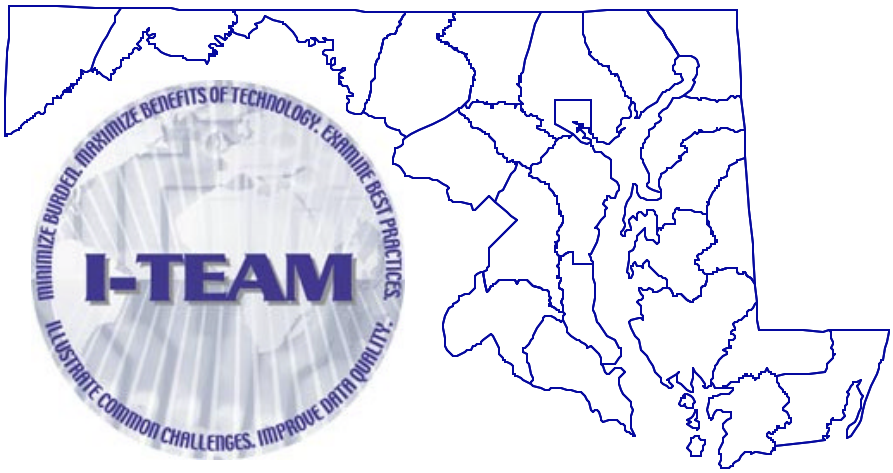
Maryland's Geospatial Data Implementation Team Plan



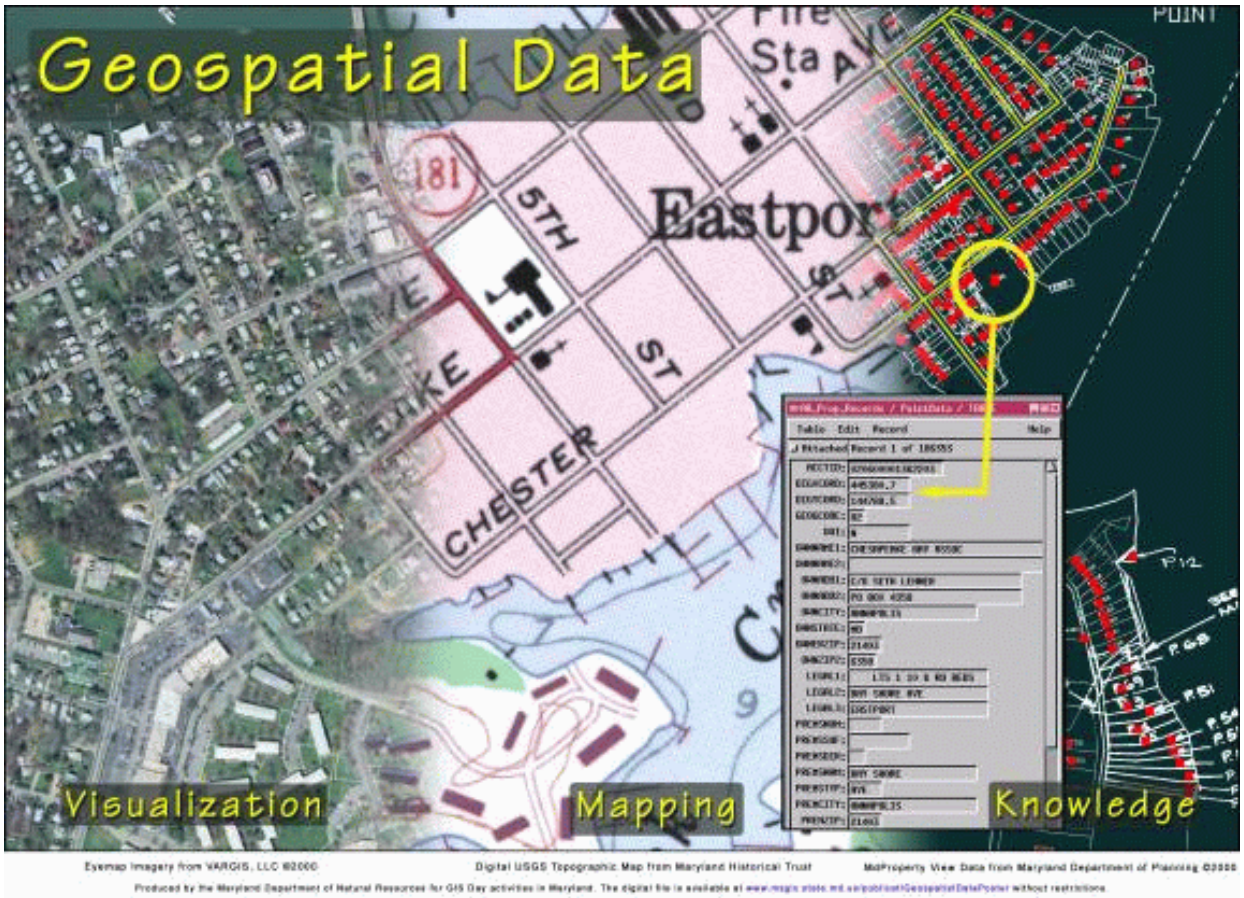
Prepared by
Maryland State Geographic Information Committee
(MSGIC)

July 12, 2002

MSGIC 003 - 071202

Foreword

Geographic Information Systems (GIS) are used by most public and private sector organizations to improve planning efforts and more efficiently manage daily operations. They are vital tools which offer numerous tangible and intangible benefits and they contribute significantly to our State's economy. Digital geographic data (geospatial data) are the "fuel" used to run these management support systems. Data development is costly and requires significant time and coordination to accomplish. The Maryland State Geographic Information Committee (MSGIC) has helped to avoid duplication of effort in the creation of these data amongst state agencies. With a new focus on all public and private sectors, MSGIC must now work in a vertical sense from local to federal levels, to create new public and private partnership opportunities. We have the technical ability and the desire to produce one common data set that meets the requirements of most public and private sector users. This plan describes the need for geospatial data, and it offers a new approach for coordination and funding to increase the production of these essential data for Maryland. Implementation of this plan will result in significant cost-savings, improved coordination and a cooperative effort that will help unite public and private organizations into a common purpose. The following graphic represents the concept of geospatial data.



Activity Log

September 30, 2000	I-Team concept presented at the National States Geographic Information Council (NSGIC) Annual Conference.
October 25, 2000	The Maryland State Geographic Information Committee's (MSGIC) Database and Resource Development Subcommittee suggests formulation of an "I-Team," which is approved by the full committee.
January 10, 2001	I-Team meeting held at MSGIC quarterly meeting.
April 16, 2001	I-Team meeting held at Department of Agriculture.
May 16, 2001	I-Team meeting held at Department of Natural Resources.
June 7, 2001	I-Team meeting held at Department of Agriculture.
July 25, 2001	I-Team meeting held at the MSGIC Quarterly meeting. Original draft unanimously approved by the full MSGIC Committee.
Aug. - Sept. 2001	PowerPoint presentation (http://www.msgic.state.md.us) and briefing document (Attachment E) developed to support plan.
Aug. - Sept. 2001	MSGIC State agency members (from agencies represented on the Smart Growth Sub-cabinet) briefed their Secretaries on the Smart Growth Data Factory plan and indicated their support for the plan.
September 14, 2001	The PowerPoint presentation and briefing document were presented to the Governor's Smart Growth Sub-cabinet. MSGIC was informed that dollar amount was too high given the current budget situation. Sub-cabinet members requested MSGIC to formulate a new strategy with low cost improvements for specific Smart Growth activities and present the new plan to the Sub-cabinet at the next meeting.
September 26, 2001	Meeting held with Departments of Assessments and Taxation, Natural Resources, Planning, Business and Economic Development, and the State Highway Administration. New strategy developed at the request of the Smart Growth Sub-cabinet (Attachment F).

October 10, 2001	New strategy was presented at the MSGIC quarterly meeting and approved.
October 15, 2001	Scheduled and later "bumped" from the Smart Growth Sub-cabinet meeting due to higher priority issue.
November 2001	Smart Growth Sub-cabinet meeting cancelled.
December 20, 2001	Smart Growth Sub-cabinet meeting held. I-Team Plan not scheduled on agenda.
January 4, 2002	I-Team Plan modified with general edits, addition of the Foreword section, addition of this Activity Log tracking sheet, significant edits to the Executive Summary, addition of Section 2.2, a complete rewrite of Section 3, additions to Table 9.2, additional vacant data profiles for sections 34 - 42 which will be required for Homeland Security applications, and the inclusion of Attachments E, F, G and H.
January 9, 2002	Critical Infrastructure Data Layers identified by I-Team.
February 12, 2002	I-Team Plan presented to State CIO.
April 10, 2002	Proposed Grid system reviewed and finalized.
July 10, 2002	I-Team Plan modified with general edits, addition of Section 5.6, addition of Figure 5.1, modification of Table 8.2, replacement of Table 9.2 and addition of Attachment I.

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1.0 Executive Summary

We live in a complex society that requires us to consider the interrelationship of many things as we deal with emergencies and routine operational matters. Understanding these interrelationships is frequently accomplished by acquiring and carefully analyzing accurate information in a spatial context. Over the past decade, geospatial data have become vital to the decision-making process because they allow managers to easily visualize options and evaluate the results of their decisions prior to implementing them. Geographic information systems (GIS) have given Maryland's decision-makers significantly improved capabilities to implement the Smart Growth program, including Priority Funding Areas, Green Print, Rural Legacy and other key planning efforts. These systems are also essential for proper management of such diverse fields as Homeland Security, law enforcement, emergency services, public works, health care, agriculture, environment and natural resources management. For example, consider the fact that the following relationships can be "discovered" in seconds, minutes or hours with the appropriate geospatial data resources:

- county or state roads that provide access to a reservoir for Baltimore City and its treatment facilities. (Homeland Security)
- a parcel of land that is available for acquisition, compared to an existing state park, a forest corridor, or endangered species. (Green Infrastructure/Natural Resources Management)
- a hurricane storm track related to people's homes, food prone areas, escape routes and evacuation shelters. (Emergency Services)
- location of police resources compared to calls for assistance, arrest locations, and other enforcement actions. (Public Safety)
- aircraft noise compared to landing and takeoff patterns, people's homes, and runway placement. (Transportation)
- particular types of cancer compared to environmental, agriculture, commercial, industrial, water supply, and electromagnetic factors. (Environmental Health)
- public transportation routes compared to employment, health clinics, shopping and social services. (Human Resources)
- Proposed industry siting compared to brownfields, available properties, water supply, electricity, gas, rail lines, highways and a suitable workforce. (Economic Development)

To promote intergovernmental coordination and better prepare Maryland executives to manage in the coming decades, we must begin a map modernization program that lays a new foundation for future data management systems. That program is known as the **Data Factory,** and it will

provide an appropriate infrastructure and budget to ensure that required information tools are available when needed.

Government and business routinely collect geospatial information that should be captured to provide the greatest benefit for the citizens of the State. Without effective coordination mechanisms, these organizations will produce similar types of data that yield inconsistent answers. In addition, collecting the same data many times is a costly mistake that must be avoided.

Effective coordination has been hampered by a general misunderstanding of the value of geospatial data, along with unreliable operating budgets, changing priorities and the lack of a coordinating authority. Data collection activities are vital to government agencies, but they can't provide the necessary assurances to each other that particular data collection activities will proceed. Therefore, if particular data are critical to one government agency, they continue to produce their own data irrespective of other efforts or opportunities to share. Geospatial technologies are providing 4:1 benefit/cost ratios for agencies that use spatial data for analysis, and higher returns for cooperative interagency ventures. Investments in spatial data provide a positive return and are a good investment in Maryland's economy.

Since 1991, the Maryland State Geographic Information Committee (MSGIC) has coordinated geospatial data production between State agencies. During that time, little duplication occurred within State Government, and geospatial technologies are now in use by nearly every political sub-division of Maryland government. Next, we must develop new coordination mechanisms to meet the "vertical" data needs of **all** government agencies and the private sector. With proper planning and executive support, the next generation of large scale, intelligent map products can meet the needs of all users.

Two unrelated events helped to create a proactive environment in Maryland to address the mapping needs of all users. At the national level, the White House Office of Management and Budget proposed a new initiative referred to as Implementation Teams. The I-Teams were established to provide a framework for interagency cooperation. At the state level, MSGIC reorganized in April 2001, to enroll a more diverse membership that represents all sectors. The new Committee is helping to coordinate data producers and manage the Implementation Team. However, full time staff and an appropriate operating budget are required to modernize Maryland's mapping systems.

This plan is the product of Maryland's Implementation Team which is comprised of over 70 members from the public and private sectors. It provides a comprehensive view of data

requirements, production costs and data coordination issues that will allow Maryland executives to make the right decision regarding the proposed **Data Factory**. The Technology Services Procurement (TSP) contracts approved by the Board of Public Works on April 18, 2001, have already laid the foundation for coordinated procurement of geographic data and services.

MSGIC proposes the creation of an oversight office for geospatial data production referred to as the Geographic Data Partnership Office (GDPO). The GDPO will be capable of building annual data production partnerships that are valued at $12,000,000.00 per year by using $7,000,000.00 in State funds. Following established benefit to cost ratios, the work of this office will provide up to $41,000,000.00 in positive economic impact for Maryland on an annual basis. The I-Team recommends placing the GDPO at the Department of Budget and Management's Information Technology Office or at the Maryland Emergency Management Agency considering the new emphasis on geospatial data for Homeland Security planning, preparation and response. The GDPO can work between local, state and federal government agencies, and will have the authority to work with utilities and the private sector to forge true partnerships for geospatial data production.

The foundation of geospatial data created by these partnerships will include the essential elements for effective governance in the 21st Century. They will allow Maryland to attract appropriate economic development and provide exceptional services to all of its citizens. The remainder of this plan details the infrastructure, budget and data required to do this.

2.0 Geospatial Data Use in Maryland

2.1 Why are Geospatial Data Important - Over eighty percent of the data that government agencies manage have a geographic component that relates to a physical location on the face of the Earth. Federal, state and local government agencies have produced many of their data in geographic information system formats for over 25 years to "map" those data and show their relationship to other features. These data are used in many ways to support management and planning programs. The following examples provide a brief glimpse of the many uses of spatial data.

2.1.1 - Governor Parris N. Glendening effectively used spatial data to demonstrate the dramatic growth of the Baltimore/Washington corridor and gain support for the Smart Growth Initiatives. The University of Maryland and the U.S. Geological Survey created the first "red tide" images during a two year million dollar program. Figure 2.1 shows a similar "red tide" image created by using MdProperty View, the parcel mapping system developed by the Department of Planning. This product was created in less than one hour at no cost, because the data were readily available.

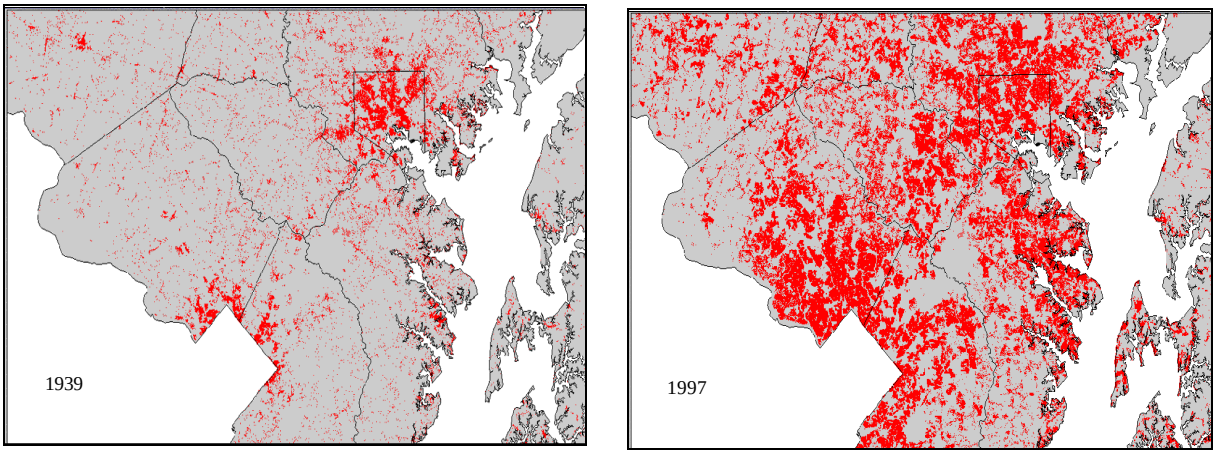
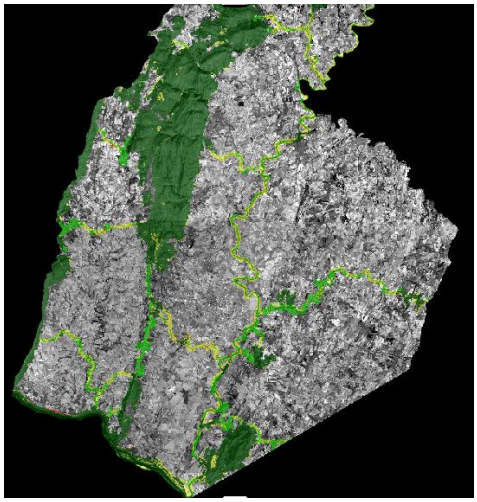


Figure 2.1
Increase in Urban Developed Lands 1939 - 1997
Washington to Baltimore Corridor

2.1.2 - Priority Funding Areas are mapped by the counties according to criteria outlined in the 1997 Smart Growth Act. The Department of Planning is charged with evaluating and commenting on these maps in light of these criteria. The criteria require that development be of a minimum density and that it be on central sewer. In addition, there needs to be a reasonable relationship between growth supply (growth capacity) and demand (projected growth). Data from *MdProperty View* is overlaid with county zoning, sewer service, land use, protected lands, and other data to develop a geographic database for MDP's analysis of these maps.



2.1.3 - The Department of Natural Resources used its existing inventory of spatial data with data produced by other agencies to develop the "Green Print" program and to map the infrastructure of green corridors and hubs to connect and preserve Maryland's natural areas. The data are now used to screen parcels for acquisition under the program. See Figure 2.2 at left.

Figure 2.2
Green Print Corridors and Hubs over
SPOT Satellite Imagery of Frederick County

2.1.4 - The Department of Planning is the custodian of the State's parcel maps, also known as tax maps or property maps. MDP assembled CD-ROM products containing digital versions of these maps, formatted for use in GIS, along with parcel data, land use/ land cover data, priority funding areas, roads and census geography. State and local government agencies, as well as non-profit organizations and private sector organizations, are able to perform detailed land use analyses using this common tool.

2.1.5 - Maryland's Rural Legacy Program is part of the Smart Growth Act. It provides funds for targeted land preservation to ensure that areas with exceptional resource value or unique character are preserved. The Departments of Planning and Natural Resources use *MdProperty View and MERLIN Online*, respectively, with other data as outlined in the Smart Growth analysis above, to determine how fragmented the landscape is, how protected from development it is, and to help target areas for preservation. For example, mapping recently developed (or improved) parcels on smaller lot sizes is a good way to illustrate fragmented land. Mapping large undeveloped parcels (e.g., 100 acres or greater) helps to illustrate areas where preservation should be targeted. This analysis provides a good inventory of parcels based on size, zoning, protection status (e.g., easements and parks), and development status.

2.1.6 - The State successfully partnered with the Mellon Foundation to acquire 58,000 acres of valuable natural resource lands from the Chesapeake Forest Products Company in a complex transaction that required rapid assessment of more than 600 Chesapeake tracts distributed over five counties on the lower eastern shore. The Department of Natural Resources used GIS to quickly identify significant resources on these lands and bring the negotiations to a successful conclusion.

2.1.7 - Similar to the Rural Legacy application above, the Department of Planning works with several counties to evaluate the effectiveness of their rural zoning and related rural preservation efforts. This type of analysis uses *MdProperty View* to provide maps and tabular data on the size, density, location, frequency, and date of development in rural areas. It also shows large

contiguous tracts of land with little or no development. Easements and parks are often mapped with these data to give a better picture of how the different components of rural preservation relate to each other. Output from this work provides clear information on rural development trends and how future development could impact rural areas.

2.1.8 - MDP utilized the PFA data and the data within MdProperty View to construct a web-enabled application that will help facilitate the implementation of the Governor's Smart Growth initiative. Users simply enter in an address or parcel account ID and a map will appear showing the subject property in relation to the priority funding area. Alternatively, users can zero in on any individual parcel and with the click of a mouse, obtain information about that property.

2.1.9 - On April 7, 2000 approximately 110,000 gallons of oil spilled into Swanson Creek and the Patuxent River when a pipeline supplying a major power plant ruptured. Field crews needed detailed maps of the area with inventories of natural and cultural features to do their jobs. The Department of Natural Resources (DNR) supplied aerial photography and maps showing wetlands and sensitive species locations, as well as maps of historic and archeological features and property ownership using data produced by DNR, the Department of Housing and Community Development and the Department of Planning.

Figure 2.3 for Section 2.1.9
Aerial Photo of Oil Spill in Swanson Creek

Figure 2.4 for Section 2.1.11
Storm Drain Outfall Mapping

2.1.10 - Montgomery County's GIS Team developed a land evaluation application that allows Agricultural Preservation staff to quickly obtain values of land parcels targeted for preservation, including soil type, topography, land use, etc. in less than 15 minutes. Previously, manual procedures required 8 or more hours per parcel. GIS was instrumental for Montgomery County to receive $8.55 million in Rural Legacy funding during FY98-01.

2.1.11 - The Office of Geographic Information Systems worked with the Bureau of Water Resource Management to complete the Source Identification and Outfall Characterization sections of Carroll County's Part 1 National Pollutant Discharge Elimination System (NPDES) permit. Staff from both agencies reviewed over 10,000 engineering drawings and conducted field investigation efforts to identify, map, and characterize over 1,000 storm drain outfalls across the county. The County's GIS was used to determine geographic coordinates for all 1000 + outfalls, drainage areas, and land uses within each drainage area for ninety-nine major outfalls being focused on in Part 1. A complete set of detailed maps comprising the data was prepared and submitted with the application. Completing this work in-house using the County's GIS saved

Carroll County an estimated $100,000 in consultant fees. See Figure 2.4 above.

2.1.12 - The Howard County Public Safety System begins with 911call-takers and dispatchers using interactive map displays to verify calls and to route responses. All calls are geographically located as they are received. Police and Fire analysts use this information with GIS tools for planning new facilities and analyzing crime trends.

2.1.13 - The Howard County Bureau of Highways uses GPS and GIS to coordinate snow removal efforts during a snow event. GPS units and sensors on snow plows provide real-time data to a map display showing roads plowed, and when they were plowed. The map and data are available to users through a web-based tool.

2.1.14 - The Howard County GIS Division provides data, mapping and information to GIS users through an Intranet web site that provides casual users a wide range of data and allows creation of simple maps. Sophisticated GIS users can download data for their own desktop analysis.

2.1.15 - Citizens of Howard County use GIS to view subdivision status in the County development approval process. Interactive maps are integrated into the County's public web site, www.co.ho.md.us, with an easy to use interface.

2.1.16 - The Baltimore City Collaborative, with assistance of numerous organizations and agencies, has mapped child and family socioeconomic and health risk indicators at the Census tract level. These data strategically target high-risk areas with preventive child program resources, and will allow future monitoring of program effectiveness for influencing risk factors.

2.1.17 - Baltimore County's Comprehensive Rezoning uses a customized ArcView GIS interface to provide planners and decision-makers the ability to query, display and track zoning issues. Current zoning can be overlaid with parcel data, and the application permits analyses of current zoning, proposed zoning changes and tracking of zoning issues. Planners can also produce mass mailings to citizens, locate zoning signs, and digitize zoning changes.

2.1.18 - Baltimore County's *LACQuire* system automates retrieval, query and reporting of assessment data for the Land Acquisition Unit. New capabilities include parcel selection, attribute query, data retrieval from assessment layers, creation of assessment forms, Titles and Appraisal forms, letters and mailings.

2.1.19 - Few events better demonstrate the need for close coordination between all levels of government and the private sector than a hurricane. The photographs and captions for Figures 2.5 through 2.10, demonstrate how we all rely on Geospatial data to respond to such an event. It is important that all levels of government and the private sector work with each other to pre-plan for such events. Routine operations also require the use of geographic information to be effective. Over 80% of government data has a geographic component (e.g. address, zip code, parcel map reference, etc.) that can be mapped using visualization tools.

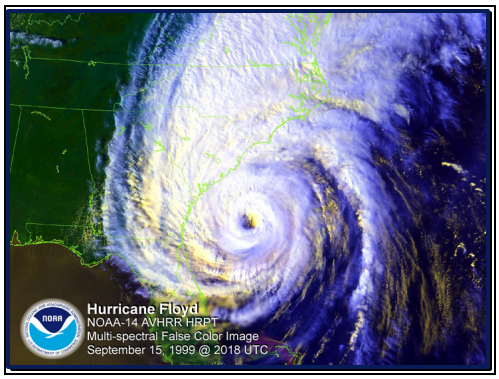


Figure 2.5 Federal weather forecasters track and relate the location of storm events using Geospatial data. They are able to make predictions for the areas that are likely to be hardest hit.

Figure 2.6 Government agencies preplan for storm events based on Geospatial data. They must know what areas will be inundated after a storm event and be ready to provide guidance to emergency services personnel about where people live and where they are likely to congregate after the event.

Figure 2.7 Emergency dispatch personnel working within city, county and state offices need to coordinate the location of their resources and personnel with the location of events and the people who are in need of services.

Figure 2.8 In a large disaster event, emergency services personnel are brought in from distant areas to assist local crews. These emergency responders are generally unfamiliar with the local area and need the assistance provided by map products to respond to citizens in distress.

Figure 2.9 Emergency coordinators preplan and map effective escape routes which are dependant on elevation data. In addition, they coordinate and track the movement of people to shelters which are pre-determined in preplanning exercises prior to the events.

Figure 2.10 Emergency coordinators deal with many unforseen activities. This example shows a relief group which is determined to collect stranded pets. These animals need to be marked and "tracked" with their approximate pick-up locations to reunite them with their owners who are also "tracked" after a storm event. Providing these groups with appropriate map resources and information tools is a tremendous coordination tool and a goodwill gesture.

Photo Credit: All photos in Figures 2.5 through 2.10 were obtained from the State of North Carolina and the Federal Emergency Management Agency Web Site.

2.2 Problems With Existing Geospatial Data Resources

- Geospatial data have the greatest value to the largest number of users when they are current, accurate, available at an appropriate scale, well attributed, available in a suitable data type, built to appropriate standards, documented correctly, and in the public domain. Over the past 25 years, government and public organizations have increasingly converted their geospatial data holdings to digital formats as improved efficiencies due to more robust hardware, software and application development have become more apparent. During this period, data production has typically been funded by individual agencies to meet specific program mandates. Funds have seldom been available to incorporate all of the above characteristics. While coordination has been good between agencies, some duplication of effort still exists due to the basic limits on the creation of data. Each of the data themes is of limited value to the full universe of potential users, in spite of the fact that many were considered "state of the art" only 5 years ago. The following sections describe the practical affect of each of the above characteristics as they relate to real examples.

2.2.1 Current - Historical geospatial data are very valuable for many activities, but current data are essential for today's planning and management efforts. Each data type has a unique update cycle that varies from daily for features like new road or home construction, to perhaps as infrequent as every 20 years for geologic or soil data. When the State first started its orthophoto program (DOQ maps) through the Department of Natural Resources, the goal was to update each map every 3 to

5 years. Production started with aerial photography from 1989 through 1995 resulting in map production from 1991 through 1999. Production of these maps was funded by a variety of general, special and grant funds that can not be relied on for continuing production on a set schedule. Due to recent budget projections, DNR will not fund production of DOQ updates. It is likely to license private sector data to meets its own management needs, resulting in no public domain updates for DOQ users in Maryland.

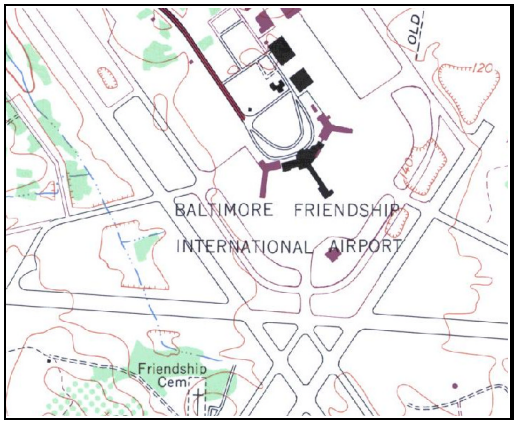


Figure 2.11

A good example of non-current data is demonstrated by this portion of a U.S. Geological Survey (USGS) quadrangle map. The rate of urban development and name changes overwhelmed the USGS's ability to maintain this map series using manual methods with update cycles as infrequent as 30 - 40 years. The "current" quadrangle map shows Baltimore Friendship International Airport which has been Baltimore Washington International Airport since 1972. In addition, the facilities have changed and expanded since this map was produced.

