Application Narrative

a) Project Application

Background
MetroGIS is a multi-organizational, stakeholder governed, collaborative organization representing over 250 local units of government and other organizations, which began in 1995. MetroGIS was established to foster sharing of geospatial data in the seven-county Twin Cities Metropolitan Area of Minnesota. Metropolitan Council is the primary sponsor of the MetroGIS project.

DataFinder (www.datafinder.org) is the MetroGIS web site that provides the mechanism for sharing GIS data between MetroGIS participants. The DataFinder web site was designed to reflect current and future needs for access to GIS information by MetroGIS stakeholders. It currently includes features that allow users to find GIS data and metadata quickly. DataFinder tools include a GIS data catalog and a search engine interface (that queries the MetroGIS DataFinder NSDI node) that provide quick access to over 50 metadata records. In addition, the DataFinder site features an online-mapping feature (currently an ESRI ArcIMS map service and associated web client), and on-line help and resources pages.

The NSDI 2001 CAP grant offers MetroGIS an opportunity to extend DataFinder's current functionality to provide additional map services to the MetroGIS stakeholders. Equally important, these map services would be provided using standards developed by the Open GIS Consortium (OGC) which would ensure that such services would be accessible by *all* MetroGIS' stakeholders. The implementation of new OGC-compliant map services would not only enhance the DataFinder functionality for our current users, but it would also encourage a wider audience to view, explore, and use geospatial information.

Eligibility
Clearinghouse Node: MetroGIS DataFinder meets both eligibility requirements for the NSDI CAP grant. DataFinder has an operational NSDI clearinghouse node (registered in January 2001). The DataFinder web site includes a metadata search interface, which executes the search on the DataFinder NSDI clearinghouse node (using the Land Management Information Center Gateway).

Map Service: DataFinder has ESRI ArcIMS map server software installed and is currently providing one map service and a web based client viewer to access this service. This "General" map service includes multiple data layers, several of which are based upon business information needs that the MetroGIS community identified as its top priorities.

Project Objective
The MetroGIS DataFinder Map Service Project would result in the successful deployment of five new publicly available Open GIS Consortium (OGC)-compliant web-mapping services. The goal of these services would be to provide reliable, public map services for stakeholders and the public to view, explore and access map images via the Internet.

Although only five mapping services will be developed for this grant, the intention is to use the experience gained from this grant as a model to increase the number of MetroGIS DataFinder site map services to sixteen. The sixteen map services are categories that place spatial data sets, defined by the business information needs of the MetroGIS stakeholders, into thematic or topical groups. The goal of this process was to provide a flexible and easy model to use in the search for spatial data sets. Each data set may be assigned to up to three categories.

In developing the MetroGIS DataFinder site, the sixteen thematic groups are used in the theme catalog to enable quick and intuitive searches using categories that stakeholders recognize. We would like to extend the use of these categories to the realm of map services. We propose to ultimately create a map service for each of the sixteen categories. The beauty of this "thematic" categorization of services is that as new data sets are added to the DataFinder site, they will be added to the appropriate service(s) as well. This framework provides a structure that is scalable for future additions and improvements to DataFinder map services. The sixteen MetroGIS DataFinder categories are listed in Attachment A.

While the long-term goal is to provide sixteen map services, we intend to implement five for this grant. A general description of the data contents of these services is given below (in Table 1), but a list the actual data sets for each service are listed in Attachment G.

Table 1: Five Proposed Map Services

Theme Category	*Description of category contents (and examples of data sets)**	*MetroGIS Priority Information Needs*	*NSDI Framework Data Themes*
Political and Administrative	Jurisdictional Boundaries, Election Boundaries and Polling Places, Zip Codes	Jurisdictional boundaries	Governmental Units
Planning and Development	Land and Property (Regulations, Use, and Development Plans, Investments in Public and Private)	Land use, existing Land use planned	
Property	Land and Structures (Descriptions, Rights, Permits, Tax, Value, Addresses, Inspection)	Parcel boundaries Parcel identifiers Land regulations Rights to property	Cadastral
Transportation	Road Networks, Rail Networks, Air Transportation Facilities, Traffic, Construction, Address Ranges	Street addresses Highway / road networks	Transportation
Imagery	Image Data		Orthoimagery

* Actual data sets to be included in the map services are listed in Attachment G.

