



## Minnesota Geospatial Information Office

---

Department of Administration  
300 Centennial Building  
658 Cedar Street  
St. Paul, MN 55155  
Voice: 651.201.2499  
Fax: 651.296.3698

# NSDI Cooperative Agreements Program Category 5 2008

---

*Building Minnesota Structures Data Stewardship  
for The National Map and the NSDI*

*Final Report*

**John Hoshal and Fred Logman**

**2/26/2010**



**Date:** 02/26/2010

**Agreement Number:** 08HQAG0062

**Project Title:** Minnesota Structures Collaborative – An Initiative to Support the National Map and NSDI

**Final Report:** 6/1/2008 through 11/30/2009

**Organization:** Minnesota Geospatial Information Office (formerly the Land Management Information Center)

**Principal Investigator:** John Hoshal, LMIC GIS Services Supervisor, Minnesota Geospatial Information Office (MnGeo), Minnesota Dept. of Administration, 658 Cedar St., Suite 300, St. Paul, MN 55155, Tel: 651-201-2482, E-mail: [john.hoshal@state.mn.us](mailto:john.hoshal@state.mn.us), Web: <http://www.mngeo.state.mn.us>.

**Collaborating Organizations:** Principal Organization: Minnesota Governor's Council on Geographic Information - Emergency Preparedness Committee (GCGI-EPC), GCGI-EPC Co-chair: Steve Swazee, C/O Land Management Information Center (LMIC), 658 Cedar St., Suite 300, St. Paul, MN 55155, Tel: 651-456-5411, E-mail: [sdswazee@earthlink.net](mailto:sdswazee@earthlink.net), Web: <http://www.mngeo.state.mn.us/committee/emprep/index.html>

**Other Organizations:** Minnesota Department of Public Safety – Homeland Security and Emergency Management Division, ([www.hsem.state.mn.us](http://www.hsem.state.mn.us)), MetroGIS ([www.metrogis.org](http://www.metrogis.org)) and the Department of Natural Resources – Firewise Program ([www.dnr.state.mn.us/firewise](http://www.dnr.state.mn.us/firewise)).

**USGS Geospatial (State) Liaison:** Ronald Wencil, USGS - National Mapping Division, 2280 Woodale Dr., Mounds View, MN 55112, Tel: 763-783-3207, E-mail: [rwencil@usgs.gov](mailto:rwencil@usgs.gov)

**Data themes:** Structures – Minnesota schools, hospitals/clinics, police stations and fire stations

## Table of Contents

|  |    |
|--|----|
| Executive Summary .....  | 5  |
| Project Narrative .....  | 5  |
| A. Project Description, Tasks, Challenges and Accomplishments .....                        | 5  |
| Highlights of Project Activities and Accomplishments .....                                 | 6  |
| Project Activities .....   | 7  |
| B. Structures Data Content.....  | 9  |
| C. Structures Data Maintenance.....  | 10 |
| D. Observations and Lessons Learned .....  | 15 |
| E. USGS Partnership.....   | 17 |
| Cooperative Agreements Program - Feedback .....  | 18 |
| Appendix A: Minnesota Structures Collaborative – Project Participants.....                 | 19 |
| Appendix B: Minnesota Structures Collaborative – Project Brochure.....                     | 20 |
| Appendix C: Minnesota Structures Collaborative – Project Meetings / Outreach .....         | 22 |
| Appendix D: Minnesota Structures Collaborative – Existing Integration Systems Review ..... | 24 |
| Appendix E: Minnesota Structures Collaborative – Sample 10K Maps.....                      | 30 |
| Appendix F: Minnesota Structures Collaborative – PowerPoint Project Overview.....          | 31 |

## Executive Summary

The Minnesota *Structures Collaborative* CAP initiative was designed to support The National Map, National Spatial Data Infrastructure, and emergency response programs. It includes the development of state and local government partnerships and the technical capacity to support the collection, publication, and long term sustainable maintenance of four critical structures GIS layers: schools, hospitals, police and fire stations.

The project team consisted of staff from the Minnesota Geospatial Information Office (MnGeo) and volunteers from the Minnesota Governor's Council on Geographic Information's Emergency Preparedness Committee (EPC). A complete listing of participants can be found in Appendix A. Members worked to gather available structures data and develop the technical capacity to support the statewide aggregation, editing, and publication of the four structures layers.

Accomplishments include:

- Assessment and standardization of existing structures data (national and state), including attribution, with capacity to add new data and integrate with The National Map.
- Development of a *MnGeo Structures Collaborative* prototype web-based map interface that includes editing and geospatial data entry tools.
- Creation of FGDC and MN State compliant metadata records.
- Creation of a statewide geospatial map library of structures based on a 10K USNG grid.
- Establishment of strategic relationships with state and local data contributors and stewards.

Project activity will continue after the grant period to test and update the *MnGeo Structures Collaborative* application, formally establish data authorities and custodians, identify and build operational processes between federal, state and local government, and promote integration of structures data that will support The National Map.

## Project Narrative

### **A. Project Description, Tasks, Challenges and Accomplishments**

MnGeo and its project partners sought to develop strategic partnerships and the technical capacity for the statewide collection, publication and long term, sustainable maintenance of four types of structures: schools (public/private), hospitals/clinics, police stations and fire stations. It intended to leverage a MetroGIS initiative underway in the Twin Cities metropolitan area to collect critical, local infrastructure data from regional, county and city sources and extend that collaborative model statewide. The proposal also sought to leverage several other successful state/local/federal partnerships, including Firewise Minnesota, a program with national roots that

includes the on-going collection of a wide variety of structures data for a large portion of the state based upon its Critical Infrastructure Assessment Protocol.

Project goals included the following:

- Identification of existing public/private GIS resources in Minnesota for structures data.
- Identification of custodians of the most accurate and complete versions of schools, hospitals/clinics, police stations and fire station locations.
- Determination of minimum attribution requirements for each data type, including attributes that may not be publicly available due to national security concerns.
- Documentation of data using FGDC and Minnesota metadata standards.
- Harvesting of available data and an assessment of its resolution, accuracy, completeness and currency.
- A recommendation for a stewardship program for each structure type that provides for its yearly update, long-term maintenance and availability, with an emphasis on engaging local government in the process.
- Publication of the structures data for public consumption through existing federal and state data clearinghouses, portals and web services.

## Highlights of Project Activities and Accomplishments

### *Outreach*

- Significant effort was made to communicate and build relationships with state and local data contributors and establish data stewards.

### *Data Technical Design*

- Assessment and standardization of existing structures data (national and state), including minimum attribution, capacity to add new structures data and integrate with The National Map. EPC volunteers completed their data review and harmonization with federal (HSIP, National Map, HAZUS, etc.) and state data holdings. This required a considerable amount of effort but we now have a better understanding of current federal, state, local and discipline-related data bases and their associated attributes.
- From this research, the EPC developed a “Minnesota” data schema for each of the grant’s data sets (hospitals, fire stations, police stations and schools).
- Starting with the original (HSIP Freedom and Mn Department of Education) data’s schema, each data set has been modified to meet the “Minnesota” design and ported to

the Minnesota Structures Collaborative Online System<sup>1</sup> web-mapping review and editing application.

- MnGeo and EPC members completed the creation of a suite (over 2,000 maps) of 10K standardized maps for the entire state based on the U.S. National Grid (USNG). These maps include the location of CAP structures data (schools, hospitals, fire stations, police stations) – where it exists – and is available for download via a ftp site hosted by MnGeo. They will also be accessible via the SharedGeo CAP Structures application. Its geospatial driven map library will allow individuals to select, view, and print U.S. National Grid (USNG) map products for anywhere in the state.