2.2.2 Accuracy - Map accuracy is a paramount concern for the map user. However, it is probably the most misunderstood cartographic term. Map accuracy relates to how precisely features are located on the map. It must be planned for in the beginning stages of production, and then tested and reported at the conclusion of mapping. The precision of feature placement is typically controlled by the scale of the map and the requirements of the end user. Geographic information systems have the ability to combine maps of disparate scales leaving the users with a false sense (positive or negative) of accuracy. Quite often, agencies engaged in mapping do not have adequate funds or personnel to properly test the accuracy of their map products. Accuracy tests are one of the first features to be eliminated as budgets are tightened. A good example of poor fit between features can be seen in Figure 2.14 which displays the FEMA 100-year floodplain with the State's parcel boundary maps.

2.2.3 Appropriate Scale - As time progresses, a larger number and type of users want access to large scale maps. The state has not been able to fund production at these larger scales, resulting in a duplication of effort with county and municipal governments, as well as private organizations.

Scale is important because it controls the type of features that can be mapped. For example, using the orthophoto base map in Figure 2.12 would not allow mapping of individual traffic lanes, whereas the base map in Figure 2.13 would support this user requirement. Local governments, utilities and many business interests are dependent on large scale mapping to locate features of interest to their operations.

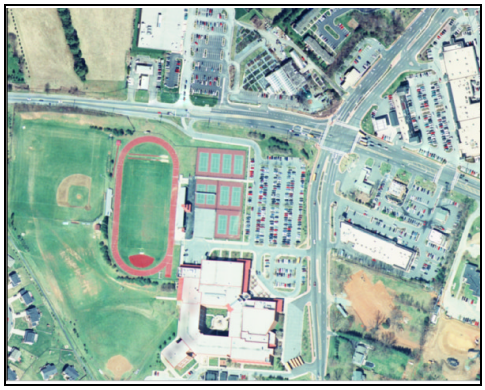


Figure 2.12 - Medium Scale
Eyemap Imagery from VARGIS, LLC

Figure 2.13 - Large Scale
Eyemap Imagery from VARGIS, LLC.

2.2.4 Well Attributed - The Department of Assessments and Taxation (DAT) records information on each parcel in the State. This information is invaluable to the real estate, banking and development communities, as well as government and non-profit organizations. At their current funding level, DAT can not maintain all information in their database and therefore concentrate on the features that affect the evaluation process to meet their mandates. This means that many of the data elements in their database are inaccurate or out of date which is a common problem with legacy data maintained by government agencies. This particular issue has prevented better coordination and sharing of data between state and county agencies. Data collection programs are often the casualties when budgets are effectively reduced and the number of mandates are increased.

2.2.5 Suitable Data Type and Data Standards - These issues are discussed together, because they are related to, and driven by user needs. An agency can produce data to current "standards" and then be faced with expensive and unbudgeted upgrades to newer standards in the future. Agencies frequently produce data that are suitable for their needs, but do not meet "standards," or the needs of other users. The reason is almost always due to a lack of funding. In some cases, the reason may relate to innovative mapping programs that start well before standards development (standards commonly follow innovation). A good example of this is MdProperty View. Figure 2.14 shows the parcel boundaries (white lines) in MdProperty View with the parcel nodes (green squares) as they relate to the 100-year floodplain boundary produced by the Federal Emergency Management Agency (blue filled area). The parcel boundaries are a graphic representation and they can not be used to intersect the floodplain to determine which properties are affected by flooding. GIS systems can use the green nodes, containing the "intelligence" of the parcel maps, to

Figure 2.14

intersect the floodplain. But in this example, that action would yield only the one parcel node that falls within the blue area. This leads to erroneous results and a requirement to use manual techniques which are inefficient. Agencies often employ "work-around" solutions to improve the accuracy of automated intersections to a reasonable level for planning purposes. If these data were produced in suitable formats using existing standards, and at large scales, there would be a much larger universe of users that may help fund their production, because they are guaranteed to obtain accurate information.

2.2.6 Documented Correctly - The Maryland State Geographic Information Committee (MSGIC) adopted the Federal Geographic Data Committee's Metadata Documentation Standard in 1995. Few agencies use this documentation protocol, because they have limited personnel resources and little incentive to document to this standard. Without complete and accurate documentation, data is virtually worthless. Without adhering to the FGDC standard, Maryland agencies will not be able to participate in the National Geospatial Data Clearinghouse program that allows others to "discover" our data across Internet.

```
Identification_Information:
        Citation:
                Citation_Information:
                        Originator:  Maryland department of Natural Resources
                        Publication_Date:  2001
                        Title:  Rural Legacy 2001
                        Edition:  1
                        Geospatial_Data_Presentation_Form:  map
                        Series_Information:
                                Series_Name:  Rural Legacy
                                Issue_Identification:  2001
                        Publication_Information:
                                Publication_Place:  Annapolis, Maryland
                                Publisher:  Maryland Department of Natural Resources
                        Online_Linkage:  www.msgic.state.md.us/techtool/
        Description:
                Abstract:  The Rural Legacy boundaries define the areas approved by the Maryland Board of Public Works as
protecting Maryland's best remaining rural landscapes and natural areas.  These areas are eligible to receive funding for the
acquisition of properties or easements that meet he goals of the program.
                Purpose:  In 1997, the Maryland General Assembly approved the
                        Rural Legacy Program as a major component of Governor Glendening's
                        Smart Growth and Neighborhood Conservation Initiative.  The purpose
                        of the Rural Legacy Program is to protect Maryland's best remaining
                        rural landscapes and natural areas through the purchase of land or
                        conservation easements.  The Rural Legacy Initiative is a "bottom up"
                        program that must be initiated or endorsed by the appropriate local
                        governments.  Often, local governments work in cooperation with
                        land trusts and individual citizens to identify Rural Legacy Areas..... (continues)
```

Figure 2.15 - Typical Example of Metadata (partial form)

2.2.7 Public Domain - The current policies on copyright, licensing and data charges limit the utility of existing data for the full range of users. This issue is discussed in greater detail in Section 5.3.

3.0 The National Spatial Data Infrastructure and the White House Office of Management & Budget's Implementation Teams

3.1 Background - In 1998, the University Consortium for Geographic Information Science (UCGIS) issued a research white paper entitled "The Future of The Spatial Data Infrastructure." In it, they conservatively estimated that well over $10 billion of direct geographic information activity occurs annually in the U.S. and the effects of this investment (facilities and data) play an increasingly important role in the national and global economy. Accurate geospatial data is a fundamental tool for governance in the 21st Century. Thousands of organizations are spending billions of dollars a year to collect and use geospatial data, yet we still do not have the data we need to support decision making at local, state, regional, national and international levels, and to enable citizens to derive economic benefit from this critical public good. Data collection and maintenance is the most significant cost associated with GIS implementation. Where is the money going? Why do we need to spend more money collecting and using geospatial data?

The problem is multifaceted:

- GIS data are extremely expensive to collect. Approximately eighty percent of the costs associated with GIS are attributable to gathering and maintaining the data.
- Much of the data created at the local level is not shared among agencies at the State or Local Government levels. Consequently, governmental agencies often duplicate data that are available and in use by other agencies.
- Most organizations need more data than they can afford to produce. Frequently, large amounts of money are spent on basic geographic data, leaving little for applications and development.
- Organizations do not always have the institutional capability to collect data that extends beyond their own jurisdictional boundary, so information needed to solve cross-jurisdictional or regional planning or analysis activities is often unavailable. They do not collect these data themselves, but other organizations do.
- Geospatial data may be available from another organization, but in many cases it is incompatible due to different standards and geographic bases.

3.2 History of Federal Geospatial Data Initiatives - For nearly 50 years, the U.S. government has led federal initiatives designed to address these issues and find ways of leveraging geospatial data collection, maintenance, and use within the entire GIS community. Figure 3-1 details a timeline of the history of Federal initiatives. In 1953, The White House's Office of Management and Budget (OMB) published the single most important document that regulates Federal agencies with respect to coordination of Federal surveying, mapping, and related geospatial data activities, Circular No. A-16. Over the years, Circular No. A-16 has evolved to reflect increasing Federal recognition of the importance of geospatial data in governance. Circular A-16 has been revised in 1967, 1983, and 1990. In 1990, an interagency committee, the Federal Geographic Data Committee (FGDC), was organized under OMB Circular No. A-16. During 2001, A-16, the "OMB Information Initiative" is undergoing revision to reflect Federal activities related to the National Spatial Data Infrastructure (NSDI) to:

- improve the quality of information collected,
- reduce the collection burden, and
- maximize the benefits of technology.

Several states were actively involved in the process, and a member of the Maryland's Department of Natural Resources (DNR) participated in the revision process.

Figure 3.1
U.S. Government's 50-year Commitment to Coordination of Geospatial Data Activities

Date	Activity
1953	**Circular A-16 issued by the Bureau of the Budget** (now Office of Managmenet and Budget, or OMB) ! Circular A-16 initiates the A-16 process, the primary mechanism used by the National Mapping Division (NMD) to determine map requirements of other federal agencies. ! Circular A-16's intent is to facilitate coordination of disparate federal mapping activities, and it assigns responsibility for such coordination to the USGS's National Mapping Program.
1967	May 1967, **OMB revises Circular A-16** to identify leadership responsibilities. ! Department of Interior, pertaining to National Topographic Map Series and National Atlas of the United States. ! Department of Commerce, pertaining to National Networks of Geodetic Control.
1983	**OMB memorandum expands the USGS/NMD role and the A-16 process** to include responsibility for providing leadership and coordination in digital cartography.
1990	October 1990, **Circular A-16 undergoes a major revision** and OMB reissues the revised version. ! Rescinds and replaces Circular A-16 dated May 6, 1967 ! Takes developments in digital geographic information systems into consideration. ! Recognizes activities pertaining to digital geospatial data, in addition to traditional surveying and mapping activities. ! Expands scope to include additional Executive Departments and additional Federal geospatial data programs. ! Calls for establishing an "interagency coordinating committee" to promote the coordinated development, use, sharing and dissemination of surveying, mapping and related geospatial data. ! Calls for development of a national digital geospatial information resource linked by criteria and standards, with involvement of Federal, State, and local government, and the private sector to: - Enable sharing and efficient transfer of geospatial data between producers and users, - Enhance coordination and build information partnerships among government institutions and the public and private sectors, - Avoid wasteful duplication of effort, and - Ensure effective and economical management of information resources in meeting essential user requirements.

1990	An interagency committee, **the Federal Geographic Data Committee (FGDC), is organized** under OMB Circular A-16.
1994	**Executive Order 12906, Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure (NSDI) is signed by President Clinton** and issued April 13, 1994, (published in the April 13, 1994, edition of the Federal Register, Volume 59, Number 71, pp. 17671-17674) **Executive Order 12906:** ! Names the national digital geospatial information resource described in OMB Circular AQ-16 as the "National Spatial Data Infrastructure, or NSDI. ! Defines the NSDI as "the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data." ! Provides for executive branch leadership by the Federal Geographic Data Committee as the interagency coordinating committee for the Federal government's development of the NSDI. ! Calls for: - Development of a National Geospatial Data Clearinghouse, - Standardized documentation of geospatial data, - Development of geospatial data standards, and - Initial implementation of a national digital geospatial framework.
1997	**The NSDI Strategic Plan is released** to articulate the vision, goals, and supporting objectives of the National Spatial Data Infrastructure. ! The vision of the NSDI is that a"Current and accurate geospatial data will be readily available to contribute lo9cally, nationally, and globally to economic growth, environmental quality and stability, and social progress." ! The goals and their supporting objectives are built upon Executive Order 12906.
2000	**I-Teams created.** On July 18, 2000, the Office of Management and Budget (OMB) held a public roundtable in cooperation with the Federal Geographic Data Committee (FGDC) and the National Partnership for Reinventing Government (NPR). The effort is part of OMB's Office of Information and Regulatory Affairs (OIRA) Information Initiative "Collecting Information in the Information Age" to examine how government may improve the quality fo the information it collects and to minimize the collection burden by maximizing the benefits of information technology. ! Over 110 senior officials from Federal agencies, states, cities, technology vendors, OMB, Senate Appropriations staff, and public interest organizations attend the July 18 meeting. ! The roundtable explores how to overcome the financial and institutional barriers to sharing of geospatial information horizontally and vertically among Federal, state, local and tribal government agencies, and the private sector. ! The Federal Geographic Data Committee and the Office of Management and Budget invite State or Regional to establish Framework Implementation Teams and submit Implementation Plans.
2000	**Maryland I-Team is created on October 25, 2000**
2001	**Circular A-16 is undergoing revision** during 2001 - 2002 to reflect Federal activities related to the National Spatial Data Infrastructure (NSDI).

2001	The Office of Management and Budget created the **Geospatial One Stop Initiative** to revolutionize e-government by providing a geographic component. This project is fundamental to establish the groundwork for the long-term vision. The implementation of the Geospatial One-Stop in the near-term will: ! Provide standards and models for the content of a geospatial data framework; ! Provide an interactive index to geospatial data holdings; ! Initiate interaction between agencies about existing and planned spatial data collections; and ! Provide an online access point to geospatial data.

The NSDI is the product of Executive Order 12906, Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure (NSDI), signed by President Clinton and issued April 13, 1994. The NSDI is the total ensemble of available geographic information that describes the arrangement and attributes of features and phenomena on the Earth, as well as the materials, technology, and people necessary to acquire, process, store, and distribute such information to meet a wide variety of needs. Executive order 12906 organized executive branch leadership for development of a coordinated NSDI and encouraged executive branch departments and agencies that have an interest in the development of the NSDI to join the FGDC. The executive order strengthened and enhanced the general policies described in OMB Circular No. A-16. Each agency was instructed to meet its respective responsibilities under OMB Circular No. A- 16, and the FGDC was instructed to involve State, local, and tribal governments in the development and implementation of the initiatives contained in the order using the expertise of academia, the private sector, professional societies, and others as necessary to aid in the development and implementation of the objectives of the order. Executive Order 12906 also addressed the development of a National Geospatial Data Clearinghouse, data standards activities, the National Digital Geospatial Data Framework, and partnerships for data acquisition.

The effects of the NSDI are far ranging. In 1993 the FGDC (operating under the aegis of the Office of Management and Budget) verbally requested the National Academy of Sciences (NAS) Mapping Science Committee (MSC) to study how to promote the NSDI through partnerships. The Defense Mapping Agency, the United States Geological Survey, the Bureau of Land Management, and the Bureau of the Census supported the study. The MSC study cited the importance of cooperation and partnerships for geospatial data activities among the federal government, state and local governments, and the private sector. Partnerships will be essential for the development of a robust National Spatial Data Infrastructure (NSDI). Moreover, the MSC study examined the demands on geospatial data within the context of the National Information Infrastructure (NII) in the twenty-first century:

> *The twenty-first century will see geographic information transported from remote nodes using computer networks to support decision making throughout the nation. The National Information Infrastructure (NII) will provide the technology infrastructure to make this possible.*
>
> *There are vast amounts of spatial data ready to move across the information superhighways today. Timely use of these data would be difficult due to ill-defined format, quality, and accuracy. National or regional decision making would be severely impaired because most data sets are not adequately characterized. This*

is to be contrasted by the fact that the NII may well be the most important technology needed to facilitate a coordinated NSDI.

The Mapping Science Committee (MSC) recommended that the NSDI be developed to a level that would support the needs of the nation. They reiterated that "The costs of creating and maintaining digital spatial data are high, so it is particularly important that spatial data collection not be duplicated, and that data be shared to fully realize its potential benefits."

3.3 OMB Framework Implementation Team Initiative - In response to an increased awareness within Federal agencies that accurate geospatial data is a fundamental tool for governance in the 21st Century, the OMB began a new initiative in July 2000 to complete the framework data that comprise the NSDI. July 18, 2000, the Office of Management and Budget (OMB) held a public roundtable in cooperation with the Federal Geographic Data Committee (FGDC) and the National Partnership for Reinventing Government (NPR). The effort was part of OMB's Office of Information and Regulatory Affairs (OIRA) Information Initiative "Collecting Information in the Information Age" to examine how government may improve the quality of the information it collects and minimize the collection burden by maximizing the benefits of information technology.

The framework is a collaborative effort to create a widely available source of basic geographic data. It provides the most common data themes geographic data users need, as well as an environment to support the development and use of these data. The framework's key aspects are:

- seven themes of digital geographic data that are commonly used,
- procedures, technology, and guidelines that provide for integration, sharing, and use of these data, and
- institutional relationships and business practices that encourage the maintenance and use of data

The framework is a partnership effort to create a widely available source of core GIS data and an environment that supports collaborative data collection, maintenance and use of these data. The FGDC initiated the concept of framework data. They identified seven themes of GIS framework data: geodetic control, orthoimagery, elevation, transportation, hydrography, governmental units, and cadastral information. The framework is a growing data resource to which geographic data producers can contribute. It will continually evolve and improve.

The framework will leverage individual geographic data efforts so data can be shared. It provides basic geographic data in a common format and an accessible environment that anyone can use and to which anyone can contribute. In this environment, users can perform cross-jurisdictional and cross-organizational analyses and operations, and organizations can funnel their resources into applications, rather than duplicating data production efforts.

A OMB document titled "*Implementing a New Paradigm*" (Attachment A) calls for individual states to create "Implementation Teams" (I-Team) to foster the development of framework data within each state. OMB is offering assistance to State governments through assignment of a Federal Partners Team, a Financing Solutions Team and a Technology Assistance Group to work with each I-Team.

As an action from the roundtable, the Federal Geographic Data Committee and the Office of Management and Budget invited States or Regions to establish Framework Implementation

Teams and submit Implementation Plans. In only a few short months, the I-Team Geospatial Information Initiative (I-Team Initiative) has gained the attention of the GIS community all over the country. Thirty states and regional groups already have or are in the process of forming I-Teams.

3.4 Geospatial One Stop Initiative - The Federal Geographic Data Committee (FGDC) will lead the Geospatial One-Stop project to define and build national consensus on content of a geographic data framework. The data from this framework will be consolidated into the National Spatial Data Infrastructure (NSDI) Clearinghouse network providing "one-stop" access to FGDC-compliant geospatial data. Interoperability tools, which allow different information communities to share data, will be utilized to migrate current data to the FGDC-endorsed NSDI Framework Data standards. A study will be conducted to test and evaluate a web portal, as an extension to the NSDI Clearinghouse network. Based on the results, a comprehensive web portal will be developed and deployed for "one-stop" access to standardized geospatial data. After initial deployment and testing of the comprehensive web portal, reusable, commercial replication services (24X7, trusted data services) will be required.

The Geospatial One-Stop builds upon existing capabilities to accelerate the development of the NSDI, technology, policies, and standards that support "one-stop" access to the Federal government's geospatial data assets. It will benefit all spatial data customers including federal, state, local, and other governments, as well as private citizens, by providing a common, consistent source of geospatial data.

This initiative is one of the 23 e-government initiatives selected by the President's Management Council (PMC). It will significantly enhance the implementation of e-government by enabling geospatial data to be more accessible and usable will simplify and unify access to geospatial data through the following five components:

1) Develop and implement data standards for NSDI Framework Data.
2) Fulfill and maintain an operational inventory (based on standardized documentation, using FGDC Metadata Standard) of NSDI Framework Data from federal agencies, and publish the metadata records in the NSDI Clearinghouse network.
3) Publish metadata of planned acquisition and update activities for NSDI Framework Data from federal agencies in the NSDI Clearinghouse network.
4) Prototype and deploy data access and web mapping services for NSDI Framework Data from federal agencies.
5) Establish a comprehensive federal portal to the resources described in the first four components (standards, priority data, planning information, and products and services), as a logical extension to the NSDI Clearinghouse network.

(This section was taken directly from the Federal A-300 document on the Geospatial One Stop Initiative.)

3.5 Maryland's Response to the I-Team Initiative - Since 1974, Maryland has been developing and using framework layers to help accomplish the mission of state government. In addition, many Maryland counties have significant GIS operations. The Maryland response to a FGDC Framework Data Survey, conducted in 1998, provides insight into the extent of interest in GIS data and framework activities within the State of Maryland. Some respondents use data

produced at larger scales to meet county needs, while others rely on the products produced by state and federal agencies. Geospatial data clearly improves the efficiency of government agencies and has played a significant role in Maryland's implementation of highly acclaimed planning efforts such as the Smart Growth Initiatives and serves as the backbone of "high-tech" initiatives such as the CHART Center at the Department of Transportation.

In September 2000, the Maryland State Geographic Information Committee conducted a two-day Strategic Planning Workshop with participation by 74 representatives from 30 State agencies, 11 local agencies, and 10 others from federal agencies and the private sector. For many, this Workshop was their first exposure to MSGIC, and they learned about the benefits of GIS and geospatial analysis to their programs and missions. More importantly, they provided valuable insights and contributions to the workshop process.

Workshop participants affirmed that it was time to broaden MSGIC's initiative, as well as its membership to become an inclusive organization statewide. The voluntary nature of the existing organization could not provide the cohesiveness and the energy required for responding to the significant array of tasks and issues that were defined in the workshop. Dedicated staff are needed to coordinate and support these initiatives which must be more openly embraced, recognized and directly supported by the IT organizational hierarchy within Maryland state and local government. It was generally felt that by remaining outside this structure, GIS growth and development have been limited, and initiatives have not been fully acknowledged or supported by management and IT decision makers. For these reasons, MSGIC was reformulated through the adoption of new Bylaws in July 2001. It now represents all sectors that use and rely on Geospatial data.

OMB's I-Team Initiative provides an ideal opportunity (at precisely the right time) for federal, state and local government agencies in Maryland to partner and develop the next generation of framework layers. Their goal, as described later in this plan, is to provide a consistent large scale product across the entire state that will meet the needs of all users. Part of our shared vision is a new framework comprised of seamless 1:2,400 scale layers. It is more cost effective and logical to produce uniform 1:2,400 scale data products to meet national standards, and to generalize them where appropriate, than it will be to redevelop the existing array of scales and data to meet national standards. As data production prices continue to fall, new products can be created for the cost of reworking existing data. In addition, most observers agree that the general demand for geospatial data has moved to 1:2,400 scale products in Maryland to support the needs of County and municipal governments, the private sector and utility companies. To accomplish this, a new infrastructure must be developed.

Today, we benefit from our past legacy of data development, but very little money is being allocated to future geospatial data needs. If we fail to fund production of the geospatial data required to govern in the next decade, decision-makers will become "handicapped" in their efforts to plan for and respond to management issues. Production of consistent high quality geospatial data typically takes 3-5 years. Once the problem is recognized and funded, it will take this amount of time to respond with adequate solutions.

4.0 Maryland's Implementation Team

The Maryland State Government Geographic Information Coordinating Committee (MSGIC) and the Maryland Local Government GIS Committee (MLOGIC) held a joint quarterly meeting on October 25, 2000. The members of MSGIC's Database and Resource Development subcommittee discussed the I-Team initiative and agreed that Maryland should forward a plan to the Federal Government for consideration and approval. The full MSGIC Committee agreed to this action during their afternoon session and the Executive Committee has met and approved this project. The following table lists the members of Maryland's I-Team which is intended to be a public/private partnership.

Figure 4.1
Maryland's Implementation Team

Name	Affiliation	Type	E-mail
William Burgess	**MD. Department of Natural Resources Dir. of Geographic Information Services**	**State Gov.**	**wburgess@dnr.state.md.us 410.260.8755 voice or 8759 fax**
Greg Slater	**MD. State Highway Administration Plats and Survey Division**	**State Gov.**	**gslater@sha.state.md.us 410-545-8952**
Frank Siano	**MD. Department of the Environment Technical & Regulatory Services Admin**	**State Gov.**	**fsiano@mde.state.md.us 410.631.3684 voice or 3873 FAX**
Michel Lettre	**MD. Department of State Planning Deputy Secretary for Data Planning**	**State Gov.**	**mlettre@mdp.state.md.us 410.767.4450 voice or 4480 FAX**
Martin Guinane	**Department of Transportation Smart Growth Coordinator**	**State Gov.**	**mguinane@dnr.state.md.us 410-260-8989 or 8111 FAX**
Shahbaz Raza	**Maryland Department of Planning Chief Information Officer**	**State Gov.**	**sraza@mdp.state.md.us 410-767-4474 voice/333-5381 FAX**
Maureen Kavanagh	**MD. Department of Housing & Community Development MD. Historic Trust**	**State Gov.**	**kavanagh@dhcd.state.md.us 410.514.7659 voice/987.4071 FAX**
Dick Bean	**MD. Department of Agriculture**	**State Gov.**	**rabean@mda.state.md.us 410.841.2743 voice or 5835 FAX**
Liana Dunne	**Maryland Geological Survey**	**State Gov.**	**ldunne@mgs.md.gov 410.544.5521 voice**
Lynda Eisenberg	**Maryland Department of Planning**	**State Gov.**	**ldodd@mdp.state.md.us 410.767.5998**
Stephanie Fleck	**Maryland Department of Planning**	**State Gov.**	**sfleck@mdp.state.md.us 410.767.4562 voice**

Ken Miller	Maryland Department of Natural Resources	State Gov.	kenmiller@dnr.state.md.us 410.260.8751 voice 8759 FAX
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Ronald Santos	U.S. Army Corps of Engineers Baltimore District	Federal Gov.	ronald.t.santos@usace.army.mil 410.962.2043 voice or 0917 FAX
Donald Mulcare	National Oceanic & Atmospheric Admin National Geodetic Survey	Federal Gov.	dmulcare@attglobal.net 410.545.8963 voice/209.5022 FAX
David Rosage	National Aeronautics & Space Admin. Goddard Space Flight Center	Federal Gov.	drosage@gsfc.nasa.gov 301.614.???? voice or ???? FAX
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Doug Adams	GIS Coordinator Baltimore County	County Gov.	dadams@co.ba.md.us 410.887.2289 voice or
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Bud Gudmundson	Washington County Planning Depart.	County Gov.	jeg01@wc-link.org 301-791-3065 voice or
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Sam Householder	Frederick County Planning Department	County Gov.	shouseholder@fredco-md.net 301-694-1127 voice or
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David Gillum	Anne Arundel County Planning and Zoning	County Gov.	dgillum@mail.aacounty.org
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Jeff Jackman	St. Mary's County Department of Planning and Zoning	County Gov.	jeff_jackman@co.saint-marys.md.us 301-475-4662 voice

Frank McKenzie	Wicomico County Planning Department	County Gov.	fmckenzie@wicomicocounty.org 410-548-4860 voice or 4955 FAX
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Marjorie Marsh	Calvert County Government	County Gov.	marshmc@co.cal.md.us 410.535.1600 x511 voice
Glen Rauner	Charles County Government	County Gov.	raunerg@govt.co.charles.md.us 301.645.0734 voice
Robert Slivinsky	Howard County Government	County Gov.	rslivinski@co.ho.md.us 410.313.3094 voice
Asfaw Fanta	Maryland National Capital Park and Planning Commission	Reg. Gov.	afanta@mncppc.state.md.us 301.952.3108 voice
John Schlee	Maryland National Capital Park and Planning Commission	Reg. Gov.	schlee@mncppc.state.md.us 301.495.4703 voice
Brian Burch	EPA Chesapeake Bay Program	Reg. Gov.	bburch@epa.gov 410.267.5736
Eric Stiles	Worcester Regional GIS Program	Reg. Gov.	eric_stiles@nps.gov 410.641.1443x222 voice
Gloria Griffin	Baltimore City Planning Department	Mun. Gov.	gloria.griffin@baltimorecity.gov
Tim Williams	City of Hagerstown	Mun. Gov.	tww01@hagerstownmd.org 301.790.3200x130 voice
Daria Hardin	City of Annapolis	Mun. Gov.	ddh@ci.annapolis.md.us 410.263.7961 voice
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5.0 Issues Discussion

This proposal is simply a starting point for the discussions required to implement a statewide large scale mapping program in Maryland. Maryland has a long history (>25 years) with digital mapping programs and there are many policy issues that must be revisited. An executive forum must be convened to complete work on the final proposal. This document is designed to clearly identify the issues and allow an informed discussion to ensue. The issues identified in this section will need discussion and resolution by Maryland's policy makers and executives.

5.1 The National Spatial Data Infrastructure (NSDI), the Digital Earth Program (DEP) and the National Map Program are built on the premise that the majority of spatial data are in the public domain and freely accessible across Internet. The NSDI is built on a rigid, but incomplete, set of standards published by the Federal Geographic Data Committee (FGDC) to ensure compatibility of data across the nation. The DEP program (see Attachment B) is an ambitious undertaking that plans to bring together disparate data types from all available sources. The National Map (see Attachment H) program run by the U.S. Geological Survey intends to provide access to geospatial data that will be seamless and consistently classified, enabling users to extract information for irregular geographic areas, such as counties or drainage basins, and to spatially analyze the information. NSDI, DEP and the National Map will likely be more efficient when data types are produced to the existing federal standards. Maryland will have to decide its level of participation and compliance in these important programs. This is especially true, given the fact that Maryland intends to work at larger scales than the existing NSDI standards.