Relationship between MetroGIS' Priority Information Needs and NSDI Framework Themes

MetroGIS previously identified, in development of the Fair-Share Financial Model, that MetroGIS' Information Needs (Exhibit 1) and the NSDI's Framework data themes (geodetic control, orthoimagery, elevation, transportation, hydrography, governmental units and cadastral information) are similar in that they both are intended to provide a reliable, standardized source for commonly needed geographic data. While MetroGIS' priority information needs fit clearly into the information content of the seven NSDI themes; others do not. With the exception of "orthoimagery" all of NSDI's Framework data themes show up in MetroGIS' listing of common information needs, although elevation data, is not among MetroGIS' priority information needs. Orthoimagery does not show up because it is generally viewed as a means to obtain desired data

and not as an information need in and of itself. Notwithstanding, significant progress has been made to identify and implement collaborative acquisition of orthoimagery for the metropolitan area. MetroGIS has cited several priority information needs that go beyond the seven NSDI Framework themes (e.g. rights to property, existing and future land use, and land regulations). Table 1 indicates how the proposed map services relate to both MetroGIS' priority information needs and the NSDI Framework.

Specific Application of Grant Funding

The Metropolitan Council, on behalf of MetroGIS, is applying for NSDI grant to perform the following specific tasks to achieve the above stated objectives.

- Receive training in OGC Web Mapping Standard (WMS) concepts and practices.
- Extend the current ESRI ArcIMS image map service "General" web map services to support OGC Web Mapping Standard 1.0.0 for Web Mapping Services.
- Develop and provide the "Political and Administrative", "Transportation", "Planning and Development" and "Imagery" map services to support OGC Web Mapping Standards 1.0.0.
- Design and implement a "Property" map service that would provide Web access to geographic information and tax record information currently maintained by the Twin Cities metropolitan counties.
- Implement the "Property" map service to support the OGC Web Mapping Standard 1.0.0 for Web Mapping Services.
- Build a web-based client viewer to provide access to the map services over the Internet. This will entail working with the NSDI to build a portal to view and interrogate map data.

Map Services Forum and Web Site Evaluation

A map services forum and web site evaluation is planned to ensure stakeholder commitment to the project and provide feedback to MetroGIS about the future of map service deployment. The forum will provide an outlet for users to test the deployed map services and provide feedback. In addition, future enhancements to the map services will be implemented based on guidance and feedback from stakeholders and the public gained through a web-based evaluation form. Our commitment to educating stakeholders in GIS technologies and using stakeholder feedback to improve MetroGIS effectiveness have been at the forefront of MetroGIS vision since its inception. MetroGIS will use the forum and evaluation as an in-kind contribution for the project.

Cooperation and Benefits

Governmental agency cooperation is key to this project and we anticipate the results will provide a significant cost-effective access to data and information for local units of government. For example, it may well limit the number of inquiries by the public at these agencies. There is a movement in the Twin Cities metropolitan area towards using map services to provide geographic information over the web. The implementation of a centralized solution envisioned by MetroGIS in this grant will be a significant step towards a streamlined process that will eliminate duplicative costs in software and hardware for deployment of web based services to the public. An essential message from the stakeholders of MetroGIS is our mission statement that clearly states the importance and future of providing access to geographically referenced data. MetroGIS' mission is to:

Provide an ongoing, stakeholder-governed, metro-wide mechanism through which participants easily and equitably share geographically referenced graphic and associated attribute data that are accurate, current, secure, of common benefit, and useable.

In providing web enabled image services to MetroGIS stakeholders, it is imperative that these resources are developed with the stakeholder community involved from the onset. Traditionally web application services provided information for a defined project. Now with the advances in technology, the service will be available for any client application that is able to use that service. In addition, it is anticipated that stakeholders will design web applications to utilize the map services provided by MetroGIS in their own web pages. This is a major step in reducing costs and work duplication between agencies.

Project Timeline and Budget

Work on this project involves three main tasks (creation of map services, evaluation of services, and documentation and training), to be conducted over a twelve-month period commencing September 3, 2001. Since the project is related to ongoing MetroGIS work, the specific activities may vary somewhat depending on current stakeholder activities. This project plan reflects our best attempt to describe the level of effort needed and our current resources. Budget and project schedules are included as attachments (Attachment B and Attachment C). If the grant funding would be available earlier than September 3, the project could start mid-to-late July.

b) NSDI Related Experience

MetroGIS' current level of activities and involvement on NSDI related work is as follows (see MetroGIS Business Plan for further information at www.metrogis.org).

