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**QUALITY ASSURANCE PROJECT PLAN FOR THE
NATIONAL PESTICIDE SURVEY OF DRINKING WATER WELLS:
HYDROGEOLOGIC CHARACTERIZATION AND
SECOND-STAGE STRATIFICATION ACTIVITIES**

Prepared by:

Bruce Rappaport, Harold Lester, and Charles Miller
ICF Incorporated
9300 Lee Highway
Fairfax, Virginia 22031-1207

Prepared for:

U.S. Environmental Protection Agency
Technical Support Division
Office of Drinking Water
26 W. Martin Luther King Drive
Cincinnati, Ohio 45268

U.S. Environmental Protection Agency
Region 5, Library (PL-12J)
77 West Jackson Boulevard, 12th Floor
Chicago, IL 60604-3590

APPROVAL PAGE

60336628309
_____, ICF Project Leader
Harold Lester

_____, ICF QAC
Gary McKown

_____, NPS QAO
Lora Johnson

_____, OPP QA Officer
Elizabeth Leovey

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3. PROJECT DESCRIPTION

The National Pesticide Survey (NPS) is a high priority undertaking to determine the degree to which pesticides are present in the nation's drinking water supply. It is jointly funded by the U.S. Environmental Protection Agency (EPA), Office of Drinking Water (ODW) and Office of Pesticide Programs (OPP). During the Survey, well water samples will be analyzed for the presence of nitrate and about 120 pesticides, degradation products, and metabolites in approximately 1,350 drinking water wells nationally. The Survey is based upon a first-stage statistical design for sample well selection categorizing sites in two key areas: agricultural pesticide usage levels and ground-water vulnerability.

By virtue of the statistical design, the Survey will facilitate evaluation of associations among pesticide concentrations in drinking water wells, patterns of pesticide use, and ground-water vulnerability. Ground-water vulnerability, for the purpose of the Survey, is determined on the basis of the vulnerability score as defined by the DRASTIC system developed by the National Water Well Association (NWWA) for the EPA.

This Quality Assurance Project Plan (QAPjP) addresses the activities related to assigning DRASTIC^{1/} vulnerability scores at the subcounty level and developing second-stage sampling units based on cropping patterns and vulnerability scores within designated counties selected for the NPS. Domestic well survey counties for the NPS were randomly selected based on their overall relative index of agricultural pesticide use and ground-water vulnerability. A 12 stratum matrix was developed for the selection of the counties. These stratum were developed from three ground-water vulnerability index values (e.g., high, moderate, low) and four pesticide use index values (e.g., high, moderate, low, and uncommon). Individual steps in DRASTIC mapping are illustrated in Exhibit 3-1. Exhibit 3-2 illustrates the sequence of events for the construction of second-stage sampling units. As is evident from the steps involved, specific activities will include data collection, mapping, and digitization, but no direct measurements will be made. The Standard Operating Procedures (SOPs) for DRASTIC mapping activities are addressed in Appendix A and the SOPs for second-stage unit construction are addressed in Appendix B. Appendices C and D present the SOPs for coding the Second-Stage County Agent Questionnaire and the data entry of completed questionnaires, respectively.

The objective of the DRASTIC mapping is to subdivide each Survey county into regions with common levels of ground-water vulnerability. This vulnerability to ground-water contamination from pesticides is a function of hydrogeologic conditions. The approach selected to achieve this objective involves characterization of seven key hydrogeologic parameters (i.e. depth to water, net recharge rate, aquifer media, soil media, topography, impact of the vadose zone, and hydraulic conductivity) for the county grouping of subregions within the county, quantification of the area encompassed by each level of vulnerability, and assignment of

^{1/} The acronym DRASTIC derives from the seven hydrogeologic factors considered in the index, namely Depth to water, Recharge (net), Aquifer media, Soil media, Topography (slope), Impact of vadose zone, and Conductivity (hydraulic) of the aquifer.

EXHIBIT 3-1
SEQUENCING OF DRASTIC MAPPING ACTIVITIES

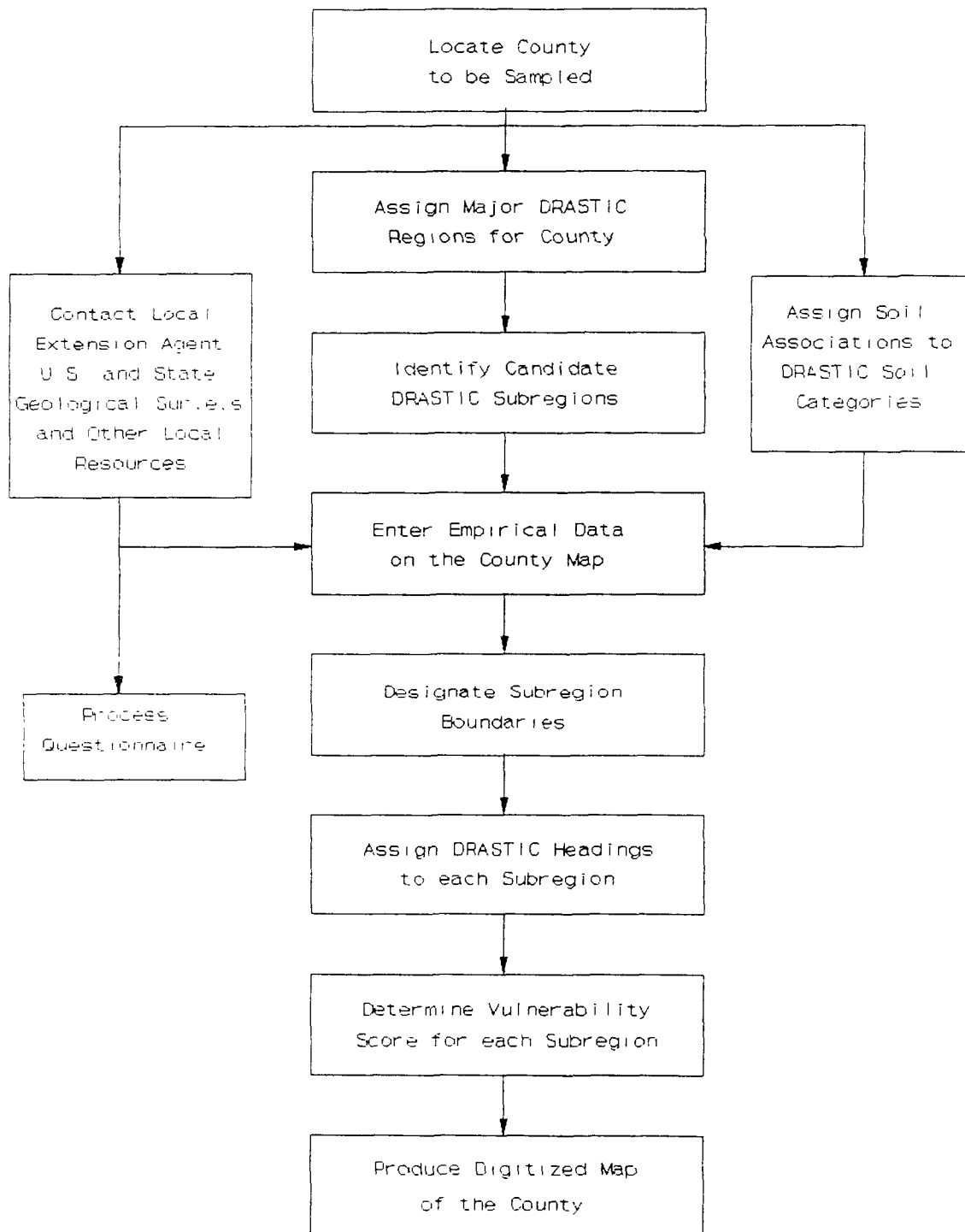
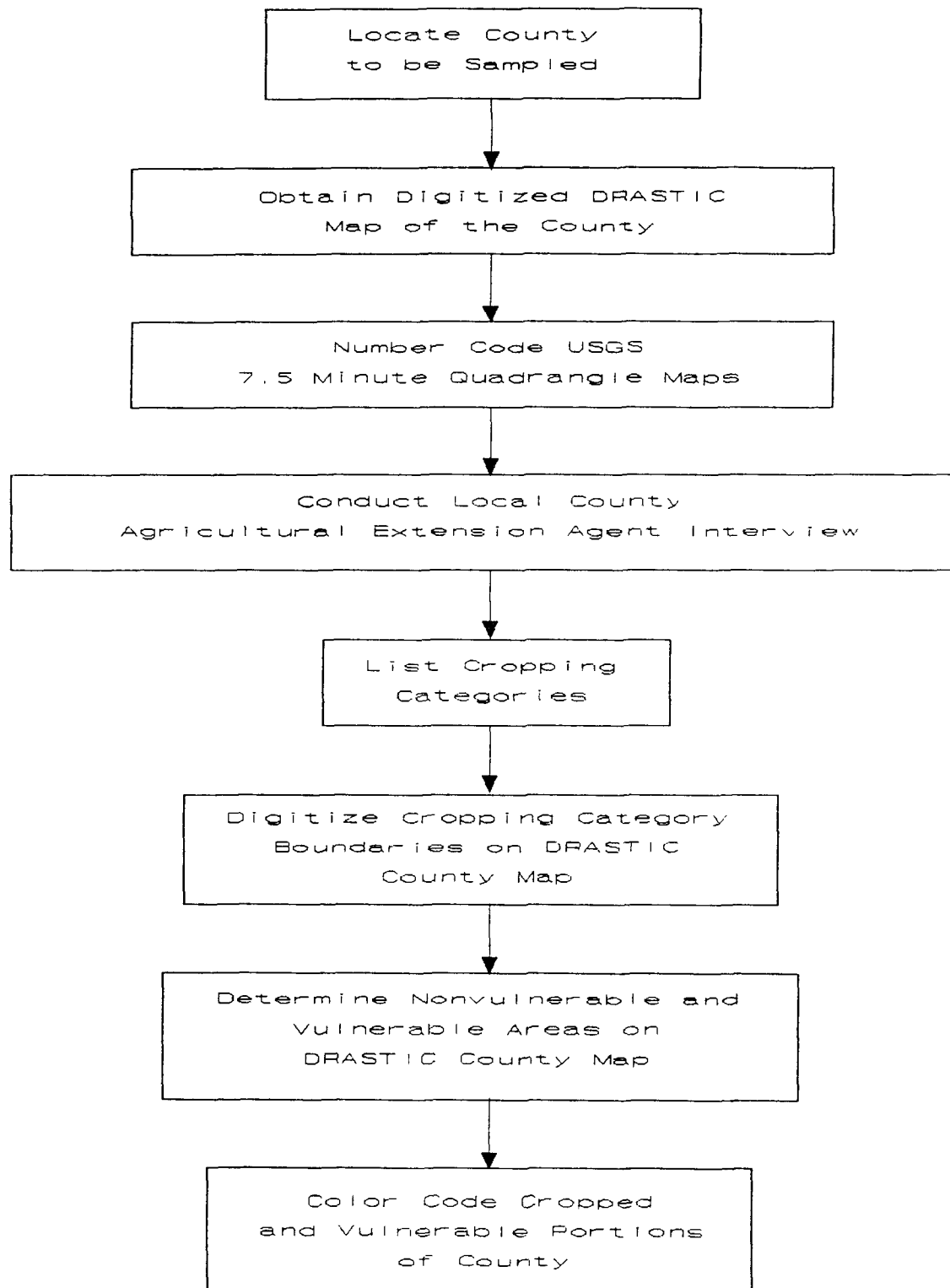


EXHIBIT 3-2
SEQUENCE OF CONSTRUCTION OF SECOND-STAGE SAMPLING UNITS



scores to each region. The method to be employed includes use of readily available empirical data and extrapolation of probable parameter values from generic descriptions of DRASTIC subregion type settings.

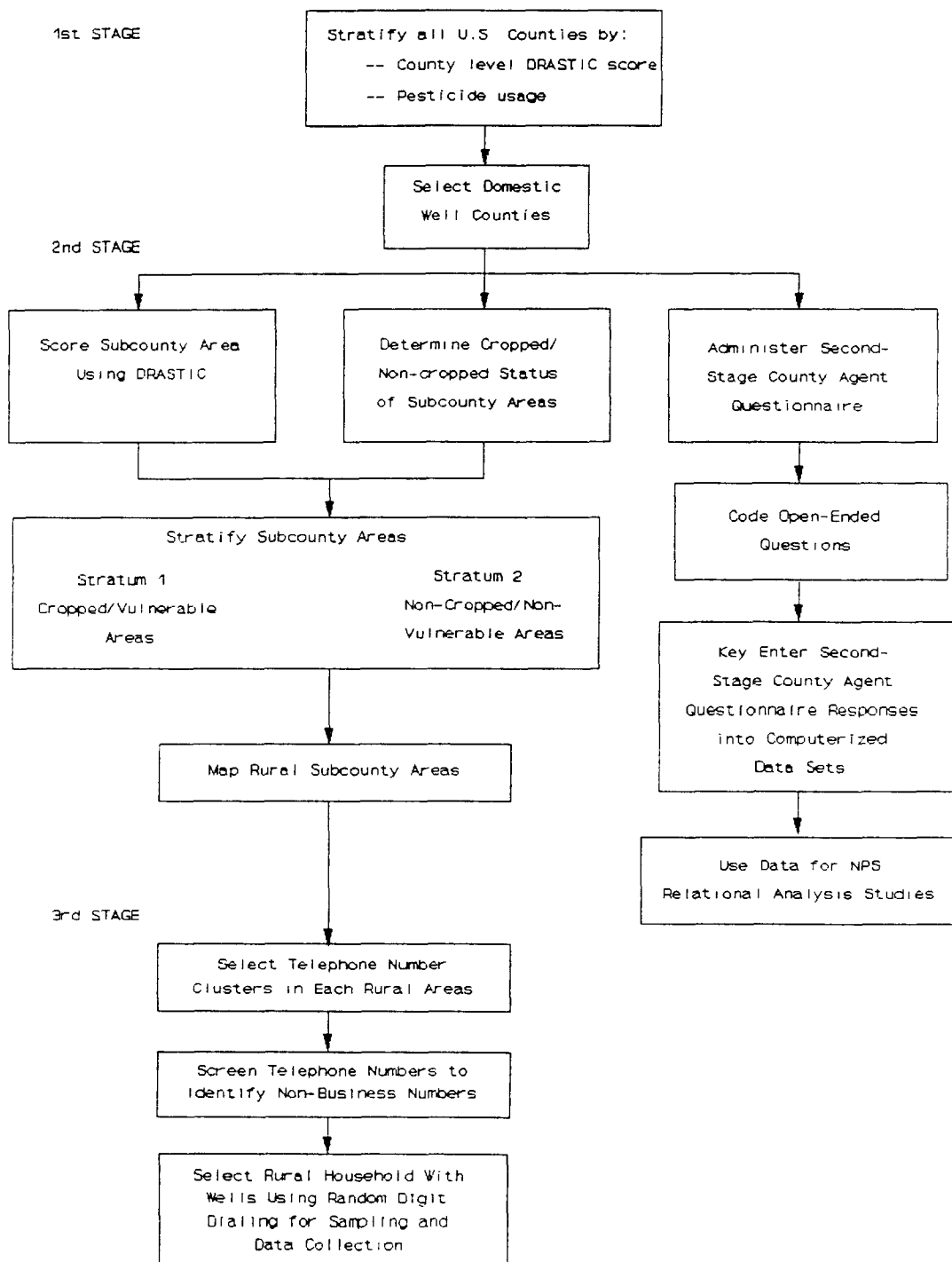
The construction of second-stage sampling units based on cropping and vulnerability will be carried out in two phases. In the first phase, interviews with county agricultural agents (Attachment 1) are conducted to classify quadrants (USGS 7.5-minute quadrangle maps) of each of the 90 Survey counties into one of three agriculture cropping categories. In general, the three agriculture cropping categories are: (1) more than 50 percent of the area is cropped; (2) 25 to 50 percent of the area is cropped; and (3) 25 percent or less of the area identified is cropped (see SOP B for complete second-stage cropping category definitions). In the second phase, the total area of the county will be partitioned into two strata using ground-water vulnerability and cropping scores for each quadrant. Cropping category maps will be combined with DRASTIC vulnerability maps to determine the two strata. One stratum will contain the more heavily cropped and more vulnerable part of the county, and the remainder of the county will be designated to the second stratum. These composite maps showing the cropped and vulnerable areas of each county will be used to identify households with wells that reside in cropped and vulnerable areas of each county.

This QAPjP for the Hydrogeologic Group and second-stage stratification team discusses the specific procedures for assuring that the data quality goals of the NPS are met. The QAPjP entails six specific features; each of these elements is described in detail throughout this report:

- 1) use of standard operating procedures (SOP);
- 2) staff training in the SOP;
- 3) calibration of staff against outside standards;
- 4) internal consistency checks;
- 5) expert evaluation; and
- 6) comparison to external data sources.

Exhibit 3-3 shows how second-stage activities fit in the overall domestic well selection process. As shown in this exhibit data entry of completed Second-Stage County Agent Questionnaires is independent of determining "cropped and vulnerable" subregions for oversampling wells as part of the Survey design. Completed second-stage cropped and vulnerable maps are produced by ICF and submitted to Westat for selecting homeowners with wells as part of random digit dialing activities. (Additional procedures on selecting wells is provided in the NPS Survey Statistics, Data Collection and Processing Quality Assurance Project Plan.)

EXHIBIT 3-3 OVERVIEW OF SECOND-STAGE ACTIVITIES



4. PROJECT ORGANIZATION AND RESPONSIBILITIES

The organization of the Survey is provided in the overall Quality Assurance Program Plan (QAPP). Exhibit 4-1 shows the position of the Hydrogeological Group and Second-Stage Stratification Team within the overall project organization. The ICF Project Director is Harold Lester. Activities undertaken to implement and conduct the NPS will be managed under five groups. These groups include the Survey Statistics Group, Well Sampling, Data Collection and Processing Group, Communications Group, Report Writing Group, and Hydrogeologic Group.^{1/}

Activities addressed in this plan are the primary responsibility of the hydrogeologic group and second-stage stratification team which is organized as presented in Exhibit 4-2. The hydrogeologic group is responsible for performing DRASTIC mapping activities by subdividing each Survey county into regions with common levels of ground-water vulnerability. The second-stage stratification team is responsible for conducting county agricultural agent interviews to determine the cropping and pesticide use patterns within each of the Survey counties. The second-stage stratification team is tasked with the responsibility for developing county composite maps which show the more cropped and ground-water vulnerable regions of each of the counties for selecting households with wells.

ICF's Quality Assurance Officer (QAO), Gary McKown, will manage the overall quality assurance activities, monitor performance by the task Quality Assurance Coordinator (QAC), review QAC reports, request audits, and inform the Project Director of any problems. Project group managers will perform file reviews for every county reviewing all supporting documentation, calculations, assumptions, and completed work. Random audits will be performed by the second-stage Team Leader on an as needed basis to ensure compliance with the standard operating procedures. The QAO will also facilitate resolution of problems identified during audits.

The QAC for the hydrogeologic group and second-stage stratification team will be Charles Miller. He will be responsible for implementing this QAPjP. As QAC, he has several responsibilities:

- Maintain copies of all protocols, methods, SOPs, QAPjPs, and other documents relevant to the activities under their jurisdiction for the Survey.
- Review activities under his jurisdiction and maintain written and properly signed records of each review. Review documentation will include the date of the review, activity reviewed, findings and problems, action recommended and taken to resolve existing problems, and any scheduled dates for additional reviews. Any significant problems found during a review that are likely to affect the integrity of the Survey will be brought to the attention of the project QAO immediately.
- Submit to the QAO written monthly program reports noting any problems and corrective action taken.

^{1/} Detailed explanations of the responsibilities for each group are presented in the QAPjPs.

EXHIBIT 4-1

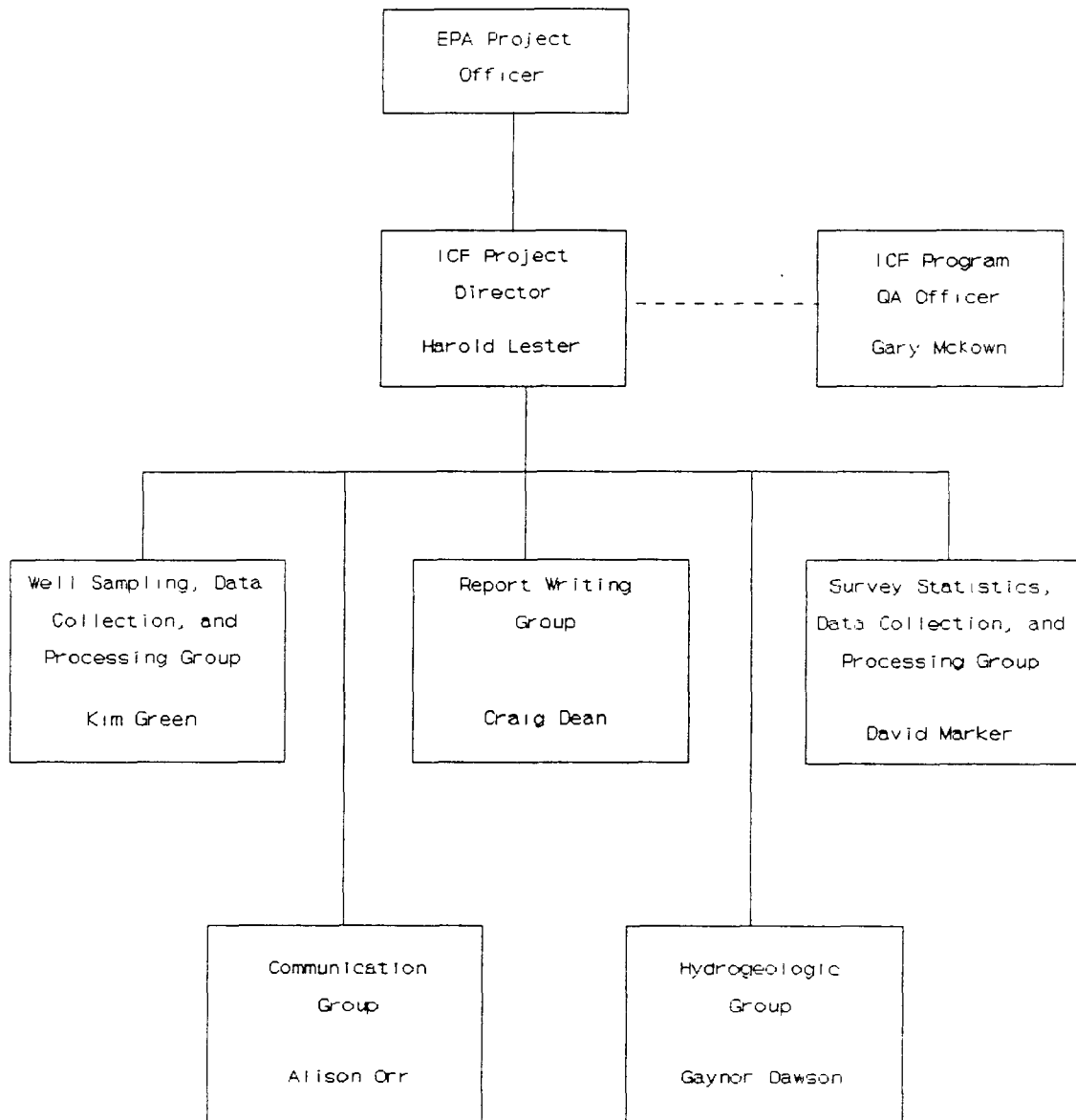
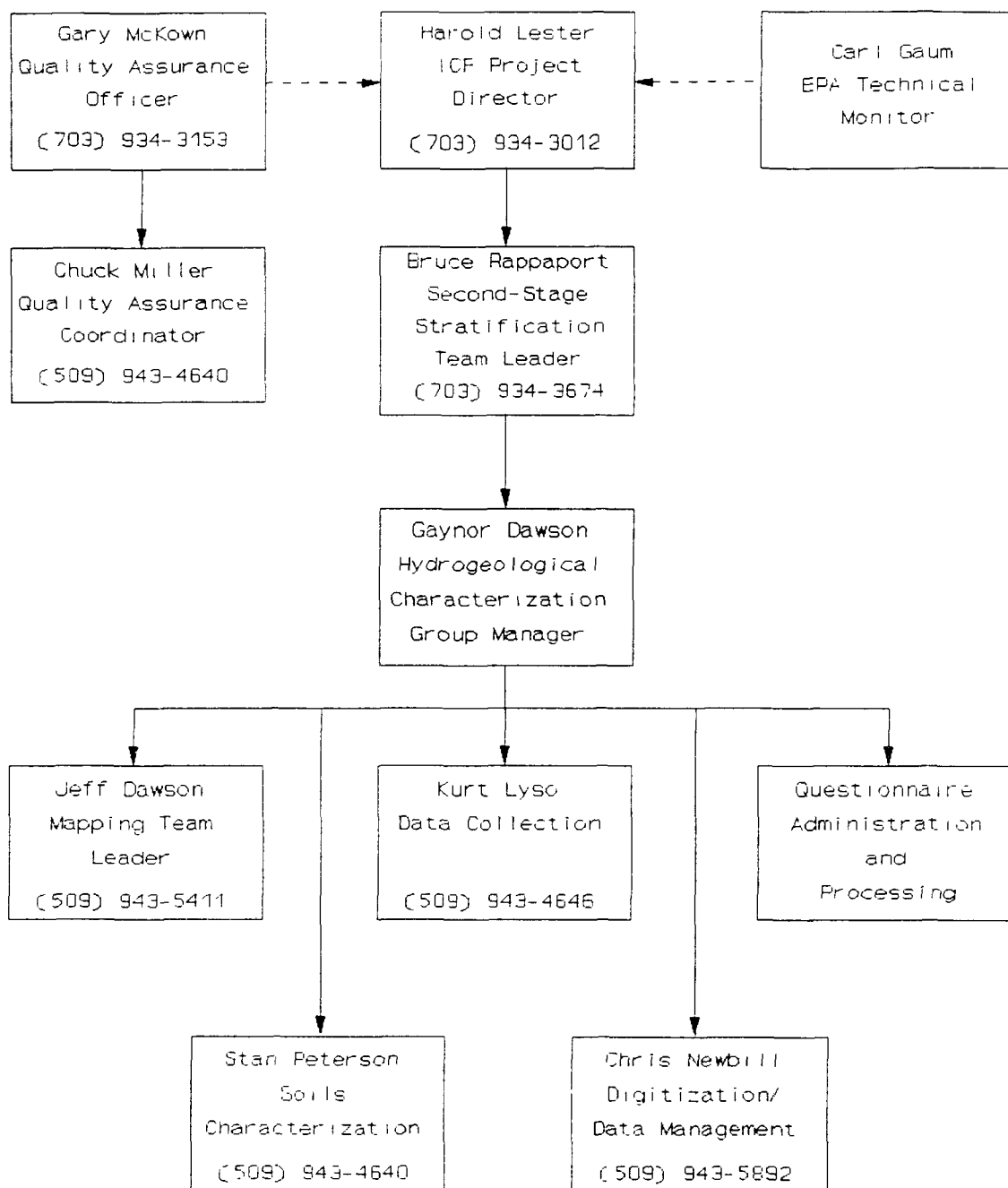


EXHIBIT 4-2

ORGANIZATION OF HYDROGEOLOGICAL GROUP AND
SECOND-STAGE STRATIFICATION TEAM



- Determine that no deviations from the QAPjP, approved protocols, or standard operating procedures were made without proper authorization and documentation.
- Review reports issued by the Hydrogeologic Group and Second-Stage Stratification Team to assure that the reports accurately represent the methods and SOP applied, and that reported results match the raw data.
- Maintain all records in one location. The method of indexing such records shall be in writing, along with the protocols and procedures used, and shall be available for audit.

