Mapping Data Collection and Integration Subactivity

Program	1999 Estimate	Uncontrol. & Related Chgs.	Program Redirect	Program Changes	FY 2000 Budget Request	Change from 1999
Mapping Data Collection and Integration	63,858	876	-7,880	1,271	58,125	-5,733
Total Requirements $000	63,858	876	-7,880	1,271	58,125	-5,733

Note: The Program Redirect column reflects the redirection of funds to the Integrated Science, Science Support, and Facilities activities.

Current Program Highlights

The technical advancements of the “Information Age” provide the possibility of more widely available and more current information that can be used to solve the increasingly difficult, interdependent, and changing problems of modern society. When complemented by computer-assisted geographic information systems (GIS) and the growing use of spatially oriented information (geospatial data), the science of geography becomes an even more capable perspective for enhancing organizational processes and outcomes in government as well as in business. Place-based discourse and analyses can facilitate mutual understanding, collaborative research, and integrated decision making throughout various levels and agencies of government; a geographic perspective can improve the effective management of services and programs and help reduce costs. As a key element of its goal to use technical advancements to strengthen the geographical perspective, the USGS will expand its capabilities to provide geospatial data with an integrated land resource observation program that enhances collection and access to remote sensing data.

Base Geospatial Data

Base geospatial data describe the most essential aspects of the earth’s surface by identifying the geographic location and characteristics of specific features and boundaries. Some examples include features such as roads, railroads, streams, and lakes; position values for elevation data and geodetic control points; and the locations of government boundaries. When combined into nationwide databases in standardized formats, base geospatial data create a common foundation for computer-aided spatial analysis.

The USGS Mapping Data Collection and Integration Subactivity ensures the development and maintenance of permanent, long-term, national, geospatial databases for the Nation. The public benefits supported by this subactivity are, by design, expansive – they apply nationwide – and diffusely distributed – they involve several types of data that are used by diverse customers at many levels of government, in business, and in the general public. Such far-reaching benefits are difficult to convey. An extended example at the State level illustrates more specifically how standardized, multi-purpose mapping data serve the public.

State Applications of USGS products

In 1990, the Minnesota Land Management Information Center (LMIC), a state agency, initiated development of a base map project to produce both traditional paper products (aerial photographs and maps) and new computer-readable data sets. The program included completing statewide coverage of USGS digital orthophoto quadrangles (DOQs), digital elevation models (DEMs), digital raster graphics (DRGs), and revision of topographic quadrangle maps. State agencies in Minnesota have developed numerous applications for these USGS products. Within the Department of Transportation, DOQs are used to verify and correct existing digital road files, aid planners in visualizing construction projects, and provide a backdrop file for district transportation workers to view and collect accident locations on roadways. The Department of Natural Resources (DNR) uses DOQs and DRGs in field offices, in cooperation with the Minnesota Incident Command System, a multi-agency emergency cooperative, to provide GIS support and map production on-site for events such as forest fires, tornadoes, and floods. The DNR also uses DEMs to determine potential archaeological sites based on terrain characteristics. Counties and local governments use DOQs to provide a visual base map for planning and GIS development.

Insert NMP Fig. 1a here

Insert NMP Fig. 1b here

USGS activities minimize duplication of efforts and costs for multipurpose data and improve the Nation's information base for resolving complex issues related to resource management, hazards mitigation, and improving the environment. The USGS (1) coordinates and oversees the fulfilling of broad national needs for base geospatial data and cartographic products, (2) provides leadership and support for the development and maintenance of geospatial data standards, (3) manages private sector contracts for the production of those data and products, and (4) reviews and evaluates map data produced by many organizations across the Nation. The USGS minimizes its mapping costs through cooperative arrangements with Federal, State, and local governments and private firms.