Standards

A priority MetroGIS function is to facilitate adoption and use of standards pertaining to its endorsed priority business information needs. MetroGIS' standards related work begins with evaluation of geospatial data standards adopted by Minnesota and by the FGDC for data associated with business information needs that are priorities of the MetroGIS community. Standards adopted by Minnesota and by the FGDC are utilized as much as possible to address the needs of the MetroGIS data producer and data user communities. To date, MetroGIS has endorsed eight standards and is promoting their use among the MetroGIS stakeholder community. Of these eight standards, two directly reflect their FGDC approved counterparts (NSSDA and metadata format) and one other (parcels) was derived from the FGDC cadastral standard. A complete listing of MetroGIS' endorsed standards is provided in Exhibit 2.

Metadata

A priority MetroGIS function is to foster development and maintenance of metadata consistent with Minnesota's approved metadata guidelines (accepted by FGDC) by the MetroGIS data producer community. In addition, MetroGIS promotes the posting of these metadata on the MetroGIS DataFinder site (see next item) or other node of the NSDI clearinghouse.

Clearinghouse
A priority MetroGIS function is to continue to support MetroGIS DataFinder (www.datafinder.org), a registered node of NSDI Clearinghouse.

Framework
A priority MetroGIS function is to implement the NSDI vision for each of its 13 business information need priorities (Exhibit 1); information needs and their associated datasets that have significance to the broad MetroGIS community (300+ local units of government, plus regional, state, and federal government interests). There is usually a many-to-one relationship between datasets and their correspondence with a singular information need. These corresponding datasets include six of the seven NSDI framework themes. The seventh, orthoimagery, was not called out specially because: a) orthoimagery is more closely associated with data than an information need and b) it was generally assumed to a vehicle through which to attain data needed to address several of the priority information needs. A replicable process has been developed through which desired data specifications and roles and responsibilities are assigned to capture and maintain the data needed to address each priority business information need. Institutional policies are also advocated as needed to foster wide spread sharing of the data associated with each priority information need.

Organizational coordination
Evolution of an appropriate and effective organizational structure for MetroGIS and implementing methods of effective coordination with other organizations with similar objectives have been priorities of MetroGIS since its inception in 1996. MetroGIS' stakeholder community entails 300+ local units of government, plus regional, state, and federal government interests. Traditional methods of legally defining an organizational structure were found early on to be ineffective in this environment. MetroGIS was awarded a NSDI Framework Demonstration Grant in 1998 that made possible significant advancement in policy and philosophy necessary to successfully sustain MetroGIS as a voluntary geospatial/framework collaborative committed to be effectively and efficiently achieving the functions set forth in its adopted Business Plan (April 2000).

In addition to striving to refine an effective mechanism to organize and carry out its own objectives, MetroGIS' team members and staff are actively participating in the following interests that have significant influence on the evolution of Geospatial policy in the State of Minnesota.

- Minnesota Governors Council on Geographic Information Board and several of its committees to insure that lessons learned through MetroGIS taken into consideration as geospatial policy is developed for the State and to provide a means for regular transfer of information to others that can benefit from MetroGIS' work.
- Minnesota GIS/LIS Board and annual Conference and to learn from others and transfer of information to others that can benefit from MetroGIS' work.
- Meetings of each of the seven county-based GIS Users Groups. These groups were required to be created and/or fostered during the term of each of the GIS Data and Cost Sharing Agreements entered into with each county by the Metropolitan Council. These agreements created the initial conditions for MetroGIS. The users groups provide a mechanism for

regular dialogue to resolve institutional and technical obstacles to data sharing at the intra-county level and to identify obstacles that require cooperation among the counties and their local government partners to resolve, hence a topic for MetroGIS.

Finally, MetroGIS also was privileged to have had three representatives participate in the evolution of the foundation philosophy for the National GeoData Alliance from February to September 2000. (Commissioner Randy Johnson MetroGIS Policy Board and Hennepin County; Steven Lehr, MetroGIS Coordinating Committee; and Randall Johnson, MetroGIS Staff Coordinator.)

