Date of Report: June 30, 2000
LCMR Work Program Final Report
Project Completion Date: June 30, 2000

I. Project Title: Foundations for Integrated Access to Environmental Information

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Total Project Budget:	LCMR	$650,000
	Balance	$ -0-

Legal Citation:

ML 1997, Ch.216, Sec. 15 Subd. 11(a).

ML 1999, Ch 231, Sec. 16 Subd. 25. Carryforward.
The availability of the appropriations for the following projects is extended to June 30, 2000:
Laws 1997, chapter 216, section 15, subdivision 11, paragraph (a), foundations to integrated access to environmental information.

Appropriation Language:
This appropriation is from the future resources fund to the director of the office of strategic and long range planning for a collaborative effort among natural resource agencies to design, develop and test a solution to provide integrated electronic access to environmental and natural resources data. These data must be made accessible and free to the public unless made private under the Data Practices Act.

II. Project Summary and Results

This project will improve the public's access to the state's environmental and natural resources data and information. Using information engineering techniques and following guidelines established by the Office of Technology, a sustainable technology implementation plan, or "blueprint," will be created from the point of view of an "information seeker" rather than the more limited scope of an agency. Based on this blueprint, indexed data directories and advanced search and retrieval techniques will be used to improve and integrate agency Internet web sites and make them available through the state's North Star initiatives. This integrated solution, based upon a "consumer view" of information search and retrieval, will result in a more responsive solution to information access than would otherwise be attainable.

A number of important initiatives to improve the public's access to environmental data and information are currently underway in state agencies, but no integrated plan exists to integrate these efforts. Tangible benefits certainly will result from work that has begun, including the joint project of the DNR and PCA to provide public access to information through the World Wide Web. However, the long-term success of these early efforts will depend greatly upon the strength of a comprehensive resources management and technology plan for environmental and natural resources information. The Office of Technology requires such plans for technology investments of individual agencies, but no equivalent guideline exists for multi-agency environmental information resource management plans. The Office of Technology will be asked to review progress towards this goal at key project milestones.

This project is designed as a "foundation" project for major agency initiatives that use information technology to provide environmental and natural resources data and information to the public. Its objective is to accomplish the following:

1.   Clearly identify consumer-oriented needs for information and data maintained by or available through state agencies.

2.   Design an approach to providing integrated access to information and data that is consistent with emerging technology standards, guidelines and best practices.

3.   Fully evaluate the effectiveness of the design for integrated access, using external reviewers representing a diverse range of public points of view.

4.   Prepare a workable blueprint for guiding environmental information technology investments beyond the scope of this project.

5.   Design, evaluate and implement standards for documentation and indexed directories that promote responsive search and retrieval procedures.

6.   Design, evaluate and implement strategically selected web sites, building upon ongoing efforts and making adjustments in compliance with the goals of this project.

7.   Conduct outreach to promote the long-term effectiveness and sustainability of the technology blueprint.

This project began as three separate technology proposals concerned with improving access to natural resources information:G1, G2 and G4. The LCMR chose not to fully fund any of these projects, which are listed below, but asked the lead agencies to develop a collaborative proposal that would address the common issue of information access. In addition, this project seeks to incorporate elements of proposal G8, at the request of the Project Manager for that project.

G1	Electronic Library of Environmental and Natural Resource Information	
	Office of Environmental Assistance	$1,100,000
G2	Natural Resource Data Architecture and Conversion	
	Department of Natural Resources	$ 300,000
G4	Building an Accessible Geographic Information Clearinghouse	
	Land Management Information Center	$ 725,000

This collaborative project does not attempt to fully accomplish the ambitious goals of the original projects; simply put, the resources are inadequate. Instead, it seeks to provide the glue that would hold together these and future efforts to improve public access to environmental and natural resources information and data. The Land Management Information Center (LMIC), the Department of Natural Resources, Pollution Control Agency, and the Office of Environmental Assistance are committed to implementing the broader goals of their approved budgets and will pursue those goals in a manner consistent with the blueprint created by this project.

III. Progress Summary

In March 1998, project management responsibility was shifted from David Arbeit (Land Management Information Center, Minnesota Planning) to Colleen Mlecoch (Minnesota Department of Natural Resources). Based on learnings during the first nine months of the project, the work program was modified slightly. The essence of the project remains the same.

The results detailed below diverge from the original work program in order to secure the full cooperation and commitment of Minnesota's environmental and natural resource agencies, incorporate other key initiatives, and make use of a rapid applications development approach.

David Arbeit and Colleen Mlecoch met with LCMR staff on March 27, 1998 to present their proposed change in leadership and approach. LCMR supported their recommendations. (A separate document is available to show how the results in the original and revised work programs are related.)

Specific project accomplishments and progress summaries are detailed as appropriate under results 1-8 in Part IV: Outline of Project Results and Accomplishments.

KEY	Task tables in the project results section use these codes for "Staff"
AC	Advisory Committee
DNR	Dept of Natural Resources
MC	Metadata Cataloger
MS	Metadata Specialist
OC	Outreach Coordinator
PC	Project Coordinator
PM	Project Manager
WA	Web Assistant

IV. Outline of Project Results and Accomplishments

Result 1. Relationships with key agencies and initiatives established.