Private Sector Services — The USGS Mapping Data Collection and Integration Subactivity generates business opportunities for private sector firms in two ways. First, within the USGS, the production of base geospatial data is accomplished largely through the services of private sector firms. Second, the availability of consistent base geospatial data on a national scale encourages a wide range of commercial enterprises that utilize these data in varying degrees.

The USGS has used private sector services for many years, having begun to emphasize the use of contracting in the early 1980's as a valuable option for achieving program objectives. In 1992, the USGS formally endorsed this business practice with a written policy to use private sector services in all cases where appropriate. For the past few years, the USGS has been working with Congress, particularly the Appropriations Committees of both the Senate and the House, to ensure that map and digital data production activities conform with Congressional expectations for the use of private sector services by Federal agencies. Both Congress and industry advocacy groups have expressed appreciation of USGS efforts in this arena. In FY 1999, the USGS will spend over $32 million for private-sector firms to acquire geospatial data.

Data Collection (Production) — The data collection component ensures the development and maintenance of permanent, long-term, national databases of base geospatial data. Contributing to the National Spatial Data Infrastructure (NSDI), these databases form a common foundation for computer-aided spatial analysis across the Nation. This program component also generates and revises topographic maps and special-purpose maps. When it is operational, the Landsat 7 satellite will routinely acquire high-quality observations of virtually all of the land masses of the Earth. The USGS on behalf of NOAA operates the ground data system to collect scientifically relevant data and will continue to systematically archive Landsat information in order to preserve an objective record of the Earth for use in the future.

Mapping Data Collection and Integration Subactivity - Selected Output Summary

Product Line	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate
1:24,000-scale maps revised	450	917	1,009
1:24,000-scale digital elevation models (DEM) *	11,107	10,256	9,840
1:24,000-scale digital raster graphics (DRG) *	5,770	917	2,509
1:24,000-scale digital line graphs	5,050	5,753	7,268
1:24,000-scale digital line graphs revised	2,539	4,470	5,433
digital ortho-images	39,174	44,000	42,750

* The 1:24,000-scale DEMs are on an accelerated schedule to achieve national coverage by the end of FY1999. National coverage of 1:24,000-scale DRGs completed, September 1998. This product line is in maintenance mode for FY 1999 and following.

DOI High-Priority Digital Data Base Program — A major element of the data collection component is the USGS responsibility for satisfying the highest priority geospatial data needs of Department of the Interior bureaus. The USGS provides this service through the DOI High-Priority Digital Base Data Program. Working together, the DOI bureaus annually assess the geospatial data needs that will satisfy the highest priority program activities of the Department. Although the funding for this program directly supports data collection for the Department, the DOI data needs often coincide with the needs of other users, and the data are incorporated into the long-term, national, geospatial databases available to all users. Thus Federal data collection redundancies are greatly reduced.

One measure of success for the DOI High-Priority program is the increased coordination among the DOI bureaus in responding to the program's annual solicitation of data product needs. For the FY 1999 program, the percentage of requests that simultaneously serve multiple purposes for multiple bureaus was 14 times greater than that for FY 1994. Another measure of the program's success is the steady increase in the average number of customers satisfied for each product generated. In FY 1994, the first year of the program, the data needs of two bureaus were met for every data product generated. In FY 1999, an average of six bureaus' requirements were met for every data product generated, fulfilling 82,400 individual user requests with 14,100 products. Had these individual requests been satisfied independently, $72.3 million would likely have been spent. Actual production costs for these data was $11.0 million — a cost avoidance of over $61 million for FY 1999 DOI data production.

National Spatial Data Infrastructure -- To implement the National Spatial Data Infrastructure (NSDI), the Federal Geographic Data Committee (FGDC) has initiated a national geospatial data framework to be completed by the year 2000 and maintained in the decades beyond. The framework consists of those geospatial data that are significant to a broad variety of users within any geographic area and nationwide. To institute the framework, the USGS, the Environmental Protection Agency, the Bureau of the Census, and the Bureau of Land

Management (BLM) have entered into partnership agreements critical to resolving major national issues, such as implementing the Clean Water Act, conducting Census 2000, and supporting BLM's Natural Resource Management and Range Management Programs. Because the continual upgrade and maintenance of the national geospatial data framework is most efficiently conducted at the local level with aggregation to higher levels, additional partnerships are being established with other data producers and maintainers to support long-term data sharing and maintenance goals of the NSDI, with the USGS providing leadership and support.

