

Mass Casualty Data Management System (From Complaint to Grave)

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Abstract

The threat of a new pandemic with consequences potentially as devastating as those during the 1918 Spanish Flu Pandemic necessitated the development of specific modifications to existing emergency operations plans. What was particularly weak was a detailed process for dealing with significant numbers of fatalities over cyclical periods of weeks to months.

To effectively manage a pandemic it was obvious that all of the government agencies particularly the health, emergency medical services and law enforcement agencies needed a single source of data. It was also obvious that linking data to GIS was an essential element to facilitate epidemiological efforts, locate medication distribution sites and the associated traffic control issues and to manage the establishment of temporary morgues.

The system provides for identifying disease clusters, selection of the most appropriate immunization/medication distribution sites, monitoring the efficacy of distributed medications, management of mass fatalities as well as electronic photographic links for fatality identification for use at Family Assistance Centers.

Background

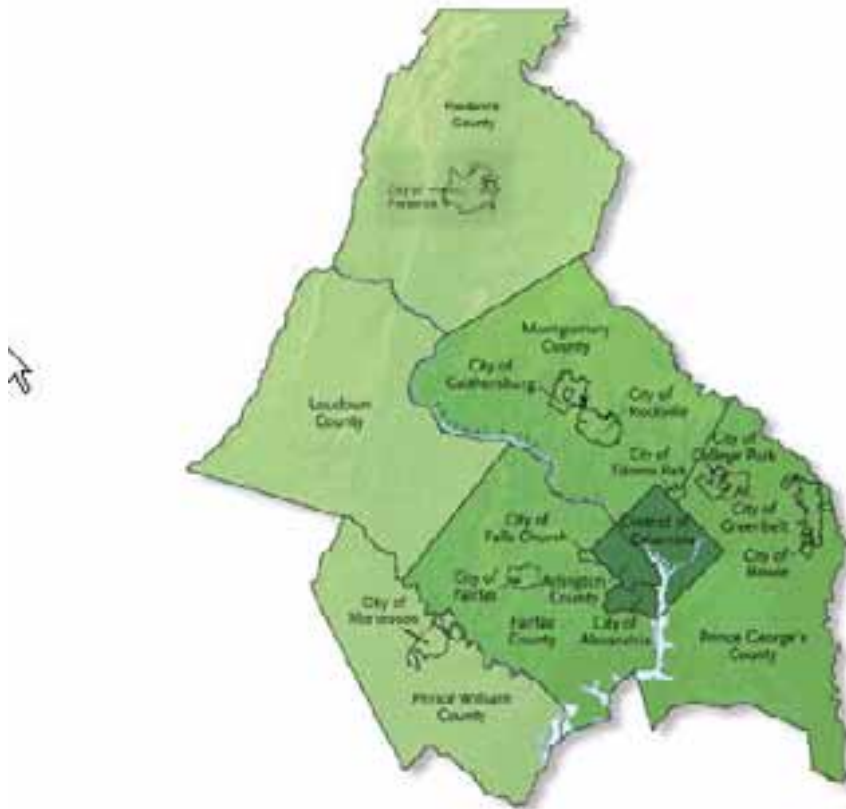
Emergency Managers and the first responder community are familiar with the concept of mass casualty management. Health care systems plan for mass casualty incidents and are required to have annual disaster exercises to practice their internal plans. In many jurisdictions mass casualty exercises are conducted on a regular basis and often include the local health care facilities. In the Washington DC area an annual regional mass casualty drill is conducted.

These drills and the term Mass Casualty are typically associated with a discrete trauma event. Traditionally, the scenarios have been based on mass transit events such as plane crashes or passenger train derailments and the casualties would obviously have injuries associated with trauma. Regardless of the scenario used, the typical exercise involved the emergency medical system (EMS) and focused on triage, patient care, patient transport hospital involvement included dealing with patient loads and surge capacities.

Prince William County began to modify its approach to mass casualty management planning after March of 1995 when the Aum Shinrikyo Cult released the organophosphate nerve agent Sarin in the Tokyo subway system. In concert with its regional partners through the Metropolitan Washington Council of

Governments (COG), Prince William County participated as the COG started to develop plans to address a similar release in the Washington DC Metro System. The planning efforts looked at the consequences of a deliberate release of chemical, biological or radiological materials. This was the beginning of the work to integrate weapons of mass destruction (WMD) into the Mass Casualty Response Plans.

Metropolitan Washington COG Member Jurisdictions



Preliminary WMD planning was well underway when the commercial jetliner was crashed into the Pentagon on September 11, 2001. The Pentagon attack was shortly followed by the mailing of the Anthrax tainted letters to the Capitol. These events provided additional impetus for COG to address a variety of terrorist scenarios involving the full spectrum of potential terrorist weapons. WMD was no longer a potential concern. Now the threat from terrorists and WMD was only too real.