5.2 Federal and State Interest in 1:2,400 Scale Mapping are not assured. Federal agencies normally don't have an interest in mapping at this large scale and their participation in the NSDI is built on a foundation of 1:12,000 to 1:24,000 scale products. They have recently shown interest in larger scales, however, and have tentatively offered to fund a portion of New York State's large scale orthophoto program. Maryland State government agencies ocncur that 1:2,400 scale mapping is required to form effective partnerships with local government. The Maryland Department of Planning suggested that the State should consider mapping the Priority Funding Areas (PFA's) at 1:2,400 scale to implement the provisions of the Smart Growth Initiatives while mapping the remaining areas of the State at 1:4,800 scale. The PFA's comprise about 26.5% of the area that needs to be mapped throughout the State. They are most heavily concentrated in the metropolitan counties, but there are PFA's in each Maryland county (Refer to Table 9.1 in Section 9). Other agencies such as the Department of Natural Resources, Department of Transportation, Department of General Services and Maryland Environmental Service will benefit from mapping at 1:2,400 scale to assist in managing their facilities which are located throughout Maryland. In addition, the State Police have previously expressed an interest in large scale mapping to assist them in accomplishing their mission.

It is clear that county governments prefer mapping at 1:2,400 scale to effectively provide county services and manage their operations. Although there may not be a clear Federal or State interest in mapping <u>all</u> areas at 1:2,400 scale, it will be required to form effective partnerships with county government agencies and gain their support for this project. It has been suggested that we map at variable scales depending on the area (e.g. absence or presence of PFA's). Both New York State and Tennessee have already begun variable scale mapping programs that are well documented. Maryland needs to refer to the work already done by these states.

The most critical issue is compatibility across jurisdictions. We currently have county, state and federal agencies mapping the same features at different scales and possibly developing different answers to the same questions. For example, Norway recently announced that the measured length of their shoreline had increased by 45% after they created a larger scale and more accurate map of the Country. While there are actually some distinct benefits associated with having a variety of map products, we will benefit significantly if all agencies use the same data to make decisions and manage their operations. Further discussion on required and/or variable scales will be necessary, and the end result may be the use of variable scales.

5.3 Licensing, Copyright and Data Charges are important public policy issues that need to be revisited in Maryland to ensure compatibility with the NSDI, DEP and National Map programs. Currently, Maryland uses the authority found in State Government Article 10-901 through 10-905, inclusive (Appendix C), to copyright and license spatial data products, and to charge for the cost of their distribution. In the past, custodians of spatial data products have been directed by the Governor's Office to recover costs of data distribution to help offset the high cost of production. In order to do this, and to prevent liability issues for the State, the Attorney General's Office has directed data custodians to copyright and license their products. A standard license agreement (Appendix D) was developed to ensure consistent licensing practices.

Data custodians have worked closely together through MSGIC to ensure the public has reasonable and fair access to state-produced data products. Some custodians are concerned that the current policies prevent effective sharing of data in limited cases and certainly result in lost opportunities for partnerships. In addition, the data producing agencies must divert staff to deal with the public on sales which do not generate significant revenues.

5.4 Licensing Data from the Private Sector is an issue that will also require further discussion. Maryland agencies typically support their individual missions through the production of spatial data. Since they do not produce these products for the sole purpose of distributing them, licensing privately produced data becomes an attractive option for the agencies. To date, some State agencies have negotiated the acquisition of private data to include favorable terms that allow sharing between State agencies and local government, and they have ensured that the data products could be viewed across Internet without downloading the actual data. This last provision supports public access to information regarding decisions that affect them. State agencies have not negotiated rights to share these data with the federal government or non-profit organizations.

Licensing data from the private sector is an attractive option, because it can significantly decrease the acquisition time and cost of the products. The products are readily available from private sector vendors for other entities that wish to license these products. However, licensing of products by the public sector may decrease the utility of the NSDI, DEP and National Map programs, because many public end users are simply not willing to pay the licensing fees. Therefore, we must question if the Implementation Team and Maryland policy-makers have more of an obligation to the taxpayer to minimize the expense of acquiring spatial data, or to fully fund data acquisition for the benefit of all public interests?

5.5 Funding Models for Spatial Data Production have always been problematic in Maryland and elsewhere. It is sometimes difficult for policymakers to understand, or justify, the enormous costs associated with spatial data production, because they seldom see the direct use or value of the products in everyday decision-making activities. It is also difficult for data custodians to

articulate the future uses for spatial data, because applications are constantly being built around new data as it is made available. These future applications are not apparent and their cost/benefits are difficult to determine. We do have excellent anecdotal examples of how 10-year old planning efforts to produce spatial data have just recently provided significant returns during implementation of the Governor's Smart Growth Initiatives, State acquisitions of large land tracts, and development of high technology applications (See Section 2).

Maryland State government agencies have coordinated data production through MSGIC. To date, the individual agencies have each justified and funded the particular data required to meet their respective missions. Agencies depend on general and special fund appropriations for their operating budget with few enhancements to conduct mapping programs. They frequently use federal grant programs to increase production rates. This has resulted in very slow production and if we continue to fund data production through these methods, it is unlikely that the State could realistically enter into effective partnerships to create a map base for the entire State at 1:2,400 scale. In addition, mapping small areas is much more expensive than mapping large areas on a cost per square mile basis. The advantage of funding data production by the existing method is that the individual agencies place a high priority on production of data required to meet their mission and will aggressively "fight" for, or defend the appropriation. Other states (e.g. Ohio and Virginia) have relied on large appropriation requests for a central GIS coordination office to fund data production. This method frequently results in the loss of the appropriation and stoppage of the mapping programs. When budgets become tight due to decreasing revenues, mapping programs typically become easy targets because they have large appropriations with few positions attached. In addition, when law makers and budget analysts are not keenly aware of the benefits of a "spatial data infrastructure" they are not likely to support large appropriations for data production.

The above discussion clearly points to the need for a paradigm shift whereby spatial data is considered a capital asset of government instead of an operational expense. The use of spatial data products has become pervasive in government programs and will continue over the next decade at significantly increasing rates. The need for spatial data by government agencies and the public is already as fundamental as their need for office buildings, computers, roadways and public lands. Previously, it has been thought of as a "temporary asset" that has value for a short time and then becomes worthless. We now clearly see that spatial data has a permanent value as a historical record which in the future will allow us, among other things, to determine ownership of land at a certain point in time, or determine growth patterns that have led to lost environmental quality.

The following information is excerpted from Summary Proceedings of the Geospatial Information Roundtable which was held on July 18, 2001, in Washington, D.C. "The FGDC should invite the spatial data community to quickly establish a Financing Solutions Team (Financing Team). The purpose of the Financing Team is to work with Federal agencies, States, regions and tribal areas, and the private sector to identify and develop intergovernmental and public-private financing capabilities to support the NSDI and the implementation strategies of the Teams or Consortia. The Financing Team should include representatives from Federal and State governments, financial institutions, professional organizations, academic institutions, and non-profit organizations. The Financing Team should help build a business case for the NSDI that would justify funding from legislative bodies and financial markets. The Financing Team should identify and evaluate alternative ways to align the present stove-piped legislative appropriation process. It should help develop the evidence to assist Federal agencies and States

collaboratively fund (and explain to their separate appropriations sources the reasons for funding) spatial data infrastructure investments yielding interagency and intergovernmental benefits and economies of scale. It should explore ways to align and leverage interagency and intergovernmental geospatial capital planning and budgeting processes through memoranda of understanding or other cross-cutting arrangements that incorporate common investment criteria and consortia that responsibly maximize the efficiency and effectiveness of shared information. The Financing Team should advise and support the efforts of the Teams or Consortia and share knowledge gained. The FGDC should work together with Federal agencies and States in an effort to establish a mechanism for developing and sharing econometric case studies regarding shared investment in spatial data assets and decision support tools."

5.6 Homeland Security has become a paramount concern for all levels of government and presents new data access issues that were previously of little concern. The General Assembly passed Emergency Senate Bill 240 during its regular 2002 Session (See Attachment I). This legislation provides new powers to government entities within Maryland to withhold certain types of data from public inspection. These include:

- Response procedures or plans prepared to prevent or respond to emergency situations, the disclosure of which would reveal vulnerability assessments, specific tactics, specific emergency procedures, or specific security procedures; or

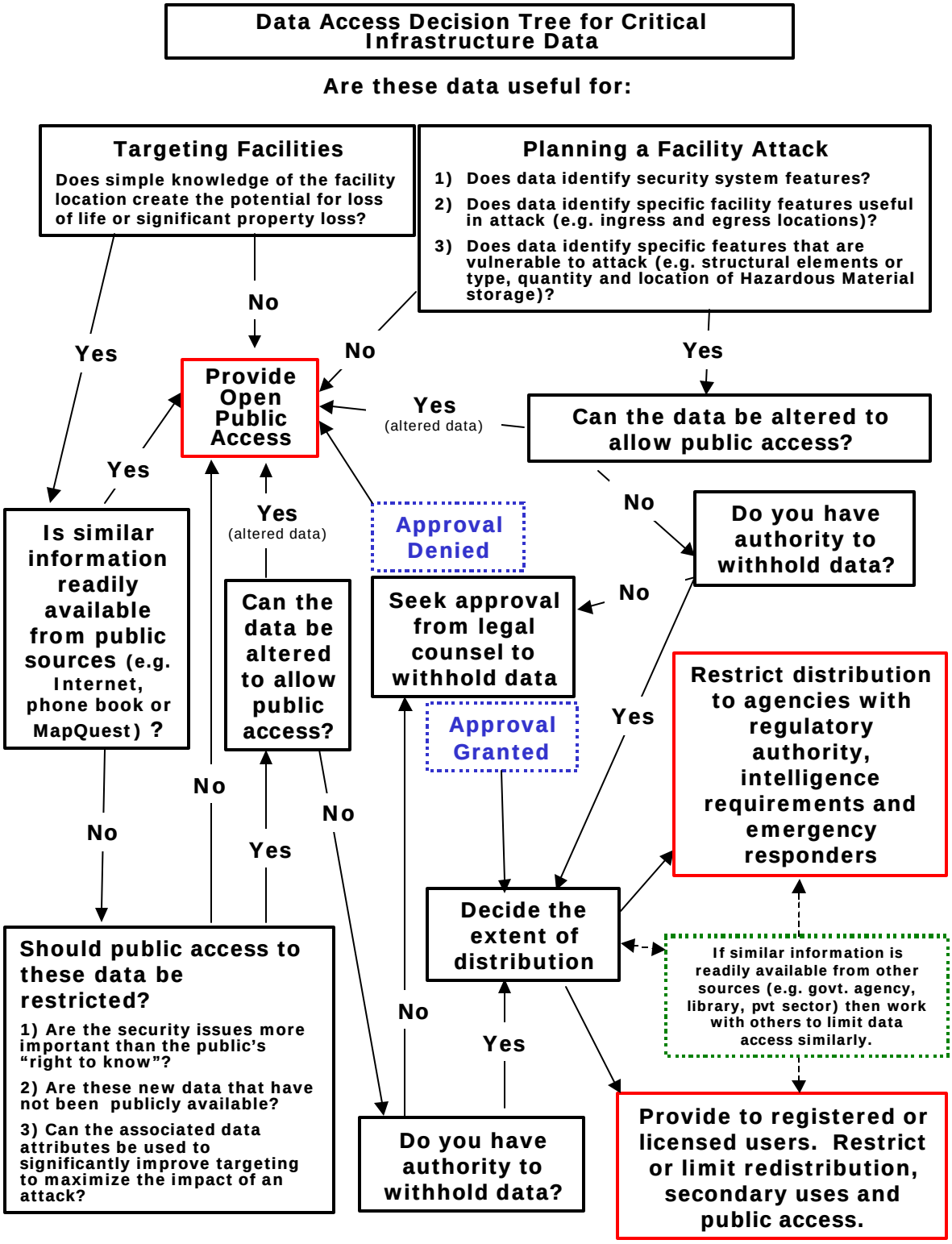
- Building plans, blueprints, schematic drawings, diagrams, operational manuals, or other records of airports and other mass transit facilities, bridges, tunnels, emergency response facilities or structures, buildings where hazardous materials are stored, arenas, stadiums, and waste and water systems, the disclosure of which would reveal the building's or structure's internal layout, specific location, life, safety, and support systems, structural elements, surveillance techniques, alarm or security systems or technologies, operational and transportation plans or protocols, or personnel deployments; or

- Records of any other building or structure owned or operated by the state or any of its political subdivisions, the disclosure of which would reveal the building's or structure's life, safety, and support systems, surveillance techniques, alarm or security systems or technologies, operational and evacuation plans or protocols, or personnel deployments; or

- Records prepared to prevent or respond to emergency situations identifying or describing the name, location, pharmaceutical cache, contents, capacity, equipment, physical features, or capabilities of individual medical facilities, storage facilities, or laboratories established, maintained, or regulated by the state or any of its political subdivisions.

The decision tree on the following page can be used by data custodians to help make decisions about withholding these data resources from public inspection. This "D-Tree" was created by the National States Geographic Information Council.

Figure 5.1
Decision Tree for Providing Public Access to Geospatial Data on Critical Infrastructure



6.0 Proposed Mapping System and Cost/Benefit Factors

No rational decision can be made on implementation of a mapping program without an evaluation of the options and the benefit/cost ratios. The Team reviewed the following options and considered the cost and benefits of implementing this program.

6.1 Design Options - The Implementation Team discussed several design options for a statewide framework layers mapping program, including uniform 1:12,000 scale products, opportunistic random scale products, variable large scale products and a uniform 1:2,400 scale product. The uniform 1:2,400 scale product was agreed to early in the process. The next four sections provide a succinct statement regarding each option.

6.1.1 Uniform 1:12,000 scale products (Rejected) - This option would be entirely suitable for state and federal government agencies. It is useful for local governments in the absence of larger scale products, but local governments continue to move to 1:2,400 scale products to support their missions. This means that we must support larger scale products to form effective partnerships with local government.

6.1.2 Opportunistic Random Scale Products (Rejected) - In essence, this is the system we use today. Products range in scales, because they are funded for a specific purpose and not with the intention of integrating into a cohesive mapping program. This results in numerous "fit" issues that degrade the overall usefulness of the maps to the smallest scales. This option results in lost opportunities to effectively partner.

6.1.3 Variable Large Scale Products (Rejected) - This option was initially rejected but may be revisited for further consideration as the I-Team continues deliberations in the Regional Action Teams. It was estimated that mapping at multiple scales would increase costs, because each different scale has to treated as a separate project. The original concept was to map developed areas at 1:2,400 scale while mapping remaining areas as a smaller scale, possibly 1:4,800.

6.1.4 Uniform 1:2,400 scale Products (Accepted) - The I-Team endorses a uniform 1:2,400 scale mapping project across the entire State. For a variety of reasons, a uniform product is easier to manage than multiple scale products. This scale of mapping is clearly the choice of county agencies and while it is not ideal for municipal governments, it will provide a reasonable product for those cities that have not yet invested in the extremely large scale products they desire. This recommendation is for the "Framework Layers," which include property maps, transportation features, political boundaries, water features, geodetic control, elevation and ortho imagery. This program will build a "solid foundation" for all future mapping efforts in Maryland. It is not feasible, nor appropriate, to map all desired layers at 1:2,400 scale. For example, it could cost up to $350,000,000 to map geology for the entire State at the selected scale. This level of detail is only required for major construction projects at specific locations.

6.2 The Value (Benefit/Cost) of Spatial Data - In past years, it was difficult to demonstrate Benefit/Cost ratios for implementation of GIS systems and production of spatial data. They were required, however, and we now have a great deal of literature to cite. Also, now that the technology is better understood, there is less demand for this information, because executive decision makers see (first hand) the value of these systems. Regardless, we should be clear about the value of spatial data.

6.2.1 Benefit/Cost Ratios - The following information was taken from the GIS World article that appeared in the July 1996 issue titled, "*Weighing GIS Benefits with Financial Analysis" by George Korte.* It is the most frequently quoted source on benefit/cost ratios for GIS. The article provided brief descriptions of several projects and presented a detailed benefit/cost (B/C) analysis of several projects, including the following findings for B/C ratio of a GIS:

1) A digital system used only for computer-aided mapping and updating gives you your money back (B/C 1/1).
2) If the system is used for planning and engineering purposes, your money will be doubled (B/C 2/1).
3) Research reports published in Norway and Sweden show that the B/C ratio for automating conventional maps is greater than three times your money back (B/C 3).
4) If you manage to create a common system in which information can be shared among the different relevant organizations, you will regain investment by four times (B/C 4/1).
5) For organizations with a poor system for manual map production, automated systems have given B/C ratios up to 7/1.

6.2.2 Benefits of Spatial Data and Geographic Information Systems - Benefits are generally put into the following categories. Direct Benefits include operational efficiencies such as a reduction in staffing levels or staff time to accomplish the same work task or an increased work load. An example of a direct benefit is that the City of Philadelphia used GIS in 1995 to optimize their garbage truck routes, allowing them to save $1,000,000.00 in overtime costs the following year. Government-wide Benefits include the value of having better information to make management decisions. An example of this occurred in Scottsdale, Arizona, when the City mounted a challenge to the mid-decade census in 1996, resulting in increased per capita revenues to the City of $1,800,000.00 million per year for five years, totaling $9,000,000.00. External Benefits are generally intangible and include such things as the public saving OR protecting an archeological structure or an endangered species, because the government mapped its location and distributed the information.

7.0 Options For Implementing Recommendations

I-Team members discussed several options for funding and managing data production. A repeatable 1:2,400 scale mapping program is an ambitious undertaking on a statewide basis. It will take the collective resources of municipal, county, state, regional and federal agencies working with utility companies and others in the private sector to accomplish the desired results. Doing this will require a great deal of coordination and a reliable government funding source that can be used to form partnerships and respond to grant opportunities that require a funding match. It will also require that an appropriate unit be empowered to "broker" partnerships on behalf of all data partners.

Team members focused on four options to implement this program, including status quo, private financing/licensing, a data cooperative and creation of a new data coordination office. The I-Team supports a new data coordination office based on its deliberations that are summarized below.

7.1 Status Quo - In the past, the MSGIC Database and Resource Development Subcommittee has coordinated data development between state agencies. The new organization will have the ability to coordinate between a larger community, but there is no mandate for the parties to work together.

The level of coordination and work required to implement a large scale mapping program is significantly greater than past activities. In addition, the existing GIS coordinators in each agency simply don't have more time to spend on coordination activities because their workloads are constantly increasing. It may be feasible to continue improving attribute quality through development and promotion of better standards, but coordinating large scale data production using existing staff and resources will not be possible. It would take an unacceptable period of time to produce the first products and maintenance would not be completed. Problems inherit with this approach include:

- The task is enormous and beyond the current capabilities of state agencies to coordinate.
- Without a central budget and "authority" it will be difficult to coordinate multiple groups to take advantage of existing activities and funds.
- Doing "piece-meal" data production in small areas will be much more expensive and will take an inordinate amount of time that will be unpalatable to the partners (perhaps as long as 20 years).
- Agencies have competing standards & requirements for GIS data because there is a lack of common standards for large scale mapping. It will be difficult to get consensus from multiple partners that do not "have" to work together.
- This activity will lead not help to gain data parity between all governmental units.

Coordination of large scale data production through the MSGIC Committee is not favored by the I-Team.

7.2 Private Financing and Licensing of Data - Private companies offer a variety of private financing options for development of spatial data. One option is to privately finance data production for a particular entity (agency or group) and then enter into a long term agreement to

license the data on an annual basis. The private entity usually licenses the data for a fee that is significant, but lower than the actual production cost. The private company maintains ownership of the data and the right to resell it to other users. A second option is financing production of standard spatial data products for general sales. This is becoming more popular and many government agencies license this type of data. The major problem with this option is that there has to be a business model that allows the private sector to recover the cost of data production and make a profit based on expected sales. For this reason, privately produced spatial data products are only available in metropolitan areas. Many other options and variations exist. Problems inherit with this approach include:

- Some data sets are inherently valuable to governmental entities and will have limited appeal to private investment.
- The dynamic nature of the market place may place some long term arrangements at risk, companies may choose to stop offering data or terms and conditions may change. Users must perform ongoing research to locate different sources of data and shop for the best value.
- How much liability will the different partners be willing to accept. Who will have the ultimate liability for the data and does sufficient legal precedent exist to create a model for this type of relationship.
- Who within each organization will be authorized to enter into agreements regarding the lease or license.
- What works in one County may not work in another. Some geographic areas may have multiple licenses while other areas may only be able to afford a single license. Data costs will be uneven across different areas.
- License agreements generally tend to restrict State government entities from distributing data.
- To support a state-wide program, MSGIC or some other entity need to act as a lease holder and the data could then be distributed to local government partners. Counties would have to transfer funds to MSGIC, what would happen if a local government entity refused to cost share.

Procurement of large scale spatial data through private funding and licensing is attractive for small areas, but is not recommended by the I-Team for a statewide project.

7.3 Data Cooperative - A GIS Cooperative, including members from public, private and academic organizations could be formed to create a statewide large scale map. A relatively small central coordination body could manage the activities of a cooperative. The objectives of the cooperative are similar to those of the state sponsored approach, which are to coordinate GIS data requirements, define information and technology standards, data production efforts and applications development for the greater Maryland community. However, the primary difference is the reliance on voluntary and mostly non-funded participation.

There are several examples of GIS cooperatives throughout the nation including the New York State GIS Cooperative and the City of Tucson GIS Cooperative. Many of these cooperatives share common goals including:

- Development of policies for data development including data quality,
- Adoption of standards for metadata and data transfer,
- Development of policies on data access and data security,

- Provision for multi-organizational communication and coordination, and
- Development and support of cooperative funding strategies.

GIS cooperatives are typically bound by a Memorandum of Understanding (MOU) or a formal agreement that define how organizations implement joint data development efforts, specify which agency is responsible for which activities and define how they share the ownership or use of the information. These agreements are executed between the cooperative coordinating body and each member of the cooperative with limited liability for each party.

Cooperatives may not always be the most effective means of organization. Problems inherit with this approach include:

- lack of motivation and participation by organizations that are data rich,
- prioritization and resolution of conflicts, and
- operational costs of the coordinating body.

Costs should be nominally lower than the state sponsored approach, but must be stable enough to sustain continuity during fiscal downturns.

A Maryland State GIS Cooperative could potentially be hosted by the MSGIC and funded at a 2-3 FTE level. The remaining funding for coordination activities would come in the form of in-kind contributions from members or seed money from potential sponsors of the cooperative. The I-Team does not favor creation of a data cooperative.

7.4 Creation of a Geospatial Data Partnership Office - The Implementation Team recommended a budget enhancement for fiscal year 2003, and on-going budget appropriations to provide the foundation of this effort. However, the state of the budget in FY 2002 prevented such an enhancement. When funded, this activity will have far reaching benefits to all Maryland municipalities, counties, state agencies, federal agencies and regional governments. It will bring parity to all government agencies that currently have very disparate data holdings, allowing them to participate as equal partners in all inventory, planning, and implementation activities. This program will also have a very positive economic impact on utility companies, the private sector and Maryland's citizens. Problems inherit with this approach include:

- This will look like "just another state agency here to help us,"
- Funding levels will be disparate between the various partners,
- Without qualified and talented staff this program may flounder, and
- A significant budget cut, or dissolution of this office would have disastrous impacts on municipal, county and state agencies.

8.0 Geospatial Data Partnership Office (GDPO)

Coordination of spatial data production in Maryland will require varying levels of liaison activity with every municipality, county, state and federal agency operating in Maryland. In addition, all utility companies operating in the state and many private sector businesses (e.g. engineering and real estate firms) will have a keen interest in spatial data production and are likely partners. This formidable task will require staff who are both experienced "networkers" and intimately familiar with contracting and managing spatial data assets. The Implementation Team recommends that an office be established in the Office of Information Technology at the Department of Budget and Management or within the Maryland Emergency Management Agency.

8.1 Role of the GDPO - GIS operations offer a powerful dimension to their parent organizations. In nearly all cases, these operations are continually assigned additional work to help meet the highest priority missions. While these service functions are clearly useful, they prevent production oriented GIS operations from accomplishing data production. The I-Team is concerned that the proposed GDPO will suffer a similar fate. Therefore, it recommends that the mission of the GDPO be clearly defined as follows, and that an oversight board be established.

8.1.1 Partnership Development and Liaison Activities - The primary function of the Geospatial Data Partnership Office will be building partnership arrangements between municipal, county, regional, state and federal agencies. It will also develop strategies allowing it to work with utility companies and private sector businesses. Staying in contact with all these groups will allow the GDPO to monitor opportunities and to match likely partners. This activity is extremely important, because the cost of spatial data production dramatically decreases on a per square mile basis (as much as 90%) as the production area becomes larger. The GDPO will also maintain a well published schedule of data production activities and can use its own operating budget to ensure that more effective partnerships are created.

8.1.2 Grant Management - Many federal grants are available for spatial data production. The GDPO will always have production contacts in place and will have an appropriate operating budget in place to take advantage of grant opportunities. It can provide a valuable service to other agencies by managing these types of federal grants, or working under MOA's with other agencies to produce data to meet a single requirement of a more complex federal grant.

8.1.3 Contract Management - The GDPO will maintain standing contracts and operations for the production of nearly every spatial data type. This will provide for cost effective data production that will benefit every participant. The GDPO staff will be very proficient in contracting for spatial data production and can provide valuable services to other entities. The GDPO should also serve as the focal point for contracting of GIS services under the State's Technology Services Procurement.

8.1.4 Quality Assurance - The GDPO staff will develop and implement data quality assurance standards and procedures to ensure that all contract production meets appropriate standards. It may also manage quality assurance service contracts for data supplied by vendors.

8.1.5 Internet Data Access - The GDPO will maintain a high-bandwidth Internet connection and FTP servers to distribute all spatial data products. The staff of the GDPO will be

responsible for data management to ensure its timely access across Internet.

8.1.6 Physical Data Distribution - The GDPO will be responsible for managing and distributing data on CD-ROM, or other suitable media, to those persons not capable of retrieving the data across Internet. In addition, they will be responsible for ensuring that all data is appropriately forwarded to the State Archives to ensure its future preservation.

8.1.7 Internet Mapping Services and E-Government - In the coming years, spatial data will become increasingly important to E-Government operations. The GDPO will be responsible for coordinating E-Government activities related to spatial data. The Office will establish an Internet Map Service to ensure the public has timely access to all government spatial data products for viewing and reasonable manipulation.

8.1.8 Staffing and Administrative Support for MSGIC - The Maryland State Geographic Information Committee is an all volunteer organization that is focused on the same work as the GDPO. MSGIC needs the approximately 1/2 of an FTE for support of administrative functions related to mailings, minor contracting and web site management. A close working relationship between the GDPO staff and MSGIC committee members will be very valuable.

8.2 Staffing Requirements - The I-Team recommends the following staffing level for the GDPO to be phased in over two years. Seven of the twelve positions will be required for the first year of operation. The remaining five positions can be hired during the second year of operation.

Table 8.1
Geospatial Data Partnership Office Personnel Requirements

Quantity	Classification	Year 1	Year 2	Grade	Function
1	Program Manager IV	1		22	Lead the Data Coordination Office
2	Administrator V	1	1	20	Initiate and Manage Partnership Agreements, Contracts and Production
1	GIS Coordinator	1		19	Manager Internet Map Access
1	Administrative Officer III	1		15	Administrative and Budget Functions
1	Office Secretary III	1		10	Secretarial Support
4	GIS Technician I	1	3	16	Data Quality Assurance
2	GIS Technician II	1	1	18	Internet Mapping Application / E-Gov

These twelve positions will cost approximately $527,000.00 for the grades indicated in Table 8.1 using step III salary appropriations to account for hiring issues. Including the 30% fringe expenses for labor requires an approximate total of $685,000.00 for labor expenses. An operating budget (less data production) of $315,000.00 is suggested for the GDPO, resulting in a total appropriation of $1,000,000.00, not including contractual services. The GDPO could be placed in any of the existing agencies within state government, but the most likely choice is the

Information Technology Office at the Department of Budget and Management.

8.3 GDPO Operating Budget - The I-Team recommends that the GDPO be provided with a $6,000,000.00 contractual services budget which is limited to data production and Internet services only. This money will be used to initiate partnership arrangements according to the I-Team plan priorities, and to match federal grant opportunities that arise which are consistent with the goals of the I-Team plan. The operating fund should be able to generate partnership opportunities in excess of $12,000,000.00 per year.