The Foundations Project builds on the experience of ongoing efforts by individual agencies and prior LCMR grants to create access to environmental data and information. It involves a broader range of environmental and natural resources agencies and information seekers than has been previously attempted. The project will invite the participation of all member agencies of the Environmental Quality Board (EQB). Their participation will ensure that the primary stewards of environmental and natural resource data and information are involved in the project from the outset. The project will make every effort to collaborate with other public information access initiatives launched by the Office of Technology (OT), the Information Policy Council (IPC), the Forest Resources Council (FRC), Metropolitan Council, the Governor's Geographic Information Council, the Legislative GIS Office, and the Information Policy Task Force.

Revised Budget: $ 39,150
Balance: $ -0-
Completion Date: June 30, 2000

Task	Results	Staff	Due Date
Contact agency cooperators and key participants re: project status	Key cooperators informed of project transition and interest in participating re-ignited.	PC	03/31/98
Create Project Steering Committee	Committee formed to ensure agency participation and completion of project.	PM	04/15/98
Project Steering Committee meeting	Review and approve revised project plan.	PM	04/15/98
Schedule Steering Committee meetings and develop agendas	Schedule of meetings and tasks for the Committee through project completion.	PC	ongoing
Establish collaborative links with related groups and initiatives	Effective collaboration and synergistic approach to advancing the shared goal of enhanced public access to environmental information.	PM, PC	ongoing
Compile brief summary of current agency efforts to provide access	Baseline from which to begin project discussions and promote communication.	PC	06/30/98

Activity Status

Oct 1997   **Meetings with key environmental and natural resource agencies.**
Project staff met with key environmental data and information producers and distributors in Minnesota state government. The purpose of the meetings was to inform agency staff responsible for information management and public communications about the project, and to develop a basic understanding of current and planned agency efforts to improve access to information.

The meetings provided a basis for inviting agency participation and gaining commitment to the project. Based on the meetings, project staff will compile a summary of current and planned agency initiatives in improving access to information via the Internet and World Wide Web.

Mar 1998

Strategic linkages with related initiatives established.
The Project Manager communicated with several other groups working to improve access to government information. Groups consulted include the Electronic Government Services Committee of the IPC, the GIS Standards Committee of the Governor's Council on Geographic Information, the Metro Council Web Index Project staff, the Legislative GIS Office, and the FRC Interagency Information Cooperative. Each of these groups is advancing the goal of improved public access to environmental information.

May 1998

Project Cooperators meeting.
A meeting was convened 5/15/98 to engage the project cooperators as an advisory group, and to confirm their role as a focal point of contact between the project and the agencies they represent. Agenda: (1) review revised project plan and progress to date; (2) highlight findings of the Information Needs Assessment; (3) outline priority tasks for the next six months, including selection and implementation of a search engine, development of a project web site, and work on metadata standard; (4) presentation by Eileen Quam (Metadata Specialist) on the meaning and use of metadata; (5) presentation by Chris Cialek (LMIC) on GIS metadata standards and possible links to the Foundations project; and (6) discussion of how our efforts will satisfy the common goal of a distributed, integrated search mechanism for effectively locating environmental information.

Sept 1998

Project Cooperators meeting.
A meeting was held 9/3/98. Agenda: (1) search engine research, tests and decision to license Infoseek's Ultraseek server; (2) demonstration of the Ultraseek search engine, TagGen and the LIV Thesaurus for metadata development; (3) Office of Technology collaboration in upgrading the Foundations Project Ultraseek license for use on the North Star web site; (4) assistance available to project cooperators in customizing the Ultraseek search screen for agency web sites; (5) Minnesota Metadata Guidelines – Dublin Core (MMG-DC) development; (6) hiring of three metadata catalogers; and (7) Minnesota State Archivist interest in and support of the project – Robert Horton is interested in adopting and adapting Dublin Core for use as a archiving mechanism for state electronic resources, and will make a presentation at the next Cooperators meeting.

May 1999   **Project Cooperators meeting.**
A meeting was held 5/6/99. Agenda: (1) introduction of 6 metadata catalogers; (2) statistics of added metadata and status of completed and in-progress agencies; (3) demonstration of metadata affecting relevance ranking; (4) demonstration of Ultraseek's Content Classification Engine; (5) demonstration of the GIS Data Deli; (6) cost-benefit analysis status; (7) kudos for the project; and (8) next steps.

June 1999   **Individual Project Cooperators meetings**
to June 2000   Throughout the final year of the project, the Project Coordinator met individually with Project Cooperators, making presentations and addressing specific concerns.

Result 2. Consumer-oriented needs for information and data maintained by or available from state agencies identified.

Project staff will initiate a multi-faceted assessment of citizen / "information seekers'" environmental and natural resource information needs, and prepare a report based on this assessment to help inform Project Steering Committee decisions and to ensure that decisions concerning information access are based on expressed citizen information needs. The results of the information needs assessment will be reviewed to identify "unmet needs," defined as information resources sought by the public but not available online.