Other NSDI Activities

Randall Johnson, MetroGIS Staff Coordinator, participated in 4 of the 5 Framework workshops held 1995-97 and in the Framework Organizational Workshop held January 1998. In addition, several members of the Policy Board and Coordinating Committee have participated in NSDI/FGDC-sponsored workshops and seminars (e.g. Hennepin Commissioner Randy Johnson, Dr. David Arbeit, LMIC, Dr. William Craig, U of M, Gary Caswell (Hennepin County), and David Claypool (Ramsey County).

c) Clearinghouse and Metadata Capability

Metadata

A priority MetroGIS function is to foster development and maintenance of metadata consistent with Minnesota's approved metadata guidelines (accepted by FGDC) by the MetroGIS data producer community. In addition, MetroGIS promotes the posting of these metadata on the MetroGIS DataFinder site or other node of the NSDI clearinghouse. Currently, the DataFinder web site contains over fifty compliant metadata records. A "Frequently Asked Questions" section of the DataFinder web site explains metadata, their importance and the tools available for creation of FGDC-compliant metadata.

Clearinghouse Node

The MetroGIS DataFinder web site has provided metadata and metadata search capability for over four years. Over the past year, MetroGIS initiated, implemented and completed a process to enhance the functionality of the DataFinder web site. A major element of this process was to convert the existing search mechanism to an NSDI clearinghouse node. This process was implemented (including a front-end search interface) and was on-line in January 2001. The clearinghouse node was registered with NSDI in January 2001, and has since been functioning consistently and reliably. The MetroGIS DataFinder node is one of three registered nodes in Minnesota, all of which use Land Management Information Center (LMIC) as their gateway. LMIC and MetroGIS worked closely on the process of setting up the NSDI clearinghouse node and MetroGIS continues to work closely with them to ensure smooth transition of new software versions or other enhancements to the clearinghouse structure. Currently, the MetroGIS DataFinder node is running on a Windows NT server using the Isite Software Version 207i.

d) Web Mapping Service Capability

Background

Currently, MetroGIS DataFinder includes one "general" map service. A *map service* is a map that is published over the Internet. The current model of implementation for this map service is limited because it is somewhat software specific. The completion of the MetroGIS DataFinder map service project described in this grant would benefit DataFinder's map service capabilities in two ways. First, it would facilitate the addition of five more map services. This would provide MetroGIS stakeholders with another method to view, analyze and use the data and metadata currently available on DataFinder. Secondly, by providing OGC-compliant map services, more GIS users would have access to these map services since they would not be limited to use through solely web-based clients and software-specific GIS clients. MetroGIS has and continues to be a strong supporter and implementer of GIS standards (see section b above) and so the execution of OGC-compliant services would support this larger goal. The existing map service capability and anticipated capability under the grant are described below.

Existing Web Mapping Service Capability

The existing "general" map service is an image service that is implemented using ESRI's ArcIMS product. The service may be viewed by the HTML web client available on DataFinder, or by using any GIS product that understands the ArcIMS AXL (Arc Extensible Markup Language). Currently, the only commercially available GIS package (we are aware of) that can read this type of map service is ArcExplorer 3. This ability to utilize this type of map service is promised by ESRI in upcoming releases of ArcView 8x and ArcInfo 8x.

Future Web Mapping Service Capability

The implementation of the MetroGIS DataFinder map service project described in this grant would benefit expansion of DataFinder's map service capability and would facilitate the addition of five more map services. The property, political and administrative, and transportation, planning and development and imagery services would be added and together provide access at implementation to over twenty individual GIS data sets. This would provide an efficient and effective mechanism for MetroGIS stakeholders and members of the wider GIS community to view, analyze and use GIS data available on DataFinder. In addition, the map services would be offered in the OGC-compliant format. This would be accomplished by using the map service software that is currently in place, ArcIMS, but with the addition of the OGC-Compliant WMS 1.0.0 Image server extension that is freely available. This extension converts an ArcIMS map service into an OGC-compliant standard map service. By providing OGC-compliant map services, we will meet the needs of a larger number of MetroGIS stakeholders and the GIS users in the public. While MetroGIS DataFinder currently uses ESRI's ArcIMS software, the emphasis is not on this particular software product, but on the solution of offering standardized map services in OGC format. This ensures that, if necessary, or desired, the software product could be switched in the future without compromise to the MetroGIS user community as long as the new product provides OGC-compliant map services. This structure offers maximum flexibility while ensuring a secure and consistent service to the MetroGIS DataFinder users.