In addition to the QAC, several other key personnel have significant responsibilities within the Hydrogeologic Group and Second-Stage Stratification Team:

Gaynor Dawson	--	Group Manager - responsible for all work performed by the group; reports to the ICF Program Manager; and coordinates with other group managers. Certifies all mapping personnel.
Jeff Dawson	--	Mapping Team Leader - responsible for implementation of DRASTIC mapping activities and arranging the mapping certification exercise.
Kurt Lyso	--	Data Collection - responsible for collection of data from relevant State agencies, county agricultural extension agent, and local drillers.
Chris Newbill	--	Digitization/Data Management - responsible for digitization of completed county maps and management of all data generated within the group.
Stan Peterson	--	Soil Scientist - responsible for reviewing soil survey reports to select vadose zone media.
Bruce Rappaport	--	Second-Stage Stratification Team Leader - responsible for county agricultural extension agent interviews and implementation of cropped and vulnerable mapping activities. Also, responsible for coordinating deadlines for digitizing cropped and vulnerable county maps and for reviewing finished hydrogeologic characterization maps.

5. SELECTION OF RURAL DOMESTIC WELL COUNTIES

5.1 Selection of First-Stage Counties

The NPS used a process known as stratification in selecting the subsets of rural domestic wells for sampling. In general, stratified designs are used to improve the accuracy of the estimates by controlling the distribution of the sample of the population from which data will be collected. The selection of the samples of the population of rural domestic wells took place in stages, with additional selection criteria at each stage. The resulting final samples of the population of rural domestic wells were controlled for two specific criteria: pesticide use and ground-water vulnerability in the county or subcounty area in which the wells to be sampled were located.

Each of the 3,137 counties or county equivalents in the U.S. (which were determined to be conveniently-sized units for constructing the first-stage sampling frame) was categorized by pesticide use and ground-water vulnerability. The first-stage sampling frame was stratified in this manner to ensure that samples were taken from wells located in areas with different levels of pesticide use and ground-water vulnerability.

In 1984 when the Survey design was begun, only limited data were available on pesticide use. Originally, all types of pesticide use -- agricultural, home and garden, industrial, rights-of-way, commercial, and government -- were considered as stratification criteria. Because agricultural use of pesticides was significantly higher than other uses, agricultural pesticides has been found in ground water, and data on agricultural pesticide use were better than for other categories of use, agricultural pesticide use was chosen as one of the stratification criteria.

EPA developed county-level pesticide use estimates for each county, based on 1982 Census of Agriculture information for crop acreages and on private marketing data (provided by Doane Marketing Research, Inc.) for pesticides. Total acreage using 63 specific chemicals was calculated for 28 crops. The acreage to which a specific chemical was applied in a county was estimated; acreages for all chemicals were summed, and the total expressed as a percentage of the total area of the county. Agricultural pesticide use was described as high, medium, low, or uncommon, based on the following criteria:

- **High Pesticide Use.** Agricultural pesticides applied to the equivalent of 75 percent or more of the total county area;
- **Moderate Pesticide Use.** Agricultural pesticides applied to the equivalent of between 30 percent and 74 percent of the total county area;
- **Low Pesticide Use.** Agricultural pesticides applied to the equivalent of between 5 percent and 29 percent of the total county area; and
- **Uncommon Pesticide Use.** Agricultural pesticides applied to the equivalent of less than 5 percent of the total county area.

In order to examine any relationships between levels of pesticides and nitrate and hydrogeologic characteristics conducive to ground-water contamination, NPS developed a system for identifying a variety of hydrogeologic conditions and classifying them into areas of relatively greater or lesser ground-water

vulnerability on a county-wide basis for the purpose of sample stratification. One of the goals of the Survey was to test this system and determine if it functioned as a useful sorting technique.

The Agricultural DRASTIC classification system, one variation of an indexed scoring system that had already been developed by the National Water Well Association, was modified for use in the Survey by Research Triangle Institute. DRASTIC is an acronym for a ranking system for evaluating the vulnerability of aquifers to pollution beneath a particular land area. It is derived from the seven hydrologic factors considered in the ranking system: depth of water, recharge (net), aquifer media, soil media, topography (slope), impact of vadose zone, and conductivity (hydraulic) of the aquifer. Another proposed classification system, the Great Soil Groups, was not chosen because its component factors apply only to the top 30 inches of soil. Site-specific classification systems were precluded for a large-scale national survey such as NPS because of the large amounts of data such systems require. Design of an entirely new system for use by the Survey was precluded by the cost and time that would have been needed to develop it.

To represent relative ground-water vulnerability, a county-level DRASTIC hazard index was developed for each of the 3,137 U.S. counties, based on a number of information sources and the experience and judgment of hydrogeologists familiar with particular regions. The sources of information included:

- U.S. Geologic Survey (USGS) 7.5 minute quadrangle maps (or 15 minute quadrangle maps where 7.5 minute maps were not available);
- USGS Geologic Maps and USGS Groundwater Maps (where available);
- U.S. Department of Agriculture, Soil Conservation Service Soil Survey Maps; and
- Materials from State geologic surveys, Departments of Water and Natural Resources, Departments of Environmental Protection, regional planning authorities, county and regional water supply agencies, private water supply firms, hydrogeologic and engineering firms, professional associations, and local colleges and universities.

These DRASTIC scores were used to divide counties into areas of relatively high, moderate, and low ground-water vulnerability, as follows:

- **High.** County-level DRASTIC score that identifies the most highly vulnerable 25 percent of households with wells within each of the pesticide use strata.
- **Moderate.** County-level DRASTIC score that identifies the most highly vulnerable 50 percent of households with wells within each of the pesticide use strata.
- **Low.** Remainder of the area frame (i.e., counties with the lowest DRASTIC scores identifying 25 percent of households with wells within each of the pesticide use strata).

Thus, the DRASTIC scores, together with the pesticide use criteria, result in a matrix of 12 strata. The strata, and their associated DRASTIC scores, are described in Exhibit 5-1. From each of these 12 strata a statistically specified number of counties were selected at random from each strata for a total of 90 counties as the primary sampling unit in which to randomly select wells (Exhibit 5-2).

EXHIBIT 5-1

STRATA FOR NPS FIRST-STAGE SURVEY DESIGN

Agricultural Pesticide Use	Ground-Water Vulnerability	Defining DRASTIC Scores
High	High	148 and over
High	Moderate	116 to 147
High	Low	115 and under
Moderate	High	163 and over
Moderate	Moderate	113 to 162
Moderate	Low	112 and under
Low	High	159 and over
Low	Moderate	132 to 158
Low	Low	131 and under
Uncommon	High	152 and over
Uncommon	Moderate	121 to 151
Uncommon	Low	120 and under

EXHIBIT 5-2

NATIONAL PESTICIDE SURVEY: FIRST STAGE SAMPLE LISTING
 OF DOMESTIC WELL COUNTIES

Stratum	State	County	Stratum	State	County
Stratum 1 High Use, High Vulnerability			Stratum 2 High Use, Medium Vulnerability		
Arkansas		Greene	Illinois		Kane
Delaware		Sussex			Mc Henry
Florida		Palm Beach	Indiana		Hendricks
Indiana		Hancock	Iowa		Benton
		Marshall			Greene
Missouri		Mississippi	Louisiana		Jefferson Davis
North Carolina		Washington	Minnesota		Le Sueur
			Nebraska		Burt
Stratum 3 High Use, Low Vulnerability			Stratum 4 Medium Use, High Vulnerability		
Illinois		Peoria	Georgia		Candler
		Warren	Michigan		Allegan
Missouri		Saline	North Carolina		Beaufort
South Dakota		Lincoln	South Carolina		Clarendon
			Virginia		Lancaster
Stratum 5 Medium Use, Medium Vulnerability			Stratum 6 Medium Use, Low Vulnerability		
Arkansas		Lawrence	Kansas		McPherson
Indiana		Lake	Minnesota		Clay
Maryland		Cecil	Missouri		Andrew
Michigan		Cass	Ohio		Medina
		Kalamazoo			
		Washtenaw			
North Carolina		Yadkin			
Ohio		Montgomery			
Pennsylvania		Berks			

EXHIBIT 5-2 (continued)

NATIONAL PESTICIDE SURVEY: FIRST STAGE SAMPLE LISTING
OF DOMESTIC WELL COUNTIES

Stratum		Stratum	
State	County	State	County
Stratum 7 Low Use, High Vulnerability		Stratum 8 Low Use, Medium Vulnerability	
Florida	Okaloosa	Alabama	Talladega
	Washington	Connecticut	New London
Georgia	Walker	Georgia	Newton
Massachusetts	Hampshire	Louisiana	Beauregard
Michigan	Grand Traverse	Michigan	Oakland
Mississippi	George		Presque Isle
North Carolina	Carteret	New Jersey	Monmouth
Virginia	Gloucester	New York	Dutchess
			Schoharie
		North Carolina	Henderson
		Ohio	Columbiana
		Pennsylvania	Susquehanna
		South Carolina	Lancaster
		Tennessee	Marion
Stratum 9 Low Use, Low Vulnerability		Stratum 10 Uncommon Use, High Vulnerability	
California	Kern	Florida	Osceola
Georgia	Henry		Volusia
Idaho	Latah	Massachusetts	Worcester
Ohio	Carroll	Mississippi	Clarke
	Geauga	North Carolina	Madison
Oklahoma	Pottawatomie	Pennsylvania	Lackawanna
Tennessee	Franklin	Rhode Island	Kent
Stratum 11 Uncommon Use, Medium Vulnerability		Stratum 12 Uncommon Use, Low Vulnerability	
Connecticut	Fairfield	Arkansas	Izard
	Middlesex	California	Ventura
Louisiana	Sabine	Idaho	Bonner
Montana	Lewis and Clark	Missouri	Taney
New Mexico	Lea	Oregon	Jackson
North Carolina	Cherokee	West Virginia	Nicholas
Tennessee	Union		
Texas	Washington		
Vermont	Windham		
Virginia	Wise		
Washington	Thurston		

5.2 Pilot Study

In March 1987, EPA launched a pilot study to field test the major components of the Survey and to provide an opportunity for any necessary revisions, or modifications before implementing the full Survey.^{1/} Between March and August, the pilot study for the NPS was conducted in six counties in three States: Kern County, California; Ventura County, California; Le Sueur County, Minnesota; Clay County, Minnesota; George County, Mississippi; and Clarke County, Mississippi. As a result of the pilot study, recommendations were made for changes in hydrogeologic characterization and the selection of households to participate in the full Survey. These recommendations were implemented as part of hydrogeologic characterization and second-stage stratification activities for the full Survey.

^{1/} For more information on the pilot study, see National Pesticide Survey Pilot Study Evaluation Report, U.S. EPA September 1987, or National Pesticide Survey: Pilot Evaluation Technical Report, Contract No. 68-01-7350, Research Triangle Institute, Research Triangle Park, NC. January 29, 1988.

6. QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The primary objective for hydrogeologic characterization and second-stage stratification mapping activities is to construct a sampling frame to identify private water wells supplying occupied housing units located in rural areas of the U.S., except government reservations. Second-Stage maps were produced to increase the probability of randomly selecting rural domestic wells in geographic areas that have high pesticide usage and ground-water vulnerability.

Accuracy. Objective is to construct a sampling frame to identify a cropped and vulnerable domain (population of interest) as small as 0.25%. This is achieved by mapping discrete areas as small as 100 acres and using data from local sources. All data collection involves retrieval of published information or primary data from local sources such as geological surveys and county agricultural extension agents. A maximum labor expenditure of eight hours per county will be allowed for data retrieval.

Precision. Objective is to have less than 10% variation between mapping personnel; achieved through a certification exercise.

Completeness. All counties selected for the domestic well survey will be mapped, with the exception of six counties which were mapped by Research Triangle Institute as part of the Pilot Survey.

7. DATA REDUCTION AND REPORTING

No parameters will be measured or raw data collected during conduct of the hydrogeologic characterization and second-stage stratification tasks. Data collection will focus on use of published information or information provided by local experts. As a consequence, no data reduction or reporting will be performed on measurement parameters. Hence, this section of the QAPjP is not required. Related quality assurance requirements for the DRASTIC mapping activity are addressed in Appendix A, Standard Operating Procedures for DRASTIC Mapping Activities. Second-stage stratification activity related quality assurance requirements are addressed in Appendix B, Standard Operating Procedures for Construction of Second-Stage Sampling Units: Cropped and Vulnerable. Data reporting for these activities will consist of two color-coded maps. The first map will present weighted average DRASTIC hazard index range scores with the percent land area covered by each index range. The second map will show the cropped and vulnerable and non-cropped and vulnerable regions of the county. The Sampling Unit map will be delivered to the Survey Statistics Group showing identifiable boundary regions of the cropped and vulnerable regions of the county.

Data coding and key entry requirements for reporting responses to the County Agent Questionnaire are presented in Appendices C and D. Data reporting of completed County Agent Questionnaires will be used during data analysis to try and explain the overall well sampling results.

8. INTERNAL QUALITY CONTROL CHECKS

The QAC will perform internal quality assurance checks of completed mapping activities to ensure conformance to the standard operating procedures. He will conduct file checks of all DRASTIC mapping activities and second-stage stratification tasks to provide product documentation and ensure consistency between counties.

Once a DRASTIC mapping team is certified, periodic quality assurance checks will be made. The quality assurance checks will consist of observation of the mapping process to verify that established procedures are followed, and inspection of records to verify currency of data (3 times per county). The QAC will check the currency and accuracy of solicited hydrogeologic mapping data for the seven DRASTIC factors, confirm the DRASTIC region and subregion identifications and compare DRASTIC scores with DRASTIC default values, and evaluate the completed county digitized DRASTIC map. The completed county DRASTIC map is evaluated from the information developed on the USGS quadrangle maps in relation to the location of DRASTIC subregions (i.e., shape and size of subregions and color coding). Should problems be identified during those reviews, the QAC will help develop appropriate corrective actions.

The quality assurance provisions for DRASTIC mapping activities include a certification or calibration exercise. During this exercise, the mapping staff perform a mapping analysis on Clark County, Mississippi and their results are compared to those developed during the NPS pilot study. The objective of the comparison is to determine if mapping staff are sufficiently adept at application of the DRASTIC system. In part, DRASTIC mapping is judgmental and this exercise is to ensure that the teams work would be deemed acceptable by the DRASTIC system creators, the NWWA.

For the purposes of this certification/calibration activity, two quantitative tests will be made:

- 1) an overlay of the map outputs to compare subregion boundaries; and
- 2) a comparison of vulnerability scores for each subregion.

Compatibility of results will be judged on the basis of subregion boundary differences and subregion vulnerability scores each exceeding a level of 10% for each test. With reference to the two tests, certification is accomplished if:

- 1) overlays reveal that subregion boundaries leave $\leq 10\%$ of the county area in nonconforming subregions; and
- 2) modified vulnerability scores for each subregion are $\leq 10\%$ different than those reported in the pilot study.

The quality assurance provisions for second-stage stratification mapping activities include each member of the team completing a certification exercise by producing a completed cropped and ground-water vulnerability map on Clarke County, Mississippi. The objective is to determine if procedures can be performed on a routine basis.

The QAC will be responsible for performing routine checks of completed work by the Hydrogeologic Group and second-stage stratification team. He will be responsible for performing random spot checks on

all completed county files to be sure they are in accordance with the SOPs. He will detect any problems and identify those individuals responsible for performing corrective action.

Mr. Miller will ensure that all files pertaining to DRASTIC mapping and second-stage stratification activities are properly maintained and indexed for future retrieval. He will be responsible for ensuring that all available data is correctly filed, assumptions and calculations are properly documented, that DRASTIC mapping procedures are applied using the NWWA's method, and that other individuals familiar with the assignments could duplicate the team's work.

Exhibit 8-1 provides an overview of the quality control checks for providing DRASTIC maps, second-stage cropped and vulnerable maps, coding County Agent Questionnaires, and key entering completed questionnaires. Internal quality control checks will be completed by senior members of the Survey staff. Ms. Lora Johnson, the NPS Quality Assurance Officer will complete external audits.

EXHIBIT 8-1
SUMMARY OF QUALITY CONTROL CHECKS

Quality Control Check	Key Personnel				
	C. Miller	L. Johnson	B. Rappaport	C. Lindsay	S. Beidas
<u>Develop Standard Operating Procedure</u>					
- DRASTIC Mapping Activities	✓		✓		
- Construction of Second-Stage Sampling Units: Cropped and Vulnerable Stratum			✓		
- Data Coding for Second-Stage County Agent Questionnaire			✓	✓	
- Procedures for Data Entry of Second-Stage County Agent Questionnaire			✓		✓
<u>Train Staff on Standard Quality Procedure</u>					
- DRASTIC Mapping Activities	✓				
- Construction of Second-Stage Sampling Units: Cropped and Vulnerable Stratum			✓		
- Data Coding for Second-Stage County Agent Questionnaire			✓	✓	✓
- Procedures for Data Entry of Second-Stage County Agent Questionnaire					✓
<u>Certify Staff</u>					
- DRASTIC Mapping Activities	✓				
- Construction of Second-Stage Sampling Units: Cropped and Vulnerable Stratum			✓		
- Data Coding for Second-Stage County Agent Questionnaire			✓	✓	
- Procedures for Data Entry of Second-Stage County Agent Questionnaire			✓		✓
<u>Review DRASTIC Map</u>					
- Currency, source, and adequacy of data	✓				
- DRASTIC subregion and scores	✓				
- Digitization and final map	✓		✓		

EXHIBIT 8-1 (continued)
SUMMARY OF QUALITY CONTROL CHECKS

Quality Control Check	Key Personnel				
	C. Miller	L. Johnson	B. Rappaport	C. Lindsay	S. Beidas
<u>Review Cropped and Vulnerable Map</u>					
- Legend	✓		✓		
- DRASTIC subregion areas	✓		✓		
- Cropping categories	✓		✓		
- Size and shape of digitized areas	✓		✓		
- Boundary delineations	✓		✓		
<u>Review County Agent Questionnaire Data Coding</u>					
- Pesticides entered			✓	✓	
- Time of application			✓	✓	
<u>Check Completeness of Files</u>					
- Data references	✓				
- Records of communication	✓				
- Justification statements	✓				
<u>Monitor Production Activities</u>					
- DRASTIC maps	✓		✓		
- Cropped and vulnerable map	✓		✓		
- County agent interviews	✓		✓		
<u>Perform Audits</u>					
- Internal audits			✓		
- External audits		✓			

9. SYSTEM AUDITS

System audits will be conducted during hydrogeologic characterization and second-stage stratification activities. These audits will be conducted by the Second-Stage Stratification Team Leader, Dr. Bruce Rappaport and the NPS QAO, Lora Johnson. The audit conducted by the Team Leader will be an internal audit of conformance to requirements presented in this QAPjP, whereas the NPS QAO will conduct an independent external audit of all activities. The Team Leader will be responsible to reporting all audit findings to the NPS Project Director, whereas the NPS QAO will report directly to the EPA Program Director.

The audit conducted by Dr. Rappaport will consist of reviewing the files of the completed counties, selected at random approximately half-way through mapping activities. Dr. Rappaport will check the files to see if all information can be easily reproduced from the hydrogeologic mapping activity. This review will consist of talking with each team member, asking them to explain their role on mapping activities and then jointly going through the files maintained in a central location to see if the final hydrogeologic characterization assessment can be reproduced.

To determine the mapping team's conformance to the procedures outlined in this QAPjP, an auditing form checklist will be completed (Exhibit 9-1). This form was prepared from the guidelines presented in this QAPjP. Upon completing the internal audit, Dr. Rappaport will prepare a summary letter along with the completed checklists to the QAC, mapping team, and Project Director recommending improvements where necessary to document mapping activities. The QAC will be responsible for ensuring that all recommendations are followed through.

