model 33 S-C-T conductivity meter. If a different instrument is used, appropriate instructions will be used.

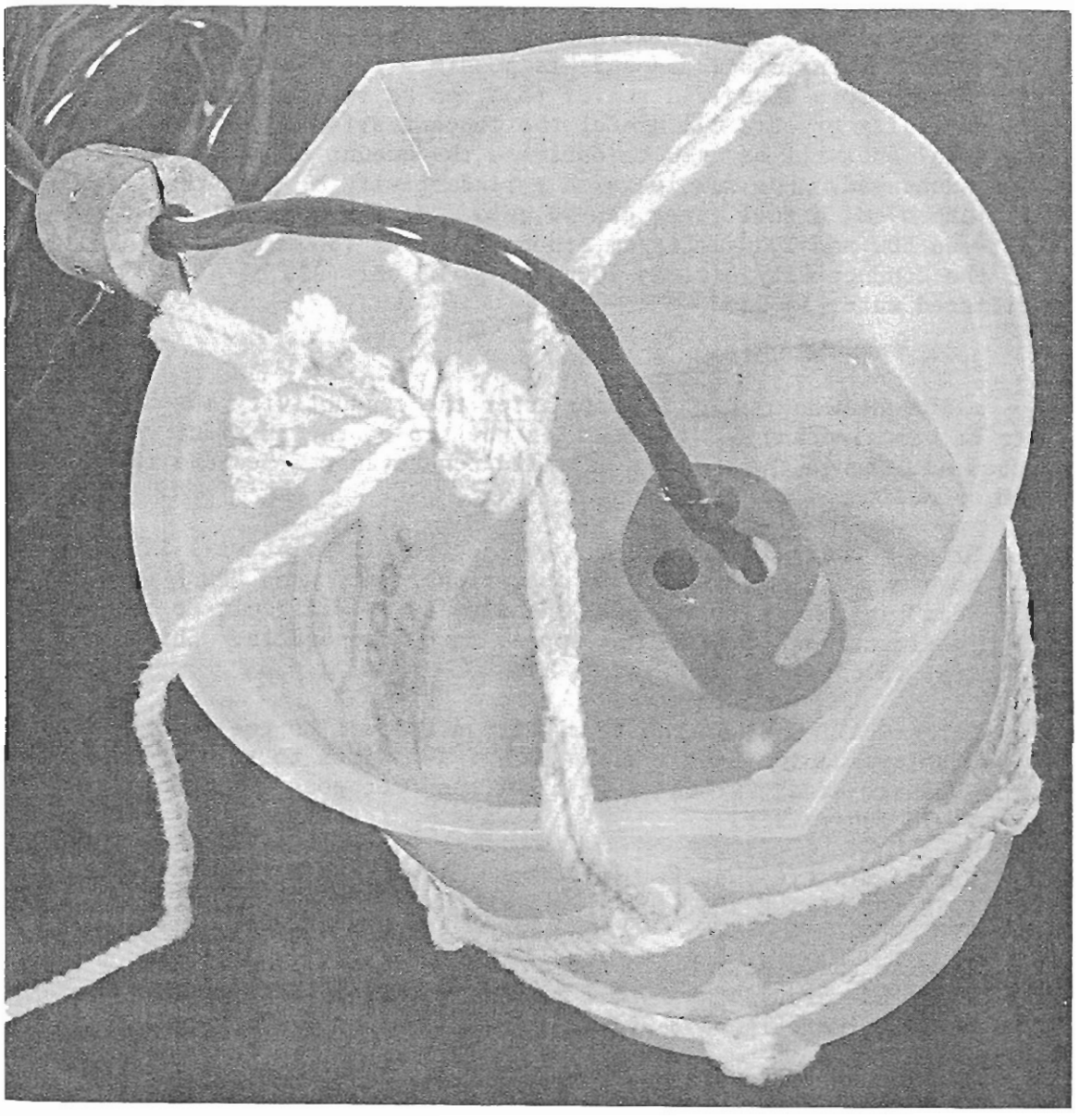


FIGURE B-22. Measuring Conductivity of Ground Water Sample

reached (at least ten minutes). *When the stirrer is removed, insert it into a fresh 1-liter bottle to make sure that it remains clean until used again.*

The amount of filtered ground water which is allowed to react with ion exchange resin will normally be exactly one liter, with any excess being discarded. It is possible for one liter of water to contain more dissolved solids than can be removed by the resin. Conductivity gives a measure of the concentration of dissolved material and will be used to estimate the amount of water to be ion exchanged. For samples with a conductivity of less than 500 µmhos/cm, a full liter can be used. If the conductivity is between 500 and 1000 µmhos/cm, then 1/2 liter (500 ml) is used. If the conductivity exceeds 1000 µmhos/cm, only 200 ml of the filtered water is used.

pH Measurement

The pH measurement is made after the conductivity measurement to be certain that KCl solution on the tip of the pH electrode does not change the water's specific conductance. Measure the pH as described below:*

- Slide "Power" switch to ON. NOTE: Decimal point will light; however, digital display is operational only when "Push-to-Read" switch is depressed. The display is difficult to read in direct sunlight and may appear to be inoperable. Shield the dial to obtain a reading.

