

# NATIONAL COOPERATIVE GEOLOGIC MAPPING PROGRAM

STATUS, PROGRESS, IMPLEMENTATION AND RECOMMENDATIONS

U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

National Cooperative Geologic Mapping Program Status, Progress, Implementation and  
Recommendations

by

U.S. Geological Survey

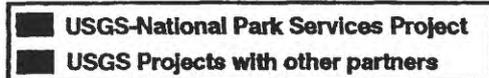
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Open-File Report 98-372

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FEDERAL ADVISORY COMMITTEE  
OF THE  
NATIONAL COOPERATIVE GEOLOGIC MAPPING PROGRAM  
AND THE  
U.S. GEOLOGICAL SURVEY  
1996

# NCGMP FEDMAP PROJECTS (FY 97)



**-1-I70 Urban Corridor Geologic Mapping:** Coop with Colorado GS - Hazards, Resources & Environment..  
**Infrastructure Initiative:** Aggregate resources & land use in growing Denver urban area

**-2-Pacific NW & Urban Hazards Initiative:** Geologic Mapping to locate earthquake faults, zones of increased seismic & volcanic risk, and landslide/liquifaction hazards

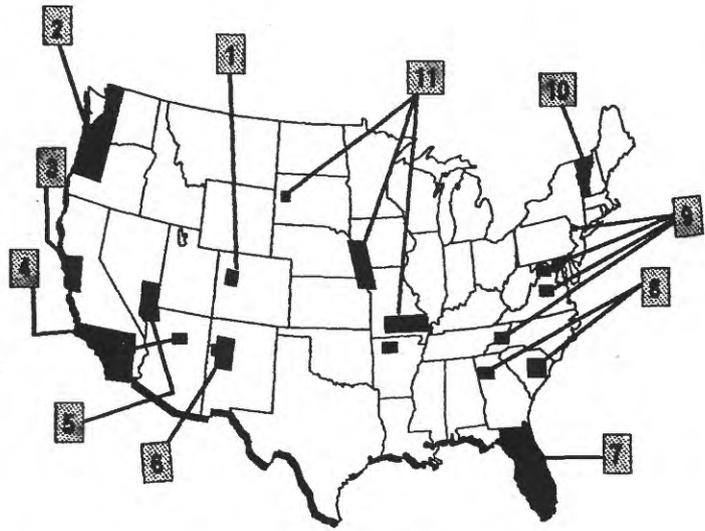
**-3-SFO Bay Project:** Geologic mapping, earthquake hazards, urban planning & risk analysis. NPS Coop: Golden Gate NRA & innovative products

**-4-Southern California Areal Mapping:** Geologic mapping, hydrogeology, resources, locating earthquake faults and urban geology. Coops. with 14 local, state & Federal agencies. NPS Coop: Joshua Tree NP, Grand Canyon NP

**-5-Las Vegas: Hydrogeology & urban geology** in rapidly developing region. Nevada Test Site: Environmental restoration & ground water contamination, public health issues. NPS Coop: Lake Meade NRA

**-6-Middle Rio Grande Basin:** Geologic Mapping & Geohydrology in coop with WRD, NMD, NM State, Universities, & LANL. Main issue - projected **shortfall of water** resources for Santa Fe-Albuquerque-Socorro, and **treaty rights** to water from Rio Grande River. NPS Coop: El Malpais NM, Petroglyphs NM

**-7-Florida Coop:** Geologic mapping and biostratigraphy (with FGS): Water & phosphate resources. **Ecosystems** - Providing geologic and chronologic baseline for Environmental Restoration of the **Everglades**, Biscayne Bay and Florida Bay (Coop with FGS, S & SW FL Water Mgmt. Distr., Dade Co., Army Core of Engineers, NOAA, Everglades NP, & universities). NPS Coop: Everglades NP



**-8-SE Geology & Geohydrology: Water resources and quality.** Geologic mapping, Atlanta data base, Coastal Plain stratigraphy, Trans-River flow (Savannah River Site)

**-9-Mid Atlantic Urban Corridor:** Geologic maps, Infrastructure, environmental geology, hazards, resources & Chesapeake Bay Restoration. NPS Coop: Shenandoah NP (& debris flow hazards), Great Smoky Mtn. NP, C&O Canal, Delaware Water Gap NRA

**-10-USGS-State Coop:** Geologic Map of State of Vermont. Ecosystems, ground water planning & well head protection, natural resources analysis & environmental protection

**-11-Omaha-Kansas City:** Geologic Mapping and Urban Geology, land use (agriculture vs. urban development). **Mid-Continent Mapping:** Earthquake Hazards - New Madrid Fault Zone. NPS Coop: Buffalo National River, Ozark National Scenic River, Jewel Cave NM- Wind Cave NP

**National Projects:** **National Geologic Map Data Base:** An NSDI compliant digital data base of Federal and State geologic maps for the Nation, accessible through the FGDC Clearing House and the Internet; research into GIS applications for geologic data. **National Geologic Map Project:** A Geologic Map of the Nation and **Quaternary Atlas** (4-by-6 degree sheets); provides geologic data for national and regional planning (e.g., by FEMA, Insurance companies). **Center for Earth Science Research:** Use of geologic and geospatial data for **assessing risks** from natural hazards and cost-benefit analysis of geologic data. Emphasis on ground failure related to earthquakes, **cost-benefit analysis** of resource/urban development and environmental restoration. **Shared Facilities:** Analytical facilities in isotope geology, paleontology, stratigraphy, analytical chemistry, and quantitative analysis of aerial and oblique photographs. Provides support for geologic mapping, hazard, and resource studies as well as research in **analytical techniques and forensic geology.**

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**THE FEDERAL ADVISORY COMMITTEE  
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**Cover: Preliminary Geologic Map of the Pahute Mesa 30' x 60' Quadrangle, Nevada**

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Marvin A. Lanphere, WC Swadley, and James C. Cole**

**1993**

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## **I. MEMBERS OF THE ADVISORY COMMITTEE**

### **Federal Agency Representatives:**

Gerald T. Garvey, Office of Science and Technology Policy  
Courtney Riordan, Environmental Protection Agency  
Reginal W. Spiller, Department of Energy  
Mark S. Gaede, Department of Agriculture

### **State Geological Survey Representatives:**

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Donald C. Haney, State Geologist of Kentucky  
Thomas M. Berg, State Geologist of Ohio  
Charles J. Mankin, State Geologist of Oklahoma

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Martha Blair Tyler, Spangle & Associates, Portola Valley, California  
Richard E. Wright, R.E. Wright Environmental, Inc., Middletown, Pennsylvania

### **Academic Representatives:**

Robert D. Hatcher, Jr., University of Tennessee  
Elizabeth L. Miller, Stanford University  
Stephen J. Reynolds, Arizona State University

### **USGS Representatives:**

(Chair) P. Patrick Leahy, Chief Geologist  
(Vice Chair and Executive Secretary) John S. Pallister, Program Coordinator,  
National Cooperative Geologic Mapping Program

## **II. EXECUTIVE SUMMARY**

This report is a review of the status, and a summary of recommendations, of a Federal Advisory Committee on the National Cooperative Geologic Mapping Program, as authorized by the National Geologic Mapping Act of 1992 (Public Law 102-285). The Advisory Committee met on April 24-25, 1996, to overview the status of the Program and its Implementation Plan, discuss plans for the future, and to form working groups. The working groups made recommendations for the future of the Program, revised the Implementation Plan for the Program, revised the Requests for Proposals for the external components of the Program, and compiled the resulting components into this report.

The Committee determined that except for an increase in funding, all components of the Program, as authorized by Public Law 102-285 have now been implemented. Future plans focus on increasing partnerships between Federal, State, University and private sector groups in the production of geologic maps and in the construction of an National Spatial Data Infrastructure (NSDI-compliant National Geologic Map Database). Recommendations are made on how to integrate National, State and local priorities in the selection and funding of projects, and on ways to address the shortage of trained geologic mappers. These efforts are directed at increasing the effectiveness of geologic mapping and providing geologic map information for the solution of earth science problems that are critical to public safety, and in balancing resource, environmental and land-use issues.

## **III. STATUS OF NATIONAL COOPERATIVE GEOLOGIC MAPPING PROGRAM**

The National Cooperative Geologic Mapping Program (NCGMP) is authorized through the National Geologic Mapping Act of 1992. Through the Mapping Act, the Program has the mandate to produce multipurpose geologic maps of the country in cooperation with State geological surveys and acting through the American Association of State Geologists. The Geologic Mapping Program is developed in consultation with a Federal Advisory Committee, consisting of representatives from the U.S. Geological Survey, other Federal agencies, State geological surveys, academia and the private sector.

The NCGMP has been designed so that the Nation will have the quantitative geologic map data needed to address tomorrow's problems. To this end, the following goals are

being pursued:

- o Produce geologic maps of the highest quality.
- o Continue to ensure that the maps address societal priorities and are produced in forms easily accessible and usable.
- o Expand cooperative agreements with the State geological surveys, academic communities, other Federal agencies and the private sector to enhance the output of map information and data.
- o Develop a National Geologic Map database and make the data available through the Internet. Enhance the ability to produce digital as well as analog (paper) map products.

As charged by the Act, the U.S. Geological Survey (USGS) is the lead Federal agency responsible for planning, developing priorities, coordinating and managing the Geologic Mapping Program. Under this mandate, a Federal Advisory Committee was chartered and met on April 24-25, 1996. The Advisory Committee reviewed the draft Implementation Plan and the scientific progress of the geologic mapping program, including progress made toward fulfilling the purposes of the Act. This report summarizes the results of the Advisory Committee's review and makes recommendations toward implementing the Program under reauthorization of the Bill. The revised Implementation Plan to accompany the Reauthorization will be submitted to the Committee on Resources of the House of Representatives and the Committee on Energy and Natural Resources of the Senate, as required by the Act.

Geologic mapping activities under this Program are accomplished through four main subprograms: STATEMAP, a matching-funds cooperative with the State geological surveys to produce geologic maps; EDMAP, a matching-funds cooperative with Universities for training in geologic mapping; and FEDMAP/SUPPORTMAP, the federal geologic mapping and support investigations activities. Geologic maps produced under all elements of the NCGMP address all four USGS themes (hazards, environment, resources and information) and are considered as the framework for more detailed investigations of local issues by Federal, State, local governmental agencies and by the private sector. Priorities for the Program are established cooperatively with external mapping partners and with cooperators in other USGS programs. Planning and prioritization of Program projects and review of the Program's four-year implementation plan are guided by the Program's public and private-sector interagency Federal Advisory Committee.

The program has four major components with the following goals and priorities:

FEDMAP/SUPPORTMAP are components whose objectives are to determine the geologic framework of the Nation and to develop a national geologic map database. Mapping priorities are based on national requirements for geologic-map information in areas of multiple-issue needs or areas of compelling single-issue need; and in areas where mapping is required to solve critical earth science problems. Emphasis is placed on areas determined to be vital to the economic, social, or scientific welfare of the Nation. The USGS continues to be active in executing geologic mapping (FEDMAP) and supporting studies (SUPPORTMAP) of paleontology, stratigraphy, geochronology, isotope geology, geophysics and geochemistry. Over the past two years, the USGS Geologic Mapping Program has moved from large numbers of essentially one-person projects to more integrated regional synthesis projects in which clients and cooperators are involved in the planning, implementation and execution of project work. For this reason, much of the Program in geologic mapping has moved from rural and wilderness areas to the "urban corridor" and "urban fringe" areas, where competing land-use decisions benefit from improved geologic information. In 1996, priorities were established through a series of mid-year reviews of all FEDMAP projects in each of the three USGS regions of the Nation. In each case, the review panels consisted of the NCGMP Program Coordinator or Program Scientist, the NCGMP team Chief Scientist from the region, the USGS Regional Geologist or representative, two or more members from other USGS Programs, a representative from a State geologist's office in the region, and a representative from the National Park Service.

STATEMAP: A component of the overall program that supports the States in cooperative agreements to produce geologic maps. The principal objective of the State geologic mapping component is to determine the geologic framework of areas vital to the economic, social, or scientific welfare of individual States. Mapping priorities are determined within individual states by State Advisory Committees and the highest priority proposals are forwarded to a peer panel consisting of representatives of the State surveys that are appointed to rotating terms by the American Association of State Geologists (AASG). Proposals are evaluated, prioritized and funding levels recommended by the panel, which the USGS coordinates. Federal funding for the State component is matched on a dollar-for-dollar basis with non-Federal funds. In FY 1995 only about six percent of total program funding was available for matching by State geological surveys, whereas in FY 1996 and beyond a minimum of 20 percent of appropriated funds will be apportioned to the STATEMAP component, thereby increasing the amount of high-priority geologic mapping by individual states (Table 1).

Additionally, this had a significant impact on both the number and the type of geologic maps produced. For the first time in FY 1996, the Program supported digital compilation of existing geologic map data in the production of small- and large-scale geologic maps. Also, production of geologic maps based on new field mapping increased four-fold. In FY 1996, forty-two States were funded for approximately 60 mapping projects.

Coordination among many of the State Surveys and the NCGMP Data Base Project was initiated and the framework for building the Federal/State geologic map database is underway. A comprehensive draft document, USGS Open-File 95-525, outlining geologic map standards was distributed to the State Surveys for review. The results of the review will be used to generate a geologic map standards document to be used by the Federal, State and University partners funded by the NCGMP.

At present, the STATEMAP awards are made by a panel of five State Geologists, one each from the eastern, central, and western regions of the United States and two at-large members. The USGS provides one advisor from each of the three regions to assist in coordination of the STATEMAP projects with ongoing FEDMAP projects. The panel is coordinated by the USGS.

The EDMAP provides funding for academic research programs through cooperative agreements, and ensures the training of students in producing geologic maps. This important component of the Geologic Mapping Program was implemented for the first time in FY 1996. Two percent of the total program funding is available for matching by universities. The funding is to help support graduate students to conduct geologic mapping in areas of priority to State or Federal agencies. These studies not only help increase the geologic mapping of high priority areas, but also help train the next generation of geologic mappers. In FY 1996, cooperative agreements are being made with 37 universities to support 40 geologic mapping projects recommended for funding by a peer review panel consisting of experts in geologic mapping. The peer panel of five university scientists represents the eastern, central, and western regions of the country, along with two representatives from the State geological surveys and one representative from the USGS. The USGS and State representatives provide linkage to Federal and State projects and priorities, and the USGS representative coordinates and chairs the panel. Panel members selected by the EDMAP subcommittee of the NCGMP Advisory Committee must have a demonstrated strong background in geologic mapping and knowledge of regional geology. Proposals are evaluated, prioritized and funding levels are recommended by the Committee. The State Geological Surveys

and the NCGMP Program facilitate the publication and distribution of geologic maps generated in field-based academic research programs. The EDMAP component also contributes to the educational capacity of academic programs that teach earth science students the techniques of geologic mapping and field data analysis that will permit them, as they become professionals, to critically evaluate the quality of geologic map data sets, even if they are not actively making maps as professionals.

#### Status of Private Sector contributions:

In increasing numbers, both FEDMAP and STATEMAP subprogram activities are working with private-sector firms to help prioritize the objectives and to increase the economic usefulness and relevance of geologic maps. Such activities range from involving the users of geologic maps in the private sector (e.g., aggregate producers, urban planning and environmental planning/remediation firms) to participation of private sector representatives during Program planning through the NCGMP Federal Advisory Committee. For example, at the local level, private sector map users and geologic consulting firms were involved in workshops and planning sessions for the new (FY 1996) Middle Rio Grande Basin Project and in Program contributions to two new Bureau-wide Initiatives (Pacific Northwest Urban Hazards and Colorado Urban Corridor Infrastructure Initiative). Looking to the immediate future, workshops with private sector participation are in the FY 1997 project plans for two FEDMAP projects (San Francisco Bay and Geology of Mid-Atlantic Corridor). The Advisory Committee recognizes these efforts of the Program, and encourages continued involvement of the private sector in setting project and program goals.

In addition, the NCGMP relies upon the private sector to provide a variety of services and products related to the cost of production and distribution of geologic maps. These services include:

- \* Aquisition of aerial photography and photographic processing.
- \* Contracting geophysical surveys, including airborne surveys.
- \* Contracting for scanning and digitizing maps.
- \* Aquisition of base map materials and data from the USGS National Mapping Division (much of which is produced by private sector firms). The National Mapping Division has a goal (established by Congress) of utilizing private sector firms to perform at least 60 percent of the map production workload by the end of FY 1999.

In addition, the NCGMP intends to make increasing use of private sector firms in steps associated with the release and publication of data and information in map and digital forms. The conduct of interpretive field investigations, geologic mapping and map compilation, for which private sector resources are limited, however, will continue to be performed by USGS geologists and geologists of the State geological surveys and academic institutions through cooperative agreements. Geologic maps are basic interpretive products upon which the private consulting industry relies to produce more refined, site-specific, derivative maps.

The STATEMAP subprogram also provides funds to the private sector for a variety of activities. These include:

**Drilling**—Several states are doing subsurface mapping and use contract drilling firms for data acquisition.

**Printing Maps**—The cartography and printing of color geologic maps is almost always done by the private sector.

**Digitizing and scanning**—Many state surveys use contractors to digitize and scan maps for inclusion in the National Geologic Map Database.

**Contract Mappers**—Many state surveys are now using contract geologists to do field mapping. The source of these mappers is limited, and many of the states hire university professors and students for contract mapping during summer months.

**Aerial photography**—Almost all geologists who map use aerial photography. All of this imagery is acquired outside of state surveys, with most coming from private contractors.

**IMPLEMENTATION PLAN**—The Implementation Plan for the 1992 National Geologic Mapping Act was developed by the NCGMP in concert with State Survey geologists appointed by the AASG. Although Congressional appropriations have never met the authorized level, by FY 1996, the Program has fully implemented all other aspects of the Plan. The present Advisory Committee has reviewed the Implementation Plan for the FY 1997 through 2000. The plan is included in this document and will be used in conjunction with the reauthorized 1992 Bill of the National Geologic Mapping Act.

**EXTERNAL ADVISORY COMMITTEE**—The USGS sponsored two national workshops, one in December, 1994, and a second in February, 1995, to begin the process of soliciting advice on the planning and implementation of the Geologic Mapping Program.

Workshop participants were producers and users of geologic map information, including representatives from Federal and State agencies, academic institutions and the private sector. A 16-member National Cooperative Geologic Mapping Program Advisory Committee has been chartered and appointed. It held its first meeting April 25-26, 1996, in Washington, D.C. This report contains the results from that meeting and the deliberations of subsequent working groups.

**NATIONAL GEOLOGIC MAP DATABASE**—A draft of this database design has recently been released for comment via the Internet by creating a site on the World Wide Web (WWW). The Uniform Resource Locator (URL) for this site is "<http://wwwflag.wr.usgs.gov/ngmdb>". This web site is also linked to the recently created web site for the NCGMP whose URL is "<http://ncgmp.usgs.gov>". A critical element in database construction is the development, acceptance and adherence to a certain level of standardization. The USGS is currently working with both producers and users of geologic map information to develop draft format, symbols and technical attribute standards so that geologic map database information can be accessed, exchanged, and compared efficiently and accurately as required by Executive Order 12906 (59 Fed. Reg. 17,671; 1994), which established the National Spatial Data Infrastructure (NSDI).

#### **OTHER PROGRAMMATIC DATABASES**

**Geochronologic:** Geologic age dates throughout the country have been evaluated and compiled and are available on CD-ROM as Digital Data Series DDS-14. This data is presently being revised and updated to be more inclusive of the different types of geochronologic data.

**Geochemical and Geophysical:** A variety of geochemical databases have been prepared by the USGS Minerals Resources Survey Program. These include geographically referenced data that include all chemical analyses produced in USGS laboratories. Various geophysical maps for the Nation have been prepared and are available. These data include low-resolution magnetic and gamma-ray information.

**Paleontologic:** Two prototypes exist under the general category of paleontological information. A geologic names database is now available on CD ROM as Digital Data Series DDS-6 and it details the USGS stratigraphic names used in maps and reports. A second database includes fossil designations used by the USGS in all stratigraphic correlations. This database is also available on CD ROM and will be available on the World Wide Web.

USGS CIRCULAR 1111—"Societal Value of Geologic Maps", published in 1993, is an economic analysis by the geologic mapping program that describes geologic maps, a benefit-cost model for valuing geologic map information and the economic issues associated with determining whether or not a geologic map is a public good. Nearly ten thousand copies have been requested since publication. This publication and similar studies are increasing public awareness of the utility (value in use) of geologic map information to issues of land use management.

FEDERAL PARTNERSHIPS—The NCGMP is developing a series of cooperative relationships with various Federal partners, in addition to our State and academic cooperators. The most mature of these is with the National Park Service (NPS). In 1995, the USGS and NPS signed a Memorandum of Understanding that outlined areas of interaction between the two agencies. The Geologic Mapping Program responded by working with NPS during 1995 as part of their "Science in the Parks" initiative to direct a portion of the Program's Geologic Mapping and supporting activities toward priorities established by NPS. The NPS used a National project call and priority system to rank over 100 proposals for geologic work in FY 1996. The Geologic Mapping Program has begun work in FY 1996 with 10 of the 30 top-priority parks. The Geologic Mapping Program is currently in the process of fostering partnerships with other Federal agencies including Bureau of Land Management, U.S. Forest Service, Environmental Protection Agency and Department of Energy.

**TABLE 1**  
**FUNDING HISTORY FOR NATIONAL GEOLOGIC MAPPING PROGRAM**  
(Gross funding in dollars)

<b>FY 1993</b>		
STATEMAP	1,442,734	7%
EDMAP	0	0%
FEDMAP	<u>20,539,266</u>	93%
<b>Total Program</b>	<b>21,982,000</b>	<b>100%</b>

<b>FY 1994</b>		
STATEMAP	1,979,641	9%
EDMAP	0	0%
FEDMAP	<u>21,032,359</u>	91%
<b>Total Program</b>	<b>23,012,000</b>	<b>100%</b>

<b>FY 1995</b>		
STATEMAP	1,287,000	6%
EDMAP	0	0%
FEDMAP	<u>20,595,000</u>	94%
<b>Total Program</b>	<b>21,882,000</b>	<b>100%</b>

<b>FY 1996</b>		
STATEMAP	4,376,400	20%
EDMAP	437,600	2%
FEDMAP	<u>17,068,000</u>	78%
<b>Total Program</b>	<b>21,882,000</b>	<b>100%</b>

#### IV. RECOMMENDATIONS OF THE ADVISORY COMMITTEE

##### 1. Prioritization of FEDMAP/SUPPORTMAP projects

###### a. Process for prioritization and funding

A five-year plan and an annual Program Prospectus that is consistent with the Implementation Plan for the National Cooperative Geologic Mapping Act and with the guidance of this Advisory Committee should be prepared by the Program. The prospectus should outline ongoing project activities within FEDMAP/SUPPORTMAP, opportunities to improve those activities, as well as opportunities for new-start projects. The Advisory Committee recognizes that geologic mapping projects, especially those of National importance, are often of multiyear duration. As a result, opportunities for new-start projects depend either on increases in funding or on the completion, phase-down, or termination of projects. The five-year plan for FEDMAP/SUPPORTMAP should anticipate these changes and set broad program goals for the future. Project termination or phaseout, as well as startup of new projects may be recommended by project reviews (see below).

