International Disaster Management

By Holly Harten

On September 29th, 2009 a table top mock disaster was conducted in Sault Ste. Marie, MI to assess the ability of emergency management personnel to communicate and control a possible disaster scenario. The twin cities of Sault Ste. Marie, ON and Sault Ste. Marie, MI are connected by an International Bridge and are home to the Soo Locks which connects Lake Superior to Lake Huron via the St. Mary’s River.

The Sault Ste. Marie Innovation Centre’s Community Geomatics Centre was asked to generate maps depicting hazardous aerial plumes and critical infrastructure in both cities, and to assist on the day of the exercise with a live Geographic Information System (GIS) on site to allow emergency personnel to comprehend the value of such systems and make informed decisions to assist in the management of the disaster.

**The Scenario:**
A train tanker carrying 337,075 kg of Benzene exploded after an improvised explosive device (IED) was detonated on the southern-most train bridge beneath the Sault Ste. Marie International Bridge, West of the MacArthur Lock and the Poe Lock.

**The Exercise:**
The exercise was conducted at Lake Superior State University and was organized and facilitated by the

---

**Effect of Contamination from September 29, 2009**

- **Wind Speed:** 18 MPH from 270° at 25 meters
- **Release Location:** 46.503527 N, 84.363428 W
- **Chemical Name:** Benzene
- **Release Amount:** 337075 kg
- **Evaporation Time:** 3058 s
- **Evaporation Rate:** 110.227 kg/s
- **Release Duration:** 34 minutes

**Max Average Sustained Release Rate:**
31,100 pounds/min (averaged over a minute or more)

**Threat Zone:**
- **Model Run:** Heavy Gas
- **10% lethal:** 1566 yards --- (1400 ppm)
- **AEGL 2:** 1.3 miles --- (800 ppm)
- **AEGL 1:** Greater than 6 miles --- (32 ppm)

*continued on page 5*
International Disaster Management

Department of Homeland Security.

Other organizations involved in the exercise included:

- Royal Canadian Mounted Police (RCMP)
- Federal Bureau of Investigation (FBI)
- U.S. and Canadian Coast Guard
- U.S. and Canadian Border Patrol and Customs
- Ontario Provincial Police (OPP)
- Michigan State Police
- Chippewa County Police Department
- Sault Ste. Marie Police Services
- Michigan National Guard
- The 49th Field Regiment
- Transport Canada
- Federal Rail Administrations
- Ontario Ministry of Natural Resources
- Ontario Ministry of the Environment
- Ontario Ministry of Health
- U.S. and Canadian Sault Fire/ Hazmat Services
- Environmental Protection Agency
- Michigan State Public Health
- Algoma Public Health
- American Red Cross
- War Memorial Hospital and Sault Area Hospitals
- Municipal Representatives

The group of 100+ personnel from both of the twin cities were broken into 7 groups and each group was posed with specific questions regarding their response and communication to this event. The Community Geomatics Centre staff members were distributed amongst the 7 groups to provide insight from a geographic perspective and aid in the interpretation of the maps.

The Maps:
The Community Geomatics Centre staff used the Environmental Protection Agency software ALOHA (Aerial Location of Hazardous Atmospheres) to generate the plume models and then imported them into the ArcGIS Desktop environment using an ALOHA extension. The Community Geomatics Centre has a large volume of data related to the Sault Ontario side but at the time did not have data for Sault Michigan. Data was acquired and created from a variety of sources including the Federal Emergency Management Agency (FEMA) and the Centre for Geographic Information Michigan Geographic Data Library as well as many others.

The maps contained the plume, which was modeled using Acute Exposure Guideline Levels (A EGL) and the Lower Explosive Limits for the chemical Benzene. AEGLs are considered the best public exposure guidelines to date, because they undergo a rigorous review process, have multiple exposure durations, and are designed as guidelines for nearly all members of...

Winter 2010
International Disaster Management

the general public, including sensitive individuals. In this exercise the exposure duration of 60 minutes was used. When Benzene is concentrated at 10% of the Lower Explosive Limit (LEL) safety considerations against the hazards of explosion must be taken into account. 60 minutes of exposure in a Benzene concentration in the A EGL 2 (800 ppm) category could result in serious effect or impaired ability to take proactive action. 60 minutes of exposure in a Benzene concentration in the A EGL 1 (52 ppm) category could result in minor, reversible, health effects and possibly odour.

Along with the plume information, critical infrastructure layers were also displayed on the map. These layers provided pivotal information to the participants of the exercise and assisted in informed decision making. These layers included water intakes, electrical substations, generation plants, hydroelectric dams, water treatment plants, transportation routes (roads, highways, ferries, bridges, railways, marinas), emergency response locations (police, fire, and ambulance), hospitals, long term care facilities, schools, churches, other places where large amounts of people may congregate such as malls, golf courses, parks, etc. This also assisted in determining operations command centres that would be ideal for the management of this situation and allow for staging areas for police, medical personnel, volunteers and potentially military supports.

The On Site GIS:
Since the CGC has such a large volume of data available, not all layers were displayed on the maps. Instead the team brought a server and a couple of portable workstations to the site allowing them access to all layers for live querying. Emergency management personnel had the opportunity to ask the GIS Analysts questions and see how the GIS could be used to assist them in their roles. One specific example of this was the use of census population data to estimate the potential number of residential evacuee’s in the affected areas of the plume and visualize the distance and capacity of potential temporary emergency shelters. This in turn allowed emergency management personnel to estimate the resources required if this was the desired course of action.

The Outcome:
The exercise was viewed as a success and further improved the lines of communication between the twin cities. Many of the emergency management personnel who attended had a chance to see the applications of a GIS and how it could be useful in this type of a situation. “Being able to use the excellent GIS capability that the Sault Ste. Marie Innovation Centre has built is going to enable the first responders and our other partners the ability to visualize the incident to help make the decisions that need to be made. SSMIC was an excellent and valuable partner for this Table Top Exercise and we can’t thank them enough for their contribution” says Mike Moll, A Protective Security Advisor for the Department of Homeland Security who acted as the moderator of the exercise. Having that much information available and in a geographic context really allows emergency management personnel to gain insight into the big picture and allows them to visualize the impact of their decision making.

This exercise demonstrated how GIS can be used in emergency management and enlightened the attendee’s as to how much information can be accessed from one centralized source.

About the Author
Holly Harten is the GIS Team Leader for Health and Human Services at the Sault Ste. Marie Innovation Centre’s Community Geomatics Centre and can be contacted at (705)942-6938 ext. 34 or by email hharten@ssmic.com