- Slide "BATT-CHK" switch to right. A red dot to the right of display should light. With "BATT-CHK" switch to right, depress "Push-to-Read" switch -- if right hand dot goes out, contact field supervisor.

- Remove plastic boot from electrode prior to use. DO NOT LOSE THIS PROTECTIVE BOOT!

- Immerse the electrode in the unfiltered water. Swirl the electrode around for 1 to 2 minutes to allow it to reach equilibrium (Figure B-23).

- Depress the "Push-to-Read" switch on the side of the pH meter; read the pH display.

- Repeat the swirling step and re-read the pH to verify equilibrium has been reached.

- Record the pH to the nearest 0.1 pH unit on the data form (Figure C-1, Columns 41-43).

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* These instructions apply to the Markson Model 80 mini-pH meter. If a different instrument is used, appropriate instructions will be issued.

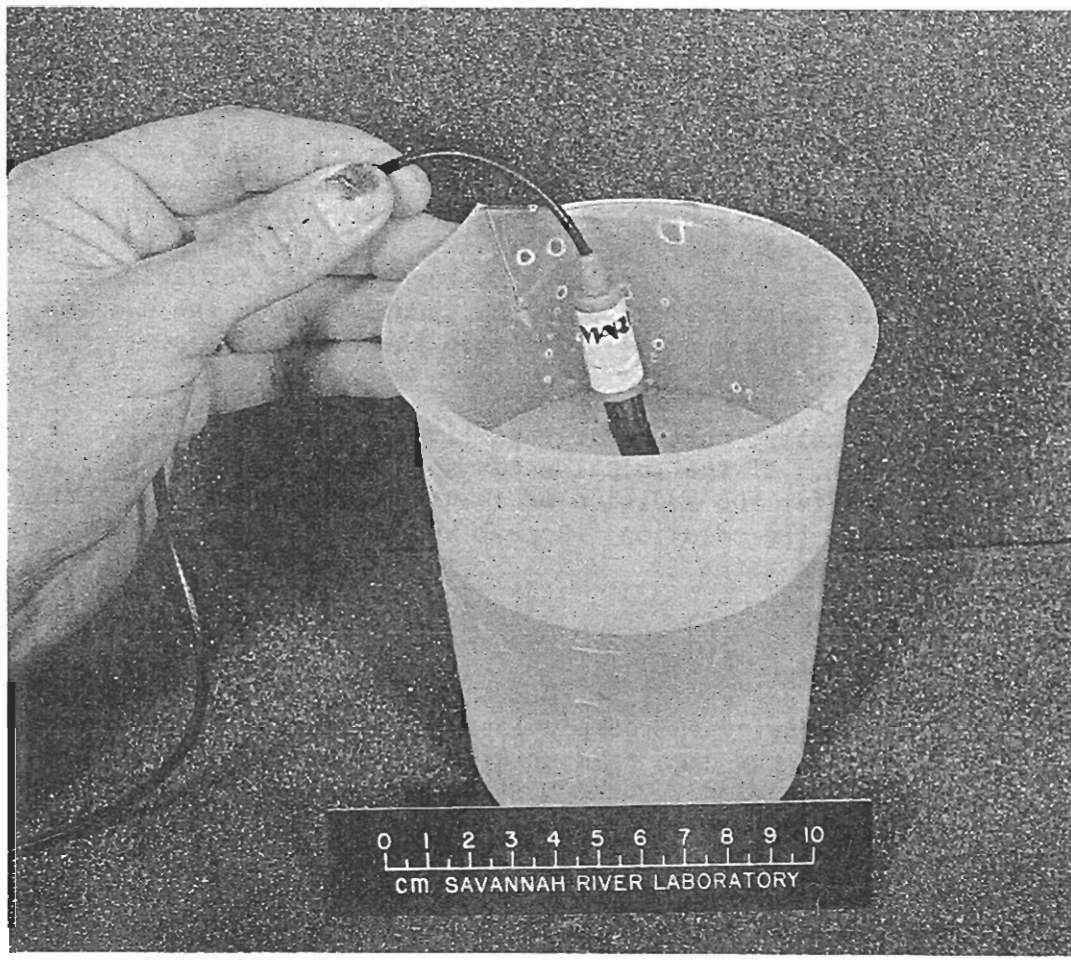


FIGURE B-23. Measuring pH of Ground Water Sample

- TURN THE pH METER OFF.
- Store the WET pH electrode in its plastic boot.
- Discard the beaker of unfiltered ground water.

Alkalinity Titration

Into the 125-ml Ehrlenmeyer flask, pour 50 ml of unfiltered ground water, add 4 to 6 drops of bromo-cresol green/methyl red indicator solution and mix. Add 0.02N sulfuric acid solution dropwise, while gently swirling the flask. Only the dropper provided by SRL is to be used. Count the number of drops required to cause the solution to turn light pink and record this on the data sheet (Figure C-1, Columns 51-54). Discard the titration solution. Shake the flask dry.

Occasionally, particularly in limestone areas, alkalinity may be quite high. If the solution has not shown signs of changing to light pink after the addition of twenty (20) drops of 0.02N sulfuric acid, discard the solution. Repeat the titration on 10 ml of unfiltered ground water.