An important issue facing the Program is to develop a prioritization procedure for FEDMAP/SUPPORTMAP projects that is at once consistent with the authorizing legislation of the National Geologic Mapping Act of 1992 and with prioritization and review processes that are being developed within USGS following the 1996 reorganization of the USGS, Geologic Division. The Advisory Committee recommends that reviews of FEDMAP/SUPPORTMAP projects, such as conducted in Spring of 1996, be done on an annual basis. As in 1996, these reviews could be conducted in each of the regional centers, or on a National basis and should involve participants from NCGMP as well as partners and client groups such as: other USGS programs and the Regional Geologist's staff, other Federal agencies, and State Surveys. Reviews should be coordinated with those of other USGS programs to allow overlapping priorities to be identified and staffing to be optimized. In addition, the Advisory Committee recommends that a representative from private sector partners be included in project reviews. Project reviews should: 1) consider the scientific and societal merit of projects; 2) determine if they are consistent with the objectives and Implementation Plan of the National Geologic Mapping Act; 3) prioritize the projects within the region and Nation; 4) evaluate progress of projects toward their planned goals; 5) make recommendations as to whether or not funding should be continued; and 6) recommend steps to improve performance, including shifting of resources from one project to another.

###### b. Development of new projects

Starting in 1997, it is recommended that proposals for new projects also be submitted to the project review panels. These proposals would be evaluated using the same criteria as for continuing projects (except for progress toward planned goals), as well as to determine if the Program should entertain a full proposal for a new project under

the subsequent year's FEDMAP funding. The review panel should provide written comments on the proposals, and for those recommended to go ahead to the full proposal stage, recommendations for improvement. It is recommended that budgeting for individual FEDMAP projects, and decisions on funding levels for new start projects take place at a subsequent meeting of NCGMP managers, to be consistent with the project reviews, recommendations of this Advisory Committee, the Implementation Plan of the Mapping Act, and the annual appropriation from Congress.

It is also recommended that proposals, written jointly by USGS geologists and potential cooperators within one or more State Surveys, or with other federal agencies (e.g., NPS) may be submitted to the project review panels. To be successful, such proposals should demonstrate a Federal role for the FEDMAP/SUPPORTMAP activity (e.g., activities or scientific issues of national scope, or concerns that involve more than one state). In addition, there would be an expectation that the State Survey or surveys would participate in the project, and would seek separate funding (e.g., from the state, from STATEMAP, or from other sources).

#### c. Urban focus and Federal role of projects

As noted previously, the FEDMAP/SUPPORTMAP element of NCGMP was reorganized in FY 1996, staff levels were decreased through a Reduction-In-Force, the number of projects was reduced dramatically and the number of staff per project increased. Prior to the reorganization, there were many more small projects in rural areas, and FEDMAP projects were distributed more widely across the Nation. In contrast, most projects in the Program now focus on urban or urban fringe areas and involve close cooperation with local agencies and State Surveys. This poses a concern regarding the uneven distribution of federal mapping resources among the states. This committee recommends that the urban focus of the Program be maintained, but that smaller projects in more rural settings, as well as State and National geologic map compilation projects, should not be abandoned or not funded without a careful examination of scientific merit. Such projects should be evaluated using the same criteria of Federal role, national need, as other FEDMAP/SUPPORTMAP projects.

#### d. Appropriate scale for FEDMAP mapping and compilation.

Individual mapping projects are encouraged to use whatever field-mapping scale is most appropriate for the geologic issues being addressed. The Advisory Committee recognizes that actual working scales and interim map products will typically be at 1:24,000-scale or larger, and selection of scale will depend on the complexity of the geology, the issues being addressed, and the needs of users of the geologic map data. However, to maintain the Federal role as a coordinator and compiler of mapping efforts of diverse partners and to facilitate the construction of the National Geologic Map Database, small-scale (1:100,000) compilations are recommended and constitute the preferred compilation product for those FEDMAP projects in which the construction of a regional geologic framework is a project goal.

e. Overlap of FEDMAP/SUPPORTMAP with STATEMAP and EDMAP projects

The Advisory Committee recognizes the benefits in synergy that results from coordinated geologic mapping efforts of FEDMAP/SUPPORTMAP, STATEMAP and EDMAP projects. Coordinated projects bring more diverse priorities and varied expertise to define and solve scientific problems. Moreover, project coordination should prevent duplication of effort. They also ensure that project goals remain connected to the user community needs and they provide more varied training opportunities for student mappers funded by EDMAP. Project chiefs and proposers of projects for each of the Program components are encouraged to coordinate their activities and priorities, and review panels should take these factors into consideration when recommending funding levels.

In the future, the NCGMP Advisory Committee suggests that members of all three parts of the Program (EDMAP, STATEMAP, & FEDMAP) be involved in the review and awards process for these three components. For example, one representative from STATEMAP and EDMAP should be part of the review of projects for FEDMAP.

f. Cooperative projects with NPS and other Federal Agencies - maintaining the geologic mapping mandate

Two million dollars of 1996 FEDMAP funds were identified for geologic mapping related projects done in coordination with the NPS. The NPS set priorities for geologic projects in lands it administers, then a joint USGS-NPS panel met to merge NPS priorities with available FEDMAP resources. The Advisory Panel recognizes the federal role that the Program serves in providing needed geologic data to sister agencies in the Department of the Interior. It also recognizes the significant role that work with NPS serves in providing geologic data directly to a large customer base of taxpayers (the ~270 million annual visitors to National Parks and Monuments).

The advisory panel recommends continued funding of cooperative work with NPS, and with other Federal Agencies as part of the FEDMAP component of the Program. Creativity and use of nontraditional products are encouraged to facilitate communication with the public through the NPS venue; however, projects should not lose track of the geologic mapping mandate of the Program, as authorized by Congress. Cooperative projects should be selected that take into account both NPS priorities as well as NCGMP capabilities and commitments. This committee feels that the level of FEDMAP funding of cooperative projects with NPS is adequate, and recommends that the Secretary encourage the Directors of NPS and USGS to continue to expand the level of cooperation between the two agencies, and to seek additional funding for cooperative geologic projects by other programs within both agencies.

Starting in FY 1997, the Committee recommends that draft versions of new-start proposals for work on NPS-administered lands should be submitted jointly by USGS scientists and NPS cooperators to the FEDMAP review panels. The FEDMAP scientists are encouraged to work through the three NPS liaison scientists in the three

regional USGS centers and through the three regional NPS-project coordinators within the mapping teams to develop proposals for new projects.

## 2. Planning

The National Geologic Mapping Act, the Implementation Plan, and the need for a new five-year plan for NCGMP.

The National Geologic Mapping Act of 1992 provides the guiding legislation that sets the general goals and objectives of the program, and through the Implementation Plan also provides the structure and methodology to achieve these goals and objectives. In addition, the Strategic Plan of the USGS for the period 1996-2006, provides broad guidelines on the development of core competencies and business activities that are designed to lead the organization into a future in which change and variation in the mission of the agency is anticipated.

To a significant degree, the 1992 Act and Implementation Plan serve as a strategic plan for the program, although, these documents do not substitute for ongoing planning and accounting for technological, scientific, and societal changes that will affect the Mapping Program over the next decade. A five-year plan for NCGMP has been drafted, but is in need of revision and rethinking to be consistent with both changes in organizational structure of USGS and with the National Geologic Mapping Act and Implementation Plan. It is suggested that a major role for the next Advisory Committee, should be to develop a new five-year plan for the program.

## 3. FEDMAP/SUPPORTMAP Staffing Issues

### a. Salary Constraints

One of the major issues facing the FEDMAP program is how to adequately staff new and continuing projects that are prioritized by review panels. A five-year staffing plan for FEDMAP has been constructed. As a consequence of the Geologic Division Reduction-In-Force of FY 1995-1996, the ratio of operating expenses to permanent salary and other fixed costs was increased from about 5% to about 20% and is projected to decline unless funding levels increase or staffing levels decline. The Advisory Panel recommends that the salary load should be reexamined annually, and an acceptable ratio maintained. As a consequence, new permanent hires will have to be offset by losses in permanent staff or increases in program income.

### b. Need for Specialists

The change in focus of the program to address problems in urban and surficial geology and responding to customer needs requires a large investment in digital technology and Geographic Information System expertise. These factors require a shift in expertise of employees. This shift can be accommodated in three ways: hiring new

staff, retraining existing staff, or partnering with experts in other agencies. The Advisory Committee recommends that all three methods are used.

New specialist hires can be accommodated to a limited degree within salary restrictions, through temporary and term appointments and contract hires.

Retraining of existing staff has rarely been done in a serious manner by the Program. The Advisory Committee recommends that the Program establish and fund a training project, administered by the Chief Scientist, in each region. The committee recommends funding levels of approximately 5 percent of available operating expenses be devoted to training, and that training should include funding long-term (month-to-year length) course work at universities or technical training institutions.

c. Shared Facilities/Capabilities Projects and SUPPORTMAP

A shared facilities project has been set up within the Program to provide geochronology, paleontology and stratigraphy and geochemical support to FEDMAP projects. To the degree that excess capacity is available, this project will also provide support to other programs within USGS and to other customers on a reimbursable basis.

## V. IMPLEMENTATION PLAN FOR REAUTHORIZATION OF THE NATIONAL GEOLOGIC MAPPING ACT

### **NATIONAL COOPERATIVE GEOLOGIC MAPPING PROGRAM**

*A Plan for Implementation for a Coordinated Program  
of Geologic Mapping of the Nation*

#### **I. PROGRAM DEFINITION**

An association of geologic mapping investigations by Federal and State agencies and academia for the purpose of developing geologic map information for the Nation.

#### **II. PROGRAM OBJECTIVES**

To expedite the production of geologic maps for the Nation through coordinated geological, geophysical, and geochemical investigations that lead systematically to the following integrated databases that can be applied to resolution of issues related to land-use management, assessment, utilization and conservation of natural resources, ground water management and environmental protection:

- o *National geologic-map database* at 1:100,000 scale and as original map data, at open-file or archival scale of 1:24,000 for most land regions of the United States as appropriate. Some regions, such as Alaska, will be mapped at smaller scales.
- o *Supplementary earth-science databases*, including
  - *National geophysical-map database*
  - *National geochemical-map database*
  - *National geochronologic database*
  - *National paleontologic database*

#### **III. PROGRAM INFRASTRUCTURE**

##### **A. Program Components**

1. Federal geologic mapping component (FEDMAP)
2. Geologic mapping support component (SUPPORTMAP)
3. State geologic mapping component (STATEMAP)
4. Geologic mapping education component (EDMAP)

## **B. Management Structure**

The USGS is the lead Federal agency designated by authorizing legislation to coordinate management of the NCGMP. The USGS and State geological surveys cooperate with other Federal and State agencies, the public and private sectors and academia to develop the geologic map database for the Nation in the manner outlined below.

### **1. Geologic Mapping Priorities.**

- a. Geologic mapping priorities for the National Cooperative Geologic Mapping Program shall be identified through coordination with Federal agencies, State and local governments, and industry.
  - o The USGS will coordinate priorities for the FEDMAP and SUPPORTMAP components. The USGS will provide these priorities for the nationwide summary.
  - o Each State geological survey, through a State geologic mapping advisory committee, will coordinate the priorities for the STATEMAP component within State boundaries. Each State will provide these priorities for the nationwide summary.
  - o Mapping priorities for the EDMAP component are those identified by the Federal/State prioritization process.
- b. The USGS and State geological surveys will exchange results of the priority-setting mechanisms so that all parties can develop funding initiatives to legislatures and funding proposals for appropriate components of the National Cooperative Geologic Mapping Program, all consistent with consensus priorities.

### **2. Advisory Committee**

The President shall appoint members to the advisory committee.

- a. Participants (Number of members and representation)  
Federal agencies (4; one each from the Office of Science and Technology Policy; the Department of Agriculture; the Department of Energy; and the Environmental Protection Agency).

The Secretary of the Interior, acting through the Director of the USGS, with the advice and consultation of State geological surveys, shall appoint two members of an advisory committee.

U. S. Geological Survey (2, including the Chief Geologist as Chairman)

State geological surveys (4)

Private sector (3; energy, minerals, hazards, environment)

University (3; eastern, central, western regions)

Terms of appointments will be established to provide for an orderly rotation of members

b. Role

- o Review and critique the draft implementation plan prepared by the USGS
- o Review the scientific progress of the geologic mapping program
- o Submit an annual report to the Secretary that evaluates the progress of the Federal and State mapping activities and evaluated the progress made toward fulfilling the purposes of this Act

3. Proposal Review

Funding proposals to components of the program will respond to identified priorities and will be reviewed by peer panels composed of scientists who both have published geologic maps of recognized high quality and have working knowledge of regional geologic, geophysical, and geochemical problems. The peer panels shall be separate and distinct from the Advisory Group (Item III.B.2 above).

- a. Proposals to the FEDMAP and SUPPORTMAP components will be reviewed by a peer panel of qualified scientists from the USGS chaired by the Program Coordinator of those components. Representatives of other USGS Programs, State Geological Surveys, and university professors familiar with EDMAP will serve on the review panels.
- b. Proposals to the STATEMAP component will be reviewed by a peer panel composed of five scientists from State geological surveys (one each from the eastern, central, western regions of the country, and two from the Nation at large, selected by ballot of State geologists from a slate proposed by the AASG); and three scientists from the USGS (one of who will be the official responsible for the coordination of the STATEMAP component of the National

Cooperative Geologic Mapping Program and who will act as Chair) and one university professor familiar with the EDMAP component of the Program.

- c. Proposals to the EDMAP component will be reviewed by a peer panel of five university scientists who represent the eastern, central, and western regions of the country; two representatives from State geological surveys, nominated by the President of the AASG; and one representative from the USGS who will be the official responsible for the coordination of the EDMAP component of the program and one State Survey representative. Each committee member must have a demonstrated strong background in geologic mapping and knowledge of regional geology.

#### 4. Mapping Standards

The NCGMP will use the draft scientific and digital geologic map standards developed by the USGS in cooperation with State geological surveys and distributed through the Geologic Data Subcommittee of the Federal Geographic Data Committee. These standards will facilitate the use, translation, and exchange of geologic information among all sectors of the mapping association and among map users.

#### 5. Annual Report

The Advisory Committee will submit an annual report to the Secretary on the progress of the geologic mapping activities.

The Secretary shall, within 90 days after the end of each fiscal year, submit an annual report to the Committee of the House of Representatives and the Committee on Energy and Natural Resources of the Senate describing the status of the nationwide Geologic Mapping Program.

## **IV. FUNCTION AND MANAGEMENT OF PROGRAM COMPONENTS**

### **A. Federal Geologic Mapping Component (FEDMAP)**

#### **1. Primary research objectives**

- a. Determine the geologic framework of areas that are important to the economic, social, and scientific welfare of the Nation.
- b. Develop a National geologic map database at 1:100,000 scale. Geologic maps will be made at larger scales such as 1:24,000, as appropriate, to present more detailed data or to resolve special problems subsequently archived, and compiled at the 1:100,000 scale.

#### **2. Mapping Priorities**

Priorities are determined by the USGS through coordination with:

- o Federal agencies
- o State agencies
- o Public and private sectors

#### **3. Mapping Implementation**

- a. Proposals are developed by scientists of the USGS in response to national priorities.
- b. Proposals are reviewed by a peer evaluation panel as described above (Item III.B.3.a).
- c. Geologic mapping is conducted by scientists of the USGS.
- d. The program component will produce geologic map information to meet standards and formats common to all Federal and State geological surveys.
- e. The USGS will publish geologic maps resulting from the investigations.

#### **4. Funding**

Line-item appropriation from the U. S. Congress to USGS for expenditure by the USGS

### **B. Geologic Mapping Support Component (SUPPORTMAP)**

## 1. Primary Research Objective

Provide interdisciplinary support for Federal geologic mapping activities and, as contracted for by States using funds from the STATEMAP Component, for States' geologic mapping. Representative categories of interdisciplinary support include:

- a. Research and development that leads to the implementation of cost-effective digital methods for the acquisition, compilation, analysis, cartographic production, and dissemination of geologic map information;
- b. Paleontologic studies that provide information critical to understanding the age and depositional environment for fossil-bearing geologic map units.
  - o These studies will be focused on determination of the paleontologic, systematic, and stratigraphic information required to support the production of geologic maps. The resulting data will be incorporated into a National Paleontologic Database.
- c. Geochronologic and isotopic studies that (1) provide radiometric dates for geologic map units and (2) fingerprint the geothermometry, geobarometry, and alternation history of geologic map units;
  - o These studies will create geochronologic data that will be incorporated into a National Geochronologic Database.
- d. Geophysical investigations, using potential-field and remote-sensing techniques, that assist in delineating and mapping the physical characteristics and three-dimensional distribution of geologic materials and geologic structures.
  - o These studies will create geophysical information that will be incorporated into a National Geophysical map Database.
- e. Geochemical investigations and analytical operations that characterize the major- and minor-element composition of geologic-map units, and that lead to the recognition of stable and anomalous geochemical signatures for geologic terranes.
  - o These studies will create geochemical information that will be incorporated into a National Geochemical Map Database.

2. Investigation priorities: Linked to FEDMAP priorities and, as contracted for under funds from the STATEMAP component, to STATEMAP needs.
3. Investigation Guidelines
  - a. Proposals are developed by scientists of the USGS in response to national priorities.
  - b. Proposals are reviewed by a peer-evaluation panel as described above (Item III.B.3.a).
  - c. Investigations are conducted by scientists of the USGS.

4. Funding

Line-item appropriation from the U. S. Congress to the USGS with expenditure by the USGS.

**C. State Geologic Mapping Component (STATEMAP)**

1. Primary Research Objectives

- a. Produce geologic maps of areas that are important to the economic, social, and scientific welfare of the State and the Nation.
- b. Contribute geologic mapping to the National geologic map database at a uniform scale (1:100,000) and format used by all Federal and State geological surveys. Geologic maps at a scale of 1:24,000, are appropriate for development of data for archiving or for resolution of special problems, and for compilation as part of 1:100,000-scale published maps.

2. Mapping Priorities

- a. Priorities for investigation within a State are determined by each State geological survey through internal mechanisms, including State geologic mapping advisory committees, that identify specific intra-State needs.
- b. Determination of State investigations to be supported from among all proposals made to the STATEMAP component will be by a peer-review panel (Item III.B.3.b above).

3. Investigation Implementation

- a. The component will produce geologic map information to meet standards and formats common to all Federal and State geological surveys.

- b. State geological surveys will publish the geologic map data resulting from investigations in the STATEMAP component. State surveys can contract with the USGS to publish geologic map data developed in the program. Cost of publication will be included in the funding proposal.

#### 4. Funding

- a. Line item appropriation from the U. S. Congress to the USGS that will coordinate the nationwide program through cooperative agreements with States. The USGS retains only administrative overhead costs necessary for managing the program. Such costs can be reviewed by the Advisory Committee (Item III.B.2, above).
- b. Distribution of funds to States shall be determined by priorities established by the process described in item IV.C.2, above.
- c. State geological surveys shall match Federal funds with non-Federal funds.

### **D. Geologic Mapping Education Component (EDMAP)**

#### 1. Objectives

- a. Develop opportunities for training students in the fundamental principles of geologic mapping and field analysis.
- b. Provide support for graduate-level field studies involving geologic mapping and field analysis directed toward program priorities.

#### 2. Management

- a. Graduate students through their institutions make application to the program for support of geologic mapping.
- b. Graduate student geologic mapping must be integrated with priorities and technical guidelines of FEDMAP and/or STATEMAP components. The program will produce geologic map information to meet standards and formats common to all Federal and State geological surveys.

- c. A committee of 5 scientists from universities (one each from the eastern, central and western regions of the country and two at-large), two representatives of State geological surveys, nominated by the President of AASG, and a representative of the USGS who will also serve as committee chairman, will comprise the peer review committee for the EDMAP component.

### 3. Funding Priorities

Priorities for funding are established by a peer review panel as specified in item III.B.3.c above.

### 4. Funding

- a. Line-item appropriation from the U. S. Congress to the USGS that will coordinate the nationwide program through cooperative agreements with universities. The USGS retains only administrative overhead costs necessary for managing the program. Such costs can be reviewed by the Advisory Committee (Item III.B.2, above).
- b. Distribution of funds to universities shall be determined by priorities established by the process described in item IV.D.2.c, above).
- c. Universities shall match Federal funds with non-Federal funds.

## APPENDIX 1

### FY-1996 FEDMAP PROJECTS AND PLANS FOR FY-1997

#### Program Management Project

Program Coordinator: John Pallister (703) 648-6960

The Program Coordination Project carries the responsibility for program activities and funding at the national level. Primary project activities are: planning for future program directions and outreach, tracking program activities to ensure compliance with programmatic responsibilities and obligations, responding to requests, outreach and coordinating program activities with other organizational units of USGS, Department of Interior, OMB, Congress, and with external partners and customers in State and local governments and in the private sector. Most projects are implemented through the NCGMP Program Council and through the regional teams as led by the team Chief Scientists. Additional cooperation is required with the three USGS Regional Geologists and program coordinators from the four division of USGS, with theme coordinators and the Director's office, as well as with external partners from other federal agencies, the States, and the private sector. External parts of the program are implemented and prioritized by the NCGMP external affairs and National Data Base projects, and are reviewed and blended with other program goals through the Program Coordination Project. All program activities are prioritized to be consistent with the National Geologic Mapping Act and the NCGMP Implementation Plan as reviewed by the National Cooperative Geologic Mapping Program's Federal Advisory Committee.

#### **National Geologic Map Data Base**

Project Chief: Dave Soller (703) 648-6907

The National Geologic Mapping Act of 1992 (PL 102-285) specified that the USGS develop a National Geologic Map Data Base as a national archive containing geologic maps and related databases. Geologic maps, derivative maps, and related information serve a vital role in supporting public and private decision-making, general education, and advances in scientific research. The Data Base project serves as the central archive or point-of-contact for users searching for earth-science information. The central component of the Data Base is a catalog of metadata, searchable over the Internet. These metadata are supplied in standard format to the USGS by each participant in the data base. The catalog will provide the user with the information needed to assess the availability and utility of earth-science information in their area of interest. A draft of this database

design has recently been released for comment via the Internet by creating a site on the World Wide Web (WWW). The Uniform Resource Locator (URL) for this site is "<http://wwwflag.wr.usgs.gov/ngmdb>". This web site is also linked to the recently created web site for the National Cooperative Geologic Mapping Program whose URL is "<http://ncgmp.usgs.gov>". A critical element in database construction is the development, acceptance, and adherence to a certain level of standardization. The USGS is currently working with both producers and users of geologic map information to develop draft format, symbols, and technical attribute standards so that geologic map database information can be accessed, exchanged, and compared efficiently and accurately as required by

Executive Order 12906 (59 Fed. Reg. 17,671; 1994), which established the National Spatial Data Infrastructure (NSDI).

### **Center for Earth Science Information Research**

Project Chief: John Sutter (703) 648-5331

The Center for Earth Science Information Research (CESIR) fosters research to build linkages between programmatic scientific research and data collection and users of the information in public and private sectors. These linkages take the form of new products that translate complex earth science information into decision making tools. A principal goal of CESIR is combining geologic map and hazard information to produce geospatial digital databases that allow economic assessment of land-use decisions. Test cases analyzed to date include an experimental analysis of the potential economic benefits of using geologic map information for land-use decisions use in Loudoun County, Virginia (USGS Circular 1111), and analyses of liquefaction and landslide potential in parts of the San Francisco Bay region in California.