The following diagrams represent the existing and envisioned map service capabilities for MetroGIS DataFinder.

Figure 1: Current Scenario

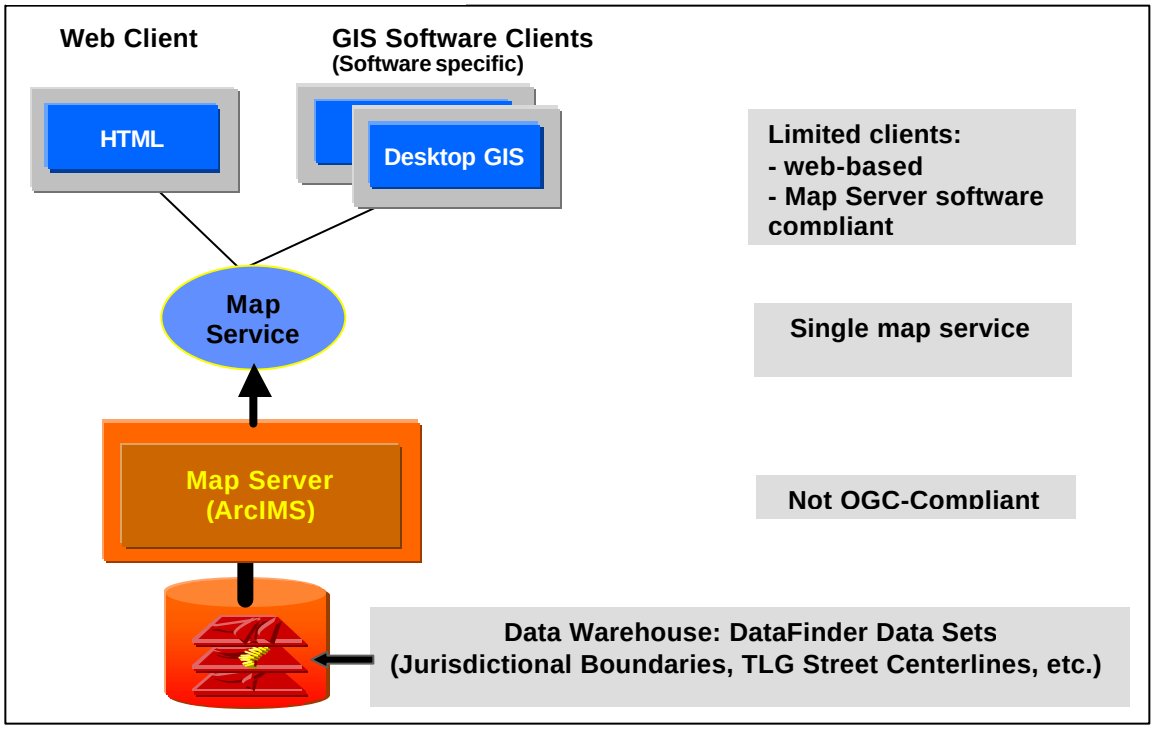
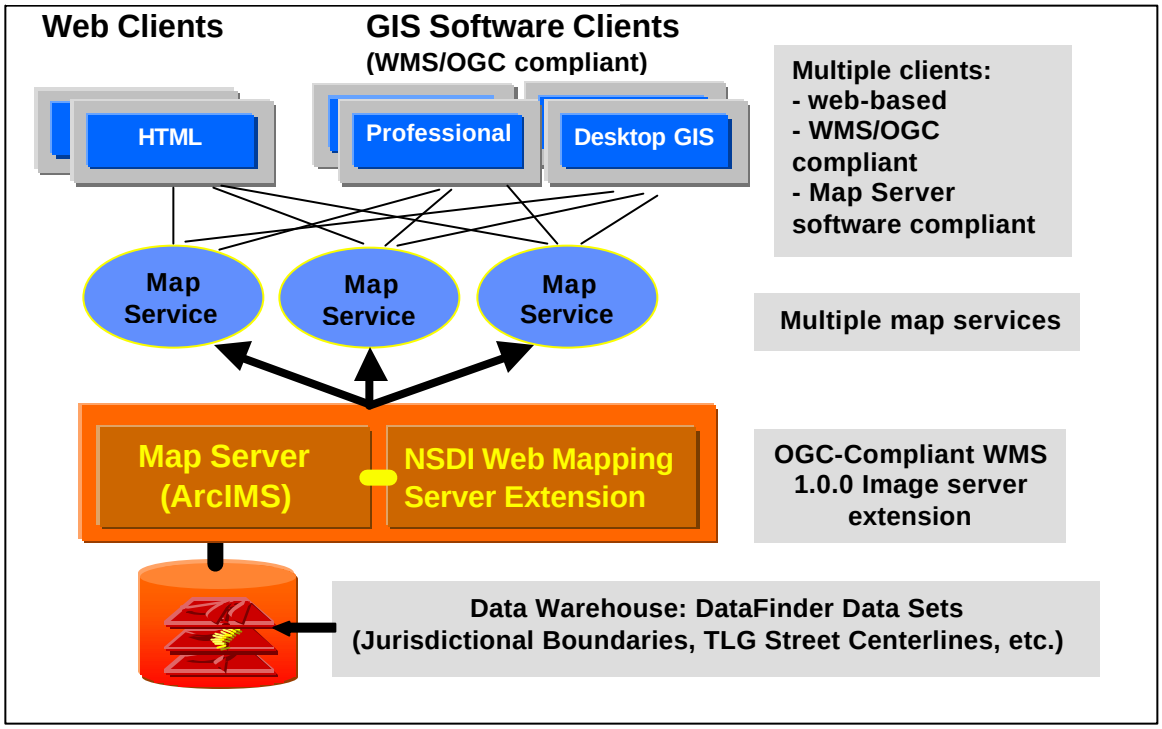