EXHIBIT 9-1

HYDROGEOLOGIC CHARACTERIZATION
AUDIT CHECKLIST

<u>County</u> <u>State</u>					
<u>QUESTION</u>		<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>COMMENTS</u>
A. DRASTIC Mapping Activities					
1.	Has the county boundary line been clearly drawn on the USGS 7.5 minute quadrangle maps?	_____	_____	_____	_____
2.	Can the major DRASTIC region be duplicated for the county by locating county boundaries on the master DRASTIC map which depicts the major DRASTIC regions (NWWA/EPA, p. 15)?	_____	_____	_____	_____
3a.	Do written file materials indicate when county borders lie along the boundary of a DRASTIC region to ensure that a major DRASTIC region has not been eliminated?	_____	_____	_____	_____
3b.	Have DRASTIC region descriptions and the Soil Conservation Service county soil survey been reviewed to ensure that a major DRASTIC region has not been eliminated when county borders lie along the boundary of a DRASTIC region?	_____	_____	_____	_____
4.	Have assignments been directed to individual mappers who will deal with counties in a prescribed subset of DRASTIC regions (e.g., mapping staff specialized in the distinctions between subregions of a limited set of regions)?	_____	_____	_____	_____
5a.	Have Records of Conversation been maintained for data which is sought by telephone interview?	_____	_____	_____	_____

Date: _____

EXHIBIT 9-1 (continued)

HYDROGEOLOGIC CHARACTERIZATION
 AUDIT CHECKLIST

QUESTION	YES	NO	N/A	COMMENTS
5b. Do the Records of Conversation indicate the date of the conversation, the interviewer's name, and the individuals who supplied information including their Agency's address and phone number?	—	—	—	—
5c. Have all assumptions made to interpret verbal or written information been defined in a Record of Decision and placed in the project file?	—	—	—	—
6a. Are Judgement Call Records maintained in the project file when the area within a county does not clearly fit into a specific DRASTIC subregion description?	—	—	—	—
6b. Does the Judgement Call Record include pertinent information used in selection of an appropriate DRASTIC subregion designation in that area?	—	—	—	—
6c. Has the site Quality Assurance Coordinator signed-off that he is in agreement with the mapping team's Judgement Call Record?	—	—	—	—
7a. Are the files on depth to ground water properly maintained (e.g., USGS, State, geological surveys)?	—	—	—	—
7b. Are the well depths plotted on the USGS 7.5 minute quadrangle maps properly recorded in the project file records indicating the latitude and longitude data used on the maps?	—	—	—	—

Date: _____

EXHIBIT 9-1 (continued)

HYDROGEOLOGIC CHARACTERIZATION
AUDIT CHECKLIST

QUESTION	YES	NO	N/A	COMMENTS
8. Are files properly maintained that show subcounty region vulnerability calculations for depth to ground water?	___	___	___	_____
9. Are the weighted average scores for the determination of recharge (net) (e.g., $R = (MAP + Irr.) - ET - RO$) in each county subregion reproducible from project file data calculation sheets?	___	___	___	_____
10. Are the sources of information listed for the recharge (net) parameters?	___	___	___	_____
11. Was the recharge data correctly recorded on the USGS 7.5 minute quadrangle maps such that each parameter was placed where the value was measured?	___	___	___	_____
12. Is a Record of Decision available that indicates the reference source and page number used to identify the aquifer media?	___	___	___	_____
13. Has a Record of Decision been maintained in the project file listing the soil associations in the county?	___	___	___	_____
14. Are the major soil types identified for each soil association with a Record of Decision on why each soil type was chosen?	___	___	___	_____
15. Are the Soil Conservation Service soil surveys maintained in the project file?	___	___	___	_____

Date: _____

EXHIBIT 9-1 (continued)

HYDROGEOLOGIC CHARACTERIZATION
AUDIT CHECKLIST

QUESTION	YES	NO	N/A	COMMENTS
16. Have the depths, thicknesses, and textures of each soil horizon from the major soil series been listed?	_____	_____	_____	_____
17. Has a Record of Decision been filed that indicates the dominant soil texture which influences pollution migration the most for each major soil series in a soil association?	_____	_____	_____	_____
18. Has a Record of Decision been filed that justifies how a representative soil texture was chosen for an entire soil association?	_____	_____	_____	_____
19. Are slope (topography) calculations available for each county subregion?	_____	_____	_____	_____
20. Is there a Record of Decision in the project file that indicates the choice of the most representative county sub-region area used to calculate slope?	_____	_____	_____	_____
21. Has a Record of Decision been filed on the selection of the vadose zone media?	_____	_____	_____	_____
22. Does the Record of Decision on vadose zone media reference the Soil Conservation Service county soil survey figures showing the pattern of soils and the underlying material in the soil association or other references on area geology and soils used to determine the parent material from which the soil is developed?	_____	_____	_____	_____

Date: _____

EXHIBIT 9-1 (continued)

HYDROGEOLOGIC CHARACTERIZATION
 AUDIT CHECKLIST

QUESTION	YES	NO	N/A	COMMENTS
23. Has a Record of Decision been filed on whether the aquifer media underlying the vadose zone media is confined or unconfined including the decision for a conservative rating when the reviewer was in doubt about which rating to select?	_____	_____	_____	_____
24. Has a Record of Decision been filed that indicates the reference source and page number used to determine the hydraulic conductivity of a county DRASTIC sub-region?	_____	_____	_____	_____
25. Can DRASTIC subregion boundaries on the USGS 7.5 minute quadrangle maps be recreated from project file documentation (e.g., NWWA subregion descriptions, land feature characteristics)?	_____	_____	_____	_____
26. Is there a copy of the county computer coded DRASTIC database in the project file?	_____	_____	_____	_____
B. Internal Consistency Review				
27. Are Internal Consistency Review files available on quad interface checks to ensure a match between boundaries?	_____	_____	_____	_____
28. Have comparison checks been made between empirical data and those associated with the DRASTIC designations?	_____	_____	_____	_____
29. Are additional data sources documented when empirical data and DRASTIC designations were inconsistent?	_____	_____	_____	_____

Date: _____

EXHIBIT 9-1 (continued)

HYDROGEOLOGIC CHARACTERIZATION
AUDIT CHECKLIST

QUESTION	YES	NO	N/A	COMMENTS
C. External Consistency Review				
30. Is a file maintained showing the results of each external consistency check?	—	—	—	—
31. Does the External Consistency Review file contain the GEMS designations, the selected major DRASTIC regions, the designated DRASTIC subregions, and comments received from local experts?	—	—	—	—
32. Has a written report been prepared when significant discrepancies were noted during an External Consistency Review and how the problem was resolved?	—	—	—	—
D. Quality Assurance Coordinator (QAC) Review				
33. Is a completed Hydrogeologic Characterization quality assurance check sheet in the project file?	—	—	—	—
34. Has the Quality Assurance Coordinator verified that all empirical data used in the determination of DRASTIC scores was done in accordance with the following procedures:				
-D (Depth to ground water) - The QAC checked for correct location of wells after plotting on the USGS 7.5 minute quadrangle maps by the mapping team. The QAC selected 10 percent of the wells plotted for verification. If more than 10 percent of those wells were incorrectly located outside one-quarter mile radius of the correct location, then the QAC required that the location of all wells in the county be replotted. The QAC reviewed				

Date: _____

EXHIBIT 9-1 (continued)

HYDROGEOLOGIC CHARACTERIZATION
AUDIT CHECKLIST

QUESTION	YES	NO	N/A	COMMENTS
calculations of the percent of each well depth category in each DRASTIC subregion;	—	—	—	—
-R (net Recharge) - The QAC verified the source of rainfall, runoff, irrigation, and evapotranspiration data and recomputed the net recharge for the DRASTIC subregions;	—	—	—	—
-A (Aquifer media) - The QAC verified the aquifer media identified in the available literature;	—	—	—	—
-S (Soil media) - The QAC reviewed the soil media report and compared to it the available soil survey data for consistency and interpretation. The QAC also reviewed the soil maps to verify the correct percentage of each soil type in the DRASTIC subregions;	—	—	—	—
-T (Topography) - The QAC verified the slope in each subregion by calculating the slope over a representative area of the USGS 7.5 minute quadrangle map;	—	—	—	—
-I (Impact of vadose zone) - The QAC verified the selection of vadose zone media using the data available; and	—	—	—	—
-C (hydraulic Conductivity) - The QAC verified the hydraulic conductivity of the aquifer using the available literature.	—	—	—	—

Date. _____

EXHIBIT 9-1 (continued)

HYDROGEOLOGIC CHARACTERIZATION
AUDIT CHECKLIST

QUESTION	YES	NO	N/A	COMMENTS
E. Cropped and Vulnerable Mapping Activities				
35. Is a completed cropped and vulnerable map quality assurance check sheet in the project file?	_____	_____	_____	_____
36. Is there a copy of the county computer coded cropping category database in the project file?	_____	_____	_____	_____
37. Is a completed cropping category record sheet available in the project file?	_____	_____	_____	_____
38. Is there a copy of the county computer coded cropped and vulnerable database in the project file?	_____	_____	_____	_____
39. Was a DRASTIC map available that outlined the USGS quadrant boundaries for the country?	_____	_____	_____	_____
40. Were postal service zip code boundaries compared to the cropped and vulnerable map delineating oversampling areas?	_____	_____	_____	_____
41. Were major highways, roads, railroads, and county boundaries on the oversampling map compared to the Rand McNally atlas to ensure digitization accuracy and labeling?	_____	_____	_____	_____
F. Additional Comments				_____ _____ _____ _____

Date: _____

10. CORRECTIVE ACTION

Corrective action measurements for hydrogeologic characterization and second-stage mapping activities are divided into three categories:

- Certification failures;
- QC checks; and
- Audit deficiencies.

Certification Failures. If the assigned DRASTIC mapping staff pass the certification exercise described in Section 8 of this QAPjP, they will be authorized to proceed with implementation of mapping activities. If either subregion boundary or subregion vulnerability score discrepancies are greater than 10%, all DRASTIC mapping work will be stopped and an analysis made of the differences. If these differences arise from new, more accurate data, work will be restarted. If the DRASTIC mapping differences reflect alternate interpretations of the data, staff will be retrained and a second certification exercise will be conducted using George County, Mississippi. Failure to pass certification test will result in replacement of the mapping team.

QC Checks. The QAC will complete a mapping checklist for hydrogeologic characterization activities to 1) determine the currency and adequacy of data; 2) verify DRASTIC subregions and scores; and 3) verify final digitized maps. Quality assurance checks to determine the accuracy of the final hydrogeologic maps will include:

- Verifying road locations against published maps (e.g., Rand McNally);
- Verifying city boundaries and water bodies against published materials; and
- Checking zip code boundaries against an available zip code Atlas.

Audit Deficiencies. Any mapping deficiencies noted during the QC check will result in the mapper correcting any deficiencies. The QAC will discuss each item noted as deficient with the mapping team member responsible for the county. No maps will be released for Survey use until all corrections have been made and a second review is conducted by the QAC.

11. QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Hydrogeologic Group QAC, Chuck Miller, will submit monthly progress reports to the Program Director, Harold Lester and the QAO, Gary McKown. These monthly reports will summarize the past months activities, deliverables submitted, changes in staff, difficulties encountered and remedial action taken, and work expected to be completed during the next month's time period. These reports will be submitted no later than on the third day of the following month.

This report, while brief in nature, will constitute a formal record of Survey activities. The report will be used to track mapping progress and to inform Survey project managers of any task difficulties. The reports will document problems and resolution of the problems as well as the implementation of this phase of the Survey. This report will be attached to the National Pesticide Survey Progress Reports for EPA review. The table of contents of a monthly progress report is provided below.

Activities Undertaken During the Month	--	Provides a brief statement of the task schedule, summary of progress to date, and a summary of the mapping schedule.
Difficulties Encountered and Remedial Action Taken	--	Identifies problems encountered and actions taken to resolve problems identified or anticipated.
Activities Anticipated During the Next Month	--	Identifies activities expected to begin, continue, or end in the upcoming month.

APPENDIX A

STANDARD OPERATING PROCEDURES

1. **TITLE:** DRASTIC Mapping Activities
2. **AREA OF RESPONSIBILITY:** NPS Project
3. **GENERAL REQUIREMENTS:**

- a. **Methodology**

Hydrogeologic characterization for the NPS will be performed by the DRASTIC method as described in DRASTIC: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings. The DRASTIC system was developed by the National Water Well Association (NWWA) for the EPA and is described in detail in Publication EPA-600/2-87-035. References to DRASTIC in this SOP refer to the method described in that document.

All aspects of this SOP require a fundamental understanding and working knowledge of the DRASTIC method. Due to the extensive size of the DRASTIC manual (455 pages), it is not reproduced in this SOP. The SOP is, therefore, a brief description of the procedures to be followed for hydrogeologic characterization of the counties selected for study in the NPS. For specific procedures see the DRASTIC manual.

The purpose of DRASTIC mapping activities is to delineate intra-county ground-water vulnerability patterns. The output of the DRASTIC scoring process is a map for each county, delineating the hydrogeologic settings and their associated vulnerability scores, accompanied by a list of reference materials for each county. DRASTIC scoring for second-stage stratification is performed using USGS 7.5 minute quadrangle maps and geologic maps to identify boundaries between cropping areas. The boundaries are drawn in by hand on USGS maps and quantified using a digitizing table and computer system with graphics software.

Time constraints and the size of the sample selected for the NPS necessitate the use of a team to perform the DRASTIC mapping activities. In order to minimize variability among members of the team as well as to accommodate reproducibility by future survey participants, a standard set of procedures has been devised and formalized. This procedure will be applied by all participants in the manner and order prescribed herein.

- b. **Equipment and Materials Required**

- i. DRASTIC Manual (Publication EPA-600/2-87-035)
 - ii. USGS 7.5 minute quadrangle maps (15 minute where 7.5 minute are not available)
 - iii. USGS Geologic Maps (where available)
 - iv. USGS Groundwater Maps (where available)
 - v. Soil Conservation Service Soil Survey Maps
 - vi. Microvax Computer
 - vii. Pen Plotter

viii. Table Digitizer

ix. Miscellaneous reference materials supplied by State and local sources for empirical data as needed

4. PROCEDURE:

DRASTIC mapping activities for determining hazard range index values and plotting DRASTIC subregion vulnerability areas proceed in a step-by-step fashion as follows:

1. Order county USGS 7.5 minute quadrangle maps;
2. Verify that all county quadrangle maps have been received;
3. Draw county boundary lines on the appropriate USGS 7.5 minute quadrangle maps;
4. Identify the major DRASTIC region;
5. Contact USGS, state geological survey, and other relevant State agencies, the county agricultural extension agent, Soil Conservation Service, and other local sources to obtain county specific data on the seven factors affecting the DRASTIC score;
6. Upon receipt of requested county data plot the depth to ground water from the well depth information, calculate the net recharge, and determine the aquifer media, soil media, topography, impact of vadose zone, and hydraulic conductivity of the aquifer. (This is done for as many different definable areas that information is available for within the county);
7. Identify the location of the DRASTIC parameters determined in Step 6 on the county USGS 7.5 minute quadrangle maps;
8. Define the DRASTIC subregion boundaries by reviewing the information from Step 7 written on the maps;
9. Calculate weighted average DRASTIC scores for each subregion as prescribed in the DRASTIC manual and NPS pilot study; and
10. Digitize map.

DRASTIC mapping activities first begin by ordering all USGS 7.5 minute quadrangle maps once a county is assigned to the DRASTIC mapping team. The mapping team leader, J. J. Dawson is responsible for ensuring that all maps are received before mapping activities can start. Prior to assigning a major DRASTIC region to a county which will be scored, the county boundary lines are drawn in with a bold marker to delineate the county.

The major DRASTIC region assignment will be performed by Mr. Dawson. The assignment will be accomplished by locating the county boundaries on a master DRASTIC map which depicts the major DRASTIC regions (see NWWA/EPA, p. 15).

When county borders lie along the boundary of a DRASTIC region, the DRASTIC region descriptions, the Soil Conservation Service (SCS) county soil survey, and other references will be reviewed to assure that a major candidate region is not eliminated. When a decision is not clear cut, additional region designations will be listed so that the mapping team has a broader array of potential subregions to select from. As each

county is classified by the appropriate major DRASTIC regions, it will be assigned to a single member of the mapping team who will be responsible for integrating the various data inputs and performing the mapping.

Data will be sought for each county through telephone interviews. Staff will contact USGS, state geological surveys, and other relevant State agencies, the county agricultural extension agent, Soil Conservation Service, and other identified local sources to inquire about depth to groundwater, average well completion depth, aquifer media, the presence of confining layers, net recharge, and irrigation practices in each county. The recharge factor considered for irrigated areas will be handled in accordance with the NWWA's procedures (see NWWA/EPA, pp. 44-49). The general formula for calculation of net recharge is: $R = (MAP + Irr.) - ET - RO$. Where R = net recharge, MAP = mean annual precipitation, Irr. = irrigation applied, ET = potential evapotranspiration, and RO = estimated runoff. These data will be recorded on the USGS maps such that each parameter is placed where the value was measured.

Dr. Peterson, the team soil scientist/geochemist, will review the SCS county soil survey reports for each county assigning a DRASTIC soil category for each SCS soil association. The key will be based on matching soil descriptions. Information in the SCS soil surveys is used to define the soil and vadose zone media according to the DRASTIC classification system (see NWWA/EPA, pp. 51-56). To classify the soil media according to the DRASTIC system, several types of information are obtained from the soil surveys. A list of the soil associations^{1/} in a given county is identified, then the soil association descriptions are read to identify the major soil types. After identifying the major soil types, the descriptions of the major soil series are read. Depths, thicknesses, and textures of each horizon from the major soil series are then listed. These depths, thicknesses, and textures are reviewed and evaluated for their potential contribution to pesticide movement or attenuation. The texture and/or horizon dominant in its effect on pollution potential is chosen for each major soil series in an association. The textures chosen from the individual soil series within an association are compared and evaluated, and a representative texture is chosen from the entire association. This texture is then correlated with one of the soil media in the DRASTIC manual.

Information found in the soil surveys is also used to help select vadose zone media. This information is used to supplement other available information on vadose media. If the surveys contain figures showing the pattern of soils and the underlying material in the associations within the county, then this information can be used to classify vadose media. If this information is not available, then area geology and soil descriptions are read to determine the parent material from which the soil is derived. This parent material is assumed to be the underlying vadose media, unless bedrock material is listed with the description. If the bedrock material is given, it is chosen as the vadose media. It is not possible to determine from the soil survey information whether the aquifer underlying the vadose zone media is confined or unconfined. Occasionally,

^{1/} Soil associations are landscapes that have a distinctive proportional pattern of soils and, generally, consist of one or more major soil series and at least one minor soil series. A series is composed of soils that have similar profiles.

the rating for the vadose zone media is adjusted to reflect information not encompassed within the DRASTIC methodology. Moreover, conservative ratings are chosen when in doubt about which of two ratings is the proper selection. Data will be recorded on the USGS maps where the information was evaluated.

A file will be maintained for each county indicating the phone calls made to obtain information, reports obtained, and all assumptions made to interpret verbal or written information. The files will indicate the names of the phone interviewers, the individuals who supplied information, and the date and time the information was collected. Files will be maintained that show all subcounty region vulnerability calculations for each of the seven DRASTIC factors.

Data from the SCS survey on soil types and ground water depth will be used to divide the county into preliminary zones of like soil characteristics. Soil types, subsoil structure and depth to ground water will be listed for each subregion. DRASTIC subregion descriptions will be reviewed and used along with the soil, subsoil, geology, topography, and depth to ground water to designate DRASTIC subregions within the county and locate the boundaries between the subregions (see NWWA/EPA, Section 7, pp. 174-335). Soil association boundaries may be found to be coincidental with DRASTIC subregions, but do not in and of themselves define the boundaries of the DRASTIC subregions. If no DRASTIC subregion can be found that matches all the empirical data for individual parameters, the subregion which matches the most parameter values will be selected. Priority will be given in the following order:

- 1) surface soil and depth to ground water;
- 2) recharge and subsoil; and
- 3) topography.

This priority reflects the relative weight of the parameters in the development of an agricultural vulnerability score under DRASTIC.

When all parameter data are not consistent with the subregion selection (empirical data for one or more parameters differ from the assigned range of values for the DRASTIC subregion selected) the DRASTIC score for that parameter will be adjusted. In place of the subregion parameter score, a value will be assigned on the basis of the actual empirical data. The selected DRASTIC subregion will be used to assign values to parameters for which no empirical data are available. It is anticipated that for many subregions there will be no empirical data for depth to groundwater, aquifer media, and hydraulic conductivity.

Once the subregions have been determined, the boundaries between subregions will be drawn on the USGS quads along with the subregion designations. When individual parameters have different values than the DRASTIC subregion, the vulnerability score modification will be noted. Weighted averages will be used for each parameter when empirical data is used for scoring a particular subregion. If data are available on irrigation practices, irrigated areas will be sectioned off and designated with a recharge score for vulnerability based on equivalent recharge levels.

Completed maps will be sent for internal review and then digitization. Digitization will be performed across the county on all subregion boundaries as well as key geographic features. The latter have been defined

as major cities, rivers, and interstate highways. In areas without such features, smaller towns, railroad tracks or other features will be included to allow the reader to orient himself. A single composite county map will be produced from the digitized quads and data prepared on the percentage of each county that falls in each subregion. For the purpose of calculating subregion areas, designated metropolitan areas and large lakes will be excluded during digitization. Scores and parameters along with the subregion boundaries will be put in the data base to allow retrieval of values by latitude and longitude.

5. STAFF TRAINING:

Each member of the mapping team will be trained with the SOP by Jeff Dawson, the Mapping Team Leader. Clay County, Minnesota, will be used to demonstrate the procedures through the entire process.

6. STAFF CERTIFICATION:

Upon completion of training, each member will be given quads from Clarke County, Mississippi, and asked to designate the DRASTIC subregions. Results of these independent designations will be compared to the map prepared during the pilot study. If significant differences are observed, the rationale behind the NWWA version will be reviewed and used for retraining. Subsequently, the mapper will be retested on other quads from the county. If on the second round, there are still significant deficiencies, the mapper will be replaced. The corrective action aspects of certification are detailed in Section 10.

7. INTERNAL CONSISTENCY REVIEW:

All output will be reviewed by the mapping team leader, J. J. Dawson. He will check quad interfaces to ensure a match between subregion boundaries. He will also compare results between counties to ensure consistency between team members. If empirical data are significantly different from those associated with the DRASTIC designations, additional data sources will be sought (e.g., local well drillers, state agencies) to resolve the inconsistency. The quality assurance coordinator will complete the Quality Assurance Check Sheet (Exhibit A-1) to ensure that the hydrogeologic characterization activities are conducted correctly for each county.

8. EXTERNAL COMPARISONS:

Results of the DRASTIC mapping will be compared to similar work by others at two points in the process:

- 1) the assignment of major DRASTIC regions; and
- 2) the quantification of fractions of a county in each subregion.

At each of these stages, data on county DRASTIC designations contained in the Graphic Exposure Modeling System (GEMS) data base will be compared to the mapping results. If significant discrepancies are noted, additional data will be sought and the differences resolved.

Completed maps and data will be reviewed with county agricultural extension agents and other local experts when such experts are identified during the data collection phase. If discrepancies are identified, a consensus will be reached and scores modified accordingly.

EXHIBIT A-1

QUALITY ASSURANCE CHECK
HYDROGEOLOGIC CHARACTERIZATION

County: _____

Mapping Team: _____

QA Coordinator: _____

Check 1: Currency, Source, and Adequacy of Data

Date: _____

Comments: D =
R =
A =
S =
T =
I =
C =

Check 2: Verification of Drastic Subregions and VARSCORES

Date: _____

Comments: Region Selected:

Default Score Project

Hydrogeologic Settings (Subregions) Selected:

Check 3: Verification of Digitization and Final Product Map

Date: _____

Comments:

1. General Size and Shape
2. Region/Subregion Delineation
 - DRASTIC Color Code Used
 - Adequate Cross-hatching variation
3. Adequate Reference Features

A file will be prepared and maintained showing the results of each external consistency check for each county. Each file will contain the GEMS designations, the selected major DRASTIC regions, the designated DRASTIC subregions, and comments received back from local experts. Wherever significant discrepancies are noted, a narrative will be developed describing how the discrepancy was dealt with. These files will be available to the QAC at all times. All files will remain in ICF's Richland, Washington office upon completion of mapping.

9. DATA FILE ORGANIZATION

Data files for each county in the study will be maintained by the hydrogeologic characterization staff during that phase of the survey. Files will be kept in a central location in ICF's Richland, Washington office.

Files will be arranged in alphabetical order by States and by counties within each State. Files will contain a hard copy of the following materials:

1. Reference materials used to develop the values applied to the seven factors of the DRASTIC score (where reference materials include published documents, the document will generally not be included in the file, but will be noted in the reference and bibliography for each county). Reference materials may include soil association maps, soil evaluations by project staff, and printouts of well location and depth;
2. Records of communication from solicitation of data;
3. Justification statements for selection of specific hydrogeologic settings (subregions) within the county;
4. Scoring worksheets for each subregion in the county;
5. Calculation sheets related to computation of DRASTIC scores;
6. Copies of quality assurance checksheets for initial characterization and for final product maps;
7. A copy of the final first-stage county DRASTIC map with USGS quad map boundaries drawn in;
8. A copy of the final second-stage county cropped and vulnerable region map; and
9. A copy of the final file completion checklist shown in Exhibit A-2.