### *Web Tool Development*

- The successful development of a *Minnesota Structures Collaborative Online System* prototype web-based map interface application. This is a **prototype**, geospatially driven, structures editing tool that will allow communities to review, update, and add location and attribute data for structures in their community or region. It will be made available to EPC members and select emergency managers for review and comment.

## Project Activities

### *Outreach*

The outreach activities were focused on identifying partners to view and validate data, test the prototype application and provide feedback that can be used to develop on-going operational capacity. These efforts served to inform participants of the many functions and benefit that geospatially enabling various data and functions can provide. The project team has seen an increase in the geospatial thinking of many of the project participants and contacts as well as their awareness of the importance of structures data. The project has also increased the awareness of the National Map and the roles that the State and local governments have in making it a reality.

To promote the project and on-going efforts a tri-fold brochure (Appendix B) was developed and has been used as a hand out at several meetings and conferences. Additionally a PowerPoint Presentation<sup>2</sup> (Appendix F) with recorded narration was also developed to highlight the prototype web-based viewing and editing tool and the 10K USNG based structures maps that were developed and are described below. These communication tools will be used in the coming months to promote project activities, data vetting, identification of local data “authorities”, garner participation and to highlight the emergency management need for structures data.

---

<sup>1</sup> See - <http://www.mngeo.state.mn.us/committee/emprep/structures/index.html>

<sup>2</sup> See - [http://www.mngeo.state.mn.us/committee/emprep/structures/MS\\_C\\_Final\\_Embedded\\_19FEB10\\_sds.ppt](http://www.mngeo.state.mn.us/committee/emprep/structures/MS_C_Final_Embedded_19FEB10_sds.ppt)

## *Partnerships*

There were a number of project participants who directly and indirectly contributed data and expertise towards developing the *Minnesota Structures Collaborative Online System prototype* database from the Emergency Preparedness Committee<sup>3</sup>. Providing leadership and ongoing participation were volunteer professionals from the City of St. Paul, Dakota County, Minnesota Department of Transportation, Minnesota Department of Natural Resources, MnGeo, SharedGeo<sup>4</sup>, and the USDA. The project made extensive use of SharePoint and teleconferencing to enable a broader statewide participation. Outreach activities to promote awareness and garner the support of local and state emergency management and GIS personnel included several formal presentations, publications, and training sessions. These activities are summarized in Appendix C. To date, over 650 hours were contributed by EPC members to this project; MnGeo staff have contributed more than 350 hours.

## *Review of Existing Structures Integration Systems*

A number of existing local, state and federal web-based mapping programs were reviewed to determine if they could be used by this project for data collection, storage, editing and viewing. While none was found to meet project needs, collectively they were able to provide the criteria desired for creating a map interface with web-based tools to edit and map the structures data. Refer to Appendix D for a summary of systems reviewed. Key elements of these programs include:

- A common picture of geospatial information that assist emergency management organizations to plan for, respond to, and mitigate outcomes of natural and manmade disasters.
- Map-based tools enabling users to view, edit and evaluate data for accuracy and currency.
- Data standards that allow and promote vertical and horizontal geospatial data sharing and integration.
- Tools that are easy to use minimizing the need for training and support.
- A means to import and export data
- Compliance with existing standards.
- Ability to add additional structure types over time
- Search capabilities

---

<sup>3</sup> See - <http://www.mngeo.state.mn.us/committee/emprep/>

<sup>4</sup> SharedGeo a Minnesota Nonprofit see - <https://www.sharedgeo.org/Plone>

## *Recommendations*

Minnesota governments need to work toward having their business systems more spatially enabled. We also need to make the public base layer data they contain widely available through web based services that are accessed interactively in addition to users acquiring a copy or extract of a data set for their use.

The project team believes that a single tool and associated databases be found or developed that would be freely available and used by federal agencies, state and local governments for the collection, editing and viewing of structures data. The emergency preparedness and management community has begun to develop significant systems for their use. For federal emergency managers HSIP Gold is commonly used during emergencies. However, access to HSIP Gold and its data by state or local government is not allowed except in presidentially declared emergency. This restriction severely limits state and local review of the data. The project team supports recent federal efforts to reduce access restrictions to HSIP Gold. While the data has improved significantly over the past two years, Minnesota's experience during the 2009 floods in the Red River basin indicated that the HSIP Gold data is not as current or as accurate as needed. The project team also found inconsistencies in basic attributes between structure types in HSIP data. In many cases the state and its local units of governments have more current, accurate and extensive data. As the State and local governments do not have access to HSIP Gold, its data in not corrected. Having a single system and database that government agencies have access to should lead to better quality data for everyone. A single system and data source would also eliminate the issues and problems with vertical and horizontal data integration.

## **B. Structures Data Content**

The project team identified several potential GIS structures data sources for the four types of data being collected. Primary selection criteria were accuracy and completeness. In most instances the authoritative data source for a structure type is a state agency. However, most state agency structures data did not include spatial components. The project team also found that data standards for structures data in Minnesota were virtually non-existent. Through a collaborative review process, it was determined data selected to be used for this project would come from HSIP Freedom (police stations, hospitals, and fire stations). In consultation with MnGeo staff, TechniGraphicS, one of the HSIP Freedom developers, acquired much of their police station, hospitals and fire station data from the authoritative State agencies sources including the Department of Natural Resources (Firewise program), Department of Health and Department of Public Safety. The Department of Education provided schools data. TechniGraphicS has added a spatial component to the data they harvested for state data sources and standardized the format of the data so that it is very compatible across structure types. Department of Education schools data was spatially defined. Attribute data for each structures layer selected for this project were

standardized based on state and federal data guidelines and aggregated in the geo-database. The database is structured to support integration with the National Map, can be expanded to accommodate additional structures types, and contains FGDC and State compliant metadata records.

Because Minnesota participated in the collection of the three HSIP Freedom data elements, the data collected for this project will be available freely to anyone. Work is underway to publish the data in MnGeo's Data Clearinghouse. School locations are currently available through the Clearinghouse. No data was uploaded to the National Map as the project did not generate any significantly different data than what was passed by TechniGraphicS to federal agencies. MnGeo has a history of making unrestricted public data freely available. Further, for some highly sought after data, MnGeo develops, hosts and supports services to deliver data. MnGeo promotes, encourages and enables making state public data readily and freely available.

### C. Structures Data Maintenance

After its research, the project team determined that a viable web-based structures maintenance tool was not reasonable or freely available to the state and its local government partners. Further, MnGeo did not have the funding needed to license a product it and local government could use. Therefore, in order to meet the needs of the project, MnGeo contracted with SharedGeo, a local non-profit organization that had experience developing software for emergency management, to develop a prototype application.

#### *Web Based Editing Tool*

The project team strongly believed that an easy to use, web based tool was needed to promote and vet data by local "authorities". It also felt that to be accepted and used, the application needed to be available to users a no cost. The system would also need to be executable on a variety of PCs and operating systems. The *MnGeo Structures Collaborative* (<http://www.mngeo.state.mn.us/committee/emprep/structures/index.html>), a web-based mapping application with editing tools, was developed based on the underlying principals and functions of the programs evaluated by the team and additional criteria that they felt were important. Project time frame, budget and existing understanding of local needs did not allow for development of a full-featured production system, so a prototype web base tool was developed. The prototype was based on work previously done to meet emergency management needs and was funded by a FGDC 2005 grant - *Establishing Framework Data Services using the OGC Web Feature Service*. The application functionality includes:

- Ability to import and store data originating in standardized formats from other sources such as State business databases and federal systems.
- Location-based data entry and editing for physical building locations (points) on a map.