### **Mid-Atlantic Urban Corridor Geologic Mapping**

Project Chief: J. Wright Horton, Jr (703) 648-6933

The project conducts 1:24,000- and 1:100,000-scale bedrock and surficial geologic mapping and related multidisciplinary research to provide a comprehensive understanding of the regional geology in the mid-Atlantic urban corridor. The project makes geologic data available in formats required for diverse environmental, land use, natural hazard, and resources decisions in the mid-Atlantic region. The project is planning a workshop with clients and customers in the Fall of 1996 to define new priorities for investigations of infrastructure, environmental geology and hazards, and resource issues in the mid-Atlantic Urban corridor and Chesapeake Bay regions.

FY 1997 Products planned:

\* Publish I-maps of :

Washington West 30'X60' quadrangle (1:100,000-scale)

Fredericksburg 30'X60' quadrangle (1:100,000-scale)

New Jersey, Northern Bedrock (1:100,000-scale)

New Jersey, Central Bedrock (1:100,000-scale)

New Jersey, Southern Bedrock (1:100,000-scale)

New Jersey, Northern Surficial (1:100,000-scale)

New Jersey, Central Surficial (1:100,000-scale)

New Jersey, Southern Surficial (1:100,000-scale)

\* Field work and compilation of:

Frederick 30'X60' quadrangle (1:100,000-scale)

\* Compilation of:

South Boston 30'X60' quadrangle (1:100,000-scale)

Washington East 30'X60' quadrangle (1:100,000-scale)

\* Begin Compilation:

Baltimore 30'X60' quadrangle (1:100,000-scale)

\* GIS pilot study

\* Lithogeochemical map of Chesapeake Bay drainage basin for Ecosystem Program

\* Evaluate new gamma-ray spectrometer surveys as aids for geologic mapping

\* Biostratigraphy, U-Pb, and Ar-Ar geochronology support for mapping

**Eastern Region State-USGS Coop Geologic Mapping (Vermont)**

Project Chief: Nicholas M. Ratcliffe (703) 648-6939

The major objective of this project is to produce a new bedrock geologic map of the State of Vermont by 1998 in cooperation with the State of Vermont. The new map and resulting data in GIS format will be used by the USGS and State Forest Service managers, State and local planning

agencies and industry for such purposes as Ecosystem analysis, planning and design of ground-water well-head protection plans, resource analysis, and environmental protection.

Products since inception: Twenty two geologic maps published since 1989, eight maps in press. Four research papers and numerous abstracts published.

FY 1997 Products planned:

- \* Completion of :           Chittenden quadrangle (1:24,000-scale)  
                                  Pico Peak quadrangle (1:24,000-scale)  
                                  Hartland quadrangle (1:24,000-scale)  
                                  Mt. Carmel quadrangle (1:24,000-scale)
- \* Draft of:                   Rutland 30'X60' quadrangle (1:100,000-scale)

**Eastern Region National Park Service-USGS Cooperative Project**

Project Chief: Benjamin A. Morgan (703) 648-6927

Four parks are presently under study:

- 1) Shenandoah National Park--(Sub-project leader: Benjamin A. Morgan). Severe environmental degradation has resulted because of its proximity to large urban centers and industrial and motor vehicle pollution of the air affecting the natural resources of the park. Broader understanding of the surficial geology of the park would guide park managers to make decisions on a wide range of problems including protection of aquatic species, road/trail construction and maintenance, and hazards related to potential landslides, rock falls, and debris flows associated with storm events and flash flooding.
- 2) Great Smoky Mountains National Park--(Subproject leader: Art Schultz). Surficial and bedrock mapping are focused on landslide, old mine drainage and ecosystem issues.
- 3) C&O Canal National Historical Park--(Subproject leader: Scott Southworth). Geologic mapping will provide a detailed geologic guide to this 180 mile long trail.
- 4) Delaware Water Gap National Recreation Area--(Subproject leader: Jack B. Epstein). Bedrock and surficial geologic maps are needed to address a wide variety of land use planning and public outreach needs.

Work planned for FY 1997:

Shenandoah National Park

\*Investigations of debris flow and landslide deposits of the Staunton and Rapidan River basins in Shenandoah National Park. Mapping of parts of the Fletcher, Madison, and Big Meadows 7 ½' quadrangles.

\*Open File Reports:

Surficial geologic maps of the Staunton River and Shaver Hollow basins

\*Technical paper on debris flows co-authored by Morgan and Wiezoreck

C&O Canal National Historical Park:

\*Complete USGS Special Map of the Great Falls region and trail guide.

\*USGS Bulletin and geologic map of the Broadtop synclinorium and surficial deposits near the Potomac River.

Great Smoky Mountains National Park:

\*Inventory of geologic outreach for GSMNP

\*Begin compilation of 1:100,000-scale surficial map of GSMNP

\*Begin compilation of a 7.5' geologic map database for GSMNP

Delaware Water Gap National Recreation Area

\*Bedrock geologic map of DWGNRA

\*Updated surficial geologic map of DWGNRA

\*Bedrock lithologic map of DWGNRA

\*Guide to the Appalachian Trail, DWGNRA

\*Popular report on the origin of DWGNRA

### **Southeastern Geology/Geohydrology Mapping**

Project Chief: Gregory Gohn (703) 648-4382

This project conducts geologic mapping and regional geologic studies in selected areas of Georgia and South Carolina to address water resource and water quality issues. The project performs a spectrum of traditional geologic research addressing a variety of programmatic and societal needs. The north Georgia study conducts field mapping and structural, petrologic, stratigraphic, and isotopic analyses of complexly deformed rocks near the southern terminus of the Appalachians. The South Carolina study conducts surface and subsurface mapping as well as lithostratigraphic, biostratigraphic, and paleoenvironmental analyses of the Cretaceous and Cenozoic sedimentary sections that constitute the South Carolina and eastern Georgia Coastal Plains.

Products for FY 1997 and beyond:

Digital geologic database for greater Atlanta area.

Geologic maps of the Atlanta, Athens, and Cartersville 30' x 60' quadrangles (1:100,000).

Digital geologic database for the South Carolina Coastal Plain.

Digital paleontologic database for the South Carolina Coastal Plain.

Graphic correlation models for the South Carolina Coastal Plain sections.

Digital geologic database for Charleston County, South Carolina.

Stratigraphic reports for benchmark drillholes in the South Carolina Coastal Plain.

Summary biostratigraphy report for the Trans-River Flow project.

### **Mid-Continent Mapping Project/Ozark National Park Service Project**

Project Chief: Richard Harrison (703) 648-6928

The main objective of the Midcontinent Project is to develop a tectonic framework through detailed mapping of 7.5-minute quadrangles and compilation at 1:100,000 scale. The project is located both in a geologically and hydrogeologically complex area characterized by karstic recharge regions, major losing streams, caves, and aggrading gravel beds along the Current and Jacks Fork Rivers, and north of New Madrid where mapping is focused on earthquake and fault studies. Recent mapping investigations and trenching have identified young (Quaternary) offset of faults northwest of the principal New Madrid fault zone.

Products planned for FY 1997:

Complete field work on Scott City 7.5-minute quadrangle. Begin mapping Bell City 7.5-minute quadrangle; begin compilation of the Cape Girardeau 1:100,000 sheet. Continue neotectonic investigations through trench excavations and core drilling of suspected Late Quaternary faults. Complete field on the Toledo 1:100,000 sheet. Complete mapping and submit for publication the Greer, Low Wassie, and Eminence 7.5-minute quadrangles; complete compilation of the Spring Valley 1:100,000 sheet and submit as an Open-File Report. Begin mapping the Van Buren North, Powder Mill Ferry, and Alley Spring 7.5-minute quadrangles; begin compilation of the West Plains and Poplar Bluff 1:100,000 sheets.

### **Florida Cooperative Mapping**

Project Chief: Bruce Wardlaw (703) 648-5288

This is a large project currently divided into 5 subprojects. The basic goals and objectives are to provide the framework for understanding (1) resource distribution (water, phosphate, etc.) in the subsurface of Florida and (2) ecosystem variability and change prior to and during human development of South Florida. The project is a cooperative effort with the Florida Geological Survey (FGS). Activities of the FGS include primary responsibility for surficial geologic mapping, stratigraphic test drilling, and analysis and curation of drill core samples. NCGMP provides high resolution biostratigraphy and interpretation of the ancient environments where sediments were deposited. This joint work has established the geologic framework for hydrologic flow modeling by the South and Southwest Florida Water Management Districts and USGS, and has resulted in a reevaluation of the stratigraphic setting and flow patterns within the principal Floridan aquifers and has extended the stratigraphic range (thickness) and defined depositional settings where economic deposits of phosphate occur in Florida.

In addition, NCGMP has formed a partnership with the FGS, South and Southwest Florida Water Management Districts, Dade County, U.S. Army Corps of Engineers, NOAA, Everglades National Park, and several area universities to investigate the quality and quantity of water delivered to both the southeast (Biscayne Bay) and south (Florida Bay) coasts of Florida. Both of these shallow bays are showing increasing signs of distress such as algal blooms, seagrass die-offs, fishery declines, increases in pollution, and changes in nearshore vegetation patterns. It is important to know how many of these observed changes are direct consequences of human activity and how many are related to natural variation in the ecosystems. This project is testing theories about human influences by examining the geologic record for the past 300 years and determining the ability of the natural systems to recover from disturbances. Initial results suggest that there are both man-induced changes, such as changes in plant distribution related to canal building, as well as natural cycles in seagrass abundance and fishery productivity.

Products planned for FY 1997:

1. Continue modern census sampling.
2. Produce reports on vegetational history from sites in Water Conservation Area 2A and Taylor Creek.
3. Produce report on modern pollen assemblages; correlate pollen record with standing vegetation.
4. Complete coring in Buttonwood Embankment and begin coring in new regions of interest.

5. Complete analysis of replicate cores from Russell Banks.
6. Produce a report on modern biotic distributions of Biscayne Bay.
7. Collect short cores for Biscayne Bay.
8. Begin drilling in Big Cypress National Preserve and aquifer testing.
9. Analyze long core GB-1.

### **National Geologic Map Project**

Project Chief: John C. Reed, Jr. (303) 236-1276

This project includes two Federal-level geologic tasks: the Quaternary Geologic Atlas of the Conterminous United States and the Geologic Map of North America. The Quaternary Geologic Atlas was originally planned to consist of a series of 1:1,000,000, 4 by 6 degree quadrangle maps which show bedrock of Quaternary age (emplaced or formed during the past 1.81 million years) and surficial deposits and materials of Quaternary age that overlie bedrock of all ages. Of the 53 maps that cover all of the conterminous United States and parts of Canada, 37 have been published only on paper; four have been released digitally. The goals of this task have been redefined. Highest priority is to release all published maps in digital form and to integrate the publication of these through the National Geologic Map Database Project. Method of compilation and publication of remaining unpublished maps is under consideration.

The Geologic Map of North America represents the first compilation of the geology of North America since 1949. It will depict the distribution, character, and temporal and structural relations of bedrock units throughout North America, Greenland, Iceland, the Antilles, and parts of Siberia and northern South America, as well as the sea-floor geology of large parts of the adjacent ocean basins. The map will be published in four sheets (plus a fifth sheet for explanation) on the 1:5,000,000 transverse Mercator base map of North America prepared by the USGS. Compilation is a cooperative effort among the USGS, the Geological Survey of Canada, the Woods Hole Oceanographic Institution, and the Geological Society of America; The Geological Society of America is bearing the cost of cartographic preparation and hard-copy publication. At present, both the on-land and sea-floor geology of the southeastern and northeastern quarters of the map are complete, the on-land geology of the northwestern quarter is essentially complete, and the compilation of the southwestern quarter is about half finished. Sea-floor geology of the northwestern and southwestern quarters are in progress. It is expected

that the USGS component of the hard-copy compilation will be completed in a year. Digital publication of the map is planned through the National Geologic Map Database Project.

Products for FY 1997:

Completion for the Quaternary Atlas 4 degree x 6 degree sheets of the Regina and Winnipeg quadrangles. Northeast and Northwest quarter portions of the Geologic Map of North America will be sent to GSA for printing.

### **Geologic Mapping of the Middle Rio Grande Basin**

Project Chief: David Sawyer and Ren Thompson (303) 236-1021,0929

The rapidly growing Albuquerque-Santa Fe region of New Mexico offers exceptional opportunities for application of geological sciences and research to issues of great societal importance. The principal issue driving this project, and numerous coordinated efforts by other USGS Division and agencies is the discovery that the world-class aquifer beneath Albuquerque is much more limited in extent than previously thought and urban development will be limited unless new resources are identified and exploited. The project is framed around compilation of the Albuquerque, Belen, and Los Alamos 1:100,000-scale geologic maps, which include the most rapidly urbanizing part of New Mexico. These new digital geologic maps, and more detailed mapping at 1:24,000-scale mapping by this project and by partners from the New Mexico Bureau of Mines and Mineral Resources, Universities, and Los Alamos National Lab, along with contracted geophysical surveys will form the framework for land-use planning and aquifer management. The project is coordinated and integrated with ongoing and new-start activities within Water Resources Division (District office and National Research Program), National Mapping Division and with a variety of other federal, state, city, county and private sector agencies. The project is addressing a variety of earth science issues through multipurpose geologic mapping. These range from seismic, subsidence, and volcanic hazards to infrastructure and mineral resource and water quality issues; however, the principal issue that is being addressed is the geohydrology of the Santa Fe Group, the sedimentary deposits that fill the Rio Grande rift and contain the principal ground water aquifers.

Products for FY 1997:

100K compilation and new geologic mapping in the following 24K quadrangles—Albuquerque, 100K-LaMesita Negra SE, Santa Ana Pueblo, San Felipe Pueblo, 3 of western 6 quads of Albuquerque 100K along Rio Puerco; Los Alamos 100K-Horacado Ranch, Jemez Springs & Frijoles

15Ks; Belen 100K-Rio Puerco, and continuing compilation of acceptable existing published geologic mapping.

### **Omaha-Kansas City Urban Corridor Geologic Mapping**

Project Chief: Bill Langer (303) 236-1249

During 1995, the state geological surveys of Iowa, Kansas, Missouri, and Nebraska, and the USGS formed a partnership to conduct geologic studies related to land-use issues in the Middle Missouri Basin. These studies are being conducted in a corridor (herein referred to as the Omaha-Kansas City Corridor) encompassing the cities of Omaha and Lincoln, Nebraska; Council Bluffs, Iowa; Kansas City, Missouri and Kansas; and Topeka, Kansas. The corridor is in an area of 15,800 square miles, consisting of 28 counties, and comprising 445, 7.5 minute quadrangles. The corridor is in the agricultural heartland of the United States. Most of the area between the cities is a mix of smaller urban centers and intervening rural areas that support intensive agricultural activities. Even though the corridor is the population center of the heartland, with a population of 2.5 million people, a large percentage of the Nation's grain crops and livestock are produced here. This area is the best example in the United States where expanding urbanization is in conflict with traditional agricultural use. This conflict causes significant impacts on natural resources and highly sensitive environments. To provide background geologic data that are essential to deal with these issues within the Omaha-Kansas City Urban Corridor, the U. S. Geological Survey and the four collaborating states have identified three pilot areas for study: Omaha City-Council Bluffs, St. Joseph, and each of these consists of 12 7.5-minute quadrangles.

Activities for FY 1997:

To continue surficial geologic mapping in the Omaha-Council bluffs area and St. Joseph area; to begin air photo interpretations in the Leavenworth area; and to begin preparing 3-dimensional "stack maps" for the Omaha-Council Bluffs area and St. Joseph area.

### **Central Region National Park Service/USGS Cooperative**

Project Chief: Mark Hudson (303) 236-7446

This project contains 3 new subprojects in different parks:

- 1) El Malpais National Monument—interpretation of volcanic history and digital mapping of important geologic and ecological resources that are directly related to lava-flow field evolution; geologic research on the evolution of lava tube systems and development of large pahoehoe sheet

flows applying new concepts recently developed in Hawaii Volcanoes National Park.

2) Buffalo National River—the principal goal of this project is to investigate the stratigraphic and structural controls on ground water flow within exposed Ordovician through Pennsylvanian sedimentary strata in the region to effectively manage current and future agricultural pollutants that issue from springs within the Buffalo River watershed.

3) Ozark National Scenic Riverways—the principal goal of this project is to investigate the stratigraphic and structural controls on ground water flow of the region. This information is needed for effective management of current and future agricultural pollutants that issue from springs within the watershed.

Products for FY 1997:

Buffalo National River:

Continue mapping, fracture, and paleomagnetism studies. Finish mapping within Jasper and Hasty quadrangles. Prepare mosaic Open file map of NPS-defined area of suspected intrabasin groundwater transfer (centered on Mill Creek tributary).

El Malpais National Monument:

Continue mapping of major lava tube systems. Prepare color geologic map showing flow units and principal features of volcanologic interest. Continue development of visitor center display materials.

Ozark National Scenic Riverways:

Complete mapping and submit for publication the Greer, Low Wassie, and Eminence 7.5 minute quadrangles; complete compilation of the Spring Valley 1:100,000 sheet and submit as an Open-File Report. Begin mapping the Van Buren North, Powder Mill Ferry, and Alley Spring 7.5 minute quadrangles; begin compilation of the West Plains and Pollar Bluff 1:100,000 sheets.

**Central Region State/USGS Cooperative - Geologic Mapping (I-70)**

Project Chief: Robert Scott (303) 236-1230

The "Colorado I-70 corridor" project concentrates on geologic mapping along Interstate Highway I70 between Dillon, Colorado, and the Utah State line, a region undergoing rapid population growth. Mapping is focused toward providing maps that can be used to derive information on geologic hazards, resources, and environment. Both the USGS and the Colorado Geological Survey are working cooperatively to provide high-quality geologic maps needed by the growing population of the area.

Geologic issues under study that affect society include mass wasting (landslides, debris flows, and rock falls), hydrocompaction of soils, evaporite deformation, subsidence, availability of aggregate, oil and natural gas concerns, and the environmental effects of mine tailings, waste disposal, and evaporite dissolution. The project area extends from the core of the Rocky Mountains into the northern Colorado Plateau and includes Precambrian metamorphic and granitic rocks, Cambrian through Tertiary sedimentary strata, and Quaternary and Tertiary volcanic rocks and surficial deposits. Besides societal concerns numerous scientific issues will be addressed including the role of evaporite-related deformation and associated geologic hazards, the timing and mechanisms of uplift in the Rocky Mountains, the regional Neogene geomorphic history of the Colorado River drainage system, and the links between climate, geomorphic processes, and surficial deposits. In association with the Colorado Geologic Survey, the project will produce 1:24,000-scale 7.5' multipurpose geologic quadrangle maps as well as 1:100,000-scale compilations of existing geology in four 30' x 60' quadrangles along the corridor for the National Geologic Map Database Project. All maps will be open-filed and published in digital form. Collaboration with other divisions of the USGS, other agencies, counties within the area, and universities is being established.

Products for 1997:

The plan is to finish the Palisade, Storm King Mountain, New Castle, Rifle, and Wolcott 7.5 minute quadrangles respectively before the end of FY 1997. These will initially be published as Open-File Reports and then be released as CD ROMs in an ARC/INFO format.

### **Infrastructure Resources Initiative**

Project Chief: Bill Langer (303) 236-1249

This is one of three banner initiatives identified by the Director in FY95 and intended to be a multidisciplinary project focused on energy, water, and construction materials. Funds from Geologic Division, Water Resources Division, and National Mapping Division will be redirected into the initiative. The interest area of this initiative is the Colorado Front Range with a rapidly growing population currently of over 2.5 million. The infrastructure of this area, including roads, airports, water and energy transmission and distribution facilities, sewage-treatment and many other facilities, is in the process of rehabilitation and development. This process requires large volumes of three natural resources, construction materials (primarily stone, sand, and gravel), water, and energy. NCGMP will concentrate its effort on developing and demonstrating methods for better integration of data on mineral, water, and energy

resources into local land-use decisions that could sustain the area's infrastructure. The NCGMP project will identify and characterize potential sources of natural aggregate in the Colorado Front Range, identify coincidental occurrences of aggregate resources with other infrastructure resources, and determine the rate of sterilization of natural aggregate by competing land uses. The project will produce resource databases that will be integrated with land-use data in a Geographic Information System (GIS). The databases will be made in formats that are appropriate for land-use planners.

Planned work for FY 1997:

Begin digitizing existing data; begin characterization of bedrock quality; begin correlation of bedrock geology source areas with sand and gravel deposits; begin characterization of sand and gravel.

### **Shared Facilities Project**

Project Chief: Larry Snee (303) 236-5619

NCGMP in the Central Region has made a commitment to form a Shared Facilities Project that will provide isotope geology, paleontology and stratigraphy, analytical chemistry (INAA), and plotter laboratory support and collaboration, not only to NCGMP mapping projects, but also to all USGS programs on a cost-reimbursable basis. It is anticipated that additional shared facilities could be coordinated through the NCGMP or the Regional Geologist; these additional facilities could include the electron microprobe, SEM, additional analytical chemistry, ice and rock core laboratories, reactor, etc. The exact organization and composition are currently under consideration and study. Management of this project will include ensuring appropriate use of resources, coordination of efforts, accountability, availability of instrumentation, acquisition of funds, equipment acquisition, etc. Staff associated with this project will work as project members in other projects in all USGS programs or as collaborators on a per-sample-cost basis. Shared facilities and capabilities include: 1. Instrumental neutron activation analyses. 2. Geochronology including U-Pb, Nd-Sm, Rb-Sr,  $^{40}\text{Ar}/^{39}\text{Ar}$ . 3. Stable isotope geochemistry. 4. Heavy isotope (Pb, Sr, Nd, etc.) geochemistry. 5. Ostracod, conodont, radiolarian, and pollen studies (stratigraphic and environmental). 6. Analytical plotter analysis and interpretation.

## **Geologic Mapping and Environmental Restoration, Nevada Test Site**

Project Chief: Pete Rowley & Gary Dixon (303) 236-1245

The USGS has been involved in OFA studies at the Nevada Test Site (NTS) since the mid-1950s. The USGS mission is formalized by means of an Interagency Agreement (IA) between the USGS and DOE, that is renegotiated every 5 years. Funding from the IA supports Geologic and Water Resources Division investigations. The Geologic Division portion of the funding is composed of three elements: Testing Capabilities and Readiness, Geologic Framework for Environmental Restoration (ER) studies, and Arms Control and Nonproliferation activities. Because of a ban on nuclear testing, USGS activities have focused on environmental restoration through continuing research on the effects of major structures on ground water flow away from underground nuclear test sites. Project is in transition, workshop is being planned to refine project goals and to seek wider scope and stakeholders. Program considers this project to hold some of the most promising scientific opportunities and highest societal relevance of NCGMP projects in the Central Region. Project involved in frontier areas of ground water modeling and radioactive plume tracing and developing methods and protocols for acceptable levels for radioactive contamination of deep water resources as well as particulate contamination of surfaces. Project deals with sensitive issues, such as radioactive contamination, cross-agency politics, and public safety.

### **Activities for FY 1997:**

Continuation of hydrogeologic studies in progress on the Test site, structural and hydrologic framework of the Oasis Valley discharge studies area, structural and hydrologic framework of the Ash Meadows discharge area, and structural and hydrologic framework of single-point discharge from faults on the NTS and environs.