Data Form Completion

Before leaving the sample location, fill in all remaining information on the data form according to the standard coding instructions provided. Make a final check to be sure that the appropriate sample location number has been written on the label on the 2-ounce, ion exchange resin bottle.

Clean-up and Storage

Return all equipment to cases. Check the ion exchange stirrer and drive to the next site.

At the End of Each Day

Ion Exchange Recovery

Remove the case containing the day's collection of ground water samples. By using a swirling, pumping action recover the resin into the labeled 2-ounce bottles (Figure B-24). Package for shipment to SRL.

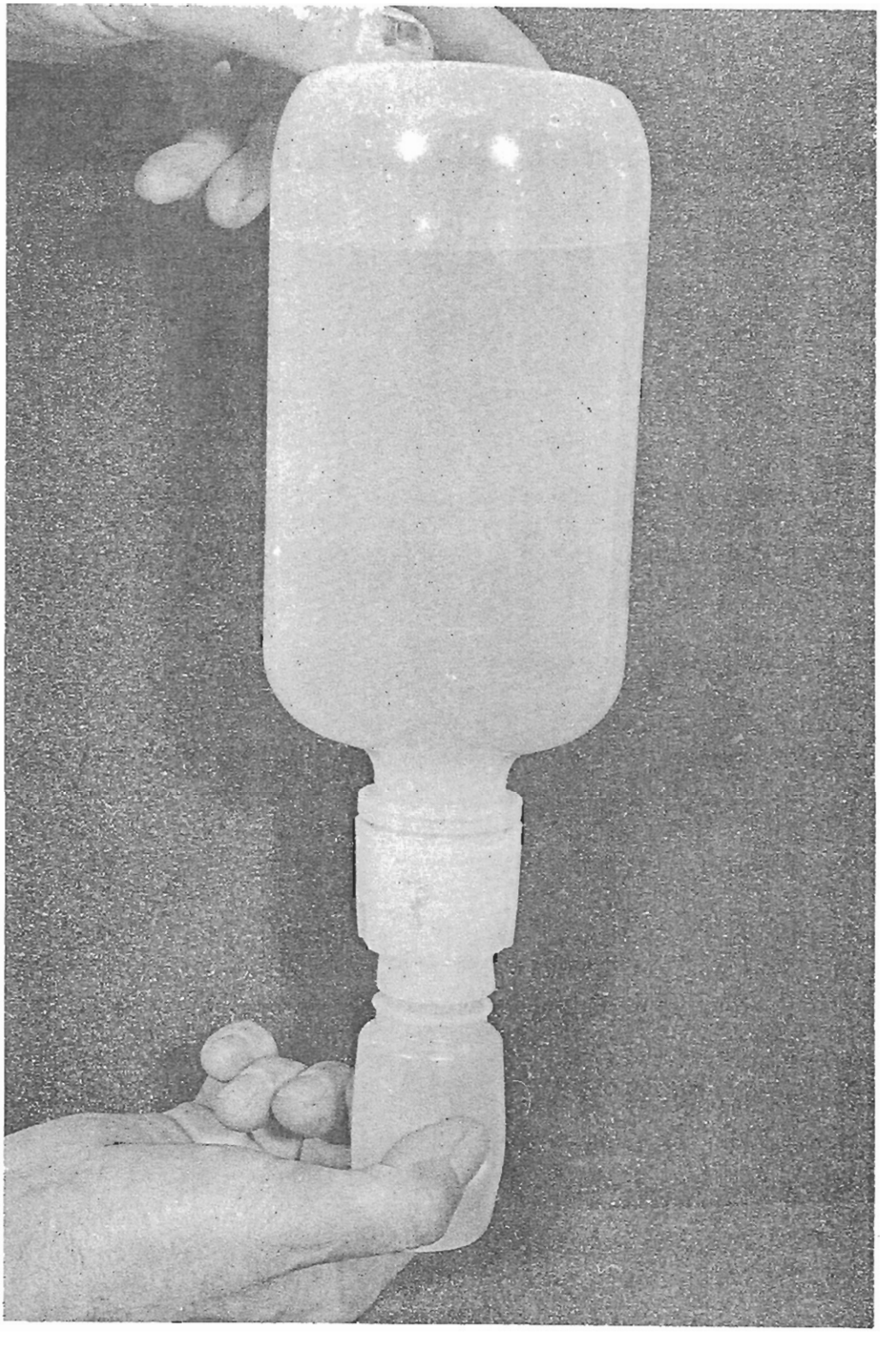


FIGURE B-24. Transfer of Ion Exchange Resin into 2-oz Sample Bottle

APPENDIX C: STANDARD CODING INSTRUCTIONS

SAVANNAH RIVER LABORATORY GEOCHEMICAL
GROUND WATER SURVEY FIELD DATA FORM

General Statements

A copy of the data form is shown in Figure C-1 (Card Code 3). All data to be entered on the SRL Field Data Form MUST be entered CORRECTLY and RIGHT JUSTIFIED in the appropriate columns of the 80-column form. The form MUST be completed using ONLY a No. 2B soft-lead wooden or mechanical pencil. All data forms and associated samples must be CHECKED for accuracy, correct format, and legibility. All letters and numbers will be formed ONLY as shown below and at the bottom of each form:

Standard Letters and Numbers

A B C D E F G H I J K L M N Ø P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9

Only those choices given on the form are acceptable. DO NOT IMPROVISE.