Table 8.2
Approximate Budget Allocation By Data Groupings

Data Theme	FY03	FY04	FY05	FY06	FY07
Digital Elevation Model and Ortho Imagery	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$800,000
Bathymetry					$1,500,000
Political Boundaries	$200,000	$200,000	$200,000	$200,000	$100,000
Hydrography (Stream/River)	$150,000	$150,000	$150,000	$150,000	$150,000
Transportation Features and Road Centerline w/Addresses	$650,000	$650,000	$650,000	$650,000	$650,000
Cadastre (Parcel Mapping)	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Land Cover and Land Use	$170,000	$170,000	$170,000	$170,000	$170,000
Smart Growth Package	$250,000	$250,000	$250,000	$250,000	$250,000
Critical Infrastructure Package	$400,000	$400,000	$400,000	$400,000	$400,000
Local Master Plans with Water & Sewer and Zoning	$400,000	$400,000	$400,000	$400,000	$150,000
100-year Flood Plain	$300,000	$300,000	$300,000	$300,000	$300,000
Agriculture, Environment & Natural Resource Related Data	$380,000	$380,000	$380,000	$380,000	$300,000
Historic and Archeologic Data	$100,000	$100,000	$100,000	$100,000	$100,000
TOTALS	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000

8.4 Oversight of GDPO Operations - It is imperative that the GDPO activities stay focused on data production, quality assurance and data distribution. This group will likely come under intense pressure to perform routine GIS service work for the agency they are assigned to. The I-Team recommends that a five member Oversight Board be created with the following membership; two members appointed by the MSGIC Executive Committee, one member of the Governor's Cabinet, one member representing a County Government GIS Office, and one member from a federal agency involved with mapping and GIS. The GDPO Oversight Board

shall meet twice annually to review the activities of the GDPO to ensure that they are meeting their obligations under Section 8.1. The Advisory Board will also monitor and advise on budget allocations and prioritization of activities.

9.0 Data Production Plan

9.1 Planning Activities - During the initial planning stages, the Implementation Team has developed approximate costs for completing coverage of each data layer at 1:2,400 scale. Since we have private sector partners on the Implementation Team, we don't want to jeopardize their ability to bid on future contracts for work under this initiative. We are developing a draft plan with approximate costs and product specifications for planning purposes. Most of the information contained in this section comes from existing contracts in Maryland or government agencies in other jurisdictions. Before entering a bidding phase, a select group of individuals will develop the detailed product specifications to prevent a conflict for the private sector partners on the Team.

For planning purposes, we will use the areal extent and other map tiling information located in Table 9.1 for each Maryland County and the State. This information was generated by the GIS Division at the Department of Natural Resources using the following methods. The number of USGS 7.5' map sheets with a portion in Maryland comes from their index book. The number of 3.75' map sheets comes from the DNR orthophoto program. This number excludes map sheets that are all open water and does not include the number of map sheets on the Virginia shore of the Potomac River that have no land mass in Maryland. The land area for each county was calculated from data tables associated with the Department of Planning's 1997 Land Use and Land Cover data for all cover types except water. The total area for each county was calculated from the same data by including all land cover types. The approximate number of 1:2,400 map sheets was determined by creating a 2000' by 3000' grid and intersecting it with a county political boundary file and excluding areas that were all water. The number of Priority Funding Areas (PFA's) were generated by intersecting the Department of Planning's PFA data with the same grid file. The number of parcels for each county was determined from the latest release of the Department of Planning's MdProperty View. The county totals for several columns in Table Four will not add up to the Statewide Totals, because many map sheets are in two or more counties.

The most appropriate organizational structure to accomplish the proposed mapping programs is to establish Regional Action Teams that will foster development of a consistent statewide product while trying to integrate Maryland's efforts into those of the federal agencies and surrounding states. A Regional Action Team will be established for each of the Framework layers and for other essential data such as Land Use and Land Cover. Each of the Regional Action Teams will be responsible for maintenance of a web page similar to the National Hydrography Data web page located at: http://www.fs.fed.us/emc/nris/water/nhd_lib/index.htm .

9.2 Regional Action Teams - Taking the production of data from planning concepts to actual production will take significant commitments from diverse committees that will be responsible for fostering development of each Framework Layer. MSGIC will assign a Regional Action Team to each layer with an appropriate designee from federal and state agencies to ensure that regional concerns and federal standards are being addressed. Additional staff for each committee will come from local government, academia (as appropriate), the private sector and utility companies. The Regional Action Teams will be responsible for developing a detailed data profile that can be used to procure data that is consistent over regional boundaries.

Table 9.1
Planning Units for Map Production

County	# 7.5' Maps	# 3.75' Maps	Land Area Acres/Square Miles	Total Area with Water Acres/Square Miles	Approx. # of 1:2,400 Map Sheets Total # / # in PFA Area	Number of Parcels
Allegany	15	46	266,780 / 417	269,539 / 421	2,169 / 996	40314
Anne Arundel	15	47	265,388 / 415	379,353 / 593	2,311 / 1,058	187364
Baltimore City	4	11	51,732 / 81	58,886 / 92	460 / 457	233355
Baltimore County	23	66	384,893 / 601	441,876 / 690	3,188 / 1,250	276481
Calvert	9	26	137,151 / 214	220,976 / 345	1,285 / 294	37962
Caroline	15	39	204,739 / 320	208,611 / 326	1,665 / 126	14810
Carroll	17	47	286,985 / 448	289,487 / 452	2,260 / 571	59313
Cecil	13	44	222,868 / 348	270,389 / 422	1,916 / 399	41245
Charles	21	67	294,519 / 460	414,306 / 647	2,451 / 483	51447
Dorchester	24	67	355,180 / 555	614,030 / 959	3,423 / 262	19164
Frederick	21	66	424,938 / 664	427,102 / 667	3,279 / 923	79214
Garrett	18	62	419,576 / 656	425,060 / 664	3,251 / 227	25814
Harford	15	49	280,668 / 439	335,285 / 524	2,329 / 568	81695
Howard	10	29	124,813 / 195	126,177 / 197	1,297 / 583	86020
Kent	15	39	178,479 / 279	257,434 / 402	1,592 / 270	12511
Montgomery	18	53	317,048 / 495	324,158 / 506	2,513 / 1,212	298368
Prince George's	19	57	310,038 / 484	318,785 / 498	2,479 / 1,575	258510
Queen Anne's	19	53	237,588 / 371	325,850 / 509	2,119 / 198	21843
St. Mary's	20	58	230,794 / 361	352,580 / 551	2,146 / 351	15984
Somerset	18	50	206,808 / 323	539,393 / 843	2,161 / 278	39474
Talbot	16	41	171,608 / 268	301,406 / 471	1,679 / 349	18003
Washington	19	57	293,352 / 458	298,857 / 467	2,403 / 527	51654
Wicomico	15	43	240,434 / 376	257,297 / 402	1,963 / 569	40810
Worcester	18	60	301,646 / 471	433,859 / 678	2,746 / 351	54563
STATEWIDE TOTALS	260	898	6,208,025 / 9,699	7,890,698 / 12,326	51,100 / 13,521	2045918

9.3 User Needs Assessment

The Implementation Team has identified the following statewide management issues and the data themes required to address each issue. This analysis is summarized in the table below for convenience. The Governor's highest priority programs are identified by bold text.

Table 9.2
User Needs Assessment

DATA LAYERS	Emergency Mgmt & Disaster Response	Law Enforcement	E911 Operations	Electronic Government	Traffic & Transportation	Economic Development	Agriculture & BMP's	Smart Growth	Environmental Regulation	Natural Resources Protection	Public Land Management	Sea Level Rise & Coastal Erosion	Family & Youth Issues	Education	Infrastructure Management	Epidemiology & Health Care		NSDI Framework Layer	National Map Layer	Considered Critical Infrastructure
Digital Elevation Model	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X	X	
Bathymetry	X	X	X	X	X	X	X		X	X	X	X			X	X		X	X	X
Orthophotography	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Political Boundaries	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Point Labels/Place Names	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X
Hydrography (Stream/River)	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X	X	X
Cadastre (Parcel Maps)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
Building Structures	X	X	X	X	X	X	X	X	X	X	X	X			X	X			X	X
Geodetic Control	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		
Geology					X	X	X	X	X	X	X	X			X	X				
Water & Sewer Plans	X			X	X	X		X	X	X	X	X	X	X	X	X				X
Historic Properties	X	X	X	X	X	X		X	X	X	X	X		X	X	X				
Archeological Sites	X	X		X	X	X	X	X	X	X	X	X		X	X	X				
Zoning	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
Wetlands	X	X	X	X	X	X	X	X	X	X	X	X			X	X				
Critical Area Boundary		X		X	X	X	X	X	X	X	X	X			X					

DATA LAYERS	Emergency Mgmt & Disaster Response	Law Enforcement	E911 Operations	Electronic Government	Traffic & Transportation	Economic Development	Agriculture & BMP's	Smart Growth	Environmental Regulation	Natural Resources Protection	Public Land Management	Sea Level Rise & Coastal Erosion	Family & Youth Issues	Education	Infrastructure Management	Epidemiology & Health Care		NSDI Framework Layer	National Map Layer	Considered Critical Infrastructure
Protected Lands	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
Land Use and Land Cover	X		X	X	X	X	X	X	X	X	X	X			X	X			X	
SG -Hot Spot Community	X	X	X	X	X	X		X			X		X	X	X	X				
SG - Home Loan				X	X	X		X					X		X					
SG - Priority Funding Areas				X	X	X		X	X	X	X	X		X	X					
SG - Main St. Maryland				X	X	X		X			X		X		X					
SG - Live Near Your Work				X	X	X		X			X		X		X					
SG - Enterprise Zones				X	X	X		X					X		X					
SG - Empowerment Zones				X		X		X							X					
SG - Designated	X	X	X	X	X	X		X			X		X	X	X					
SG - Brownfields	X	X	X	X	X	X		X	X	X	X	X			X	X				
SG - Heritage Areas				X	X	X	X	X	X	X	X	X			X					
SG - Designated Rural				X	X	X	X	X	X	X	X	X			X					
100-year Flood Plain	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X
SURGO Soil Maps				X	X	X	X	X	X	X	X	X			X	X				
Demographics	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X
Wildlife Habitat Areas				X	X	X	X	X	X	X	X	X		X	X	X				
Roadway & Curb Features	X	X	X	X	X	X		X	X			X			X					X
Road Centerlines w / Address Range	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Bridges and Tunnels	X	X	X	X	X	X	X	X	X	X		X			X			X	X	X
Emergency & Evacuation Routes	X	X	X	X	X	X		X	X		X	X			X					X

DATA LAYERS	Emergency Mgmt & Disaster Response	Law Enforcement	E911 Operations	Electronic Government	Traffic & Transportation	Economic Development	Agriculture & BMP's	Smart Growth	Environmental Regulation	Natural Resources Protection	Public Land Management	Sea Level Rise & Coastal Erosion	Family & Youth Issues	Education	Infrastructure Management	Epidemiology & Health Care		NSDI Framework Layer	National Map Layer	Considered Critical Infrastructure
Shipping Channels & Anchorages	X	X	X	X	X	X		X	X	X		X						X	X	X
Port Facilities	X	X	X	X	X	X	X	X	X	X		X			X			X	X	X
Airport Facilities	X	X	X	X	X	X		X	X	X	X	X			X	X		X	X	X
Helicopter Landing Sites	X	X	X	X	X										X					X
Rail Lines and Rail Facilities	X	X	X	X	X	X	X	X	X	X		X			X	X		X		X
Special Routing (Wide Load, Nuclear & Hazardous Materials)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X
Dams and Downstream Hazard Zones	X	X	X	X	X	X	X	X	X	X	X	X			X					X
Hurricane Inundation Zones	X	X	X	X	X	X	X	X	X	X	X	X			X	X				
Digital & Analog Communication Facilities (Cell Systems, Local Phone and Long Distance, TV & Radio)	X	X	X	X	X	X		X	X		X	X	X	X	X	X				X
Electric Generation, Substations & Distribution Networks (Including Nuclear)	X	X	X	X	X	X	X	X	X		X	X		X	X	X				X
Oil Production, Storage & Transportation	X	X	X	X	X	X		X	X	X	X	X		X	X	X				X
Natural & LP Gas Production, Storage, Transportation & Distribution	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X				X

DATA LAYERS	Emergency Mgmt & Disaster Response	Law Enforcement	E911 Operations	Electronic Government	Traffic & Transportation	Economic Development	Agriculture & BMP's	Smart Growth	Environmental Regulation	Natural Resources Protection	Public Land Management	Sea Level Rise & Coastal Erosion	Family & Youth Issues	Education	Infrastructure Management	Epidemiology & Health Care		NSDI Framework Layer	National Map Layer	Considered Critical Infrastructure
Hazardous Material & Nuclear Manufacturing, Storage & Transportation	X	X	X	X	X	X		X	X	X	X	X			X	X				X
Hospitals & Medical Facilities	X	X	X	X	X	X		X	X			X	X	X	X	X				X
Fire Facilities & Equip.	X	X	X	X	X	X		X		X	X	X	X	X	X					X
Police Facilities & Equip.	X	X	X	X	X	X		X			X	X	X	X	X					X
National Guard Facilities & Equip.	X	X	X	X	X							X			X					X
Military Facilities & Equip.	X	X	X	X	X	X						X			X					X
Portable Electric Generation Equipment	X	X	X	X	X									X						X
Schools	X	X	X	X	X	X		X				X	X	X	X	X				X
Government Facilities	X	X	X	X	X	X		X			X	X	X	X	X					X
Banking & Financial Centers	X	X	X	X		X		X				X			X					X
Water Supply Treatment and Distribution	X		X	X	X	X		X	X	X	X	X	X	X	X	X				X
Storm Drain Systems and Retention Facilities	X		X	X	X	X	X	X	X	X	X	X			X	X				X
Potable Surface Water Intakes	X		X	X		X		X	X	X	X	X			X	X				X
Surface Water Sources Including Swimming Pools	X		X	X		X	X	X	X	X	X	X	X		X	X				X
Wastewater Treatment Facilities and Collection Systems	X		X	X		X	X	X	X	X	X	X		X	X	X				X

DATA LAYERS	Emergency Mgmt & Disaster Response	Law Enforcement	E911 Operations	Electronic Government	Traffic & Transportation	Economic Development	Agriculture & BMP's	Smart Growth	Environmental Regulation	Natural Resources Protection	Public Land Management	Sea Level Rise & Coastal Erosion	Family & Youth Issues	Education	Infrastructure Management	Epidemiology & Health Care		NSDI Framework Layer	National Map Layer	Considered Critical Infrastructure
Animal Feedlots	X		X	X		X	X	X	X	X	X	X				X				X
Agricultural Production & Storage	X		X	X		X	X	X	X	X	X	X				X				X
Employment Information	X	X	X	X	X	X		X		X		X	X		X	X				X
Ice Rinks (for temp. morgues)	X	X	X																	X

10.0 Digital Elevation Model and Bathymetry Data Profile

10.1 General Discussion: The Department of Natural Resources has been the lead agency for production of Digital Elevation Models to support production of their 3.75' digital orthophoto maps. In addition to this project, the State Highway Administration contracts for production of digital elevation data on a frequent basis to support road development work. The Department of the Environment occasionally contracts for digital elevation data to support flood plain mapping. In addition, several counties have contracted for production of digital elevation data using similar specifications to the product suggested below. The Implementation Team supports remapping the State every five years to maintain current data. New technologies are presenting themselves that will make more frequent mapping a possibility. They include airborne Light Detection and Ranging Laser (LIDAR), Broad Beam LIDAR and Interferometric Synthetic Aperture RADAR (IFSAR). A great deal of interest has been expressed by emerging and established companies in this section of the Implementation Team Plan. Many of these companies and technologies hold the promise to dramatically reduce the cost for production of these data, however, the Implementation Team must ensure that product specifications can be achieved.

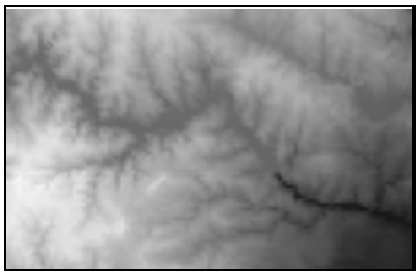


Figure 10.1 - "Bare Earth" digital elevation model (DEM) that shows the relative height of the land surface by interpreting each shade of grey as a different elevation value.

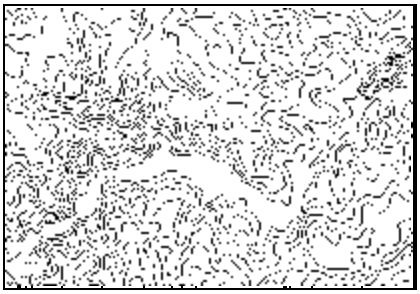


Figure 10.2 - Elevation contour lines that are computer generated from a portion of the DEM in Figure 10.1.

10.2 Existing Statewide Product: The existing elevation data are available from the Department of Natural Resources. They represent 90-meter post spacing with interpolated points at 30-meters that were collected to create 1:12,000 orthophotography (see next section). These data were collected as ASCII files representing x, y & z coordinates in the State Plane Coordinate System NAD 1983, meters. The data are generally considered to be map accurate to a contour interval of 10' +/- ½ contour. These files can be used directly by software packages in use at DNR, but have proven to be problematic for users of the prevalent desktop mapping/GIS software packages. No effort has been made to convert them to a standard DEM product. The entire State is available. The total investment to date is $430,000.00 for coverage of the entire State.

10.3 New Product Specification: Topographic vector contours will be created using appropriate technologies at an interval of approximately .6 meters. In addition to the topographic contours, the digital elevation data shall be delivered as a 3-D model (first surface return) and as a "Bare Earth" model (actual ground elevation). The Federal Emergency Management Agency has developed detailed LIDAR topographic mapping specifications developed by a panel of experts. FEMA's specifications are generally referred to as Appendix 4B. Maryland will adopt the Appendix 4B specifications and modify them as required to ensure that the product specifications can be realistically achieved by potential contractors. The modifications will involve the vertical root-mean-square error (RMSE) accuracy standard to ensure that realistic goals are established for the contractor in varying land cover areas. Initial suggestions will be a 20 cm RMSE for Coastal Plain

areas, 25 cm RMSE for Piedmont areas and a 50 cm RMSE for mountainous areas. All elevations will be orthometric heights. Variably spaced, bare earth digital topographic data in ASCII point file format will be combined with imagery (either flown concurrently or by using existing digital orhtophotos) to eventually establish a Triangulated Irregular Network (TIN) that includes selected breaklines to be used for hydraulic modeling. Uniformly spaced Digital Elevation Models (DEM's), with 5m x 5m point spacing, will be generated in multiple file formats for hydrologic and hydraulic modeling and other federal, state and county applications.

These data will be stored in tiles of approximately 9,000 meters squared on increments starting at the Maryland State Plane Coordinate System NAD 1983. The vertical datum will be NAVD 1988. Data will be produced in each tile area to provide for ortho correction of the 1:2,400 map sheets located in that tile.

10.4 Responsibility for Statewide Production or Acquisition: A Regional Action Team will be established by MSGIC.

10.5 Cost and Procurement Options: The principal option for acquiring elevation products to meet these specifications is contract procurement from the private sector. Current estimates for production of LIDAR data to meet the above specifications range from $450 to $640 per square mile. Therefore, using the number of 1:2,400 scale map sheets required for statewide coverage at an approximate cost of $500.00 per square mile, the total cost will be $5,500,000.

A secondary option will involve working with the Regional Earth Science Application Center at the University of Maryland to develop a commercial instrument based on the Vegetation Canopy LIDAR (VCL) satellite prototype instrument known as LVIS. The cost of obtaining data for statewide coverage is estimated at $950,000 based on the costs to build a new 5-meter instrument, obtain coverage and post-process the data.

10.6 Funding Options: Federal grant funds, federal cost share and state funds (general or special) may be used to procure this data. Maryland may be able to form joint funding arrangements with federal agencies, utility companies, county governments, or other entities in the State. The Regional Action Team will be responsible for developing partnership opportunities and applying for grant funds.

11.0 Orthophotography Data Profile

11.1 General Disscussion: Digital orthophotography is generally considered the foundation of modern GIS systems. It provides an intuitive map base that eliminates the need for detailed mapping of many individual features. The Department of Natural Resources has managed production of the digital orthophoto quarter quad program for the State since 1991. The State Highway Administration has contracted for additional orthophotography to meet their unique requirements for "right-of-way" projects and other design work. At least thirteen counties have contracted for larger scale digital rectified or orthophoto products. Developing a uniform grid system across the State would help ensure that the respective GIS programs of state and county agencies would integrate better.

11.2 Existing Statewide Product: The Department of Natural Resources produced 1:12,000 scale, color infrared orthophoto coverage from 1991 through 2000. The data are based on aerial photography dated from 1988 through 1995. The products are distributed by DNR as composite color images in 8-bit TIFF format with an accompanying .TFW file. The TIFF files have a rotation factor which is accounted for in the .TFW files. The most prevalent desktop mapping/GIS system encounters problems with this rotational factor, even though the file specification is their own format. The files are distributed in Maryland State Plane Coordinate System, NAD 1983 in meters. DNR finished an innovative partnership with the USGS in March 2001 to populate the National Orthophoto Database with standard federal specification 1:12,000 scale products. The Maryland products were delivered in color formats for approximately two-thirds of the state. The remaining files in the National Database will be black and white format produced for the surrounding states. The cost of production for this product, excluding the photography and DEM expenses, was approximately $ 1,011,000.00.

Figure 11.1 Sample Orthophoto provided by VARGIS, LLC

11.3 New Product Specification: Natural Color Orthophotography shall be created from winter or early spring leaf-off condition imagery or aerial photography. The orthophotos shall be cast on U.S. State Plane Coordinate System (Zone 1900 - Maryland) NAD 1983 in Units of Meters. All orthophoto shall be cast orthogonal to the State Plane Grid to prevent image rotation. The pixel ground resolution shall be one foot. If aerial photography is utilized, the flight altitude shall be 9,000' with a six-inch focal length lense camera to yield source photography at 1:18,000 scale. The grid system shall be based on a map sheet of 600 meters in the Northing direction and 900 meters in the Easting direction. It shall originate at Maryland State Plane coordinates 0,0. Each resulting map sheet shall have a 40 meter over-edge to allow for conversion and mosaicing in other projections. All map sheets shall be radiometrically corrected and balanced for tone against adjoining map sheets to provide a uniform appearance over large areas. Each map sheet shall be stored as an 8-bit composite color image at approximately 7.4 megabytes when uncompressed, or approximately 400 kilobytes when compressed. Each map sheet shall also be stored as a 24-bit, 3-band image which will be 22 megabytes when uncompressed and less than 1 megabyte when compressed to facilitate transfer across Internet.

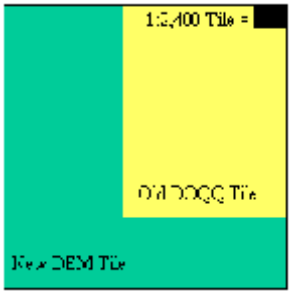


Figure 11.2 - Shows the relative size of the newly proposed DEM Tile (Green/Gray), the existing DOQQ tile (Yellow/White) and the newly proposed 1:2,400 map sheet tile (Black).

The 1:2,400 scale map sheets shall be mosaiced and resampled to produce USGS standard specification 3.75' digital orthophotos in the UTM NAD 1983 Projection if there is sufficient interest in this product.

11.4 Responsibility for Statewide Production or Acquisition: A Regional Action Team will be established by MSGIC.

11.5 Cost and Procurement Options: Four options currently exist for acquiring orthophoto products to meet these specifications. 1) They can be licensed from the private sector. 2) Their production can be contracted through standard State procurement methods utilizing a services procurement contracting mechanism. 3) The State or local government agencies might be able to do a Joint Funding Agreement or Innovative Partnership with the USGS. 4) The State might be able to form a partnership with other federal agencies, utility companies, county governments, or other entities in which the State simply funds a portion of the product cost if the contracting agency ensures the State that it will meet standard product specifications.

It is doubtful that we will be able to determine accurate prices for these products due to the exceptionally competitive nature of this market and the number of vendors that might bid on the contract. Using current licensing costs, approximately 2,300 square miles of the "metropolitan" portion of the State could be procured by one agency for the full retail cost of $223.00 per square mile or $512,900.00. Significant price reductions are offered for licensing large areas, but multipliers will be added for sharing the data with county governments and other partners, or for providing Internet viewing access.

Recently, one Pennsylvania County contracted for production and ownership of data at a rate of $30.00 per square mile. However, this is an exceptional case, and the average low cost appears to be approximately $75.00 per square mile if the customer has a suitable DEM. Therefore, it would be reasonable to expect that the State could contract for production at no more than $100.00 per square mile for planning purposes. Based on 51,100 map sheets at .21522 square miles each, the expected Statewide cost would be approximately $1,099,744.00.

11.6 Funding Options: Federal grant funds, federal cost share and state funds (general or special) may be used to procure this data. Maryland may be able to form joint funding arrangements with federal agencies, utility companies, county governments, or other entities in the State. The Regional Action Team will be responsible for developing partnership opportunities and applying for grant funds. DEM is required prior to production of the orthophoto product to obtain the projected costs.

12.0 - Political Boundaries Data Profile

12.1 General Discussion: The U.S. Geological Survey and the State Highway Administration maintain separate political boundary files at 1:24,000 scale. The SHA file is currently used by agencies within State Government, many counties and a few federal agencies. There is no consistent political boundary file available at a larger scale. Developing a consistent 1:2,400 scale political boundary file for the State will be a significant undertaking, because there is no consistent source material that it can be digitized from. It is likely that each boundary would have to be COGO'ed from historic documents or generated from field surveys. The Implementation Team members recommend that we create a Regional Action Team to evaluate the cost to have all State, county and municipal boundaries surveyed and generated using COGO techniques. This will involve significant field work and political action to reconcile any differences. The border between Maryland and adjoining Virginia and West Virginia will be a significant (but welcome) undertaking.

12.2 Existing Product: As noted above, all State agencies use the political boundary files produced by the State Highway Administration as part of their GRID map product. The original files are created in a CADD system and converted for use in GIS formats. They are available for the entire State in the Maryland State Plane Coordinate System, NAD 1983 in meters. It is not possible to estimate the cost of this individual layer.

12.3 New Product Specification : A Regional Action Team will be established by MSGIC to develop a consistent method and contract specifications for surveys and digital conversion.

12.4 Responsibility for Statewide Production or Acquisition: The Geospatial Data Partnership Office should be responsible for creating this layer.

12.5 Cost and Procurement Options: Unknown at this time.

12.6 Funding Options: Unknown at this time.

13.0 Hydrography Data Profile

13.1 General Discussion: Hydrographic features (stream and shoreline boundaries with flow and other characteristics) are important data that are used in nearly every mapping and analysis effort.

13.2 Existing Product: Three statewide stream and shoreline files exist for the State of Maryland. One was produced and is maintained by the State Highway Administration as part of its GRID map effort. SHA readily acknowledges that this CADD layer was not produced to exacting standards and is intended to be a cartographic product that provides for the general locations of streams. The Department of Planning and Department of Natural Resources contracted for a digital GIS version of this file which is the "official" State stream file. A second effort was contracted by the Department of Planning well before the completion of the SHA GRID files. The streams were digitized from the U.S. Geological Survey 7.5' quadrangle maps in a low-cost effort to develop data for modeling efforts. Again, the standards were not very exacting. The most current file available was completed in 2000 by the U.S. Geological Survey. It is the 1:24,000 DLG file and is complete for all Chesapeake Bay drainage. This means that portions of Garrett and Worcester counties are not included. This file represents stream locations faithfully from the existing 7.5' U.S. Geological Survey quadrangle maps, but still does not provide the level of detail that is required for state and local mapping programs, nor does it represent up-to-date information.

13.3 New Product Specification : Unknown at this time, but federal specifications for the National Hydrographic Database will likely be used to create a 1:2,400 scale product. The Department of Natural Resources has conducted test mapping to determine the location of streams and ditches on its 1:12,000, 3.75' digital orthophoto quadrangles that were beyond (or in addition to) the "blueline" streams on the U.S. Geological Survey's 7.5' quadrangle maps. Worst case examples lead to 180 additional miles of streams and ditches in a 15 square mile area (one DOQQ map in an area with significant agricultural drainage). In all cases, significant additional stream miles were mapped. It is not likely that mapping streams, ditches and shorelines at 1:2,400 scale will lead to similar significant increases in mileage, but it will lead to much greater positional accuracies that are essential for many programs such as the Conservation Resource Enhancement Program (CREP - vegetative plantings along riparian corridors).

13.4 Responsibility for Statewide Production or Acquisition: A Regional Action Team will be assigned by MSGIC to develop contract specifications and determine the appropriate to manage data production.

13.5 Cost and Procurement Options: Unknown at this time.

13.6 Approximate Cost for Product: Based on very rough estimates developed by the Department of Natural Resources, the line work will cost approximately $1,500,000.00. To attribute this file to the extent of the National Hydrographic Database would likely take an additional $2,000,000.00, resulting in a total project cost of $3,500,000.00.

13.7 Funding Options: Federal grant funds, federal cost share and state funds (general or special) may be used to procure this data. Maryland may be able to form joint funding arrangements with federal agencies, utility companies, county governments, or other entities in the State. The Geospatial Data Partnership Office will be responsible for developing partnership opportunities.