## **Southern California Areal Mapping Project (SCAMP)**

Project Chief: Doug Morton (909) 276-6397

This cooperative project between the USGS and the California Division of Mines and Geology is centered on the Los Angeles urban area and provides geologic-map information for the population centers of southern California, extending from San Luis Obispo on the north to the Mexican border at the south, an area that includes ~20% of the population of the US. The project addresses a broad range of societal applications, including geologic hazards, natural resources, and environmental quality. Examples include: 1) mapping the geometry of ground water basins and flow regimes to assist California water districts in dealing with water resource and recharge problems and to help the Air Force monitor

contaminant plumes in ground water, 2) mapping limestone and aggregate building resources to assist the National Forest Service manage it's land, 3) providing geologic map data to assist the Army Corps of Engineers in siting a dam between two strands of the San Andreas fault, and 4) helping the Metropolitan Water District define the structural setting of the Domenigoni reservoir, now under construction, which when completed will be the largest water retention structure in Southern California. Objectives are achieved primarily through the systematic production of general-purpose geologic maps in digital form, although mapping priorities are generally set on the basis of grass-roots support from local partners, cooperators and funding customers. The project has a broad cooperator and funding base, clients include the U.S. Air Force (March Air Force Base and Edwards Air Force Base), the U.S. Navy (Twenty-nine Palms Marine Corps Air/Ground Combat Center and the Chocolate Mountains Gunnery Range), the U.S. Forest Service (San Bernadino National Forest), the U.S. Army Corp of Engineers (Seven Oaks Dam), National Park Service (Joshua Tree National Park), San Bernadino Valley Municipal Water Agency (Yucaipa and San Bernadino Basins), Mojave

Water Agency (Lucerne and Morango Basins and Mojave River), Metropolitan Water District, and the Southern California Earthquake Center.

Products for FY 1997:

The following 7.5 minute quadrangles are expected to be completed and released: Apple Valley Souty, Bald Mountain, Beverly Hills, Deadman Lake, NW, Fifteenmile Valley, Figueroa Mountain, Foxen Canyon, Goat Mountain, Harrison Mountain, Hildalgo Mountain, Hollywood, Lake Arrowhead, Lavic, Los Angeles, Ludow, Old Woman Springs, Pasadena, San Rafael Mountain, Twentynine-Palms, Winchester, and Zaca Lake.

### **Geologic mapping and urban hazards in the Pacific Northwest Urban Corridor**

Project Chief: Ray Wells (415) 329-4933

Primary issues facing the population of the Pacific Northwest include: ground shaking and ground failure from earthquakes, declining groundwater and other natural resources, frequent landslides during the extended rainy season, and volcanic debris flows and ash deposits from active volcanoes. In the Pacific Northwest, geologic maps form the basic framework and data base for locating and assessing geologic hazards, such as earthquake-producing faults, liquefaction- or landslide-prone

regions, and areas that will be impacted by volcanic eruptions or non-volcanic debris flows, as well as for the location and assessment of natural resources. The Pacific Northwest Urban Corridor Geologic Mapping Project is working with State surveys, universities, and other USGS programs to provide geologic information for the urban corridor and surrounding regions of western Oregon, and Washington, extending from the Portland metropolitan area on the south, to Puget Sound on the north. The project is expanding activities in the Puget Sound region in response to the bureau Puget Sound Urban Hazards Initiative. The project has two broad goals: 1) To create a uniform digital geologic and geophysical database for the greater urban and surrounding regions which can be applied to assessment of geologic hazards, natural resources, and the environment. 2) To determine the tectonic framework and history of the active Cascadia convergent margin, in particular the structure, evolution and young deformation of the seismically active forearc region containing most of the population centers.

#### Products for FY 1997:

In the Puget Sound metropolitan area the Poverty Bay, and des Moines, and an additional fifteen 7.5 minute geologic maps will be completed. In the Portland metro area five 7.5 minute geologic maps will be done in the Mist Gasfield and two 7.5 minute geologic maps will be completed in the North Willamette area. The Robinson Mountain 1:100,000 geologic map will be finished in the northern cascades area. Numerous other maps and reports are planned for production.

#### **San Francisco Bay Region Geologic Mapping Project**

Project Chief: David Howell (415) 329-5430

The San Francisco Bay Regional Geologic Mapping Project is using geologic mapping as the "fabric" to integrate a wide variety of urban geologic issues facing this region with a population of 7 million; a region that is predicted to continue to grow, possibly reaching a population of 20 million in an extended metropolitan area that could extend from east of Sacramento through the delta region, to the far southern end of Santa Clara County, with northern prongs into Napa and Sonoma Counties. Social, ethical, economic, and scientific uncertainties will all come into play while dealing with resource use, environmental quality, and waste disposal issues. Furthermore, this urban corridor has running through it a variety of natural and anthropogenically induced hazards (landslides, earthquake faults, flood zones, toxic spills, chemical waste) that pose enormous potential risk if not properly identified. Geologic mapping at

1:24,000-scale and compilation at 1:100,000-scale is continuing. Geologic maps produced by the project form the geologic data base for assessment of economic risk assessment in the San Francisco Bay Area conducted by the CESIR project (see Element 2.7).

Products for FY 1997:

Completion of the geologic (GIS) 100,000 scale San Jose Map sheet. Digitize the Mt. Diablo 7.5 minute quadrangle. Digitize the Laurel, Loma Prieta, Santa Teresa Hills, Los Gatos, and Mt. Madonna 7.5 minute quadrangles. Digitize the Contra Costa and Alameda count map quadrangles. Digitize the Monterey 7.5 minute quadrangle. Numerous other reports with accompanying maps on a wide variety of topics in the Bay area will be produced.

### **Las Vegas Urban Corridor Geologic Mapping Project**

Project Chief: Gary Dixon (702) 897-4032

The primary project objective is to determine the geologic, geophysical, and hydrologic history of Las Vegas Valley, which is being commercially developed at the rate of one square mile every three months. Las Vegas is the fastest growing city in the U.S., and Clark County is the fastest growing county. This objective will be achieved through the systematic production of general-purpose 1:24,000 and 1:100,000-scale geologic maps that will provide a uniform data base. Primary issues include: 1) Mapping the aerial distribution of permeable strata and fracture zones and effects on the migration of ground and surface water, and on pollution plumes in these waters. 2) Mapping, geophysical surveys, and hydrologic studies of hazards, such as expansive soils, flooding, subsidence due to ground water withdrawal, landslides and faulting. 3) Providing GIS-based information critical for planning and zoning and communication and outreach to the public through the Lake Mead-Lake Mojave National Recreation Areas. 4) Evaluation of the stratigraphic and structural setting of Las Vegas basin to determine ground water, petroleum, building materials, and mineral resource potential.

Products for FY 1997:

Geologic map of the Littlefield 1:100,000 scale quadrangle; 7.5 minute geologic maps of the Blue Diamond, Arrow Canyon, Flat Top Mexa, Moapa East, Hen Springs, Valley, Overton NW, Overton NE Overton Beach, Gass Peak SW, Tule Springs, Frenchmen Mountain, Devils Throat, Riverside, and Whitney Pocket. Geophysical maps will be

completed in support of the geologic mapping and numerous topical reports on the geology of this area are planned.

### **Western Region National Park Service/USGS Cooperative Project**

Project Chief: Bonnie Murchey (415) 329-4980

This project began with the development of collaborative contacts within National Park Service and with their partners. The Western Region NPS-cooperative project is focusing on four principal projects, which were selected as a result of NPS prioritization of geologic needs of Parks and Monuments. These projects are based at: 1) Grand Canyon National Park; 2) Joshua Tree National Park; 3) Lake Mead Recreation Area; and 4) Golden Gate Recreation Area. Specific goals are categorized as follows: National/Regional activities (web site, bibliographic compilation database, newsletter, curriculum development), Golden Gate (exhibit development, multi-media production, digital geologic and derivative maps), Grand Canyon (exhibit development, digital geologic and derivative maps, TV-geology curriculum programming, training), Joshua Tree (book on Neogene tectonics, curriculum products, WQED TV script on California deserts, digital geologic and derivative maps), Lake Mead (exhibit development, geologic history book, geologic compilation map, boating guide, training, TV project). Additional work is planned for Yosemite (training, mapping), and Northern Cascades (guidebook, archiving) and is based on available Emeritus support. The project is facilitating cross-program collaboration with NPS.

#### **Products for FY 1997:**

Digital geologic compilation maps of the Lake Mead, Golden Gate, and parts of the Grand Canyon 1:100,000 scale will be completed. Derivative maps and cross sections in the Lake Mead and Golden Gate areas will be completed as well as a book on geologic history of Lake Mead. Other outreach products will be completed for parks along the San Andreas Fault as well as Lake Mead and Grand Canyon.

## FY-1996/97 STATEMAP Projects

### **ALABAMA**

State Geologist: James D. Moore (205) 349-2861

Under the STATEMAP Program, the Alabama Geological Survey is doing detailed 7.5 minute quadrangle mapping in northeast Alabama. The quadrangles are the Anniston, Oxford, Munford, and Eulaton. Several critical needs are addressed including protection of groundwater, location of karst topography, mineral resource assessment and remediation issues associated with closing of ammunition site.

### **ALASKA**

State Geologist: Milton A. Wiltse (907) 451-5050

Under the STATEMAP Program, the Alaska Geological Survey is doing detailed 1:63,360-scale geologic mapping in parts of the Rampart and Hot Springs mining district. The mapping of the Tanana B-1 quadrangle is approximately equivalent to four 1:24,000 scale quadrangles. Digital compilation mapping will be done in the McGrath quadrangle at 1:100,000 scale. The purpose of the detailed geologic mapping is to investigate gold, tin, and other mineral occurrences in support of exploitation that will be economically beneficial to the regions and habitants. The digital compilation is important to assessing the mineral resources including oil and gas which is the focus of the proposal.

### **ARIZONA**

State Geologist: Larry D. Fellows (520) 770-3500

Under the STATEMAP Program, the Arizona Geological Survey will be producing both detailed 7.5 minute maps and 1:100,000 scale maps as well as digitizing existing geologic data. The 1:100,000 scale quadrangles to be digitized are the Salome, Little Horn, Phoenix North, and Phoenix South. The new mapping will be done in the Theodore Roosevelt Lake quadrangle at 1:100,000 scale and new mapping in the Morman Flat Dam and Horse Mesa Dam 1:24,000 quadrangles. Several critical needs are addressed by the new mapping including: ground water issues, flood plain planning, selling soils, land-use planning, earthquake faults, subsidence, and landfill siting. An important need for up-to-date digital, standardized geologic map data exists to address many urban problems and urban growth.

## **CALIFORNIA**

State Geologist: James F. Davis (916) 445-1923

Under the STATEMAP Program, the California Department of Conservation is undertaking detailed 1:24,000-scale geologic mapping northeast of the greater Los Angeles metropolitan area and compilation and digitizing in the Long Beach area. The detailed quadrangles are the El Monte, Baldwin Park, and San Dimas. Digital compilation is in the Long Beach 1:100,000 scale quadrangle.

No other place in the United States are so many people confronted with so many geologic hazards and earth science-related problems as in California. High-quality geologic maps are needed to address problems related to socioeconomic issues including geologic hazards in urbanized areas. Geologic hazards in the greater Los Angeles area are the focus of the work. These include earthquakes, landslides, and flooding.

## **COLORADO**

State Geologist: Vicki Cowart (303) 866-2611

Under the STATEMAP Program, the Colorado Geological Survey is concentrating its' efforts in two areas of the State. 7.5 minute quadrangle mapping is being undertaken in the Glenwood Springs and Durango areas. The geologic maps in the Glenwood Springs area are the Dotsero, Carbondale, and the south half of Cottonwood Pass 7.5 minute quadrangles. The Rules Hill 7.5 minute quadrangle will be mapped in the Durango area.

The Glenwood Springs region has experienced rapid development along the Interstate Highway 70 and State Highway 82 corridors. There are known coal, gypsum, limestone construction material, and geothermal resources plus a host of geological hazards and engineering and environmental problems.

The Durango area is experiencing rapid population growth and development. There are substantial oil, natural gas, coalbed methane, and coal resources in the area. Recently water wells and homes near the outcrop of the Fruitland Formation have been contaminated with methane gas prompting La Plata County to define coalbed methane as a potential geological hazard.

## **CONNECTICUT**

State Geologist: Richard C. Hyde (203) 424-7292

Under the STATEMAP Program, the Connecticut Department of Environmental Protection is undertaking both new 7.5 minute geologic mapping and a digital compilation of the Quaternary geology of Connecticut. The Rockville 7.5 minute quadrangle will be completed. Propose to digitize at 1:24,000 scale the Quaternary Geology for all 116 of Connecticut's 7.5 minute quadrangle and submit them for inclusion in the National Digital Geologic Map Database.

Mapping of crystalline bedrock and fault zones in the Rockville Quadrangle will greatly enhance the understanding of ground water resources. State and Federal agencies, researchers, municipalities, educators, and consultants can all benefit from the availability of digital Quaternary geologic information. This data base can be used as a predictive tool when trying to understand the stratified drift deposits that fill the State's valleys, where our population centers, aquifers, and sand and gravel resources all coincide.

## **FLORIDA**

State Geologist: Walter Schmidt (904) 488-4191

Under the STATEMAP Program, the Florida Geological Survey is doing bedrock and surficial geologic mapping of the Sarasota 1:100,000 scale quadrangle in the western part of the State. Rapid population growth in west-central Florida has impacted the environmental quality of the Sarasota quadrangle region. Infrastructure demands on solid-earth resources in the region continually give rise to urban geology issues such as the need for aggregates, pipeline, and transportation corridors and drinking water supplies. Urban development also requires knowledge of detailed surficial geology in order to characterize the lithology of the vadose zone within the surficial aquifer system. This geologic information, coupled with core data (i.e., cross sections herein proposed) will provide an improved understanding of potential geohazards such as flooding, sinkhole events, and human-induced aquifer contamination.

## **KENTUCKY**

State Geologist: Donald C. Haney (606) 257-1147

Under the STATEMAP Program, the Kentucky Geological Survey is generating 1:100,000-scale geologic maps from compilation and digitizing of existing 1:24,000-scale geologic maps in the Kentucky River Basin. The Hazard 1:100,000 quadrangle will be completed in the first year.

The Kentucky River Basin has a wide variety of land use and some of the most intensive mining, logging, and oil and gas drilling in the U.S. The digitizing of 7.5-minute geologic quadrangles and the generation of 1:100,000 geologic quads for this area will provide the basis for analyses of geology, land use, mineral development, environmental geology, and hydrogeology.

## **IDAHO**

State Geologist: Earl H. Bennett (208) 885-7991

Under the STATEMAP Program, the Idaho Geological Survey is mapping three 7.5-minute quadrangles and portions of five others and is compiling digitally three 1:100,000 scale geologic maps. Will complete the 1:24,000-scale surficial geologic maps for the following quadrangles in the three project areas: Buhl, Pocatello North, Rathdrum, southern portions of the Liberty Lake and Newman Lake. Compilation of 1:100,000 scale Pocatello, Lake Walcott, & Twin Falls quadrangles will be completed.

The bedrock and surficial 7.5-minute geologic maps are centered on Idaho's urban areas and will be used by city and county planners, construction and geotechnical companies, and the general public as construction related to rapid growth places greater demands on the natural resources of the area.

The digital mapping is part of an effort to develop a digital geologic map database for the State of Idaho. By law, the Idaho Geological Survey is the lead State agency for the collection, interpretation, and dissemination of all geologic and minerals data for Idaho. As the compilation process progresses, this expertise will be fully utilized in editing the maps and in resolving stratigraphic and map interpretation problems.

## **IOWA**

State Geologist: Donald L. Koch (319) 335-2754

Under the STATEMAP Program, the Iowa Geological Survey is undertaking detailed 1:24,000 geologic mapping and compilation geologic mapping. The detailed mapping is in the Bertram quadrangle. The compilation map will be titled Bedrock Geology of Northwest Iowa and will be at the 1:250,000 scale.

The detailed maps will address critical urban needs associated with growth in the Cedar Rapids area including water quality, karst hazards, flooding, well head protection, and waste disposal. The county-wide geologic map database will provide digital GIS to assist in the analysis of water and mineral resources, protection and utilization of sensitive land use areas, and environmental protection.

## **ILLINOIS**

State Geologist :            William W. Shiels            (217) 333-5111

Under the STATEMAP Program, the Illinois Geological Survey is doing detailed 7.5-minute scale geologic mapping in several areas of the State and 1:100,000-scale geologic compilation.

The 7.5-minute detailed geologic mapping addresses a host of State needs including: evaluation of possible occurrence of Quaternary faulting, wetland protection, ground water studies, and sand, gravel, and limestone resource potential.

Digital geologic map compilations of Henry and Whiteside Counties are needed to address concerns about ground water resources for irrigation and slope stability in thick loess deposits. Additionally, the location of sand and gravel deposits to be used as building materials will be located.

## **INDIANA**

State Geologist:            Norman C. Hester (812) 855-5067

Under the STATEMAP Program, the Indiana Geological Survey is preparing a digital compilation geologic map in Allen County and is doing detailed glacial terrain geologic mapping in LaGrange County and in the Evansville metropolitan area. 7.5-minute glacial terrain maps of the Shipshewana, Topeka, Millersburg, Middlebury, and the Indiana portion of the Sturgis quadrangles.

Although numerous specific needs are addressed by the detailed mapping some of the most important are ground water contamination, landfill siting, and earthquake hazards. The compilation and GIS to be produced are important chiefly for ground water issues related to urban planning.

## **KANSAS**

State Geologist:            Lee C. Gerhard (913) 864-3965

Under the STATEMAP Program, the Kansas Geological Survey is performing detailed 7.5-minute geologic mapping in Hamilton, Kearny, Comanche, Greenwood and Bourbon Counties. Several issues important to the State are being addressed. These include oil and gas production, economically important gypsum deposits, and coal and limestone resources. Potential problems with water quality from the use of agricultural chemicals makes the availability of high quality geologic maps important.

## **LOUISIANA**

State Geologist: William E. Marsalis (504) 388-5320

Under the STATEMAP Program, the Louisiana Geological Survey is preparing 1:100,000 scale geologic maps in the southern part of the State. This includes both new mapping and digital compilation. The new mapping at 1:100,000 scale includes the Louisiana portions of the Lake Charles, Bogalusa, and Gulfport quadrangles and the complete quads of the Crowley, Amite, and Ponchatoula quads. The digital compilation map is of the Ville Platte 1:100,000 quadrangle.

Part of the proposed investigation is considered economically and socially vital because the coastwise Prairie terraces have been a favored setting for the siting of solid-waste repositories in recent years. Additionally, the investigations will provide geologic information for a large portion of the Louisiana coastal zone.

## **MAINE**

State Geologist: Robert G. Marvinney (207) 289-2801

Under the STATEMAP Program, the Maine Geological Survey surficial geologic maps will be produced in Cumberland and York County and a digital geologic map at 1:100,000 scale of the Portland area will be completed. The 7.5-minute maps are Cumberland Center, Gorham, North Windham, and Standish quadrangles.

The mapping will provide essential geologic data for ongoing Maine Geological Survey (MGS) bedrock ground water characterization studies, an ongoing multi-agency investigation of arsenic in ground water, and an MGS study of the distribution and associations of radon in ground water.

Detailed mapping of surficial deposits in the study area provide data needed for a variety of land-use planning applications. These include:

- Location of safe, well-drained building sites;
- Discovery and inventory of sand and gravel resources;
- Protection of aquifers and wetlands;
- Siting of landfills, leach fields, and other waster-disposal systems;
- Determination of areas vulnerable to shoreline erosion;
- Avoidance of flood hazards.

## **MICHIGAN**

State Geologist: R. Thomas Segall (517) 334-6907

Under the STATEMAP Program, Michigan Geological Survey is producing a surficial geologic map of Kent County and a geologic map of St. Joseph's County. The St. Joseph's 7.5-minute maps include the Sturgis, Klinger, and Burr Oak quadrangles. The Kent County 7.5-minute maps include Cutterville, Caledonia, Alto, Cascade, Grand Rapids East, and Grand Rapids West. Detailed 7.5 minute mapping will also be done in Calhoun County. In St. Joseph's County the potential uses of the mapping include: (1) future management of agrichemicals in vulnerable areas; (2) delineation of aquifers and aquitards in the glacial drift; (3) wellhead protection programs for water supply well; (4) location of sand and gravel resources; and (5) geologic data for future urban and rural planning projects.

In Kent County the geologic maps are important to determine aquifer thickness and extent, range of transmissivities, and sensitivity to surface and near surface derived contaminants.

## **MINNESOTA**

State Geologist: David L. Southwick (612) 627-4780

Under the STATEMAP Program, the Minnesota Geological Survey is producing both detailed and regional scale Quaternary geologic maps. The detailed map is the 7.5-minute Shakopee quadrangle. Digital compilation will lead to the production of the Anoka quadrangle at 1:100,000 scale.

The Shakopee quadrangle is in a rapidly growing out suburban area southwest of Minneapolis. Although the Quaternary geology of much of the quadrangle has been mapped at scale 1:100,000, additional detail is required to cope with pressing land-use issues including well-head protection, septic-system regulation, open-space set-asides, the protection of sand and gravel resources, and flood-related zoning concerns. The most pressing geological concern in the urbanizing area northwest of Minneapolis and St. Paul is the susceptibility of the ground water system to pollution. State and local planners and resource managers are aware of the sensitivity problem and of the need for caution in their land-use decisions. The proposed digital map compilation will provide them with a better tool for carrying out their responsibilities.

## **MISSISSIPPI**

State Geologist:                    S. Cragin Knox                    (601) 961-5500

Under the STATEMAP Program, the Mississippi Department of Environmental Quality is focusing its detailed 7.5 minute mapping in the central portion of the State. 7.5 Geologic quadrangle maps to be submitted include Sturgis, Double Springs, Ackerman, Reform, Tomnolen, Kilmchael, Stewart, Poplar Creek, French Camp, Weir, Ethel North, McCool, Ethel Southeast, Highpoint, and Louisville Southwest. Geologic mapping addresses a number of timely applications these include citing a lignite coal strip mine, protecting ground water resources in the area of the strip mine, and refining prospects of additional lignite occurrences nearby. Additionally, important ceramic clay deposits used in the manufacture of bricks will be more clearly defined by the maps.

## **MISSOURI**

State Geologist:                    James H. Williams (314) 368-2101

Under the STATEMAP Program, the Missouri Geological Survey is undertaking detailed 7.5 minute mapping in the Branson area of southwest Missouri. The Shell Knob, Golden, Branson, Hollister, Forsythe, and Mincy 7.5 minute quadrangles will be delivered for this cooperative agreement.

Geologic mapping addresses a critical need for the earth science information in an area of explosive tourist and other urban development near the new country western capital of Branson, Missouri. Southwest Missouri is a setting with rugged wooded hills, clean-water, caves and karst, and large springs. Geologic information must be made available to land-use planners who are responsible for protecting the environment and who must identify mineral resources suitable for meeting the areas of new population needs.