> PAYMENT TO CONTRACTORS WILL BE MADE ONLY FOR THOSE SAMPLE LOCATIONS WHERE ALL APPROPRIATE DATA ARE UNAMBIGUOUSLY PROVIDED ON THE FIELD DATA FORM AND SAMPLE SITE LOCATION MAP.

Specific Coding

Columns 1-8

Site Code — Columns 1-2 are coded with the two-letter designator for the state in which the sample is collected, e.g., NC for North Carolina, GA for Georgia, etc. Columns 3-4 are coded with the two-letter designator for the map from which the sample is collected. Official map codes are furnished with each map unit. Only the official codes are acceptable. Site numbers are entered in Columns 5-7. All numbers in Column 5 should be 5 or greater.

SRL GROUND WATER SITE FIELD DATA FORM

SITE CODE: State (1 2)	Map Code (3 4)	Site Number (5 6 7 8)	DATE: Mo. (9 10)	Day (11 12)	Yr. (13 14)	Hr. (15 16)	TEAM NO. (17 18 19)	GENERAL SITE DATA: Well or Spring (20)	Depth of Well (feet) (21 22 23 24)	Conf. of Depth (25)	Age of Well (Yr) (26 27 28)	Conf. of Age (29)	Type of Well (30)	Main Use (31)	Freq. Use (32)	Odor (33)	Pipe Compos. (34)	Where Samp. Taken (35)	Classification (36)	ml of Water Ion-exchanged (37 38 39 40)
1 2	3 4	5 6 7 8	9 10	11 12	13 14	15 16	17 18 19	20	21 22 23 24	25	26 27 28	29	30	31	32	33	34	35	36	37 38 39 40

Have a Good Day ☺

																				3
41 42	43 44	45 46 47 48	49 50	51 52	53 54	55 56	57 58 59	60	61 62	63 64 65 66 67 68 69	70 71	72 73 74 75	76	77	78	79	80

pH	SPECIFIC CONDUCTANCE µmhos/cm	WATER TEMP (°C)	ALKALINITY: Drops H_2SO_4	ml Water	INSTRUMENTS: INSTRUMENT I.D. — pH	pH · PROBE I.D.	COND. INSTR. I.D.	COND. PROBE I.D.	SPARE (DO NOT USE)	Comments	Inform. Request	Do Not Use	CARD CODE

State (1 2)	Map Code (3 4)	Site Number (5 6 7 8)	ADDRESS (use / to separate lines) (9 10 … 39 40)
1 2	3 4	5 6 7 8	9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

			1 3
41 42	43 44	45 46 47 48	49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

IN THE CASE OF EACH CIRCLED ENTRY SPACE, ENTER MOST APPROPRIATE DESIGNATORS LISTED BELOW

20 W - Well
S - SPRING
Q - Others (use comments)

25 and 29
1 Certain
2 Probable
3 Possible
4 Educated Guess
5 Unknown

30
1 Drilled
2 Dug
3 Driven
4 Unknown

31
1 Human drinking
2 Animal drinking
3 Irrigation
4 Others (use comments)

32
1 Continuous (> once per day)
2 Once per day
3 Once per week
4 Once per month
5 Less than once per month
6 Not in use

33
1 None
2 Weak H_2S
3 Strong H_2S
4 Others (use comments)

34
1 Galvanized
2 Copper
3 Plastic
4 Steel
5 Lead
6 Unknown
7 Others (use comments)

35
1 Immediately after storage tank
2 From pipe before storage tank
3 Direct from pump
4 Direct from well or spring
5 From Municipal system
6 Unknown
7 Others (use comments)

36
1 Private (<3 families)
2 Semi-Private (used by 3 to 10 families)
3 Public (used by >10 families)
4 Industrial
5 Commercial (motel, etc.)
6 Recreational
7 Agricultural
8 Unknown
9 Others (use comments)

76 Enter "C" when comments are made

76 Comments (Explain all "other" designators used above, plus describe all unusual or significant conditions such as proximity of contaminants, general rock type, formation when known, problems with instruments, etc. Use back of form for additional space). _____

77 Enter "X" when analysis information is requested

I certify that the above sample was taken by SRL procedures at the indicated site and the information listed is correct at time of sampling. _____ Sampler(s) Signature(s)

I have checked this form and associated samples for accuracy, correct format, and legibility. _____ Field Supervisor (initials)

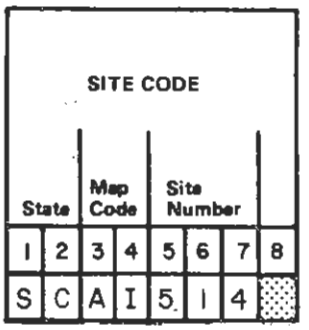
Standard Letters and Numbers

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9

FIGURE C-1. SRL Ground Water Site Field Data Form

Sites should be consecutively numbered within each map unit, beginning with 501. No valid site codes should be skipped. Columns 1-7 should be filled. None should be blank. Column 8 is left BLANK.