Data Coordination and Standards — Through this component, the USGS provides (1) policy, guidance, and support for the development of partnerships with Federal, State, local, and private organizations for data sharing and maintenance and (2) leadership for the development, maintenance, and promulgation of national standards for the consistent collection and description of all types of base geospatial data.

Coordination of Partnerships — The national demand for base geospatial data is enormous and increasing. To help meet the demand, the USGS leverages its resources by forming strategic alliances with other organizations that produce or utilize geospatial data to support their own mapping needs. This partnership-based approach affords not only a greater return on the USGS investment, but also minimizes duplication of effort, advances the NSDI, and reduces taxpayer costs in securing these crucial national databases. One of the primary activities under the Mapping Data Collection and Integration Subactivity, therefore, is to encourage the development of long-term, flexible partnerships that can be easily adapted to meet changing customer requirements over time.

National Hydrography Data Set

The USGS is assisting the Environmental Protection Agency (EPA) to perform its mandate under the Clean Water Act to report and assess the Nation's surface water conditions through the National Hydrography Data set. This data set is being built and maintained in partnership with other Federal, State, and local governments and private organizations. To ensure an efficient and nationally consistent approach for reporting water quality across the Nation, State and local governments will be required to use the common, standardized National Hydrography Data set. The USGS and the EPA will then use updated information from the State and local governments to maintain the National Hydrography Data set as a national reference tool.

The USGS actively engages both public and private sector partners in the effort to build and maintain national geospatial databases. To foster relationships with partners, the USGS sponsors 27 National Mapping Program (NMP) partner liaisons. Presently, 13 of the 27 liaisons are based in offices local to their area of responsibility (e.g. Alaska, Florida, Minnesota, Texas). The USGS intends to shift another ten liaisons to local offices over the next 3 to 4 years. A more regionally distributed NMP presence will enable greater interaction and better communication with partners, and increase discovery of new partnering opportunities.

The USGS encourages Federal, State, and local efforts to establish consortia of geospatial data users, producers, and providers. Through these consortia, common geospatial data requirements and natural partnering opportunities are identified. The Interior Geographic Data

Committee, which works to advance the DOI High-Priority Digital Base Data Program, is a successful example at the Federal level of one such consortium. The USGS is transferring the knowledge gained through that experience broadly throughout the geospatial data community. The efforts of many States to establish geographic information councils are advanced as a result.

Coordination of Data Needs — The data made available through national geospatial data sets are intended to provide the cartographic information that is most generally required for analytical needs of the Nation as a whole. While the long-term objective is to provide national coverage in each of the national data sets, the manner in which each database is populated is driven by the needs of its particular set of users. The priority in which the data are collected is determined by several factors and sets of users. Two of the most important are: (1) the DOI High-Priority Program; and (2) those areas of the Nation that are in highest demand by the largest number of potential users. In support of the NSDI, the USGS engages consortia of Federal and State agencies in establishing the program priorities of the national databases for aerial photography and digital ortho-imagery.

Development and Maintenance of Data Standards — The USGS, through its leadership of the FGDC Subcommittee on Base Cartographic Data, is responsible for developing, maintaining, and promulgating standards for the consistent collection and the origin description (metadata) of all types of geospatial data. The USGS establishes digital cartographic and geospatial data standards as well as quality control procedures for collecting data in a form that meets these standards. Once collected, the standardized data become part of the NSDI. To date, the USGS has led the development of FGDC data standards for ortho-imagery and elevation data, as well as standards for metadata, data accuracy, and data transfer standards.