Revised Budget:	$ 18,500
Balance:	$ - 0 -
Completion Date:	March 3, 2000

Task	Results	Staff	Due Date
Conduct informal surveys at the 1997 State Fair & MLA Convention	Data collected from citizens' and information providers' on their information needs.	PC	10/31/97
Prepare questions for the MN Survey and analyze results	Statistically defensible data collected from a sample of MN residents on information needs.	PC	03/31/98
Collect and analyze recent information needs assessments	Data available on information needs of resource managers and local units of government.	PC, OC	08/31/99
Summarize and synthesize information needs from all sources	Report documenting public environmental and natural resource information needs.	PC, OC	12/31/99
Review needs assessment report and other data collected describing public information needs	Report documenting unmet public environmental and natural resource information needs.	OC	03/03/00

Activity Status

Aug 1997   **Conducted survey of the general public at the 1997 MN State Fair.**

Oct 1997   **Conducted survey of public and school reference librarians at the Minnesota Library Association (MLA) Annual Conference.**

Dec 1997   **1997 Minnesota Survey conducted by the MN Center for Survey Research.**

May 1998   **Reviewed existing environmental agency data on information needs.**
Gathered data from participating agencies regarding the types of information frequently requested from the agency by the public (e.g. online user surveys and web log files), and compiled and analyzed data gathered in recent information needs assessments, including the FRC Interagency Information Cooperative *Forest Information Needs Assessment*; MetroGIS *Business Object Framing Model*; and the DNR *Enterprise-Wide Framing Business Object Model*.

June 1998   **Information needs assessment.**
The information needs assessment was completed and is available on the Foundations Project web site, "Bridges," at: http://bridges.state.mn.us/INA.pdf.

Result 3. Cost-benefit analysis of indexing and cataloging electronic resources.

The development and maintenance of electronic resources metadata and indexing will require farsighted planning up-front and an ongoing commitment of staff resources. We expect that this initial planning and a sustained investment will lead to a radical increase in user satisfaction with information search and discovery results. Project staff will employ methodologies to test this hypothesis, review the literature on the subject, and complete a cost-benefit analysis.

Revised Budget:	$ 32,800
Balance:	$ -0-
Completion Date:	April 15, 2000

Task	Results	Staff	Due Date
Conduct literature review	Summary of relevant research findings on topic.	CBA	10/31/98
Develop and implement methodology to test hypothesis	Research conducted to evaluate the benefits and costs of searching for electronic documents with and without metadata and controlled vocabulary.	MS, CBA	12/31/99
Document research findings and recommend next steps based on cost-benefit analysis	Written report documenting research findings and recommendation to Steering Committee on how to proceed.	PC, CBA	04/15/00

Activity Status

Summer 1998   **Analysis of search results using metadata and a controlled vocabulary.**
Dana Noonan was hired to study the effectiveness of using qualified Dublin Core metadata elements and a controlled vocabulary to find electronic information. Her study is being conducted in three phases – the first phase tested search results based on full-text keyword searches, the second will test results after metadata has been added to some web pages, and the third will be conducted near the end of the project when a substantial amount of metadata has been added. The results of this study will be used in the Cost Benefit Analysis to be completed Spring 2000.

March 1999   **Cost Benefit Analysis**
Maureen Puettemann began work on the Cost Benefit Analysis in March 1999 and subsequently decided to withdraw. The work will be continued by Jeffrey Radford. The primary objective of this research will be to answer the questions: (1) what are the ongoing costs (training, staff time, tool maintenance) of using metadata and a controlled vocabulary to catalog electronic information resources? and, (2) based on Dana Noonan's study, do the benefits justify the costs?

Spring 2000   **Bridges Search Interface Study**
Foundations staff, along with consultant Jeff Radford, developed and conducted a usability study that examined the effectiveness of the Bridges search interface. Six participants were given search queries to complete, and staff observed and recorded the results. The Bridges search interface performed very satisfactorily, and the results were used to further enhance the search page for ease of use. The report is included in **Best Practice Guidelines for Web Metadata**, and also posted at: http://bridges.state.mn.us/userstudy.pdf.

June 2000   **Metadata Study and Cost Benefit Reports**
Following the final phase of the metadata and controlled vocabulary study conducted by Dana Noonan, the Foundations Coordinator and staff analyzed the data, producing an analysis of the effectiveness of adding Dublin Core metadata utilizing a controlled vocabulary, and staff costs associated with these tasks. Both the study and current literature has highly supported the addition of metatags in this manner. The report is included in **Best Practice Guidelines for Web Metadata**, and also posted at: http://bridges.state.mn.us/user2study.pdf.

Result 4. **Virtual catalog of environmental and natural resource data and information resources developed.**

This phase of the project will inform the cost-benefit analysis described above. It will result in a prototype virtual catalog, or database of electronic resources, using a controlled vocabulary and metadata standards. Data directories and documentation for publicly available data and informa-

tion will be prepared and evaluated. The need for a separate catalog of electronic resources will be evaluated, and a catalog structure for electronic resources designed and populate if need confirmed. Usability testing will be conducted with various user groups throughout the process.

Revised Budget: $265,970
Balance: $ -0-
Completion Date: June 30, 2000

Task	Results	Staff	Due Date
Select electronic resources in participating agencies for cataloging	List of electronic resources ready to be cataloged compiled and approved.	PC, MS	10/31/98
Apply metatags to existing static HTML web pages	Selected resources fully cataloged in accordance with standards.	MS, MC	06/30/00
Implement methodology to create metadata on-the-fly for virtual pages	Tools selected and tested to create metadata for database generated web pages.	MS, MC	04/15/00
Populate catalog/database by using automated data gathering methods	Virtual environmental information resource catalog developed.	MS, MC	06/30/00

Activity Status

Summer 1998   **Electronic resources selected for cataloging**
The following state agency web sites were selected as resources for the project: Agriculture, Forest Resources Council, Health, LCMR, LMIC, Met Council, MN Planning, Natural Resources, OEA, Pollution Control, Public Safety, SEEK, and Transportation.