## **MONTANA**

State Geologist:                    John C. Steinmetz                    (406) 496-4180

Under the STATEMAP Program, the Montana Bureau of Mines and Geology is working toward completing a 1:100,000 scale geologic map database for the entire State. Maps produced at 1:100,000 scale are Red Lodge, Big Timer, Roundup, Musselshell, Great Falls North, Great Falls South, Plentywood, and Culbertson. Also produced will be a 1:48,000 special focus map of the Bitterroot Valley. Both compilation of existing data and new mapping are included in their work. As well as developing a much needed state-wide GIS, the 1:100,000-scale compilation digital maps are needed for water

resource work, geologic and seismic hazard mitigation, and mineral and energy resource evaluation. The 1:100,000-scale new maps address a wide range of needs including Land-use planning, metallic and energy minerals, coal resources, swelling clays and seismic hazards.

## **NEBRASKA**

State Geologist: Perry B. Wigley (402) 472-2410

Under the STATEMAP Program, the Nebraska Geological Survey is doing both regional-scale and detailed geologic mapping of four 1:250,000-scale quadrangles will produce the Broken Bow, O'Neill, Alliance, and Valentine geologic maps. The detailed geologic mapping will be focused on urban problems in the Omaha area.

Water quality and urban resource management are the critical socioeconomic needs addressed by the process.

## **NEVADA**

State Geologist: Jonathan G. Price (702) 784-6691

Under the STATEMAP Program, the Nevada Geological Survey is undertaking both 7.5-minute detailed geologic mapping and digital compilation at 1:100,000 scale. The mapping of the seven 7.5-minute quadrangles will be done in three projects: (1) Tuscarora area (Mt. Blitzen and Tuscarora quadrangles), (2) Las Vegas area (Tule Springs Park and Frenchman Mountain quadrangles), and (3) Reno area (Griffith Canyon, Eagle Rock, and Hazen quadrangles).

These projects strike a balance in addressing the major socioeconomic issues of the State, including growth in Las Vegas, Reno, and Carson City, the State's largest urban areas, and mineral development and the environmental impact of mining in northeastern Nevada, one of the world's premier mineral belts. Nevada is currently the fastest growing State in the Nation. Las Vegas is the fastest growing urban area in the U.S., and the Reno-Carson City area is in the top 10%. Detailed geologic maps are needed to plan growth and to avoid the many problems that typically affect areas of rapid growth.

## **NEW HAMPSHIRE**

State Geologist: Eugene L. Boudette (603) 271-3406

Under the STATEMAP Program, the New Hampshire Geological Survey is focused on producing Quaternary surficial geology maps at 1:24,000 scale. The maps produced are: Parker Mountain, Loudoun, Troy, Springfield, Claremont South, Mount Pawtuckaway, Spoford, and Keene.

The mapping addresses important issues including: aggregate reserves, ground water management, transportation engineering, land use planning (including local Conservation Commissions), environmental remediation, radon emanation, and climate change. The titles selected for this proposal are in areas in critical need of geologic data because of the intense population growth there. For the most, part, these areas also contain some of the most significant sand and gravel reserves in the State.

## **NEW JERSEY**

State Geologist: Haig F. Kasabach (609) 292-1185

Under the STATEMAP Program, the New Jersey Geological Survey is producing both detailed surficial and bedrock quadrangles in three areas of the central part of the State. Surficial geology will be done in the Tranquility, Washington, and Blirstown quadrangles and bedrock geology will be mapped in the Raritan, Bound Brook, and Perth Amboy quadrangles.

The mapping projects are in suburban and suburban-fringe regions dependent on local ground water withdrawn from a mix of domestic and community-supply wells. As suburbanization proceeds each area will see increasing demands on the ground water resource. This will spur exploration for new ground water sources, and will heighten concern over the delineation and protection of aquifer recharge areas. Ground water is also threatened by pollution from major and minor contamination sources, which are especially numerous in the area of the proposed bedrock mapping. Other geologic concerns in the project areas that will be addressed by the mapping include the identification of sinkhole and radon hazards; sand, gravel, clay and peat resource assessment; and suitability of surficial materials for the installation of septic systems.

## **NEW MEXICO**

State Geologist: Charles E. Chapin (505) 835-5420

Under the STATEMAP Program, the New Mexico Bureau of Mines has assembled a team of scientists to map 12 quadrangles adjacent to population areas along the Rio Grande watershed between Albuquerque and Taos. The twelve 7.5-minute

quadrangles are: Carson, Taos SW, Ojito Spring, San Ysidro, Jemez Pueblo, Santo Domingo Pueblo Glorieta, Sky Village SE, Alameda, Sedillo, Isleta and Mt. Washington.

Quaternary and Pliocene-age alluvial deposits form most of the exposed basin fill along the Rio Grande between Albuquerque and Taos. These units and underlying Miocene basin fill constitute the major aquifer zones developed for municipal water supplies, as well as sites for landfills and other urban development. Planning for growth, and allocation and protection of groundwater, have become a major social, economic, and scientific issues along the Rio Grande. Several of the quadrangles also contain rocks (Proterozoic to Cenozoic and age) which are the focus of topical, ongoing investigations in rock and mineral resources, structural geology, stratigraphy and sedimentology, basin evolution, and tectonics.

## **NEW YORK**

State Geologist: Robert H. Fakundiny (518) 474-5816

Under the STATEMAP Program, the New York Geological Survey is mapping in rapidly developing suburbs of major metropolitan districts with engineering and ground water problems. The 7.5 minute quadrangles are in Onondaga and Westchester Counties. Bedrock geologic maps are the Otisco Valley, Tully and Mt. Kisco. Surficial geologic maps are the Otisco Valley and Tully. Onondaga County in central New York has been experiencing a number of geologic disasters and environmental problems including: (1) ground water pollution and increases in salinity; (2) mudslides and other types of landslides; (3) unstable walls in quarries, and rock falls from natural cliffs; (4) high levels of radon in basements; (5) diminishing available aggregate and crushed stone products; and (6) floods.

Westchester County contains major transportation corridors, and is rapidly developing area in southeaster New York. Detailed mapping is needed to delineate the engineering characteristic of bedrock units at the 1:24,000 scale.

## **NORTH DAKOTA**

State Geologist: John P. Bluemle (701) 328-4109

Under the STATEMAP Program, the North Dakota Geological Survey will provide 1:24,000-scale multi-purpose geologic maps and technical reports of the Bismarck-Mandan area. Six 7.5 minute quadrangles will be mapped in detail. These are the Harmon, Mandan, Bismarck, Menoken SW, Schmidt, and Sugarloaf Butte quadrangles.

The resulting maps will be used to steer development away from areas of potential economic minerals and from natural and manmade hazards. Large quantities of

minable sand and gravel are present in terrace deposits just south of Bismarck. Potential geologic and manmade hazards in the area include at least three abandoned garbage dumps and three operating sanitary landfills, an oil refinery, and a coal-fired electric generating plant, several large landslides in areas of unstable slopes along the Missouri River trench, flood and erosion prone areas, and potential increased radon concentrations in areas overlain by till.

Additional objectives of this project are to:

- \* Educate land developers, city planners and engineers, and sand and gravel operators as to areas geologically suited for development.
- \* Educate the general public on the geologic features and hazards of the Bismarck-Mandan area as well as developing limitations.

## **NORTH CAROLINA**

State Geologist: Charles H. Gardner (919) 733-3833

Under the STATEMAP Program, the North Carolina Survey is undertaking detailed 7.5 minute mapping and 1:100,000 scale digital compilation in the Asheville and Raleigh areas of the State. Bedrock geologic maps for the following 7.5 minute quadrangles are being done; Bunn East, and Bunn West, Clayton, Cokesbury, Knightdale, Middlesex, Rolesville, and Zebulon. This detailed 7.5 minute data that are being compiled at 1:100,000 scale in the Raleigh and Asheville quadrangles.

Geologic mapping is focused on the most rapidly growing parts of the State. The rapid growth has accentuated many geologic-related problems such as land use and infrastructure planning, mineral resource identification (particularly construction aggregates) and environmental assessment and planning, particularly related to highway construction, waste disposal siting and ground water conservation and development. An adequate understanding of the geology and mineral resources is needed to help resolve these problems.

## **OHIO**

State Geologist: Thomas M. Berg (614) 265-6988

Under the STATEMAP Program, the Ohio Geological Survey is completing a new geologic map of the entire State. This year digitization of bedrock geology of 164 7.5-minute quadrangles in central Ohio will be completed. These maps are then used in the final 1:100,000 scale map.

The basic geologic database will be used to evaluate slope stability, areas of proposed solid waste facilities, evaluation of oil and gas resources, identification of low level

radioactive waste sites, and for construction and maintenance programs of transportation infrastructure.

## **OKLAHOMA**

State Geologist: Charles J. Mankin (405) 325-3031

Under the STATEMAP Program, the Oklahoma Geological Survey is doing detailed 1:24,000 geologic mapping in central Pittsburg County and is producing new 1:100,000 digital maps for the new State geologic map. The 7.5 minute maps are the McAlester and Savannah quadrangles. The compilation maps are the Watonga and Foss Reservoir 1:100,000 geologic map sheets.

The geologic maps will enable the Oklahoma Geologic Survey, other State agencies, county and municipal agencies, and private individuals and organizations to evaluate potential for major coal, natural gas, aggregate, building stone, and clay resources; location of, and assessment of hazards from old mines and areas of old gas production; location of springs and significant aquifers in alluvial deposits; identification of landslide-prone formations.

## **OREGON**

State Geologist: Donald A. Hull (503) 731-4100

Under the STATEMAP Program, the Oregon Department of Geology and Mineral Industries is conducting both detailed 7.5-minute mapping and digitizing and compiling at 1:100,000 scale. Detailed geologic maps are being done of the Medford, LeGrande, and Eugene quadrangles. Digital compilation maps to be completed are the Vale, Mahogany Mountain, and Bend quadrangles.

Numerous critical needs are addressed by the 7.5-minute mapping including groundwater, seismicity, slope suitability, mineral resources, ecosystem management, and urban planning. Natural resource management and land-use planning are the chief issues addressed by the 1:100,000 scale map compilation.

## **PENNSYLVANIA**

State Geologist: Donald M. Hoskins (717) 787-2169

Under the STATEMAP Program, the Pennsylvania Geological Survey is planning a three-year project of the surficial geology of the Scranton 1:100,000 quadrangle. For this quadrangle 7.5-minute data will be revised and digitally compiled. Additionally, the Survey will conduct detailed geologic mapping in the central part of the Wyoming-Lackawanna Valley. For FY 1997, the 1:24,000-scale bedrock geologic map of the Olyphant quadrangle is the deliverable.

Important environmental issues addressed by the mapping in these areas are groundwater quantity and quality and suitability of surficial materials for septic disposal. Major surficial mineral resources are sand and gravel and peat. The Wyoming-Lackawanna Valley is one of the major metropolitan areas of the commonwealth, with a total population of more than 300,000 people. Solid-waste disposal is the major environmental issue related to surficial geology in the Valley. Also, up-to-date bedrock mapping is vital to combating the numerous environmental problems that plague the area, e.g., deep-mine subsidence and ground water contamination.

## **SOUTH CAROLINA**

State Geologist: William Clendenin (803) 896-7700

Under the STATEMAP Program, the South Carolina Geological Survey is doing detailed geologic mapping in the Greenville-Spartanburg area and in the Upper Lake Marion area, South Carolina. The quadrangles being mapped are: Pelham, Paris Mountain, Tigerville, Greer, Inman, Valley Falls, Wellford, Reidville, Lone Star, Saint Matthews, Fort Motte, Pinewood, St. Paul, and Elloree.

Ground water contamination and hazardous and solid-waste landfills are the two issues addressed by the mapping. These are in an area of population growth and increasing tourism. Detailed mapping of these areas will provide a modern understanding of sedimentology, stratigraphy, petrology, hydrogeology, and structural geology. This information will establish a foundation that address a number of the socioeconomic needs and accommodates the 1995 Act of Local Planning Organizations.

## **TENNESSEE**

State Geologist: Edward T. "Ned" Luther (615) 532-1500

Under the STATEMAP Program, the Tennessee Division of Geology is undertaking detailed 7.5 minute mapping of the Lenoir City quadrangle. The major focus of the mapping is to provide geologic data in an urban area where an EPA Superfund site occurs and where leaking underground storage tanks have been documented.

## **TEXAS**

State Geologist: Noel Tyler (512) 471-7721

Under the STATEMAP Program, the Texas Bureau of Economic Geology will perform geologic mapping of 7.5 minute quadrangles to support responsible development in karst aquifer areas undergoing rapid urban growth, South-Central Texas. In the West San Antonio corridor, the Bandera, Timber Creek, Tarpley Pass, Twin Hollow, Tarpley, and Texas Mountain quadrangles. In the Austin-Georgetown Corridor, the Round

Rock, Georgetown, Hutto, Weir, Cobbs Cavern, and Jarrell quadrangles. In the Del Rio corridor, the Del Rio Southwest, Del Rio Northwest, and Rough Canyon quadrangles.

The purpose of this mapping project (all three study areas) is to develop geologic base maps that are sufficiently detailed and accurate to meet the needs of a variety of professionals who must respond to the demands placed on the environment and resources of the Central Texas region that is undergoing rapid urban growth. An improved geologic base is needed for studies of recharge and hydraulic flow in the Edwards limestone aquifer, which is crucial to the economic wellbeing of the region and is also critical for responsible urban development and construction needs.

## **UTAH**

State Geologist: M. Lee Allison (801) 467-7970

Under the STATEMAP Program, the Utah Geological Survey will compile existing mapping of three 1:100,000-scale quadrangles and will be performing new geologic mapping in both 7.5-minute quadrangles and 1:100,000-scale quadrangles. The 1:100,000-scale quadrangles are the Smoky Mountain, Delta, and LaSalle. The detailed geologic mapping is in the Harrisburg Junction, White Hills, and Spanish Fork 7.5-minute quadrangles. Additionally, new mapping in the Ogden 1:100,000 sheet will also be done.

The mapping on this project addresses numerous socioeconomic issues, some of these include: the impact of coal mining near recreation and wilderness areas; economic interest in petroleum, salt, metals, and gravel; and impact of recreational areas on vulnerable archaeological features and endangered flora and fauna. Also, the geologic map data will be used to evaluate earthquake, slope failure, problem soils, and threatened groundwater resources.

## **VERMONT**

State Geologist: Laurence R. Becker (802) 241-3499

Under the STATEMAP Program, the Vermont Geological Survey is undertaking both reconnaissance and detailed 7.5 minute bedrock geologic mapping as part of a multi-year project to produce a new Vermont State geologic map.

As development pressures increase because of expanding population from urban centers, accurate and up-to-date geologic information will be necessary in the surrounding communities to understand and react to natural resource and environmental issues. This has immediate relevance for short-term development, as the geological function of locating water supplies, arranging waste disposal, and

understanding the effects of contamination will all affect land use. Geological research helps to locate the source of groundwater and earth materials upon which ecosystems are based, as well as to understand the soil that supports agricultural production.

## **VIRGINIA**

State Geologist: Stan Johnson (804) 293-5121

Under the STATEMAP Program, the Virginia Department of Mines, Minerals, and Energy is doing digital mapping and compilation in the southwest Virginia coal fields. The deliverables for this year's part of the project are the Virginia part of the Pikeville 1:100,000-scale quadrangle, and the coal-bearing portions of the Bluefield, Middlesboro, and Bristol 1:100,000 quadrangles.

With all of the data available for the southwest Virginia Coalfield, DMR is now in an excellent position to prepare digital geologic and other maps that will aid in the analysis of the problems related to mineral resources, economic development, and the environment. The mine maps and geologic maps can be used to greatly facilitate the disposition of problems regarding subsidence, landslides, and groundwater.

## **WASHINGTON**

State Geologist: Raymond Lasmanis (360) 902-1450

Under the STATEMAP Program, the Washington Geological Survey is undertaking both detailed 7.5 minute mapping and 1:100,000 scale geologic map compilation. The 7.5 minute maps are the Deming, Kendall, and Mead quadrangles. The 1:100,000 digital maps are: Astoria, Centralia, Chehalis River, Ilwaco, Mount Baker, Mount St. Helens, Port Townsend, Priest Rapids, Richland, Sauk River, Seattle Skykomish River, Snoqualmie Pass, Spokane, Tacoma (south half), Vancouver, and Westport.

The detailed geologic mapping will address critical needs that are associated with important land-use decisions regarding landslides, earthquake hazards, ground water supply, and mineral potential. Indian land-use is also an issue. The 1:100,000 scale digital maps are extremely useful in slope stability analysis, ecosystem management, watershed analysis, pollution evaluations, geohazard prediction, mineral exploration and archaeological evaluations.

## **WEST VIRGINIA**

State Geologist: Larry Woodfork (304) 594-2331

Under the STATEMAP Program, the West Virginia Geological Survey is doing both detailed 7.5-minute quadrangle mapping and digital compilation of existing data at both

1:100,000- and 1:24,000-scale mapping. The detailed mapping is of the Blackbird Knob, and parts of the Great Cacapon, Belle Grove, Paw Paw, and Artemus quadrangles. Digital compilation is in the Hagerstown and Frederick 1:100,000 sheets with specific 7.5-minute maps of Hedgesville, Martinsburg, Middle Way, Berryville, Williamsport, Sheperdstown, Charlestown, Round Hill, Keedysville, and Harpers Ferry.

Critical needs addressed by the detailed mapping include evaluation of construction sites, location of water wells, well head protection, landfill siting, gas exploration and aggregate resources. Critical needs addressed by the map compilations include karst hazards and ground water contamination from numerous sources.

## **WISCONSIN**

State Geologist:                James M. Robertson        (608) 262-1705

Under the STATEMAP Program, the Wisconsin Geological Survey will be conducting detailed Quaternary geologic mapping in Manitowoc County with the ultimate goal of producing a 1:100,000-scale surficial geologic map. The detailed maps are specifically the Manitowoc County parts of Minitowoc, Cleveland West, Cleveland East, School Hill, Kiel, Potter, Valders, and Clarks Mills will be completed and submitted first.

The mapping will be used: (1) to improve our understanding of the late glacial and Holocene history of the Lake Michigan basin, (2) to provide a sound stratigraphic framework for understanding the 3-dimensional distribution of Quaternary deposits (3) to provide the county with this three-dimensional distribution of deposits and associated hydrogeologic and engineering properties to aid in location of on-site waste disposal systems, landfill sites, and identification of groundwater recharge areas, (4) to provide a map showing the availability of sand and gravel resources, (5) to provide a framework for a future groundwater study, (6) and to provide more information for a planned interpretive center at Two Creeks, a part of Wisconsin's Ice Age Scientific Reserve.

## **WYOMING**

State Geologist:    Gary B. Glass        (307) 766-2286

Under the STATEMAP Program, the Wyoming Geological Survey is mapping in the Guemsey 1:24,000-scale quadrangle. The detailed geologic mapping in this quadrangle will be useful in assessing industrial and metallic mineral potential and large deposits of Precambrian marble and granite suitable for decorative stone. Additionally, the maps will be useful in showing large hematitic iron deposits and chemical grade limestone.

## **FY-1996/97 EDMAP PROJECTS**

### **ARIZONA STATE UNIVERSITY**

Professor: Steven J. Reynolds (602) 965-9049

Under the EDMAP Program, the Arizona State University will produce both Quaternary and bedrock geologic maps at 1:24,000 scale. Bedrock and surficial mapping will be focused on the White Tank Mountains.

The White Tank Mountains contain an important and not fully studied record of the Proterozoic and Cretaceous-Tertiary geologic history of central Arizona located near the rapidly growing Phoenix metropolitan region. The purposes and goals of the bedrock and Quaternary geologic mapping are naturally different, but the two studies will together provide a 1:24,000 geologic map of the entire range and its piedmont.

### **AUBURN UNIVERSITY**

Professor: Mark Steltenpohl (334) 844-4282

Under the EDMAP Program, the Auburn University will be conducting geologic mapping in the 1:24,000 scale Choccolocco Quadrangle in northeast Alabama. The Choccolocco Quadrangle borders the Anniston Quadrangle to the east presently being mapped under the USGS STATEMAP Program.

The socioeconomic importance of this work includes: mapping karst features, helping delineate possible contamination of ground water, supplying data to planners coping with rapid urban expansion, providing data to the Army to help in Fort McClellan closing. Scientifically this work will address fault-related tectonostratigraphy, CSD delineation, décollement geology and petrology of rift and drift sediments.

### **COLORADO SCHOOL OF MINES**

Professor: Roger M. Slatt (303) 273-3817

Under the EDMAP Program, the Colorado School of Mines is undertaking geologic mapping along the I-70 corridor, Eagle, Garfield, and Pitkin Counties. This mapping is well coordinated with quadrangle mapping along the I-70 corridor being carried out by the Colorado State Survey under the USGS STATEMAP Program.

The purpose of the geologic mapping is the delineation of geologic hazards and processes that impact development along the I-70 corridor. Slope stability is a major concern in this area. Landslides, debris flows and rock falls are common and the geologic maps will aid the Colorado Department of Transportation in their statewide

inventory of potential landslide and rock fall areas and in the maintenance and reconstruction of roads.

### **DUKE UNIVERSITY**

Professor: Peter E. Malin (919) 681-8889

Under the EDMAP Program, the Duke University will produce a detailed 7.5 minute geologic map in east-central North Carolina in the southern Durham basin. The New Hill quadrangle is entirely underlain by Triassic-age, clastic sedimentary rocks of the Chatham Group.

Geologic mapping in this area is needed for land use and infrastructure planning; mineral resource identification (specifically clay resources); environmental assessment and planning; waste disposal siting; and ground-water use, conservation, and contamination.

### **EAST CAROLINA UNIVERSITY**

Professor: David P. Lawrence (919) 328-6360

Under the EDMAP Program, the East Carolina University will produce a detailed 7.5 minute geologic map in a complexly deformed area near Greenville, SC. The Pelzer, SC, quadrangle will be mapped as part of a Master's research project.

The region is one of rapid population growth, suburban to the city of Greenville, SC. The area is a transportation corridor (Interstate 85, State Highways 20 and 25, and two railroad lines). Because of this development there is a need of accurate, detailed geologic maps that will aid in land use planning, evaluation of radon risk, determination of seismic risk, location of rock and sand for construction, and the maintenance of potable surface and ground water.

### **FLORIDA STATE UNIVERSITY**

Professor: James F. Tull (904) 644-1448

Under the EDMAP Program, the Florida State University is undertaking a comprehensive multi-student geologic mapping program at 7.5-minute scale. Geologic mapping will be focused on the southern Appalachian Blue Ridge-Talladega belt, Alabama and Georgia.

The mapping will achieve the detailed understanding of regional structural geology, structural evolution, stratigraphy, metamorphism, and tectonic history. Additional socioeconomic benefits to the greater Atlanta area include ground water quality and

quantity issues, slope stability problems associated with development, landfill and septic system siting, and potential for mineral resources.

### **IDAHO STATE UNIVERSITY**

Professor: David W. Rodgers (208) 236-3365

Under the EDMAP Program, the Idaho State University has selected the Inkom 7.5-minute quadrangle as a high priority. This quadrangle is within the Pocatello 1:100,000-scale map that has been chosen by the Idaho State Geological Survey for its USGS STATEMAP focus. The Inkom quadrangle contains type sections of several Late Proterozoic formations as well as structures that formed during Mesozoic thrusting and Cenozoic extension. Mapping will identify the geometry and kinematics of Mesozoic and Cenozoic deformation and characterize the age and distribution of Cenozoic sediments in the valleys in order to better understand the dynamics of the Portneuf Valley aquifer, the sole source of water for the city of Pocatello.