14.0 Transportation Data Profile

14.1 General Discussion: Transportation significantly influences the lives of every citizen in the State of Maryland. Highways affect the mobility of the public, impact the environment, effect economic development, and collectively influence the quality of our lives and communities. In 1998 The Maryland Department of Transportation State Highway Administration (SHA) embarked on a new way of doing business called "Thinking Beyond the Pavement" (TBTP). This approach assures projects are developed with a renewed and greater commitment toward community integration and environmental sensitivity. A primary component of this program is understanding the landscape, community, and valued resources before engineering design is begun. Geographic information, especially that which is transportation related, is vitally important for this analysis and maps and other visual tools provide extremely useful project information to the community. TBTP dovetails well with the State's Smart Growth initiatives to promote the needs of the stakeholders and customers. This new era of transportation means putting more emphasis on the people, neighborhoods, and businesses transportation serves, as well as on the sensitive areas of the state that we must protect. For example, Maryland Executives want to map sidewalks on a regular interval as part of the Smart Growth program relating to livable communities. Transportation projects are now evaluated within these larger contexts and require a new and more comprehensive set of transportation data products for decision makers.

Transportation data is currently developed and maintained separately, at different spatial accuracies, by Federal, State and local governments to support their existing business requirements for information, reporting, and management of the system. In order to make most efficient use of available resources for collection of information related to this theme, and to leverage partnerships and data sharing opportunities, the common denominator for transportation data must be established. Priorities for transportation must be set and how needed data can best be collected and shared at all levels of government must be decided. Obviously, such a database includes roads, rail, airports, and ocean ports. A fully comprehensive transportation information system might also includes such features as dirt roads, alleys, sidewalks, multi-use trails, and roads under construction.

Maintenance of the Transportation layer is a good candidate for vertical data integration. In a vertical integration scenario, new features are added at the local level to a high level of spatial accuracy, then migrated through State and Federal government levels, generalizing as needed. Due to its dynamic nature, the transportation layer requires daily maintenance and a data architecture needs to be designed in a manner which encourages and enhances the effectiveness of this data stream while helping to fulfill the requirements of TBTP and Smart Growth. There are also requirements for the ability to query and display information about incidents in a real time environment from both the State (CHART) and from local governments (E-911) which demand accurate and timely data. From the standpoint of information flow, vertical integration of this data layer is already in place. Local governments annually provide information to the Maryland State Highway Administration on new roads within their jurisdictions. Similarly, the State provides information to the Federal Highway Administration through both electronic and paper transactions. For true vertical integration this process needs only to be standardized and applied uniformly.

14.2 Existing Product: The Maryland State Highway Administration maintains 1:24,000 scale transportation data as part of its GRID map series. The files are produced and maintained in CADD formats and converted, by others, to GIS formats as required. Data collected for

Maryland's report on the Vertical Integration of Spatial Data shows that the State Highway Administration spent approximately $110.00 per square mile to create the road centerline file. This equals approximately $1,067,000 for the entire state. Again looking at the Vertical Integration of Spatial Data Report, they spend an additional $194,000 maintaining the file each year.

14.3 Product Specification: Digital vector graphic features representing transportation elements shall be captured from aerial photography. Photography used will be suitable for capture of road centerlines, medians, edge of pavement, edge of travelway, rail lines, airport facilities and other transportation features as needed. Data spatial accuracy shall meet the parameters of National map Accuracy Standards (NMAS) for 1" = 200' (1:2,400) scale mapping. Features shall meet the following graphic standards:

1. Road centerlines, lane centerlines, medians and edges shall be captured as linear graphic elements.
2. Railroads shall be captured as patterned linear elements. A single patterned line shall represent each track.
3. Linear features shall be represented as lines or line strings only. Line elements, elements with only two vertices, shall only be accepted to represent features with no shape points from the beginning to the end of the features. Features requiring shaping points must be represented as line string elements. Line string elements must only contain those vertices needed to maintain feature shape. Features with excessive vertices or non-shaping vertices shall not be accepted.
4. All data will be free of overshoots, undershoots, slivers, duplicate lines or other data anomalies. Where graphic elements meet visually, they shall also meet digitally by exact coordinates.
5. High quality cartographic appearance shall be achieved. Transitions from straight lines to curvilinear line segments shall be smooth and without angular inflections at the point of intersection. There shall be no jags, hooks or zero length lines or line segments. Curvilinear graphic features shall be smooth, with a minimum number of vertices. Line or line segments that are straight, or should be straight, shall be digitized using only two vertices representing the beginning and ending points of the line or line segment.
6. The data shall contain 100% of the features visible on the aerial photography.

14.4 Responsibility for Statewide Production or Acquisition: A Regional Action Team will be assigned by MSGIC.

14.5 Cost and Procurement Options: The transportation layer will have to be created and maintained as a partnership between local and State government agencies. It has a significant impact on local emergency services as part of the E911 service. During the Vertical Integration of Spatial Data study, one county indicated that cost approximately $1,000.00 per square mile for production of a 1:2,400 road centerline file with premise addressing. Using this figure and taking the efficiencies that can be realized taking a statewide project approach, we estimate it could cost between 6 and 8 million to complete a similar file for the entire state.

15.0 Cadastre Data Profile

15.1 General Discussion: Depending on the mapping technique used, a 1:2,400 scale cadastre file may be the most expensive framework data layer to produce. Maryland is fortunate to be one of only two states that maintain responsibility for parcel mapping at the state level. This allows for production of uniform products on a statewide basis such as the existing MdProperty View product. However, in spite of its small size, Maryland will likely incur greater expenses than many other states during creation of a cadastre layer for two reasons. First is the number of parcels, and the other reason is that our parcels are based on the "Meets and Bounds" system instead of the Public Land Survey System. A cadastre layer built on the "Meets and Bounds" system is inherently more difficult and expensive to accurately map.

Two basic options exist for creating a vector layer of parcel ownership. The first is to convert the existing parcel maps to a vector base and then "approximately hand fit" each parcel boundary to the visual references in a 1:2,400 scale orthophoto. This effort will create a vector based product that is more precise and useful than existing products, but can not be used for legal purposes. The second option uses a technique called COGO which is an acronym for Coordinate Geometry. Using this technique, an operator enters the "Meets and Bounds" from the deed description or plat for each property. Eventually a uniform cadastre layer is created by the accumulation of individual property plats. This technique requires a great deal of reconciliation, because many surveys are not accurate and the boundaries of adjoining parcels will not join or "close" properly. Assuming it is accurately created (under the supervision of a Licensed Land Surveyor), this layer can then be used for certain legal purposes.

There is also significant interest in the maintenance of information regarding lands managed under public ownership, currently about 15% of Maryland's land mass. Under the new 2000 Chesapeake Bay Agreement (C2K) each state will have to report public land ownership and show progress toward goals established by the Agreement to increase the acreage of public lands. Additionally, Maryland has many easement acquisition programs including the Maryland Agricultural Land Preservation Foundation easement program, the Maryland Environmental Trust easement program and the Maryland Historic Trust easement program. Each of these programs can benefit from more precise and larger scale cadastre data.

15.2 Existing Product: Several counties have initiated or completed vector based mapping of their parcels. An accurate and up-to-date inventory does not exist. The Maryland Department of Planning (MDP) produces MdProperty View which is a product that combines, 1) binary raster scans of the existing parcel maps, 2) a vector node for each parcel that is linked to 3) the Department of Assessment and Taxation's real property database and 4) other non-parcel specific layers that make the product more useful to a wider range of users. This digital map series is available for the entire state at a scale of 1:24,000. During the Vertical Integration of Spatial Data study, MDP determined that this product cost approximately $818,000.00 to create. Since its introduction, it costs approximately $1,228,000.00 to maintain the product on an annual basis. The existing product is created through a "zero-base budget" and depends on data sales to fund the operation.

15.3 Product Specification : Unknown at this time.

15.4 Responsibility for Statewide Production or Acquisition: A Regional Action Team will be assigned by MSGIC.

15.5 Cost and Procurement Options: MSGIC studied data production costs in 1999 as part of its Vertical Integration of Spatial Data study. It was determined that the existing parcel maps could be vectorized and "hand fitted" to an orthoimage base map for approximately $1.40 per parcel. It was also determined that using COGO techniques, it costs approximately $24.00 per parcel. This results in a range of costs between approximately $2,900,000.00 and $49,100,000.00. In addition to the initial conversion cost, there will be a significant maintenance costs associated with this layer due to the continuous sale of real property in the State.

15.6 Funding Options: Funding options will have to be studied by the Regional Action Team.

16.0 Geodetic Control Data Profile

16.1 General Discussion: This is one of the easier layers to create and maintain. The data itself is stored by the National Geodetic Survey (NGS) and submitted to agencies on a yearly basis. The processing of the data is all that would be required.

16.2 Existing Product: A point coverage file is created from the ASCII format NGS DAT files. Each point contains all of the data that is included in the NGS data sheets. The DAT files are created at NGS for all geodetic control monuments that have been logged and blue booked with the agency. The accuracy of this data will vary from point to point but all will be more than acceptable for any 1:2,400 scale mapping effort. The accuracy is generally +/- 6 seconds.

16.3 New Product Specification : Same as above.

16.4 Responsibility for Statewide Production or Acquisition: As The Plats and Surveys Division of the Maryland State Highway Administration has done in the past, they will continue acquiring this data from NGS and producing the ESRI shape file layer. This office will also maintain this data layer and update it on a yearly basis at the same time that NGS releases their yearly updates to the DAT files.

16.5 Cost and Procurement Options: The simplest option for this data layer is to continue the process that is currently in place, which is to continue the data creation within the Plats and Surveys Division of the Maryland State Highway Administration. The data is available free of charge from the Maryland State Highway Administration. The cost of processing the data should be able to be completed within SHA, but depending on volume of work, consultant assistance may be required.

16.6 Funding Options: No additional funding appears to be required at this time.

17.0 - Geology Data Profile

17.1 General Discussion : The Maryland Geological Survey (MGS), part of the Department of Natural Resources (DNR), has been the primary Maryland state government agency for the production of geologic maps. The Environmental Geology and Mineral Resources Program, of the MGS, produces standard geologic maps that are used by agencies and organizations such as the State Highway Administration (SHA), the United States Geological Survey (USGS), United States Department of Agriculture (USDA), Maryland Department of the Environment (MDE), county governments, as well as private contractors and the public.

Geologic mapping by the Environmental Geology and Mineral Resources Program has primarily been completed at two scales, 1:24,000 (for 7.5-minute quadrangle maps) and 1:62,500 (for individual county maps), with some site-specific geologic maps completed at other scales for special projects. Since 2000, the Environmental Geology and Mineral Resources Program has shifted from traditional cartographic methods to digital methods using GIS software for geologic map production. Currently, unpublished maps as well as new mapping projects are being developed digitally for publication.

It should be noted that, in addition to standard geologic maps, the entire MGS produces a variety of maps containing information such as, but not limited to, shoreline changes, geologic resources, hydrogeologic recharge, physiographic provinces and sediment distribution.

17.2 Existing Product: Standard geologic maps exist statewide at the county scale (1:62,500) in hard copy (paper). Less than half the state is mapped at a scale of 1:24,000 (the standard for a 7.5-minute quadrangle). However, a number of the existing maps are over 25 years old and are in need of review, update, revision, and digitization.

17.3 New Product Specification: To produce additional maps at 1:24,000 scale, spatial geologic data would need to be collected in the field, which would be supplemented by GPS collected data for point features. These data would then be compiled and transformed into digital vector data. The digital vector data would consist of line and point features for structural elements, polygons for geologic rock units and surficial deposits, and point features for any geohazards that are found. All data would meet the criteria set by the National Map Accuracy Standards for 1:24,000 scale mapping set by the United States Geological Survey.

17.4 Responsibility for Statewide Production or Acquisition: The MGS will work in conjunction with the Regional Action Team established through MSGIC.

17.5 Cost and Procurement Options: One quadrangle mapped and digitized per year would cost approximately $110,000. This estimate does not include overhead costs including, but not limited to: additional support staff, software, hardware, state vehicles, vehicle maintenance, and travel expenses.

17.6 Funding Options: No funding options are being developed at this time.

18.0 Water and Sewerage Plans Data Profile

18.1 General Discussion: The Code of Maryland Regulations (COMAR), Title 26 Department of the Environment provide specifications for the creation, review and adoption of county water and sewerage plans as required by Environment Article, §9-511 – 9-51, Annotated Code of Maryland. The plans must be submitted to the Departments of Planning, Natural Resources and Environment for review and comment. Counties are required to develop and submit annual amendments or revisions to the plans.

18.2 Existing Product: Individual counties maintain their own water and sewerage plans. The scale and detail are specified by COMAR but still vary from county to county. The Department of Planning creates and maintains a sewer service mosaic derived from the county plan submissions in digital format. The database was developed by obtaining digital data from individual counties or digitizing hardcopy maps. The compilation scale of the plans vary but the derived scale is published as 1 inch = 1 mile.

18.3 Product Specification: COMAR 26.03.01.04 details the requirements for the submission of the County plans to the Maryland Department of the Environment. In general, the regulations require counties to submit to specific map products for each utility; a small-scale 1 inch = 1 mile displaying general details and a larger-scale map series, 1 inch = 2,000 feet displaying utility and related features in greater detail.

The large-scale maps must include existing or proposed facilities including wells, reservoirs, intakes, transmission and feeder mains, storage facilities, interceptor and truck sewers, pumping stations, force mains, treatment works, outfall sewers, and service areas. Facility sizes or capacities are to be delineated as appropriate. Existing and planned service must be identified as follows: (S = Sewer and W = Water) 1 – Existing or under construction, 2 – final planning stages, 3 – immediate priority, 4 – construction programmed for 3 to 5/6 years, 5 – construction programmed for 6/7 to 10 years, 6 – no planned service. COMAR specifies standard symbols for the features in the database.

18.4 Responsibility for Statewide Production or Acquisition: Responsibility for statewide production should reside with the individual counties with technical and financial assistance being provided to counties requiring such assistance. The Department of the Environment should create the mosaic based on the plan submissions. A Regional Actions Team will be assigned to develop specifications, data dictionary and ensure compliance with COMAR.

18.5 Cost and Procurement Options: The water and sewer plans will need to be developed as a cooperative initiative between state and county governments. Where available, counties are using GIS and CADD technologies to create the plans. Assistance will be required to ensure adherence to COMAR standards. Since water and sewer plans generally follow cadastral (parcel) boundaries, this layer is "derivative" database. Large-scale compilation of the plans should commence after a suitable cadastral layer is developed. The cost to develop a consistent small-scale (1 inch = 1 mile) database should be less than $10,000 per county. The cost to develop a large-scale (1 inch = 2,400 feet) would cost on average $50,000 per county.

18.6 Funding Options: Cost for development of county plans would remain the responsibility of the individual counties. Funding options will have to be studied by the Regional Action Team.

19.0 Historic Properties Data Profile

19.1 General Discussion: This information consists of properties that have either been determined historically significant or potentially historically significant. The Maryland Historical Trust began maintaining a statewide inventory of historic sites in the early 1970's. Traditionally, the data has been collected and maintained at a 1:24000 scale. Each property has a unique ID number, name, an inventory form containing textual description, and photographs. The inventory includes individual buildings, sites, districts, structures and objects. The statewide inventory does not include a comprehensive survey of burial sites and cemeteries.

19.2 Existing Product: At the state level the Maryland Historical Trust, located within the Maryland Department of Housing and Community Development, has developed three separate vector layers to depict historic properties. One layer depicts approximately 24,000 individual buildings, districts, structures, sites and objects that have been identified as significant or potentially significant historic sites listed on the state-level Maryland Inventory of Historic Properties. A second layer depicts approximately 1200 properties that are listed on the federal-level National Register of Historic Places. A third layer depicts Maryland Historical Trust Preservation Easements, properties with historic preservation easements. All of these have been developed at the 1:24000 scale. Coverage is complete with the exception of Baltimore City. All of the properties in these layers are currently digitized as polygons.

Some counties, particularly in the metropolitan areas, also have developed historic sites data at a scale of 1:2400. These systems should serve as the starting point for developing the specifications for the larger scale information.

19.3 New Product Specification: Specifications will need to be developed cooperatively between the state and county and local entities. County interests may involve tying the historic sites designation to the cadastral maps or data. Specifications would possibly entail rectifying existing vectors to the 1:2400 scale; however, issues of data normalization (e.g., one historic property covering multiple parcels; multiple sites designated within a single parcel) and topological problems (e.g. overlapping district boundaries) would need to be addressed. Specifications will need to include a process for generalizing the data back to a 1:24000 scale for state-level management purposes, federal reporting, and intrastate projects.

19.4 Responsibility for Statewide Production or Acquisition: The Maryland Historical Trust has a legislated mandate to maintain a statewide historic sites inventory and is the agency designated by the U.S. Dept. of Interior to manage the National Register listings for Maryland. Data collection for the statewide inventory, however, is often coordinated through the county Planning and Zoning offices, with many surveys funded through Maryland Historical Trust grants. Some counties have incorporated historic sites information into a county GIS.

19.5 Cost and Procurement Options: This data will need to be upgraded through a cooperative effort between the state and the counties/Baltimore City. The data can only be developed in areas in which the other base layers (cadastral and orthoimagery) are complete. Cost per jurisdiction would vary widely, from minimal in counties where this data is already developed (e.g. Howard), up to as much as $50,000 for completing Baltimore City. A preliminary cost estimate for statewide development is $450,000.

19.6 Funding Options: No funds have been identified to develop this information; however, possible sources include National Park Service, State Highway Administration Tea-21 funds; and MHT grant funds to local jurisdictions.

19.7 Maintenance: Approximately 700 additional properties are added annually to the inventory through field surveys. In addition, data is corrected through field reports, and condition is noted (e.g., demolished). Occasionally, houses are relocated (moved) as well. MHT currently has one full-time staff position for maintenance of GIS data.

20.0 Archeological Sites Data Profile

20.1 General Discussion: This information consists of archeological sites that have been inventoried by the Maryland Historical Trust, a state agency located in the Maryland Department of Housing and Community Development. Begun in the late 1960s, the inventory contains approximately 10,000 sites. Traditionally, the data has been collected and maintained at a 1:24000 scale on USGS topographic quadrangle maps. Each property has a unique ID number, name, and a form containing information about the site, sometimes including reports and photographs.

20.2 Existing Product: Locations of archeological sites are confidential and are protected from release under state law in order to prevent site looting. Therefore the Trust has prepared both an internal and external version of the sites data. The internal layer depicts the approximate boundaries of sites as recorded in the field on USGS topographic maps. The second product, prepared for outside distribution, is archeological site presence grids, which consist of 700-meter-wide grid cells superimposed on each county. Cells which cover areas where archeological sites have been recorded in the Maryland state inventory are classified as "present". The archeological site grid is intended to be used as a general planning tool to identify areas in which recorded archeological sites are found without revealing more precise site information.

20.3 New Product Specification: Due to the nature of the original mapping on UGSG quads, and lack of more specific information, rectification onto a larger scale would be virtually impossible. Even re-survey of existing sites, if feasible, would not be successful in many cases without test excavations in order to determine site boundaries. However, once a new, larger scale topographic map becomes widely available, it could be used for future site recording. In any case, it would be desirable to re-do the separate county grids that currently exist into one statewide grid to provide seamless coverage across county boundaries.

20.4 Responsibility for Statewide Production or Acquisition: The Maryland Historical Trust has a legislated mandate to maintain a statewide archeological sites inventory. Data collection for the statewide inventory is centralized through that office. Many counties have copies of the presence/absence grid of archeological sites.

20.5 Cost and Procurement Options: At this time, no changes in the current data are planned. Creating a new, statewide grid system could be done as part of the normal update cycle.

20.6 Funding Options: N/A

20.7 Maintenance: Approximately 250 additional sites are added annually to the inventory through field surveys. MHT currently has one full-time staff position for maintenance of GIS data.

21.0 Zoning Data Profile

21.1 General Discussion: Maryland Code does not specify the requirement for counties and municipalities to create and maintain zoning databases. The code does; however, provide the authority for counties and municipalities to regulate zoning designations. County and municipalities in Maryland have existing regulations that govern the zoning designation of real property. Most zoning designations conform to property boundaries but there are exceptions that create "split" zoned parcels. Comprehensive rezoning activities occur on a designed schedule. There is usually a process to provide for "out-of-cycle" designation changes. Traditionally, the authoritative zoning maps are those signed by their respective governing authority. Digital representation of the zoning maps may exist but they are not authoritative.

21.2 Existing Product: Individual counties maintain their own zoning maps. The scale and detail is depend on the scale of the base map used in producing the zoning maps. Zoning maps are typically based on one of two base maps: cadastral maps or planimetric maps. The Maryland Department of Planning creates and maintains a mosaic derived from the county maps in digital format. The database was developed by obtaining digital data from individual counties or digitizing hardcopy maps. The compilation scale of the zoning maps vary but the derived scale is published as 1 inch = 1 mile.

21.3 Product Specification: Specifications for zoning databases vary from county to county. Common production scales are 1"=200' and 1"=600'. Counties could continue to produce zoning databases at a variety of scales but the mosaic would need to be "published" at the smallest compilation scale. It is unlikely that zoning designations will be consistent statewide. Generalization through zoning designation could be developed to present the data in consistent categories, e.g. residential, commercial, industrial, etc.

21.4 Responsibility for Statewide Production or Acquisition: Responsibility for statewide production should reside with the individual counties with technical and financial assistance being provided to counties requiring such assistance. The Department of Planning should create the mosaic based on digital submissions or by digitizing hardcopy maps. A Regional Action Team will be assigned to develop specifications and a data dictionary.

21.5 Cost and Procurement Options: The zoning maps will need to be developed as a cooperative initiative between state and county governments. Where available, counties are using GIS and CADD technologies to create the plans. Priority funding should be provided to counties and municipalities not currently using GIS or CADD to create their maps. Since zoning designations generally follow cadastral (parcel) boundaries, this layer is "derivative" database. Large-scale compilation of the plans should commence after a suitable cadastral layer is developed. The cost to develop a consistent small-scale (1 inch = 1 mile) database should be less than $10,000 per county. The cost to develop a large-scale (1 inch = 2,400 feet) would cost on average $50,000 per county.

21.6 Funding Options: Cost for development of county zoning maps will remain the responsibility of the individual counties. Funding options will be studied by the Regional Action Team.

22.0 Wetlands Data Profile

22.1 General Discussion: Very few features have been the subject of as many mapping exercises as wetlands. Federal, State and local agencies have many uses for wetlands data to support a variety of regulatory, enhancement and stewardship programs. The Maryland Department of the Environment (MDE) has assumed portions of the Federal 404 and Section 10 permit programs and has its own programs to regulate construction or fill activities in tidal and nontidal wetlands. County governments participate in these programs to ensure consistency in permit issuance. Regulators and the regulated public are constantly seeking wetlands maps of larger scale and greater precision, although regulatory personnel do not generally want a series of regulatory maps unless they can match the precision of a field delineation and survey. Field delineations are conducted for every permit issued in nontidal wetlands. The Maryland Department of Natural Resources (DNR) has studied the "attitudes" of regulatory personnel with regard to regulatory maps and produced some grey literature on the subject.

DNR has participated in several Federal research programs to find better methods to accurately inventory nontidal wetlands and, again, has produced some grey literature on the subject. To date, no method has proven more reliable than photo interpretation for the original inventory, although using the sum of several programs will yield the most comprehensive view of wetlands. New methods using satellite imagery to conduct status and trends mapping are showing great promise. One of the greatest problems in mapping wetlands is gaining concurrence on the definitions of what will be mapped.

22.2 Existing Product: Since the early 1980's, the National Wetlands Inventory (NWI) of the U.S. Fish and Wildlife Service has worked to produce a 1:24,000 scale wetlands inventory of the nation and has conducted many status and trends reports for Congress. The National Resources Conservation Service (NRCS) maintains the status and trends of wetlands (and other features) based on the National Resources Inventory which is a sampling method. Recently, these two groups agreed to common definitions of wetlands to ensure their efforts produced consistent results. The NWI data are commonly used for planning purposes in Maryland since they represent the only complete statewide inventory. The NRCS also maintains the "Swamp Busters" data on wetlands location to support incentive programs that prevent farming on wetlands. The National Oceanic and Atmospheric Administration (NOAA) produced the Coast Watch land cover inventory in 1988 that identified tidal and nontidal wetlands using Landsat satellite imagery.

Since 1971 Maryland has maintained a series of 1:2,400 scale tidal wetlands "maps" that show the location of State and Private tidal wetlands. These maps are legal documents that are filed with the Circuit Court Clerk in each of the 16 tidal counties. The Tidal Wetlands Maps are produced on an uncorrected aerial photographic base that makes it difficult to transfer the data to a modern map accurate base.

In 1988 the Nontidal Wetlands Protection Act was passed. It required the DNR to produce a series of nontidal wetlands maps. DNR contracted with Salisbury State University to produce a series of digital maps using SPOT Satellite Imagery as the base with an overlay of the NWI data for nontidal wetlands. In addition, the State's nontidal Wetlands of Special State Concern (WSSC) were identified and delineated on this map series. That map series was "retired" in 1998 due to the increasing availability of a larger scale map from DNR and the production of a smaller scale (1:63,360) countywide map series that showed the updated locations of WSSC's and wetlands.

In 1991 DNR began production of the 1:12,000 scale digital orthophoto quarter quadrangle (DOQQ) maps using color infrared imagery to support a statewide 1:12,000 wetlands inventory. The DOQQ maps were completed in 1999 and the wetlands inventory is complete or in production for all counties except Garrett, Allegany and Washington.

22.3 Product Specification: Given the fact that all permit issuance requires a field delineation, it would not be cost effective to produce a statewide 1:2,400 scale wetlands map. Previous experience shows that the cost of mapping wetlands on a per square mile basis increases in an approximately linear fashion with the increase in map scale. Therefore it costs approximately four times as much to maps wetlands at 1:12,000 scale as it does at 1:24,000 scale.

The existing 1:12,000 wetlands inventory should be enhanced and continually maintained to improve its quality. Enhancement should include; 1) "fitting" it to the 1:2,400 scale base maps in areas where there are obvious fit problems, 2) incorporating field delineations and surveys into the database, 3) incorporating wetland mitigation and other naturally created wetland areas, and 4) incorporating wetlands from other data sources that support the identification of additional features. In addition, the State should work with the Regional Earth Science Applications Center at the University of Maryland to develop new methods of inventorying wetlands based on new sensors and the availability of more precise data such as the proposed Digital Elevation Model.

22.4 Responsibility for Statewide Production or Acquisition: The Department of Natural Resources should continue to be the focus for production of wetlands data.

22.5 Cost and Procurement Options: Continual maintenance of the wetlands inventory and coordinating with external research activities will require one permanent FTE.

22.6 Funding Options: DNR should be authorized one additional FTE during the second year, if the Geospatial Data Partnership Office is authorized and funded.

23.0 Critical Area Boundary Data Profile

23.1 General Discussion: The Critical Area law required that a 1000-foot Critical Area buffer be mapped from the landward edge of State Tidal Wetlands. This law affects the 16 counties that have tidal waters and their political subdivisions. In addition to the boundary line, the maps had to appropriately identify Resource Conservation Areas (RCA), Limited Development Areas (LDA), and Intensely Developed Areas (IDA) according to the law that was passed in 1985. Program managers completed mapping of the boundary on the circa 1971 State Tidal Wetland boundary maps by manually swinging a series of 1000' arcs from the tidal wetlands boundary line. Each of the jurisdictions affected by the Critical Area Law were required to identify the RCA, LDA and IDA areas. Most chose to transfer the Critical Area Boundary completed by the Department of Natural Resources (DNR) over to another map base that they commonly used. Each jurisdiction then petitioned the Critical Area Commission to accept their map products which became the basis for regulating these areas. This approach led to a variety of inconsistent map types.

23.2 Existing Product: At their headquarters office, the Critical Area Commission maintains a copy of the official paper maps for each jurisdiction. The Commission digitized the Critical Area features for planning purposes, but the work was not completed for mapping purposes. Beginning in 1999, DNR began adjusting the digital Critical Area Boundary files to an approximate map scale of 1:24,000 and verified that the RCA, LDA and IDA areas were correct. That work should be completed by December 2001. The Commission is also performing quality control checks on the work to certify the maps for use by public agencies.

23.3 New Product Specification: Since the Critical Area Boundary and area designations are used as a regulatory map and affect the use of private property, the I-Team recommends that the 1:24,000 scale data should be adjusted to the proposed 1:2,400 scale orthophoto and cadastral map base. This work should be conducted in consultation with a licensed land surveyor.

23.4 Responsibility for Statewide Production or Acquisition: A Regional Action Team will be assigned to develop a contract specification and mechanism for production of Critical Area data working in consultation with each affected jurisdiction. The local jurisdictions could use these same contracts to work directly with the vendors for quality control and verification purposes. The I-Team recommends that the Department of Natural Resources maintain custodial responsibility for this map series.

23.5 Cost and Procurement Options: Production of 1:2,400 scale Critical Area data should be started after the orthophoto and cadastral bases are completed for each county. Based on previous adjustment work, the cost to produce 1:2,400 scale Critical Area Boundary data should be approximately $400,000.00.

23.6 Funding Options: If the Geospatial Data Partnership Office is authorized and funded the money should be apportioned from the Agriculture and Natural Resource related data allocation as determined by the oversight board.