The effects of chemical, biological, explosive and radioactive materials and the nature of the casualties they produce complicate the mass casualty scenario. Not only are special medications and treatment protocols required but new facets of responder training and personal protection become important. These new facets must be integrated into the existing mass casualty plans.

The Federal Government has provided support to the states and local jurisdictions to assist in the acquisition of protective clothing and other equipment through a series of Homeland Security Grants. The requirement for special medications has been addressed through the establishment of programs such as the Strategic National Stockpile. Other federal initiatives such as the Cities Readiness Initiative (CRI) have been designed to assist local jurisdictions in responding to WMD events. The grants and other federal programs provided the resources needed to enhance local capabilities and to acquire the specialized equipment and pharmaceuticals required to be better prepared to deal effectively with a WMD event. Unfortunately, each of these new programs and initiatives created a concomitant requirement to collect and manage additional data. Just the number of sheets of paper required to collect the data necessary to dispense medications and immunizations has become a logistical burden. The problem of integrating all of the planning assistance and guidance and the associated data needs has become a monumental challenge.

Even though work had begun to address the threats from WMD and new resources were made available, particularly with regard to pharmaceuticals, the basic approach to mass casualty management continued to focus on the triage of trauma victims and transport to health care facilities. The only major change other than the introduction of specific WMD pharmaceuticals involved planning for decontaminating patients as part of the triage process. It was evident that significant work still needed to be done.

Mass Casualty Management

As WMD response plans headed toward completion, a new threat began to emerge. Part of the WMD planning effort involved biological agents that would produce casualties as a result of disease rather than by trauma. The biological event was looked upon as a discrete or localized event even though it was recognized that the incident site could be expansive and that there would be a risk that if the biological agent released was communicable, then exposed persons could spread the disease virtually anywhere. During the planning for responding to the deliberate release of a biological agent, there had been no consideration given to the threat posed by the outbreak of a naturally occurring disease. Warnings about the potential spread of the Bird Flu and the notion that this flu could rival the 1918 Spanish Flu not only introduced the emergency management community to the word Pandemic but forced the issue of expanding mass casualty management plans to include managing mass fatalities.

To alter or adapt mass casualty plans for a pandemic event requires a significantly broader view of the entire process. The planning process must be expanded to address, as a minimum, the major problems associated with managing a pandemic.

The 5 major problems with managing a pandemic are discussed in the following

paragraph. The major problems are basically differences in the nature of the mass casualty event. Once the differences are understood, steps to manage the problems can be integrated into existing mass casualty plans.

The first problem is that the incident site itself is not discrete. The site will expand and grow as additional persons become sick. The source and number of casualties will spread across the jurisdiction and beyond. A second problem is that the duration of the incident will not be short term. The casualties will continue to occur over a period of weeks or months and the cycle may be repeated. The third problem is the fact that the medical care will be far more complicated than applying life saving steps on site and then transporting casualties to medical treatment facilities. You do not need to bandage or back board someone exposed to an infectious disease. Administering pharmaceuticals or immunizations to large numbers of persons becomes the treatment challenge. Additionally, there will most likely be far more casualties than treatment facilities can handle. The fourth problem is the requirement to recognize the fact that the first responders may very well become part of the patient population. This results in a situation where as the need for medical support increases, the number of persons available to respond and satisfy the need will be decreasing. The last problem identified is possibly the most difficult to appreciate. The tremendous number of sick persons is projected to result in an extraordinary number of fatalities. Consequently, mass fatality management has become a necessary evil to address on scale not here-to-fore attempted.

As work progressed locally on developing plans to address the emerging terrorism threat scenarios, it became obvious that to effectively manage the effects of a pandemic, either naturally occurring or as the result of a deliberate release of a pathogenic biological agent, the existing data systems needed to be better integrated in order to provide decision makers with essential information to both recognize what was happening as well as to provide a basis for resource allocation and other policy decisions.

In addition to the operational changes necessary to integrate a pandemic response capability into existing plans, it was also obvious that all of the agencies that would be involved in a pandemic response, especially emergency management, health care providers, emergency medical services and law enforcement agencies would need a responsive single source of data. Not only did the requirement exist for a single source of data but data elements associated with the myriad plans as well as other federal and state statutory requirements needed to be included.

Adding additional data elements further increased the burden on the data management process. Each protocol or plan had associated data requirements that ran into scores of pages of information. Medical forms required for dispensing and administering medications and issuing Isolation and Quarantine orders create a tremendous burden for data collection. Information needed by

Medical Examiners, especially data needed to aid in the identification of remains, is another example of new data elements that were not part of the present mass casualty plans.