EXAMPLE: Sample is taken from the 14th site sampled in Aiken County, South Carolina; site is marked on the Aiken County map with code AI. The site is marked in the field at the time of sampling.



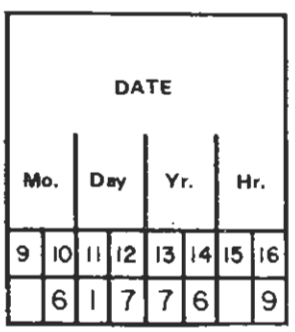
Columns 9-16

Date

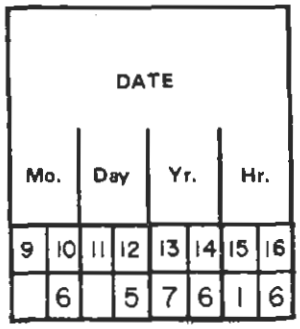
The month, day, and year are to be coded in Columns 9-14 using one or two digits (right justified) as necessary, so that any unused columns are left blank.

The time (hour) will be coded in Columns 15-16 using the 24-hour clock, and rounding to the nearest whole hour. The hour entry will also be right justified so that Column 15 will remain blank when only one digit is appropriate.

EXAMPLE: Sample taken on June 17, 1976, at 9:27 a.m.



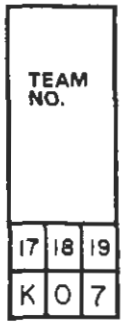
Sample taken on June 5, 1976, at 3:35 p.m.



Columns 17-19

Team Number

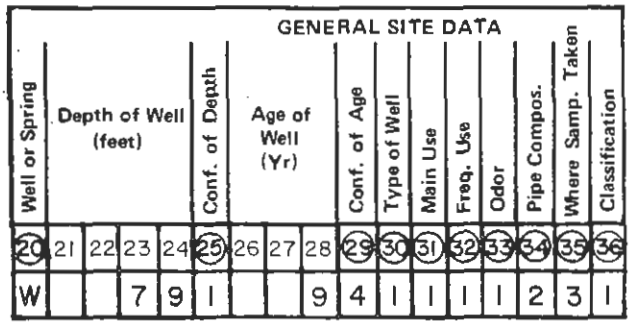
The assigned team number is coded in Columns 17-19.



Columns 20-31

General Site Data

The general site data columns are to be coded using only the most appropriate indicator descriptor listed on the form. Good judgment is requisite to these evaluations.



Column 20

Well or Spring

20 W - Well
S - SPRING
Ø - Others (use comments)

The column labeled "Well or Spring" should be coded with the appropriate descriptor listed on the form. Since this is a ground water survey, collection of well samples is preferred. Free-flowing springs are acceptable. Other types of samples should not be collected unless very unusual conditions exist. Explain all "Others" in the "Comments" section (remembering to see that a "C" is entered in Column 76).

Columns 21-24

Depth of Well, ft

Record the depth of the well to the nearest whole foot, using one to four digits (right justified) as necessary, so that any unused columns are left blank. Free-flowing springs should have "zero" foot depth. If depth of well is totally unknown, code a slash (/) in Column 24.

Column 25

Confidence of Depth

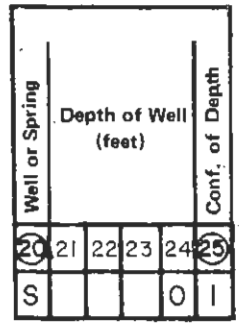
25 1 Certain
2 Probable
3 Possible
4 Educated Guess
5 Unknown

The degree of confidence with which the depth of the well is known is coded in Column 25. If Column 24 is coded with a slash (/), then Column 25 must be coded as "Unknown."

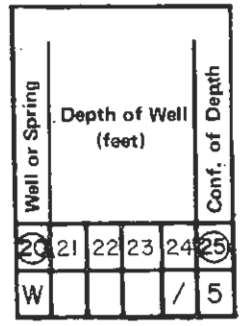
EXAMPLE: Sample taken from a well which the owner knows is 123 feet deep.

Well or Spring	Depth of Well (feet)				Conf. of Depth
20	21	22	23	24	25
W		1	2	3	1

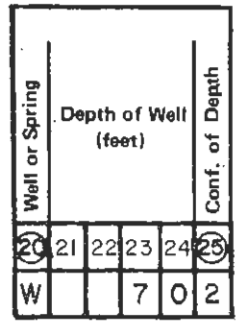
EXAMPLE: Sample taken from a free-flowing spring.



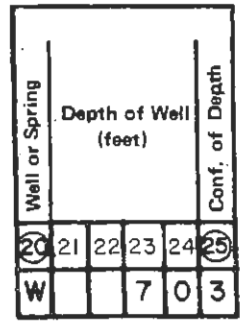
EXAMPLE: Sample taken from well of which nothing is known about the depth.



EXAMPLE: Sample taken from a well which the owner thinks is about 60 to 80 feet deep.



or



Columns 26-28

Age of Well, yr

Record the age of the well to the nearest whole year, using one to three digits (right justified) as necessary, so that any unused columns are left blank. If the age of the well cannot be determined, but owner knows that it is older than a certain age, then

record that limiting age. If age of well is totally unknown, code a slash (/) in Column 28. If the well is new (<1 yr), do not sample.