EXHIBIT A-2

DATA FILE COMPLETION CHECKLIST

County: _____

Date of File Closure: _____

File Closed by: _____

File Contents:

1. Data References

- | | | |
|------|--------------------------------|-------|
| D -- | a. Reference Material Included | _____ |
| | b. Reference in Bibliography | _____ |
| | c. Default Parameters Used | _____ |
| R -- | a. Reference Material Included | _____ |
| | b. Reference in Bibliography | _____ |
| | c. Default Parameters Used | _____ |
| A -- | a. Reference Material Included | _____ |
| | b. Reference in Bibliography | _____ |
| | c. Default Parameters Used | _____ |
| S -- | a. Reference Material Included | _____ |
| | b. Reference in Bibliography | _____ |
| | c. Default Parameters Used | _____ |
| T -- | a. Reference Material Included | _____ |
| | b. Reference in Bibliography | _____ |
| | c. Default Parameters Used | _____ |
| I -- | a. Reference Material Included | _____ |
| | b. Reference in Bibliography | _____ |
| | c. Default Parameters Used | _____ |
| C -- | a. Reference Material Included | _____ |
| | b. Reference in Bibliography | _____ |
| | c. Default Parameters Used | _____ |

2. Records of Communication _____

3. Justification Statements and Scoring and Calculation Worksheets _____

4. QA checksheets (2) _____

5. First Stage Map _____

6. Second Stage Map _____

Comments:

APPENDIX B

STANDARD OPERATING PROCEDURES

1. **TITLE:** Construction of Second-Stage Sampling Units: Cropped and Vulnerable Stratum
2. **AREA OF RESPONSIBILITY:** NPS Project
3. **GENERAL REQUIREMENTS:**

- a. **Methodology**

The construction of second-stage sampling units will be carried out in two phases. Data will be collected by conducting interviews with local county agricultural extension agents to complete the County Agent Questionnaire (Attachment I). Cropped areas are determined from these questionnaires corresponding to each map quadrant or region. In the first phase, 7.5-minute USGS quadrangle maps (quadrants) of each of the 84 survey counties will be assigned a score representing the amount of agricultural activity within the quadrant. The scores that are available are 50 percent (or more) cropped (high cropping), 25 to 50 percent cropped (moderate cropping), and 25 percent or less (low cropping). Next, the total area of the county will be partitioned into two strata using ground-water vulnerability and cropping scores for each quadrant. One stratum will contain the more heavily cropped and more vulnerable part of the county, and the remainder of the county will be designated as the relatively less vulnerable-less cropped stratum. Cropping category maps are overlaid with DRASTIC mapping scores to determine the cropped and vulnerable regions of the county. Composite maps showing the relatively more cropped and more vulnerable areas of the county will be used to identify households with wells.

The county agent interview questions focus on the cropping pattern in each quadrant and pesticide usage in the area. For this survey, farming is defined as an activity from which \$1,000 or more of agricultural products were sold or normally would have been sold during a year. Interviews are expected to take from two to four hours for each of the 84 counties. Interview length is dependent upon the number of quadrants there are for a county. Appointments will be made in advance of the interviewer's visit. In the large counties, multiple agents may be responsible for the agricultural extension program. This may require more complex coordination and appointment timing.

County agent interviews conducted one growing season earlier than required for second-stage mapping will require follow-up phone calls with the agents to confirm previously collected information. County agents will be telephoned to ensure that the cropping category for each of the quadrants remains accurate. This operation will be overseen by Dr. Rappaport.

- b. **Equipment and Materials Required**

- i. County Agent Questionnaire (one per quadrant)
 - ii. USGS 7.5 minute quadrangle maps
 - iii. County Agent Interview Team

- iv. Mapping Team
- v. Microvax Computer
- vi. Pen Plotter
- vii. Laser printer
- viii. Personal Computer
- ix. County Cropping Category Record Sheet

4. PROCEDURE:

In the first phase of second-stage stratification, interviews with county agricultural agents are conducted to classify quadrants (USGS 7.5 minute quadrangle maps) into one of three cropping categories shown in Exhibit B-1.

EXHIBIT B-1

SECOND-STAGE CROPPING CATEGORIES

Category	Definition
1	More than 50 percent of the quadrant is cropped, or, 25 to 50 percent of the quadrant is cropped, but pesticide use in the quadrant is above the county average.*
2	Between 25 and 50 percent of the quadrant is cropped, or, 25 percent or less of the quadrant is cropped but pesticide use in the quadrant is above the county average.
3	25 percent or less of the quadrant is cropped and pesticide use in the quadrant is about average for the county, or below average, or, the percentage of the quadrant that is cropped is unknown.

* Pesticide use in a quadrant is defined as "above county average" if use in that quadrant is high relative to overall use in the county. For example, in a county with 20 quadrants, if 17 quadrants are non-cropped (no pesticide use) and three quadrants are partially cropped with moderate pesticide use, those three quadrants that are cropped would be defined as having pesticide use "above county average."

The process begins with obtaining all the USGS quadrangle maps for each county and arranging the maps by latitude and longitude coordinates. The quadrangle maps are then number coded properly in consecutive order within a county. Number codes are listed starting with the first quadrant in the northeast corner of the county (quadrant 1) and proceeding west across the county. Quadrants in following rows are numbered in continuing consecutive number order from east to west. The last map quadrant is located in the far southwest corner of the county. The configurations of some counties are such that consecutively numbered maps need not be adjacent. The quadrant code number assigned to each map is to be written in the upper right hand corner of the USGS quadrangle map.

Coded USGS quadrangle maps are used in conjunction with the County Agent Questionnaires (Attachment I) for in-person interviews with the local county agricultural extension agents. These coded maps

will be prepared in advance of the interview. County agent interviews are conducted by project soil scientists, Drs. S. Peterson and B. Rappaport and Mr. Charles Miller and Project Geologist James Sperry. County extension agents are requested to complete questionnaires for each quadrant map showed to them by one of the scientists. In instances where a county is comprised of more than 10 quadrangle maps, extension agents will be given the opportunity to group quadrants where the cropping and pesticide use pattern are similar. Interviewers will provide appropriate guidance to the county agents on how to make appropriate groupings of quadrants (e.g., similar farm crops, percent farm land area, percent farm land which receives pesticide applications). To accommodate changes in the procedure from individual quadrants to groups of quadrants (regions), questionnaires will be numbered to correspond to the appropriate quadrants. For example, if the extension agent groups quadrants 1, 2, 3, 10, 11, and 12 for a county divided into 18 quadrants, then one questionnaire is used for this grouped region and all the quadrant code numbers that apply are listed in the upper right corner of that questionnaire.

Questions will be administered by the team interviewer in accordance with the Question-by-Question specifications (Attachment B) developed for the County Agent Questionnaire. When administration of the questionnaire is considered by the interviewer to be a time burden to the respondent, the interviewer may combine the answers to related questions. For instance, the answer to the time of year when pesticides are applied (Q.21) may be recorded along with the list of what pesticides have been used (Q.6) in the area identified on the map. In other instances when deemed necessary by the interviewer to reduce the time burden placed on the respondent Q.8 may be answered as "see Q.6" when the pesticides recommended (Q.8) are the same as those known to be used (Q.6).

After each county agent interview session has been completed, interviewers will be responsible for identifying the appropriate cropping category (shown in Exhibit B-1) for each of the quadrants or regions. The identification of the correct cropping category for a quadrant will be based primarily on the agent's response to question 2 in the County Agent Questionnaire. The choice of responses listed in question 2 are: (1) more than 50 percent of the area identified is cropped (e.g., high); (2) 25 to 50 percent of the area identified is cropped (e.g., moderate); (3) 25 percent or less of the area identified is cropped (e.g., low); or (4) the area identified is not known. When the cropping category is not clearly definable from the response to question 2, the interviewer will identify the cropping category by evaluating question 12 which identifies whether or not pesticide use in the quadrant or region of quadrants is above or about average for the county.

The county agent interview team will be responsible for maintaining a Field Notebook (3 ring binder) on each county agent interview session. This Field Notebook will include all County Agent Questionnaires and additional notes recorded by the interviewer about county agricultural practices that may have been provided by the county agent. After each county agent interview session, the interviewer will record the cropping category (e.g., high, moderate, low) for each quadrant on the County Agent Cropping Category Record Sheet (Exhibit B-2). When the cropping category is not clearly defined from Question 2 of the County

EXHIBIT B-2

NATIONAL PESTICIDE SURVEY
COUNTY AGENT CROPPING CATEGORY RECORD SHEET

County: _____ Interview Date: _____ County Agent: _____

State: _____ Interviewer: _____ County Agent
Phone Number: _____

Directions: _____

This form is to be filled out upon completing County Agent Questionnaires with corresponding USGS 7.5-minute quadrangle maps for determining cropping categories. The basis for deciding the second-stage cropping category for each quadrant is listed below:

<u>Cropping Category</u>	<u>Definition</u>
1	More than 50 percent of the quadrant is cropped, or, 25 to 50 percent of the quadrant is cropped, but pesticide use in the quadrant is above the county average.
2	Between 25 and 50 percent of the quadrant is cropped, or, 25 percent or less of the quadrant is cropped but pesticide use in the quadrant is above the county average.
3	25 percent or less of the quadrant is cropped and pesticide use in the quadrant is about average for the county, or below average, or, the percentage of the quadrant that is cropped is unknown.

In those cases, where the cropping category is not clearly defined for a quadrant from Question 2 on the questionnaire then state the justification for the selected category for that quadrant in the comments section.

Questionnaire Code No.	Second-Stage Cropping Category	Comments
1		
2		
3		
4		

Agent Questionnaire a justification for the cropping category will be written in the comments section provided on the County Agent Cropping Category Record Sheet.

Once cropping categories have been determined, digitization work can proceed on defining relatively more cropped and more vulnerable regions of the county. The procedure for producing a digitized composite map of cropping categories and DRASTIC vulnerability proceeds in several steps. First the relatively low vulnerable and high and moderately vulnerable areas of the county are mapped by interpretation of the county DRASTIC VARSCORES. Based on discussions with Jay Lehr, principal author of the DRASTIC system developed by the National Water Well Association, relative ground-water, vulnerability can be defined as shown in Exhibit B-3. DRASTIC hazard index values <120 are considered the relatively low vulnerable regions of the county compared to values ≥ 120 which are considered the more vulnerable regions. The more vulnerable regions of the county are color coded using the data already stored on a computer disk from the digitization process of the DRASTIC composite county map (Appendix A). Using the cropping category data recorded on the County Agent Cropping Category Record Sheet a map is made showing the intersection of the more relatively cropped and more vulnerable regions of the county.^{1/}

The step-by-step procedures for digitizing cropped and vulnerable regions are as follows:

1. Identify county to be mapped;
2. Create a cropping category data base;
3. Digitize cropping categories 1, 2, and 3 for each USGS quadrant;
4. Retrieve DRASTIC VARSCORE data base;
5. Retrieve cropping category database;
6. Compare DRASTIC VARSCORES with cropping categories by showing the intersection of the cropped and vulnerable regions from completed digitized maps;
7. Identify subregion county land areas where DRASTIC hazard index values of ≥ 180 intersect cropping land areas of $>25\%$ and DRASTIC hazard index values of ≥ 120 intersect cropping land areas of $>50\%$;
8. Map the cropped and vulnerable regions defined by the overlaid boundaries using the pen plotter;
9. Draw major land features for the cropped and vulnerable regions of the county on the map; and
10. Deliver county maps identifying cropped and vulnerable stratum to the Survey Statistics Group to begin identification of households in the stratum.

^{1/} Cropped and vulnerable subregion county land areas are where DRASTIC hazard index values of ≥ 180 intersect cropping land areas of $>25\%$ and DRASTIC hazard index values of ≥ 120 intersect cropping land areas of $>50\%$.

EXHIBIT B-3

SECOND-STAGE RELATIVE GROUND-WATER VULNERABILITY CATEGORIES

Relative Vulnerability	DRASTIC Hazard Index Value
High	180-230
Moderate	120-179
Low	<120

Major land features will be provided on the completed maps in the region of cropped and vulnerable to allow boundary area determinations for third-stage sample allocation. These land features will be digitized onto the composite county maps and include major cities, rivers, and interstate highways. This will provide the cropped and vulnerable regions within each county that will be oversampled using Random Digit Dialing (RDD). When zip code files are made available, zip code regions will be digitized onto completed second-stage maps.

5. STAFF TRAINING:

Each member of the team will be trained with the SOP by Bruce Rappaport. A set of Question-by-Question Specifications (Attachment II) will be used during the training.

6. STAFF CERTIFICATION:

Upon completion of training, each member of the county agent interview team will be reviewed by Dr. Rappaport for conformance to the SOP. One member of the interview team will be evaluated by Dr. Rappaport in the field to determine the adequacy of the training program.

7. INTERNAL CONSISTENCY REVIEW:

All cropped and vulnerable maps will be reviewed by Chuck Miller, the quality assurance coordinator (QAC). He will complete the Quality Assurance Check Sheet (Exhibit B-4) to ensure that the maps are produced correctly.

8. EXTERNAL COMPARISONS:

Completed cropped and vulnerability maps will be reviewed by members of the DRASTIC mapping team. If discrepancies are identified, a consensus will be reached and categories modified accordingly.

A file will be prepared and maintained showing results of each external consistency check for each county. Each file will contain the designated cropping regions, the County Agent Questionnaires, and comments received back from project reviewers. Wherever significant discrepancies are noted, a narrative will be developed describing how the inconsistency was dealt with. These files will be available to the QAC at all times.

EXHIBIT B-4

QUALITY ASSURANCE CHECK
CROPPED AND VULNERABLE STRATA MAP
NATIONAL PESTICIDE SURVEY

County: _____

Mapping Team:

QA Coordinator: _____

Check 1: Legend Detail

Date:

Comments:

1. County Title
2. North arrow
3. Scale

Check 2: Verification of Cropped and Vulnerable Strata Map

Date:

Comments:

1. Vulnerable subregion delineation corresponds to the DRASTIC subregion digitized on the DRASTIC county map
2. Cropping categories recorded correctly on the map
3. General size and shape of digitized cropped and vulnerable subregion areas
4. Boundary delineations

APPENDIX C

STANDARD OPERATING PROCEDURES

1. **TITLE:** Data Coding for Second-Stage County Agent Questionnaire: Questions 6, 8, and 21
2. **AREA OF RESPONSIBILITY:** NPS Project
3. **DEFINITIONS:**

Active Ingredient: constituent in a compound responsible for chemical control.

Active Ingredient Rate: measure of the actual chemical killing agent used for dispensing the pesticide.

Formulation: symbolic expression of the dilution or percentage and physical state of the active ingredient.

Mixture: combination of two or more pesticides (may include formulations) mixed by applicator and applied together to a specific crop.

Value: numerical quantity of the specified pesticide designated for land application rate.

Units: ratio of quantity of specified product to the area of land specified for application.

4. **GENERAL REQUIREMENTS:**

- a. **Methodology**

County Agents were interviewed in 84 counties to obtain information on crop types and corresponding pesticide usage in county quadrants mapped for hydrogeologic characteristics. A **County Agent Questionnaire** was completed for every quadrant mapped in each county. Questions 6 and 8 of the **County Agent Questionnaire** requested information on pesticides known to be used (by crop) with the application rate, and those recommended (by crop) with the recommended application rate, for the years 1984 through 1988.

Question 21 of the **County Agent Questionnaire** requested information concerning the time of year pesticides were applied to the major crops farmed in the area. At the beginning of the County Agent survey, the **County Agent Questionnaire** contained only 19 questions (in these Questionnaires, Question 19 requests information on time of application). Two questions were added to the original (19 question) Questionnaire after several County Agent interviews were completed. The "new" questions were numbered 11 and 12, and the existing questions 11 through 19 were renumbered accordingly. The "new" question 11 requested information on the presence of a golf course in the area, and the "new" question 12 requested information on general pesticide usage in the area (e.g. high or low). **County Agent Questionnaires** completed prior to the addition of the "new" questions will be edited and renumbered for key entry following specific procedures

identified in this SOP. In addition, questions 9, 10, and 17 will be edited for key entry. For these questions, blank spaces in front of numbers will be filled in with zeros to ensure correct key entry of the data.

Due to the quantity and complexity of the responses to questions 6, 8, and 21 in the **County Agent Questionnaire**, recoding the information will be necessary before data entry can be performed. Because the data from questions 6, 8, and 21 is interrelated, one coding sheet (Exhibit C-1) has been designed to organize all responses to those questions. Codes have been designated for pesticides (Exhibit C-2), formulations (Exhibit C-3), units (Exhibit C-4), and time of application (Exhibit C-5).

County Agent Questionnaires are maintained in three-ring binders in the document control room. For each county, a Questionnaire was completed for every mapped quadrant in that county. In some cases, responses were the same for two or more quadrants in a county; when this is the case the applicable quadrant codes will be identified in the top right hand corner of the **County Agent Questionnaire** introduction page. One binder will contain every Questionnaire completed for an individual county, with the county name identified on the outside of the binder.

Each Questionnaire will be reviewed and responses from questions 6, 8, and 21 recoded following the specific procedures identified in this SOP.

b. Materials Required

- i. County Agent Questionnaire(s)
- ii. Blue Pencil, Black Felt-tip Pen
- iii. Data Coding Sheet(s)
- iv. Q.11/Q.12 Coding Sheet(s)
- v. Pesticide Code List
- vi. Formulation Code List
- vii. Units Code List
- viii. Time of Application Code List

5. PROCEDURE:

a. Preliminary Steps

1. Select a county for data coding. Locate the name of the interviewer for the selected county on the "County Agent Cropping Category Record Sheet" (first page in binder).
2. Review **County Agent Questionnaires** to locate responses to questions 6 and 8. Meet with the interviewer, if necessary, to clarify format or any responses that are unclear at this point.
3. Review the first **County Agent Questionnaire** to locate response to question 21 (19).
4. If question 19 is the last question in the Questionnaire, look for an insert with xeroxed questions (re: golf course and general pesticide usage in the area). If an insert is present, make sure it is placed in the Questionnaire after the page with questions 8,9, and 10, then number the "golf course" question 11, and the "general pesticide usage" question 12 (**NOTE:** always use a blue

EXHIBIT C-1

**COUNTY AGENT QUESTIONNAIRE
CODING SHEET**

EXHIBIT C-2
PESTICIDE CODE LIST

0001	2,4-D	0040	Avitrol Corn Chips
0002	2,4-D Amine		Azinophos methyl see 0228
0003	2,4-D Ester	0041	Azodrin 5
0004	2,4-D Butyl Ester	0042	Azulox
0005	2,4-D,B Amine	0043	Alanap 3
0006	2,4-D,B	0044	Avadex
0007	2,4-D Salt	0045	Avenge
	2,4,5-T see 0128	0046	Assert
0008	AAtrex	0047	Astar
0009	Acaraben	0048	Alanap
0010	Acarben	0049	2,4-D LV ester
	Acephate see 0368	0050	Ambush/Pounce
	Acifluorfen see 0070	0051	Asure
0011	Agri-mect	0052	Asadrin
0012	Agri-mycin 17	0558	Ally
0013	Agri-Strep	0561	Alar
0014	Alachlor + Atrazine	0562	A-rest
0015	Alachlor + Dinoseb	0563	Acclaim
0016	Alachlor	0568	Amitrole
0017	Alar-85	0576	Accelerate
0018	Alfa-spray	0577	Arsenic Acid
0019	Alfa-Spray (methoxychlor + malathion) 22E	0608	2,4-D Amine Salts
0020	Alfa-tox	0610	Ammonium sulfate
0021	Aliette	0611	Arena
0022	Amate-X	0614	Arsenal
0023	Ambush	0615	Arrosolo
0024	Amdro	0617	Agrox DL plus
0025	Amiben	0619	Aceto Dimethoate
0026	Amid-Thin	0630	Ammate XN1
0027	Amitral		B-Nine see 0561
	Ammate see 0028	0053	BAAM
	Ammonium Sulfamate see 0028	0054	Bacillus Thuringiensis
	Ammo see 0124	0055	Bactospeine
0028	AMS	0056	Bactur
	Anilazine see 0170	0057	Balan
0029	Apex	0058	Banvel
0030	Apron		Barban see 0119
0031	Aquathol	0059	Basagran
0032	Arid	0060	Baygon
0033	Asana	0061	Bayleton
0034	Asulam		Bendiocarb see 0203
0035	Atrazine	0062	Benlate
0036	Aurs		Benefin see 0057
0037	Avid	0063	Benomyl
0038	Avitrol Corn Chips-99	0064	Bensulide
0039	Avitrol	0065	Bentazon
		0066	Berfane
		0067	Betasan

EXHIBIT C-2 (continued)

PESTICIDE CODE LIST

0068	Biobit	0104	Classic
0069	Bladex	0105	COCS
0070	Blazer	0106	Comite
0071	Bolero	0107	Command
0072	Bordeaux Mixture	0108	Copper (metallic)
0073	Boron	0109	Copper Sulfate
0074	Botran	0110	Copper
0075	Bravo	0111	Cotoran
0076	Bravo 500	0112	Counter
	Bromomil see 0078	0113	Cutrine-Plus
0077	Bromoxymil		Cyanazine see 0069
	Broot see 0303	0114	Cycloate
0078	Buctril	0115	Cygon
0079	Butylate	0116	Cygon 400
0080	Butylate + Atrazine		Cyhexatin see 0402
0081	Bicep	0117	Cyprex
0082	Butyrac		Cymbush see 0124
0083	Bravo 720	0118	Cobra
0084	Balatan	0119	Carbyne
0085	Bolstar	0120	Curtail
0086	Bidrin	0121	Calcium
0087	Baytan	0122	Canopy
0088	Bueno Six	0123	Crossbow
0089	Butoxone	0124	Cypermethrin
0090	Bronco	0125	Casoron
0572	Butyrac 200	0126	Calcium Polysulfide
0574	Bravo 750	0127	Copper (fixed)
0581	Baythroid	0557	Cupric Hydroxide
0597	Bronate	0564	CMA
0606	Banrot	0566	Cadminate
0091	Cacodylic Acid	0570	Crop Oil Concentrate
0092	Calibar	0571	Carbonate
0093	Caparol	0573	Chloropit
0094	Captan	0578	Clomazone
0095	Carbaryl	0579	Chlorimuron
	Carbofuran see 0208	0580	Curacron
0096	Carzol	0588	Curbite
	Carzol sp see 0635	0594	Cyclone
0097	Chipco 26019	0598	Chem Hoe
0098	Chloramben	0604	Copper Oxide
0099	Chlordane	0605	Copper Count N
0100	Chloro-I-P-C	0620	Carbaryl formulations
	Chloroneb see 0504	0622	Commence
0101	Chloropicrin	0637	Contacts (C8-C10)
	Chlorothalonil see 0129	0638	Chlordimeform
0102	Chloroxoron	0128	Dacamine
0103	Chlorpropham	0129	Daconil 2787
	Chlorpyrifos see 0296	0130	Daconil

EXHIBIT C-2 (continued)

PESTICIDE CODE LIST

0131	Dacthal	0172	Disyston
0132	Dalapon 85	0173	Defend
0133	Dalapon	0174	DSMA
0134	Dasanit	0175	Dicar
	DCPA see 0131	0176	Dithane
0135	De Vine	0177	Du-ter
	Demeton see 0484	0178	Duosan
0136	Demosan	0179	Daconate
0137	Devrinol + Tillam	0180	DEF-6
0138	Devrinol	0575	Dropp
0139	Devrinol + Sencor/Lexone	0595	Diphacinone
0140	Dexon	0601	Dinocap
0141	Di-Syston	0613	Deterec
0142	Diazinon	0616	Diazinon (Hopkins seed protectant)
0143	Dibrom	0631	Dacamine 4D
0144	Dicamba	0634	Dymet
0145	Dichlobenil	0181	Endosulfan
0146	Dichlone	0182	Enide
	Dichlorvos see 0247	0183	Eptam
0147	Dicofol	0184	EPTC
0148	Diethatyl-ethyl	0185	Eradicane
	Diiflubenzuron see 0153	0186	Ethephon
0149	Difolatan	0187	Ethion + Superior Oil
0150	Dikar	0188	Ethion
0151	Dimethoate		Ethoprop see 0326
0152	Dimethody	0189	Ethrel
0153	Dimilin	0190	Evik
0154	Dinitro	0191	Extrazine
0155	Dinoseb	0192	Escort
0156	Dipel	0193	Eradicane Extra
0157	Diphenamid	0194	Ethalfuralin
0158	Diquat	0195	Endrin
0159	Direx	0196	Exotherm Termil
0160	Dithane M-22 Special	0197	Ethyl Parathion
0161	Dithane M-45	0198	none
	Dithio or Dithione see 0534	0199	none
0162	Diuron	0200	none
0163	Dormant Oil		Fensulfothion see 0134
0164	Dowpon M	0201	Fenvalerate
0165	Dual	0202	Ferbam
0166	Dual + Atrazine		Fermate see 0202
0167	Dursban	0203	Ficam
	Dycarb see 0203	0204	Fluazilfop Butyl
0168	Dyfonate	0205	Folpet
0169	Dylox		Fonofos see 0168
0170	Dyrene		
0171	Diazinon AG500		

EXHIBIT C-2 (continued)