What Prince William County learned during the anxious times after 9/11 and the Anthrax mailings was that a data collection and management system was needed to simplify the collection of essential elements of information in a manner that would facilitate data management while at the same time providing the ability to share data elements among any and all agencies involved in the response. Timely data was essential to provide an overall picture of the situation to aid decision making. The system needed to be able to allow each participating agency to build upon the initial data elements by adding the other elements necessary to fulfill the respective agency functions without over burdening the entire system with information that is not pertinent to the specific needs of the operators or management at a particular level.

Mass Casualty Data Management System

The mass casualty data management system developed locally was based on an existing Mass Casualty Disaster Tag which has been used for years in the Washington Metropolitan Region. This tag has a unique number that is assigned to a patient as the person is entered into the system, e.g., triaged at the mass casualty incident site. The number is also bar coded on the tag. This unique patient number will be used as the key attribute for linkage to all other data bases. The tag contains peel off labels that also have the bar code patient number. Although initially designed to support mass casualty incidents, the peel off tag feature provides multiple copies of the same bar code that can be used for any situation where people, processes and supplies are involved and must be identified and tracked.

The Disaster Tag is shown below. It is a 2 sided tag that has peel off strips. Initial information is written on the tag and the tag is affixed to the patient. The tag follows the patient through the entire process.



WASHINGTON METROPOLITAN AREA

DISASTER TAG DO NOT REMOVE

PATIENT INFORMATION

MALE FEMALE AGE WEIGHT

NAME

ADDRESS

CITY STATE PHONE

PATIENT NUMBER

039367

TRIAGE STATUS

| EVALUATION | TIME | RED | YELLOW | GREEN | BLACK |
|------------|------|-----------|---------|-------|----------|
| INITIAL | | IMMEDIATE | DELAYED | MINOR | DECEASED |
| SECONDARY | | IMMEDIATE | DELAYED | MINOR | DECEASED |
| | | IMMEDIATE | DELAYED | MINOR | DECEASED |
| HOSPITAL | | IMMEDIATE | DELAYED | MINOR | DECEASED |

CHIEF COMPLAINT

EMOTIONAL (uncontrollable)
 Head Injury C-Spine
 Blunt Trauma
 Penetrating Injury
 Burn Fracture
 Laceration Amputation

Medical _____
 Cardiac Respiratory
 Diabetic OB/GYN
 Haz-Mat Exposure

COMMENTS

TRANSPORTATION AGENCY/UNIT DESTINATION

TREATMENT *039367*

HOSPITAL *039367*

OTHER *039367*

OTHER *039367*

OTHER *039367*

OTHER *039367*

TRANSPORT RECEIVED

MALE FEMALE AGE

NAME

CHIEF COMPLAINT

DESTINATION

TRANSPORTATION AGENCY/UNIT TIME OUT

PATIENT NUMBER

039367

TRIAGE STATUS

RED YELLOW GREEN

DISASTER TAG**DO NOT REMOVE**

| VITAL SIGNS | TIME | PULSE | BP | RESP | LOC |
|-----------------|--|---|------------------------------|------------------------------|----------|
| | | | | | |
| | | | | | |
| | | | | | |
| MEDICAL HISTORY | MEDICATIONS/MEDICAL PROBLEMS | | | | |
| | ALLERGIES | | | | |
| TIME | TREATMENT RECORD | | | | INITIALS |
| | <input type="checkbox"/> BVM | <input type="checkbox"/> ET | <input type="checkbox"/> EOA | <input type="checkbox"/> PTL | |
| | <input type="checkbox"/> Oxygen by | at | | L/min | |
| | <input type="checkbox"/> Bleeding Control | <input type="checkbox"/> Tourniquet@ | | | |
| | <input type="checkbox"/> Spinal Immobilization | <input type="checkbox"/> Extremity Splint | | | |
| | <input type="checkbox"/> IV Started at | | at | | |
| | <input type="checkbox"/> MAST | Inflated at _____ | | | |
| | <input type="checkbox"/> Gross Decon. | <input type="checkbox"/> Final Decon. | | | |
| | <input type="checkbox"/> Chest Decompression | R | L | | |
| | <input type="checkbox"/> MEDS | Dose/Route | | | |
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DISASTER TAG

The bar code is the probably the most useful feature of the tag and will greatly facilitate data management and data sharing. Regardless of the system employed, the ability to enter data by writing on something will be a requirement.

Once the initial information is recorded on the tag, the information becomes linked to the unique patient number. This unique number also becomes a key data item in the attributes for any GIS application or for any other data base that may be used. Subsequent data collection may then be done using bar code scanners and the peel off labels can be affixed to anything associated with the patient. For example, Prince William County has used the tags for decontamination exercises to identify the persons processed and to mark the bags holding the persons belongings. The peel off tag also goes on a board that identifies where the belongings are stored. Another application of the peel off tags is to mark bags of medications during the dispensing of pharmaceuticals and to add to associated forms used during the administration of immunizations. The peel off tags can also be attached to deceased persons and to mark bags containing their effects.