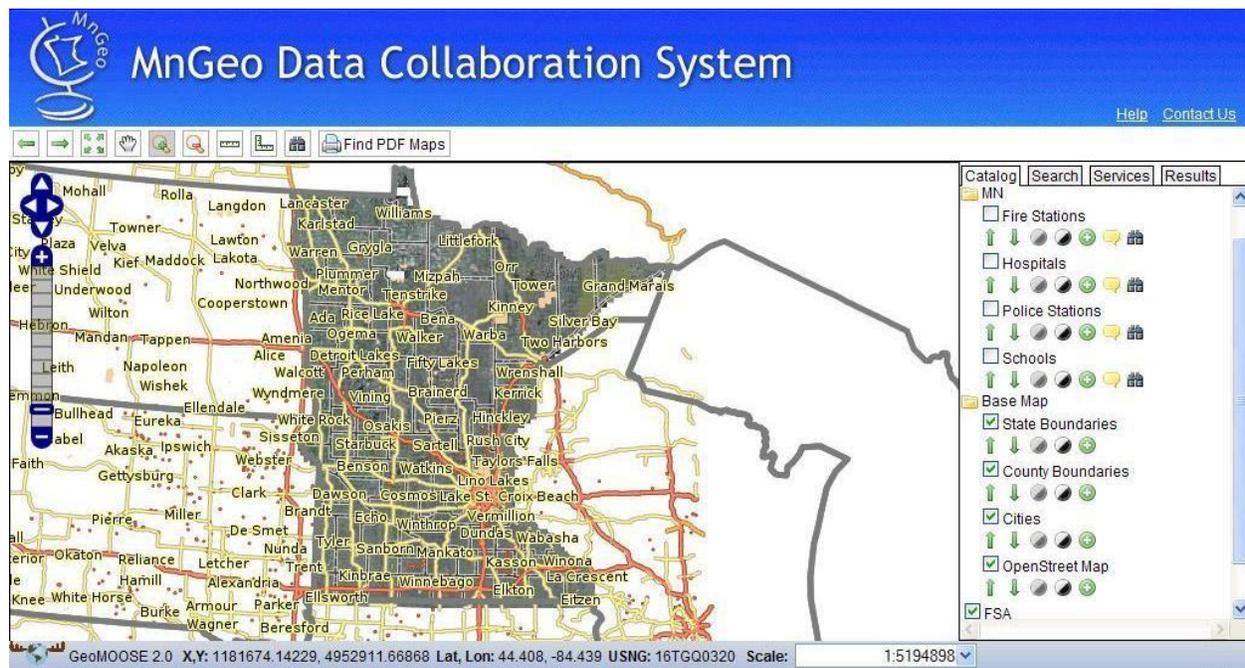
- Location-based query function using United States National Grid (USNG) coordinates, latitude/longitude, building address, or exact building name to identify a structure.
- The prototype uses a dynamic Minnesota map with zoom and pan functionality, background aerial imagery, roads and other transportation, and USNG. Other background layers can be easily added in the future.
- Integrated “Help” function and information.
- A structure editing function engaged by clicking a structure on a map, entering a building address, or exact building name, or picking a new point location for a new structure.  
Some of the common data elements include:

Entity Name  
 Physical street address  
 City  
 State  
 Zip Code  
 County  
 Type of structure  
 Geocoded location  
 GNIS Id  
 5 Digit County code (FIPS)  
 National Map Id. (which will promote aggregation to the National Map.)  
 For some structures, a GPS generated location

- A data publisher/maintainer tool for adding and maintaining compliant metadata associated with each particular structure type data layer.
- Minnesota and U.S. Geological Survey (USGS) compliant metadata.
- Track updates- when a change or update was made and by whom.
- A quality flag that allows users to indicate the quality of the data.
- A mechanism for users to provide feedback on the prototype.

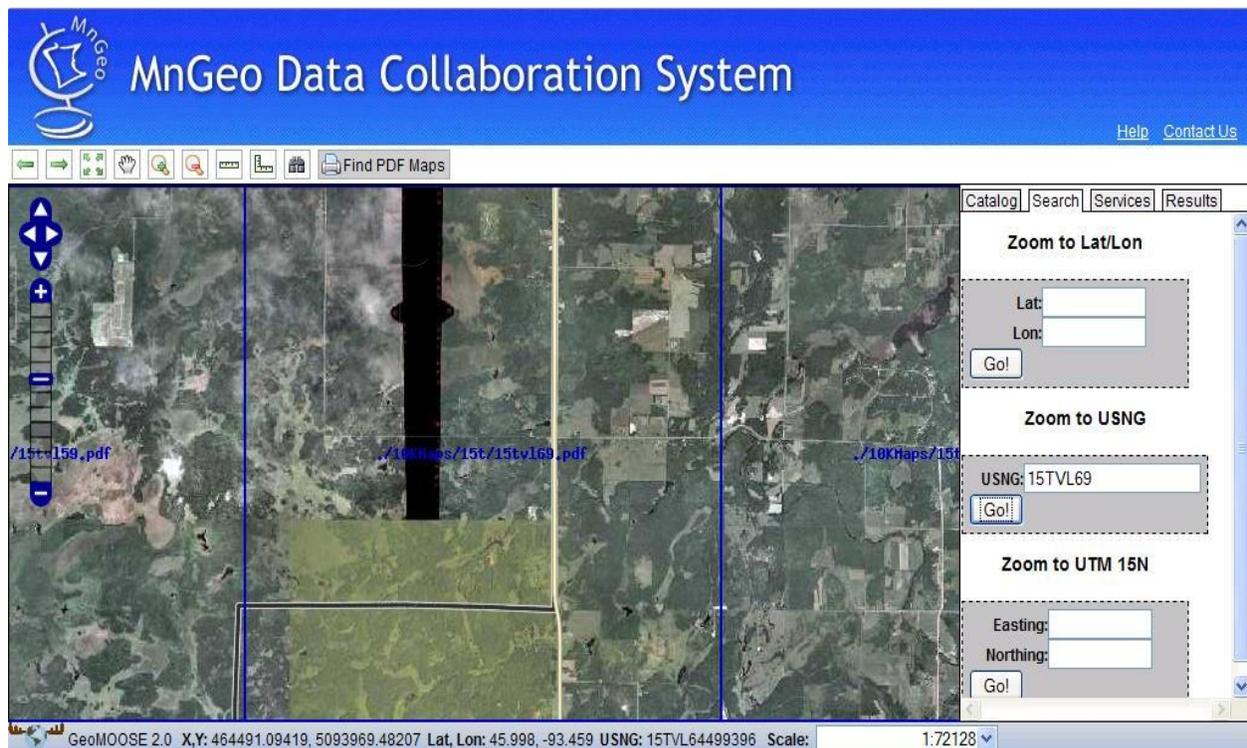
Figures 1 through 4 below illustrate some of the functions of the *MnGeo Structures Collaborative* prototype.