### **ILLINOIS STATE UNIVERSITY**

Professor: Robert Nelson (309) 438-5694

Under the EDMAP Program, the Illinois State University will produce a detailed bedrock and surficial geologic map of the Peoria West 7.5 minute quadrangle. The project is focused in central Illinois and is coordinated with the USGS STATEMAP Program funded Peoria County mapping project of the Illinois Survey.

Peoria and surrounding communities are undergoing population growth and urban expansion into an area where there are significant environmental considerations. The maps will address ground water quality and quantity, slope stability, and land use planning.

### **INDIANA UNIVERSITY**

Professor: Lee Suttner (812) 855-3848

Under the EDMAP Program, the Indiana University is conducting both bedrock and surficial geologic mapping focused on the stratigraphic relationships within Cenozoic deposits. Parts of the Harrison and Maltbys Mound 7.5 minute quadrangles Madison County, Montana will be completed.

The study of the Cenozoic units will reveal important sedimentation patterns and subsurface geometries, that will provide a vital database for a hydrologic study of the

Willow Creek watershed. Interpretations of Cenozoic deposits in the Willow Creek watershed will also provide data for environmental assessment, especially those concentrating on ground water flow.

## **UNIVERSITY OF IOWA**

Professor James E. Faulds (319) 335-1097

Under the EDMAP Program, the University of Iowa will undertake detailed geologic mapping in the Grand Wash fault zone in the southern White Hills and northern Cerbat Mountains, northwestern Arizona and in the southern Eldorado and northern Newberry Mountains of southern Nevada. In Nevada, the Ireteba Peaks and the majority of the Nelson southwest 7.5-minute quadrangles will be mapped. In Arizona parts of the Mount Tipton Northwest, White Hills East, and White Hills West quadrangles will be mapped.

The investigations of the Grand Wash fault zone in northwestern Arizona will have important societal implications for seismic hazard assessment and evaluation of fresh ground water supplies. The project in the southern Eldorado Mountains also has important implications for assessing seismic hazards. This work is also closely tied to the USGS Las Vegas mapping project.

## **UNIVERSITY OF KENTUCKY**

Professor: William A. Thomas (606) 257-6222

Under the EDMAP Program, the University of Kentucky will undertake detailed geologic mapping in the Appalachian thrust belt in northwestern Georgia. The 7.5-minute quadrangles mapped for this project will be the southwest part of the Rocky Mountain quadrangle and the southeast part of the Chattoogaville quadrangle in Floyd and Chattooga Counties, Georgia.

This project will address both important socioeconomic and scientific issues. This study will map a fractured chert aquifer that is important for understanding contamination problems in this important water source. Scientifically the work focuses on a long standing tectonic problem on the genesis of bends in strike along Valley and Ridge thrust-and-fold belts.

## **LOUISIANA STATE UNIVERSITY**

Professor: Judith Schiebout (504) 388-2717

Under the EDMAP Program, the Louisiana State University will undertake detailed geologic mapping of Tertiary and Quaternary rocks in the Vernon Parish, western

Louisiana. Mapping will include the Fort Polk 7.5 minute quadrangle and parts of the Bird Creek and Slagle quadrangles.

The socioeconomic value of the proposed work is in providing reliable, current, basic geologic data for a region under heavy use by the U.S. Army. Specifically, there is a need to identify more precisely the aquifer recharge areas in the Miocene and Quaternary deposits. Another goal is to locate where faults are found at the surface.

#### **UNIVERSITY OF MASSACHUSETTS**

Professor: Peter Robinson (413) 545-2593

Under the EDMAP Program, the University of Massachusetts will produce detailed geologic maps of the Leverett area on the east side of the Mesozoic Connecticut Valley border fault, west-central Massachusetts. The 7.5 minute quadrangles to be completed on this project are the Mount Toby and Shutesbury quadrangles.

The purpose and justification for this project includes unraveling the details of tectonics and metamorphism, providing needed geologic information for a new State map of Massachusetts and to provide the geologic foundation for a new proposed field laboratory near the university. Additional socioeconomic issues to be addressed include ground water quality, identifying sources of natural pollution such as radon, lead, iron and sulfur and siting of septic systems and sewage disposal works.

#### **MICHIGAN STATE UNIVERSITY**

Professor: Graham Larson (517) 353-9485

Under the EDMAP Program, Michigan State University will be mapping surficial geology of the Allendale Delta in southeastern Ottawa County, Michigan. The quadrangles to be mapped included Allendale, Grandville, and the Hudsonville East and Hudsonville West quadrangles.

The purpose for this mapping is to document the development of the delta into glacial Lake Chicago, and to determine the elevation of stages of glacial Lake Chicago from beaches developed on and adjacent to the delta, and from the internal structure and morphology of the delta itself. Additionally, because the proposed mapping lies close to Grand Rapids which is presently experiencing rapid urbanization, the geologic data will be invaluable to State, county and local agencies responsible for citing landfills and directing clean-ups of contaminated soil and ground water.

## **MONTANA TECH UNIVERSITY**

Professor: Diane Wolfgram (406) 496-4353

Under the EDMAP Program, the Montana Tech University will undertake detailed geologic mapping of the Elkhorn Volcanics, southern Bull Mountain area, Jefferson County, Montana. Portions of the Doherty Mountain and Black Butte 7.5-minute quadrangles will be completed for this study.

The proposed project area is located due north of the Golden Sunlight gold mine, whose ore bodies are localized in a breccia pipe related to the Elkhorn Mountains Volcanics. Two unexplored breccia pipes are known to exist in the project area and more may be present. The Montana Bureau of Mines and Geology has determined that the proposed project integrates with the needs of the Montana State Map, as determined by its Advisory Committee. An objective of that program is to provide detailed geologic maps of areas of possible significant economic resources. Such information needs to be publicly available for long-range planning in the public sector.

## **UNIVERSITY OF NEVADA-LAS VEGAS**

Professor: David Weide (702) 895-3118

Under the EDMAP Program, the University of Nevada-Las Vegas will be mapping immediately north of Las Vegas, Nevada in the Gas Peak Southwest 7.5 minute quadrangle.

This quadrangle is important because the area will ultimately be urbanized as part of the rapid growth of Las Vegas. Local planners will use the map to identify potential geologic hazards from floods, neotectonic faults, swelling soils, and areas of subsidence.

## **NEW MEXICO INSTITUTE OF TECHNOLOGY**

Professor: Bruce Harrison (505) 835-5864

Under the EDMAP Program, the New Mexico Institute of Technology proposes to undertake detailed geologic mapping within the Rio Grande Watershed southwestern end of the Albuquerque Basin. The two 7.5 minute quadrangles to be mapped are the Sky Village Southeast quadrangle and the La Joya northwest quadrangle.

The Sky Village SE quadrangle is located on the western margin of the fastest growing urban area in New Mexico. In order to plan for this urbanization it is necessary to understand both the hydrologic and seismic framework of the area. Superb exposures of both the main aquifers of the Albuquerque Basin and the main fault bounding the

basin offer an unprecedented opportunity to investigate the interaction between faults in poorly consolidated sediments and fluid flow. The La Joya NW quadrangle is located near one of the most seismically active areas in New Mexico. The high rate of seismic activity and the unusual geomorphic landscape in this area suggest that the rate and style of deformation are unique.

#### **UNIVERSITY OF NEW MEXICO**

Professor: Karl E. Karlstrom (505) 277-4346

Under the EDMAP Program, the University of New Mexico will undertake detailed geologic mapping in the Albuquerque Basin as part of USGS-STATEMAP interdisciplinary effort. Three quadrangles include the Ojito Springs, Gilman, and Mt. Washington 7.5 minute maps.

The area of this study is one of the most rapidly growing urban areas in the Southwest and the project's overall goal is to provide a new detailed mapping (in digital form) that will aid in city planning, hydrologic studies, environmental studies, and evaluation of seismic hazards, as well as to simultaneously address scientific and educational goals.

#### **STATE UNIVERSITY OF NEW YORK AT BUFFALO**

Professor: Robert Jacobe (716) 645-2977

Under the EDMAP Program, the State University of New York at Buffalo is conducting detailed geological mapping of a seismically active intracontinental fault zone, western, New York State. The 7.5-minute quadrangles to be mapped are Rawson, Freedom, and Pike.

Several important issues are addressed by the detailed mapping. These include: 1) delineation of a seismically active fault zone, 2) characterization of potential low level radioactive waste sites, 3) aiding in the evaluation of oil and gas potential, and 4) providing data for potential gas storage areas.

#### **UNIVERSITY OF NORTH DAKOTA**

Professor: John Reid (701) 777-2131

Under the EDMAP Program, the University of North Dakota will undertake Quaternary geologic mapping in the Bismarck-Mandan area in south-central North Dakota. The detailed mapping will be in the Linwood 7.5 minute quadrangle and this data will be combined with existing maps in the surrounding Bismarck area.

The geologic mapping will be used to aid in minimizing development in areas of

potential economic minerals as well as natural and man-made hazards. The targets include large quantities of minable sand and gravel in terrace deposits. Additionally, geologic data is needed in the evaluation of three abandoned garbage dumps, three operating sanitary landfills, an oil refinery, and a coal-fired electric generating plant.

### **UNIVERSITY OF OKLAHOMA**

Professor: M. Charles Gilbert (405) 325-3253

Under the EDMAP Program, the University of Oklahoma will produce two maps of 1:12,000 scale in an area of the Wichita Mountains of southwestern Oklahoma. The Mount Scott Granite will be mapped in the Cut Throat Gap area and in the eastern Wichita Wildlife Refuge.

The mapping will be focused on two problems, better definition of fracture aquifers in the Mount Scott Granite and better definition of textural changes and clarification of relative age relationships.

### **UNIVERSITY OF OREGON**

Professor: Ray Weldon, II (541) 346-4584

Under the EDMAP Program, the University of Oregon is undertaking detailed geologic mapping in Los Angeles, Riverside, and San Bernardino counties. Two quadrangles along different segments of the San Andreas fault will be mapped, the Mecca Hills and Mescal Creek 7.5 minute quadrangles.

This work is very important and the link between science and society is close. Obviously, trying to unravel the San Andreas fault history has impact on millions of citizens. Furthermore, the science of working out the complex fault tectonics is some of the most challenging structural geology known! This project is coordinated with the USGS Southern California Aerial Mapping Program (SCAMP).

### **SAN DIEGO STATE UNIVERSITY**

Professor: Phil Kern (619) 594-4930

Under the EDMAP Program, the San Diego State University will be producing a Quaternary geologic map in coastal San Diego County. The Quaternary mapping at 7.5 minute scale is the National City 7.5 minute quadrangle.

In the study area the Quaternary shorelines and associated geomorphic and stratigraphic features are deformed in the National City quadrangle by numerous faults in the La Nacion fault zone. Mapping of this quadrangle thus will also provide valuable

information bearing on documentation of earthquake hazard in metropolitan San Diego, as has mapping of adjacent quadrangles in the Rose Canyon fault zone.

### **UNIVERSITY OF SOUTH CAROLINA**

Professor: Donald Secor (803) 777-4516

Under the EDMAP Program, the University of South Carolina will do detailed geologic mapping in Cherokee County northwestern South Carolina. The Gaffney 7.5 minute quadrangle is along Interstate 85 which connects Atlanta, Georgia, and Charlotte, North Carolina and has become the locus of one of the fastest growing areas in the southeastern United States.

Understanding the geology in this study area becomes paramount: 1) because of the location of a newly proposed gas pipeline; 2) because of the potential interrelationships between pollution related to solid waste disposal, surface recharge, and groundwater flow and discharge; and 3) because of the need to ensure natural resources for the future.

### **SOUTHERN ILLINOIS UNIVERSITY**

Professor: James Staub (618) 453-7366

Under the EDMAP Program, the Southern Illinois University will produce a detailed 1:12,000 scale bedrock and surficial geologic map in the Illinois part of the Thebes 7.5 minute quadrangle north of the Mississippi embayment.

The mapping will be used to delineate faults and structural style. Quaternary deposits will be mapped to better understand the current and frequency of neotectonic activity. This geologic map data will be used to determine the frequency of large magnitude earthquakes and seismic risk in the New Madrid seismic zone.

### **UNIVERSITY OF VERMONT**

Professor: Barry Doolan (802) 656-0248

Under the STATEMAP Program, the University of Vermont will produce a detailed 1:12,000 scale geologic map of the Richmond 7.5 minute quadrangle in west-central Vermont. The proposed study is part of the Vermont-USGS cooperative mapping project to produce a new State geologic map. Additionally, many significant tectonic problems will be addressed by the mapping.

## **UNIVERSITY OF WASHINGTON**

Professor:       Derek Booth (206) 543-7923

Under the EDMAP Program, the University of Washington will produce geologic maps of four adjacent quadrangles through the central part of Pierce County, Washington. The 7.5 minute quadrangles to be mapped include: the Tacoma North and Tacoma South, Steilacoom, and Puyallup.

The eastern part of the proposed study area has been identified as the fastest growing part of Pierce County for residential, commercial, and industrial development. The western part of the proposed study area includes several known contamination plumes in the shallow and deep aquifers. Accurate geologic maps and descriptions of the surficial geology and subsurface stratigraphy are essential for resolution of groundwater contamination issues, groundwater protection, and sighting new developments.

## **WEST VIRGINIA UNIVERSITY**

Professor:       J. Steven Kite       (304) 293-5603

Under the EDMAP Program, the West Virginia University will undertake mapping of bedrock and surficial geology of the upper North Fork drainage basin, Monongahela National Forest, Pocahontas County, West Virginia. Portions of the Green Bank, WV, and Hightown, VA-WVA, 7.5 minute quadrangles will be mapped at a scale of 1:12,000.

The general goals of this work are to 1) contribute to the environmental resource database for the State of West Virginia, and 2) further delineate the geomorphic controls on hillslope form and process in the central Appalachians. The results of this work will have direct application for land-use management strategists in private, State and Federal organizations, as well as make a significant contribution toward the advancement of the geological sciences.

## **WESTERN MICHIGAN UNIVERSITY**

Professor:       Alan Kehew (616) 387-5495

Under the EDMAP Program, the Western Michigan University will produce a glacial terrain map in LaGrange County, Indiana. The western half of the Oliver Lake 7.5 minute quadrangle will be mapped in cooperation with the Indiana Geological Survey, the Michigan Geological Survey, and the USGS STATEMAP Program.

Attempts by the county to prevent and mitigate contamination of groundwater have

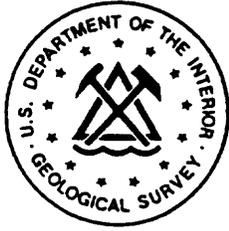
been hampered by the lack of accurate geologic information. Detailed stratigraphic information is needed to provide better planning and direction for zoning, septic field regulation and wellhead protection. The information compiled from this proposal will give LaGrange County the technical edge that it needs to protect its largest natural resource and preserve its reputation as a safe and rural community.

#### **UNIVERSITY OF WISCONSIN-MADISON**

Professor:           David M. Mickelson           (608) 262-7863

Under the EDMAP Program, the University of Wisconsin-Madison is mapping at a scale of 1:24,000 to produce a 1:100,000 scale map of Quaternary deposits in Calumet County, Wisconsin. The Chilton, Stockbridge, Sherwood, Hilbert, and Brillion 7.5 minute quadrangles will be completed in the first year of this study.

Knowing the horizontal and vertical distribution of unconsolidated sediments in Calumet County will be useful for ground water studies, in that the sand and gravel is an aquifer used for domestic water supply, and in that the distribution of the unconsolidated deposits affects the amount and location of recharge to the dolomite aquifer and the potential for contamination. Needs for waste containment facilities and aggregate sources will be better met with a knowledge of the distribution of surface materials such as clay, and sand and gravel.



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**UNITED STATES DEPARTMENT OF THE INTERIOR**  
**GEOLOGICAL SURVEY**

**STATE GEOLOGIC MAPPING PROGRAM**

**-- STATEMAP --**

**A Component of the National Cooperative Geologic Mapping Program  
under the National Geologic Mapping Act of 1992**

**PROGRAM ANNOUNCEMENT No. 00005**

**1997**

**ISSUANCE DATE: SEPTEMBER 3, 1996**

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**CLOSING DATE: November 4, 1996**

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## ATTACHMENTS

### Application Submission Forms and their Instructions

- A. Standard Form (SF) 424 - Federal Assistance
- B. SF-424A - Budget Information - Non Construction programs
- C. SF-424B - Assurances - Non-Construction Programs
- D. Certification for Federal Assistance

### Additional Forms and their Instructions

- E. SF-270 - Request for Advance or Reimbursement
- F. SF-269A - Financial Status Report (Short Form)
- G. STATEMAP Proposal Data and Summary Sheet
- H. Budget Sheets (Sub-Project & Project Total)
- I. Evaluation Sheet

## PART I. REQUIREMENTS AND INSTRUCTIONS FOR APPLICATION SUBMISSION

A. Application Issuance Date: September 3, 1996

Application Closing Date: November 4, 1996

B. Eligibility - Who May Submit an Application

The State Geologic Mapping STATEMAP component of the National Cooperative Geologic Mapping Program is, by Congressional authorization, eligible only to State geological surveys. Since many State surveys are organized under a State University system, an application may be submitted by a State college or university on behalf of the State geological survey. States must have a State Geologic Mapping Advisory Committee or equivalent to qualify for funding. A letter of support from the State geologic mapping advisory committee must accompany the proposal. States that have been funded previously under the STATEMAP Program must have submitted deliverables (geologic maps) to the USGS as stipulated in their cooperative agreement. States that have not submitted a proposal or have never received funding under STATEMAP are exempt from this condition until a cooperative agreement is awarded.

C. Application Delivery Instructions

1. Applications delivered by mail. Please submit one stapled original application and **seven** stapled copies, including attachments to the following address:

U.S. Geological Survey  
Office of Acquisition and Federal Assistance  
Attn: Francine Harris, MS-205A  
12201 Sunrise Valley Drive  
Reston, Virginia 20192

a. An application received by the Office of Acquisition and Federal Assistance after the closing date will not be considered unless it was sent by at least first-class mail and it was determined by the USGS that late receipt was due solely to mishandling after receipt at the USGS, or it was sent by registered or certified mail not later than five (5) calendar days before the application receipt date specified.

- b. Proof of mailing consists of a legible dated U.S. Postal Service (USPS) postmark; a legible mail receipt with the date of mailing stamped by the USPS; or a dated shipping label, invoice, or receipt from a commercial carrier. A private metered postmark will not be considered as proof of mailing.

NOTE: The applicant should note that the USPS does not always provide a dated postmark. Before relying on this method, the applicant should check with their local post office.

- c. An application that does not meet the mailing requirements above will be returned to the applicant.

2. Applications delivered by hand.

- a. An application that is hand delivered shall be taken to the USGS, Office of Acquisition and Federal Assistance, Room 6A331, 12201 Sunrise Valley Drive, Reston, Virginia 20192. The Office of Acquisition and Federal Assistance will accept hand delivered applications between 7:45 a.m. and 3:00 p.m. daily, except Saturdays, Sundays, and Federal holidays.
- b. An application that is hand delivered will be accepted by the Office of Acquisition and Federal Assistance only until 3:00 p.m. on the closing date.

**PART II. RESEARCH PRIORITIES, PRODUCTS APPLICABLE TO THE PROGRAM, AND FORMATS FOR APPLICATIONS AND BUDGET/COST DATA**

**A. Research Priorities and Duration of Proposed Projects**

The objective of the State Geologic Mapping (STATEMAP) component of the National Cooperative Geologic Mapping Program is to produce geologic maps of areas in which knowledge of geology is important to the economic, social, or scientific welfare of individual States. Mapping priorities shall be determined by multi-representational State panels, and shall be integrated and coordinated with national priorities developed by the NCGMP Advisory Committee. The geologic information will be presented as maps, each at a scale appropriate to the problem(s) to be solved, and will be archived by the producing State and the U.S. Geological Survey (USGS) as part of the National Digital Geologic Map Data Base. Emphasis of STATEMAP is on the acquisition of new geologic maps with attendant explanatory information

including correlation of map units, description of map units and symbols, stratigraphic columns, geologic sections, and other pertinent information. Additionally, the program supports projects on compilation of existing data at 1:100,000 scale for inclusion in the National Digital Geologic Map Database.

In accordance with the National Geologic Mapping Act, priority will be given to geologic mapping projects and geologic mapping compilation projects identified by multi-representational State panels. Mapping priorities can include areas for which geologic mapping at a scale of 1:24,000, 1:100,000, or other scale is deemed essential, or may include mapping to contribute to development of the National Digital Geologic Map Database (scale 1:100,000) or new State geologic map(s). In any case, the justification for the priority must be included in the application for a cooperative agreement.

Priorities are established by the State Geologist in consultation with the State Geologic Mapping Advisory Committee. Priorities are *not* dependent on past Cooperative Geologic Mapping Program agreements with the USGS.

State proposals cannot include in-kind services by the USGS. The costs of paleontologic or isotopic age determinations by the USGS are on a reimbursable basis from a State geological survey to the USGS. Paleontologic or radiometric studies conducted as separate projects by the USGS may coincide with proposed STATEMAP projects. Age determinations made under any component of the National Cooperative Geologic Mapping Program will become part of the National Paleontologic or National Radiometric Data Bases. The USGS may continue separate geologic mapping projects in cooperation with State geological surveys where separate Federal geologic mapping priorities and program goals are parallel to State priorities.

For purposes of the State geologic mapping program element, the duration of a project can be defined for one to a maximum of three years. *However, the award of all cooperative agreements is made on a yearly basis only, and acceptance of a multi-year proposal for one year does not ensure funding to the proposed end of the project, nor does it ensure funding at proposed levels during succeeding years.* Therefore, applicants will submit funding requests not for multiple years but only for the current program year. Requests for no-cost extensions or supplementary requests (including late deliverables) will be handled on a case by case basis by the USGS. The USGS will contact State geologists on the current Peer Review Panel for advice and counsel on requests for cooperative agreement extensions.

One proposal (cooperative agreements) will be accepted from each State for FY 1996. The single proposal or cooperative agreement can have 4 subprojects; 3 for new mapping and 1 for compilation. Each new mapping subproject may consist of one or multiple quadrangles in a single area. Quadrangles need not be contiguous. The digital map compilation subproject is of existing data (generally digitizing from data at 1:100,000 scale). There is no set limit on the number of maps that may be compiled under this subproject. Note: Some field checking and reconnaissance mapping may be done in compiling of map data.

In the proposal each subproject should be clearly defined and justified. Priorities of mapping subprojects in the proposal shall be determined by the State Geologist in consultation with the State Geologic Mapping Advisory Committee, with the highest priority subproject first and the lowest priority last.

It is envisioned that the Peer Review Panel will recommend funding levels for both the compilation and digitization type subproject and new mapping subprojects. If full funding is not granted for either proposal, it is expected that the State Survey will do the subprojects in the order prioritized by the State Survey in consultation with their State Geologic Mapping Advisory Committee. For example, if funding is only granted for two of the three subprojects of the new mapping section of the proposal, the State Survey should submit an amended proposal to complete the first two subprojects listed in the proposal.

When the panel recommendation is adopted by the Program Officer and an offer is made for a modified funding award, an applicant can elect to submit to the Contracting Officer a revised work plan and budget limited to recommended area. Alternatively an applicant can decline to participate in the program under proposed revised terms. Approval and funding of part of a proposal does not convey acceptance of the entire proposed project and funding request for multiple subsequent years.