Once the patient is entered into the system by being tagged, the unique number can then be used to communicate location and status from entry (complaint) to final disposition (grave). The Microsoft Access application permits searching and sorting by patient number and virtually anyone that uses a computer can readily enter data into the simple input screen. Because Prince William County uses a Microsoft operating system and this application is Windows compatible there are no local issues associated with administrative privileges or non-standard software. The system can be used on any computer found throughout the Prince William County Government.

Mass Casualty Data Management Form

The first approach to automating the Disaster Tag was to create a Microsoft Access Form using the essential data elements on the front side of the tag. A place to enter an incident number was added. The incident number would be provided from the county's Computer Aided Dispatch System (CAD) to provide a consistent reference for all activities associated with the incident. Bar code readers were acquired to permit scanning the patient number to expedite data collection. The first version of the form is shown below.

The screenshot shows a Microsoft Access form titled "Casualty Management Information : Form". The form is displayed in a window with a menu bar (File, Edit, View, Insert, Format, Records, Tools, Window, Help) and a toolbar. The form fields are as follows:

| | | | |
|------------------|----------------------|------------------|-------------|
| Patient Number: | 21504 | Status: | Discharged |
| Last Name: | Jones | Remarks: | Green dress |
| First Name: | Henry | | |
| Middle Initial: | J | | |
| Sex: | Male | | |
| Age: | 30 | | |
| Chief Complaint: | Difficulty breathing | | |
| Triage Status: | Black | | |
| Transport Unit: | P003 | | |
| IRR-UC: | U11 | Incident Number: | 4012345 |
| Destination: | Pittsburg hospital | | |
| Triage ID: | | | |

Integrating Pandemic Response Issues

To handle the additional data elements related to a Pandemic Response, the original Microsoft Access Mass Casualty Management Form was expanded to include additional drop down blocks to accommodate the data elements generated by and for the agencies operating during a pandemic event. The blocks provide a method to integrate data for the distribution of pharmaceuticals, the administration of immunizations as well as additional patient personal and fatality data. Information regarding whether or not a person was decontaminated or exposed to radiation may also be entered. A major change was the inclusion of morgue and funeral home information as an expansion of the patient disposition category. A place to enter a digital picture was also added. The utility of this feature should not need to be described further. A photographic link would be extremely useful at Family Assistance Centers.

Expanded Mass Casualty Data Management Form



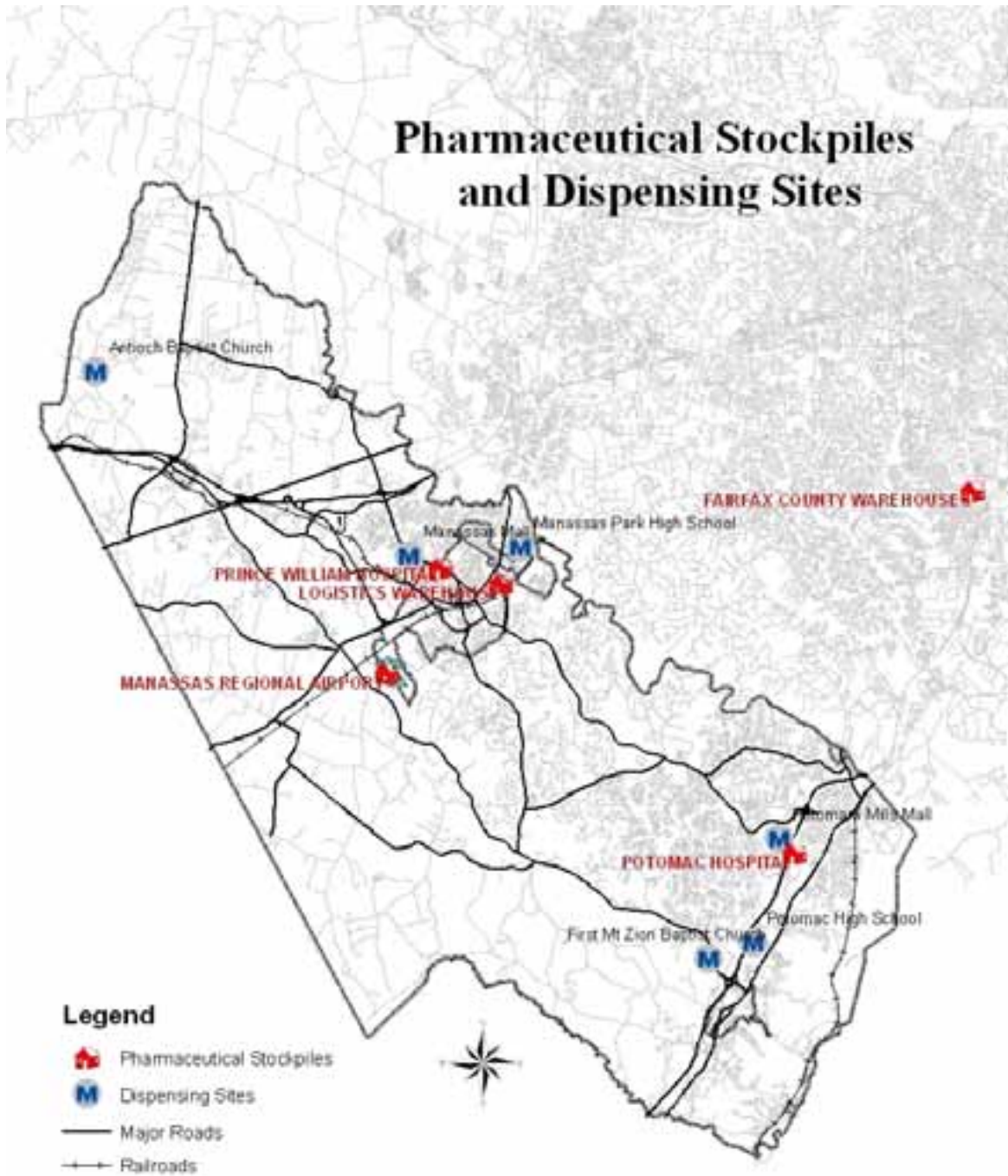
Integrating GIS and Access into the System