**Figure 1: Structures Prototype**



*The Structures prototype is a map interface that includes web-based mapping, editing, and querying tools. Base maps currently include 2008 FSA aerial photography for the entire state, 1 Kilometer and 10 Kilometer USNG lines, county and city boundaries, and streets. Future base layers may include hydrographic data, elevation data derived from LiDAR technology for the entire state, and other layers required for emergency management.*

**Figure 2: Find a PDF and Search Tool using USNG Coordinates**

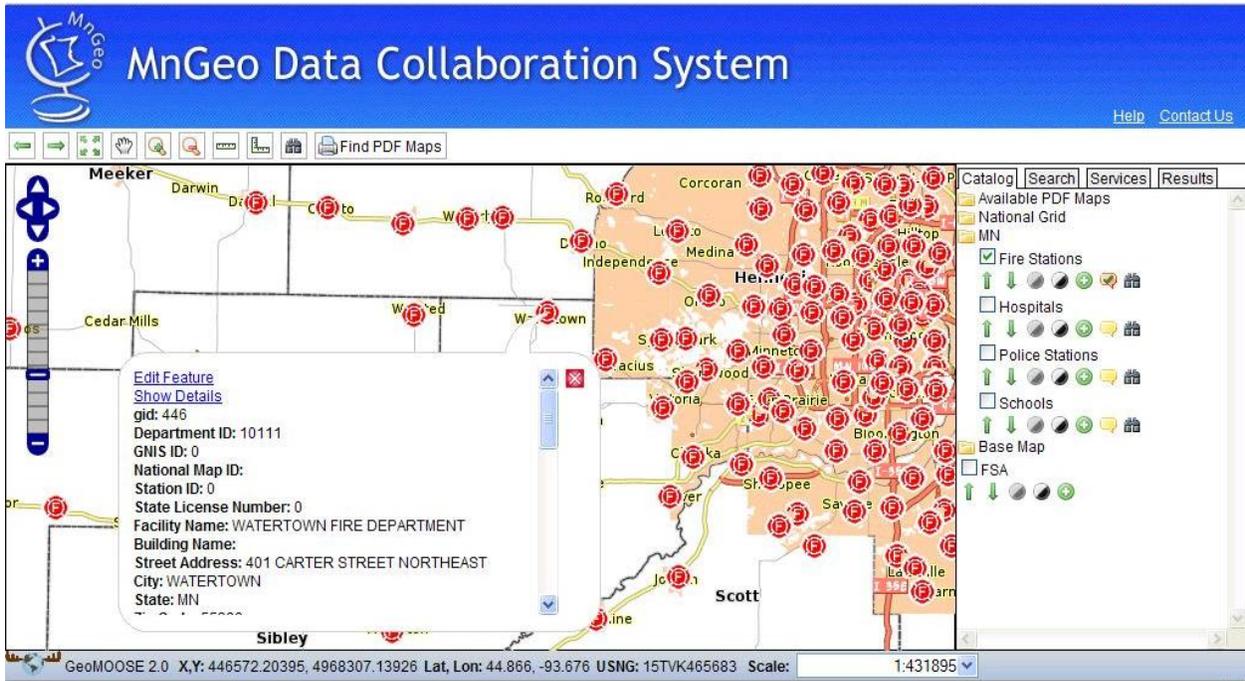


*The Find PDF Maps tool allows the user to find printable 10K USNG maps through various search tools. The base maps and structures data can be overlaid and the maps can be printed to scale. For more detailed instructions on how to use this MnGeo Structures Collaborative feature go to:*

[http://www.mngeo.state.mn.us/committee/empreg/structures/CAP\\_Help\\_Doc\\_Print\\_20FEB10\\_sds.ppt](http://www.mngeo.state.mn.us/committee/empreg/structures/CAP_Help_Doc_Print_20FEB10_sds.ppt)

*The Search tab enables the user to enter latitude/longitude, USNG, or easting and northing coordinates to zoom to the area of interest.*

**Figure 3: Select and Edit Feature Tools**



*Select and Edit tools enable the user to view and edit structure features details. Data can be updated in-situ, increasing data accuracy and currency. Data editing requires an id and password.*

### **Printable Maps**

In addition to the web based structures editing tool, the project team wanted a product that would assist emergency managers by mapping, in a standardized format, the location of structures data and engage their interest in viewing and editing data. In collaboration with Delta State University, the project team developed and has published over 2,200 maps in a PDF format based on a 10 kilometer USNG – encompassing the entire state. These maps include structures (police stations, fire stations, hospitals and schools), roads, hydrography, 2008 FSA imagery, USNG grid lines and political subdivisions. A sample map is shown in Appendix E. These maps are available for download through the MnGeo FTP site at:

<ftp://ftp.lmic.state.mn.us/pub/data/basemaps/usng/>

All maps conform to the FGDC standard for the USNG (FGDC-STD-011-2001) and are fixed at a scale of 1:24,000 for a print size of 22 by 24 inches. The project team will continue to promote these maps to law enforcement, fire and first responders as well as the emergency management community.

## D. Observations and Lessons Learned

**Complex Data Models:** The USGS *The Best Practices Data Model – Structures* was too extensive and difficult to fully comprehend. Understanding of, and integration with the National Map was also problematic. If on-going updates are to be pushed to the National Map by states, the circumstances and processes need to be easily understood, relatively easy to perform and fully documented.

**Acquiring Data:** The project team found data acquisition difficult and problematic with the biggest challenge being the acquisition of both attribute and map data from an authoritative source. Data bases built to support state agency business needs often are not spatially referenced despite that agency being the data “authority” or custodian. Data licensing and use limitations by state agencies and local units of government also inhibited data acquisition and sharing. Acquiring extracts from business data sets was also difficult. None of the desired data was available through a web service. The project team was also unable to download data from the National Map by either direct or indirect methods.

**Multiple Data Sources and Aggregation:** Acquiring data from different sources poses a number of problems including: data elements are not defined or listed in metadata in a common manner, i.e. there are format and capitalization differences because standards are not employed. For example, location could refer to the physical location of a structure or be its mailing (administrative) address. Another problem is the lack of State data element standards making combining and comparing data difficult. In some cases the team found data that data did not comply with existing State standards such as county number. If additional structure types are added, it will compound aggregation issues. HSIP Freedom data acquired from TechniGraphicS was reviewed and edited to make it compatible across structure types. The prototype web editing system developed does accommodate different data structures for different structure types. The project team believes that the best quality, most current and most complete data can best be acquired from State agency or local government business system data bases. Linking to or harvesting the data will not be easy and may require significant investments.

**Data Integration:** The project team did not upload or integrate the data it acquired or developed to the National Map. The process to do so and criteria for an update were not clearly articulated. The HSIP Freedom data used in this project has likely been transmitted to the National Map via TechniGraphicS. Regardless, all of the project data can be uploaded to the National Map as it has the appropriate attribute fields and XML schema. The data is also available through WMS and WFS services. For details, see:

<http://www.mngeo.state.mn.us/committee/emprep/structures/index.html>

Local to state and state to federal integration of data is difficult at best due to the use of different systems and data stores as well as lack of standardization amongst the various players. Each structure type has its own issues that need to be addressed. State and its local governments are building capacity for better integration of geospatial data but it will be some time before it becomes a smooth and dependable process. Administrators will need to determine if updates are to replace an entire file, just the records that have been added or changed, or just the new data elements or records that require integration. We also need to consider accessing data at its source instead of making multiple copies then, attempting to synchronize the various versions.

**Tools:** Almost all commercially available data maintenance tools require licensing fees making it difficult for the state to have a tool let alone making it available to its local government partners. Federally available datasets like HSIP Gold are not available to the State or its local partners unless there is a declared disaster or emergency. To meet this grant's goals, a prototype tool for storing, viewing and editing both spatial and attributes structures data was developed for a small financial outlay. The prototype system is just that, a prototype. It was not intended, nor is it a good tool for on-going processing - yet. A single tool that provides for the access and use by all levels of government including local, state and federal highly is a highly desirable goal.

**Resource Constraints:** There are significant resource (staffing and financial) constraints at both the state and local level. The State of Minnesota is dealing with a multi-billion dollar shortfall for the current biennium. Most Minnesota local governments also have budget and staff deficiencies and are very reluctant to take on additional responsibilities such as vetting structures data. Also, there are significantly different levels of spatial technology among State agencies and an even greater disparity exists between local units of governments. Without additional resources, it is going to be very difficult to secure data custodians, data valuers or add additional structure types.