Column 29

Confidence of Age

25 and 29

1 Certain
2 Probable
3 Possible
4 Educated Guess
5 Unknown

The degree of confidence with which the age of the well is known is coded in Column 29. If Column 28 is coded with a slash (/), then Column 29 must be coded as "Unknown."

EXAMPLE: Sample taken from a well which the owner knows is 25 years old.

Age of Well (Yr)			Conf. of Age
26	27	28	29
	2	5	1

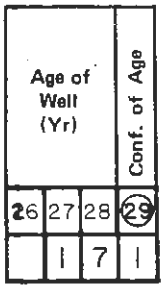
EXAMPLE: Sample taken from a well of unknown age.

Age of Well (Yr)			Conf. of Age
26	27	28	29
		/	5

EXAMPLE: Sample taken from a well which the owner thinks is about 10 to 12 years old.

Age of Well (Yr)			Conf. of Age
26	27	28	29
	1	1	3

EXAMPLE: Sample taken from a well which the owner knows has been there longer than he has owned the house. He has lived in the house for 17 years.



Column 30

Type of Well

30
1 Drilled
2 Dug
3 Driven
4 Unknown

The column labeled "Type of Well" should be coded with the appropriate descriptor listed on the form. This description should reflect the type of well by its method of construction. A well which is formed using a rotary drill or auger should be coded "1 Drilled." If the well is dug using manual or mechanical scooping equipment, it is coded "2 Dug." If the well is formed by a vertical pile driving device, it is coded "3 Driven." If the method of construction cannot be determined, then code Column 30 as "4 Unknown."

Column 31

Main Use

31
1 Human drinking
2 Animal drinking
3 Irrigation
4 Others (use comments)

The main use entry is a descriptor of how the water from the well is used. If the entry "4 Others (use comments)" is coded, then make appropriate comments on Line 76 (remembering to enter a "C" in Column 76).

Column 32

Frequency of Use

32
1 Continuous (> once per day)
2 Once per day
3 Once per week
4 Once per month
5 Less than once per month
6 Not in use

The column labeled "Frequency Use" should be coded with the appropriate descriptor to indicate how often water is drawn from the well. Samples should not be taken from wells used once a week or less except under unusual conditions.

Column 33

Odor

33
1 None
2 Weak H_2S
3 Strong H_2S
4 Others (use comments)

Code the appropriate descriptor of the smell of the water in Column 33. Hydrogen sulfide (H_2S) smell has often been described as the smell of "rotten eggs." If other odors are encountered, then record a description in the Comments section (remembering to code a "C" in Column 76).

Column 34

Pipe Composition

34
1 Galvanized
2 Copper
3 Plastic
4 Steel
5 Lead
6 Unknown
7 Others (use comments)

The major material used to form the water plumbing system is coded in Column 34. If "Others (use comments)" is coded, then record a description in the Comments section (remembering to code a "C" in Column 76).

Column 35

Where Sample Taken

35
1 Immediately after storage tank
2 From pipe before storage tank
3 Direct from pump
4 Direct from well or spring
5 From Municipal system
6 Unknown
7 Others (use comments)

The sampling location is coded in Column 35 using the appropriate descriptor listed on the form. If "Others (use comments)" is coded, then record a description in the Comments section (remembering to code a "C" in Column 76).

Column 36

Classification

36
1 Private (<3 families)
2 Semi-Private (used by 3 to 10 families)
3 Public (used by >10 families)
4 Industrial
5 Commercial (motel, etc.)
6 Recreational
7 Agricultural
8 Unknown
9 Others (use comments)

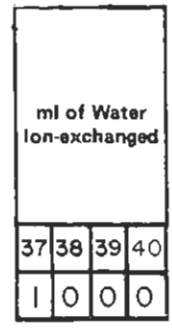
The classification of the well that was sampled is coded using the appropriate descriptor list on the form. If "Others (use comments)" is coded, then record a description in the Comments section (remembering to code a "C" in Column 76).

Columns 37-40

ml of Water Ion Exchanged

Record (to the nearest ten milliliters) the volume of water which is mixed with the ion exchange resin. Normally, this will be 1000 ml unless the specific conductance is too large. If less than 1000 ml is used, then Column 37 is left blank.

EXAMPLE: A sample taken from a well is filtered and 1000 ml of water is mixed with the ion exchange resin.



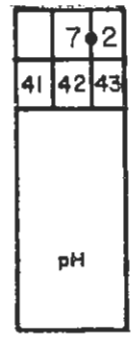
Columns 41-43

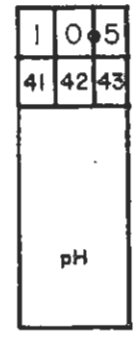
pH

The pH of the sampled water is to be measured using the pH meter provided, and will be recorded to the nearest tenth (0.1) of a pH unit.

If the pH is less than 10, only Columns 42 and 43 will be coded, and Column 41 will be left blank (only rarely will the pH be greater than 10, thus Column 41 will normally remain blank). A stationary decimal point occurs between Columns 42 and 43 and it must be respected.