The Mass Casualty Data Management system provided the vehicle to collect, store and share data elements. To maximize the usefulness of the system, integrating the Geographic Information System (GIS) was essential. By integrating GIS, the system would provide the capability to graphically display data as the event evolves. The graphic displays are critical for effectively tracking persons who may be immunized or receive prophylactic medications; become casualties to assist in the identification of disease clusters; selecting the most appropriate immunization/medication distribution sites; identifying sites to establish temporary morgues; develop optimum routes for distributing pharmaceuticals or removing bodies; monitoring the efficacy of distributed medications and a host of other logistical support issues. This was done to provide the policy makers and operators with as timely a display as possible to ensure that the most recent information is available to assist in deliberations and decision making.

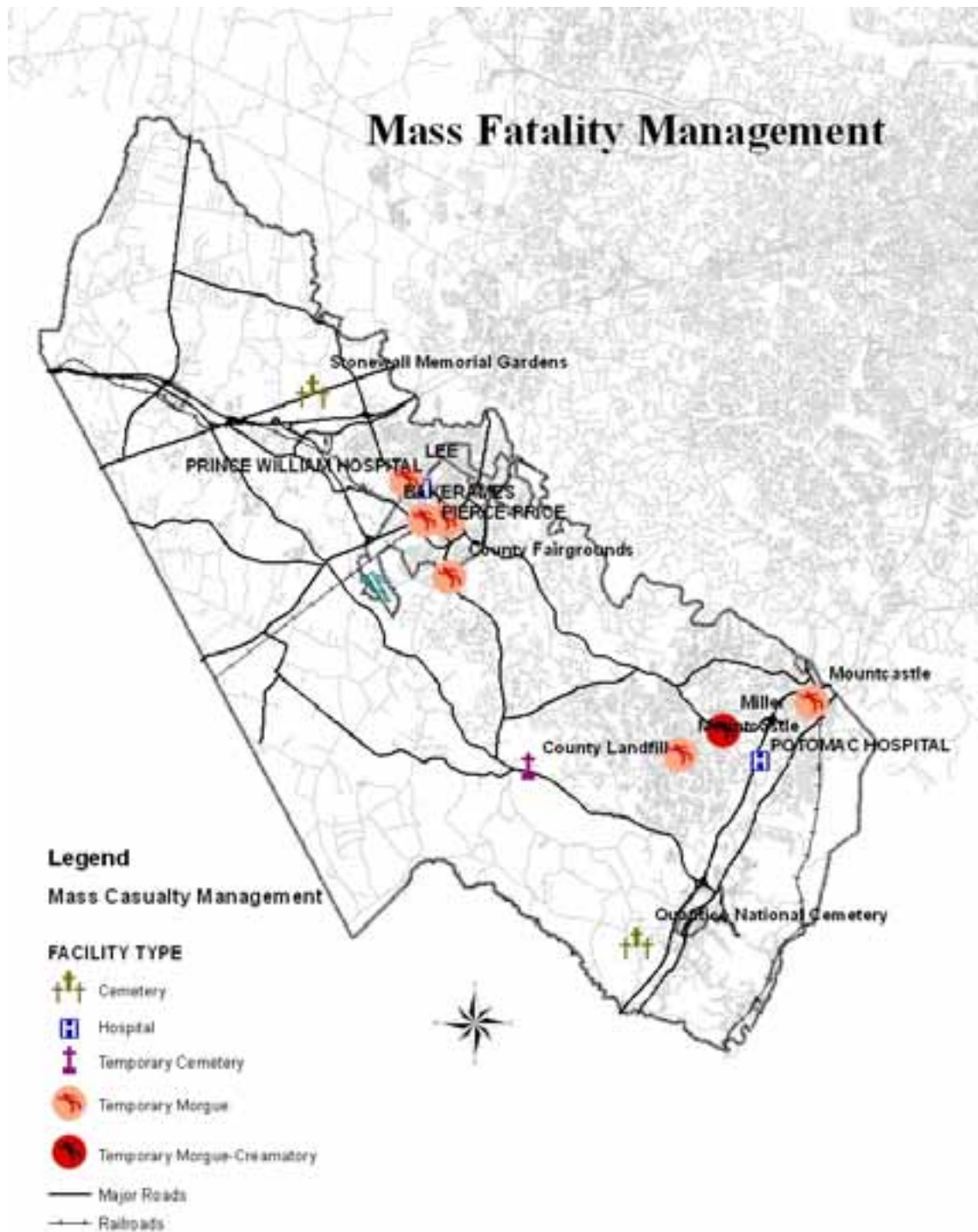
The importance of integrating GIS into can not be understated. Graphic representations become exceedingly critical when large geographic areas are involved and numerous sites must be used to support operations. The use of GIS in support of emergency management has been an integral part of the Prince William County Disaster Management Program for almost 20 years. The prospect of managing a pandemic had never been considered before. Linking to GIS would create elements to facilitate epidemiological studies and to identify the associated traffic control issues. Because the probable result of a pandemic is a mass fatality issue, it was deemed important to bring the funeral directors in the jurisdiction into the system early as part of the planning process.