Two professional librarians and three technicians were hired to work with the metadata specialist in cataloging and classifying electronic resources. In addition, for 60 working days between November 1998 and April 1999, a serials cataloger on sabbatical from the University of Minnesota assisted with cataloging operations. In April and May 1999, the number of professional librarians increased to four, and the number of technicians decreased to one. Library and/or web staff from many participating agencies have been trained in using the metadata tools and thesaurus.

Fall 1998   Dublin Core metadata tags are being added to web pages through the use of TagGen, an application developed by Hiawatha Software (www.hisoftware.com), and tailored in close consultation with the software developers to meet specific project requirements.

TagGen provides a means to easily create and embed metadata in HTML documents. This can be done via remote access, without disrupting individual agency web development procedures. TagGen also accommodates metadata stored as pointer records to resources in non-HTML formats, such as PDF files and database records. The project has licensed the software and made it available to all state agencies.

The Legislative Indexing Vocabulary (LIV) developed by the Library of Congress is being customized and used to index documents. The value of using a thesaurus will be evaluated in the cost benefit analysis. A thesaurus can be defined as "a controlled vocabulary that leverages synonymous, hierarchical, and associative relationships among terms to help users find the information they need." The value of a thesaurus stems from the inherent problems of natural language indexing and searching. Different users define the same query using different terms. Document authors, indexers, and information architects describe the same concepts using different terms. To address this problem, a thesaurus maps variant terms (synonyms, abbreviations, acronyms, and alternate spellings) to a single preferred term for each concept. For document indexers, the thesaurus tells them which index term must be used to describe each concept. This enforces indexing consistency. For users of the Web site, the thesaurus works in the background, mapping their keywords to the single preferred term, so they find the complete set of relevant documents. A background report on thesauri has been included in **Best Practice Guidelines for Web Metadata**, and is also available at: http://bridges.state.mn.us/bestprac/reports.pdf.

Spring 1999   As of July 1, 1999, metadata tags have been added to over 4,300 web pages. This represents nearly 50% of the web pages that were identified as metadata candidates. The following agencies' web sites have metadata: MDA, DNR, DOT, MN Planning, LMIC, and OEA.

Fall 1999   As of October 1, 1999, metadata tags have been added to nearly 7,000 web pages. In addition the agencies mentioned above, metadata has been added to Health's web pages as well as DOT's remote servers. Approximately 80% of the web pages in the Foundations Project have been examined for adding metadata.

Winter 1999   A TagGen organizational site license was purchased, to allow anyone in the state to apply metadata in a consistent manner. Each training session included download information and basic TagGen guidelines. This information is available in the training manual section of **Best Practice Guidelines for Web Metadata** as well as at http://bridges.state.mn.us/bestprac/training.pdf.

April 2000   Metadata statistics for the eight EQB agencies involved in the Foundations Project and the Metropolitan Council appear below. Nearly all of the web pages on these agencies web sites were examined for appropriate application of metadata. Metadata was added to the most relevant pages for user queries, allowing the user to link to lower level pages as necessary. Approximately 53% of the web pages examined contain metadata.

Foundations Project Metadata Statistics April 2000	
Agency	Total Pages
Department of Agriculture	1,799
Department of Transportation	1,888
Department of Natural Resources	1,022
"Bridges"	18
Minnesota Planning and the Land Management Information Center	2,271
Department of Health	752
Department of Public Service (now part of the Department of Commerce)	
Office of Environmental Assistance	309
Metropolitan Council	1,128
Pollution Control Agency	
Board of Water and Soil Resources	
Total pages with metadata	9,187

It is well to note that there are three agencies without metadata from this project. All agencies involved in the project were assessed for metadata except the Pollution Control Agency. The Board of Water and Soil Resources and Department of Public Service have small websites, which were developed during the course of the project.

Result 5. Search tools that provide effective and efficient access to heterogeneous, distributed text and data resources tested and implemented.

A primary outcome of this project is the identification and implementation of tools that facilitate data and information searches across all participating agency resources. The goal is to design an interface to catalogs, or databases, and indexes that make simultaneous multiple agency search and retrieval transparent to the user. The public will be able to search across environmental agencies using an intuitive search engine interface. In addition, community discussions and web conferencing forums will be tested as a means to deliver and solicit information from the public.

Revised Budget: $140,650
Balance: $ -0-
Completion Date: June 30, 2000

Task	Results	Staff	Due Date
Evaluate, select and test potential search engines (e.g. Harvest, HTDig)	Briefing paper documenting search tools available that meet criteria for project.	PC, MS	10/31/98
Define requirements, design, build, install, configure, test, implement	Operational search engine implemented at Foundations web site.	PC, WA	10/31/98
Test web conferencing and online forum capabilities	Prototype web forum with targeted user groups.	PC, WA	06/30/99
Conduct usability tests	User validation of search tools.	OC	06/30/00

Activity Status

Summer 1998   Search engine selected and implemented
The project team received significant assistance in the testing and evaluation of web search engines from Stephen Lime, DNR web applications programmer. Research resulted in the selection of Ultraseek Server from Infoseek Corporation. A site license to index 100,000 documents was secured for $47,000, and the web sites of participating agencies were "spidered" and indexed. It is now possible to find environmental information from multiple agency web sites by performing *a single search*. The search interface is on the web at: http://bridges.state.mn.us.