**Building Relationships:** The project team, and in particular the Emergency Preparedness Committee, found interest and some level of buy-in among the emergency management groups and organizations it met with. However, unless an organization or individual has a compelling business need, they are very reluctant to take on additional responsibilities. Also, it takes time and multiple interactions with emergency managers to build interest in and participation on new or different endeavors. The project team also found that different structure types likely will require different local data valuers; which means building multiple partnerships unless the local emergency preparedness and response entities take overall responsibility and ownership. Visible leadership and sustained sponsorship by the State of Minnesota's Homeland Security and Emergency Management Office could significantly help this effort. Unfortunately, they too have resource and time constraints to deal with.

## E. USGS Partnership

MnGeo has a long history of partnering with the USGS, other federal agencies and State departments. Through the Minnesota Geographic Data Clearinghouse, MnGeo hosts and provides access to data sets that have been developed by organizations throughout the state. As manager of the Clearinghouse, MnGeo maintains a variety of services that promote and support web mapping and data delivery, including critical framework data. Clearinghouse applications already serve *The National Map* and feed other applications based on a Service Oriented Architecture model. MnGeo hosts the state's imagery web mapping service, which delivers over 1,000,000 images each month. WMS and WFS provide over 60 web mapping services that function as "shared services" for state and federal agencies, local governments, and other organizations.

### *Planned Follow-on Activity*

While the FGDC funded portion of this project has been completed, many project activities will continue.

- Emergency Preparedness Committee (EPC), with support from MnGeo, will continue to communicate with prospective groups and organization regarding the structures collaborative and its benefits. In particular, they will support further testing of the prototype tool and use of the 10K, USNG based structures maps. They anticipate that the maps may be of use to the State and local governments as they deal with spring flooding in Minnesota this year. Some work may be done to identify the benefits and issues with generating 1K based maps. The EPC will continue making presentations and promoting structures data. EPC members will also do additional data validating and editing.
- MnGeo is going to continue to support and participate on the Emergency Preparedness Committee. In its new statutory roles as the geospatial coordinator for the state, it will work to promote the Minnesota Spatial Data Infrastructure in support of the NSDI and identification of state agencies that will be "custodians" for primary data layers including structures.
- MnGeo will continue working on developing and promoting standards, development of data delivery services and increased use of spatial components in agency business systems. MnGeo will be the primary interface between the State and federal agencies.
- SharedGeo has committed to continue support of the *MnGeo Structures Collaborative* prototype system including fixing any identified bugs and making some system enhancements. SharedGeo is also planning to use the *MnGeo Structures Collaborative* code as a base in other systems they develop. SharedGeo is committed to providing support and tools to the Minnesota emergency management community.

## Cooperative Agreements Program - Feedback

### **CAP Program Strengths and Weaknesses**

Strengths: Providing the impetus and opportunity for states to undertake projects and activities that they would not be otherwise inclined to do. Without this grant Minnesota would not likely have undertaken this project. The project brought focus on several issues related to the NSDI and specifically structures data as well as various emergency management tools. It also provides multi-state focus on a single issue which in turn identifies some common issues as well as alternatives.

Weakness: Funding is project based and often does not provide for significant on-going efforts after the grant period.

### **Where CAP Grants Make a Difference**

The funding made it possible for Minnesota to undertake this project. It also acted as a catalyst for our Emergency Preparedness Committee focus on structures data.

### **Was Assistance Sufficient and Effective?**

We received all of the assistance and help that we asked for.

### **What Should the FGDC Do Differently?**

Additional funding would always be useful. Consider having some sort of forum, where participants in similar grants are gathered to discuss their project activities, identify common issues and opportunities. The result of the forum could be some sort of summary or follow-on report. A forum could also serve as a means for other states who are undertaking a similar project to ask questions and hear different perspectives. Perhaps a forum could be held at a NSGIC conference?

### **What's Missing from the Grant Program and Should be Considered?**

Nothing comes to mind.

### **Program Management Concerns**

None.

### **What We Would Do Differently Next Time**

Attempt to acquire data earlier and have a tool for editing available sooner. Doing so would have resulted in more testing and broader participation. Acquire greater project participation by the state agencies that either are or could be authoritative structures data sources. Focusing on fewer structure types would have allowed the project team to do more data validation.

## Appendix A: Minnesota Structures Collaborative – Project Participants

### Minnesota Geospatial Information Office (MnGeo):

David Arbeit  
Anna Brenes  
John Hoshal  
Fred Logman  
Matt McLees

### Minnesota Governor's Council on Geographic Information – Emergency Preparedness Committee:

Steve Swazee, Co Chair  
Bob Basques, City of St. Paul / SharedGeo  
Chad Riley, Carver County  
Jan Chezick, Olmsted County  
Joella Givens, MN Department of Transportation  
John Blood, MN Department of Public Safety, Homeland Security and Emergency Management  
Katherine Hurley, Hennepin County  
Mike Dolbow, MN Department of Agriculture  
Pete Knutson, MN Pollution Control Agency  
Randy Knippel, Dakota County  
Ron Wencil, USGS  
Bill Glesener, MN Department of Natural Resources  
Jeff Bloomquist, USDA Farm Services Agency

## Appendix B: Minnesota Structures Collaborative – Project Brochure

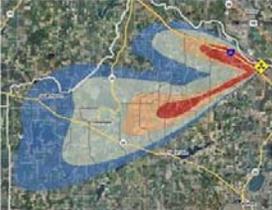
To promote the project and on-going efforts a tri-fold brochure (Appendix B) was developed and has been used as a hand out at several meetings and conferences. To download the brochure, see:

[http://www.mngeo.state.mn.us/committee/emprep/structures/MN\\_Structures\\_CAP\\_brochure.pdf](http://www.mngeo.state.mn.us/committee/emprep/structures/MN_Structures_CAP_brochure.pdf)

Minnesota Structures Collaborative

In a major emergency...  
Evacuees need shelter...  
EMTs need help...  
Hospitals are overwhelmed...

**We need to be *geospatially* prepared BEFORE these types of events happen!**



Minnesota has approximately:

- 1,400 Schools
- 150 Hospitals
- 650 Police stations
- 800 Fire stations

**No single authority can confidently tell us *where* they all are.**

**CONTACT INFORMATION:**



**John Hoshal**  
Supervisor – GIS Services, MnGeo  
Minnesota Geospatial Information Office  
658 Cedar St., Suite 300  
St. Paul, MN 55155-1603  
Tel: 651-201-2482  
Fax: 651-296-3698  
E-mail: [john.hoshal@state.mn.us](mailto:john.hoshal@state.mn.us)  
[www.mngeo.state.mn.us](http://www.mngeo.state.mn.us)



**Steve Swazee**  
Co-Chair, MnGeo Emergency Preparedness Committee  
4524 Oak Pond Road  
Eagan, MN 55123  
Tel: (651) 456-5411  
Fax: (651) 456-5411  
Email: [sdswazee@earthlink.net](mailto:sdswazee@earthlink.net)  
[www.gis.state.mn.us/committee/emprep](http://www.gis.state.mn.us/committee/emprep)

Version 1.3, 10-20-09 MD, JH

Minnesota Structures Collaborative

### Minnesota Structures Collaborative



*An Initiative Supporting the National Map, National Spatial Data Infrastructure, Emergency Response and Homeland Security*

The Minnesota Structures Collaborative seeks to develop the partnerships and technical capacity needed to support the long-term collection, publication and maintenance of databases pertaining to four types of structures in Minnesota:

- Schools
- Hospitals
- Police stations
- Fire stations

Funded by the Federal Geographic Data Committee, 2008

Minnesota Structures Collaborative  
2008 CAP Award, Category 5 – Final Report  
Page 20  
2/26/10

