Great Lakes Maritime Research Institute

A University of Wisconsin - Superior and University of Minnesota Duluth Consortium

Expanding Regional Freight Information Resources for the Upper Midwest Phase V:

The Great Lakes Maritime Information Delivery System: A Resource for the Regional Analysis of Intermodal Freight Flows in the Great Lakes Region

Interim Report

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This is the fifth phase of a long-term effort to develop and manage the Great Lakes Maritime Information Delivery System (GLMIDS). This web-based data repository, information clearinghouse and online geographic information system (GIS) is designed to serve as a comprehensive data resource linking maritime freight transportation in the Great Lakes to the wider regional economy (see http://www.maritime.utoledo.edu). Users can take advantage of the GIS location-based query and selection capabilities as well as mapping functions to report data concerning transportation networks, ports, economic activities and commodity flows in the region. This project collectively contains the following functions and data sets in its current state:

- An information clearinghouse and centralized data facility furnishing links to other sites, private vendors furnishing commercial products, and government agencies, *etc*.;
- A data delivery system that includes detailed regional economic data, weather and climatic data, dock and terminal facilities, commodity movements, intermodal connectivity, lock data and navigation facilities, movements, intermodal transportation networks (including rail, highway and air);
- Access to AIS data for tracking vessel movements in the Great Lakes;
- An interconnected intermodal network (water, rail, highway) that will enable analysts to incorporate transshipment costs and characteristics at terminals;
- An online *Atlas of Great Lakes Maritime Commerce* that includes maps for download in *.pdf* format;
- A data delivery function in the form of a secured FTP site at the project web page for approved users;
- A customized GIS data viewer in the form of ***Midwest FreightView (MWFV)***;

The current phase of this project has been devoted in large part to continued data collection and management, with an emphasis toward automated data collection and toward the collection of new sources of data. In addition, the project team has continued efforts in collaboration with researchers in GLMRI partner institutions through data sharing and providing access to the online GIS. The project team has also stepped up efforts to provide more detailed information on commodity flows and the preparation of maps, graphics and data displays in the *Atlas of Great Lakes Maritime Commerce*. The final stages of this phase of the project are concentrated on phasing out the current version of ***MWFV*** in favor of a newer, more user-friendly online GIS data viewer that will feature the same data viewing features of the old system, but with improved data download capabilities and a new set of analytical tools. The project team has programmed modules for seamless incorporation into the new MWFV for the routing of cargoes, definition of market and port catchment areas, site selection, and intermodal connectivity on this data delivery site. As these features are incorporated in the new system, the project team will devote its attention to technology transfer functions, including workshops, online documentation, and publications.

Data Collection with an Emphasis on Automation

Data collection will always remain an ongoing central process if the repository is to remain current and relevant to the maritime community in the region. However, many of our data collection efforts to date have been labor intensive and reliant on existing sources of data either through download or purchase. An alternative to this approach is to identify and implement new ways to collect data through automated methods. As a result, project team has implemented new procedures for data collection through web-based data entry by dock owners and operators, as well as through the acquisition of AIS (Automated Identification System) data in partnership with

the Great Lakes and Seaway Shipping Online, Inc. (GLSS, *aka* Boat Nerd). GLSS has placed several AIS receivers at key points throughout the Great Lakes region and is currently planning to install additional sites. The Toledo project team has purchased three additional AIS receivers for GLSS to install at key points. In return, GLSS streams vessel positions to the Toledo server, where vessels are tracked at ½ hour intervals and posted into the MWFV GIS on their closest link in the USACE National Waterway Network. These data, however, are not available for public viewing through an agreement with GLSS. As these data are processed, reduced and summarized, the repository will maintain an inventory of aggregate monthly vessel movements. The project team will also use this technology to track arrivals to and departures from specific docks and terminals when used in conjunction with the USACE ***Master Docks Plus*** data residing in the repository. This capability is an outcome of a related project undertaken by the Toledo project team in partnership with the USACE, U.S. Customs, the IRS, and the Coast Guard through the Federal Initiative for Navigation Data Enhancement (FINDE) program. This information could be applied in a number of ways in addition to monitoring vessel traffic in the lakes, such as in promoting and marketing port functions or in providing accurate and timely data for dredging requests, *etc*. To date the dock data collection and AIS data collection methods have been successfully integrated into the repository (see Figures 1 and 2). As mentioned above, the streamlined AIS data are secured with encryptions and password protections and are not available to the general public.