During this same period, the Minnesota Office of Technology (OT) was also investigating search engine options for the North Star web site. As a test, the Foundations project team used the Ultraseek Server to index all web sites in the Minnesota state web domain, and presented the results to OT. Staff determined that this would meet North Star's needs and agreed to fund extension of the document license from the original 100,000 documents to 250,000 documents.

An Interagency Agreement between OT and the DNR stipulates that DNR will:
(1) purchase, install, configure, maintain and host the State of Minnesota license for the Ultraseek search engine to a total page count as funded by OT;
(2) provide custom search engine programming and updates of the search engine;
(3) provide technical support for the maintenance of the search engine;
(4) specify, purchase, configure, install and maintain the host server for the Ultraseek search engine, including hardware and software upgrades, to the level funded by OT; and
(5) provide OT with access to metadata tools.

In consideration of these services, OT will:

(1) publish a guideline establishing Ultraseek as the search engine for North Star searches within the domain state.mn.us, consisting of MN state government entities;

(2) provide funds for the purchase of a host server (search.state.mn.us) ($20,000);

(3) provide funds to upgrade the Ultraseek search engine ($42,750);

(4) provide funds annually for the Ultraseek maintenance license ($12,000); and

(5) provide funds to cover host server administration costs ($2,000).

Fall 1998

The Foundations Project was asked by the Infoseek Corporation (now Ultraseek Corporation) to help develop and test a new product called the Content Classification Engine (CCE). This software automates the process of categorizing documents by theme according to rules established by the system administrator. OT financed an upgrade of the state's Ultraseek license to Ultraseek Server v 3.0 with CCE ($23,750).

Spring 1999

In June 1999 a separate server was installed to facilitate administration and functioning of Ultraseek and of CCE. Foundations Project staff have been developing CCE for the North Star search site, thus for the entire State of Minnesota. The most complete piece is the Environment and Ecology topic, which will also reside on the Bridges search site. Completion of the first release of CCE on North Star is expected in July 1999.

November 1999

CCE was completed and made live on the North Star search site. Now all topics are well-populated and return excellent search results, without the need for keyword searching. However, keyword searching can be incorporated within any of the nearly 600 topics in the CCE hierarchy. Log reports show heavy usage of the topics in CCE. In addition, some agencies, including Health and Transportation, are interested in having their topic implemented on their customized search interfaces.

Spring 2000

Over 30 search interfaces have been provided to individual agencies. This allows for a seamless way of searching within the state on Bridges, North Star, or specific agencies. Efforts are underway to work with Ultraseek on providing discounted search interface licenses for Intranet sites for individual agencies.

Summer 2000

North Star search receives on the average 8000 hits per day. Since North Star encapsulates Bridges, the work done to make Bridges so effective is readily available to all who use North Star, thus exceeding by far the original aim of the Foundations Project.

Result 6. Search and retrieval of spatial data integrated in catalog and search environment developed in results 4 and 5.

The GIS user community in Minnesota has developed, adopted and is using metadata standards applied to public geographic data. Search and retrieval mechanisms that rely on metadata are currently being developed to provide access to these data. This activity will ensure 1) proper integration of spatial metadata systems, 2) proper integration of spatial and non-spatial metadata systems through the creation of a standards cross-walk, 3) user access to data and information as a result of searches, and 4) development of procedures and instructions so that future participants are properly informed on how to participate in an expanded network of data access providers. FTP servers, including those that already exist, will be set up to allow testing of data search and retrieval across platforms.

Revised Budget: $ 86,725
Balance: $ -0-
Completion Date: June 30, 1999

Task	Results	Staff	Due Date
Select and install hardware and software for FTP demonstration site, and populate site with test data	FTP server solution researched, selected, purchased, and populated for testing.	DNR	01/31/99
Design Internet access interface	Prototype interface for spatial data queries.	DNR	02/15/98
Develop cross-walk between MN geographic metadata guidelines and the Dublin Core metadata standard	Map showing the relation between geographic data description guidelines and description guidelines for other types of information.	MS	04/15/99
Test information retrieval search engine against FTP server	Cross platform information retrieval including access to geographic data.	PS	06/30/99

Activity Status

November 1998 **Dublin Core - GIS metadata cross-walk work underway**
A cataloger joined the project for three months to assist in the development of a cross walk between the Minnesota GIS metadata standard and the Dublin Core.

December 1998 Host server was specified and purchased for delivering GIS data via File Transfer Protocol (FTP). The server will be installed and configured January 1999.

Spring 1999 In April 1999, the "GIS Data Deli," an Internet-based GIS data delivery system, was implemented. The system allows users to download large quantities of DNR GIS data for inclusion in their own GIS databases. Users can select one or more data layers, and specify an area of interest on an index map. The system determines which data meet the request criteria and reports the results to the user, who then can select the data they would actually like to acquire. The Data Deli

bundles the data into a PKZIP archive and provides the user with a link to download the resulting data package. The site also includes a complete suite of metadata that includes full format Minnesota Geographic Metadata Guideline records, plus full attribute table format descriptions and data samples. The Data Deli is free of charge and located at: http://deli.dnr.state.mn.us.