## What is the Minnesota Structures Collaborative?

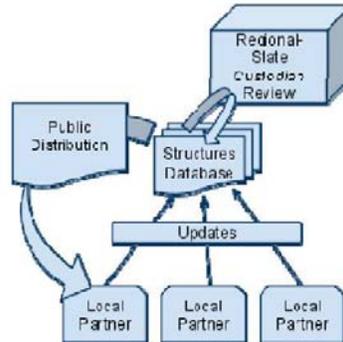
Funded by the Federal Geographic Data Committee Cooperative Agreements Program (CAP), the Minnesota Structures Collaborative will increase situational awareness for emergency responders by enhancing our existing geographic databases of structures. More specifically, the project intends to:

- Identify the existing public/private GIS data resources on structures.
- Identify custodians of the most accurate and complete data sets for schools, hospitals, police and fire station locations.
- Propose a stewardship program for each custodian of each structure type that will ensure its yearly update, long-term maintenance and availability. This program will emphasize engaging local government in the process.
- Determine minimum attribution requirements for each data type<sup>1</sup>.
- Ensure that data is documented with standard metadata.
- Assess available data for resolution, accuracy, completeness and currency.
- Publish the data for public consumption through existing federal and state clearinghouses, portals and services.

1. Consideration will be given to attributes that may not be publicly available due to national security concerns.

## How is this going to work?

The Minnesota Structures Collaborative will use the *Data Custodian Roles Model*, developed by MetroGIS, to facilitate a **statewide effort** engaging local partners in the maintenance of structures data.



Working with the non-profit entity SharedGeo, the Minnesota Structures Collaborative funded the development of an online maintenance tool that local partners can use to add, review and maintain locational and attribute data for structures in their community or region. Powered by open-source GeoMoose code, the online tool is easy to use and is essentially free for other states to implement.



## How can I help?



**GIS and Mapping Professionals:** Participate in the MnGeo Emergency Preparedness Committee and get access to the maintenance tool at the link below.

**Local Government Officials:** Spread the word to your emergency responders and encourage them to contribute their knowledge.

**Regional and State Government Officials:** Consider serving as a data "custodian"; filling gaps in local information and reviewing data for public use.

Learn more about this effort and how you can participate by visiting:

[www.sharedgeo.org/Plone/mngeo-msc](http://www.sharedgeo.org/Plone/mngeo-msc)

\*\*\*\*\*  
**Private Partners / General Public:** You too can participate in this effort. Know your surroundings, including where critical facilities are in relation to your home and work. Use online mapping tools such as Google Maps and Open Street Map, and report inaccuracies when you see them.

## Appendix C: Minnesota Structures Collaborative – Project Meetings / Outreach

MnGeo and Minnesota Governor’s Council on Geographic Information – Emergency Preparedness Committee members participated in numerous meetings during the grant period and made several important presentations to a wide range of audiences to promote the goals of the CAP project.

### *Meetings*

- 4/10/08 – Minnesota Governor’s Council on Geographic Information – Emergency Preparedness Committee / Data Workgroup: included an overview of the CAP grant and discussion of data sources, potential participants, etc.; solicited members for participation in a CAP grant sub-committee.
- 5/08/08 to
- 5/13/08 – Attended NSGIC Mid-year conference in Annapolis, MD where there was a great deal of discussion about structures data, HSIP, HSIP Freedom, data distribution, data maintenance, etc. NSGIC and MnGeo covered travel costs.
- 5/09/08 – FGDC CAP Grant Review: WebEx session with CAP Grant Category 5 recipients to discuss grant requirements.
- 9/16/08 – Minnesota Governor’s Council on Geographic Information – Emergency Preparedness Committee – CAP grant sub-committee: Members from several state agencies, USGS and counties met to discuss project, identify procedures for collecting and verifying data, discussed data model, data sources, etc.
- 10/23/08 – At the request of the MetroGIS Policy Board, Randy Johnson (MetroGIS), Laurie Beyer-Kropuenske (State of Minnesota – Information Policy Analysis Division) and John Hoshal (MnGeo) met to discuss barriers to sharing emergency management data. Barriers include data pricing, restrictive license agreements, etc. These barriers may impact the collection and distribution structures data.
- 10/29/08 – CAP grant project review and planning session with GCGI-EPC Data Work Group co-chairs Randy Knippel (Dakota County) and John Hoshal (MnGeo).
- 11/26/08 – Minnesota Governor’s Council on Geographic Information – Emergency Preparedness Committee members - Steve Swazee (co-chair GCGI-EPC), Randy Knippel (Dakota County) and John Hoshal (MnGeo) met with Kris Eide, Director, Department of Public Safety’s Homeland Security and Emergency Management Division (HSEM) to discuss the CAP grant and HSEM’s role. Kris agreed to ask HSEM regional managers to promote the project and work with the GCGI-EPC to ensure its success. HSEM regional managers work closely with city and county emergency management officials and public safety officers. Kris will also ask HSEM’s Critical Infrastructure team to work with the GCGI-EPC.

1/1/09 to

12/31/09 – During each quarterly Emergency Preparedness Committee meetings members were updated in the status of the CAP project.

7/1/09 to

11/30/09 – Emergency Preparedness Committee / CAP work team members met bi-weekly with SharedGeo staff to design, implement and test the web-based structures editing tool.

### *Outreach - Publications Prepared Regarding the CAP Project*

02/22/08 – Article about the grant published in Minnesota GIS/LIS Consortium's Winter, 2008 newsletter (John Hoshal, MnGeo):

(<http://www.mngislis.org/displaycommon.cfm?an=1&subarticlenbr=348>)

10/27/09 – Publication of an informational Minnesota Structures Collaborative hand-out, Appendix C (Mike Dolbow, USDA)

11/01/09 – Article in Newsletter for Minnesota GIS/LIS Consortium Fall 2009 newsletter (Steve Swazee, SharedGeo):

(<http://www.mngislis.org/displaycommon.cfm?an=1&subarticlenbr=518>)

01/31/10- Informational PowerPoint Presentation (Steve Swazee, SharedGeo) completed:

[http://www.mngeo.state.mn.us/committee/emprep/structures/MSC\\_Final\\_Embedded\\_19FEB10\\_sds.ppt](http://www.mngeo.state.mn.us/committee/emprep/structures/MSC_Final_Embedded_19FEB10_sds.ppt)

Spring, 2010 – A follow-up article about the grant will be published in Minnesota GIS/LIS Consortium's newsletter (John Hoshal, MnGeo).

### *Outreach – Significant Presentations and Workshops*

03/26/08 – Minnesota Governor's Council on Geographic Information – full council

04/10/08 – Minnesota Governor's Council on Geographic Information – Emergency Preparedness Committee

04/23/08 – MetroGIS Policy Board

05/08/08 – State Agency GIS Managers (SAGIS)

10/03/08 – Minnesota GIS/LIS Consortium Annual Conference – Session 27

12/18/08 – Minnesota Government Information Technology Symposium

10/15/09 – Minnesota State Fire Chiefs Association Convention

10/23/09 – Minnesota GIS/LIS Conference

2010 – FBI InfraGuard Program, EMI Incident Command Course, IEMC Situation

In addition to these notable presentations, the Minnesota Structures Collaborative project was identified in numerous presentations to a variety of organizations including GITA, Wisconsin Land Information Association and the Minnesota's Department of Public Safety's Emergency Preparedness and Response Committee.