EXAMPLES:





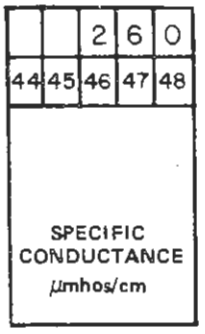
Columns 44-48

Specific Conductance, μmhos/cm

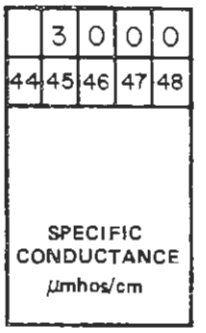
The specific conductance measurement is recorded in Columns 44-48 as read on the meter, or as some multiple of the meter reading which is determined by the scale range setting used. The specific conductance

reading must always be right justified, so that any of the appropriately designated (but unused) columns will be left blank.

EXAMPLES:



Meter reads 260 with scale X1, record 260



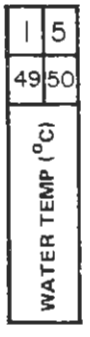
Meter reads 300 with scale X10, record 3000

Columns 49-50

Water Temperature, °C

The water temperature, taken at the time of sampling, will be coded in Columns 49-50. The water temperature will be recorded in degrees Celsius (°C) to the nearest whole degree (1.0°C). Any time the water temperature is between 0°C and 9°C, the temperature will be coded in Column 50, and Column 49 will remain blank.

EXAMPLES:

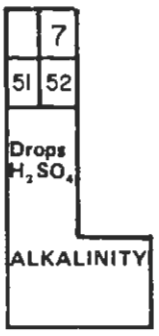


Columns 51-52

Alkalinity, drops of acid solution

Record in Columns 51-52 the number of drops of 0.02N sulfuric acid solution necessary to reach the end point of the alkalinity titration. If fewer than 10 drops are used, then Column 51 is left blank.

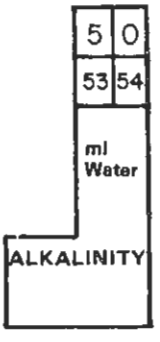
EXAMPLE:



Columns 53-54

Alkalinity, ml of water

Record in Columns 53-54 the actual number of milliliters of water which is titrated with the sulfuric acid. This is normally ∿50 ml, but might be as few as 5 to 10 ml in limestone areas.



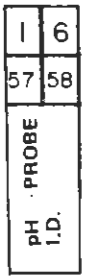
Columns 55-56

pH Meter, I.D.

Enter in Columns 55-56 the identification number of the pH meter used at the site. If Column 55 is not needed, then leave it blank.

Columns 57-58

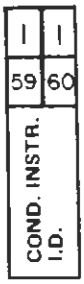
pH Probe, I.D.



Enter in Columns 57-58 the identification number of the pH probe used at the site. If Column 57 is not needed, then leave it blank.

Columns 59-60

Conductivity Instrument, I.D.



Enter in Columns 62-63 the identification number of the conductivity meter used at the site. If Column 62 is not needed, then leave it blank.

Columns 61-62

Conductivity Probe, I.D.

Enter in Columns 61-62 the identification number of the conductivity probe used at the site. If Column 61 is not needed, then leave it blank.

Columns 63-75

Blank

Leave Blank

Column 76

Comments

Any time there are comments entered at the bottom of the data form, enter a "C" in Column 76. If there are no comments, leave Column 76 blank. It should always be remembered that there can never be too many comments. Every observation made at a sample site pertaining to geology, geography, hydrology, possible contamination, etc. should be entered. This information may be important for evaluating the data which are developed for each sample and sample site. All comments must be written legibly.

76 Enter "C" when comments are made

76 Comments (Explain all "other" designators used above, plus describe all unusual or significant conditions such as proximity of contaminants, general rock type, formation when known, problems with instruments, etc. Use back of form for additional space). Well is located in a hollow. Limestone outcrops in area. Plumbing is a combination of plastic and copper. Sample was taken from kitchen sink – blue stains noted in sink.

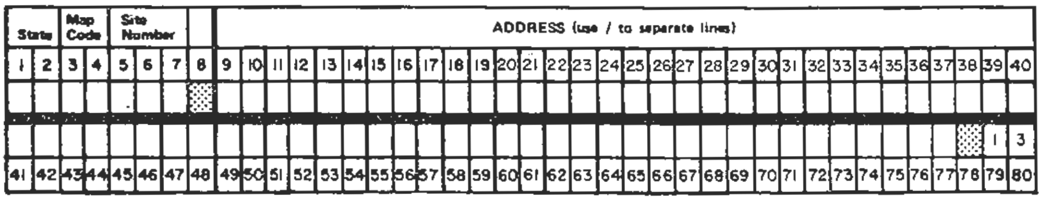
Column 77

Information Request

If you have to agree to send analytical information to a person in order to gain access to his property, then enter an X in Column 77 (see comment on page 8).

77 Enter "X" when analysis information is requested

Address Card (Card Code 13)



General

This card is used to record the mailing address where the sample was taken. All sample sites must have a completed address card (Card Code 13). If it is at all possible, include the name of the person(s) who provided sample. All letters and numbers will be formed ONLY as shown at the bottom of each form.