Statistics for the Data Deli: 1) 7.4 Gb of data in compressed PKZIP archives (approximately 11 Gb when converted to direct-use format); 2) 9,700 individual data files; 3) 40 GIS layers, including complete statewide coverage of National Wetlands Inventory (NWI), Land Use-Land Cover, Digital Raster Graphics (DRGs), Digital Elevation Models (DEMs), and Major/Minor Watershed Delineations at scales of 1:250K, 1:100K.

June 2000   The DNR Data Deli has been in production for over a year, and is functioning well as a major Minnesota GIS data acquisition site. GIS data transfer statistics for the month of June 2000 demonstrate the level of usage that the Data Deli is currently enjoying. During June, one-thousand six-hundred and twenty-four data bundles were transferred to Deli users with an average bundle size of 15.5 Mb, resulting in approximately 25 GB of data downloaded. Adjusted for lower usage on weekends, June statistics also showed nearly sixty-five data bundles being acquired from the Data Deli on a typical working day. Data Deli clients are a varied group. In the month of June, 20 percent of the clients were private commercial users, 12 percent were federal government sites, 11 percent were from education institutions, and 9 percent included a variety of government organizations (including Minnesota State agencies). An additional 34 percent could not be characterized because their internet addresses were numeric or otherwise non-interpretable. The remaining 14 percent included a mix of non-profit and international organizations. Comments submitted to the site are consistently positive and complementary.

Result 7. Blueprint for integrated and distributed discovery and retrieval of environmental information resources created.

The project will produce a blueprint for improving discovery and retrieval of environmental information resources based on the findings of research, testing and experimentation in the activities outlined above. The blueprint will specify standards for describing and indexing web accessible electronic data and information; promote use of standards in design of agency web sites; and assess barriers to implementation of the blueprint. The blueprint will be reviewed by the Office of Technology as a guide for interagency technology investment decisions. A series of briefing papers will be written documenting issues, options considered and decisions made. A project demonstration web site will be developed early to prototype information retrieval tools, communicate progress and solicit feedback.

Revised Budget: $15,680
Balance: $ -0-
Completion Date: June 30, 2000

Task	Results	Staff	Due Date
Adopt information access principles (Information Policy Task Force)	Principles for information access adopted, and implemented by environmental agencies.	AC	06/30/99
Adopt metadata standards	Standards for electronic resource description adopted, publicized and implemented.	AC	10/31/98
Build a keyword thesaurus	Authority list of keywords for electronic resource description developed and available to agencies.	MS, MC	12/31/98
Create a project web site: purchase server, design interface, and populate	Web site for prototyping applications and communicating project information.	PC, WA	12/31/98
Write "blueprint" based on testing and demonstration project findings	Blueprint for environmental information retrieval adopted, approved and publicized.	PC, PM	12/31/99

Activity Status

May 1998   **Project web site - Bridges - online at http://bridges.state.mn.us**
The logo and framework for the project web site - Bridges - was designed and implemented in May. Project reports, guidelines and standards were published. The web site provides an ongoing means of communication.

June 1998   **Metadata research conducted**
Project staff conducted a review of options for describing digital resources, and attended a workshop, "Understanding and Using Metadata," at the OCLC Institute in Dublin, Ohio, June 15-17. The emerging Dublin Core (DC) metadata standard was the focus of the workshop.

Metadata is information that *qualifies* other information – it is information *about* information. An everyday example is a library catalog record that provides information (data such as title, author, date, publisher, etc.) about a book (the source data). On the web, metadata pertains to the data elements used to describe digital resources, such as a page of text, a scanned image, a digital photograph, a PDF file, a computer graphic, a video or sound recording, or a database record.

The purpose of metadata is to improve information discovery. It can be coded in an HTML document and displayed in a web browser (e.g. *View - Page Source* option in Netscape, or *View - Source* option in Internet Explorer). Search engines use metadata to make information retrieval more precise.

The DC metadata standard is the result of an international and interdisciplinary effort to define a core set of elements for digital resource discovery. It was developed by a consortium of librarians, computer scientists and Internet developers over a two year period beginning in March 1995, in Dublin, Ohio - hence the name. Subsequent workshops were held in Warwick, England (April 1996); Dublin, Ohio (Sept 1996); Canberra, Australia (March 1997); and Helsinki, Finland (October 1997). Sponsors include the National Center for Supercomputing Applications, National Science Foundation, Coalition for Networked Information, OCLC, UKOLN in the U.K., the Australian National Library, the National Library of Finland, and many others.

At the last meeting in Helsinki, about 70 workshop participants agreed to the following set of fifteen data elements as the Dublin Core - Content Elements: Title, Subject, Coverage, Description, Type, Relation, and Source; Intellectual Property Elements: Creator, Contributor, Publisher, and Rights; Instantiation Elements: Date, Format, Identifier, and Language.

September 1998   **Metadata standard adopted and training session held**
The proposed Minnesota Metadata Guidelines - Dublin Core (MMG-DC) are based on the international DC standard. Cooperators attending the September meeting adopted this as the metadata standard for the project.

As described in Result 4, the Legislative Indexing Vocabulary (LIV) was selected as the standard thesaurus. It is being customized to meet the unique needs of Minnesota environmental agencies, and will be an important part of the blueprint.

Staff conducted a metadata workshop for 14 project catalogers and cooperators September 22. Participants learned how to use TagGen to generate DC compliant metadata, and to assign subject terms to documents from the LIV-MN Thesaurus. The metadata workshop has been offered many times since, according to demand.