## Appendix D: Minnesota Structures Collaborative – Existing Integration Systems Review

A number of existing local, state and federal web-based mapping programs were reviewed to determine if they could be used by this project for data collection, storage, editing and viewing. Within Minnesota the Department of Natural Resources (DNR) has created a web-based MapServer application for its Firewise program that allows rural communities to update key resources and risks for wildfire mitigation and response. Federal, state, local agencies and volunteers have formed a coalition and are collaborating to locate and map a wide spectrum of Minnesota's "critical infrastructure," ranging from hotels to fire stations to schools to emergency helicopter staging areas to homes to gas stations. A flexible data model allows features to be added quickly. The current protocol recognizes nearly 250 types of facilities.

MetroGIS has endorsed a project to develop a web-based application that facilitates a similar process for maintaining address points in the Twin Cities metro area. When completed, the application will allow staff at a local level to update points representing addressable locations within their community. These updates will then be synchronized with a centralized database, automatically or semi-automatically using the oversight of a data aggregator. The outreach effort required to engage local government organizations in the address point updating process could also be leveraged for updating structure data for homeland security and emergency preparedness. Federal applications that were examined included:

### **1. Department of Homeland Security Geospatial Data Model (GDM) Schema Generation Tool using web based technology through ArcXML**

- *Audience/Users*
  - EMS-E911
  - Federal agencies
  - Fire
  - Police

- Commercial and NGO Entities
- State, Regional, Tribal, and Local government units
- All organizations and agencies involved in planning for and responding to natural and manmade disasters and hostile events
- *What is it?* The GDM is a mechanism designed to provide a means of aggregating and sharing geospatial information between organizations and agencies responsible for planning for, responding to, and mitigating outcomes of natural and manmade disasters and hostile events. The GDM is based on common standards mandated by the National Information Exchange Model (NIEM), and the Federal Geographic Data Committee (FGDC). The common standards are intended to reduce friction/confusion, speed of adoption, and improve data exchange and sharing.

Primary/Core feature data sources/framework layers of the data model include:

- FGDC Framework Data Content Standard
- USGS Project Bluebook data model (ESRI form)
- National Information Exchange Model (NIEM)

Secondary sources for framework layers include:

- FEMA Multi-hazard: Emergency Management & Infrastructure Protection
- DHS Infrastructure Protection Taxonomy, v1.0
- GNIS Feature IDs and types
- Feature types for FGDC Emergency Management Symbology ([http://www.fgdc.gov/HSWG/ref\\_pages/Operations\\_ref.htm](http://www.fgdc.gov/HSWG/ref_pages/Operations_ref.htm))
- National Incident Management System (NIMS) Resource types
- National Hydrography Dataset (NHD) Feature Types
- FGDC Cadastral Subcommittee, Revised Cadastral Model
- National Response Plan Categories
- Homeland Security Infrastructure Protection (HSIP) Feature Types
- NASA Land Cover Classification types
- American Planning Association (APA) Land Use Classifications

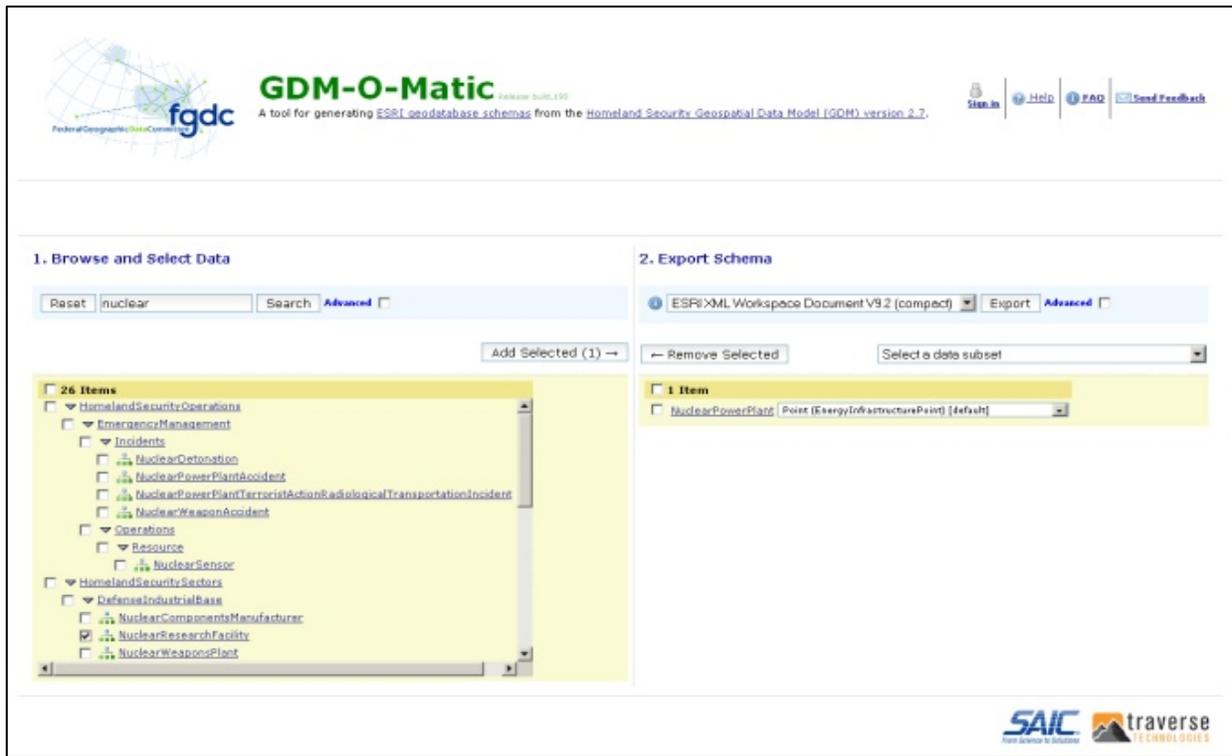
- FGDC and ISO Geospatial Metadata
  
- *How does it work?*

GDM provides a common operating picture of geospatial information that is shared between organizations responding to national catastrophic events. These organizations contribute relevant geospatial information for:

  - Water resources: pumping stations, water service lines, sanitary sewer, rivers, stream, hydrographic data, dams, ground wells, hydrants, psi, flood zone, water bodies
  - Utilities: electric, nuclear, telecommunications
  - Transportation: roads, airports, railroads, seaways
  - Cadastral Data: PLSS, geodetic control points
  - ER features and major structures: police stations, hospitals, fire stations, shelters, schools, care centers, stadiums
  - Economic
  - Biological (flora and fauna)
  - Geological: steep slopes, fault lines, shorelines, areas prone to erosion and landslides
  - Social information

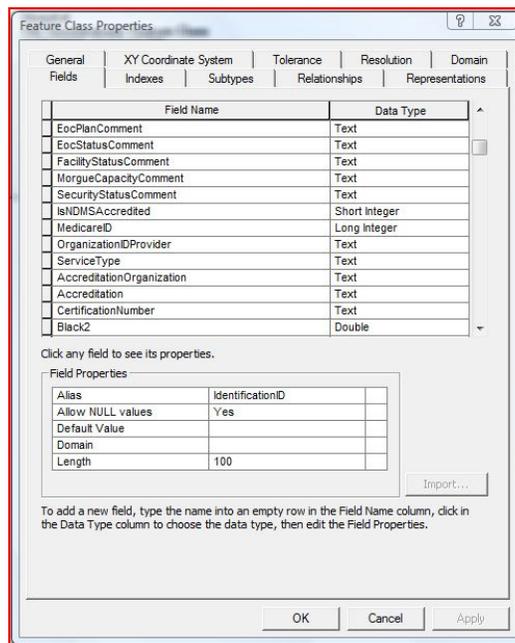
Samples of the categories of schemas available via the GDM-O-Matic website are illustrated in **Figure 1** below. The system is designed to provide a pipeline that enables data to flow up and information to flow down. The system provides a simple tool to construct XML schema files that are format compliance.