PESTICIDE CODE LIST

0206	Fore	0250	none
0207	Funginex	0251	none
	Fungo see 0514	0252	none
0208	Furadan	0253	none
0209	Furbam	0254	none
0210	Fusilade 2000	0255	Imidan
0211	Fusilade		Iprodione see 0442
0212	Fargo	0256	Javelin
0213	Finnesse	0257	Igran
0214	Flopro	0258	Imaziquin
0215	Folitek	0259	Isopropalin
0216	Folatec	0260	Isotox D
0217	Fatty Alcohol	0261	Isotox F
0218	Folex	0262	none
0219	Fluometuron	0263	none
0220	Furloe	0264	none
0221	Fosetyl aluminum	0265	none
0635	Formetanate hydrochloride	0266	none
0636	Fenbutatin oxide	0267	Karathane
0222	Gibberellic Acid	0268	Karmex
0223	Glyodin	0269	Kelthane
0224	Glyphosphate + Metolachlor +	0270	Kerb
	Atrazine	0271	Koban
0225	Glyphosphate	0272	Kocide 101
0226	Goal	0273	Kocide 606
0227	Gramoxone	0274	Komeen
0228	Guthion	0275	Krovar I
0229	Glean	0276	Krovar II
0230	Gemini	0277	Kocide
0231	Grazon P&D	0278	Kromad
0232	Grazon	0279	Kocide 404s
0233	Gemini	0280	Karate
0234	Gramoxone Super	0281	Kerbit
0235	Genep	0282	K-tea
0236	Germate	0283	Kolo 100
0237	none	0284	Kolospray
0238	none	0285	Kolodust
0239	Herbicide 272	0286	none
0240	Hexazinone	0287	Lannate
0241	Hoelon	0288	Lasso + Atrazine
0242	Hydrated Lime	0289	Lasso + Premerge/Dinitro
0243	Hydrothal 191	0290	Lasso
0244	Hyvar X	0291	Lastone
0245	Harmony	0292	Lead Arsenate Spray
0246	Harvade 5F	0293	Lindane
0247	Herkol	0294	Linuron
0248	none	0295	Lorox
0249	none	0296	Lorsban

EXHIBIT C-2 (continued)

PESTICIDE CODE LIST

0297	Lexone	0340	Marlate
0298	Lariat	0565	MAMA
0299	Landmaster	0593	M & M
0300	Larvin	0599	Milban
0301	Lime	0602	Manex
0302	Lactofen	0626	Maneb complex
0303	Landrin	0341	N. Butylate
0304	Linex	0342	Nabam
0305	Lorox Plus	0343	Naphthaleneacetic Acid, (NAA)
0306	Lasso (Micro-Tech Lasso)	0344	Napromide
0640	Lime Sulfur	0345	Napromide + Metribuzin
0307	Malathion	0346	Napromide + Pebulate
	Maleic Hydrazide see 0451	0347	Napronamide
0308	Mancozeb	0348	Naptalam, Sodium Salt
0309	Maneb	0349	Nemacur
0310	Manganese	0350	Nonflurazan
0311	Manzate 200		Norflurazon see 0555
0312	Mayrex	0351	Norosac/Casoron
0313	MCPA	0352	Nudrin
0314	MCPP	0353	NZN
0315	Mesuroil	0354	Nonionic Surfactant
0316	Metaldehyde	0355	(liquid) Nitrogen
	Metalaxyl see 0433	0356	Niacide M
0317	Metasystox	0357	none
0318	Metasystox-R	0358	none
0319	Methomyl	0359	none
0320	Methoxychlor	0360	none
0321	Methyl Bromide	0361	none
0322	Metolachlor + Atrazine	0362	none
0323	Metolachlor	0363	Oftanal
0324	Metribuzin	0364	Oil (FC 435-66)
	MH 30 see 0451	0365	Omite
0325	Mitax	0366	Optam
0326	Mocap	0367	Ornalin
0327	Monitor	0368	Orthene
0328	Morestan	0369	Orthrorix
0329	MSMA	0370	Oryzalin
0330	Mycoshield		Oxamyl see 0540
0331	Manzate	0371	Oxyflourfan
0332	Mertect	0372	Ordram
0333	Mitac	0373	Oxadiazon
0334	Milogard	0374	Oil
0335	Methyl Parathion	0375	Omite CR
0336	Miscible Oil (Miscible Superior Oil)	0376	Oil ("spray oil")
0337	Marksman	0377	One Shot
0338	Mowdown	0378	Oxycarboxin
0339	Mavrik	0379	Oxy Cop

EXHIBIT C-2 (continued)

PESTICIDE CODE LIST

0380	Oxymil	0418	Pyrellin SCS
0381	none	0419	Preview
0382	Paraquat CL/Gramoxone + Dual + Atrazine	0420	Pencap
0383	Paraquat CL	0421	Polysulfide
0384	Paraquat Plus	0422	Pyramin
0385	Paraquat	0423	Pursuit
0386	Paraquat + Metolachlor + Atrazine	0424	Pyram
0387	Parathion	0425	Probe
	Parlaan see 0259	0426	Pix
0388	Pay Off	0427	Puracon
0389	PBO (piperonyl butoxide)	0428	Procomil
	PCNB see 0503	0559	Prime Plus
0390	Pebulate	0560	Prime
0391	Pendex	0567	Propamocarb
0392	Pendimethalin	0582	Pramax
0393	Penncap-M	0583	Pyrethrum
0394	Pentac	0584	Phenothrin
0395	Permethrin	0586	Promalin
0396	Petroleum Solvents	0589	Palanap
	Phorate see 0508	0590	Pencozeb
	Phosalone see 0546	0592	Phosphate defoliant
0397	Phosdrin	0600	Penamil
	Phosmet see 0255	0612	Proxel
0398	Phosphamidon	0628	Protector
0399	Phosphene	0632	Pennamine D7
0400	Phygon	0633	PT 1200
0401	Picloram		Quel see 0562
	Plantvax see 0378	0429	Quintar
0402	Plictran	0430	Ramik Brown
0403	Poast	0431	Revisual
0404	Polyram	0432	Ridomil MZ
0405	Pounce	0433	Ridomil
0406	Prefar	0434	Rodeo
0407	Premerge/Dinitro	0435	Ronilan
0408	Premerge	0436	Ronstar
0409	Premize	0437	Rotenone (Rotenox, Noxfire, Rotacide EC)
0410	Primicid	0438	Rotenone
0411	Princep	0439	Roundup
	Profluralin see 0533	0440	Roundup + Dual + Atrazine
0412	Pronamide	0441	Roal
	Propargite see 0365	0442	Rovral
0413	Propenil	0443	Rozol
0414	Prowl	0444	Rubigan
0415	Pydium	0445	Rebelate
0416	Pydrin	0446	Ramrod
0417	Pyrazon	0447	Randox
		0448	Rescue

EXHIBIT C-2 (continued)

PESTICIDE CODE LIST

0449	Reflex	0596	Strychnine
0450	Ranger	0609	Super-Tin
0451	Retard	0618	Sevimol
0452	Resmethrin	0621	Savit
0453	Reward	0624	Stylet
0454		0639	Sumithrin
0455	Safers Soap	0495	Talstar
0456	Sceptor	0496	Tandem
0457	Sencor	0497	Tedion
0458	Sencor/Lexone	0498	Telone C-17
0459	Sencor/Hexane	0499	Telone II
0460	Sethoxydin	0500	Temik
0461	Sevin	0501	Tenoran
	Siduron see 0530	0502	Terbacil
0462	Sim-Trol		Terbufos see 0112
0463	Simazine	0503	Terrachlor
0464	Sinbar	0504	Tersan SP
0465	Sodium Salt	0505	Tersan LSR
0466	SOK-BC	0506	Tersan 1991
0467	Solicam	0507	Tersan
0468	Solicarb	0508	Thimet
0469	Sonar AS	0509	Thiodan
0470	Spike		Thiodicarb see 0300
0471	Stan Guard		Thiophanate Methyl see 0514
0472	Stoddard Solvent	0510	Thiram
0473	Streptomycin	0511	Thuricide
0474	Stylet Oil	0512	Tillam
0475	Subdue	0513	Tilt
0476	Sulfate	0514	Topsin-M
0477	Sulfur	0515	Tordon
0478	Superior Oil	0516	Treflan
0479	Supracide	0517	Treflan + Sencor/Lexone
0480	Surflan		Trey see 0530
0481	Sutan		Triallate see 0212
0482	Sutan + Atrazine	0518	Tri-guard
0483	Sutan Plus	0519	Tribasic Copper Sulfate
0484	Systox	0520	Trifluralin + Metribuzin
0485	Sutazine	0521	Trifluralin
0486	Sonolan		Triphenyltin Hydroxide see 0177
0487	Sutazine + 6ME	0522	Trithion
0488	Scout	0523	Triumph
0489	Sodium Chlorate	0524	Truban
0490	Squadron	0525	Topsin
0491	Su-Pass	0526	Tackle
0492	Streptomycin Sulfate	0527	Toxaphene
0493	Sumithion	0528	Tordon 22K
0494	Salute	0529	Trifloran
0585	Storm		

EXHIBIT C-2 (continued)

PESTICIDE CODE LIST

0530	Tupersan	0542	Zinc
0531	Turcan	0543	Zinc Phosphide
0532	Trichlorofon	0544	Zineb
0533	Tolban	0545	Ziram
0534	Thiotepp	0546	Zolone
0587	Tre-hold Srprout	0547	Vydate L
0591	Telone	0548	Vitavax
0603	Tenn-cop	0549	Weedmaster
0607	Triforine	0550	Whip
0623	Turbo	0551	Vernam
	Vapona see 0247	0552	Vorlum
0535	Vapam	0553	Zyban
0536	Velpar	0625	Zinc Ion Plus
0537	Vendex	0627	Vinclozolin
0538	Vernam, Surpass	0629	Vitavax
	Vernolate see 0551	0554	Zinc Sulfate
0539	Vorlex	0555	Zorial
0540	Vydate	0556	Zeram
0541	Zinam	0569	Zectran

EXHIBIT C-2 (continued)

PESTICIDE CODE LIST

Numerical Cross Reference

0557	Cupric Hydroxide	0603	Tenn-cop
0558	Ally	0604	Copper Oxide
0559	Prime Plus	0605	Copper Count N
0560	Prime	0606	Banrot
0561	Alar	0607	Triforine
0562	A-rest	0608	2,4-D Amine salts
0563	Acclaim	0609	Super-Tin
0564	CMA	0610	Ammonium sulfate
0565	MAMA	0611	Arena
0566	Cadmate	0612	Proxel
0567	Propamocarb	0613	Deterec 200
0568	Amitrole	0614	Arsenal
0569	Zectran	0615	Arrosoir
0570	Crop Oil Concentrate	0616	Diazinon (Hopkins Seed Protectant)
0571	Carbonate	0617	Agrox DL Plus
0572	Butryac 200	0618	Sevimol
0573	Chloropit	0619	Acetodimethoate
0574	Bravo 750	0620	Carbaryl formulations
0575	Dropp	0621	Savit
0576	Accelerate	0622	Commence
0577	Arsenic Acid	0623	Turbo
0578	Clomazone	0624	Stylet
0579	Chlorimuron	0625	Zinc Ion Plus
0580	Curacron	0626	Maneb complex
0581	Baythroid	0627	Vinclozolin
0582	Pramax	0628	Protector
0583	Pyrethrum	0629	Vitavax
0584	Phenothrin	0630	Ammate XN1
0585	Storm	0631	Dacamine 4D
0586	Promalin	0632	Pennamine D7
0587	Tre-hold Sprout	0633	PT 1200
0588	Curbite	0634	Dymet
0589	Palanap	0635	Formetanate hydrochloride
0590	Pencozeb	0636	Fenbutatin Oxide
0591	Telone	0637	Contacts (C8 - C10)
0592	Phosphate defoliant	0638	Chlordimeform
0593	M & M	0639	Sumithrin
0594	Cyclone	0640	Lime Sulfur
0595	Diphacinone	9997	County Agent referenced publication but did not identify specific pesticides used or recommended
0596	Strychnine		
0597	Bronate		
0598	Chem Hoe	9999	Mixture
0599	Milban		
0600	Penamil		
0601	Dinocap		
0602	Manex		

EXHIBIT C-3

FORMULATION CODE LIST

0001	0.005%	0049	2.5 EC
0002	0.5% Solution	0050	2.67 EC
0003	0.15 EC	0051	2%
0004	0.66 EC	0052	20% G (20 G)
0005	0.35 or 0.44% oats	0053	21.6%
0006	0.5%	0054	22 E
0007	none	0055	~25% CU#
0008	16,000 IU/MG	0056	25 C
0009	1.5 lb/gal	0057	25 WP
0010	1 E	0058	2 E
0011	1 EC	0059	2.4 L
0012	1 lb./gal EC	0060	2.4
0013	1.53 EC	0061	25 DL
0014	1.6 EC	0062	25 G
0015	1.8 L	0063	25 W
0016	1% D	0064	20%
0017	1% L	0065	25 DF
0018	10 G	0066	25 EC
0019	10 WP	0067	3 EC
0020	10% G	0068	3 SC
0021	12.7 S	0069	3.2 EC
0022	14 G	0070	30 EC
0023	14% G	0071	30 WP
0024	15 G	0072	30% Solution
0025	15 WP	0073	320
0026	17 WP	0074	33%
0027	18.2 EC	0075	35% WP
0028	18.25 WP	0076	37.4 LC
0029	19.5 WP	0077	3.2
0030	1.6 E	0078	3 E
0031	1.9 EC	0079	3.2 L
0032	1.6	0080	3.2 E
0033	15	0081	3.2 F
0034	1.8	0082	3.9
0035	1.4	0083	3 G
0036	1.5	0084	3.8 F
0037	15	0085	3.6 EC
0038	1.8 EL	0086	4
0039	2	0087	4 EC
0040	2 EC	0088	4 F
0041	2 EL	0089	4 L
0042	2 F	0090	4 M
0043	2 FM	0091	4 S
0044	2 L	0092	4.17 F
0045	2 LC	0093	4.5 F
0046	2 S	0094	400
0047	2 SC	0095	400 EC
0048	2.4 EC	0096	4D/Hi-Dep

EXHIBIT C-3 (continued)

FORMULATION CODE LIST

0097	4 AS	0145	75% WP
0098	4 E	0146	76.6% EC
0099	4 WP	0147	76% WP
0100	44 %	0148	77%
0101	4 WSL	0149	75%
0102	4 E	0150	75 S
0103	4 G	0151	70%
0104	43	0152	75 W
0105	41.4 EC	0153	76 W
0106	5 EC	0154	70 W
0107	5 F	0155	75 DG
0108	5% Bait	0156	76%
0109	5% G (5G)	0157	70.5%
0110	50%	0158	8 Aq.
0111	50 SL	0159	8 Aqua
0112	50 WP	0160	8 EC
0113	50-W	0161	80
0114	500	0162	80 Sprills
0115	57% EC	0163	80 W
0116	58 WP	0164	80 WP
0117	58	0165	80%
0118	5% BC	0166	80% DG
0119	50 DF	0167	80% S
0120	5 D (dust)	0168	80% SP
0121	57%	0169	80% WP
0122	50% EC	0170	81% WP
0123	5 B	0171	85 DS
0124	50% P	0172	86% SP
0125	57% L	0173	8 E
0126	6 EC	0174	80 DF
0127	6 S	0175	81
0128	6.7 E	0176	85 DF
0129	65% WP	0177	81 W
0130	66%	0178	85
0131	6 E	0179	8.4%
0132	6 F	0180	8 L
0133	60%	0181	81% S
0134	65 W	0182	90 WP
0135	64%	0183	90% S
0136	60 DG	0184	90% SP
0137	60 DF	0185	92 SP
0138	6 L	0186	93% WP
0139	6-6-100	0187	96 WP
0140	7 E	0188	90
0141	70 WP	0189	95 MFW
0142	720	0190	9.4
0143	75 DF	0191	95% WP
0144	75% SP	0192	90 W

EXHIBIT C-3 (continued)

FORMULATION CODE LIST

0193	95% ULV concentrate	0241	Aerosol
0194	90 WDG	0242	"half strength"
0195	95% SS	0243	LV
0196	90 SP	0244	23 F
0197	Aquaflow	0245	2.4 WP
0198	As a Dust	0246	2.4 E
0199	F-4	0247	2 G
0200	FC	0248	2 AS
0201	FZ	0249	20 EC
0202	JPC Aqueous	0250	18 EC
0203	L	0251	1% solution
0204	M 85	0252	15% smoke
0205	MZ 58	0253	12.5% WP
0206	W	0254	17%
0207	WP	0255	15 D
0208	AD	0256	18.2%
0209	EC	0257	58 EC
0210	FM	0258	5% aerosol
0211	DF	0259	5 ppm
0212	ATC	0260	52%
0213	ADW	0261	5 L
0214	FL	0262	53 W
0215	BW	0263	5 E
0216	IMZ	0264	4 SC
0217	30 W	0265	4 F
0218	35 W	0266	49%
0219	34.8 EC	0267	4 XLR
0220	30 R	0268	4 oil
0221	38 F	0269	4 FL
0222		0270	47.5 W
0223	340 F	0271	1.8 EC
0224	35	0272	20.4%
0225	3.2 WP	0273	23.4 EC
0226	15 W	0274	21.3%
0227	12.5 EC	0275	20 WP
0228	1.5 AS	0276	2.4 LV
0229	1.5 L	0277	28%
0230	13.3 EC	0278	G
0231	1.5 EC	0279	S
0232	15.6 EC	0280	SP,EC
0233	18.5 EC	0281	WP,EC
0234	XLR	0282	ULV
0235	SL	0283	MZ 78
0236	gas	0284	bait
0237	ME 4	0285	M 45
0238	XL	0286	7 EC
0239	CM	0287	19.5 W
0240	XLR plus	0288	40 WP

EXHIBIT C-3 (continued)

FORMULATION CODE LIST

0289	WD	0316	53 WP
0290	1991	0317	1.5 LC
0291	F	0318	24 E
0292	47.5	0319	65%
0293	40.4%	0320	25 L
0294	780 S	0321	1.8 lb L/gal
0295	SP	0322	74% SP
0296	6.55 EC	0323	33% EC
0297	MF	0324	69% EC
0298	3.91% L concentrate	0325	5%
0299	50 WP2	0326	F 45
0300	18.2 E	0327	53%
0301	3% emulsion	0328	10-10-100
0302	5 EC	0329	6-6-100
0303	50% WS	0330	WM
0304	3.6 E	0331	7
0305	25% DG	0332	41.8
0306	20% bait	0333	8
0307	1.5 G	0334	200
0308	LS	0335	D
0309	WSP	0336	340 P
0310	57% EL	0337	3.2 LE
0311	48% EC	0338	2.5
0312	65%	0339	65 EC
0313	20.5%	7777	No formulation
0314	11	9998	Don't know formulation
0315	25		

EXHIBIT C-4

UNITS CODE LIST

001	fl. oz/A	047	quarts in 75-125 gallons of water per
002	fluid oz product/A		3,000 linear ft. of area
003	fl.oz in 20 - 50 gal product/A	048	quarts product/A
004	fl.oz formulation/A	049	quarts/A
005	fl.oz/100 gal water/A	050	quart/50 gal water
006	gal/acre-foot	051	quart formulation/A
007	gallons product/A	052	quart/A/100 gal
008	gal/A	053	rate variable
009	gal/100 gal water/A Units Given	054	tablespoon/1000 linear row ft.
010	gal formulation/A	055	tablespoon/A
011	handful granular/bush	056	teaspoon/1000 linear row ft.
012	lb/100 yds ²	057	teaspoon/A
013	lb/1000 ft ²	058	tablespoon/2 gal water (spray
014	lb/500 gal.		seedlings)
015	lb a.i./A	059	tablespoon/gal water/1000 sq.ft.
016	lb/acre-foot	060	tablespoon/gal water/A
017	lb element/500 gal.	061	tablespoon/1000 sq.ft.
018	lb formulation/A	062	tablespoon/gal/unknown area
019	lb in 50-100 gal. of water/A based on	063	teaspoon formulation/gal
	38-40" spacing	064	ppm/100 gal water/A
020	lb product/A	065	quart/100 gal water/1" in tree
021	lb product/20 to 40 gallon of water/A		diameter
022	lb product/A for 30" rows	066	spot treatment
023	lbs/100 gallon water	067	oz/100 wt.
024	lbs/gallon water/A	068	pint/1000 row ft.
025	lb/A	069	lb/100 gal water/A
026	lb/100 sq.ft	070	quarts/100 gal (for spot treatment)
027	lb/1000 linear ft.(ft.row)	071	pint/sprayed area (for spot treatment)
028	lb actual/A	072	oz/gal (for spot treatment)
029	lb/gal	073	lb/300 gal/A
030	lbs formulation/100 gal. water/A	074	pint/300 gal/A
031	oz/100 lb of seed	075	pint/50-100 gal water/A
032	oz/1000 ft ²	076	pint a.i./A
033	oz/1000 linear ft.	077	lb dilute/A
034	oz product/A	078	gal dilute/A
035	oz/yd ³	079	dry compound on seed
036	oz a.i./A	080	pt/100 gal
037	oz/A	081	oz/100 gal water
038	oz formulation/A	082	oz/1000 gal water
039	pint product/20 to 40 gal. H ₂ O/A	083	lb/900 sq. ft. bed
040	pints/500 gal.	084	pt/gal/A
041	pints/A	085	lb/20 gal/A
042	pints product/A	086	oz/50 gal
043	pints	087	oz/cwt
044	pint formulation/A	088	teaspoon/gal
045	pint/100 gal water/A	089	oz/1" trunk diameter
046	quart/3 quarts water		

EXHIBIT C-4 (continued)

UNITS CODE LIST

090	seconds of 5% aerosol spray per 100 ft.	122	pint/20-50 gal/A
091	oz/400 ft.	123	lb a.i./100 gal
092	oz/7.5 gal water	124	oz
093	lb/100 gal mixture/1/2 acre	125	qts/20 gal water
094	gal/100 gal/1/2 acre	126	pints/500 gal dilute spray
095	lb/100 gal/1/2 acre	127	% rate/500 gal dilute spray
096	lb/100 gal/1/4 - 1/2 acre	128	lb/500 gal dilute
097	lb/100 gal/1/4 acre	129	oz/500 gal dilute
098	oz/100 gal/1/4 - 1/2 acre	130	oz/500 gal water (apply 10 gal per tree w/4" diameter)
099	pt/25 gal/1/4 acre	131	gal/500 gal dilute spray
100	oz/gal	132	qt/100 sq.ft.
101	fl. oz./10,000 cubic ft.	133	pint/100 sq.ft.
102	seconds of aerosol spray/100 square feet	134	oz/site
103	qts/25 gal spray for 60-70 seconds	135	gallons spray
104	lb/25 gal	136	pts/100 gal spray
105	tablespoons/3 gal	137	lb formulation/100 gal spray
106	lb/1000 square yards	138	pt/50 gal water
107	teaspoons/100 sq yd plant bed	139	pt/13,000 linear ft of row
108	qt/25 gal water/A	140	fl.oz./cubic yd
109	gal/92 gal	141	fl.oz./100 gal
110	seed treatment	142	oz/bu (seed treatment)
111	lb	143	pt/bu (seed treatment)
112	fl.oz./100 gal/400-800 sq ft	144	lbs/100 lb seed
113	lb a.i./100 gal sprayed	145	gal/1000 linear ft. of row
114	oz/160 gal	146	qt/20-40 gal water/A
115	fl. oz. a.i./A	147	gal/100 gal
116	teaspoon/lb of seed	148	quarts/100 gal
117	oz/100 gal/400 - 800 sq.ft.	149	oz/25 gal
118	can/1000 sq. ft.	150	gal a.i./A
119	oz/10 gal	151	oz product/100 lb seed
120	oz/cubic yd	888	'See Label rate' units
121	oz/100 lb	777	No Units Given
		998	Don't Know Units

EXHIBIT C-5

TIME OF APPLICATION CODE LIST

01	January 1 - January 15	50	Jun 1 - Aug 31
02	January 16 - January 31	51	Late Summer
03	February 1 - 15	52	Early Spring
04	February 16- 31	53	Late Winter
05	March 1 - 15	54	"When larvae are small"
06	March 16 - 31	55	As needed
07	April 1 - 15	56	Once a year
08	April 16 - 30	57	Jun 1 - Sept 30
09	May 1 - 15	58	Jan 1 - Apr 30
10	May 16 - 31	59	Oct 16 - Apr 30
11	June 1 - 15	60	Mar 16 - Jul 31
12	June 16 - 30	61	Once every 25 years
13	July 1 - 15	62	Varies through growing season
14	July 15 - 31	63	When weeds are actively growing
15	August 1 - 15	64	Late spring
16	August 16 - 31	65	Early summer
17	September 1 - 15	66	Tight cluster
18	September 16 - 30	67	Petal fall
19	October 1 - 15	68	2nd cover
20	October 16 - 31	69	3rd cover
21	November 1 - 15	70	5th cover
22	November 16 - 30	71	1/2 inch green
23	December 1 - 15	72	Pink
24	December 16 - 31	73	5 - 6 applications per season
30	Spring	74	1 - 2 applications per season
31	Summer	75	1st cover
32	Winter	76	Bloom
33	Fall	77	1 - 2 summer applications
34	Year Round as Needed	78	Not after petal fall
35	See Label	79	Not more than 4 lb/acre/year
36	Growing Season	80	Not more than 3 applications per season
37	At Planting		
38	Pre-Emergence	81	Pre-bloom
39	Post-Emergence	82	Not after pink
40	Information Not Available	83	To 2nd cover
41	Question not asked	84	After petal fall
42	Question not answered	85	Post plant
43	Year Round	86	Late fall
44	Preplant	87	5 weeks before harvest to harvest
45	Mar 1 - Nov 30	88	3 weeks before harvest to harvest
46	May 16 -Sept 15	89	Jun 1 - Oct 31
47	Apr 1 - Aug 15	98	Don't know
48	Apr 16 - Aug 31	99	Multiple time of application
49	Apr 16 - Sep 15		

pencil when making any edits to a Questionnaire). Then renumber the existing questions 11 through 19, so they become 13 through 21.