Recent Accomplishments

Florida Fires Fought with USGS Imagery — Firefighters battling the worst wildfires in recent Florida history were aided by the availability of digital ortho-imagery of the fire zones. The Saint Johns River Water Management District in central Florida, particularly hard-hit in this year's burning, relied on the digital ortho-imagery to help plan and manage fire suppression activities. Digital ortho-imagery was especially useful because it enabled firefighters to plan deployment of fire fighting resources, identify routes for vehicle movement, and identify types of vegetation in fire areas. Fortunately, the State, in conjunction with the Water Management Districts, had recently completed statewide coverage of color infra-red digital ortho-imagery. Without the aid of digital ortho-imagery, planners and firefighters would have had to rely on older, more traditional maps and aerial photography, which did not contain the vitally needed information for these situations.

USGS Celebrates DRG Availability

In September 1998, a USGS cartographer and a U.S. Representative from Missouri spoke at a celebration to announce the availability of nationwide USGS Digital Raster Graphic (DRG) coverage. These computerized images of topographic maps can be used to collect, review, and revise other digital data and are valuable for use in emergency and hazards relief efforts.

High-Performance Computing and Communication: OhioView Pilot Project — By the end of FY 1999, and for the first time, the USGS will be able to receive, process, and deliver Landsat data, using an ultra-high speed communication link, to the State of Ohio in just a few hours after each satellite overpass. An affiliation of Ohio universities, K-12 educators, and State government agencies – the OhioView Consortium – will provide these data to land managers, researchers, educators, and the private sector throughout the State. The greatly reduced cost of the data (from $4,400 to $600 per scene) brings the vast and largely untapped educational resource of remotely sensed data within range of students and scientists at Ohio educational institutions. Researchers can exploit the data by means of computer-driven applications in the fields of agriculture, civil engineering, education, disaster management, urban planning, resource development, and environmental protection.

USGS Geopatial Data Delineates the Boundary Between Oklahoma and Texas — The south bank of the Red River serves as the border between the States of Oklahoma and Texas. For about 60 miles of this border, the nature of the Red River's stream bed and seasonal fluctuations in water level cause the river to change course frequently. This fluctuation makes it difficult to delineate an exact boundary between the states, causing land ownership, tax assessment, and jurisdictional problems, which have existed for decades. The Red River Boundary Commission, established by the U.S. Congress to permanently define the boundary, is using digital ortho-imagery and global positioning system (GPS) data to help determine the boundary. Instead of measuring the fluctuating south bank of the river, the commission is delineating "fast land," which is the land adjacent to a stream created by the depositional processes of that stream and is no longer inundated by the waters of that stream, except in conditions of major floods. Using digital ortho-imagery, digital elevation models, and field surveys through GPS and other techniques, the commission is digitizing the fast land boundary and erecting permanent markers delineating the boundary between the states. Use of digital ortho-imagery is dramatically improving the speed and accuracy of completing this project.

USGS Data Keep Formation of Management Plan for the National Petroleum Reserve on Schedule — The National Petroleum Reserve - Alaska (NPR-A) is estimated to have 8.5 billion barrels of recoverable oil and 2.7 trillion tons of coal. The area contains over 250,000 lakes, contains threatened and endangered species, is resident area to 500,000 caribou, and is one of North America's premier staging, nesting, molting, and rearing areas for water fowl and shore birds. The Bureau of Land Management State Office, Anchorage, Alaska, had been given the responsibility and the lead for developing an integrated planning process and an Environmental Impact Statement effort for the NPR-A. The purpose of the integrated planning is two fold: (1) to determine whether there are lands within the planning area that are suitable for oil and gas leasing; and (2) to determine whether there are lands within the planning area that are suitable for further protection for wildlife habitat and other surface resources. BLM was given 18 months to complete the task. BLM needed 1:25,000-scale digital orthophoto quarter quadrangles, digital raster graphics of the 1:63,360-scale maps, digital elevation models, and revised digital hydrography files. BLM has the following applications for the USGS geospatial data products: (1) identify crucial habitat for water fowl and shore birds, (2) identify crucial caribou calving grounds, (3) acquire baseline resource data, and (4) if oil leasing occurs: (a) develop a geo-reference base for resource and leasing data, (b) conduct hazard assessment for drilling and spill mitigation, (c) support spill response, (d) identify sand/gravel deposits for infrastructure development, and (e) identify routes for feeder lines.