Examples of the maps generated using GIS to support the planning effort are included on the following pages.

Pharmaceutical Stockpiles and Dispensing Sites



Mass Fatality Management

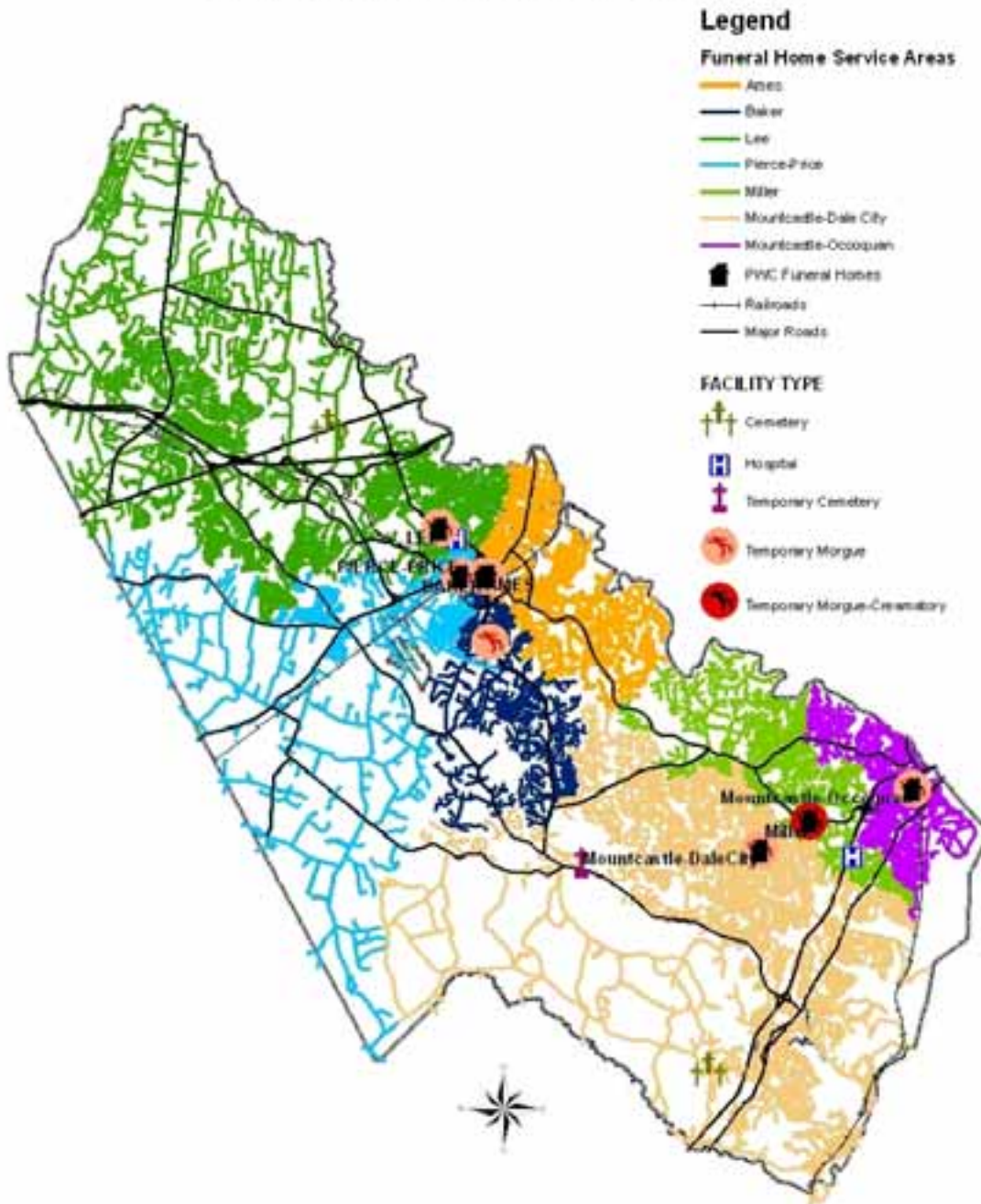


Network Analyst (An Invaluable Tool)

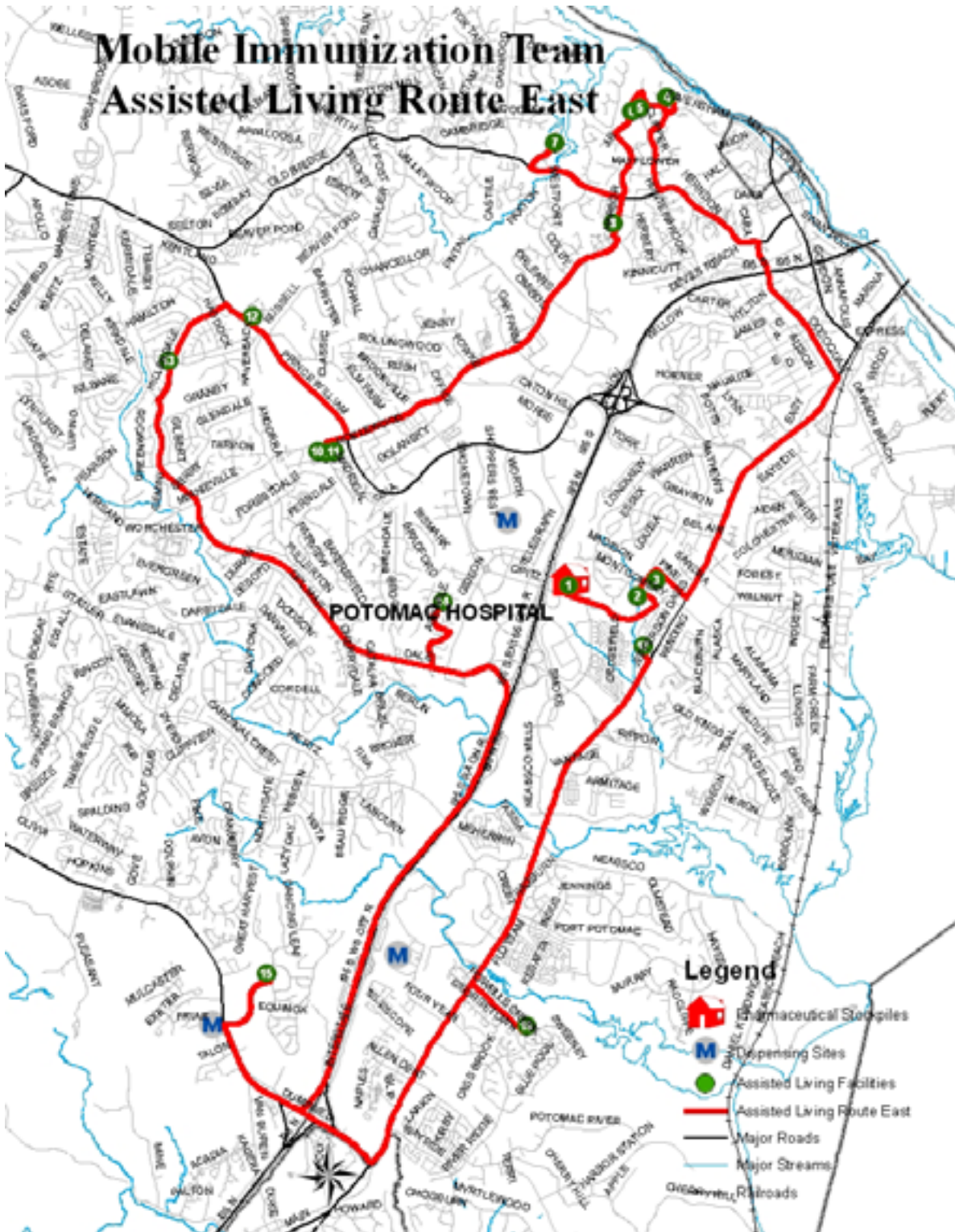
Prince William County uses ARCGIS Network Analyst for fire station location analysis and travel time modeling and the development of first due response areas. This methodology was applied to funeral homes, morgues, body storage sites, crematories and cemeteries. Additionally, the requirements for mass pharmaceutical dispensing and immunizations to include medication stockpiles and distribution were all addressed using the model. Often during natural disasters or significant events time is of the essence and things need to be done expeditiously. The use of Network Analyst enables us to establish effective and optimal routing for picking up and distributing medications and other necessary supplies using the least amount of time. Directions to all of the facilities which require a visit can be easily produced, printed and provided to service providers not familiar with a particular area. Service areas and operating districts are also easily set up for various functions at all levels, making for a much better coordinated and organized operation.