24.0 Protected Lands Data Profile

24.1 General Discussion: There is an increased emphasis on reducing urban sprawl in Maryland and preserving open spaces to serve as natural corridors and hubs to maintain environmental quality. The mapping of Protected Lands, or lands under some form of protection from the threat of development, have become critical to many Smart Growth programs as well as a requirement of the 2000 Chesapeake Bay Agreement. These data, originally released in 1994, are useful for many purposes and have become very popular for governments, private businesses and numerous advocacy groups.

24.2 Existing Product: The Protected Lands theme is currently managed as six separate databases. There is a separate file for 1) Federal lands (including military bases), 2) properties owned by the Department of Natural Resources (DNR), 3) county parks, 4) lands held by private conservation groups (such as The Nature Conservancy), 5) the Maryland Environmental Trust which holds donated easements, and 6) the Maryland Agricultural Land Preservation Foundation which purchases easements.

Each database contains a vector property boundary and attribute database. The files are digitized from a variety of source materials and are created to be map accurate at 1:63,360 scale. The update frequency ranges from annual cycles to an "as-we-get-to-it" cycle. Since there are many producers of these databases, some databases are merely collected from the producer and added to the collection. Other data custodians do not have the mapping capability so DNR and the Department of Planning create the rest. But is has been primarily DNR that has been the producer and organizer of this mapping effort and they are recognized as the custodian of these data.

24.3 New Product Specification: If the Geospatial Data Partnership Office is approved, digital 2400-scale cadastral data for properties (or portions of properties) will be collected or created for each of the appropriate Protected Lands themes. The attribute database will include property ownership information in addition to the data elements required by the respective protection program.

24.4 Responsibility for Statewide Production or Acquisition: Ultimately, it is envisioned that the Maryland Department of Assessments and Taxation, which is the State agency responsible for tracking and managing land ownership information, would add land protection information to the land ownership information that it already collects. Until that time, however, some entity shall be responsible for collecting, managing and distributing the digital protected lands databases. Since there are, and will continue to be, multiple parties involved in the creation of these data, there will be a great deal of coordination, communication and data sharing between the partners. These partners range from federal, state and county governments, land trusts, advocacy groups and other entities that buy or hold land that meets the definition of "protection." The Department of Natural Resources or the Department of Planning should lead this effort.

24.5 Cost and Procurement Options:

24.6 Funding Options: It will require at least two FTE's to keep the Protected Lands databases current on an annual basis. The duties will include coordinating with the various partners, collecting existing data, creating the data that does not exist, performing quality assurance reviews and package the data for distribution.

25.0 Land Use and Land Cover Data Profile

25.1 General Discussion: Land Use and Land Cover data are separate but related data themes. In Maryland, land cover is generalized into seven landscape categories including developed, agricultural, forest, grasslands, open water, wetlands and bare ground. Typically land use represents man's specific uses within these categories. For example developed lands can include commercial, industrial, institutional and residential uses. These categories can be divided even further into more distinct activities or uses. A commercial property could be used for a dry cleaning store, a gas station, a food store or a book store.

Each land cover or land use has particular impacts that are important to modeling efforts for environmental impacts. These are also important for understanding and planning growth, looking at human health issues and providing public services. Land use and land cover data are one of the most important and popular Geospatial data types.

25.2 Existing Product: The MDP data is a GIS land use and land cover data product that was originally generated by aerial photographic interpretation with updates from LandSat satellite imagery. In addition, the MDP data has been enhanced by using MdProperty View to more accurately identify developed land use categories. Maryland land use statistics are developed in cooperation with all 23 counties and Baltimore City. The current land use statistics and projection were reviewed and approved by the local jurisdictions in 2000.

The MDP data is representative of both statewide and county trends in development (acres by type). It tracks the conversion of resource land to development based on a statewide inventory. The land use data is a complete inventory based on geo-rectified LandSat satellite imagery and Md Property View.

The land use data base used by the Maryland Dept. of Planning is based on a modified Anderson Level II classification system and contains 20 land use/cover classes. It is a standard classification system used by land planners. Based on the number of households per acre, this classification scheme divides developed land into nine land use/cover categories.

The 1990 Land Use / Land Cover databases were derived from high altitude aerial photography. The photographs were interpreted and land use was outlined in polygon format using a ten-acre minimum map unit. No adjustment was made for the natural distortion caused by the curving of the Earth's surface. While this difference appears minimal in a single photograph, the distortion can become significant when map sheets are tiled together. This is especially true when geo-rectified data, which is data that has been adjusted to compensate for the natural distortion, is "layered" over the land use database.

The 1994 Land Use / Land Cover databases began with the 1990 data as a jump-off point. The 1990 vector files were laid over geo-rectified LandSat satellite imagery. Overlaying the two data sets allowed technicians to pick out where new development and other changes had occurred. This made developments hidden by forest cover, infill areas, and mistakenly identified polygons much clearer and easier to identify. A third step involved superimposing the more finely delineated State Highway Administration's 1:24,000 scale shoreline onto the 1994 Land Use / Land Cover files.

The 1997 Land Use databases are further refinements and updates of the 1994 Land Use

databases. SPOT Satellite Imagery (1994) and MDProperty View (1997 Edition) parcel point data were used to make corrections similar to those performed to create the 1994 databases. In addition, land uses 1991 (agricultural large lot residential development) and 192 (forested large lot residential development) were eliminated. Using the satellite imagery and parcel point information, areas formerly coded as 191 or 192 were re-evaluated and broken into their separate residential, agricultural or forested cover components. In addition, a new code of 80 (transportation) was introduced where applicable. Transportation features include major light rail or metro stations and large "Park 'N Ride" lots, generally over ten acres in size. In addition to this the Maryland Office of Planning has worked with each individual county and Maryland Property View to "ground truth" the results. Hoping to insure the best quality land use/land cover data. The 1997 updates for all Maryland jurisdictions were released in late 1998.

Direct comparisons of land use statistics for 1990 and preceding years with 1997 data were complicated by significant improvements to the 1997 GIS coverage. To resolve this problem, the improvements made to the 1997 data had to be incorporated into the 1990 data (Weller and Edwards, 2001) using Md Property View. The original 1973, 1981, and 1985 land use data were also reconciled with the 1997 land use.

25.3 New Product Specification: The I-Team recommends production of a 1:12,000 scale, Anderson Level II (modified) land cover and land use data theme with an update cycle of every three years. The classification scheme shall be adapted from the scheme currently used by the Maryland Department of Planning except as noted herein. A cross-walk table shall be devised to support the National Land Cover Database.

The minimum mapping unit shall be one acre, or smaller for obvious significant features. The current transportation features from the State Highway Administration shall be incorporated. Linear features greater than 20 feet in width shall be identified.

The Contractor shall intersect the land cover/land use classification file with the Department of Natural Resources existing 1:12,000 scale wetlands inventory and create new polygon boundaries. The newly created boundary file will be attributed with the existing three digit (OP) attribute, followed by a fourth digit using 0 for upland and 6 for wetland.

All work will be edge-matched throughout the project area and all gaps and overshoots will be eliminated. All polygons and linear features will be attributed with a four digit code. Work will be performed to meet national map accuracy standards at the compilation scale of 1:12,000.

25.4 Responsibility for Statewide Production or Acquisition: The Maryland Department of Planning should continue to be responsible for production of land use and land cover data. They have an existing network of planners who work with local government to ensure the data are accurate.

25.5 Cost and Procurement Options: Based on previous work completed by Towson University for the Department of Natural Resources, this work should cost approximately $50.00 per square mile or about $500,000.00 for the land area of the state.

25.6 Funding Options: The I-Team recommends allocation of approximately $170,000.00 per year to support land use and land cover mapping activities on an on-going basis.

26.0 Smart Growth Data Suite Profile

26.1 General Discussion: Eleven different map products were required to implement the various elements of Governor Parris N. Glendening's Smart Growth Program initiatives. Most of these products were created under "extreme" time schedules to avoid delaying implementation of the program elements.

26.2 Existing Product: The eleven existing map products in this suite are briefly described in this section. They represent a wide range of mapping protocols from many custodians.

26.2.1 HotSpot Community Initiative

Custodian: Department of Public Safety & Correctional Services
Division of Parole and Probation

Description: Thirty-five (35) Maryland communities receive state and federal grant funding through its Cabinet Council on Criminal and Juvenile Justice's HotSpot Communities Initiative, a statewide crime-reduction strategy that promotes locally based, comprehensive planning in high-crime at-risk neighborhoods. It is one of several statewide initiatives in the country that approach crime control and prevention with a focus on concerns and priorities at the community level and promote collaboration across criminal justice system components, community institutions, and state-level agencies. HotSpot Communities are based on strategies implemented by neighborhoods and nonprofit community advocate groups that had been successful in collaborating and involving key community leaders in solving problems in the community.

26.2.2 Home Loan Boundaries

Custodian:

Description:

26.2.3 Priority Funding Areas delineated as of 11/1/1999

Custodian: Maryland Department of Planning

Description: The 1997 Smart Growth Areas Act established certain areas as Priority Funding Areas determining the locations most suitable for State-funded projects. These areas are: municipalities, Baltimore City, areas inside the Baltimore and Washington Beltways, Revitalization Areas designated by the Maryland Department of Housing and Community Development (DHCD), Enterprise Zones, and Heritage Areas. This legislation allows Counties to designate additional areas as Priority Funding Areas if they meet specified requirements for use, water and sewer service, and residential density. Counties must provide maps and other information which show the precise location of their Priority Funding Areas based on criteria in the legislation. The Maryland Department of Planning is responsible for providing State agencies with maps that illustrate the Priority Funding Areas along with any comments by the Department of Planning on locally designated areas.

Areas eligible for county designation are:

- Areas with industrial zoning;
- Areas with employment as the principal use, which are provide with, or planned for, sewer service;

Residential areas which have an average density of 2 or more units per acre, are within designated growth areas, and are served by water or sewer systems, or
Rural Villages designated in the comprehensive plan before July 1, 1998.

Other areas within county-designated growth areas that:
Reflect a long-term policy for promoting an orderly expansion of growth and an efficient use of land and public services;
Are planned to be served by water and sewer systems, and
Have a permitted density of 3.5 or more units per acre for new residential development.

26.2.4 Main Street Maryland Downtown Revitalization Program
Custodian: Department of Housing and Community Development

Description: Main Street Maryland is a comprehensive downtown revitalization program created by the Maryland Department of Housing and Community Development. Its goal is to strengthen the economic potential of Maryland's traditional main streets and neighborhoods. Using a competitive process, Main Street Maryland will select communities that make a commitment to succeed, and will assist them in improving the economy, appearance and image of their traditional downtown business districts.

To accomplish these goals, the Department has partnered with the National Trust for Historic Preservation's National Main Street Center, which developed the Main Street Approach to downtown revitalization. Since 1977, the Main Street Approach has been implemented in over 1400 communities nationwide, resulting in net gains of 33,000 new businesses and 115,000 new jobs. Over seven billion dollars cumulatively reinvested in these communities has resulted in a reinvestment ratio of over $30 for every $1 used to support a local Main Street program. Currently, the communities selected are Cumberland, Easton, Mt. Rainier, Oakland, the Charles Village Community Benefits District in Baltimore City, Denton, and Westminster.

26.2.5 Live Near Your Work Program
Custodian: Department of Housing and Community Development

Description: The Live Near Your Work (LNYW) Program is a partnership between the Maryland Department of Housing and Community Development (DHCD), local governments, and Maryland's businesses and institutions to provide a cash incentive for employees to live near their work in targeted neighborhoods. Participating employees will receive a minimum $3,000 grant for costs associated with the purchase of their home.

26.2.6 Enterprise Zones
Custodian:: Maryland Department of Business & Economic Development
Maryland Department of Planning

Description: Enterprise Zones are designated areas in each Maryland County and Baltimore City for which special tax incentives are available to industrial and commercial businesses that hire additional full-time workers. Each jurisdiction provided either maps or digital files depicting the Enterprise Zones. The Maryland Department of Planning then created digital data using the property map data from MdProperty View.

26.2.7 Empowerment Zones

Custodian: Maryland Department of Planning
Baltimore City Department of Planning

Description: Empowerment zones are areas in Baltimore City which have received special designation by the U.S. Department of Housing and Urban Development.

26.2.8 Smart Growth Designated Neighborhoods

Custodian: Department of Housing & Community Development
Department of State Planning

Description: Designated Neighborhoods are existing mixed-use (residential and commercial) areas in need of social or physical revitalization which have been approved by the Secretary of the Department of Housing and Community Development (DHCD). The areas are first declared by the city, town, or county government. The local declarations are then submitted to the State for concurrence. If the submitted neighborhood is approved by the Secretary of DHCD, it is placed on a list of official Designated Neighborhoods and is made eligible for State targeted funding programs.

Although all incorporated cities and towns are Priority Funding Areas under the 1997 Smart Growth Initiative, this does not automatically qualify these jurisdictions as Designated Neighborhoods. Most often a Designated Neighborhood will be a small portion of a town, city, or county which is showing clear signs of distress. Jurisdictions are not limited to just one Designated Neighborhood if more than one is needed and can be justified.

26.2.9 Brownfields

Custodian: Department of Business and Economic Development

Description: Brownfields are abandoned or underutilized industrial or commercial sites, located primarily in urban areas, that are either contaminated or perceived to be contaminated. In order to encourage the cleanup and redevelopment of industrial and commercial properties in Maryland, the Voluntary Cleanup and Brownfields Revitalization Incentive Programs were established in February 1997 as part of Governor Glendening's Smart Growth policy. These programs are intended to promote economic development, especially in distressed urban areas, by creating new job opportunities, expanding the tax base, utilizing the existing infrastructure and preventing urban sprawl.

The Voluntary Cleanup Program (VCP), administered by the Maryland Department of the Environment, streamlines the environmental cleanup process for sites, usually industrial or commercial properties, that are contaminated, or perceived to be contaminated, by hazardous substances. Developers and lenders are provided with certain limitations on liability and participants in the program are provided certainty in the process by knowing exactly what will be required. The Brownfields Revitalization Incentive Program, managed by the Department of Business and Economic Development, provides economic incentives such as loans, grants, and property tax credits to clean up and develop certain properties.

26.2.10 Heritage Areas

Custodian: Maryland Department of Housing & Community Development/
Maryland Heritage Areas Authority

Description: House Bill 1, entitled "Heritage Preservation and Tourism Areas," passed both houses of the Maryland General Assembly on April 8, 1996 and was signed by Governor Glendening on May 23, 1996. This legislation created a new Maryland System of Heritage Areas which became effective on October 1, 1996. The intent of the program is to build upon Maryland's potential for "heritage tourism" which promotes historic preservation and areas of natural beauty to stimulate the creation of new businesses and generate sales, income, and
property tax revenues for the State and local jurisdictions. This program will be overseen by the Maryland Heritage Areas Authority, established as an independent government unit operating in the Department of Housing and Community Development.

26.2.11 Designated Rural Legacy Areas by Fiscal Year
Custodian: Department of Natural Resources/Chesapeake & Coastal Watershed Service

Description: In 1997, the Maryland General Assembly approved the Rural Legacy Program as a major component of Governor Glendening's Smart Growth and Neighborhood Conservation Initiative. The purpose of the Rural Legacy Program is to protect Maryland's best remaining rural landscapes and natural areas through the purchase of land or conservation easements. The Rural Legacy Initiative is a "bottom up" program that must be initiated or endorsed by the appropriate local governments. Often, local governments work in cooperation with land trusts and individual citizens to identify Rural Legacy Areas. Digital files representing the Rural Legacy application areas by Fiscal Year were compiled and prepared by the Maryland Department of Natural Resources, with assistance from the Maryland Department of Planning and many of the applicants. The scale of the source material varied, but the database is considered accurate at a scale of 1:24,000. These files are used to produce various maps used by the application review teams, the Rural Legacy Advisory Board, the Rural Legacy Board, the Board of Public Works, and for media events announcing the funded applications.

26.3 New Product Specification: The I-Team recommends production of an entirely new series of Smart Growth data products at 1:2,400 scale. A Regional Action Team will be assigned by MSGIC to work with the existing data custodians, the Office of Smart Growth and the National Center for Smart Growth Education and Research. The Team will determine the most appropriate specifications and attribution for the new product.

26.4 Responsibility for Statewide Production or Acquisition: The Regional Action Team will work with the Geospatial Data Partnership Office and custodial agencies to identify appropriate allocation of funds and responsibility for mapping each of these layers. In many cases these layers represent programmatic activities that require frequent updating and would, therefore, be most appropriately produced by those agencies.

26.5 Cost and Procurement Options: The I-Team estimates that approximately $350,000.00 per year will be required to support production and maintenance of the Smart Growth Data Suite.

26.6 Funding Options: The I-Team recommends allocation of approximately $350,000.00 per year to support these mapping activities on an on-going basis.

27.0 100-year Flood Plain Data Profile

27.1 General Discussion: Activities within the 100-year floodplain in Maryland are regulated by the Department of the Environment and local planning and zoning offices. The floodplain boundaries are defined by FEMA's (Federal Emergency Management Agency) paper maps that were widely produced in the 1970's. These maps utilized planimetric features such as roads and streams that were defined from the USGS quad maps. This base was adequate for FEMA's original nationwide mapping effort. However, over time, as road alignments changed and new roadways and developments were created, FEMA decided not to update or add these planimetric features unless they altered or impacted the floodplain elevations. Developers, regulators, and planners were left to wonder where the floodplain boundaries actually were located as the road network continued to change. Generally, a FEMA floodplain is modified when a new roadway or crossing is added that directly impacts the flood profile or elevations. This elevation change may or may not result in a paper map update. The paper map distribution is based on the amount of development in the area studied. Furthermore, these maps only indicate the floodplain depths at the time of the study (1970's). Development throughout the watersheds and grading is not computed and remapped on a regular basis unless the community notifies FEMA that significant changes have occurred and a new study is requested. FEMA then catalogs these requests and provides funding based on many factors and distributes monies when and if they are available. The result is a patchwork network of up to date maps that may not reflect consistent depths on opposite sides of the stream in separate adjoining jurisdictions.

27.2 Existing Product: The existing regulatory floodplain maps are produced and distributed by FEMA. Map scales vary based on community size and location and are produced at a higher scale (1:600 scale) in a few municipalities with high flood risks (Cumberland). In rural and less populated areas, these maps are produced at a smaller scale of 1:24000 (Countywide). Typically, the maps are produced at 1:7200 in many developed areas. Many communities have expressed a concern over FEMA's inability to keep up with development pressures in their areas, and have begun to study and remap floodplains themselves. FEMA has adopted a CTC (Cooperating Technical Community) Program to work with communities that wish to work ahead of the curve. The level of assistance from FEMA and the ability of the community to do their own work vary widely across the State. Studies usually start and stop at the community boundary, which adds to the patchwork network that the original paper maps created.

FEMA has produced a digital floodplain layer called a Q3 floodplain. This layer was produced by scanning the original paper maps and geo-referencing the data into a specific map projection. The data has been converted into a vector format and is suitable for planning purposes. FEMA's intent for this data was to create a process that could quickly convert the data into a digital format useful for large-scale emergency management operations in disaster areas. This data generally represents the location of the mapped 100-year floodplain, but it is not accurate enough to be used by local officials for flood insurance determinations. FEMA does not accept this product for any regulatory purposes and still uses the original paper maps as the official document.

FEMA has produced and distributes the Q3 floodplain data for Baltimore City and 18 Maryland Counties. The Maryland Emergency Management Agency and MDE have been working with FEMA to acquire funding to complete this layer statewide. By October the remaining 5 counties will be available in a Q3 format.

MDE is currently working with FEMA on a new regulatory digital map product in Saint Mary's County. The project will create over six miles of new flood studies, a countywide digital floodplain map (DFIRM) utilizing the county's existing 5- foot contours. Funding for this project was provided by FEMA through their CTC Program. Once completed, this product will enable MDE and the County to regulate the 100 year floodplain in Saint Mary's County on a digital (GIS) environment that can utilize other GIS layers, such as Orthophotos, to make more consistent planning and regulatory decisions.

27.3 Product Specifications: In order to remap the existing floodplain studies, new or up to date topography is a primary need. In County's where this is available, then the older paper maps can be converted into a digital product. Caution should be taken that this procedure does more than convert the existing paper elevations. If the Hydrology and Hydraulics that define the analysis are also updated then the product generated will be more useful. In addition, a more accurate analysis is also possible by obtaining a 0.6 meter DEM and integrating land-use, soils and curve number data to upgrade the Hydrology used in the study and more accurately map the floodplain elevations.

27.4 Responsibility for Statewide production or Acquisition: The regulatory authority for floodplain management is provided by the Department of the Environment through the State National Flood Insurance Program coordinator in the Technical and Regulatory Services Administration and the Waterway Construction Regulations in the Wetlands and Waterway Program of the Water Management Administration. These programs work closely with local planning and zoning offices to manage and coordinate floodplain activities statewide. Responsibility for statewide production of digital floodplain data should reside with MDE to ensure that the consistent framework with local officials is maintained and that the established Engineering Procedures are applied.

27.5 Cost and procurement Options: FEMA has recently begun a CTC program nationwide that provides limited funds for local States/Counties/Municipalities that have sought to improve their floodplain management and mapping programs. Using whatever resources the CTC partners have available, FEMA has supplemented the local programs to update flood maps. The DEM's and other digital data specified in the I-Team proposal are the types of data and support that FEMA is seeking from their laocal CTC partners, and should provide FEMA the incentive to provide additional funding to upgrade our floodplain maps. At this time the only Statewide CTC Partners with FEMA are North Carolina, New York, and Florida.

The cost to remap the existing studies on new or upgraded topography would be approximately $ 100,000 per County or $ 2,400,000 statewide when the topography already exists. If the topography were not available, then the cost of acquiring the data would have to be added. Estimates to recompute the flood elevations with new Hydrology and Hydraulics are approximately $ 200,000 per County or $ 4,800,000 when DEMS's are available.

MDE should be authorized to work with FEMA and the GDCO to obtain matching FEMA funding to update and modernize the state's floodplain maps.

28.0 SURGO Soil Map Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

29.0 Demographic Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

30.0 Communications Facilities and Infrastructure Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

31.0 Facilities and Infrastructure Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

32.0 Wildlife Habitat Area Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

33.0 Road Centerline/address Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

34.0 Electric Generation & Distribution Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

35.0 Oil Storage and Transportation Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

36.0 Natural Gas Storage and Transportation Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

37.0 Hazardous Materials Storage and Transportation Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

38.0 Banking and Financial Operations Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

39.0 Water Supply and Distribution Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

40.0 Government Facilities and Operations Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

41.0 Hospitals and Medical Facilities Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

42.0 Employment Information Data Profile (Vacant)

General Discussion:

Existing Product:

New Product Specification:

Responsibility for Statewide Production or Acquisition:

Cost and Procurement Options:

Funding Options:

Attachment A

Implementing a New Paradigm
An Outcome of OMB's Information Initiative
"Collecting Information in the Information Age"

BACKGROUND

Governments at all levels (federal, state, local, and tribal) manage complex natural and social environments. They build streets, schools and airports; protect public health and the environment; and provide for public safety and disaster relief. Legislative bodies, executive branch decision-makers, and private sector businesses require accurate information about the communities, people, businesses and habitats affecting and affected by their decisions. This information about buildings, forests, waterways, weather, crime patterns, disease outbreaks, and traffic patterns is spatial data.

Spatial data has long been part of government and business processes, but its value and ubiquity are only now becoming universally recognized because of new technology that can handle large volumes of data and interoperability standards. Approximately 80% of all data used in business and government has a locational component. Much of this information has been developed over the past 30 years to serve narrow parochial missions (such as repairing streets, assessing property taxes, or dispatching emergency services). Little of it is integrated and anchored to other Geospatial information. With the Internet's distributed architecture and the Web's browsing and display capability, users inside and outside of government are demanding increased data pooling and sharing, based on market-driven interoperability standards.

There are a vast number of applications for geospatial data that would help Government make better decisions, conduct better operations, provide better customer service, and be more accountable. Banks, utilities, insurance companies, police departments, and other public and private sector organizations increasingly find new uses for location-based services, remote sensing, GPS and other technologies to serve citizens and customers better.

The Federal Government has a lead role to play in coordinating the development, access and use of spatial information. This role requires Federal agencies to exercise leadership and co-operate with State, Local and Tribal authorities, the private sector, and academia to develop a coordinated "National Spatial Data Infrastructure" (NSDI). An NSDI integrated across jurisdictions can be a key component for enabling E-Government and E-Commerce to flourish.

Historically, government budget authorities treated spatial data and its supporting infrastructure as data processing expenses to be funded from current year operating budgets. However, as spatial applications began to extend into nearly every aspect of our lives, they began to cut across organization lines and exceed the capacities of single department missions and budgets. Like the national road system, each level of government has an appropriate role, as does the private sector. No one agency or level or government can or should build or fund its spatial data and decision support needs alone.

Spatial Infrastructure has become an essential part of the nation's capital infrastructure. Despite this fact, no widespread capital financing model for GIS has emerged. Spatial infrastructure, an intergovernmental capital asset, continues to be funded by "stovepiped" annual appropriations.

This mismatch between the need for long-term capital financing and the current reliance on annual appropriations remains one of the chief obstacles to the attainment of the NSDI.

Government entities at all levels, as well as private sector organizations, are making major investments in spatial data needed for operations. They fulfill governmental data mandates supporting essential public services and policy goals (such as clean air and water, efficient transportation, safe streets, emergency relief, and urban and rural sustainability). The costs of data stewardship for municipalities, water districts, and other local, state and tribal government organizations are significant. The challenge for all levels of government is to develop common criteria for spatial infrastructure investments, align annual public and private budget cycles more effectively, and pool and leverage spatial investments.

In addition, if spatial data is an important part of the nation's information infrastructure, it should be constructed, maintained, renewed, and budgeted for over its long-term life cycle as any other critical capital asset. Alternative financing mechanisms to the current annual appropriation "stovepipes" are needed.

A NEW PARADIGM EMERGES

We have an historic opportunity for all levels of government, and the private and nonprofit sectors to establish a new paradigm.

Partnerships among State, local, Tribal, and Federal authorities, and the private sector could help share costs by capturing economies of scale and aligning their pooled capital investments in standardized spatial data layers and content.

Mechanisms for allocating and sharing data collections and costs efficiently effectively and fairly would encourage data development and stewardship at the right place by the right organization.

All investors in spatial infrastructure should use common criteria when investing in spatial infrastructure. Criteria would include Federal and market standards for interoperability, data format, and metadata and content standards, along with principles for public access, data security, privacy and other goals affecting governmental and business data.

Creative financing outside of government appropriation cycles, such as infrastructure bonds or other financial products, could supplement and de-politicize the funding process, providing the liquidity to deploy and sustain shared spatial infrastructure.

In this paradigm, no Federal program or initiative needs to dictate policy to States, local, and tribal jurisdictions, or the private sector, for the NSDI to develop. Rather, all parties collaborate as partners in consortia operating in states, regions, industries or interest groups. This strategy implements the NSDI by aligning spatial infrastructure investments using common investment criteria.

IMPLEMENTING THE NEW PARADIGM

As part of OMB's Information Initiative "Collecting Information in the Information Age", OMB recently completed a series of public Roundtables exploring how to improve the quality of the

spatial data Government collects while minimizing the collection burden. Dialogue focused on the need to overcome the financial and institutional barriers to the sharing of spatial information among Federal, State, local, and tribal entities, and the private sector. In response to participants' recommendations, OMB (in cooperation with the Federal Geographic Data Committee (FGDC), National Performance Review (NPR), Council for Excellence in Government, Urban Logic, and other public and private sector stakeholders) has invited the spatial data community to begin several implementation actions.

Implementation Teams (I-Teams). I-Teams will organize institutions in their state or region to build statewide portions of the NSDI. Already, New Jersey, Kentucky, North Carolina, Oregon and Metropolitan New York City have committed to establish an I-Team. Each Team, aligning the needs and resources of its State, local, tribal, Federal, and private sector partners, will prepare a comprehensive plan for compiling, maintaining, and financing spatial infrastructure in its Team area. It will identify the needs and responsibilities of the partners, align and leverage resources, and establish detailed timetables and performance measures.

A Federal Partners Team. Consisting of senior officials of OMB, FGDC, USGS, NOS/NGS, Census, DOT, BLM, NRCS, and EPA, and other interested agencies. The Federal Partners Team will focus Federal agency efforts, respond to and coordinate with I-Teams, and explore new alternatives to develop needed standards.

A Financing Solutions Team (FSTeam). The FSTeam will identify and recommend inter-governmental and public-private financing alternatives to support the NSDI and the I-Teams.

A Technology Advisory Group (TAG). Open to all vendors and led by the Open GIS Consortium, TAG will be a resource for I-Teams. It will keep I-Teams and Federal Partners informed of technology innovations and be available to solve common technology challenges. By working with I-Teams to develop and test new products and solutions, TAG will accelerate dissemination of knowledge of the substance and process of building interoperable networks and open systems. TAG also will help the FSTeam use standards to develop strategies for procurement, budgeting and capital pooling.