Figure 2: Scenario under NSDI grant



e) Project Software Integrator

Name and Credentials
Alison Slaats will be the software integrator for MetroGIS DataFinder Map Service Project.

Alison Slaats is the GIS Web Application Developer for the Metropolitan Council and the DataFinder Manager for MetroGIS. She has over five years experience in GIS and interfacing GIS with the Internet. She earned her Bachelor of Arts at the University of Minnesota and her Master of Science in Geography (specializing in GIS) from the University of South Carolina. She has taught classes and made several presentations on the subject GIS and web applications, including one at the national GIS/LIS conference in 1996. Slaats has significant practical experience in defining, implementing and maintaining web-related GIS projects and in addition, she has a thorough understanding of web based GIS map services.

Ms. Slaats has managed and implemented many successful GIS Web projects for the internal and external web sites of the Metropolitan Council. For example, the Community Development Division of the Metropolitan Council required a way to convey spatial and tabular Land Use data to the public. Slaats developed an interactive map with associated tables and graphs to meet these needs (see http://GIS.metc.state.mn.us/). In addition, Slaats has successfully developed and implemented the enhanced MetroGIS DataFinder web site. The new web site was created using HMTL, Active Server Page (ASP), and JavaScript. The metadata search tool uses the MetroGIS DataFinder NSDI Clearinghouse node behind the scenes. Slaats implemented the NSDI node and she is responsible for its ongoing maintenance. Slaats also set up the ESRI ArcIMS web mapping service and web client on DataFinder.

Previously, Slaats worked at ESRI, Inc. in St. Paul, Minnesota, as an applications developer and software instructor. At ESRI, she worked on many client projects, of which some were web-related. In addition, Slaats taught many classes in the use GIS software.

Tasks
In order to implement the OGC-standard map services, Ms. Slaats intends to extend the currently used map server software (ESRI ArcIMS) to meet the OGC WMS 1.0.0 standard for map services. Slaats looks forward to the training provided by the NSDI to assist in the implementation of the OGC WMS 1.0.0 standard with the existing software. The current hardware and software available is sufficient to support this effort.

Workload
Alison Slaats' permanent workload includes 50% time for development and management of the MetroGIS DataFinder web site. This provides adequate time for implementing the new web services and accompanying tasks that are outlined in this grant application. In addition, Alison Slaats will work closely with the network of competent MetroGIS stakeholders that will provide input, feedback, advice and guidance for this project as necessary. The Metropolitan Council has a web implementation team that can provide additional web expertise as needed.