B. Products Applicable to the Program

During the 1997 program year, two types of products are acceptable. One is for digital map compilation and one is for new geologic mapping. The product envisioned for the digital compilation proposal is a 1:100,000 scale digital geologic map of existing geologic data for the both the State data base and National Digital Geologic Map Database. Note: (Exceptions will be made where base maps of 1:100,000 are not generally available or where

the State Mapping Advisory Committee has authorized scales other than 1:100,000).

The geologic map projects are of new data acquired during the award period and should be at a scale of 1:24,000, 1:100,000, or other scale, as appropriate to the problem to be solved. Applications for STATEMAP cooperative agreements can include costs of digitizing and preparation of new geologic map information for final publication. However, prompt release of the new geologic map information to the public, in the format of open-file or other readily available reports, is a primary objective of the program.

A geologic map is defined as a map that depicts the geographic distribution at the earth's surface of bedrock and/or surficial geologic materials and structures, on a published base map showing topography, hydrography, culture, cadastral, and other base information. The geologic map includes an explanation, description of map units and symbols, geologic (structure) sections, a stratigraphic column, and other information such as index, reliability, authorship, and tectonic maps, and structure or isopachous contours on mapped geologic units. Examples of products that are not considered geologic maps include: Structure contour maps, isopachous maps, stratigraphic and/or facies diagrams, aquifer maps, gravity or magnetic anomaly maps, and element-distribution geochemical maps. Digitization of topographic maps not done concurrent with preparation of digital geologic maps of the same area is not considered applicable to the program. Purchase of digital topographic data of the project area may be possible if approved by the State Geologic Mapping Advisory Committee and by the multi-representational STATEMAP Review Panel.

Part V, C. of this announcement define the specific format of products deliverable to the Program Officer in satisfaction of requirements for completion of cooperative agreements awarded in the program.

C. Application Format

The following format is required for submittal of applications:

1. STATEMAP Proposal Data and Summary Sheet  
(Include letter from State Advisory Committee)
2. Proposed investigation [Two to five pages, excluding figure(s) and table(s)]

a. Introduction: Background and overall problems and project objectives.

b. Location

The proposal must include an index map, with scale and latitude and longitude, showing area of proposed study (with mapping scale) and, where appropriate, adjacent areas which have already been studied. Provide names of mapped adjacent quadrangles or areas, scale, and date of publication. Indicate whether geologic mapping exists for the proposed area and the scale of that earlier mapping. [Please use reproducible black and white patterns (not color) to show different categories of information on index maps(s).]

c. General geologic setting [An illustration showing the outline of the proposed study area, including the scale and latitude and longitude of the illustration should support the summary of the geologic setting.

d. Purpose and justification, including social benefits (economic minerals and natural resources, hazard, and other applications) specific to the proposed area [one to three paragraphs].

Documentation must identify specific applications of the geologic mapping and a statement of the appropriateness of the proposed study to the program. *The justification and social application should be written by the principal investigator and must be specific to the area proposed.* Broad general applications will have significantly less impact on review panel recommendations than project-specific justifications.

e. Strategy for performing the investigation.

f. Summary of results or status of prior work in the area and/or for completed adjacent areas.

g. Support investigations (geochronology, geotechnical studies, geophysics, geochemistry, or other kinds described) needed and proposed means of procuring such support investigations together with the individuals or organizations which will provide the results.

3. Deliverables

Map title(s) and scale

Schedule for delivery

*NOTE: Emphasis of the program is on the prompt release of the geologic map information acquired under a program award. In order to document completion of mapping at the conclusion of an award year, a successful project must submit to the USGS Program Officer at the completion of an award year the following product(s): the compiled geologic mapping completed at the end of the award year, together with an explanation and correlation of map units, stratigraphic column, and geologic sections. [For a proposed multiple-year project, the geologic map with explanatory information submitted for the award year may, if appropriate, be part of a quadrangles (if the area to be mapped is larger than a 7.5 minute quadrangle, or is part of a 1:100,000 or smaller-scale map area)]. The quality of the product submitted must be adequate to be released on open-file by the State geological survey at the time the product is submitted to the program. For map information that is produced in digital format (such as ARC/INFO, ARC/VIEW, or GSMAP) a copy of the digital file on floppy diskette, CD-ROM, or other similar medium must be submitted with one paper print of the map to the Program Officer.*

4. Project personnel

Proposed position categories and number of positions for each category (such as geologist, field assistant, cartographer, administrative assistant, and editor).

Proposed project personnel, (list names only), show contract personnel separately.

5. Budget

Budget for cash award requested from the USGS Budget for contributions from applicant State geological survey. Amount of contributions from a State geological survey must be equal to or greater than amount requested from the Federal agency, and must be

derived from non-Federal sources. Source(s) of non-Federal funds must be identified in the breakdown of the budget.

Non-Federal funds can be applied only one year at a time to match a cash award requested from the USGS. [More than one-year of funding from a non-Federal source cannot be applied in advance to one-year award within a proposed multi-year project.

Specific budget information, described below, must be provided to the Contracting Officer. The Proposed Project Budget form should be used for projects that include a single map area or to summarize the total budget for projects that include more than one area. The totals from the separate areas are summarized as the total proposed project budget.

Summary cost data to support the proposed Federal funding requested in block 15 of the SF-424. Cost data requested in block 15 of the SF-424 must be provided to the Contracting Officer on SF-424A.

- a. Personnel. List names, positions, and cost for all persons on the project.
- b. Fringe Benefits. Propose your rates/amounts. If rates are audit approved, include a copy of the audit agreement and/or the name of the audit agency.
- c. Field Expenses. Briefly itemize the estimated travel costs (i.e., number of people, number of travel days, per diem rate, mileage rate, airfare, transportation, and any other travel costs). *Note: The State proposal review panels have determined that travel to meetings of professional societies is not an acceptable expense for the program.*
- d. Miscellaneous

Equipment. The State Geologic Mapping Program element is intended to support geologic mapping for the acquisition of new geologic map information. Federal STATEMAP funds are not intended for the purchase of capital equipment.

Supplies. Briefly identify any supplies to be used including itemized costs. Supplies include base maps, aerial photographs,

petrographic thin sections, and office and laboratory supplies. Itemize each request.

Drilling. Describe drilling costs.

Map Digitizing Costs.

Contractual. List any contractual services and the associated costs. Identify proposed contractors (individual or corporate) and provide the criteria by which contractors will be, or have been selected.

Construction. Not applicable.

Tuition waivers to support student assistants on projects cannot be accepted as a cost to the program. Although under regulations for Federal cooperative grants programs, State geological surveys that are part of State university systems would be eligible to apply for tuition waivers, also by contract regulation geological surveys within other State agencies are not eligible for such waivers. In order to treat all State applicants uniformly and fairly, the program does *not* fund tuition waivers as part of proposed remuneration for student assistants. Salaries or wages for student assistants are an acceptable cost to the program.

Federal STATEMAP funds are not intended for State printing of multicolored or quality black-and-white versions of geologic maps produced in the program, nor can the cost to a State for such printing be used as a matching cost for Federal funds.

Other. Itemize all other costs not identified elsewhere.

- e. Total Direct Charges. Totals for items a-d.
- f. Indirect Charges. Show proposed rate and amount. Because requests for funding have increasingly far exceeded total program funds available, proposals with lower indirect charges will have a greater potential of receiving USGS financial support.

Applicants are encouraged to hold their indirect charges at or below the 18% that was informally agreed upon by the State geologists for the program. Proposals, however, must include a

copy of the indirect negotiated cost rate between the State and the Federal government. States may use their full indirect cost rates, including any excess above 18% of the Federal total direct costs, as part of their match.

- g. Total. Total for items e and f.

#### 6. Application Submission Forms

- a. The following Standard Forms (SF) and Department of Interior (DI) forms are required to accompany your application package: SF-424, SF-424A, SF-424B, USGS form entitled "Certifications for Federal Assistance," STATEMAP Proposal Data and Summary Sheet, and Proposed Project Budget Sheet. These forms are included as enclosures to this program announcement. **Failure to return the forms may result in an application being declared unresponsive and in turn not funded.**
- b. Standard Form 424, Item 5, second block in right column, must clearly identify the name of the person to be contacted on matters related to the scientific content, staffing, and budget of the application. The person identified may be the State Geologist or the principal investigator, or both (please indicate the State preference for the contact person). However, the contact must have the authority to bind the State to the terms of the assistance award.
- c. Any questions regarding these documents should be directed to the Contracting Officer, Francine Harris, at (703) 648-7386.

### III. Evaluation Criteria

- A. **Review Panel.** Applications for funding in the STATEMAP Component of the National Cooperative Geologic Mapping Program will be reviewed by a peer panel composed of 5 State Survey Geologists. Three of these geologists represent each of the three AASG Clusters; two are at large members. The three State Survey Cluster representatives will be responsible for understanding their respective cluster State's proposals in depth but will be required to read and evaluate all submitted proposals. To resolve possible conflicts of overlapping or duplication of mapping projects, the USGS will have three non-voting regional geologist at the Peer Panel discussions, one from each cluster region. They will provide expertise about the status of USGS programs in their cluster area. Selection of the panelists will be by

ballot of State geologists from a slate proposed by the Executive Committee of the Association of American State Geologists (AASG). Non-voting panelists from the USGS will include the official responsible for the STATEMAP part of the National Cooperative Geologic Mapping Program as chairman, by virtue of the legal program responsibility residing with the USGS, and 3 advisors appointed by the NCGMP Coordinator.

- B. **Conflict of Interest.** No panelist may review, or take part in any discussion with other panel members, prior to or during a panel meeting, or vote on an application that originated with the State geological survey or State agency by which the panelist is employed.
- C. **Evaluation Criteria.** All applications for funding will be considered in accordance with the following criteria. Each reviewer will complete an evaluation form for each application reviewed, and the evaluation forms will become part of the official proceedings record of the conclusion of the review panel meeting.
1. **Programmatic appropriateness.** Considers the degree to which the proposed study contributes to a balanced National-State Cooperative Program by (a) developing intermediate- and large-scale geologic maps and digitized map data, or (b) providing assistance in the development and preparation of State geologic maps. Emphasis will focus on the development and prompt release of *new* geologic map information, including necessary explanatory information, stratigraphic column(s), and geologic sections, and on release of compiled existing data at 1:100,000 scale for the National Geologic Map Database (see Note under Part II, B).
  2. **Application to resolution of significant socioeconomic issues (includes economic minerals, natural resources, and hazards).** Considers (a) the degree to which the proposed geologic mapping will contribute to the resolution of one or more significant socioeconomic issues *specific to the area defined in the proposal*; (b) the breadth of socioeconomic impacts of the proposed geologic mapping within the specific area; and (c) the importance of the proposed geologic mapping as developed in a manner described in the proposal that represents a broad consistency of State, county and local governments, academia, and the private sector in the State.
  3. **Technical quality of the Application.** Examines the appropriateness of the methodology, including the methodology for geologic mapping and identification and application of necessary support data such as

paleontologic and isotopic geochronology, geochemistry, and geophysics, and drilling.

4. **Reasonableness of the Budget.** Considers (a) whether the proposed budget is commensurate with the level of effort required to accomplish the objectives; (b) whether the cost is reasonable relative to the anticipated results; and (c) the completeness of the certification, that non-Federal funds are available to at least match equally the requested Federal funding amount.
5. **Proposal Evaluations.** If fully funded, the award notification will include a brief critique. If either or both parts of a State's proposal are not funded, the State will receive a written explanation from the Peer Review Panel.

#### **PART IV. GENERAL PROVISIONS**

##### **A. General Provisions of the National Cooperative Geologic Mapping Program**

By accepting Federal assistance, your organization agrees to abide by the provisions of the National Geologic Mapping Program.

- The National Geologic Mapping Act of 1992, Public Law 102-285.
- OMB Circular A-16 "Coordination of Surveying, Mapping and Related Spatial Data Activities"

##### **B. Office of Management and Budget (OMB) Circulars**

By accepting Federal assistance, your organization agrees to abide by the applicable OMB Circulars in the expenditure of Federal funds and performance under this program. However, a State can propose other circulars in their application if these circulars are not applicable.

- OMB Circular A-87 "Cost Principles for State and Local Governments"
- OMB Circular A-102 "Uniform Administrative Requirements for Grants-In-Aid to State and Local Governments"
- OMB Circular A-128 "Audits of State and Local Governments"

C. Rights in technical data.

The U.S. Government may publish, reproduce, and use all technical data developed as a result of this assistance award in any manner and for any purpose, without limitation, and may authorize others to do the same. However, the STATEMAP Program Coordinator agrees that full review by the State Geologist will occur prior to any use or release of any geologic materials and full credit will be given to the State Survey .

D. Publication.

1. Publication of the results of any project carried out under this assistance award is authorized in map or publication "series" of State geological surveys. Emphasis is on the prompt release of the geologic map and explanatory information, so that publication includes release of maps or segments of maps with explanatory information in open-file format. Publication includes conventional format in paper copy, reproducible mylar or similar material, and electronic format as digital files on computer readable disk, CD-ROM, or similar medium. Maps with explanatory information submitted to journals, professional organizations, or commercial firms for publication shall be accompanied by the following notation:

"This map and explanatory information is submitted for publication with the understanding that the United States Government is authorized to reproduce and distribute reprints for governmental use."

2. One copy of each map with all accompanying explanatory information shall be submitted to the Project Officer simultaneously with its submission for publication. If a map has been prepared as an electronic digital data file (or files), one copy of that file or files shall be submitted to the project officer in computer readable disk or CD-ROM version and one paper copy for review. A document or electronic "READ" file, prepared in the latest version of a major standard word processing program (such as Microsoft Word or Word Perfect) and instructions or codes needed to access the electronic digital file, shall accompany each file stating the program(s) used.

One reprint of each map shall be submitted to the Project Officer immediately following publication.

3. Program credit. All geologic maps resulting from any project carried out under this assistance award resulting wholly or in part from the cooperative agreement shall bear a cooperative statement in the map header, on the title page of an accompanying explanatory text, and in the acknowledgements that accompany the map or any resulting report.
4. Disclaimer. All maps and explanatory text submitted for publication by professional societies or commercial firms shall carry the following notation:

"The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government."

## **PART V. STATEMAP - Program Specifications**

### **A. Funding**

1. The STATEMAP program is required by statute (P.L. 105-285) to be carried out on a 50/50 matching basis; each recipient must match each Federal dollar with a non-Federal dollar. The 50 percent State share may be contributions of services or cash provided to contractors to perform geologic mapping or other services directly applicable to proposed work on the project. The specific source(s) of the State contribution [such as State legislative appropriation, non-Federal other funding agency (by agency)] must be provided in the proposal. Even though the overall proposed State work plan may be for three years, a Federal cooperative award is for one year only. Contributions for more than one year from non-Federal sources cannot be credited to a single year against the Federal match (see Part II, section A, paragraph 5).
2. Specifically excluded are monies for general administrations and accounting and/or other costs not allowable per applicable Office of Management and Budget (OMB) Circulars (see Part V, Section A, Page 10). However, general administration, accounting and/or other costs are allowable when incurred due to indirect costs. Use of USGS funds for the purchase of major pieces of equipment will not be authorized.
3. Funds for the 1997 National Cooperative Geologic Mapping Program and in turn, STATEMAP cash awards, will not be available until passage of the USGS Appropriations Bill by Congress. The majority of

the STATEMAP awards will likely support proposed on-going projects. Proposals for such projects should generally be tailored toward funding levels in 1996. Since it is anticipated that proposed awards will not be announced until January 16, 1997, proposed project start dates should not begin prior to March 15, 1997.

**SPECIAL NOTE:** A cooperative agreement issued by the USGS Office of Acquisition and Federal Assistance, signed by both the authorized State Representative and the USGS Contracting Officer, is required for the State agency to commit USGS funds. Notification of a successful application does not constitute authority to incur costs funded by USGS money. Costs incurred prior to issuance of the approved agreement will be at the risk of the State institution. Once the cooperative agreement for a successful proposal has been approved by both agencies, the State agency may start work under the agreement and begin to incur charges.

4. Performance of projects funded by this program will conform to OMB Circular A-16 (revised), "Coordination of Surveying, Mapping, and Related Spatial Data Activities."

B. Principal Investigator(s)

The principal investigator(s) will be responsible for activities including:

1. Geologic mapping activities at the appropriate scale(s), using standard geologic mapping techniques to ensure accurate presentation of geologic data.
2. Preparation of geologic maps at the appropriate scale to depict the geologic characteristics of the area and all necessary explanatory information.
3. Preparation and submittal of final digital data files with all necessary access information used in preparing the map in digital format. Files

are submitted to the USGS for inclusion in the National Geologic Map Data Base.

Note: If a student is hired under STATEMAP to conduct mapping for a state survey, although the state survey maintains primary responsibility for the product, the university is not relieved of responsibility for completion of the work if the student defaults.

## C. Project Deliverables

Applications shall clearly state what the deliverable map products under the projects will be and the date of delivery of draft geologic maps with explanatory information as described in Item C.1., below. Deliverables are submitted to the Program Officer, National Geologic Mapping Program (STATEMAP Component), National Center, MS-908, Reston Virginia 22092. Deliverables must consist of at least item (1), below, and either item (2) or (3), or both, as below. Final products are due at the end of the performance period.

1. Geologic map(s) both from new mapping and compilation of existing data and appropriate derivative maps, with all necessary explanatory information (explanation of map units and symbols, correlation of map units, stratigraphic column, and geologic sections) of the project area. Please indicate by quadrangle name(s) and latitude and longitude the map(s) to be delivered.

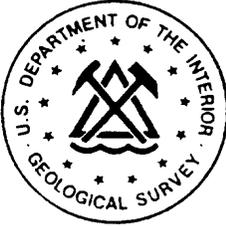
Maps and explanatory information submitted at the end of the performance period must be legible copies (1), made from scale-stable reproducible base maps and explanatory information by ozalid or large format xerographic techniques or their equivalents. The maps can be hand lettered, if fully legible, or preferably, should be machine or electronically drafted. The explanatory text should be prepared by word processing and submitted in printed text format; correlation of map units, stratigraphic columns and geologic sections can be reproduced from scale-stable base material; hand drafted and lettered copy, if fully legible, is acceptable.

At the time the map and accompanying explanatory information are submitted to the Program Officer, they should be made available to the public through the State geological survey open-file series.

Submittal of hand-drafted products should be followed, on a schedule set by the State geological survey, by publication of the geologic map and explanatory information.

2. Where appropriate, supplementary technical report(s) summarizing the geology and geologic history of the project area represented on the geologic map(s) and the overall results of the project.





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**UNITED STATES DEPARTMENT OF THE INTERIOR**  
**GEOLOGICAL SURVEY**

**GEOLOGIC MAPPING EDUCATION PROGRAM**

**-- EDMAP --**

**A Component of the National Cooperative Geologic Mapping Program  
under the National Geologic Mapping Act of 1992**

**OBJECTIVES**

- \* Provide funding for graduate students in academic research programs, through cooperative agreements, that involve geologic mapping and scientific data analysis as major components.
- \* Facilitate the publication and distribution of geologic maps generated in field-based graduate academic research programs.
- \* Expand research and educational capacity of graduate academic programs that teach earth science students the techniques of geologic mapping and field data analysis.

**PROGRAM ANNOUNCEMENT No. 00006**

**1997**

**ISSUANCE DATE: SEPTEMBER 3, 1996**

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**CLOSING DATE:**

**NOVEMBER 4, 1996**

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### Attachments

#### Application Submission Forms and Instructions

- A. Standard Form (SF) 424 - Federal Assistance
- B. SF-424A - Budget Information - Nonconstruction Programs
- C. SF-424B - Assurances - Nonconstruction Programs
- D. Certifications for Federal Assistance
- E. SF-270 - Request for Advance or Reimbursement
- F. SF-269A - Financial Status Report
- G. EDMAP Data and Summary Sheet
- H. Budget Sheets (total and individual project)
- I. State Geologic Survey listing and NCGMP Projects
- J. Evaluation Sheet

## PART I. REQUIREMENTS AND INSTRUCTIONS FOR APPLICATION SUBMISSION

A. Application Issuance Date: September 3, 1996

Application Closing Date: November 4, 1996

B. Eligibility - Who May Submit an Application

The Geologic Mapping Education (EDMAP) component of the National Cooperative Geologic Mapping Program is eligible to Masters and Doctoral students of Geoscience or related Departments at accredited United States colleges and universities.

C. Application Delivery Instructions

1. Applications delivered by mail. Please submit one unbound original application and 10 unbound copies to the following address:

U.S. Geological Survey  
Office of Acquisition and Federal Assistance  
Attn: Francine Harris, MS-205A  
12201 Sunrise Valley Drive  
Reston, Virginia 20192

- a. An application received by the Office of Acquisition and Federal Assistance after the closing date will not be considered unless it was sent by at least first-class mail and it was determined by the USGS that late receipt was due solely to mishandling after receipt at the USGS, or it was sent by registered or certified mail not later than five (5) calendar days before the application receipt date specified.
- b. Proof of mailing consists of a legible dated U.S. Postal Service (USPS) postmark; a legible mail receipt with the date of mailing stamped by the USPS; or a dated shipping label, invoice, or receipt from a commercial carrier. A private metered postmark will not be considered as proof of mailing.

NOTE: The applicant should note that the USPS does not always provide a dated postmark. Before relying on this method, the applicant should check with their local post office.

- c. An application that does not meet the mailing requirements above will be returned to the applicant.
2. Applications delivered by hand.
- a. An application that is hand delivered shall be taken to the USGS, Office of Acquisition and Federal Assistance, Room 6A331, 12201 Sunrise Valley Drive, Reston, Virginia. The Office of Acquisition and Federal Assistance will accept hand delivered applications between 7:45 a.m. and 3:00 p.m. daily, except Saturdays, Sundays, and Federal holidays.
  - b. An application that is hand delivered will be accepted by the Office of Acquisition and Federal Assistance only until 3:00 p.m. on the closing date.

## **PART II. RESEARCH PRIORITIES, PRODUCTS APPLICABLE TO THE PROGRAM, AND FORMATS FOR APPLICATIONS AND BUDGET/COST DATA**

### **A. Research Priorities and Duration of Proposed Projects**

The objectives of the EDMAP component of the National Cooperative Geologic Mapping (NCGM) Program are: 1) to assist the training of Masters and Doctoral students in field mapping techniques and 2) to produce geologic maps. The impact of the field study on the scientific, social, or economic betterment of the United States will be a component of the program, and as such will be evaluated as part of the review and funding process. Funding is to support Masters and Doctoral students conducting geologic field mapping. The support is for salary and operating expenses directly related to field work. Emphasis of EDMAP is on the acquisition of new geologic map information presented as geologic maps with attendant explanatory information including correlation of map units, description of map units and symbols, stratigraphic columns, geologic sections, and other pertinent information. These geologic maps will be presented at 1:24,000 or larger scale, will be in the format of State or USGS Open-file reports, and will be archived by the U.S. Geological Survey as part of the National Geologic Map Data Base.