The Financing Solutions Team

The FSTeam will act as investment advisors to the I-Teams and the Federal Partners. It will research and structure ways to improve how spatial infrastructure investments originate, perform and align.

Make A Business Case. The FSTeam will develop a business case, value proposition and financing options for the I-Teams and Federal Partners to use in preparing their working plans and budget proposals. It will help the geospatial community to explain to legislative bodies the benefits of aligning investments to achieve the NSDI.

Explore Better Use of Existing Appropriations Structure. Currently, almost all spatial information budget processing is annual. The FSTeam will explore better ways to fund spatial infrastructure investments by aligning and optimizing appropriations, budget, and procurement cycles at all levels of government, including interagency and cross-cutting mechanisms. It will

analyze cash flows and returns on investment, and compare costs and benefits. It will develop common investment criteria and explore ways to pool and leverage spatial investments.

Suggest New Funding Mechanisms. The FSTeam will use the cash flows, preliminary investment criteria and other results generated by its research and work to design sustainable capital financing options, such as infrastructure bonds or revolving funds. In the case of other national infrastructure and community development activities (such as roads, housing stock, airports, and small business development) the Federal government has used financial intermediaries (such as state bond banks, Fannie Mae, Community Development Corporations, and Small Business Investment Companies) to pool and administer local public and private resources through national investment criteria.

Electronic meeting support, knowledge management and other Web-based collaboration tools will be available to members of the FSTeam. This should minimize the need for face-to-face meetings, conserve the valuable time of its distinguished members, and begin the process of creating a public and private financing toolkit.

Legislation or executive guidance may be needed to authorize specific plan elements (for instance, public and private financial incentives that support the long-term sustainability and value proposition of the NSDI). In such cases, the FSTeam will provide the I-Teams and Federal Partners with suggestions for legislation, executive guidance and supporting documentation reflecting the knowledge of all Teams.

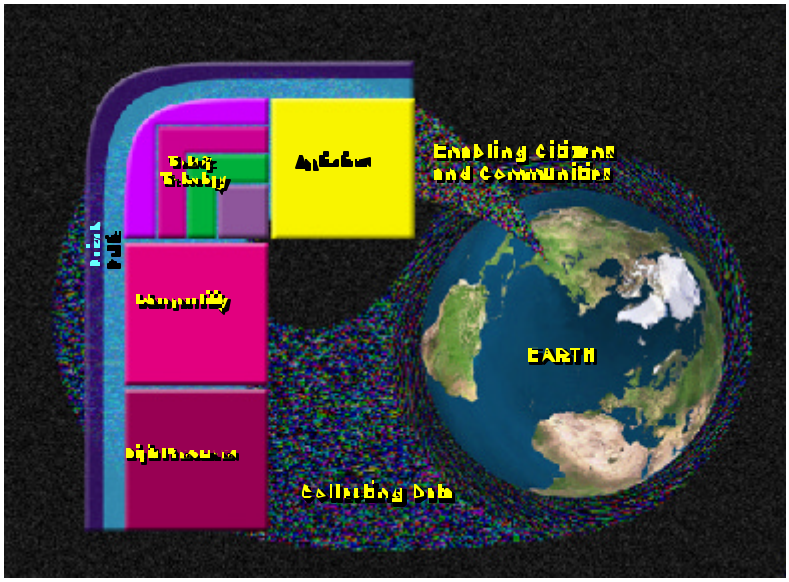
Attachment B

What is Digital Earth?
By the Digital Earth Office at NASA Goddard

Society has gathered an enormous amount of digital information about the Earth and its inhabitants. This digital information consists of everything from satellite photographs that detail cities and farm fields to databases containing information on transportation, commerce, population, crime, food production, history, and much more. The scale ranges from global to local--from humanity to the individual. This information that is stored around the world is not easily accessible or easily utilized in conjunction with other types of data.

Recognizing this challenge the *National Digital Earth Initiative* was created to enable and facilitate the evolution of Digital Earth, a digital representation of the planet that will allow people to explore and interact with vast amounts of natural and cultural information. Imagine a school child able to browse the planet, requesting information on land cover, distribution of planet and animal species, real-time weather, roads, political boundaries, and population. Imagine the quality of decisions that we could make as citizens, community leaders, business executives, and government leaders if we could seamlessly integrate information about our world from multiple sources.

Digital Earth is several things: a way to obtain information about the Earth; a framework in which to publish information; a new market for data, software and services; a set of standards; a local, national, and international collaboration; a near-term "alpha version"; technology challenges for the long-term vision. A primary goal of Digital Earth is to unlock the world's knowledge by simplifying access to georeferenced information, which is information that relates to a particular spot or area of the earth. The benefits will include reduced costs, a broadened range of users, enhanced merging of data from different sources, and improved decision-making by citizens, businesses and government.



Digital Earth provides an environment for everyone to access and employ the vast amounts of cultural and physical electronic data that exists about the Earth. This data resides in many Digital Resources around the world. An Interoperable environment is needed for Tools and Technologies to access and exploit these data archives. Tools and Technology range from generic items in the information technology marketplace to developments for specific Applications. Education, decision support, resource management, problem solving for citizens and communities are some of the many applications available through Digital Earth.

Digital Resources data, that constitute the raw materials of Digital Earth, are created and stored in many different ways. Large volumes of data are collected through various measurement methods at all geographic locations, e.g., direct measurements and remote sensing. Human activities and studies generate data with geographic components. Other data is the result of studies or activities that have an implied geographic relevance. This data includes natural and cultural themes, e.g., environmental, social, historical, government, economic, earth science, space science. All of this data is stored as a variety of Digital Resources.

Interoperability is the capacity to access multiple resources through common approaches to allow interaction of the wide variety of information technologies. Interoperability is defined in standards, through agreement on terminology; adoption of defined protocols, and through distributed services on the Internet. Interoperability allows simultaneous use of multiple geo-spatial data sets without needing to change the underlying digital resources. As users request data from multiple digital resources the interoperability is apparent as the responses from each of the various digital resources can be combined in a standard Web Browser. This allows a user to request land, water and political boundary data from different sources and overlay the data with geographic accuracy, producing a product specific to the user's application.

Tools & Technology are needed to allow users to enhance the data appropriately for their specific applications. Mature systems currently exist for management of the Digital Resources and to support the primary users of the data. The emphasis of Digital Earth is on the secondary users of the data, people who were not involved in the collection of the data, but can use the raw data for their particular purposes. Some of the tools and technologies to exploit the data exist today and others need to be developed. Standards and metadata for interoperability, Web Mapping, interactive 3-D visualization, storage and access of large multi-resolution datasets are some of the many tools and technologies.

Applications are where the value of Digital Earth is demonstrated. Imagine a social studies class learning about westward expansion across North America being able to access any relevant geo-spatial data and overlay that data to clearly visualize the topic. Another scenario might be a State Disaster Team response to an emergency in which they can access and utilize data showing the immediate area, the surrounding area, the weather and any other pertinent information. The public will determine the extent to which Digital Earth Applications develop.

Digital Earth is currently accessible to the end user, for general purposes, over the Web. In addition, high-performance access (for example, three-dimensional virtual reality displays) will be available at fixed installations in museums, libraries or educational institutions. Through Digital Earth, as with the World Wide Web, some information will be available with no charge and other data will have a fee. As a user of Digital Earth you will be able to rapidly find and retrieve relevant information through Catalogs, Portals and support services.

Once the desired information has been found, the user will be able to explore it by zooming in

from global to local views, roaming through space and time, and asking for additional information on particular features. Furthermore, it will be possible to overlay information from different sources to obtain knowledge and make decisions. Currently, web-based map services exist, but each one contains only some fraction of the total information available and each has a different user interface. Digital Earth will enable a network of data servers that use common protocols; as a result, the user will choose the interface that suits his or her needs and be able to obtain information from any server. As an analogy, consider the World Wide Web (WWW), which lets users choose the brand of web browser they prefer and to access text and multimedia content from any web site.

The Provider in a Digital Earth Environment enables you to publish information in an *open framework*. "Open" means that the standards for the framework are publicly available, defined and modified by consensus processes, and can be implemented without requiring a particular brand of software or hardware. Within that framework, you will be able to give away your information, or sell it, or restrict access as needed.

By participating in this framework, you will maximize the audience for your information because it is compatible with that of others. By analogy, nearly all businesses today offer enterprise information and service using the WWW framework rather than customized applications. This has reduced costs for businesses providing text-based information in the same way that Digital Earth will reduce the costs of providing geospatial information.

As a software or service provider, there will be a market for intermediary services or application-specific software atop this open framework. Examples include data server software allowing collections of data to be easily put on-line, conversion services that translate between formats and coordinate systems, and value-adding or aggregation services. The standards may be public, but there will be a market for commercial software with documentation and customer support. You will maximize the utility of your applications because they will be applicable to more than a single collection of data.

Within the US, relationships are being established between federal, state, local and tribal governments, between government and the commercial and academic sectors, and within agencies of government. Affiliations are being established internationally as well. The National Aeronautics and Space Administration (NASA) has been identified as the lead agency. *NASA's Digital Earth Office* performs secretariat functions for the national Digital Earth Initiative and aligns NASA's data and resources with the national initiative. Many US government agencies work together within the Digital Earth Steering Committee and the Interagency Digital Earth Workshop to determine the government's needs and positions.

The Digital Earth Initiative is establishing relationships with NSGIC and NACo to coordinate with relevant activities. The United Nations Environmental Program has been considering a Global Digital Earth (GDE) collaboration, and several other countries have Digital Earth activities, e.g., China, Canada, European Commission, and Israel.

In addressing the question what is Digital Earth we have touched on every aspect of the Digital Earth Program, including vision, environment, initiative, and involvement from many sources. The Digital Earth *Vision* is to provide Interoperability of geo-referenced digital resources. Digital Earth supports decision-making, geo-information management, increasing knowledge, and scientific discovery and dissemination to support a sustainable human world. Digital Earth is accomplished through a spirit of collaborations that enables involvement of the individual. Digital Earth

Environment is the technical, managerial, and application guidelines to facilitate a Digital Earth. The Digital Earth *Initiative* is a multi-agency collaboration that enables and facilitates the evolution of a Digital Earth. The initiative demonstrates implementation through public and private partnerships. Together with community, public, and private partnerships Digital Earth will facilitate an environment for anyone, anywhere to access and use geo-spatial data to its full potential.
For additional information see the national web page at *www.digitalearth.gov*

Attachment C

Annotated Code of Maryland
State Government Article
Sections 10-901 through 10-905, inclusive
Unofficial Version - Do Not Use for Legal Purposes

§ 10-901.

(a) In this subtitle the following words have the meanings indicated.

(b) "Cost of providing a system product" means the cost to create, develop, and reproduce the product in printed or hard copy form.

(c) "Cost of providing a system service" means the actual cost of providing the service, including a reasonable share of the overhead costs of the system.

(d) "Governmental unit" means:
(1) the State or a political subdivision, unit, or instrumentality of the State;
(2) a unit or instrumentality of a political subdivision of the State;
(3) a bicounty agency; or
(4) a combination of the entities specified in items (1) through (3) of this subsection.

(e) "Overhead costs of the system" includes the costs of:
(1) data gathering and entry;
(2) data base maintenance and update;
(3) hardware;
(4) quality control;
(5) software; and
(6) indirect costs.

(f) (1) "System" means an automated mapping-geographic information system in which geographically referenced data:
(i) are entered and stored electronically; and
(ii) can be manipulated to display selected geographic data.
(2) "System" includes data that define physical and nonphysical elements of geographically referenced areas.

(g) "System products" means drawings, lists, maps, narrative descriptions, photographs, or other hard copy formats that depict spatial data.

(h) "System services" means:
(1) electronic access to data in the system;
(2) on-line access to data in the system; and
(3) software programs to access data in the system.

§ 10-902.

The General Assembly finds that:

(1) automated mapping-geographic information system products and system services have value to the general public; and

(2) automated mapping-geographic information system services that are developed at public expense should not be unreasonably withheld from private commercial users of geographic information, but should not provide a public subsidy to private commercial users.

§ 10-903.

(a) This subtitle is applicable to a system established or maintained by any governmental unit.

(b) Except as otherwise provided in this subtitle, to the extent of any inconsistency, §§ 10-611 through 10-628 of this article do not apply to this subtitle.

§ 10-904.

(a) A governmental unit may adopt a fee structure for:

(1) system products that will:

(i) make system products available at a cost consistent with the requirements of this subtitle; and

(ii) cover the cost of providing system products; and

(2) system services that:

(i) will cover the cost of providing system services, including a reasonable share of the overhead costs of the system; and

(ii) will not discriminate among purchasers of system services.

(b) A governmental unit may sell system products to the general public for a fee that reasonably reflects the cost of creating, developing, and reproducing the product in whatever format is available.

(c) A governmental unit may sell system services to the general public, subject to subsection (d) of this section, for a fee that reflects the cost of providing the system services.

(d) A governmental unit:

(1) may reduce or waive the fees that it charges for system products and system services that are to be used for a public purpose; and

(2) shall apply its reduction or waiver of the fees uniformly among persons who are similarly situated.

§ 10-905.

(a) Only a person who has entered into a contract with a governmental unit may have on-line access to the geographic data in a system under the terms of the contract.

(b) If copy privileges are granted, the contract shall specify in addition to other conditions as may be required:

(1) the circumstances and conditions under which data can be copied; and

(2) the amount of compensation the governmental unit will receive for this privilege.

(c) On-line access:
(1) shall be limited to read; and
(2) may not include:
(i) the ability to enter, alter, or delete data; or
(ii) access to information that would be denied under §§ 10-615 through 10-619 of this article.

Attachment D
Standard Maryland Spatial Data License Agreement

[Insert Department Name Here]
[Insert Unit Name Here]
Spatial Data Order Form and License Agreement

THIS LICENSE AGREEMENT is made by the [Insert Department and Unit Name Here], hereinafter called Licensor, and the Purchaser of spatial data identified on page 1 of this License Agreement, hereinafter called Licensee.

Under State Government Article, Sections 10-901 et seq., of the Annotated Code of Maryland, Licensor is the owner and/or custodian of the geographic information system data listed on page 1 of this License Agreement, hereinafter called Spatial Data. Licensor may disclose and reproduce Spatial Data and charge fees for its products and services.

Licensee wants the non-exclusive right to use Licensor's Spatial Data.

IN CONSIDERATION of the mutual conditions in this License Agreement, Licensor and Licensee agree as follows:

1. SCOPE OF LICENSE

This is a License Agreement and not an agreement for sale. This License Agreement is between Licensee and Licensor, and it gives Licensee certain limited rights to use Licensor's Spatial Data. All rights not specifically granted in this License Agreement are reserved to Licensor. Licensor retains exclusive title and ownership of Spatial Data and, unless otherwise noted, of the component parts of Spatial Data, and hereby grants to Licensee a personal, nonexclusive, nontransferable license to use Spatial Data based on the terms and conditions of this License Agreement. From the date of receipt, Licensee agrees to use reasonable effort to protect Spatial Data from unauthorized use, reproduction, distribution or publication.

1.1 Data Medium and Format. Licensor shall furnish Spatial Data on the medium and in a form in use by Licensor, unless Licensor agrees, and Licensee pays in advance for conversion to another medium and/or form.

1.2 Restrictions of Use. Licensed Spatial Data are solely for the internal use of Licensee and not for use by any other person or entity, unless specifically stated under Purchaser Information on page 1 of this License Agreement.

1.3 Permitted Use.
a. Copies. Licensee may copy licensed Spatial Data only for use by Licensee or for backup purposes and not for use by any other person or entity. Licensed Spatial Data shall not be used by any other person for any other purpose. The licensed Spatial Data may be used on more than one computer system at any time, provided the systems are owned, leased or controlled by the Licensee.

b. Derived Products. Graphic displays and printed tabular listings derived from licensed Spatial Data may be used by Licensee in publications and presentations, provided that credit is given to Licensor as the custodian of Spatial Data as noted in the metadata citation and credit is also given to the original source of Spatial Data if other than the Licensor.

1.4 Prohibited Use.
a. Unauthorized Distribution. Any sale, distribution, loan or offering for use of licensed Spatial Data, in whole or in part, is prohibited without the expressed prior written approval of the Licensor.

b. Reproduction of Products. The reproduction of hardcopy products as provided by Licensor or derived from licensed Spatial Data with the intent to sell for a profit is prohibited without the expressed written consent of the Licensor.

2. FEES AND PAYMENTS

Licensee shall pay all License Fees before delivery of Spatial Data to Licensee by Licensor.

3. ASSIGNMENT

Licensee may not assign the License without the expressed prior written consent of Licensor. The permitted assignee shall have all rights and remedies of the original Licensee, insofar as the same are assignable. Assignment shall be only as a whole and not as a part.

4. INDEMNIFICATION

[For licenses with local government agencies, this paragraph applies] Except for damages directly attributable to the fault or negligence of Licensor, Licensee agrees to indemnify and hold Licensor and the State of Maryland, its officers, agents and employees harmless from and against any claims, liabilities, actions, costs or judgements arising out of Licensee's use of licensed Spatial Data, but only to the extent provided for in the Local Government Tort Claims Act, Title 5, Subtitle 4, Courts and Judicial Proceedings Article, Annotated Code of Maryland, or as provided for in any other judicially recognized sovereign immunity or limitation of liability in contract or in tort. This indemnification provision shall in no way be deemed a waiver of any rights and immunities Licensor or Licensee may otherwise have under State or federal law.

[For licenses with federal government agencies , this paragraph applies] Except for damages directly attributable to the fault or negligence of Licensor, Licensee agrees to indemnify and hold Licensor and the State of Maryland, its officers, agents and employees harmless from and against any claims, liabilities, actions, costs or judgements arising out of Licensee's use of licensed Spatial Data, but only to the extent to which the Licensee may be liable under federal law or as provided for in any other judicially recognized sovereign immunity or limitation of liability. This indemnification provision shall in no way be deemed a waiver of any rights and immunities that Licensor and Licensee may otherwise have under State or federal law.

[For licenses with all individuals and private organizations , this paragraph applies] Licensee shall hold Licensor and the State of Maryland, its officers, agents and employees harmless from any action, claim, suit, or proceeding arising out of the use of licensed Spatial Data in accordance with this License Agreement.

5. WARRANTIES AND LIABILITIES

Neither Licensor, nor the owner of licensed Spatial Data makes any warranty, expressed or implied, as to the use or appropriateness of licensed Spatial Data, and there are no warranties of merchantability or fitness for a particular purpose or use. The information contained in licensed Spatial Data is from publicly available sources, but no representation is made as to the accuracy or completeness of licensed Spatial Data. Licensor may not be subject to liability for human error, error due to software conversion, defect, or failure of machines, or any material used in the connection with the machines, including tapes, disks, punch card and energy. Licensor shall not be liable for any lost profits, consequential damages, or claims against Licensee by third parties. The liability of Licensor for damage regardless of the form of the action, shall not exceed the license fee paid for licensed Spatial Data.

6. TERMINATION

6.1 Causes for Termination. Licensor shall have the right to terminate this License Agreement if: a) Licensee attempts to assign its rights without the expressed prior written consent of Licensor; b) Licensee delivers or attempts to deliver the licensed data to another person without the prior written consent of the Licensor; or c) Licensee fails to perform any other of Licensee's obligations under this License Agreement.

6.2 Licensee's Obligations Upon Termination. Upon Termination by Licensor, Licensee shall a) fulfill its obligation to pay any fees required, b) erase all Spatial Data subject to this License Agreement from Licensee's permanent storage devices and archival media, and c) return all licensed Spatial Data subject to this License Agreement in Licensee's possession.

7. REMEDIES

In the event of a breach or threatened breach of any of the provisions of this License Agreement by Licensee or any employee, representative, or agent of Licensee, Licensor shall be entitled to preliminary and permanent injunctive relief to enforce the provisions hereof, but nothing shall preclude Licensor from pursuing any action or other remedy, including damages for any breach or threatened breach of this License Agreement, all of which shall be cumulative.

8. MERGER

8.1 Acknowledgment. Licensee acknowledges that Licensee has read this License Agreement and agrees to be bound by its terms, and further agrees that it is the complete and exclusive statement of the License Agreement between the parties and supersedes any oral or written communications or representations outside this written License Agreement.

8.2 Authority. The person whose signature appears as or for Licensee on page 1of this License Agreement represents that they are authorized to do so and represents that this License Agreement is a legal, valid, and binding obligation and enforceable in accordance with its terms.

9. ADDITIONAL PROVISIONS

9.1 Laws of the State of Maryland. This License Agreement shall be governed by the laws of the State of Maryland, and the parties subject to the jurisdiction of the courts of the State of Maryland.

9.2 Amendment; Waiver. This License Agreement may not be amended, except in writing signed by the parties. Waiver of any breach of the terms and conditions in this License Agreement shall not be deemed to constitute a waiver of any other or future breach.

10. SPECIFIC MODIFICATIONS (To be completed by Licensor if applicable)

_____Check here if additional specific modifications apply to this License Agreement. The following specific modifications are expressly incorporated into this License Agreement.

Name of Attachment: _____

Number of pages _____ that are incorporated.

Licensor Signature:_____

Date:_____

Attachment E
Smart Growth Data Factory Fact Sheet

A Six Point Plan To Make Smart Growth Smarter

The Smart Growth Data Factory

Smart Growth and Information Technology

Technology is the engine that drives Smart Growth. It allowed Maryland agencies to rapidly implement the individual program components, including Priority Funding Areas, Rural Legacy and GreenPrint. But if Maryland is to continue to set the Smart Growth pace nationally, and make sound growth management decisions, the information that underpins the Smart Growth decision-making process cannot be allowed to stagnate.

There are three serious problems that threaten effective Smart Growth decision-making:

The existing Smart Growth databases are becoming obsolete and will not meet future needs.

Data management policies currently hinder intergovernmental coordination.

Databases do not meet the requirements of all users.

The proposed **Smart Growth Data Factory** provides a great opportunity to build effective partnerships that will ***reduce the cost*** of data production for all agencies and ensure that technology keeps pace with needs. This proposed act will greatly enhance the effectiveness of Smart Growth in Maryland now, and in the future.

Who proposed this Plan?

The Maryland State Geographic Information Committee (MSGIC) proposed this plan: MSGIC represents all users of Geospatial data in the State, including all levels of government, education, the private sector and the general public. It created a 65-member Implementation Team in October 2000 to develop a plan for coordinated statewide data production. That plan was approved by the full MSGIC membership on July 25, 2001.

What is in the Plan?

A larger scale mapping standard and short term data improvements: MSGIC recommends that a statewide, consistent, large scale (1" = 200') digital mapping program be adopted to meet the long term needs of most government agencies and the private sector. Existing Smart Growth data will be immediately improved to offer short term fixes

for improved management and tracking of Smart Growth initiatives.

A new Geospatial Data Partnership Office (GDPO) will be established: Staffed with 12 people and located in either the Department of Budget and Management's Information Technology Office, the Office of Smart Growth, or the University of Maryland's Center for Smart Growth Education and Research. The new GDPO will have a budget of $1 million per year (General Funds) for labor and operating expenses.

A budget adequate to meet Smart Growth Data needs: A contractual services budget of $6 million per year (Capital Funds) for creation of Geospatial data, map products and quality control activities.

New partnerships to leverage funding: The GDPO will actively "broker" partnerships between federal, state and local agencies, the private sector and public utilities. The partnerships will "leverage" the contractual services budget to between $10 and $12 million per year.

Comprehensive statewide standards and effective quality control: Contract and quality control specifications for each data layer will be developed by multi-agency teams that will ensure compliance with appropriate data standards, best practices employed by private industry, and continuity with surrounding states.

Oversight and open participation: An Oversight Board will review the work of the GDPO to ensure that they are complying with the direction provided by the I-Team, in order to represent the interests of all user sectors.

Why do we need this?

Lack of statewide standards hinders good decision-making and effective communications: This initiative will bring local, state and federal agencies together with the private sector and public utilities to establish common database holdings. We work in the information age where data are considered the fundamental building blocks of government's foundation and infrastructure. We should **all** be building the same foundation.

The technology is not keeping pace with needs: Maryland has significant geographic databases that support many of its current missions. We have not planned or budgeted for the extremely detailed requirements of some current programs or future programs that will have larger scale requirements. Managers are now asking for information that is far in excess of our current capabilities. They are disappointed by the lack of precision that is currently available. This gap will continue to worsen until existing data are considered obsolete.

Penny-wise and pound-foolish policies inhibit good decision-making: Current policies dictate ownership and cost recovery mechanisms that interfere with effective governance. For the sake of recovering a few hundred thousand dollars per year within State agencies, we pass up opportunities to achieve positive economic returns of 4:1 (benefit/cost). The benefits are measured in government efficiency, cost-sharing and the positive impacts of tax revenues and business development that can be realized from new data distribution and ownership models. We expect that implementation of the I-Team plan will result in a return of up to $41 million dollars for the State's investment of $7 million per year (including partnership matching costs).

The playing field isn't level: The I-Team Plan will "level the playing field" and allow all governmental units in Maryland to have access to the same high quality data. There will not be "haves and have-nots" or agencies that are too poor to afford the data required to perform their missions.

What's in it for my agency?

New capabilities that can't be achieved without this program.

Free and immediate access to a statewide database exceeding 40 layers of information at scales that will support management needs over the next two decades.

The ability to set data production priorities by bringing your agency's partnership funds "to the table."

The ability to comply with new federal programs like the Government Accounting Standards Board Bulletin 34 and the National Pollution Discharge Elimination System - Phase 2 without having to make significant investments in data to support the increasing number of reporting requirements.

Access to data that is subjected to rigorous quality control standards and designed to meet your needs.

An experienced production staff that can respond to data required by new legislation, federal grants and private partnership opportunities. The GDPO will be expert at quickly producing Geospatial data through the new Technology Services Procurement mechanisms that are already in place.

A potential reduction in work load for those agencies currently producing Geospatial data. This will allow existing personnel to perform much-needed service work for their respective agencies.

Support for the mission of your agency through E-Government mechanisms that are becoming increasingly dependant on Geospatial technologies.

What will it cost my agency?

Nothing, unless a negative mechanism (e.g. fees, assessments or redirection of funds) is employed to fund the Data Factory initiatives.

Is the Smart Growth Data Factory Plan (I-Team) Complete?

No, it shouldn't ever be complete: The I-Team Plan is a living document that will continuously be upgraded to reflect new information and to provide more detailed guidance as required. As approved on July 25, 2001, it establishes a vision for the State of Maryland and its jurisdictions to become leaders in providing Smart Growth planning and E-Government services for its citizens.

Attachment F
GIS Data Improvement Proposal
Response to the Smart Growth Sub-Cabinet
October 15, 2001

I. Introduction

The Maryland State Geographic Information Committee (MSGIC) "Data Factory" proposal was presented to the Smart Growth Sub-Cabinet on September 14, 2001. The proposal recommended $1,000,000.00 for 12 new positions and a $6,000,000.00 contractual services budget to create new GIS data products for statewide use. While the Sub-Cabinet agreed that State and local governments need improved GIS data resources to continue implementation of the Smart Growth program, it directed staff (list attached) to report back with effective options that were lower cost than the original proposal. This proposal responds to that request and is based on an interdepartmental meeting held at the Maryland Department of Planning on September 26, 2001.

II. Key Components

A. **Funding for Data** - A lower cost is outlined below. It will require $2.1 million per year vs. the $7.0 million per year in the original MSGIC proposal. This amount is further reduced in the first year to $1.75 million due to time sequencing issues.

B. **Coordination & Strategic Planning** - In addition to recommendations about specific data improvements, this document also outlines overarching coordination, strategic planning, staffing, and reporting recommendations.

III. Data Improvements

The workgroup recommends the following key data improvements. Essentially, they are scaled-down versions of the MSGIC Data Factory proposal. The attached table outlines the costs and options associated with these items.

A. **Aerial Photography** - Aerial photographic maps (orthophotos) are an important base layer that many other data are linked to and created from. They are used to map features of interest and determine changes in land use over time. Orthophoto maps are created at various scales that have different accuracy requirements and costs. The workgroup proposes that two map scales be used for the new orthophotography to reduce the overall costs. Products will be produced at 1:2400 scale (1" = 200') for the more urban portions (PFA's) of the State and 1:4800 scale (1" = 400') for the more rural areas. This compares to the existing imagery that is collected at 1:12000 scale (1" = 1,000') and will result in imagery that is between 4 and 9 times more detailed to allow more precise mapping of ground features. As with past orthophoto projects, DNR will manage the production of a standardized program on behalf of the State in coordination with other federal, State and local government agencies. Local jurisdictions have indicated that they will provide other data in exchange for a suitable orthophoto map series.

B. **Road Centerlines with Address Ranges** – New road centerline data will be developed using the statewide aerial photographs and data gathered from local jurisdictions. This will give Maryland an accurate, up to date, and consistent look at its

roadway transportation infrastructure across the state. These centerline data will be attributed with the route numbers, road names, highway reference locators and address ranges from a combination of sources, including the State Highway Administration, U.S. Census Bureau, and Local Governments. The State and local governments have critical interests in these data for the following reasons:

- Routine operations, including reporting and analysis of highway incident management, infrastructure maintenance and asset management.
- Conducting future Census surveys so they are more accurate and less expensive.
- "Geo-coding" addresses in administrative records for Smart Growth, public safety, juvenile services, human resources, health and 911 applications.
- Improving the accuracy of the Priority Funding Area data.