Figure 1: Schema categories



The XML schema files are then imported to a geodatabase using ESRI's ArcCatalog (Figure 2).

Figure 2: courtesy of Traverse Technologies



Once the geodatabase schema has been imported, data associated with the feature can be loaded into the pre-formatted standardized table.

- *GDM and the National Information Exchange Model (NIEM)*

NIEM is a collaborative information sharing partnership between the U.S.

Department of Justice and the Department of Homeland Security, with outreach to other Government departments and agencies. The program was developed to:

- Develop standards and a common language for data exchange through several reference schemas in an XML-based exchange framework for the United States,
- Bring stakeholders and agencies together to identify data sharing requirements to address daily operational and emergency response situations,
- Provide the technological processes and methodologies to support analysis, development, discovery, information dissemination, and reusable exchange standards (e.g. DHS GDM schema) and documents; and
- Provide ongoing training and support, communication, outreach, and implementation support services for NIEM based information sharing.

## **2. HAZUS<sup>®</sup>MH: Federal Emergency Management Agency's GIS based Disaster Risk Management tool**

- Program began in 1990's to predict potential earthquake damage and has expanded to include potential losses from floods and hurricane winds. The program enables emergency responders and management personnel to estimate damage before, or after the disaster occurs.
- Potential loss estimates analyzed by program include:
  - Physical damage to buildings and infrastructure;
  - Economic losses including jobs, discontinuation of daily business, reconstruction costs; and
  - Social impacts such as displaced households, shelter requirements, and population exposures to natural disasters.

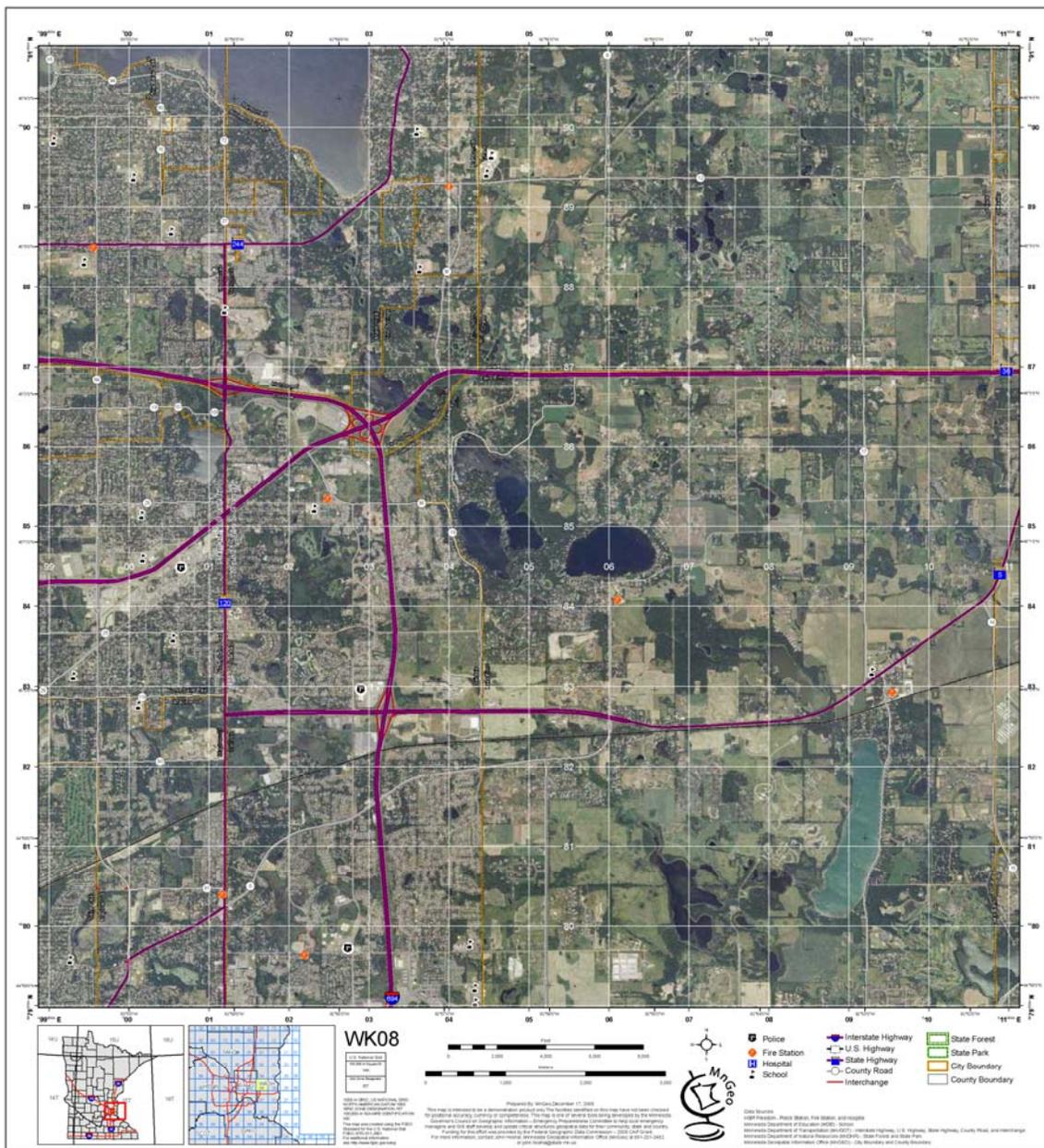
- The GIS based program utilizes software such as Inventory Collection Survey Tool (InCAST), which facilitates development and organization of databases for creating building information (e.g. type of structure, materials, functions, etc.) and Building Data Import Tool (BIT) which enables easy import of tax assessors' data.
- The latest version, HAZUS-MH MR4 (Version 1.4) is available free of charge and can be ordered through FEMA.

### **3. Universal Core (UCore)**

UCore is the Department of Defense's National Information Sharing Strategy Exchange initiative to facilitate information sharing by defining simple, but extensible XML schema. The schema's structure is based on agreed upon representation for the most widely shared and universally understood concepts of the "Five Ws": Who, What, Where, When. The UCore team is jointly led the Department of Defense (DOD), the Department of Justice (DOJ), the Office of the Director of National Intelligence (ODNI), and the Department of Homeland Security (DHS). UCore is designed to assist users with information sharing and data exchange and is geared for use by database and software programmers and managers. To use UCore, you must create a username and password through the following website: <http://www.ucore.gov>. The website offers tutorials on UCore taxonomy of the Who, What, Where, When representations in XML code.

## Appendix E: Minnesota Structures Collaborative – Sample 10K Maps

In collaboration with Delta State University, the project team developed and has published over 2,200 maps in a PDF format based on a 10 kilometer USNG – encompassing the entire state. These maps include structures (police stations, fire stations, hospitals and schools), roads, hydrography, 2008 FSA imagery, USNG grid lines and political subdivisions. These maps are available for download through the MnGeo FTP site at: <ftp://ftp.lmic.state.mn.us/pub/data/basemaps/usng/>.



## Appendix F: Minnesota Structures Collaborative – PowerPoint Project Overview

A PowerPoint Presentation with recorded narration was also developed to highlight the prototype web-based viewing and editing tool and the 10K USNG based structures maps that were developed and are described below. See:

[http://www.mngeo.state.mn.us/committee/emprep/structures/MSC\\_Final\\_Embedded\\_19FEB10\\_sds.ppt](http://www.mngeo.state.mn.us/committee/emprep/structures/MSC_Final_Embedded_19FEB10_sds.ppt)