The information on this card will be used to verify that the sample submitted to SRL was actually collected at the address given.

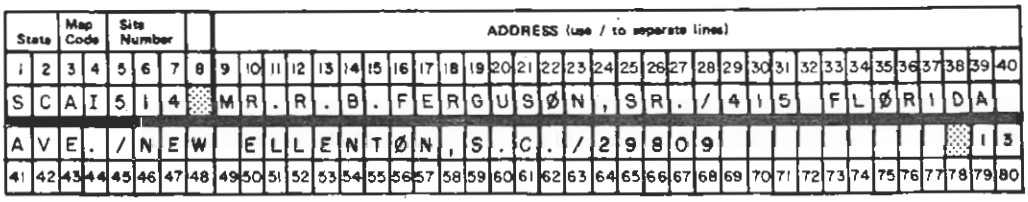
Specific Coding

Columns 1-8

Site Code State - Map Code - Site Number	The Site Code must be coded exactly the same as the Site Code in Columns 1-8 on Card Code 3 above. Column 8 is always left blank.

Columns 9-77

Address	Code the mailing address from every site at which a ground water sample is taken. If an address cannot be given, then code slashes (/) in Columns 9 and 10 and explain the reason in the "Comments" section [remembering to code a "C" in Column 76 on Card 3 (Figure C-1)]. Slashes (/) are used to separate each line of the address. Remember to include the Zip Code for each address.) EXAMPLE: Sample taken from a well at 415 Florida Ave., New Ellenton, S. C., 29809. The person providing the sample was Mr. R. B. Ferguson, Sr. The site code is SCAI514.



EXAMPLE: Sample taken from the pump at the Burrells Ford Campground in the Sumter National Forest. The site code is SCØC501.

State		Map Code		Site Number				ADDRESS (use / to separate lines)																															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
S	C	Ø	C	5	O	1		/	/																														
																																						1	3
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

C

76

Comments

76 Enter "C" when comments are made

76 Comments (Explain all "other" designators used above, plus describe all unusual or significant conditions such as proximity of contaminants, general rock type, formation when known, problems with instruments, etc. Use back of form for additional space). Sample was taken from the public pump well at Burrells Ford Campground in the Sumter National Forest. No mailing address can be given.

CERTIFICATION: Sign the form where designated to certify that the sample(s) was(were) taken and treated as described, and that the information shown is as true and complete as possible. ALL members of the sampling party will sign the form. The field supervisor will also sign or initial the form to show that he has checked the form AND ASSOCIATED SAMPLE for accuracy, correct format, and legibility.

I certify that the above sample was taken by SRL procedures at the indicated site and the information listed is correct at time of sampling.

John Q. Doe / Mary Brown
Sampler(s) Signature(s)

I have checked this form and associated samples for accuracy, correct format, and legibility.

R.B.F.
Field Supervisor (initials)

Visual Site Description (written on back of form)

On the back of each form, provide a sufficient description of the site from which the ground water sample was taken. In most cases, this will be the description of the house from which the sample was taken. The description should be so unique and complete that a different person seeking to recheck the site will be certain he is at the right place. Write clearly. In general, use compass directions rather than "right" or "left."

EXAMPLE: (Written on back of form)

Pink, two-story, frame house with an orange roof, and a metal fence around the yard. Located on U.S. 278 around 3.1 miles north of the intersection of Highways S.C. 271 and S.C. 27. Dirt road in front of the house.

EXAMPLE: (Written on back of form)

Brick, yellow-shuttered, one-story house located on U.S. Highway 52 1.3 miles east of Albemarle behind (south of) the St. James Methodist Church.

REFERENCES

Savannah River Laboratory Quarterly Report. Hydrogeochemical and Stream Sediment Reconnaissance – Eastern United States National Uranium Resource Evaluation Program.

No.	*Quarter*	*SRL Doc. No.*	*ERDA-GJO Doc. No.* *
1	January-March 1975	DPST-75-138-1	GJBX-5(76)
2	April-June 1975	DPST-75-138-2	GJBX-6(76)
3	July-September 1975	DPST-75-138-3	GJBX-7(76)
4	October-December 1975	DPST-75-138-4	GJBX-8(76)
5	January-March 1976	DPST-76-138-1	GJBX-17(76)
6	April-June 1976	DPST-76-138-2	GJBX-27(76)
7	July-September 1976	DPST-76-138-3	GJBX-63(76)

* Order from:

E. W. Grutt, Jr., Manager
Energy Research and Development Administration
Grand Junction Office
P. O. Box 2567
Grand Junction, CO 81501

NOTES

ADDENDUM

The purpose of this addendum is to clarify Section A.1.a - Notification (page 9). Experience has shown that many householders contact their local health departments and other county and city officials regarding NURE sampling team activities. These contacts have resulted in misunderstandings when such officials had no knowledge of team activities.

The field supervisor is required to contact both public health and law enforcement agencies before sampling in a county. Failure to make appropriate liaison contacts may result in public reaction against team activities with subsequent delay in completion of sampling contracts.

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21-22 ERDA-SR

23-200 TIS File, SRL

201-300 ERDA-GJ (for open file)