If no insert is present in the (19 question) Questionnaire, place an insert page (see Exhibit C-6) in the notebook after the page with questions 8,9, and 10, write the date on top of the page, and circle each 97. Then renumber the existing questions 11 through 19, so they become 13 through 21. The existing question 11 directs the respondent to "skip to Q.14" in certain cases. In the renumbering process, Q.14 becomes Q.16, so the "skip to" command must be renumbered by placing a slash (/) through the 14 and writing 16 next to it. Continue this process, reviewing all Questionnaires in the binder, ensuring that all questionnaires end with question 21.

EXHIBIT C-6

COUNTY AGENT QUESTIONNAIRE INSERT PAGE

11. Is there a golf course located in the area identified on the map?

Question not asked 97

12. Would you say that in this area, pesticide usage is generally higher, lower, or about the same as the rest of the county?

Question not asked 97

5. Review questions 9, 10, and 17. If 98 is circled for any response to these questions, place a slash through the 98 and write 998 in the three blank spaces provided (_ _ _). Place zeros in any spaces left blank where 998 does not apply (i.e. if the response is _ _ 1, place zeros in the two blank spaces before the one). Continue this process, reviewing all questionnaires in the binder, to ensure that there are no blank spaces left in any response to questions 9, 10, and 17.

b. Data Coding

Each data coding sheet is a record. A record will be filled out for each pesticide (or mixture), by crop, identified in the responses to questions 6 and 8. To complete a record, follow steps 1-15 below:

1. Select the first **County Agent Questionnaire** (in the binder) for coding. Use a black felt tip pen to fill out the coding sheets.
2. Write the page number in the Page _____ of _____ space on the data coding sheet. Initial the top right hand corner of the sheet.
3. Write the applicable quadrant number(s) in the space marked Quad: _____ on the data coding sheet.
4. Write the State and County in the space provided on the data coding sheet.

5. For Applies to question 6? answer with:
"Y" if the information in this record exactly matches that for the response to question 6.
"N" if the information in this record does not exactly match that for the response to question 6.
6. For Applies to question 8? answer with:
"Y" if the information in this record exactly matches that for the response to question 8.
"N" if the information in this record does not exactly match that for the response to question 8.
7. For Crop: enter the crop name on the data coding sheet. If no crop is identified, enter Not Specified.
8. For Pesticide Code: refer to the Pesticide Code List to identify the applicable 4 digit code and enter it. If a code cannot be found, see "code note" below. If the response states that a mixture of pesticides is used, enter 9999 for the pesticide code and use the "specify" field to enter the codes for the pesticides constituting the mixture, separating each pesticide code with a comma. Before entering 9999, make sure that the mixture isn't listed on the Pesticide Code List. If a specific code is given for a mixture, use it instead of 9999. In some cases, the interviewer responded to questions 6 and/or 8 by referencing special inserts (xeroxed pages from trade manuals, books, etc.). These special inserts should be reviewed with the interviewer. When a pesticide is selected for data coding from a special insert, the pesticide and all corresponding information selected for data coding should be underlined with blue pencil if it has not already been highlighted by the interviewer. If the respondent referenced a special insert for a crop category but did not identify specific pesticides used or recommended, enter 9997 for the pesticide code for that crop.
9. For Pesticide Formulation: if a formulation of the pesticide is identified in the response, refer to the Formulation Code List to identify the applicable 4 digit code and enter it. If a code cannot be found, see "code note" below. If the 9999 code has been entered for Pesticide Code: do not enter a formulation code (the computer will do it automatically); the "specify" field should be used to identify the formulation codes for each pesticide in the mixture. In this case (pesticide code 9999), each formulation code should be separated with a comma and listed in the same order as the corresponding pesticide codes are listed in the pesticide code "specify" field. If no formulation is identified, or if the pesticide code 9997 has been used, enter a code of 7777.
10. For Application Rate: enter the numerical value of the land application rate before the hyphen on the data coding sheet (if the rate is a fraction, put a 0 before the decimal point). If there is no response for the application rate (or if Pesticide Code 9997 has been entered), enter a code of 7777.7777. If the pesticide is a mixture (i.e. pesticide code is 9999), do not enter an application rate; use the specify field to list the values of the application rates or ranges for each component of the pesticide mixture. Values in the "specify" field should be separated by commas and listed in the same order as the corresponding pesticide "specify" field codes (if only one

- numerical value is given for the application rate of a mixture, enter that value in the "specify" field). If a range is given for the land application rate, see step 11. If the response is "see label rate" for the application rate, enter a code of 8888.8888.
11. If the application rate is given as a range of numbers instead of one value, or as both a value and a range, enter the land application rate range, with the low numerical value entered first and the high value entered in the space after the hyphen (-). The two values should be identified from low to high, separated by the hyphen.
 12. For Significant Figures: enter the number of significant figures following the decimal point in the response to Application Rate: If 7777.7777, 8888.8888, or 9999.9999 have been entered for the application rate, enter a code of 4 for significant figures. If there is more than one application rate, enter the greatest number of significant figures.
 13. For Units: refer to the Units Code List to identify the applicable three digit code for the land application rate units and enter it. If no units are identified, or 7777.7777 has been entered for the application rate, enter a units code of 777. If a code cannot be found, see "code note" below. If the pesticide code is 9999, do not enter a units code; use the specify field to enter units codes separated by commas and identified in the same order as the corresponding pesticides in the Pesticide Code: "specify field". If "see label rate" is entered for Application Rate (Value) (i.e. a code of 8888.888 is entered), do not enter a units code.
 14. For Time of Application: review question 21 to determine the time of application for each pesticide, refer to the Time of Application Code List to identify the appropriate two digit code, and enter it. If a code cannot be found, see "code note" below. If more than one time of application Code applies, enter a 99 and use the specify field to list the appropriate codes in sequence, separated by commas. If pesticide code 9997 has been entered, enter 42 for the time of application code.
 15. For Applied in 1988 (Y/N)? (and 1987, 1986, 1985, 1984), review questions 6 and 8 to determine which year is applicable. Enter Y if the record applies to that year or N if it does not. If there is no response, enter R.

Complete steps 1-15 for each pesticide identified in the responses to questions 6 and 8, using a separate data coding sheet for each pesticide. When data coding for a Questionnaire is completed, the total number of pages should be entered in the Page ___ of ___ space on each data coding sheet, and the data coding sheets checked to make sure that they are numbered sequentially and that the pages are in numerical order.

If an interviewer's handwriting cannot be interpreted or the scientific information provided is not complete, the interviewer will be contacted for assistance.

When coding is complete for the Questionnaire, select the next Questionnaire in the binder and follow steps 1-15, numbering all data coding sheets when finished. Continue this process until coding is complete for a county. In many counties, pesticide data will be the same for more than one questionnaire. If this is

the case, the data coding sheets may be xeroxed where applicable, and the information on quadrants and page number (see steps 2,3, and 4) changed as necessary. In several counties, an extremely large number of pesticides are identified. These counties will be identified by Carol Lindsay, and a special procedure will be used for coding as follows: a set of master coding sheets will be prepared including all pesticides listed for the county; the master will be placed with the quad that has the greatest number of crops; after data is key-entered for each questionnaire, including the questionnaire with the master coding sheets, Suha Biedas will copy the relevant crop files into each quadrant as they apply.

Code Note: If a code cannot be found on the master code list, one may be added in one of the blank numbered spaces provided on each code list. **DO NOT CHANGE THE NUMERIC SEQUENCE OF THE EXISTING CODES!!**

6. STAFF TRAINING:

The Lake, IN County Agent Questionnaire Quadrant 5, and Hancock, IN Quadrant 3 will be coded as test cases by Carol Lindsay and Bruce Rappaport. Each data coder will be trained with the SOP by Carol Lindsay or Jim Sperry, coding data from the Lake, IN County Agent Questionnaire Quadrant 5 to learn the procedure.

7. STAFF CERTIFICATION:

Upon completion of training, the coded Questionnaire will be reviewed by Dr. Rappaport for conformance to the SOP. Results will be compared to the test case. If significantly different, the rationale will be reviewed with the coder and used for retraining. The data coder will be retested using the Hancock, IN County Agent Questionnaire Quadrant 3. Results will be compared to the test case, and if they are not 100% correct, the data coder will be replaced.

8. INTERNAL CONSISTENCY REVIEW:

Jim Sperry or Carol Lindsay will review 10% of the coded questionnaires for each county to ensure that they are coded correctly. Dr. Rappaport will review 1% of the reviewed coded questionnaires for each county to ensure consistency. A Quality Assurance Check Sheet (Exhibit C-7) will be completed for each review performed.

9. DATA FILE ORGANIZATION:

County Agent Questionnaires for all quadrants in a county are maintained in a 3-ring binder (one binder for each county) in the NPS Prep Room. Individual counties will be signed out for coding. When coding is complete for a Questionnaire, the coding sheets will be inserted in the 3-ring binder following the page with Question 21 for that questionnaire. If all the questionnaires for a county do not fit in one notebook following data coding for that county, the questionnaires may be split into two or more notebooks per county.

EXHIBIT C-7

QUALITY ASSURANCE CHECK LIST
COUNTY AGENT QUESTIONNAIRE DATA CODING

County: _____

State: _____

Quadrant: _____

Data Coder: _____

Reviewer: _____

Question 6: All pesticides entered _____
Formulations correctly entered _____
Value or Range entered _____
Units for Application Rate entered _____

Date: _____

Comments:

Question 8: Y or N entered if corresponds to question 6 _____

Date: _____

Comments:

Question 21: Time of Application correctly entered _____

Date: _____

Comments:

APPENDIX D

STANDARD OPERATING PROCEDURES⁹

1. **TITLE:** Procedures for Data Entry of Second-stage County Agent Questionnaire
2. **AREA OF RESPONSIBILITY:** NPS Project
3. **GENERAL REQUIREMENTS:**

- A. **Methodology:**

County Agent Questionnaire responses will be entered into NPSIS2 for data analysis. The County Agent Questionnaire was administered to county agricultural extension agents in 84 counties in 35 states across the nation. Each county agent responded to questions regarding crop types, pesticide usage, soil textures, crop management practices, irrigation methods, and conservation measures across the county for which they serve as Agriculture Extension Agent. Information gathered in this questionnaire was initially used to determine cropping areas within each county for second-stage stratification. These cropping areas were later overlain with groundwater-vulnerability information to identify "cropped and vulnerable" areas for oversampling. The County Agent Questionnaires and other important and related materials gathered during the interviews will be stored in three-ring binder notebooks and maintained in Document Control.

The County Agent Questionnaire will be key entered into NPSIS2 by temporary key operators. These data key entry personnel ("keyers") will report to Ms. Lindsay and Mr. Sperry for problems involving the data as recorded in the questionnaire. The keyers will report to Ms. Beidas, the Second-stage Database Manager, for questions involving the computer program. Dr. Rappaport will oversee all operations of data entry and will ultimately be responsible for resolving any questions.

- B. **Equipment and Materials Required:**

- i. Completed County Agent Questionnaire
 - ii. National Pesticide Survey County Agent Questionnaire Data Entry User Guide
(Attachment III to this QAPjP)
 - iii. Hardware: IBM PC (640K memory)
 - iv. Software: NPSIS County Agent Questionnaire (CAQ) Data Entry System

4. **PROCEDURE:**

- A. Participate in training for data entry of the County Agent Questionnaire conducted by Ms. Beidas and Ms. Lindsay. Read the National Pesticide Survey County Agent Questionnaire Data Entry User Guide. Refer to this guide if there is any doubt about the data entry procedures.
 - B. Obtain a County Agent Questionnaire three-ring binder from either Ms. Lindsay or Ms. Beidas.

- C. Access and manipulate the CAQ Data Entry System to enter and store the coded responses in the County Agent Questionnaire as instructed in training and as outlined in the National Pesticide Survey County Agent Questionnaire Data Entry User Guide.
- D. Page Ms. Beidas or Ms. Estrada, the NPSIS Database Manager, in order to answer emergency questions regarding computer programming problems.^{1/}

5. STAFF TRAINING:

Keyers will be trained by Ms. Beidas, the Second-stage Database Manager, according to the procedures specified in the National Pesticide Survey County Agent Questionnaire Data Entry User Guide. During training, each individual responsible for data key entry will be issued this guide for reference during the data entry process. No individual will be allowed access to the CAQ data entry system or issued a Keyer Identification Number prior to training.

6. STAFF CERTIFICATION:

Upon completion of training, each keyer will be continually evaluated by Ms. Suha Beidas through her review of the "Double Key Comparisons" file.

7. INTERNAL CONSISTENCY REVIEW:

Quality assurance/quality control procedures will be implemented in order to ensure that the data are entered into the system and stored accurately and consistently and that the integrity of the data is not compromised during the data entry process. Inherent in the CAQ Data Entry System are numerous controls to ensure the accurate and consistent entry of data:

- A. Each keyer will be issued a unique and confidential Keyer Identification Number. This will prevent any unauthorized individuals (i.e., anyone not successfully completing training) from accessing the system.
- B. Training will be conducted by one individual, Ms. Suha Beidas, the Database Manager. This will ensure consistency in training.
- C. Each keyer will be issued his/her personal copy of the National Pesticide Survey County Agent Questionnaire User Guide upon completion of training for reference during the data entry process. This will ensure that a standard set of procedures is followed during the data entry process.

8. EXTERNAL COMPARISONS:

All questionnaires will be double key entered, that is, each questionnaire will be entered once by two different keyers. The computer is programmed to compare the information entered by the two keyers. Any discrepancies involving entered information will be resolved by Ms. Linda Prevatte, coder for the County Agent Questionnaire. Ms. Prevatte will review the original questionnaire and determine which keyer entered the data incorrectly. Daily printouts of the double key entry and validation process are stored in a three-ring binder

^{1/} Ms. Beidas and Ms. Estrada will wear pagers during business hours to ensure that an expert computer programmer will be available to respond to emergency programming needs.

entitled "Double Key Comparisons" which is maintained by Ms. Beidas. The double key entry and validation process will ensure the consistency and accuracy of the actual data entered into the system.

ATTACHMENT I

COUNTY AGENT QUESTIONNAIRE

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL PESTICIDE SURVEY**

COUNTY AGENT QUESTIONNAIRE

Contact:	_____
State:	_____
County:	_____
Address:	_____ _____ _____
Phone:	() _____

Introduction:

The U.S. Environmental Protection Agency is conducting a National Pesticide Survey to obtain information on pesticide contamination in drinking water wells and to learn how the pesticides in these wells are associated with pesticide usage and groundwater vulnerability. This questionnaire pertains to the area identified on the map. For this survey, farming is defined as an activity from which \$1,000 or more of agricultural products were sold or normally would have been sold during a year.

Well I.D.: ____-____-____

1. Which crops are farmed in the area identified on the map?

	YES, CROP FARMED	NO, CROP NOT FARMED		YES, CROP FARMED	NO, CROP NOT FARMED
<u>Grains</u>			<u>Vegetables</u>		
Corn	01	99	Potatoes	17	99
Dry beans or peas	02	99	Sweet corn	18	99
Rice	03	99	Tomatoes	19	99
Sorghum	04	99	Other produce/ truck farming crops	20	99
Soybeans	05	99	<u>Orchard Crops and Fruits</u>		
Sunflowers	06	99	Apples	21	99
Wheat	07	99	Cherries	22	99
Other cereal or grain crops	08	99	Grapefruit and oranges	23	99
<u>Sugars</u>			Grapes	24	99
Sugarbeets	09	99	Lemons	25	99
Sugar cane	10	99	Peaches	26	99
<u>Other Crops</u>			Pears	27	99
Alfalfa	11	99	Pineapple	28	99
Pasture	12	99	Plums	29	99
Cotton	13	99	<u>Nuts</u>		
Peanuts	14	99	Almonds	30	99
Tobacco	15	99	Pecans	31	99
Sod farms	16	99	Walnuts	32	99

2. What percent of the land area is farmed with the crops listed in Question 1?

More than 50%	01
25 to 50%	02
0 to 25%	03
Don't know	98

3. What is the average soil texture in the area?

Clay and clay loam	01
Silt and silty clay loam	02
Sandy loam	03
Sand	04
Muck and peat	05
Don't know	98

4. What is the average soil permeability condition in the area?

Very slow	01
Slow to moderately slow	02
Slow to rapid	03
Moderately slow to rapid	04
Rapid	05
Don't know	98

5. Between January 1, 1984 and the present, have pesticides been used in the area?

Yes 01
No 02 (Skip to Q.7)
Don't know 98 (Skip to Q.7)

6. Starting with 1988 and thinking back to 1984, what pesticides have been used? For each pesticide, what is the application rate? (Enter the brand name, active ingredient, or type of each pesticide used.)

	<u>Year</u>	<u>Pesticide</u>	<u>DK</u>	<u>Rate</u> (pounds per acre per year)	<u>DK</u>
a.	1988	_____	98	_ _ _ _	98
		_____	98	_ _ _ _	98
b.	1987	_____	98	_ _ _ _	98
		_____	98	_ _ _ _	98
c.	1986	_____	98	_ _ _ _	98
		_____	98	_ _ _ _	98
d.	1985	_____	98	_ _ _ _	98
		_____	98	_ _ _ _	98
e.	1984	_____	98	_ _ _ _	98
		_____	98	_ _ _ _	98

7. Between January 1, 1984 and the present, have you recommended any pesticides for use in the area?

Yes 01
No 02 (Skip to Q.9)
Don't know 98 (Skip to Q.9)

8. Starting with 1988 and thinking back to 1984, what pesticides have you recommended? For each pesticide, what is the application rate? (Enter the brand name, active ingredient, or type of each pesticide used.)

<u>Year</u>	<u>Pesticide</u>	<u>DK</u>	<u>Rate</u> (pounds per acre per year)	<u>DK</u>
a. 1988	_____	98	_ _ _ _	98
	_____	98	_ _ _ _	98
b. 1987	_____	98	_ _ _ _	98
	_____	98	_ _ _ _	98
c. 1986	_____	98	_ _ _ _	98
	_____	98	_ _ _ _	98
d. 1985	_____	98	_ _ _ _	98
	_____	98	_ _ _ _	98
e. 1984	_____	98	_ _ _ _	98
	_____	98	_ _ _ _	98

9. What percent of cropland in the area has been treated with any of these pesticides?

Don't know Percent 98

10. Of the total volume of pesticide applications in this area, what percent is applied by each of the following methods?

	<u>DK</u>
a. Preplant incorporated	_ _ _ _ % 98
b. Soil incorporated at planting	_ _ _ _ % 98
c. Pre-emergence	_ _ _ _ % 98
d. Post-emergence	_ _ _ _ % 98

11. Is there a golf course located in the area identified on the map?

Yes 01
No 02
Don't know 98

12. Would you say that in this area, pesticide usage is generally higher, lower, or about the same as the rest of the county?

Higher 01
Lower 02
About the same 03

13. Is irrigation used in the area?

Yes 01
No 02 (Skip to Q. 16)
Don't know 98 (Skip to Q. 16)

14. What irrigation methods are used in the area?

	<u>Yes</u>	<u>No</u>	<u>DK</u>
a. Spray (center pivot, handline, traveling gun, other)	01	02	98
b. Flood (furrow, ditch, trickle)	01	02	98
c. Drip	01	02	98
d. Subsurface	01	02	98
e. Other (Specify)	01	02	98

15. What are the sources of irrigation water in the area?

	<u>Yes</u>	<u>No</u>	<u>DK</u>
a. Groundwater	01	02	98
b. Surface water	01	02	98
c. Canal	01	02	98
d. Spring	01	02	98
e. Sewage effluent (primary, secondary, or tertiary)	01	02	98
f. Other (Specify)	01	02	98

16. What is the average erosion potential of the land in the area?

Severe sheet and gully erosion	01
Moderate to severe erosion of mesas and mountains	02
Moderate to severe wind erosion with some gulying	03
Moderate sheet and gully erosion with some wind erosion	04
Moderate sheet and gully erosion, serious locally	05
Erosion unimportant	06
Other (Specify)	07
<hr/>	
Don't know	98

17. What percent of the crop management practices are performed by farmers located in the area?

			<u>DK</u>
a. No tillage	_ _ _ %	98	
b. Conventional tillage	_ _ _ %	98	
c. Intertillage	_ _ _ %	98	
d. Other (Specify)	_ _ _ %	98	
<hr/>			
Total		100%	

18. What other conservation measures have been used?

	<u>Yes</u>	<u>No</u>	<u>DK</u>
a. Up-and-down slope planting	01	02	98
b. Contour planting	01	02	98
c. Terracing	01	02	98
d. Other conservation measures (Specify)	01	02	98
<hr/>			

19. Are drainage systems in common use in the area?

Yes	01	
No	02	(Skip to End)
Don't know	98	(Skip to End)

20. What drainage systems are in common use?

	<u>Yes</u>	<u>No</u>	<u>DK</u>
a. Drainage ditches	01	02	98
b. Tile drains	01	02	98
c. Other drainage systems (<i>Specify</i>)	01	02	98

21. At what time of year are pesticides applied to the major crops farmed in the area?
 (Complete only dates that correspond to predominant pesticide application. Specify the crop. Enter the brand name, active ingredient, or type of each pesticide used.)

Jan. 1-15 Yes ... 01 No 02	→ Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Jan. 16-31 Yes ... 01 No 02	→ Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Feb. 1-14 Yes ... 01 No 02	→ Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Feb. 15-29 Yes ... 01 No 02	→ Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Mar. 1-15 Yes ... 01 No 02	→ Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Mar. 16-31 Yes ... 01 No 02	→ Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Apr. 1-15 Yes ... 01 No 02	→ Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Apr. 16-31 Yes ... 01 No 02	→ Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
May 1-15 Yes ... 01 No 02	→ Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
May 16-31 Yes ... 01 No 02	→ Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____

June 1-15 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
June 16-31 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
July 1-15 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
July 16-31 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Aug. 1-15 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Aug. 16-31 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Sept. 1-15 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Sept. 16-31 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Oct. 1-15 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Oct. 16-31 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____

21.

Nov. 1-15 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Nov. 16-31 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Dec. 1-15 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Dec. 16-31 Yes... 01 No 02	Pesticide 1: _____ _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____

Thank you for your cooperation.

ATTACHMENT II

COUNTY AGENT QUESTIONNAIRE
QUESTION-BY-QUESTION SPECIFICATIONS

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL PESTICIDE SURVEY

Question by Question Specifications
for the
County Agent Questionnaire

* * * August 31, 1988 * * *

1. **This questions asks for which crops are grown in the area identified on the map.**

The response can be for a group of maps which are contiguous to one another.

Farming of crops on a given map shown is defined as an activity from which \$1,000 or more of the crop was sold or normally would have been sold during a year.

2. **This questions asks for the percent of land area farmed with the crops listed in Question 1.**

Farmed area means the land area where the crops circled in Questions 1 were grown in the past year.

3. **This question asks what is the average surface soil texture of the land identified on the map.**

For the purposes of this question, clay and clay loam soils will include silt loam soils.

Silt and silty clay loam soils will include silt loam soils.

Sandy loam will include sandy clay loam and sandy clay soils.

Sand will include loamy sand soils.

4. **This question asks what is the average soil permeability of the land identified on the map.**

Soil permeability is the ease with which gases, liquids, or plant roots penetrate through a bulk mass of soil or a layer of soil.

Ask the respondent to relate the question to the soil profile and not to either a specific surface or subsurface soil horizon.

If asked, "would a limiting horizon such as a clay pan be reason enough to say very slow," answer yes.