Winter 1998-
Spring 1999   **Training sessions update**
The Foundations Coordinator has held training sessions monthly from January through June 1999 for interested metadata staff and web page creators. Demand has been quite high from cooperating agencies, and sessions will continue to be held monthly throughout the remainder of the project as a way of ensuring continued progress beyond the duration of the project.

Summer 1999-
Summer 2000   **Training sessions continued**
High demand continued for the hands-on training sessions. Foundations Coordinator trained over 150 web page creators in the application of metadata. Training booklet was developed for trainees to continue the learning process. This booklet can be found in **Best Practice Guidelines for Web Metadata**, as well as at http://bridges.state.mn.us/bestprac/training.pdf.

June 2000 **Best Practice Guidelines for Web Metadata created**
Creating a Blueprint for best practices has been an important goal of the Project
since its inception. These practices are based on the two years of experience in
the successful application of project principles, as well as usability studies results.
Best Practice Guidelines for Web Metadata can be found on the Bridges site at:
http://bridges.state.mn.us/bestprac/ which links to the components.

Result 8. Outreach and communications plan.

An outreach plan will be developed to communicate and promote project results. The plan will
include the creation of publicity materials and workshops aimed at a variety of target information
consumers as well as the general public (e.g. high schools, colleges and libraries). Workshops
will be held throughout the state to ensure the widest possible audience. In addition, workshops
will be held to advance awareness and use of metadata and standards in state government.

Revised Budget: $50,525
Balance: $ -0-
Completion Date: June 30, 2000

Task	Results	Staff	Due Date
Develop outreach plan to inform the public and key information seekers	Opportunities to widely publicize the project results will be identified and put to use.	PC, OC	12/31/99
Develop workshops, training and outreach materials	People will be knowledgeable about the system designed and will be encouraged to use it.	PC, OC	12/31/99
LCMR field tour demonstrations	LCMR members knowledgeable about project.	PC, PM	06/30/99

Activity Status

July 1998 **Article published - Minnesota Library Association newsletter**
Mlecoch and Quam coauthored an article on metadata for the MLA Newsletter.

September 1998 **Presentation - American Society for Information Science (ASIS)**
Mlecoch and Quam made a presentation on metadata and the project to the
Minnesota Chapter of ASIS/SLA.

October 1998 **Press release**
A press release, "Bridges: Minnesota's gateway to environmental information,"
was sent to all major news outlets in the state. The Pioneer Press selected Bridges
as a hot site (10/05/98) and MN Online "Uffda" web site highlighted it.

Presentation - Minnesota Library Association (MLA) Annual Conference
Quam spoke about the project at an MLA workshop titled, "Metadata is in your future," and also participated in the Capitol Area Library Consortium (CALCO) workshop, "Underneath the covers: finding practical information on state agency websites," later published in the MLA Newletter.

November 1998 **Interview - American Libraries (American Library Association)**
Quam was interviewed by the editor for the January 1999 article titled, "Organizing the Internet: The Core of the Challenge."

Press Conference - Ultraseek Content Classification Engine (CCE) Launch
Quam spoke at the press conference as a participant in the CCE product beta tests.

Presentation - Computer & Information Technology Symposium
Quam partnered with Robert Horton, Minnesota Historical Society, in a workshop titled, "Using metadata to find, share and manage relevant information."

Solicitation - Journal of Government Information
The Journal of Government Information provides a forum for the publication of scholarship on policy, practice, new developments, and history of the distribution, processing, and use of information at all levels of government. Debora Cheney, Associate Editor, has invited us to contribute an article on the Foundation project. In her words, "the idea of cataloging web sites needs to be discussed a lot more in the literature."

Presentation - Governor's Council on GIS - Standards Committee
Quam presented information on the relationship between the Dublin Core, the MN GIS Metadata Standard, and use of a thesaurus.

December 1998 **Presentation - Legislative Reference Library**
Quam presented information on metadata and the project to LRL staff and web team.

Presentation - Statewide Network Access Project (SNAP Committee)
Quam presented information on metadata and the project to SNAP.

November 1998 **Interview - American Libraries (American Library Association)**
Quam was interviewed by the editor for the January 1999 article titled, "Organizing the Internet: The Core of the Challenge."

February 1999 **Exhibitor's table - American Society of Information (ASIS) Internet Fair**
Quam set up and staffed an exhibitor's table demonstrating Bridges and CCE at the ASIS Minnesota chapter Internet Fair.

March 1999	**Invitation - Government Information Locator Service (GILS) Workshop** Quam participated in a 2 ½-day workshop that brought together state-level metadata project coordinators (3/22-24/99).
April 1999	**Presentation - Wisconsin Association of Academic Librarians Annual Meeting** Quam presented information on metadata and the project to WAAL participants. **Presentation - Intranets '99 Annual Conference** Quam presented information on the Content Classification Engine (CCE) at the Intranets '99 conference. **Presentation - Ultraseek User Group Meeting** Quam presented an in-depth look at topic development on CCE at the all-day Ultraseek User Group meeting (4/29/99). **Presentation - Enhancing Quality Staff (EQS) Workshop** Quam and Zuriff presented information on the project and metadata at the EQS workshop, hosted by the University of Minnesota. Quam also participated in a panel on contract cataloging and outsourcing.
June 1999	**Presentation - Department of Health - Environmental Health** Quam presented information on metadata and the project to the Department of Health's Environmental Health web team. **Invitation - Minnesota Historical Society Metadata Seminar** Quam participated in an all-day seminar designed to bring together key people in state government with an active interest in promoting metadata. **Presentation - City of Minneapolis Intranet Task Force** Quam presented information on metadata, the project, and web site development to the City of Minneapolis's Intranet Task Force.
October 1999	**Presentation - Minnesota Library Association (MLA) Annual Conference** Quam participated in a panel discussion on independent contracting at the MLA annual conference.
January 2000	**Presentation - State of Minnesota DIG-IT Group** Quam presented on North Star's topic tree, developed via Ultraseek's Content Classification Engine.
March 2000	**John R. Finnegan Award Received** The Foundations Project and Bridges website received the Freedom of Information Day Award for accomplishments in providing easy and reliable access to environmental information, and for "setting the groundwork for even more accessible state government information on the web in coming years."