The State Highway Administration can best interface between the Census Bureau, State agencies, and local governments to keep this file up-to-date. They will receive data from certain counties to support this effort and they will use data obtained during production of orthophotography to complete the state. This will be a new and expanded role for SHA that they have agreed to perform with the requested funding.

C. <u>Assessment Database Improvements</u> - The Department of Assessments and Taxation (SDAT) maintains the Assessment Database for the over 2 million parcels of land in Maryland. This database is the foundation of MDP's digital property mapping and parcel referencing system that is called MdProperty View. Some of the key fields in the database are not fully maintained or kept up to date. Examples include parcel acreage, year built for improvements (particularly non-residential), premise address, zoning, water and sewer indicators and assessed value by land use type for mixed use improvements. Some of these fields are neglected, because of limited staffing while others do not directly affect the ability to assess real property and would require additional staffing and/or coordination with local government to complete and maintain. All of these fields are important for Smart Growth data purposes. SDAT has agreed to implement strategies to update these fields if they are funded for the data improvement efforts.

D. <u>Employment Database Improvements</u> - Historically accurate employment data (i.e. jobs by type of industry and place of work) have not been available in formats that support mapping by location for analysis by geographic information systems. The Department of Business and Economic Development (DBED) and the Department of Labor, Licensing & Regulation (DLLR) have been identified as the appropriate agencies to develop and maintain an Employer/Employee GIS file based on data maintained by DLLR and other public and private sources. This effort requires a high quality road centerline and premise address file like the one to be produced and maintained by the State Highway Administration. DBED has agreed to then create an address geo-coded data layer of establishment information that would include the following attribute data:

- Name of Company or Employer
- Premise (Street) Address (suitable for geo-coding, including City, State, Zip)

- Establishment ID # (unique identifier as created by DLLR)
- Employer ID# (i.e. for multiple locations - e.g. Giant Food)
- Public / Private / Non-profit
- Product or Service (description)
- SIC (Standard Industrial Code)
- NAICS (North American Industry Classification System)
- Employment (number of employees)
- Date Established

E. **Priority Funding Area and Land Use Improvements** - Priority Funding Areas (PFAs) were established in the 1997 Smart Growth Act. Currently they are a collection of mapped areas from several State agencies and local governments. MDP receives, creates, compiles, reviews, and distributes these maps and data. Given the variable sources of data and the need to overlay PFA maps with many other types of maps, MDP needs resources to update, distribute, and rectify this information based on the improved orthophoto and road centerline data.

Similarly MDP maintains other data layers such as Land Use and Land Cover to support Smart Growth and land use change detection. Procedures for updating and enhancing this layer must begin with the improved orthophoto and road centerline maps. Improving these and related Smart Growth layers (e.g. zoning, water and sewer plans, protected lands) becomes more important as other GIS data becomes more accurate and local governments update their layers in support of Smart Growth. In addition, as the implementation of Smart Growth continues, the need for related applications, analysis, and information distribution increases.

IV. Coordination and Strategic Planning

A. **Smart Growth Data Workgroup** - We recommend that each of the agencies represented on the Sub-Cabinet appoint a staff member to serve on a Smart Growth Data Workgroup that will work with MSGIC and DBM representatives on the following:

1. *Develop an Annual Smart Growth GIS and Data Strategic Plan* - This plan will outline key Smart Growth GIS and data resource needs that the workgroup agrees are priorities. It will be an overarching plan for GIS map and data improvements with an annual and projected budget. This document represents the first such plan. Each year the workgroup will present the plan to the Sub-Cabinet for their review and comment. The annual plan will be implemented with the Sub-Cabinet and DBM's concurrence. Agencies responsible for implementing the identified components will develop a work program and schedule consistent with budgeted funds. The workgroup will provide the Sub-Cabinet with periodic progress reports on the plan's implementation and related budget issues.

2. *Coordination* - The workgroup will coordinate among State agencies and with MSGIC. It will address issues such as data standards, scale, data priorities, data sharing and distribution, and developing partnerships with the private sector.

B. <u>Staff Needs</u> - To help insure that these activities occur as outlined, we recommend that two new staff positions be created to work with the workgroup and coordinate implementation of this overarching plan for GIS and Smart Growth data improvements. One position could serve as the State's Geographic Data Coordinator and the other position would serve as an assistant to this person. We see these staff positions as part of a longer-term effort and not essential to the first year activities. Therefore, we did not include cost estimates for this part of the proposal. If these positions are created, the Smart Growth Data Workgroup will suggest a job description and assist in the interviews.

V. Conclusion - It is important that we dedicate appropriate resources for Smart Growth GIS and data improvements to aid in identifying strategies, implementing programs, tracking progress and measuring performance. In addition, these data improvements are also important for many related programs other than those directly associated with Smart Growth.

TABLE ONE – DATA OPTIONS

Options	Components	Additional Annual Cost
1 - Status Quo	Individual agencies maintain their efforts working at varied scales.	NONE
2 - Multi-Scale Program **Annual Costs** Map 50% of the State at 1:2400 scale and 50% at 1:4800 scale with a 3-year repeat cycle (See attached map for areas to be mapped at each scale) **First Year Costs** (Aerial photography can not be flown until March through April of 2003. Only photography, ground control, and math solutions can be accomplished < FY 2004.	a. New orthophoto map base b. New road centerline file with address range c. Assessment database improvements d. Employment database improvements e. PFA and land use data improvements **First Year Activities** a. New orthophoto map base b. New road centerline file with address range c. Assessment database improvements d. Employment database improvements e. PFA and land use data improvements	$ 900,000.00 $ 600,000.00 $ 300,000.00 $ 150,000.00 $ 150,000.00 **Total $2,100,000.00** **First Year** $ 650,000.00 $ 500,000.00 $ 300,000.00 $ 150,000.00 $ 150,000.00 **Total $1,750,000.00**
3. Features in addition to Option 2 that require a one-time cost that will be spread over three years	a. Add vector conversion of parcel boundaries for 1:4800 scale map sheets b. Add LIDAR statewide Digital Elevation Model	(Add to Option 2) $ 400,000.00 (Add to Option 2) $2,000,000.00

(NOTE: Although these are one-time costs, some annual maintenance and updates will be required)		
4. Original Smart Growth Data Factory Plan (NOTE: The Data Factory was based on a 4-year repeat cycle)	a. Elevation Model and Orthophoto Maps b. Political Boundaries c. Streams and Rivers d. Transportation Features, Road Centerline and Address Ranges e. Parcel Map Conversion f. Land Use and Land Cover g. Smart Growth Package h. Local Master Plans with Water & Sewer and Zoning i. 100-year floodplain j. Agriculture, Environment & Natural Resources Related Data k. Historic and Archeological Data	$2,000,000.00 $ 200,000.00 $ 150,000.00 $ 750,000.00 $1,000,000.00 $ 170,000.00 $ 350,000.00 $ 500,000.00 $ 300,000.00 $ 480,000.00 $ 100,000.00 Total $6,000,000.00

Smart Growth Data Interagency Staff Workgroup

Mike Lettre	Department of Planning
Rich Hall	Department of Planning
R.C. Bates	Department of Assessments and Taxation
Jason Mielke	Department of Business and Economic Development
William Walsek	Department of Transportation, SHA
Jack Martin	Department of Transportation, SHA
Ken Miller	Department of Natural Resources
Bill Burgess	Department of Natural Resources
Tom Downs	National Center for Smart Growth

Attachment G

FGDC Homeland Security Briefing Document

HOMELAND SECURITY AND
GEOGRAPHIC INFORMATION SYSTEMS

How GIS and mapping technology can save lives and protect property in post-September 11th America

Introduction

Timely, accurate information, easily accessed and capable of being shared across federal, state, and local political jurisdictions is fundamental to the decision making capability of those tasked with the homeland security mission. But without the real-time ability to quickly visualize activity patterns, map locations, and understand the multi-layered geospatial context of emergency situations, homeland security will not be achieved.

The current state of geospatial information technology can provide decision-makers the data they need to confidently confront a wide variety of threats including natural disasters, terrorist attacks, sabotage, and similar crises. However, the current *implementation* of that technology, across all the federal, state, and local agencies and jurisdictions necessary to fully coordinate an effective response, is seriously lacking in specific areas.

As the concept of Homeland Security becomes infused into the work-a-day pattern of government and the everyday life of our citizens, decision makers will greatly profit from the crisis management "edge" that GIS provides. Homeland Security leaders should understand and implement the policy changes necessary to fully realize this technology's capability, and make the management decisions necessary to implement it on a national basis.

Background

As never before, in the aftermath of the terrorist attacks of September 11, it has become clear that in emergency situations of whatever origin our Nation is dependent on rapid access to and application of many types of current, accurate geospatial information. Critical information such as:

- Facilities and operations susceptible to attack.
- Critical infrastructure, including telecommunications; electrical power systems; gas and oil production, storage and distribution; banking and finance; water supply systems; emergency services.
- Accurate employment data tied to specific locations.
- Detailed and current "framework" data, including orthophotography, transportation, elevation, political boundaries, property ownership, hydrography and geodetic control.

Powerful geographic information systems are now available that quickly render one to several layers of digital geospatial data into map-like products. These systems can facilitate near-real time performance of a wide range of relevant geospatial analyses. These systems can be used to access and process digital geospatial data virtually anywhere because it, unlike

analog data, can be instantly transmitted from wherever it's maintained and stored to any place where its needed.

These characteristics make geographic information technologies, combined with appropriate sets of geospatial information, an invaluable tool for the handling, display, and analysis of information involved in every aspect of Homeland Security. For example:

Detection: Geospatial information provides the spatial and temporal backdrop upon which effective and efficient threat analysis is accomplished. By linking and analyzing temporally and spatially associated information in real time, patterns may be detected that lead to timely identification of likely modalities and targets.

Preparedness: Emergency planners and responders must often depend on geospatial information to accomplish their mission. Current, accurate information that is readily available is crucial to ensuring the readiness of teams to respond. Geospatial information access and interoperability standards are essential elements as they support the means for the Nation's response units to react to terrorist attacks, natural disasters, and other emergencies.

Prevention: Geospatial information provides a means to detect and analyze patterns regarding terrorist threats and possible attacks. This information, coupled with information about borders, waters, and airspace, in turn may lead to the disruption of their plans or the prevention or interdiction of their attacks.

Protection: Geospatial information is a very important component in the analysis of critical infrastructure vulnerabilities and in the use of decision support technologies such as visualization and simulation to anticipate and protect against cascading effects of an attack on one system as it relates to other interdependent systems.

Response and Recovery: Geospatial information has been used by many organizations in response to and recovery from natural disasters. Similarly, this information is invaluable for emergency response services of all kinds, as well as for carrying out long-term recovery operations. The Federal Response Plan, developed by 26 federal agencies and the Red Cross, identifies overall responsibilities and the concept of operations for presidential declared disasters. A number of emergency support functions are identified, with the Federal Emergency Management Agency (FEMA) having the lead for coordinating response to natural disasters and the federal wildland agencies responsible for coordinating response to wildland fires.

Current Status

Accurate and comprehensive data are the heart of information technology, and **geographic location is a key feature of 80-90% of all government data**. It is critical that as a Nation we take the steps necessary to assure that strategic information assets relative to Homeland Security -- particularly geospatial information assets -- are created, are maintained for currency and accuracy, are readily available to those who need them, and are interoperable. Although Homeland Security requires much of the same basic real-time spatial information needed for other uses and

applications, we know from recent events that it must be immediately and comprehensively available.

In short, we need to assure:

Implementation of a comprehensive national spatial data infrastructure,
Interoperability of the systems that process this information, and
Commonality of the processes that collect, manage, and disseminate geospatial information.

Fortunately the Nation already has a well-founded interagency effort under way to build such a National Spatial Data Infrastructure (NSDI) under the auspices of the Federal Geographic Data Committee (FGDC) which is chartered by the Office of Management and Budget. The NSDI provides crosscutting mechanisms for organizations of many types, affiliations, and responsibilities to be able to collaborate in assuring that geospatial data and systems are in-place, ready for use. The data, technology, and associated intergovernmental and government-private mechanisms forged in this effort will be invaluable to intelligence, law enforcement, and other national security-related elements, as well as to local communities, in dealing with terrorism and other major threats to public safety and welfare.

In collaboration with all levels of government, industry, and academia, the FGDC and its member federal agencies have in-place a wide variety of effective organizational relationships and processes that could readily be used and expanded upon as needed -- given appropriate sanction and backing -- to produce a nationally consistent framework of Homeland Security-related base data characterized by common data content standards and supported by interoperable technologies. Several examples already exist of how this process works well:

The coordinated application and use of geospatial data in New York City in response and recovery to the World Trade Center attack.
Development of geospatial data as a foundation for critical infrastructure protection and emergency preparedness/response in the greater Chicago area.
The use of geospatial information in wildfire suppression through the coordinated work of the Geospatial Multi-Agency Coordinating Group

However, at present there are gaps that should be filled to achieve assurance of data and technology accessibility and interoperability. Examples are:

<u>National data standards</u> still need to be developed for a number of framework and other data themes to provide data that is immediately useful in Homeland Security events.
<u>NSDI Framework Themes</u> are not yet complete.
<u>E911 capabilities</u> are limited by the lack of consistent, standardized road data across the Nation, preventing true interoperability between all levels of government.
<u>Current and accurate information about the Nation's critical infrastructure</u> is not consistently available or shareable among relevant agencies, leaving the Nation unable to effectively plan for modern terrorist activities.

The FGDC believes it is imperative that the Nation accelerate implementation of the NSDI. As we move forward to improve and support planning and management activities, the contribution of

geospatial information and technologies in support of critical decision-making should be fully utilized. The NSDI has already established certain standards, processes, and relationships that serve to advance Homeland Security including:

Well established relationships with Federal, State, Local and Tribal governments and ongoing coordination mechanisms such as I-Teams, an initiative to collect basic framework data collaboratively among all levels of government.
A multi-node geospatial information Clearinghouse Network that can be extended to promote rapid discovery, sharing, and protection of critical geospatial information.
Access to industry and international standards bodies and programs to advance standards that promote data consistency and interoperability of spatial technologies.

Recommendations

It is our opinion that more needs to be done to fully realize the potential this technology brings to decision making. To that end, we recommend that the Office of Homeland Security consider the following recommendations:

Address the gaps outlined above by supporting:
- National data standards
- Completion of all NSDI Framework Themes
- Nationwide geospatial data compatibility for E911 operations
- Compilation of comprehensive georeferenced information on Critical Infrastructure

Bring additional focus on these activities to elected officials at all levels of government across the Nation.

Promote, enhance, and provide sufficient resources for collaborative relationships between federal, state and local agencies and with the private sector.

Develop uniform approaches to planning for Homeland Security events while relying on standardized data and systems.

Develop sophisticated mobile GIS labs and trained staff that can be delivered to any site in the Nation within 12 hours of an event.

For more Information Contact:

Federal Geographic Data Committee
Reston, VA 20192
www.fgdc.gov
Phone 703-648-5752

Attachment H
The National Map

(Exact Text of http://nationalmap.usgs.gov/nmabout.html on 12/26/01)

The Nation Needs *The National Map*

Governments depend on a common set of base information that describes the Earth's surface and locates features. They use this information as a tool for economic and community development, land and natural resource management, and health and safety services. Federal functions ranging from emergency management and defense to environmental protection rely on this information. Private industry, nongovernmental organizations, and individual citizens also use the same geographic data. Geographic information underpins an increasingly large part of the Nation's economy.

USGS Role

The most widely known form of geographic base information for the United States is the USGS primary series topographic map. The USGS has produced more than 55,000 unique map sheets and approximately 220,000 digital orthorectified aerial images to cover the Nation. These maps and images are a national treasure, but the average primary series topographic map is 23 years old. Frequent changes on the landscape mean that many of these maps are no longer accurate and complete. The USGS is committed to organizing and leading cooperative activities to ensure that current geographic base information is readily available and useful.

A New Vision

The National Map will provide data about the United States and its territories that other agencies can extend, enhance, and reference as they concentrate on maintaining other data that are unique to their needs. *The National Map* will promote cost effectiveness by minimizing the need to find, develop, integrate, and maintain geographic base data each time they are needed.

Under USGS leadership, *The National Map* will provide data and operational capabilities that include the following:

- High-resolution digital orthorectified imagery that will provide some of the feature information content now symbolized on topographic maps.
- High-resolution surface elevation data including bathymetry to derive contours for primary series topographic maps and to support production of accurate orthorectified imagery.
- Vector feature data for hydrography, transportation (roads, railways, and waterways), structures, government unit boundaries, and publicly owned lands boundaries.
- Geographic names for physical and cultural features to support the U.S. Board on Geographic Names and other names such as for highways and streets.
- Land cover data that classify the land surface into categories such as open water and high-density residential.

Changes affecting *The National Map* will be captured in near real time, rather than through cyclical inspection and revision. Currentness will be measured in days and months.

Data will be seamless and consistently classified, enabling users to extract information for irregular geographic areas, such as counties or drainage basins, and to spatially analyze the information. Data resolution and completeness will vary depending on geographic area and need. For example, *The National Map* will contain higher resolution elevation data in areas of subtle relief variation, such as river flood plains, to support hydrographic modeling.

Positional accuracy will be sufficient to vertically and logically align features from different data themes. Thus, river course will correspond to land surface slope, and boundaries will align with corresponding features, such as roads or rivers. *The National Map* will contain data for many areas that surpass the standards that have been applicable to primary series topographic maps.

All content of *The National Map* will be documented by metadata that comply with Federal Geographic Data Committee standards.

Building, Maintenance, and Operations

The initial version of *The National Map* will be based primarily on existing available data. As the initial version is improved, emphasis will shift to maintaining data currentness through continuous updating. Potential data sources include State and local governments, private industry, and local trained and certified volunteers.

Access and Use

The National Map will be accessible through the Internet all day, every day. The data will be in the public domain. Provision will be made for broad access to and use of data procured from commercial sources.

Users will be able to combine data from *The National Map* with geographic information available from other organizations, such as cadastral information from the Bureau of Land Management and socioeconomic data from the Bureau of the Census. *The National Map* will be a foundation to which all organizations can reference their information, such as land use data, school district boundaries, or wildlife population counts.

The USGS will continue the tradition of the primary series topographic map by providing a standard set of paper topographic maps and digital data products derived from *The National Map*. Customers will be able to create their own maps by defining a geographic area of interest, selecting unique combinations of data, and printing their maps at home or at kiosks that will be available locally at libraries, recreational suppliers, bookstores, and so on.

Strategies

The USGS will be the (1) guarantor of national data completeness, consistency, and accuracy; (2) organizer of component activities; (3) catalyst and collaborator for partnerships and business relationships; (4) integrator and certifier of data from all sources; (5) data producer and owner when no other source exists; and (6) leader in the development and implementation of national geospatial data standards. A Federal advisory committee will make recommendations on requirements,

business processes, technology implementation, and skills development that support *The National Map* objectives.

The USGS will proactively seek partnerships and business arrangements with government agencies, the private sector, and other organizations to develop and operate *The National Map*. USGS staff will be located across the Nation to work directly with staff of other USGS disciplines, partner organizations, private industry, and universities.

Taking advantage of the ongoing convergence of broadband wireless communication, mass data storage, and geolocation capabilities in personal digital devices, the USGS will encourage the participation of organizations and private citizens to serve as a volunteer force for change detection, data compilation and validation.

Vision and Commitment

The National Map is a new perspective on geographic base information. By sharing its vision, the USGS affirms its dedication to refocusing and reinvigorating its efforts to meet the Nation's needs for this critical information. The USGS will consolidate and redefine its component mapping activities and seek creative partnerships to ensure that current, complete, consistent, and accurate information is available and useful to the Nation. It will take sustained commitment to achieve the full goals of *The National Map* vision. In the near future, the USGS and its partners will concentrate on improving data and map content and currentness for high priority areas, with emphasis on building long-term partnerships, and on improving data access and dissemination capabilities.

Attachment I

Maryland General Assembly

SENATE BILL 240

EMERGENCY BILL

Unofficial Copy 2002 Regular Session
P3 2lr0158
CF 2lr0159

By: **The President (Administration) and Senators Bromwell, Collins, Conway, Forehand, Green, Hollinger, Hughes, Kasemeyer, Lawlah, Teitelbaum, and Van Hollen**

Introduced and read first time: January 18, 2002
Assigned to: Education, Health, and Environmental Affairs

Committee Report: Favorable with amendments
Senate action: Adopted
Read second time: March 18, 2002

CHAPTER_____

AN ACT concerning

State Government - Access to Public Records - Public Security Documents

FOR the purpose of establishing the circumstances under which a custodian may deny inspection of certain records relating to public security; requiring the Office of the Attorney General to report to the Governor and the General Assembly on or before a certain date; making this Act an emergency measure; and generally relating to the inspection of public records.

BY repealing and reenacting, without amendments,
Article - State Government
Section 10-618(a), 10-622, and 10-623
Annotated Code of Maryland
(1999 Replacement Volume and 2001 Supplement)

BY adding to
Article - State Government
Section 10-618(j)
Annotated Code of Maryland
(1999 Replacement Volume and 2001 Supplement)

SECTION 1. BE IT ENACTED BY THE GENERAL ASSEMBLY OF MARYLAND, That the Laws of Maryland read as follows:

2 **SENATE BILL 240**

1 **Article - State Government**

2 10-618.

3 (a) Unless otherwise provided by law, if a custodian believes that inspection of
4 a part of a public record by the applicant would be contrary to the public interest, the
5 custodian may deny inspection by the applicant of that part, as provided in this
6 section.

7 (J) ~~A CUSTODIAN MAY DENY INSPECTION OF A PUBLIC RECORD THAT~~
8 ~~CONTAINS INFORMATION DISCLOSING OR RELATING TO PUBLIC SECURITY IF THE~~
9 ~~CUSTODIAN DETERMINES THAT INSPECTION OF THE INFORMATION WOULD~~
10 ~~CONSTITUTE A RISK TO THE PUBLIC OR TO PUBLIC SECURITY~~

11 (1) SUBJECT TO PARAGRAPH (2) OF THIS SUBSECTION, A CUSTODIAN
12 MAY DENY INSPECTION OF:

13 (I) RESPONSE PROCEDURES OR PLANS PREPARED TO PREVENT OR
14 RESPOND TO EMERGENCY SITUATIONS, THE DISCLOSURE OF WHICH WOULD REVEAL
15 VULNERABILITY ASSESSMENTS, SPECIFIC TACTICS, SPECIFIC EMERGENCY
16 PROCEDURES, OR SPECIFIC SECURITY PROCEDURES;

17 (II) 1. BUILDING PLANS, BLUEPRINTS, SCHEMATIC DRAWINGS,
18 DIAGRAMS, OPERATIONAL MANUALS, OR OTHER RECORDS OF AIRPORTS AND OTHER
19 MASS TRANSIT FACILITIES, BRIDGES, TUNNELS, EMERGENCY RESPONSE FACILITIES
20 OR STRUCTURES, BUILDINGS WHERE HAZARDOUS MATERIALS ARE STORED, ARENAS,
21 STADIUMS, AND WASTE AND WATER SYSTEMS, THE DISCLOSURE OF WHICH WOULD
22 REVEAL THE BUILDING'S OR STRUCTURE'S INTERNAL LAYOUT, SPECIFIC LOCATION,
23 LIFE, SAFETY, AND SUPPORT SYSTEMS, STRUCTURAL ELEMENTS, SURVEILLANCE
24 TECHNIQUES, ALARM OR SECURITY SYSTEMS OR TECHNOLOGIES, OPERATIONAL
25 AND TRANSPORTATION PLANS OR PROTOCOLS, OR PERSONNEL DEPLOYMENTS; OR

26 2. RECORDS OF ANY OTHER BUILDING OR STRUCTURE
27 OWNED OR OPERATED BY THE STATE OR ANY OF ITS POLITICAL SUBDIVISIONS, THE
28 DISCLOSURE OF WHICH WOULD REVEAL THE BUILDING'S OR STRUCTURE'S LIFE,
29 SAFETY, AND SUPPORT SYSTEMS, SURVEILLANCE TECHNIQUES, ALARM OR SECURITY
30 SYSTEMS OR TECHNOLOGIES, OPERATIONAL AND EVACUATION PLANS OR
31 PROTOCOLS, OR PERSONNEL DEPLOYMENTS; OR

32 (III) RECORDS PREPARED TO PREVENT OR RESPOND TO
33 EMERGENCY SITUATIONS IDENTIFYING OR DESCRIBING THE NAME, LOCATION,
34 PHARMACEUTICAL CACHE, CONTENTS, CAPACITY, EQUIPMENT, PHYSICAL
35 FEATURES, OR CAPABILITIES OF INDIVIDUAL MEDICAL FACILITIES, STORAGE
36 FACILITIES, OR LABORATORIES ESTABLISHED, MAINTAINED, OR REGULATED BY THE
37 STATE OR ANY OF ITS POLITICAL SUBDIVISIONS.

38 (2) THE CUSTODIAN MAY DENY INSPECTION OF A PART OF A PUBLIC
39 RECORD UNDER PARAGRAPH (1) OF THIS SUBSECTION ONLY TO THE EXTENT THAT
40 THE INSPECTION WOULD:

1 (I) JEOPARDIZE THE SECURITY OF ANY STRUCTURE OWNED OR
2 OPERATED BY THE STATE OR ANY OF ITS POLITICAL SUBDIVISIONS;
3 (II) FACILITATE THE PLANNING OF A TERRORIST ATTACK; OR
4 (III) ENDANGER THE LIFE OR PHYSICAL SAFETY OF AN INDIVIDUAL.
5 10-622.
6 (a) This section does not apply when the official custodian temporarily denies
7 inspection under § 10-619 of this subtitle.
8 (b) If a unit is subject to Subtitle 2 of this title, a person or governmental unit
9 may seek administrative review in accordance with that subtitle of a decision of the
10 unit, under this Part III of this subtitle, to deny inspection of any part of a public
11 record.
12 (c) A person or governmental unit need not exhaust the remedy under this
13 section before filing suit.
14 10-623.
15 (a) Whenever a person or governmental unit is denied inspection of a public
16 record, the person or governmental unit may file a complaint with the circuit court for
17 the county where:
18 (1) the complainant resides or has a principal place of business; or
19 (2) the public record is located.
20 (b) (1) Unless, for good cause shown, the court otherwise directs and
21 notwithstanding any other provision of law, the defendant shall serve an answer or
22 otherwise plead to the complaint within 30 days after service of the complaint.
23 (2) The defendant:
24 (i) has the burden of sustaining a decision to deny inspection of a
25 public record; and
26 (ii) in support of the decision, may submit a memorandum to the
27 court.
28 (c) (1) Except for cases that the court considers of greater importance, a
29 proceeding under this section, including an appeal, shall:
30 (i) take precedence on the docket;
31 (ii) be heard at the earliest practicable date; and
32 (iii) be expedited in every way.

(2) The court may examine the public record in camera to determine whether any part of it may be withheld under this Part III of this subtitle.

(3) The court may:

(i) enjoin the State, a political subdivision, or a unit, official, or employee of the State or of a political subdivision from withholding the public record;

(ii) pass an order for the production of the public record that was withheld from the complainant; and

(iii) for noncompliance with the order, punish the responsible employee for contempt.

(d) (1) A defendant governmental unit is liable to the complainant for actual damages and any punitive damages that the court considers appropriate if the court finds that any defendant knowingly and willfully failed to disclose or fully to disclose a public record that the complainant was entitled to inspect under this Part III of this subtitle.

(2) An official custodian is liable for actual damages and any punitive damages that the court considers appropriate if the court finds that, after temporarily denying inspection of a public record, the official custodian failed to petition a court for an order to continue the denial.

(e) (1) Whenever the court orders the production of a public record that was withheld from the applicant and, in addition, finds that the custodian acted arbitrarily or capriciously in withholding the public record, the court shall send a certified copy of its finding to the appointing authority of the custodian.

(2) On receipt of the statement of the court and after an appropriate investigation, the appointing authority shall take the disciplinary action that the circumstances warrant.

(f) If the court determines that the complainant has substantially prevailed, the court may assess against a defendant governmental unit reasonable counsel fees and other litigation costs that the complainant reasonably incurred.

SECTION 2. AND BE IT FURTHER ENACTED, That, on or before December 1, 2007, the Office of the Attorney General shall review the changes made to § 10-618 of the State Government Article by this Act and shall submit a report to the Governor and to the General Assembly, in accordance with § 2-1246 of the State Government Article, on the continued necessity of this Act and any recommendations for changing or modifying this Act.

SECTION ~~2.~~ 3. AND BE IT FURTHER ENACTED, That this Act is an emergency measure, is necessary for the immediate preservation of the public health or safety, has been passed by a yea and nay vote supported by three-fifths of all the members elected to each of the two Houses of the General Assembly, and shall take effect from the date it is enacted.