Service Area Map

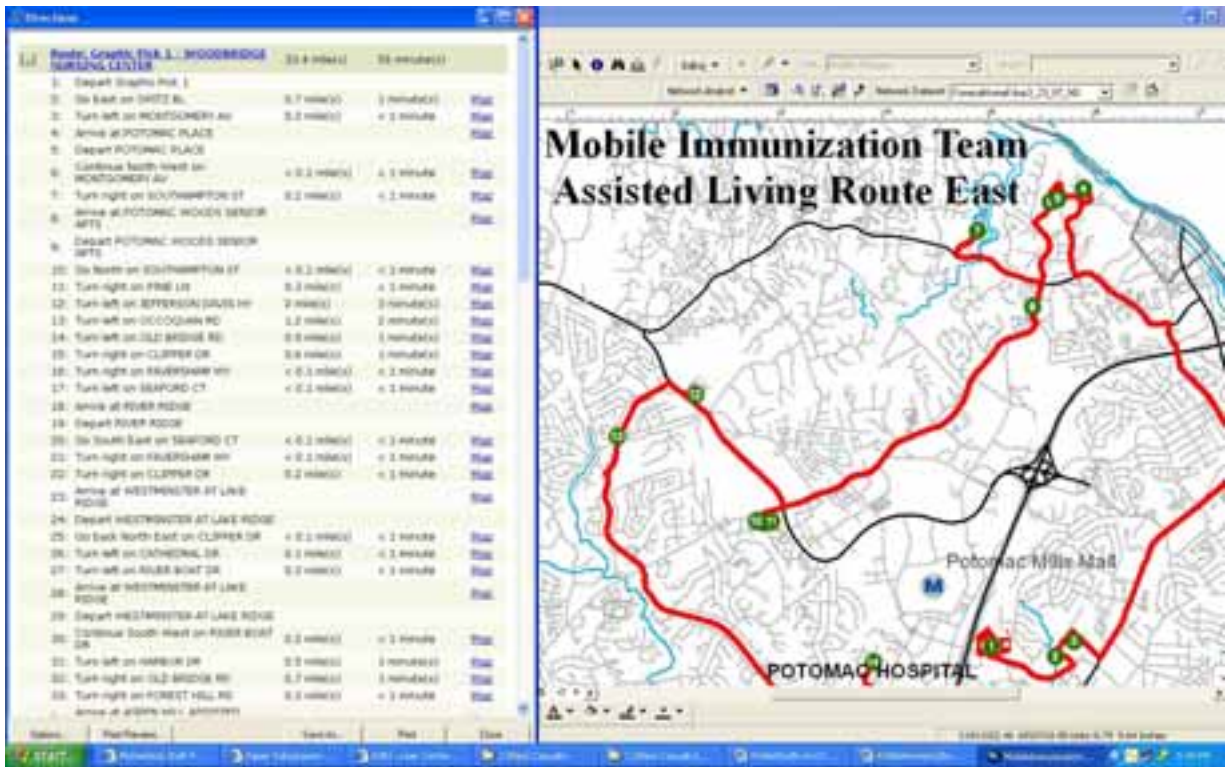
Funeral Home Service Areas



Mobile Immunization Team Route Map



Immunization Route and Directions



References

Metropolitan Washington Council of Governments <http://www.mwco.org>
("Regional map")

Highend Network <http://www.highend3d.com/> ("City ruins")

Prince William County Fire and Rescue GIS

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