Presentation - Art Libraries Society (ARLIS) Annual Conference
Quam presented on development of topic tree hierarchies for Ultraseek's Content Classification Engine and the role of metadata in topic rules.

Invitation - State GILS Conference
Bob Horton, Minnesota State Archivist, attended the GILS conference on behalf of the Foundations Project, and presented on the status of the Foundations Project, the metadata usability study in particular.

June 2000   **Interview - Government Technology Magazine**
Quam was interviewed by the editor for a forthcoming article on portals.

V. Context

A. Significance. This project addresses a fundamental need for public access to data and information about Minnesota's environment and natural resources. Such information underlies a wide range of decisions -- from determining public policy on protection of rare species, to identifying where one might go fishing or camping this weekend. By developing and applying common standards for describing, indexing and accessing environmental and natural resource information, this project will improve every citizen's ability to discover and retrieve information specifically relevant to his or her particular interests in a single, comprehensive search of government information resources.

The project blueprint, designed collaboratively by the key producers and stewards of environmental information in Minnesota, will serve as a guide to integrating existing and future initiatives concerned with delivering electronic data and information. Though most state agencies have begun to develop solutions to data access, often through world wide web sites, this project is needed to ensure that these efforts work together effectively to serve the public. The ultimate goal is to design an intelligent information retrieval system, based explicitly upon consumer identified information needs and intuitive approaches to information search and retrieval. The blueprint will complement Office of Technology information resource management requirements that focus on information technology planning within individual agencies, but which do not address planning for information systems that cut across agencies.

B. Time. Work funded by this appropriation will be conducted between July 1997 and June 2000, pending approval of the appropriation extension. Beyond completion of the project, the resulting blueprint will serve as a guide for projects and initiatives of agencies that deal with access to environmental and natural resource information and data.

C. Budget Context. This project is the first effort to develop a comprehensive approach to delivering natural resource and environmental data and information to the public. Previous expenditures have focused on individual agency web site development.

	July 1995-June1997 Prior expenditures on related projects	July 1997-June 1999 Proposed expenditures on this project	July 1999-June 2001 Future expenditures on this project
LCMR	$360,000 *	$650,000	
Other State		$250,000 **	$250,000 **
Non-State	_____	_____	_____
Total	$360,000	$900,000	$250,000

* The LCMR recommended and the legislature appropriated $360,000 in FY97 to the DNR for a joint project with the PCA to begin development of a system for "Public Internet Access to Data and Information."
** Success of the project will depend on in-kind contributions of staff time from participating agencies, both during the LCMR project years and into the future.

Budget Summary (Budget and expenditures detail attached)

Item	Budget	Percent
Project Staff	$389,175	60%
Supplies/Software	$120,700	18%
Equipment	$100,600	15%
Printing/Outreach	$ 500	< 1%
Contract Services	$ 22,650	3%
Staff Training	$ 2,850	< 1%
Travel/Outreach	$ 13,525	2%
Total	$650,000	100 %

VI. Cooperation. The following government organizations are cooperators for various aspects of the project. Most have expressed a commitment to participating in its design and implementation. All will be made aware of project activities and encouraged to participate.

Environmental Quality Board	Mike Sullivan
Forest Resources Council	Lloyd Wagner*
Governor's Council on Geographic Information	Fred Logman
Legislative GIS Office	Lee Meilleur
Board of Water and Soil Resources	John Liners, Eric Mooring
Department of Agriculture	Larry Palmer, Karen Nelson*
Department of Health	Denton Peterson
Department of Natural Resources	Les Make, Robert Make
Department of Public Service	Susan Kosowski
Department of Trade and Economic Development	John Rajkowski
Department of Transportation	Marjorie Casey
Land Management Information Center	David Arbeit, Chris Cialek
Metropolitan Council	Rick Gelbman
Minnesota Historical Society*	Robert Horton*

Office of Environmental Assistance   David Cera,* Glenn Meyer*
                                                                     Matt Comstock*
Office of Technology   Dawn Igoe*
Pollution Control Agency   Ed Meyer
University of Minnesota, College of Natural Resources   Thomas Burk
University of Minnesota, Machine Readable Data Center   Wendy Treadwell
*Cooperators changed or added since original work plan.

VII. Location. Statewide significance.

VIII. Reporting Requirements. Periodic work program reports will be submitted during the biennium at project milestones. The first report will be submitted October 1997. Others are planned for no later than December 31, 1998, December 31, 1999, June 30, 1999, or as required by LCMR. A final work program and associated products will be submitted June 30, 2000.