5. **This question asks if any pesticides have been used on the land area on the map between January 1, 1984 and the present.**

Pesticides include insecticides, herbicides, fungicides, nematocides, rodenticides, and other chemicals except fertilizers.

Pesticides for this answer include recommendations made by the county extension office, forest service, and chemicals that you do not necessarily recommend, but know they may be used.

If no pesticides have been used or the respondent does not know of any pesticide application then skip to Question 7.

6. This question asks the respondent to list the pesticide used on the land area identified on the map, starting with 1988 and working back to 1984.

The questionnaire has two lines for responses for each year. If two pesticides have been used, label the top line "1", and label the second line "2". If more than two pesticides have been used in a year, complete a continuation sheet for the question.

The code for the brand name or trade name (AAtrex) of the pesticide is the preferred response. Other acceptable responses include the active ingredient (atrazine), or type (herbicide).

If the respondent knows that no pesticide was used during the year, enter "None" on the line labeled pesticide.

If the respondent knows that a pesticide was used but does not know the name of the pesticide used, circle the code 98 for "Don't Know".

List the pounds per acre per year of the pesticide along with the formulation. If the response is in some other unit of measure, such as pounds of active ingredient per acre record the response in the margin.

7. This question asks if you have made recommendations for pesticide use on the land area identified on the map between January 1, 1984 and the present.

Pesticides include insecticides, herbicides, fungicides, nematocides, rodenticides, and other chemicals except fertilizers.

Pesticides for this answer include only recommendations that the respondent has personally made as the county agent.

If no pesticides have been used or the county agent does not know of pesticide recommendations they have made then skip to Question 9.

8. This question asks the respondent to list the pesticides for which they have made recommendations on usage for the land area identified on the map, starting with 1988 and working back to 1984.

The questionnaire has two lines for responses for each year. If two pesticides have been used, label the top line "1" and label the second line "2". If more than two pesticides have been used in a year, complete a continuation sheet for the question.

The code for the brand name or trade name (AAtrex) of the pesticide is the preferred response. Other acceptable responses include the active ingredient (atrazine), or type (herbicide).

If the respondent knows that they made no recommendation during the year, enter "None" on the line labeled pesticide.

If the respondent knows that they made a pesticide recommendation, but does not remember the name of the pesticide, circle the code 98 for "Don't Know".

If the respondent knows that the pesticides for a given year are the same as in Question 6, then refer to the answer, but writing in at a specified year. Refer to Question 6 for the list of pesticides.

List the pounds per acre per year of the pesticide along with the formulation. If the response is in some other unit of measure, such as pounds of active ingredient per acre record the response in the margin.

9. This question asks for what percent of the cropland farmed in Question 2 has been treated with any of the pesticides listed in Questions 6 and 8.

The question refers to the past 12 months.

Zero fill the field if necessary.

10. This question asks for what percent of the total volume of pesticide applications is used by the listed methods.

Preplant incorporation applies to the percent of the total volume of pesticide applications made to the land prior to planting date and incorporated into the soil.

Soil incorporated at planting applies to the percent of the total volume of pesticide applications made to the land at time of planting below the soil surface.

Pre-emergence refers to the percent of the total volume of pesticide applications made to the land before the crop emerges through the soil surface.

Post-emergence refers to the percent of the total volume of pesticide applications made to the land after the crop germinates.

Zero fill the field if necessary.

11. This question asks if there is a golf course in the area identified on the map.

A golf course is defined as an area of land laid out for the game of golf with more than 9 holes each including tee, fairway, and putting green.

12. This question asks the relative use of pesticides in the area identified on the map compared to the rest of the county.

Pesticide use in a quadrant is defined as "high" if use in that quadrant is greater relative to overall use in the county. For example, in a county with 20 quadrants, if 17 quadrants are non-cropped (low-pesticide use) and three quadrants are partially cropped with moderate pesticide use, those three quadrants that are cropped would be defined as higher than the rest of the county.

13. **This question asks if any irrigation is used on the farmland.**

Irrigation refers to the application of water to the cropland by artificial means.

If no irrigation has been used or the county agent does not know of any irrigation then skip to Question 14.

14. **This question asks for the types of irrigation methods that are used on the cropland.**

Spray irrigation is the method of applying water to the soil by an overhead spray system.

Flood irrigation is the method by which either water is released from field ditches and allowed to flood over the land or whereby water is applied to row crops in ditches made by tillage implements.

Drip irrigation is the method by which water is applied under low pressure near plants by seepage through micro emitters or porous hose.

Subsurface irrigation is the method by which water is added to the soil in such a way that it penetrates the soil from below.

Circle either "Yes", "No", or "Don't Know" for each of the irrigation methods.

15. **This question asks for sources of irrigation water used for crop production.**

Ground water applies to water that is within the earth and must be pumped to the surface by constructing a well.

Surface water applies to a water source from natural water bodies including lakes, rivers, and streams.

Canal water applies to a source of water that is used from an artificial waterway.

Spring water applies to a source of water issuing from the ground.

Sewage effluent applies to a source of water that is the treated wastewater from a wastewater treatment plant.

Circle either "Yes", "No", or "Don't Know" for each of the irrigation methods listed.

16. **This question asks for the average erosion potential of the land identified on the map.**

The land area for this question pertains to both the cropland and non-cropland.

Sheet erosion is defined as the removal of soil from the land surface by rainfall and surface runoff.

Gully erosion is defined as the erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 0.5 meter to as much as 25 to 30 meters.

Wind erosion is defined as the wearing away of the earth's surface by wind under natural environmental conditions of climate, vegetation, etc., undisturbed by man.

Local erosion pertains to small land areas which are prone to localized runoff during varying intensity precipitation events.

17. **This question asks the percent of crop management practices performed by farmers located in the cropland areas identified on the map.**

A no-tillage system is a procedure whereby a crop is planted directly into a seedbed; not tilled since harvest of the previous crop; also zero tillage.

Conventional tillage applies to the combined primary and secondary tillage operations normally performed in preparing a seedbed for a given crop grown in a given geographical area.

Intertillage is the practice of tillage operations performed in isolated bands separated by bands of soil essentially undisturbed by the particular tillage equipment.

Minimum tillage is the minimum soil manipulation necessary for crop production or meeting tillage requirements under the existing soil and climatic conditions.

If the respondent knows of another crop management practice other than the ones listed, write the response under "Other".

18. **This question asks for what types of erosion control conservation measures have been used in the area identified.**

Up-and-down slope planting is the activity of planting and managing crops up and down the slope of the land.

Contour planting is the activity of planting and managing crops on the contour.

A terrace is an embankment with the uphill side sloping toward and into a channel for conducting water, and the downhill side having a relatively sharp decline; constructed across the direction of the slope for the purpose of conducting water from the area above the terrace at a regulated rate of flow and to prevent the accumulation of large volumes of water on the downslope side of a cultivated field.

Circle either "Yes", "No", or "Don't Know" for each of the conservation measures listed.

19. This question asks if there are any water drainage systems that are used in the area.

Drainage systems provide channels, such as open ditches or drain tile, so that excess water can be removed by surface or by internal flow from a field.

If no drainage systems are used or the respondent does not know of any drainage systems then skip to Question 19.

20. This question asks for what types of drainage systems are used in the area identified.

Drainage ditches are open ditches, so that excess water can be removed by surface or by internal flow. They can be unlined or lined with sod, cement, or gravel.

Tile drainage systems are concrete or ceramic pipes placed at suitable depths and sponges in the soil or subsoil to provide water outlets from the soil.

Circle either "Yes", "No", or "Don't Know" for each of the drainage systems.

21. This questions asks at what time of year are pesticides applied to the major crops farmed in the area identified on the map.

The questionnaire has 3 columns divided into two week time periods. If more than one crop receives pesticides at the same time of year than complete crop 2 and crop 3 categories. Complete a continuation sheet if four or more crops receive pesticide applications at the same time.

More than one pesticide may be listed under a time period for the same crop.

The brand name or trade name (AAtrex) of the pesticide is the preferred response for each block. Other responses include the active ingredient (atrazine), or type (herbicide) in the time period pesticide block.

ATTACHMENT III

COUNTY AGENT QUESTIONNAIRE DATA ENTRY
USER'S GUIDE

U.S. Environmental Protection Agency
National Pesticide Survey

County Agent Questionnaire

Data Entry

March 1990

DRAFT

National Pesticide Survey Information System

County Agent Questionnaire

Data Entry Packet

Name: _____

Keyer Identification Number: _____

Environmental Protection Agency
National Pesticide Survey
County Agent Questionnaire

User Guide

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County Agent Questionnaire

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Chapter One

I. Introduction

The County Agent Questionnaire (CAQ) is a menu-driven Data Entry System designed to facilitate entering NPS County Agent interview responses into the CAQ database for later analysis.

Before you commence using the system, please ascertain that the Database Manager (Suha Beidas, X-3971) has installed all the required software and databases on your machine.

II. Useful Tips for Using CAQ

Before you start, a few things to remember are:

- Pressing the ESC key will take you out of the CAQ data entry system. You will then be taken to the Exit Screen (Figure 1).
- `<—|` refers to the ENTER key on your keyboard.
 `↑↓` refers to the Up and Down arrows on your keyboard.
 `↔` refers to the Right and Left arrows on your keyboard.
 PgUp refers to the Page Up key on your keyboard.
 PgDn refers to the Page Down key on your keyboard.
- Pressing PgUp or PgDn will save the current screen and move you backward or forward one screen.
- Pressing `<—|` or `↑↓` will move you from field to field within a screen. Pressing `<—|` at the last field on a screen acts like a PgDn.
- A "beep" from the terminal signals an error in the field you have entered. Refer to the screen for messages and resolutions.
- If you discover a mistake after you have completed entering a field (i.e. you have entered the value followed by `<—|`), you must enter the next field; but rather than pressing `<—|` to move to the next field, use `↑` to move back to the previous field and make the correction needed.

Chapter Two

I. CAQ Screens and Menu Selections

Now that CAQ has been invoked, you may select any item from the Main Menu (Figure 3). To select an item, use ↑ or ↓ to move to the item. Once the item you wish to select is highlighted, press ←| to complete the selection.

NATIONAL PESTICIDE SURVEY INFORMATION SYSTEM
COUNTY AGENT QUESTIONNAIRE - DATA ENTRY SYSTEM

Add New County Agent Questionnaires
Edit Existing County Agent Questionnaires
Copy existing questionnaire to other quadrants
Print One or More County Agent Questionnaires
Select a Printer

Quit and Exit to DOS

Press ESC to exit, use ↑↓ and ←| to select option

Figure 3 - CAQ Main Menu (USER ACCESS)

Any clarifications needed (Yes/No)? N

Save modifications? (Yes/No/Continue)? C

Figure 1 - CAQ Exit Screen

III. Invoking CAQ

To invoke the CAQ data entry system, make sure you are in the CAQ subdirectory on the C drive. If you are not, type C: at the DOS prompt followed by CD\CAQ. Now that you are in the appropriate subdirectory, type CAQ . This should invoke the Entry Screen (Figure 2). Enter the Identification Number assigned to you by the Database Manager followed by .

Once you have completed the above, CAQ should be invoked and CAQ Main Menu (Figure 3) should be on your screen.

Enter your identification number: 1111

Press ESC to return to DOS

Figure 2 - CAQ Entry Screen

A. Adding or Editing County Agent Questionnaires

Figures 4 and 5 are sample screens for Adding a new questionnaire or Editing an existing one. You must specify the four key items before any action (adding or editing) can take place. These key items identify each questionnaire; and thus, they are unique to each questionnaire. These key items are:

1. **Keyer:** This is your identification number.
2. **State:** This is the State noted on the first page of the questionnaire.
3. **County:** This is the County noted on the first page of the questionnaire.
4. **Quadrant:** This is the Quadrant Number noted on the first page of the questionnaire.

If you attempt to EDIT a questionnaire that has not been added yet or you attempt to ADD a questionnaire that was added previously, the terminal beeps and an error message appears. After you read the error message, you will be prompted to re-enter the Key Items again. You will continue to get this message until you supply valid Key Items for the desired action.

Pressing the ESC key from either screen will take you back to the Main Menu.

Refer to Adding and Editing Screens (page 11) for help on the data entry screens associated with these Main Menu Selections.

Editing Selection

Enter the Keyer, State, County, and Quadrant of the
questionnaire you wish to edit:

Keyer: 1111
State: NC
County: WAKE
Quadrant: 001

Press ESC to return to main menu

Figure 4 - Editing Screen

Adding Selection

Enter the Keyer, State, County, and Quadrant of the
questionnaire you wish to add:

Keyer: 1111

State: NC

County: WAKE

Quadrant: 001

Press ESC to return to main menu

Figure 5 - Adding screen

B. Copying County Agent Questionnaires

On the first page of each questionnaire, a list of quadrant numbers is hand written at the top. This list consists of all the quadrants that questionnaire applies to. For efficiency, the CAQ Data Entry system allows the Keyer to enter one of those quadrants in the list; and then to Copy that quadrant to the others in the list. Figure 6 is a sample Copying Screen. You must specify the four key items before you can copy the information. Again, these four Key Items are unique to each questionnaire and must be entered before the specified action can take place. These key items are:

1. **Keyer:** This is your identification number.
2. **State:** This is the State noted on the first page of the questionnaire.
3. **County:** This is the County noted on the first page of the questionnaire.
4. **Quadrant:** This is the Quadrant Number noted on the first page of the questionnaire.

If you attempt to Copy a questionnaire that has not been entered yet, the terminal beeps and an error message appears on the screen. You will then be prompted to re-enter the Key Items. The terminal will continue to beep until you enter the Key Items of a questionnaire that has been entered or you ESC out to the Main Menu. Once you supply valid Key Items, you will be prompted to enter the Quadrant Number you wish the identified questionnaire to be copied to. Enter the Quadrant number in the list at the top of the page followed by **←**. If you enter the quadrant number of a questionnaire that has already been entered, the terminal will beep and an error message will appear on the screen. You will then be prompted to re-enter the Quadrant Number. The system will repeat the above until you supply a new Quadrant Number or you ESC out.

Once you supply a new Quadrant Number, the system will copy all necessary information; and then you will be prompted to enter the next Quadrant Number you wish the data to be copied to. Continue entering Quadrant Numbers until you complete the list. Once you've completed copying, press ESC to get back to the Main Menu.

Copying Selection

Enter the Keyer, State, County, and Quadrant of the questionnaire you wish to copy to another quadrant in the same county:

Keyer: 1111

State: NC

County: WAKE

Quadrant: 001

Enter the quadrant you wish the above questionnaire to be copied to: 002

Press ESC to return to main menu

Figure 6 - Copying Screen

C. Printing County Agent Questionnaires

To print any questionnaire, you must supply the Key Items of that questionnaire. Figure 7 is a sample Printing Screen. Again, the Key Items are the fields that identify each questionnaire; and consequently are unique to each one. If you attempt to Print a questionnaire that has not been entered, the terminal will beep and an error message will appear on the screen. You will then be prompted to reenter the Key Items. The above will repeat itself until you either supply valid Key Items or you ESC out to the Main Menu.

Printing Selection

Enter the Keyer, State, County, and Quadrant of the
questionnaire you wish to print:

Keyer: 1111
State: NC
County: WAKE
Quadrant: 001

Press ESC to return to main menu

Figure 7 - Printing Screen

Chapter Three

I. Databases Management Additional Menu Selections

When CAQ is invoked with Database Manager access, a menu (Figure 3A) similar to the previous one (Figure 3) is displayed. However, as Database Manager, you will perform routine database management applications that are accessible through this menu. There are five such applications and they will be discussed further in part II.

NATIONAL PESTICIDE SURVEY INFORMATION SYSTEM
COUNTY AGENT QUESTIONNAIRE - DATA ENTRY SYSTEM

Add New County Agent Questionnaires
Edit Existing County Agent Questionnaires
Copy existing questionnaire to other quadrants
Print One or More County Agent Questionnaires
Select a Printer

Pack the databases
Index the databases
Compare Double-Entered Questionnaires
Print Schedule
Print Clarification Problems

Quit and Exit to DOS

Press ESC to exit, use ↑ and ← to select option

Figure 3A - CAQ Main Menu (DATABASE MANAGER ACCESS)

II. Database Management Routines

A. Packing the Databases

This routine will erase any record that has been marked for deletion. Once the database is packed, the records deleted are lost and may not be retrieved.

B. Indexing the Databases

This routine will index the databases by the specified fields. This will help organize the database structure; and allow for more efficient access to the respective databases.

C. Compare Double-Keyed Questionnaires

This routine will compare questionnaires that are entered at separate times by the same or different keyer (double-entry) for any differences. If any differences are found, a report will be generated containing the State, County, Quadrant, Keyers, Date entered by each keyer, which question, and both responses. This is then forwarded for resolution.

D. Print Schedule

This routine will generate the schedule of all questionnaires that need to be double-keyed into the system. This report will include the following information: State, County, Quadrant, Date entered by the first keyer, Date entered by second keyer. This report is generated nightly for next day scheduling.

E. Print Clarification Problems

This routine will generate a report of all questionnaires that the keyers had problems with. Problems include illegible, writing, missing pages in questionnaire, etc ...

This report will be generated nightly for resolution by the interviewer or project leader.

Chapter Four

I. Adding and Editing Screens

The following is a step-by-step guide to entering the required data into the CAQ Adding or Editing screens:

A. Data Entry Screen #1

Figure 8 is a sample of data entry screen 1. This screen is the data entry screen for the cover page of the questionnaire and contains most of the identification fields. The required fields of entry are Contact, Address, and Phone. The remaining fields are automatically supplied from the Adding or Editing menu selection screens.

U.S. Environmental Protection Agency	
National Pesticide Survey	
County Agent Questionnaire	
Quad: <u>008</u>	Keyer: <u>1111</u>
<div><div>Contact: <u>John A. Doe</u></div><div>State: <u>VA</u></div><div>County: <u>Fairfax</u></div><div>Address: <u>123 Your St.</u></div><div><u>STATE COOPERATIVE EXTENSION</u></div><div><u>FAIRFAX, VA 12345</u></div><div>Phone: <u>(703)777-7777</u></div></div>	
PgDn: Next screen	ESC: Exit data entry

Figure 8: Screen #1

B. Data Entry Screen #2

Figure 9 is a sample of data entry screen 2. This screen is the data entry screen for question 1. To select a crop (crop number other than 99 is circled on the questionnaire), use ↑↓ or ←→ to move to the desired crop, type X in the space provided followed by ←→. To deselect a crop, use ↑↓ or ←→ to get to the crop, press the space bar to type over the X followed by ←→. Pressing ←→ at the last crop (crop 33) results in a PgDn.

Note: If any crops are handwritten on the questionnaire (beneath Sod Farms and Walnuts), then you must type X besides Other Farming Practices.

1. Which crops are farmed in the area identified on the map?

<input checked="" type="checkbox"/> 01 CORN	<input checked="" type="checkbox"/> 17 POTATOES
<input type="checkbox"/> 02 DRY BEANS OR PEAS	<input checked="" type="checkbox"/> 18 SWEET CORN
<input type="checkbox"/> 03 RICE	<input checked="" type="checkbox"/> 19 TOMATOES
<input type="checkbox"/> 04 SORGHUM	<input type="checkbox"/> 20 OTHER PRODUCE/TRUCK FARMING CROP
<input type="checkbox"/> 05 SOYBEANS	<input checked="" type="checkbox"/> 21 APPLES
<input type="checkbox"/> 06 SUNFLOWERS	<input type="checkbox"/> 22 CHERRIES
<input type="checkbox"/> 07 WHEAT	<input type="checkbox"/> 23 GRAPEFRUIT AND ORANGES
<input checked="" type="checkbox"/> 08 OTHER CEREAL OR GRAIN CROPS	<input type="checkbox"/> 24 GRAPES
<input type="checkbox"/> 09 SUGARBEETS	<input type="checkbox"/> 25 LEMONS
<input type="checkbox"/> 10 SUGAR CANE	<input type="checkbox"/> 26 PEACHES
<input checked="" type="checkbox"/> 11 ALFALFA	<input checked="" type="checkbox"/> 27 PEARS
<input checked="" type="checkbox"/> 12 PASTURE	<input type="checkbox"/> 28 PINEAPPLE
<input type="checkbox"/> 13 COTTON	<input checked="" type="checkbox"/> 29 PLUMS
<input type="checkbox"/> 14 PEANUTS	<input type="checkbox"/> 30 ALMONDS
<input type="checkbox"/> 15 TOBACCO	<input type="checkbox"/> 31 PECAN
<input type="checkbox"/> 16 SOD FARMS	<input type="checkbox"/> 32 WALNUTS
	<input checked="" type="checkbox"/> 33 OTHER FARMING PRACTICES

Use ←→ or ↑↓ to move between crops, select a crop with an X
PgUp: Previous screen PgDn: Next screen ESC: Exit data entry

Figure 9: Screen #2

C. Data Entry Screen #3

Figure 10 is a sample of data entry screen 3. This screen is the data entry screen for questions 2 through 8. Simply type the coded number that is circled on each questionnaire at the appropriate data entry field. For example, if 03 is circled for question 2, then type 03 in the space provided for question 2.

If you attempt to enter an invalid coded value as a response to any question, the terminal will beep and you will be required to reenter that value.

Note that the responses for question 6 and 8 will be answered later. You will be required to enter a ← for now as a response to those two questions. DO NOT USE QUESTIONS 6 AND 8 OF THE QUESTIONNAIRE. INSTEAD, YOU WILL USE THE ATTACHMENTS.

2. What percent of the land is farmed with the crops listed in Question 1? 03
3. What is the average soil texture in the area? 02
4. What is the average soil permeability condition in the area? 02
5. Between January 1, 1984 and the present, have pesticides been used in the area? 01
6. Question 6 will be answered later. Press ← to continue
7. Between January 1, 1984 and the present, have you recommended any pesticides for use in the area? 01
8. Question 8 will be answered later. Press ← to continue

PgUp: Previous screen PgDn: Next screen ESC: Exit data entry

Figure 10: Screen #3

D. Data Entry Screen #4

Figure 11 is a sample of data entry screen 4. This screen is the data entry screen for questions 9 through 13. Simply type the value written or the coded number that is circled on each questionnaire at the appropriate data entry field. For example, if 025 is the response for question 9, then type 025 in the space provided for question 9. If you attempt to enter an invalid coded value as a response to any question, the terminal will beep and you will be required to reenter that value.

NOTE: If 98 (Don't Know) is circled for either question 9 or 10, then you must type the coded value 998.

9. What percent of cropland in the area has been treated with any of these pesticides? (998 - Don't know) 025 %
10. Of the total volume of pesticide applications in this area, what percent is applied by each of the following methods? (998 - Don't know)
 - a. Preplant incorporated 998 %
 - b. Soil incorporated at planting 002 %
 - c. Pre-emergence 998 %
 - d. Post-emergence 089 %
11. Is there a golf course located in the area identified on the map? 97
12. Would you say that in this area, pesticide usage is generally higher, lower or about the same as the rest of the county? 97
13. Is irrigation used in the area? 02

PgUp: Previous screen PgDn: Next screen ESC: Exit data entry

Figure 11: Screen #4

E. Data Entry Screen #5

Figure 12 is a sample of data entry screen 5. This screen is the data entry screen for question 14. Simply type the coded number that is circled on each questionnaire at the appropriate data entry field. For example, if 01 is circled as the response for question 14a, then type 01 in the space provided for question 14a. If you attempt to enter an invalid coded value as a response to any question, the terminal will beep and you will be required to reenter that value.

Note: If the response for 14e is 01 (Yes to the Other(Specify) field), then the specify field must be recorded with a response.

If question 13 was not 01, this screen (question) will be skipped.

14. What irrigation methods are used in the area?	
a. Spray (center pivot, handline, traveling gun, other)	_____
b. Flood (furrow, ditch, trickle)	_____
c. Drip	_____
d. Subsurface	_____
e. Other (Specify)	_____
Specify:	_____

PgUp: Previous screen PgDn: Next screen ESC: Exit data entry	

Figure 12: Screen #5

F. Data Entry Screen #6

Figure 13 is a sample of data entry screen 6. This screen is the data entry screen for question 15. Simply type the coded number that is circled on each questionnaire at the appropriate data entry field. For example, if 01 is circled as the response for question 15a, then type 01 in the space provided for question 15a. If you attempt to enter an invalid coded value as a response to any question, the terminal will beep and you will be required to reenter that value.

Note: If the response for 15f is 01 (Yes to the Other(Specify) field), then the specify field must be recorded with a response.

If question 13 was not 01, this screen (question) will be skipped.