Mapping priorities are those determined by the NCGMP, the State Geologic Mapping Advisory Committees, and the EDMAP Subcommittee, and will be integrated with national or State priorities. Mapping priorities are areas identified by States or the USGS for which geologic mapping at 1:24,000 or larger scales is deemed essential. All proposals must be coordinated with a State Geological

Survey or with a project in the USGS National Cooperative Geologic Mapping Program. A written justification for the priority of the mapping project from the State Geologist, USGS Project Chief, or NCGMP Coordinator must also be included in the application packet for a cooperative agreement.

Proposals cannot include a request for in-kind services by the USGS. For example, if paleontologic or isotopic age determinations are needed and are to be performed by the USGS, the costs should be budgeted for on a reimbursable basis from other sources of funds available to the University. Paleontologic or isotopic studies conducted as separate projects by the USGS may, however, coincide with proposed EDMAP projects. Age determinations made under any component of the National Cooperative Geologic Mapping Program will become part of the National Paleontologic or National Geochronologic Data Bases.

Only one cooperative agreement will be awarded to each institution. However, the agreement may consist of more than one project, more than one faculty supervisor and several students. The budget should reflect both the total request and the various subunits (different projects and personnel). Each subunit may request a maximum of \$15,000.00 for salary, field expenses, supervising faculty expenses, and university overhead (both direct and indirect costs).

When the EDMAP panel technical recommendation is adopted by the USGS Program Coordinator and an offer made for a modified funding award, an applicant can elect to submit a revised work plan and budget limited to the recommended area. Alternatively, an applicant can decline to participate in the program under the proposed revised terms. Approval for funding of part of a proposal does not constitute adoption by the NCGMP of the original proposal in its full scope nor does it convey acceptance of the entire proposed project and funding request for subsequent years.

For purposes of the EDMAP geologic mapping component, the duration of a project can be defined from one to a maximum of two years. However, the proposed period of performance must be for no more than 12 months. *Award of all cooperative agreements is made for only the current program year, but acceptance of a multiyear proposal for one year does not guarantee funding to the proposed end of the project, nor does it ensure funding at proposed levels during the succeeding year.* Requests for extensions (including late deliverables) will be handled on a case-by-case basis by the contracting officer.

## B. Description of Maps

The geologic map products will consist of new data acquired during the award period and should be at a scale of 1:24,000 or larger. Emphasis for making awards is on the acquisition of *new* geologic maps. Prompt release of the new geologic maps to the public, in the format of State or USGS Open-File reports, is a primary objective of the program. *Interim products (end of 1st field season) can be draft "field sheet" quality clearly demonstrating the work in progress done by the student during the field season.*

Geologic maps may be submitted in either paper or standard digital (e.g., ARC/INFO) format. The geologic map must include an explanation, description of map units and symbols, geologic (structure) sections, a stratigraphic column, and may include other information such as tectonic maps, and structure or isopachous contours on mapped geologic units. Examples of products that are not by themselves considered geologic maps include: Structure contour maps, isopachous maps, stratigraphic and/or facies diagrams, aquifer maps, gravity or magnetic anomaly maps, and element-distribution geochemical maps.

*NOTE: Emphasis of the program is on the prompt release of the geologic map information acquired under a program award. In order to document completion of mapping at the conclusion of an award year, a successful project must submit to the USGS Program Officer at the completion of the award year the following products: One copy of a blackline ozalid print of the compiled geologic mapping completed at the end of the award year, together with an explanation and correlation of map units, stratigraphic column, and geologic sections. [For a proposed two-year project, the geologic map with explanatory information submitted for the award year may, if appropriate, be part of a quadrangle or part of a larger area under study. The quality of the final product submitted should be adequate to be released on open-file by the USGS or State geological survey at the time the product is submitted to the program. Interim products (end of 1st field season) can be draft "field sheet" quality clearly demonstrating the work done by the student during the field season. If the map information is produced in digital format (such as ARC/INFO, ARC/VIEW, or GSMAP) a copy of the digital file on floppy diskette (or large format disk, e.g., Bernoulli) or CD-ROM must be submitted with the one paper print of the map to the Program Officer.*

C. Application Format

The following format is required for submittal of applications:

1. EDMAP Proposal Data and Summary Sheet
2. Introduction [one page]

Background, overall problem(s) and project objectives  
Introduction must include brief description of the State Geological Survey or USGS project that the research is coordinated with.  
Please list Federal or State personnel by name that were contacted as coordinators with the University.

3. Proposed investigation [maximum of five pages of single-spaced of 10 point or greater type (1 inch margins), excluding figure(s) and table(s)]

- a. Location.

The proposal must include an index map, with scale and latitude and longitude, showing area of proposed study (with mapping scale), a brief discussion of existing published and unpublished maps of the proposed study area, and, where appropriate, adjacent areas which have already been studied. Reproducible black and white patterns (not color) must be employed to show different categories of information on index map(s).]

- b. General geologic setting. [An illustration showing the general geology and the outline of the proposed study area, including the scale and latitude and longitude of the illustration should support the summary of the geologic setting.]

- c. Purpose and justification, emphasizing scientific merit. Other benefits (resource, hazard, and other applications) specific to the proposed area may also be included. [one to three paragraphs].

Documentation must address scientific merit and discuss potential applications of this geologic mapping project, scientific or otherwise, and a statement of the appropriateness of the proposed study to the program. The justification and pure or applied scientific application should be written by the principal investigator

and must be specific to the area proposed.

Extensibility of scientific work beyond the area of this project and any associated applied spinoff will both be factors considered by the review panel.

- d. Timetable and strategy for completing the investigation.
- e. Supervisory and training strategy -- How will the map be field checked? Will the faculty supervisor take part in the mapping? Will the final map be field checked by the State Geological Survey or a USGS staff geologic mapper?
- f. Support investigations (geochronology, geotechnical studies, geophysics, geochemistry, or others) needed and proposed means of procuring support for these investigations together with the individuals or organizations that will provide the data.

4. Deliverables

Map title(s) and scale

5. Project personnel

Proposed personnel (must include name of student and supervising professor). Two-page maximum for both student and faculty supervisor. This information should address the ability of the supervising faculty member and the student to successfully complete the proposed geologic mapping project. For the student this should include prior geologic mapping experience (field camp or other mapping projects) and any relevant geologic mapping course work. Faculty members should include teaching experience of geologic mapping or related courses, prior geologic mapping publications and other geologic mapping experience.

6. Budget

Budget for funds award requested from the USGS

Specific budget information, described below, must be provided to the Contracting Officer using the standard for all applicants. The format of the Proposed Project Budget form must be followed for proposed projects.

Summary cost data to justify the proposed Federal funding requested in block 15 of the SF-424 must be provided to the Contracting Officer on SF-424A.

- a. Personnel. List names, positions, and cost for all persons on the project.
- b. Fringe Benefits. Propose your rates/amounts. If rates are audit approved, include a copy of the audit agreement and/or the name of the audit agency.
- c. Field Expenses. Briefly itemize the estimated travel costs (i.e., number of people, number of travel days, per diem rate, mileage rate, airfare, transportation, and any other travel costs). Note: Travel to professional meetings is not an acceptable expense.
- d. Miscellaneous

Equipment. The Geologic Mapping Education Program element is intended to support geologic mapping for the acquisition of new geologic map information. Federal EDMAP funds are not intended for the purchase of capital equipment. Matching cost-sharing funds may be used for this purpose, provided they are directly related and essential to the project.

Supplies. Briefly itemize any supplies. These include base maps, aerial photographs, petrographic thin sections, photographic film, field equipment, and office and laboratory supplies. Itemize each request.

Map Digitizing Costs.

Contractual. List any contractual services and the associated costs. Identify proposed contractors (individual or corporate) and provide the criteria by which contractors will be, or have been selected.

Tuition waivers to support students on the projects cannot be accepted as a cost to the program.

Other. Itemize all other costs not identified elsewhere.

- e. Total Direct Charges. Total for items a - d.

- f. Indirect Charges. Show proposed rate and amount.

The appropriated funding for EDMAP is modest and the expected participation may exceed available funds. In order to maximize participation in this program and to maximize funding to students, the EDMAP Review Panel encourages participants to hold indirect costs to a minimum. Proposals, however, must include a copy of the Indirect Negotiated Cost Rate between the institution and the Federal Government.

- g. Total. Total for items e and f. Not to exceed \$15,000.00 for one year, for each student.

8. Application Submission Forms

- a. The following Standard Forms (SF) and Department of Interior (DI) forms are required to accompany your application package: SF-424, SF-424A, SF-424B, Certifications for Federal Assistance, EDMAP Proposal Data and Summary Sheet, and Proposed Project Budget. These forms are included as enclosures in this program announcement. **Failure to enclose the forms with the proposal may result in an application being declared unresponsive and in turn not funded.**

- b. Standard Form 424, Item 5, second block in right column, must clearly identify the name of the person to be contacted on matters related to the scientific content, staffing, and budget of the application. The person identified may be the Supervising Faculty member, the Chairman of the Department or a contracts official serving the University and the Department.

The contact must, however, have the authority to bind the institution to the terms of the award.

- c. Any questions regarding these documents should be directed to the Contracting Officer, Francine Harris, at (703) 648-7386.

### III. Evaluation Criteria

- A. **Review Panel.** Applications for funding in the EDMAP Component of the National Cooperative Geologic Mapping Program will be reviewed by a panel composed of 5 university geologists who represent the eastern (1), central (1),

and western (1) regions of the country and 2 at-large representatives; two representatives of State geological surveys; and two representatives of the USGS, all nominated by the NCGM Program Council and the Association of American State Geologists. The chairmanship of the committee will rotate among the senior members. Each committee member will have a demonstrated strong career record in geologic mapping and continued activity in this area, concern about producing high quality geologic maps, and a thorough knowledge of regional geology. All will serve three-year staggered terms, with the possibility of reappointment for one additional term.

- B. **Conflict of Interest.** No panelist may review, or take part in any discussion with other panel members, prior to or during a panel meeting, on an application that originated with students with whom this member has been working, from the institution or agency where he or she is employed, or other conflicts.
- C. **Evaluation Criteria.** All applications for funding will be considered using criteria outlined below. Each reviewer will complete an evaluation form for each application reviewed, and the evaluation forms will become part of the official proceedings of the review panel meeting. A summary of the review panel comments will be provided to the principle investigators for all proposals reviewed. Evaluations will be based on:
1. **Programmatic appropriateness.** Considers the degree to which the proposed study contributes to a balanced national program that produces new geologic maps. Emphasis will focus on the prompt release of new geologic map information, including necessary explanatory information, stratigraphic column(s), and geologic sections.
  2. **Application to resolution of significant problems.** Considers (a) the degree to which the proposed geologic mapping will contribute to the resolution of one or more significant scientific problems, both pure and applied, *specific to the area defined in the proposal* and; (b) the breadth of pure or applied scientific impact of the proposed geologic mapping within the specific area.
  3. **Technical quality of the Application.** Examines (a) the pure or applied scientific merit of the problem to be addressed, and (b) appropriateness of the method for geologic mapping and identification and application of necessary support data such as paleontologic and isotopic geochronology, geochemistry, and geophysics.
  4. **Reasonableness of the Budget.** Considers (a) whether the proposed

budget is commensurate with the level of effort required to accomplish the objectives; (b) whether the cost is reasonable relative to the anticipated results; and (c) whether non-Federal funds or in kind service are available to at least match equally the requested Federal funding amount. For example, this could consist of documentation showing salary paid or intended to be paid to graduate student faculty for any work relating to the field project. In addition, university stipends for RA (research assistant) work paid to the student for any work related to the research project during the year can be used as the university match. Alternatively, match can be shown as money paid to undergrad field assistants during work on the research project. The applicant is encouraged to contact Francine Harris, USGS Contracting Officer, (703-648-7386) for any questions concerning matching funds.

#### **PART IV. GENERAL PROVISIONS**

##### **A. General Provisions of the National Geologic Mapping Program**

By accepting Federal assistance, your organization agrees to abide by the provisions of the National Cooperative Geologic Mapping Program.

- The National Geologic Mapping Act of 1992, Public Law 102-285.
- OMB Circular A-16 "Coordination of Surveying, Mapping and Related Spatial Data Activities"

##### **B. Office of Management and Budget (OMB) Circulars**

By accepting Federal assistance, your organization agrees to abide by the applicable OMB Circulars in the expenditure of Federal funds and performance under this program. A university can, however, propose other circulars in their application if these circulars are not applicable.

- OMB Circular A-110, "Grants and Cooperative Agreements with Institutions of Higher Education, Hospitals, and Other Nonprofit Organizations"
- OMB Circular A-21, "Cost Principles for Educational Institutions"
- OMB Circular A-133, "Audits of Institutions of Higher Learning and other Non Profit Institutions"

C. Rights in technical data.

The U.S. Government may publish, reproduce, and use all technical data developed as a result of this assistance award in any manner and for any purpose, without limitation, and may authorize others to do the same. The Program Coordinator agrees to contact the authors of any EDMAP product for review and coordination in the release of technical data. Full credit for authorship will be given. Technical data generated by EDMAP will only be used to describe the program in a general way. Every effort to protect the scientific integrity of newly gathered data will be made by the EDMAP Program Coordinator.

D. Publication.

1. Publication of the results of any project carried out under this assistance award is authorized in map or publication "series" of the USGS and State geological surveys. Publication of any map produced under EDMAP is contingent upon final acceptance by the State Geologist and USGS and is not based on having received an award. Emphasis is on the prompt release of the geologic map and explanatory information, so that publication includes release of maps or segments of maps with technically adequate explanatory information in open-file format. Publication includes conventional format in paper copy, reproducible mylar or similar material, and electronic format as digital files on computer readable disk or CD-ROM. Maps with explanatory information submitted to journals, professional organizations, or commercial firms for publication shall be accompanied by the following notation:

"This map and explanatory information is submitted for publication with the understanding that the United States Government is authorized to reproduce and distribute reprints for governmental use."

2. One copy of each map with all accompanying explanatory information shall be submitted to the Project Officer simultaneously with its submission for publication. If a map has been prepared as an electronic digital data file (or files), one copy of that file or files shall be submitted to the project officer in computer readable disk or CD-ROM version. A document or electronic "READ" file, prepared in the latest version of a major standard word processing program (such as Microsoft Word or Word Perfect) and instructions or codes needed to access the electronic digital file, shall accompany each file stating the program(s) used. One reprint of each map shall be submitted to the Project Officer immediately

following publication.

3. Program credit. All geologic maps resulting from any project carried out under this assistance award resulting wholly or in part from the cooperative agreement will bear the following credit statement in the map header, on the title page of an accompanying explanatory text, and in the acknowledgements that accompany the map or any resulting report: Support (or partial support) provided by the National Cooperative Geologic Mapping Program.
  
4. Disclaimer. All maps and explanatory text submitted for publication by professional societies or commercial firms shall carry the following notation:

"The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government."

## **PART V. EDMAP - Program Specifications**

### **A. Funding**

1. The EDMAP program is designed to be carried out on a 50/50 matching basis; each recipient must match each Federal dollar with a non-Federal dollar. The 50 percent university share may be contributions of services throughout the year. Such services can include those related to the student research project or cash provided to contractors i.e., field assistants to perform geologic mapping or other services directly applicable to proposed work on the project (see part III, C,4, for other matching possibilities). The source(s) of the university contribution must be listed in the proposal. Even though the overall proposed work plan may be for two years, a Federal cooperative award is for one year only. Contributions for more than

one year from non-Federal sources cannot be credited to a single year against the Federal match.

2. Specifically excluded are monies for general administrations and accounting and/or other costs not allowable per applicable Office of Management and Budget (OMB) Circulars (see Part V, Section A, Page

- 10). General administration, accounting and/or other costs, however, are allowable when incurred due to indirect costs. Use of USGS funds for the purchase of equipment will not be authorized.
3. Funds for the 1997 National Cooperative Geologic Mapping Program and in turn, EDMAP funds, will not be available until passage by Congress of the USGS Appropriations Bill.

Student awards will be made in the form of cooperative agreements to the supervising faculty member and the institution. Within the total award, a maximum of 15 percent of total direct costs may be included for support of the supervising faculty member. The EDMAP Review Panel will look more favorably in making awards to those proposals with low overhead. A detailed budget will be submitted with the proposal showing each expenditure category.

Support can be requested for two years but a separate budget for each year must be submitted. Awards are made on a yearly basis and acceptance for the first year does not guarantee a second year of support. Since it is anticipated that awards will not be made until sometime in March, proposed project start dates should not begin prior to May 1, 1997.

**SPECIAL NOTE:** A cooperative agreement issued by the USGS Office of Acquisition and Federal Assistance, signed by the USGS Contracting Officer, is required to commit USGS funds. Notification of a successful application does not constitute authority to incur costs funded by USGS money. Costs incurred prior to receipt of a signed cooperative agreement will be at the risk of the university. Once the cooperative agreement for a successful proposal has been signed by both agencies, the university may begin to bill against the award amount.

4. Performance of projects funded by this program will conform to OMB Circular A-16 (revised), "Coordination of Surveying, Mapping, and Related Spatial Data Activities."

B. Principal Investigator(s)

The principal investigator(s) will be responsible for activities including:

1. Geologic mapping activities at the appropriate scale(s), using standard geologic mapping techniques to ensure accurate presentation of geologic data.

2. Preparation of geologic maps at the appropriate scale to depict the geologic characteristics of the area and all necessary explanatory information.

C. Project Deliverables

Applications shall clearly state what the deliverable map products under the projects will be and the date of delivery of draft geologic maps with explanations. Deliverables are submitted to Program Officer, National Geologic Mapping Program (EDMAP Component), National Center, MS-908, Reston Virginia 22092. Deliverables will consist of at least item (1), below, and either item (2) or (3), or both, as below. Final products are due at the end of the performance period.

1. Geologic map(s) from new mapping and appropriate derivative maps, with all necessary explanatory information (explanation of map units and symbols, correlation of map units, stratigraphic column, and geologic sections) of the project area. Please indicate by quadrangle name(s) and latitude and longitude the map(s) to be delivered. NOTE: First year or interim map products can be of "in progress" or "field sheet" quality. However, field data and other map information should be included so an evaluation of the progress of the project can be made.

Maps and explanatory information submitted at the end of the performance period must be legible copies (1), made from scale-stable reproducible topographic base maps and explanatory information by ozalid or large-format xerographic techniques or their equivalents. The maps can be hand lettered if fully legible, or preferably, should be machine or electronically drafted. The explanatory text should be prepared by word processing and submitted in printed text format; correlation of map units, stratigraphic columns and geologic sections can be reproduced from scale-stable base material; hand drafted and lettered copy, if fully legible, is acceptable.

At the time the map and accompanying explanatory information are submitted to the Program Officer, they should be made available to the public through the State or USGS Open-File series.

2. Where appropriate, supplementary technical report(s) summarizing the geology and geologic history of the project area represented on the geologic map(s) and the overall results of the project. The geologic

map and explanatory information (Item C.1., above) have highest priority for completion.

3. Other project data/information in media forms other than those listed above as agreed to by both parties.

D. Involvement Statement

All products resulting wholly or in part from the EDMAP program will bear a statement identifying that the product has been produced in cooperation with the U.S. Geological Survey, National Cooperative Geologic Mapping Program on the heading (geologic maps) or on the title page and in the acknowledgements of explanatory information and reports.

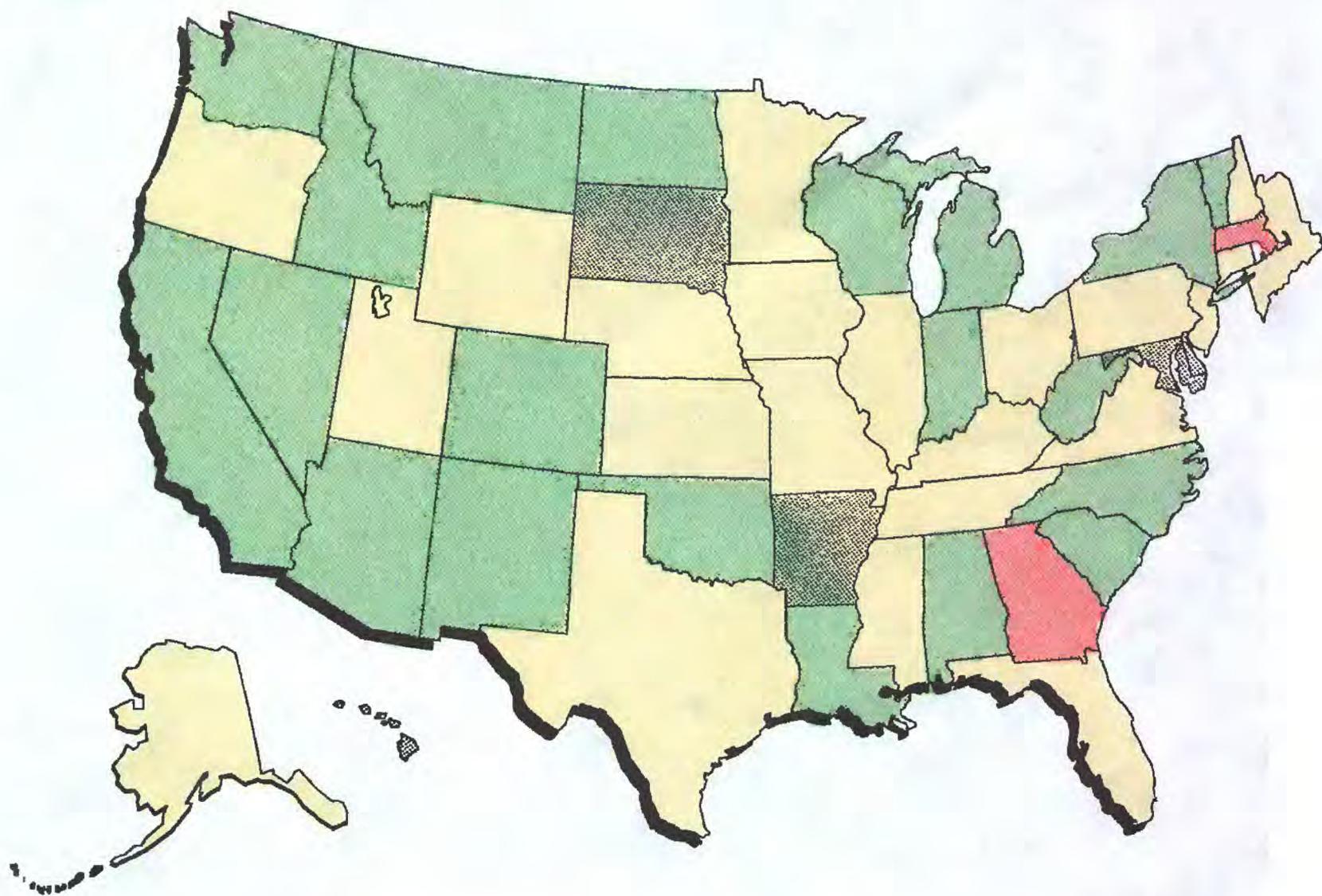
E. Method of Payment/Financial

1. The recipient will use Standard Form (SF) 270, Request for Advance or Reimbursement, to request payment under all resulting assistance awards. The SF-270 will be submitted to the Administrative Contracting Officer (ACO) whose address will be identified in the cooperative agreement document.
2. The recipient will submit a completed SF-269A, Financial Status Report, to the ACO within ninety (90) days of the end of the period of performance.

END OF PROGRAM ANNOUNCEMENT



# Statemap(42) AND EDMAP (28) STATES



-  **Both statemap and Edmap**
-  **Statemap only**
-  **Edmap only**
-  **Neither**