Figure 1. AIS Vessel Tracking on Secure Web Page.

Figure 2. Dock Information Data Site

Data collection using more traditional methods has also continued in this phase through the acquisition of information relating to the regional economy, transportation networks, port and terminal facilities, and cargo movements. As these efforts continue, the project team will also continue to maintain and improve the web site and our online GIS MWFV platform for data delivery purposes. In terms of continued data acquisition, preprocessing, and incorporation into MWFV, the following tasks (as outlined in the project proposal) are completed or currently in process:

- ORNL CTA North American Rail Interlining Network
- Integrated Network—Great Lakes Waterway, Highway, Rail linked to Commercial Docks, Locks (Army Corps of Engineers)

- Updated US Highway Network Speed / Estimated Travel Times with ATRI Travel Time Data (by time of day, day of week)
- Add ESRI Traffic Counts to integrated highway network
- Link BEA Regions/BEA GDP Data to Public Rail Waybill Data
- Encode enhanced EPA eGRID Power Plant Database into MWFV and link to Rail and Waterway Networks
- Link USACE Foreign Traffic Vessel Entrances and Clearances to Ports
- Add legends, labels and text to "Last Mile" Connections on Satellite Imagery—connect these images to the new MWFV Viewer Site
- Input County-to-County Mileage and Impedance Tables into MWFV for analytical procedures (Useful for Analytical Tools—Accessibility, Location Analysis, *etc*.). The primary modes for these tables include: Highway, Rail, Water.

Cooperative Work and Data Sharing with GLMRI Partner Institutions.

If the data products and online data delivery tools are to be useful to the maritime community, it is essential that the members of the project team find ways to put them to work in the hands of analysts with the skills to optimize their use. As data collection continues, so will the project team's involvement in disseminating and sharing data with our GLMRI partners and a wider community of partners. Selected cooperative ventures are summarized as follows:

- ***Economic Impact of the Great Lakes and St. Lawrence Seaway System (GLSLS)*** (see Doorn, D: http://www.glmri.org/research, 2009).
- **Great Lakes Marine Container Service Feasibility Study: Connecting Green Bay to *Global Container Service providers serving ports on the St. Lawrence Seaway*** (see Hutchinson, E.R.: http://www.glmri.org/research, 2009).
- ***Multimodal Freight Transportation within the Great Lakes-Saint Lawrence Basin*** **TRB National Cooperative Freight Research Program-35** (Joint project between CPCS Transcom Limited, GLMRI, University of Toledo GISAG Center, Economic Development Research Group, Prime Focus LLC, and Sustainable Ports)
- ***Ohio Statewide Freight Plan*** (Joint project between the University of Toledo GISAG Center and Wilbur Smith Associates)
- ***FINDE: Federal integrated Navigation Data Enhancement*** (Joint automated data acquisition project between University of Toledo GISAG Center, USACE, IRS, US Customs, Coast Guard)

In addition to these projects, the project team is also involved with a number of other joint projects with researchers at UW-Madison, UW-Milwaukee, and The University of Illinois-Chicago. The project team will continue to solicit opportunities for joint work with our affiliate universities and outside contractors. Data and analysis results from these efforts will be documented and published on the data delivery site where appropriate.

Commodity Flow Analysis and the *Atlas of Great Lakes Maritime Commerce*

A detailed analysis of select major commodities flowing through the Great Lakes is currently being assembled by the project team. Comprehensive coal supply chain mapping is currently underway from the mine, through the lakes, and finally to the end power plants. An economic assessment, by mode through the region, will accompany this analysis. In addition, limestone, iron ore, and petroleum are being investigated on a broader spectrum by relating flows between

origin and destination ports. Sample maps for inclusion in the *Atlas of Great Lakes Maritime Commerce* are in Figures 3-5. The final product will be in the form of an interactive PDF that can be downloaded or printed from the site and feature comprehensive commodity flows through the region.