15. What are the sources of irrigation water in the area?	
a. Groundwater	_____
b. Surface water	_____
c. Canal	_____
d. Spring	_____
e. Sewage effluent (primary, secondary, or tertiary)	_____
f. Other (Specify)	_____
Specify:	_____

PgUp: Previous screen PgDn: Next screen ESC: Exit data entry	

Figure 13: Screen #6

G. Data Entry Screen #7

Figure 14 is a sample of data entry screen 7. This screen is the data entry screen for question 16. Simply type the coded number that is circled on each questionnaire at the appropriate data entry field. For example, if 01 is circled as the response for question 16, then type 01 in the space provided for question 16. If you attempt to enter an invalid coded value as a response to any question, the terminal will beep and you will be required to reenter that value.

Note: If the response for 16 is 07 (Yes to the Other(Specify) field), then the specify field must be recorded with a response.

16. What is the average erosion potential of the land in
the area? 05

Specify: _____

PgUp: Previous screen PgDn: Next screen ESC: Exit data entry

Figure 14: Screen #7

H. Data Entry Screen #8

Figure 15 is a sample of data entry screen 8. This screen is the data entry screen for question 17. Simply type the percentage written as the responses of 17a-17d. For example, if 090 is entered as the response for question 17a, then type 090 in the space provided for question 17a. If 98 is circled as a response for any of 17a-17d, then you must type the coded number 998.

Note: If the total of the 4 percentages does not equal 100% (excluding the Don't Know responses), then the terminal will beep and an error message is displayed. You will be required to double-check the percentages you have entered. Then you will either reenter those percentages or go on to the next screen.

If a percentage is entered for 17d, then the specify field must be recorded with a response.

17. What percent of the crop management practices are performed by the farmers located in the area? (998 = Don't Know)

- a. No tillage 090 %
- b. Conventional tillage 998 %
- c. Intertillage 000 %
- d. Other (Specify) 010 %

Specify: MINIMUM TILLAGE

PgUp: Previous screen PgDn: Next screen ESC: Exit data entry

Figure 15: Screen #8

I. Data Entry Screen #9

Figure 16 is a sample of data entry screen 9. This screen is the data entry screen for question 18. Simply type the coded number that is circled on each questionnaire at the appropriate data entry field. For example, if 01 is circled as the response for question 18a, then type 01 in the space provided for question 18a. If you attempt to enter an invalid coded value as a response to any question, the terminal will beep and you will be required to reenter that value.

Note: If the response for 18d is 01 (Yes to the Other(Specify) field), then the specify field must be recorded with a response.

18. What other conservation measures have been used?

a. Up-and-down slope 02
 planting

b. Contour planting 01

c. Terracing 01

d. Other conservation 01
 measures
 Specify:

DIVERSION TERRACES, TILE DRAINS

PgUp: Previous screen PgDn: Next screen ESC: Exit data entry

Figure 16: Screen #9

J. Data Entry Screen #10

Figure 17 is a sample of data entry screen 10. This screen is the data entry screen for question 19. Simply type the coded number that is circled on each questionnaire at the appropriate data entry field. For example, if 01 is circled as the response for question 19, then type 01 in the space provided for question 19. If you attempt to enter an invalid coded value as a response to any question, the terminal will beep and you will be required to reenter that value.

19. Are drainage systems in common use in the area? 01

PgUp: Previous screen PgDn: Next screen ESC: Exit data entry

Figure 17: Screen #10

K. Data Entry Screen #11

Figure 18 is a sample of data entry screen 11. This screen is the data entry screen for question 20. Simply type the coded number that is circled on each questionnaire at the appropriate data entry field. For example, if 01 is circled as the response for question 20a, then type 01 in the space provided for question 20a. If you attempt to enter an invalid coded value as a response to any question, the terminal will beep and you will be required to reenter that value.

Note: If the response to question 20c is 01 then the specify field must be recorded with a response.

20. What drainage systems are in common use?	
a. Drainage ditches	<u>01</u>
b. Tile drains	<u>01</u>
c. Other drainage systems	<u>01</u>
Specify:	<u>DIVERSION TERRACES</u>
<hr/>	
PgUp: Previous screen PgDn: Next screen ESC: Exit data entry	

Figure 18: Screen #11

L. Data Entry Screen #12

Figure 19 is a sample of data entry screen 12. This screen is the data entry screen for question 21. Question 21 will be answered in a later screen along with questions 6 and 8. For now, press \leftarrow .

DO NOT USE QUESTION 21 OF THE QUESTIONNAIRE. INSTEAD, YOU WILL USE THE ATTACHED SHEETS.

21. Question 21 will be answered later. Press \leftarrow to continue

PgUp: Previous screen PgDn: Next screen ESC: Exit data entry

Figure 19: Screen #12

M. Data Entry Screen #13

Figure 20 is a sample of data entry screen 13. This is the data entry screen for questions 6, 8, and 21. The responses to those 3 questions are provided on sheets that are attached at the back of the questionnaire. There are several rules that differ from the rest of the previous data entry screens. The following is a guide to help you enter data into this screen.

- 1) At the bottom of screen 13 is a menu of actions that the user may select from. Each menu selection is in the format: Key: Action. That is, you press the Key for the desired Action. Only menu selections that are highlighted are accessible.
- 2) If you press F2 (QUIT), any data entered through screen 13 will be lost.
- 3) If you press F3 (Save & Exit), data entered through screen 13 is saved. However, if you answer No to Save Modifications ? at the Exit Screen (Figure 1), this data WILL BE lost.
- 4) The first two questions in screen 13 (Applies to Q6 and Applies to Q8) cannot be N. If the response to question 5 is not recorded as 01, then Applies to Q6 will be set N; and the keyer will not be able to modify its value. Similarly, if question 7 is not recorded as 01, then Applies to Q8 will be set to N; and the keyer will not be able to modify its value. If both questions 5 and 7 are recorded as 01, the keyer will be given the opportunity to modify both (Applies to Q6 and Applies to Q8) when entering the data for this screen.
- 5) If the Pesticide Code is 9999, the Formulation Code, Application Rate, and Units are automatically filled out and CANNOT be changed. You will be required to (and you may change) the value of Crop, Significant Figures, Time of Application, Application Year, and the Specify Fields associated with Pesticide Code, Formulation Code, Application Rate, and Units. Figure 22 is a sample screen.
- 6) If the Application Rate is a range on the attached sheet, you MUST press ← at the application rate first, then you will be prompted to enter the range.
- 7) If the Application Rate is 8888.8888, the Unit is automatically filled out and may not be changed. All fields on the screen with exception of Application Rate and Units may be modified. Figure 23 is a sample screen.
- 8) Significant figures refers to the number of digits after the decimal point that were recorded for Application Rate on the original questionnaire. For example, if 2.51 was recorded as the application rate, Application Rate on the screen would say 2.5100 and Significant Figures will be 2.

- 9) If Time of Application is 99, the Specify field must be recorded with a response. Also, this field scrolls horizontally, so you may enter more than the 30 characters apparent on the screen. Figure 21 is a sample screen.
- 10) All years of application cannot be N. At least one must be Y or R.

LOGNO: 0001

The following data is used to map out answers to questions 6, 8, and 21.

Applies to question 6?	<u>N</u>
Applies to question 8?	<u>N</u>
Crop:	_____
Pesticide Code:	_____
Formulation Code:	_____
Application Rate:	<u>0000.0000</u>
Significant Figures:	<u>0</u>
Units:	<u>000</u>
Time of Application:	<u>0</u>
Applied in 1988 (Y/N)?	<u>N</u>
Applied in 1987 (Y/N)?	<u>N</u>
Applied in 1986 (Y/N)?	<u>N</u>
Applied in 1985 (Y/N)?	<u>N</u>
Applied in 1984 (Y/N)?	<u>N</u>

F1: LAST SCREEN VIEWED F2: QUIT F3: SAVE & EXIT

INS: ADD DEL: DELETE/UNDELETE PgUp: PREVIOUS PgDn: NEXT

Figure 20: Screen #13

LOGNO: 0001

The following data is used to map out answers to questions 6, 8, and 21.

Applies to question 6? Y
Applies to question 8? Y

Crop:	<u>PLUMS</u>	
Pesticide Code:	<u>9999</u>	Specify: <u>0104.0503</u>
Formulation Code:	<u>9999</u>	Specify: <u>0200.7777</u>
Application Rate:	<u>9999.9999</u>	Specify: <u>0.55</u>
Significant Figures:	<u>0</u>	
Units:	<u>999</u>	Specify: <u>020.021.022.023</u>
Time of Application:	<u>0</u>	

Applied in 1988 (Y/N)? Y
Applied in 1987 (Y/N)? Y
Applied in 1986 (Y/N)? N
Applied in 1985 (Y/N)? N
Applied in 1984 (Y/N)? R

F1: LAST SCREEN VIEWED

F2: QUIT

F3: SAVE & EXIT

INS: ADD

DEL: DELETE/UNDELETE

PgUp: PREVIOUS

PgDn: NEXT

Figure 21: Screen #13
Pesticide Code: 9999

LOGNO: 0001

The following data is used to map out answers to questions 6, 8, and 21.

Applies to question 6? Y
Applies to question 8? Y

Crop: PLUMS
Pesticide Code: 0207
Formulation Code: 0105
Application Rate: 8888.8888
Significant Figures: 0
Units: 888
Time of Application: 0

Applied in 1988 (Y/N)? Y
Applied in 1987 (Y/N)? Y
Applied in 1986 (Y/N)? N
Applied in 1985 (Y/N)? N
Applied in 1984 (Y/N)? R

F1: LAST SCREEN VIEWED

F2: QUIT

F3: SAVE & EXIT

INS: ADD

DEL: DELETE/UNDELETE

PgUp: PREVIOUS

PgDn: NEXT

Figure 22: Screen #13
Application Rate: 8888.8888

LOGNO: 0001

The following data is used to map out answers to questions 6, 8, and 21.

Applies to question 6?	<u>Y</u>
Applies to question 8?	<u>Y</u>
Crop:	<u>PLUMS</u>
Pesticide Code:	<u>0207</u>
Formulation Code:	<u>0105</u>
Application Rate:	<u>0002.1500 - 0002.2500</u>
Significant Figures:	<u>0</u>
Units:	<u>008</u>
Time of Application:	<u>99</u> Specify: <u>01.02.03.04</u>
Applied in 1988 (Y/N)?	<u>Y</u>
Applied in 1987 (Y/N)?	<u>Y</u>
Applied in 1986 (Y/N)?	<u>N</u>
Applied in 1985 (Y/N)?	<u>N</u>
Applied in 1984 (Y/N)?	<u>R</u>

F1: LAST SCREEN VIEWED

F2: QUIT

F3: SAVE & EXIT

INS: ADD

DEL: DELETE/UNDELETE

PgUp: PREVIOUS

PgDn: NEXT

Figure 23: Screen #13
Time of Application: 99

Chapter Five

I. Sample Questionnaire

Things to try with the following sample questionnaire:

- 1) Type any combination of State, County, and Quadrant from any second level menu screen (ie, Editing Screen, see figure 4).
- 2) Attempt to leave a field blank.
- 3) For any coded response (ie, question 2), try entering a value other than the possible coded answers.
- 4) For questions and 17, what happens if the total of all percentages is over or under 100%?
- 5) Check the skip pattern.
- 6) Try leaving a specify field blank.
- 7) Test out the last screen by entering different combinations of responses. Everything work out?

Sample Questionnaire

Things to try:

- 1) Type any combination of State, County, Quadrant from any second level menu screen (ie.. Editing Screen. see figure 4).
- 2) Leave the Contact name blank.
- 3) For any coded response (ie.. question 2), try entering a value other than coded answer.
- 4) For questions 10 and 17, try entering percentages that total over 100 %. What about under 100%?
- 5) Check the skip pattern. For example, if you entered 02 or 98 for question 13. does it skip questions 14 and 15?
- 6) Check the specify fields. For example, question 14e.
- 7) For the last screen (screen 13), test out different combinations of responses. Does everything work out?

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL PESTICIDE SURVEY

COUNTY AGENT QUESTIONNAIRE

Contact:	JOHN A. DOE
State:	VA
County:	WISE
Address:	123 YOUR ST. STAT COOP. EXTENSION FAIRFAX, VA 22010
Phone:	(703) 777-7777

Introduction:

The U.S. Environmental Protection Agency is conducting the National Pesticide Survey to obtain information on pesticide contamination in drinking water wells and to learn how the pesticides in these wells are associated with pesticide usage and groundwater vulnerability. This questionnaire pertains to the area identified on the map. For this survey, farming is defined as an activity for which \$1,000 or more of agricultural products were sold or normally would have been sold during a year.

1. Which crops are farmed in the area identified on the map?

	YES, CROP FARMED	NO, CROP NOT FARMED		YES, CROP FARMED	NO, CROP NOT FARMED
<u>Grains</u>			<u>Vegetables</u>		
Corn	01	99	Potatoes	17	99
Dry beans or peas	02	99	Sweet corn	18	99
Rice	03	99	Tomatoes	19	99
Sorghum	04	99	Other produce/ truck farming crops	20	99
Soybeans	05	99	<u>Orchard Crops and Fruits</u>		
Sunflowers	06	99	Apples	21	99
Wheat	07	99	Cherries	22	99
Other cereal or grain crops	08	99	Grapefruit and oranges	23	99
<u>Sugars</u>			Grapes	24	99
Sugarbeets	09	99	Lemons	25	99
Sugar cane	10	99	Peaches	26	99
<u>Other Crops</u>			Pears	27	99
Alfalfa	11	99	Pineapple	28	99
Pasture	12	99	Plums	29	99
Cotton	13	99	<u>Nuts</u>		
Peanuts	14	99	Almonds	30	99
Tobacco	15	99	Pecans	31	99
Sod farms	16	99	Walnuts	32	99

Christmas trees

2. What percent of the land area is farmed with the crops listed in Question 1?

More than 50%	01
25 to 50%	02
0 to 25%	03
Don't know	98

3. What is the average soil texture in the area?

Clay and clay loam	01
Silt and silty clay loam	02
Sandy loam	03
Sand	04
Muck and peat	05
Don't know	98

4. What is the average soil permeability condition in the area?

Very slow	01
Slow to moderately slow	02
Slow to rapid	03
Moderately slow to rapid	04
Rapid	05
Don't know	98

5. Between January 1, 1984 and the present, have pesticides been used in the area?

Yes 01
No 02 Skip to Q.7)
Don't know 98 Skip to Q.7)

6. Starting with 1988 and thinking back to 1984, what pesticides have been used? For each pesticide, what is the application rate? (Enter the brand name, active ingredient, or type of each pesticide used.)

	<u>Year</u>	<u>Pesticide</u>	<u>DK</u>	<u>Rate</u> (pounds per acre per year)	<u>DK</u>
a.	1988		98		98
			98		98
b.	1987		98		98
			98		98
c.	1986		98		98
			98		98
d.	1985		98		98
			98		98
	1984		98		98
			98		98

7. Between January 1, 1984 and the present, have you recommended any pesticides for use in the area?

Yes 01
No 02 (Skip to Q.9)
Don't know 98 (Skip to Q.9)

8. Starting with 1988 and thinking back to 1984, what pesticides have you recommended? For each pesticide, what is the application rate? (Enter the brand name, active ingredient, or type of each pesticide used.)

	<u>Year</u>	<u>Pesticide</u>	<u>DK</u>	<u>Rate</u> (pounds per acre per year)	<u>DK</u>
a.	1988		98		98
			98		98
b.	1987		98		98
			98		98
c.	1986		98		98
			98		98
d.	1985		98		98
			98		98
e.	1984		98		98
			98		98

9. What percent of cropland in the area has been treated with any of these pesticides?

Don't know 98
 12 | 2 | 5 | Percent

10. Of the total volume of pesticide applications in this area, what percent is applied by each of the following methods?

	<u>DK</u>
a. Preplant incorporated	98
b. Soil incorporated at planting	98
c. Pre-emergence	98
d. Post-emergence	98

11. Is there a golf course located in the area identified on the map?

Yes 01
No 02
Don't know 98
Question not asked (97)

12. Would you say that in this area, pesticide usage is generally higher, lower, or about the same as the rest of the county?

Higher 01
Lower 02
About the same 03
Question not asked (97)

13. Is irrigation used in the area?

Yes 01
No (02) Skip to Q. 16)
Don't know 98 Skip to Q. 16)

14. What irrigation methods are used in the area?

	<u>Yes</u>	<u>No</u>	<u>DK</u>
a. Spray (center pivot, handline, traveling gun, other)	01	02	98
b. Flood (furrow, ditch, trickle)	01	02	98
c. Drip	01	02	98
d. Subsurface	01	02	98
e. Other (Specify)	01	02	98

15. What are the sources of irrigation water in the area?

	<u>Yes</u>	<u>No</u>	<u>DK</u>
a. Groundwater	01	02	98
b. Surface water	01	02	98
c. Canal	01	02	98
d. Spring	01	02	98
e. Sewage effluent (primary, secondary, or tertiary)	01	02	98
f. Other (Specify)	01	02	98

16. What is the average erosion potential of the land in the area?

Severe sheet and gully erosion	01
Moderate to severe erosion of mesas and mountains	02
Moderate to severe wind erosion with some gullying	03
Moderate sheet and gully erosion with some wind erosion	04
Moderate sheet and gully erosion, serious locally	05
Erosion unimportant	06
Other (Specify)	07
<hr/>	
Don't know	98

17. What percent of the crop management practices are performed by farmers located in the area?

		<u>DK</u>
a. No tillage	<u>2</u> <u>0</u> %	98
b. Conventional tillage	<u> </u> <u>0</u> %	98
c. Intertillage	<u>8</u> <u>0</u> %	98
d. Other (Specify)	<u> </u> <u>0</u> %	98
<hr/>		
Total		100%

18. What other conservation measures have been used?

	<u>Yes</u>	<u>No</u>	<u>DK</u>
a. Up-and-down slope planting	01	02	98
b. Contour planting	01	02	98
c. Terracing	01	02	98
d. Other conservation measures (Specify)	01	02	98

19. Are drainage systems in common use in the area?

Yes	01	
No	02	(Skip to End)
Don't know	98	(Skip to End)

20. What drainage systems are in common use?

	<u>Yes</u>	<u>No</u>	<u>OK</u>
a. Drainage ditches	(01)	02	98
b. Tile drains	(01)	02	98
c. Other drainage systems (Specify)	01	(02)	98

21. At what time of year are pesticides applied to the major crops farmed in the area?
(Complete only dates that correspond to predominant pesticide application. Specify the crop. Enter the brand name, active ingredient, or type of each pesticide used.)

Jan. 1-15 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Jan. 16-31 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Feb. 1-14 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Feb. 15-29 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Mar. 1-15 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Mar. 16-31 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Apr. 1-15 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Apr. 16-31 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
May 1-15 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
May 16-31 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____

June 1-15 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
June 16-31 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
July 1-15 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
July 16-31 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Aug. 1-15 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Aug. 16-31 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Sept. 1-15 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Sept. 16-31 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Oct. 1-15 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____
Oct. 16-31 Yes... 01 No.... 02	Pesticide 1: _____ Crop 1: _____	Pesticide 2: _____ Crop 2: _____	Pesticide 3: _____ Crop 3: _____

Nov. 1-15	→ Pesticide 1: _____ Yes... 01 _____ No 02 _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Nov. 16-31	→ Pesticide 1: _____ Yes... 01 _____ No 02 _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Dec. 1-15	→ Pesticide 1: _____ Yes... 01 _____ No 02 _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____
Dec. 16-31	→ Pesticide 1: _____ Yes... 01 _____ No 02 _____ Crop 1: _____	Pesticide 2: _____ _____ Crop 2: _____	Pesticide 3: _____ _____ Crop 3: _____

Thank you for your cooperation.

Quad: 8,9,12,13 State: VA County: VIENNA

The following is used to map out answers to questions 6, 8, and 21:

Applies to question 6? YApplies to question 8? YCrop: TOBACCOPesticide Code: 0142

Specify: _____

Formulation Code: 7777

Specify: _____

Application Rate: 0.75 - _____

Specify: _____

Significant Figures: 2Units: 042

Specify: _____

Time of Application: 42

Specify: _____

Applied in 1988 (Y/N)? YApplied in 1987 (Y/N)? YApplied in 1986 (Y/N)? YApplied in 1985 (Y/N)? YApplied in 1984 (Y/N)? Y

Quad: 89,12,13 State: VA County: VIENNA

The following is used to map out answers to questions 6, 8, and 21:

Applies to question 6? YApplies to question 8? YCrop: TOBACCOPesticide Code: 9999Specify: 0321 0101Formulation Code: Specify: 0130 0074Application Rate: - Specify: 7.23Significant Figures: 2Units: Specify: 012Time of Application: 06Specify: Applied in 1988 (Y/N)? YApplied in 1987 (Y/N)? YApplied in 1986 (Y/N)? YApplied in 1985 (Y/N)? YApplied in 1984 (Y/N)? Y

Quad: 89, 12, 13 State: VA County: VIENNA

The following is used to map out answers to questions 6, 8, and 21:

Applies to question 6? YApplies to question 8? YCrop: APPLESPesticide Code: 0228

Specify: _____

Formulation Code: 0113

Specify: _____

Application Rate: 1.5 - _____

Specify: _____

Significant Figures: 1Units: 020

Specify: _____

Time of Application: 99Specify: 06 07 08 09 10 11 12 13 14 15Applied in 1988 (Y/N)? RApplied in 1987 (Y/N)? RApplied in 1986 (Y/N)? RApplied in 1985 (Y/N)? RApplied in 1984 (Y/N)? R

Quac: 8,9,12,13State: VACounty: VIENNA

The following is used to map out answers to questions 6, 8, and 21:

Applies to question 6? NApplies to question 8? YCrop: APPLESPesticide Code: 0094

Specify: _____

Formulation Code: 0110

Specify: _____

Application Rate: 2.5 - 3.3

10.4 on p. 23

Specify: _____

Significant Figures: 1Units: 020

Specify: _____

Time of Application: 99Specify: 06,07Applied in 1988 (Y/N)? YApplied in 1987 (Y/N)? YApplied in 1986 (Y/N)? NApplied in 1985 (Y/N)? NApplied in 1984 (Y/N)? N

Quad: 891213 State: VA County: VIENNA

The following is used to map out answers to questions 6, 8, and 21:

Applies to question 6? YApplies to question 8? YCrop: PASTUREPesticide Code: 0515

Specify: _____

Formulation Code: 7777

Specify: _____

Application Rate: 8888 8888 - _____

Specify: _____

Significant Figures: 4

Units: _____

Specify: _____

Time of Application: 36

Specify: _____

Applied in 1988 (Y/N)? NApplied in 1987 (Y/N)? NApplied in 1986 (Y/N)? YApplied in 1985 (Y/N)? YApplied in 1984 (Y/N)? Y

Quad: 89,12,13 State: VA County: VIENNA

The following is used to map out answers to questions 6, 8, and 21:

Applies to question 6? NApplies to question 8? YCrop: PASTUREPesticide Code: 0001

Specify: _____

Formulation Code: 7777

Specify: _____

Application Rate: 1.0 - 1.5

Specify: _____

Significant Figures: 1Units: 015

Specify: _____

Time of Application: 99Specify: 09 10 11 12 13 14 15 16 17 1Applied in 1988 (Y/N)? YApplied in 1987 (Y/N)? YApplied in 1986 (Y/N)? YApplied in 1985 (Y/N)? YApplied in 1984 (Y/N)? Y

Quad: B9,12,13 State: VA County: VIENNA

The following is used to map out answers to questions 6, 8, and 21:

Applies to question 6? YApplies to question 8? YCrop: GREEN BEANSPesticide Code: 9999Specify: 0309, 0222

Formulation Code: _____

Specify: 7777, 0112

Application Rate: _____

Specify: 1-2, 3Significant Figures: 0

Units: _____

Specify: 015, 023Time of Application: 99Specify: 06, 07, 08, 09Applied in 1988 (Y/N)? YApplied in 1987 (Y/N)? YApplied in 1986 (Y/N)? YApplied in 1985 (Y/N)? YApplied in 1984 (Y/N)? Y

Quad: 891213 State: VA County: VIENNA

The following is used to map out answers to questions 6, 8, and 21:

Applies to question 6? NApplies to question 8? YCrop: WATERMELONSPesticide Code: 0113

Specify: _____

Formulation Code: 7777

Specify: _____

Application Rate: 7777.7777 - _____

Specify: _____

Significant Figures: 4Units: 777

Specify: _____

Time of Application: 12

Specify: _____

Applied in 1988 (Y/N)? RApplied in 1987 (Y/N)? RApplied in 1986 (Y/N)? RApplied in 1985 (Y/N)? RApplied in 1984 (Y/N)? R

VIENNA COUNTY, VIRGINIA
1988-1989
1987-1988
1986-1987
1985-1986
1984-1985