Without the aid of the USGS data, BLM would not have been able to meet the critical time frames dictated in the charge to complete the plan.

State Land Use Data Base Developments Rely on USGS DOQs — New Jersey is using USGS DOQs to build a detailed (one-acre minimum unit) land use/land cover data base, which will include impervious surface areas to support statewide watershed management and habitat data to support numerous fish and wildlife applications. Florida water management districts are using DOQs to revise their land use/land cover/wetlands data to support various applications within their districts, but primarily to monitor the loss or expansion of wetlands. The DOQs are particularly critical to these land use/land cover data base developments, because they enable researchers to measure parcel sizes as small as one acre without the need for field verification, and because the level of detail and clarity of the DOQs allows the identification of unique land use and land cover types directly from the imagery. No other source materials provide these benefits. If field methods had been required, the cost and time for completing these projects would have been prohibitive.

USGS Map Products Needed for Water Quality Analysis in Kansas — In Kansas, DOQs are being used as a base from which to collect and revise 1:24,000-scale hydrography for the entire State, in conjunction with more detailed data provided by the Kansas Geological Survey. In addition to updating and enhancing the National Hydrography Data Set (NHD), the revised hydrography is supporting the collection/delineation of riparian vegetation along the streams in the State. Both the NHD and the riparian vegetation data are critical components of the State's water quality analyses and reporting.

Justification of Program Change

	FY 2000 Request	Program Change
$(000)	58,125	+1,271

Community/Federal Information Partnership (+$4.0 million) — As a lead participant in the interagency Community/Federal Information Partnership (C/FIP), the USGS will work with State, local, and Tribal governments, the private sector, and others to advance the capacity of communities to develop, maintain, and use geospatial data, and to improve the USGS's ability to meet communities' needs for spatially referenced earth science information. The geographic data needs of Federal programs are most efficiently met by leveraging Federal investments in geographic data with those being made by State and local government agencies. The requested resources will provide matched funds to work with State and local governments to collect orthoimage, elevation, and hydrography data – core categories that are essential to nearly all programs. These standardized data types serve multiple purposes at all levels of government, such as the integration of elevation and hydrographic data for flood predictions. They also have myriad uses for management of government and private lands, environmental research and planning, hazards response, and commercial applications.

High-Performance Computing and Communication (-$2.0 million) — The decrease will reduce funding for high-performance computing and communication, a pilot completed in FY 1999 to deliver natural science data to a consortium of academic institutions in Ohio. The proposed reduction is being redirected to fund higher priorities. The remaining funds

($1.0 million) will allow for operation and maintenance of the project with the OhioView Consortium.

Technological Efficiencies (-$0.729 million) — The USGS will reduce funding for Mapping Data Collection and Integration to reflect anticipated savings that will result from technological and process improvements through the application of new hardware, software, and procedures. A modernized infrastructure reduces the amount of effort necessary to extract cartographic data from source materials, integrate data from various sources, update existing information, and produce cartographic information and products in formats useful to a broad range of customers. This modernized infrastructure allows the USGS to reduce its dependency on its in-house resources, thereby streamlining personnel and support requirements. The USGS also plans to make this technology available to its contractors, which will reduce the effort expended by the USGS to validate the quality of the contractor-produced data. The USGS expects to be able to reduce contract management costs because more efficient systems are now in place for review of contracted data and because of the improved quality of data produced by contractors.