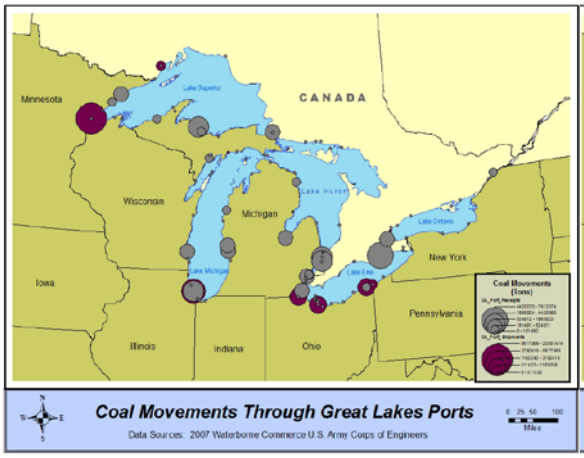

Figure 3. Origin/Destination Ports for Coal

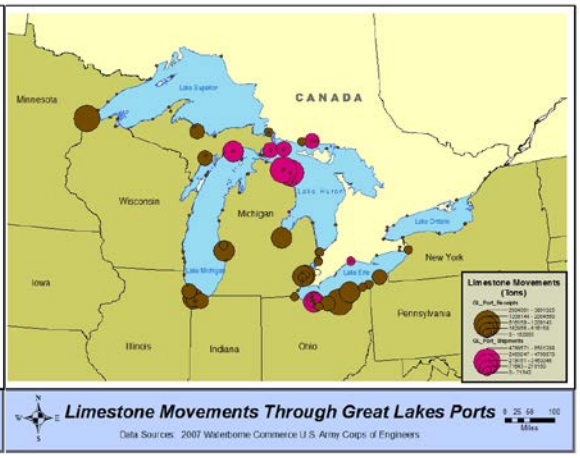

Figure 4. Origin/Destination Ports for Limestone

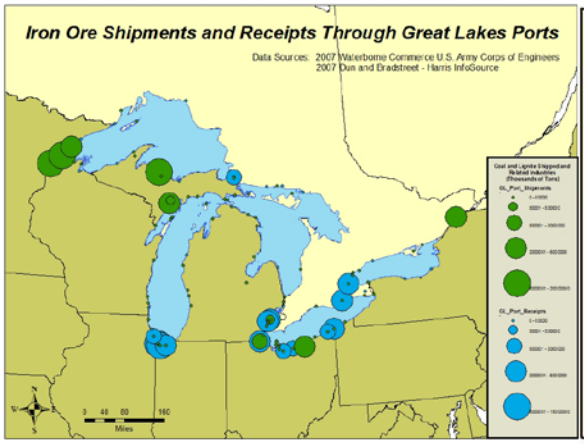

Figure 5. Iron Ore Shipments and Receipts

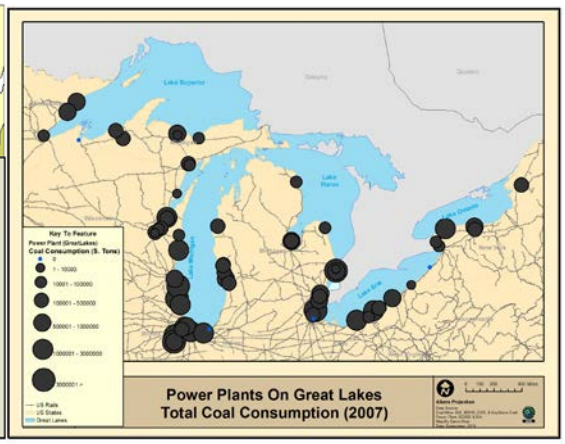

Figure 6. Coal Consumption for Power Plants

The vision for the Great Lakes Maritime Information Delivery System has evolved over the course of the project to produce a multidimensional system that can support a wide array of functions that include data storage, delivery of prepared documents, GIS functionality, and a clearinghouse of information for maritime commerce. The main objective originally envisioned for the project remains the same: to maintain a long-term database and data distribution system that is available for port authorities, state transportation agencies, regional planning agencies and economic development organizations, as well as other interested decision makers and stakeholders within the region.

During phase five, the project team has expanded its efforts to include automated data collection programs linked to AIS acquisition and web-based entry of dock and port facilities, as well as in

collecting new sources of data. Another focus has been the cooperative work and data sharing with GLMRI partner institutions and other partners. Finally, the project team has stepped up efforts to compile detailed commodity flows in the Great Lakes for incorporation into the *Atlas of Great Lakes Maritime Commerce*.