Registration & Repatriation of Disaster Evacuees: A Geospatial Approach

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Overview

Although the Dallas/Fort Worth Metroplex is located hundreds of miles away from the Gulf Coast, during Hurricanes Gustav and Ike many residents of Louisiana and the upper Texas coast found refuge in North Texas. The City of Fort Worth Office of Emergency Management relied heavily upon geospatial technology for logistical management during the response and recovery of these two disasters. The initial response to both disasters involved identifying a shelter coordination hub for the region and multiple shelters for evacuee short term housing, and then providing route maps between the hub and shelter sites. A standardized web application with a database back end was then implemented to capture evacuee identification information, place of origin, special needs, and transportation requirements. The database was the foundation for successful evacuee registration, background checks, shelter tracking, and family unification. Furthermore, it was used as the basis of the recovery effort by analyzing the place of origin and transportation need statistics within a Geographic Information System to ensure a successful repatriation process. The power of geospatial technology guaranteed the full and efficient utilization of resources during both the response and recover efforts.

Response

As Hurricane Gustav was bearing down on the coast of Louisiana, the Texas Governor's Division of Emergency Management notified the City of Fort Worth (CFW) to prepare for the arrival of dozens of buses and hundreds of personal vehicles full of evacuees; all requiring shelter and food. The City of Fort Worth Office of Emergency Management (CFWOEM) immediately began researching facility resources that would be able to provide a place to eat, shower, and sleep. It was also decided that these temporary shelter sites should only accommodate up to 100 people to avoid disorder due to masses of people in a confined area. The GIS Mapping Team (GMT) referred to the GIS Enterprise SDE database for community asset data such as community centers, churches, nursing homes, schools, hospitals, and recreation centers. Using the

required variables in a facility query a total of 22 sites were identified for sheltering purposes. A few of these sites were noted as being able to accommodate medical and special needs evacuees. The CFWOEM worked closely with American Red Cross, Tarrant County, Salvation Army, and the Clergy and Police Alliance (CAPA) to supply the shelters with cots, linens, toiletries, food, and water.

As the evacuation of Southern Louisiana and Texas began, people were loaded onto buses or jumped in their cars to begin their escape. It was at this point that some were separated from their family and loved ones. Upon arrival in Fort Worth evacuees were directed to our shelter coordination hub. The hub was designated as the single coordination point for evacuees in hopes that any separated families could be quickly reunited. Since most of the drivers were not familiar with the North Texas area providing a single arrival address made it easier and supported bringing families back together.

As the evacuation convoys began arriving at the hub, families and friends were reunited and shelter assignments began. As mentioned, evacuees are usually not familiar with the area, so route maps from the hub to assigned shelters were created. Fortunately the GIS Enterprise SDE database included street centerlines and orthophotography. The GMT had established a shelter data layer from the facility query making the generation of shelter route maps simple since all required datasets were readily available. Route maps from the hub to individual shelters were given to logistical managers at the hub to disseminate to buses and cars traveling to individual shelters.

Once the shelters began reaching capacity, population updates became essential for effective shelter resource management. Besides needing to know how many meals to prepare, linens to clean, and personal hygiene products to replenish, The Texas Governor's Division of Emergency Management needed evacuee population counts to incorporate into the disaster relief statistics from across the state.

Disaster Evacuee Registration

In response to the need to track evacuees and shelters a web-based Disaster Evacuee Registration application was created in ASP code so that evacuee information could be entered. Shelters were equipped with laptops and wireless hubs so that the application could be accessed through the internet. To protect personal data, the application was a secured site using a Secure Socket Layer protocol that also required a username and password. The information collected was stored in a centralized database which was created in SQL Server 2005.

As evacuees arrived at their assigned shelter, information was gathered from each individual including name, date of birth, home address (address, city, county/parish, state, and zip code), number of pets, any health conditions, and if they required transportation back to their home city. This allowed the application to group the evacuees together as families at the time of registration. Each person and/or family was assigned to a shelter within the system. Additionally, the evacuees could be transferred to another shelter, find temporary housing in a

hotel, or find permanent housing, and have each action tracked within the system with a date/time stamp. This level of documentation is required for reimbursement of City expenses from the state and/or the Federal Emergency Management Agency.

The Disaster Evacuee Registration application had a built-in search engine, so queries could be done within and across shelters. One of the first analyses the GMT was asked perform was shelter population compared to shelter capacity. During the initial influx of coastal residents, updated shelter census maps were routinely generated to assist in shelter resource management. The CFWOEM managed over 1200 evacuees in the system using this application. As shelters filled, the Texas Department of Public Safety was given access to the application so that they could run mandatory criminal background checks against the evacuee information. The database also supported family reunification efforts with shelters outside the Fort Worth/Tarrant County area. As the word spread about the Disaster Evacuee Registration application, the City of Dallas and City of Tyler contacted the CFWOEM to assist shelter evacuees in searching for extended family members. With ability to search the database by evacuee name, it could be verified if the family member was being housed in one of the 22 shelters being coordinated from the CFWOEM. On several occasions people's minds were put at ease because they had found their loved ones had made it to safety.

Repatriation

The database application was the backbone of a successful repatriation process. During the registration process, evacuees were asked if they needed return transportation home. The transportation field was a required field so it had to be answered before an evacuee could be officially registered. Once the State of Louisiana started announcing that parishes were open, a query was run on the database to identify evacuees in our shelters from those parishes. The people who had arrived in personal vehicles were notified by shelter managers to head home. The remaining required transportation home, which necessitated a two part analysis. The first part of the transportation equation was how many people needed a ride home so that the CFWOEM could acquire the appropriate number of buses. The second half of the analysis involved generating bus itineraries based upon the number of passengers and stops while considering the best routes. Approaching the bus manifest in this manner ensured the full and efficient use of transportation resources.

The repatriation planning began by grouping evacuees by city and parish origin, and then shifted to creating bus routes. Since all of the evacuees needing transportation were from Louisiana, geospatial datasets of Louisiana roads and place names were required. The GMT tried downloading datasets from the internet, but had no luck as data warehouse servers containing Louisiana data were jammed due to an infinite amount of requests. Fortunately, the Environmental Systems Research Institute (ESRI) Data and Maps CDs which are provided with all ESRI software licenses could be utilized. These data CDs contain regional geospatial data layers such as city, county, interstates and

highways. Once these datasets were loaded into the GIS Enterprise, the GMT was much more competent in creating efficient bus routes. A total of 407 evacuees were scheduled into 10 bus itineraries.

Recovery, Back to Response

As Hurricane Gustav after action reports were being written the CFWOEM began preparing for Hurricane Ike. Although all the shelters were empty and staff had begun cleaning, they were directed to replenish supplies and stay open for the people fleeing Hurricane Ike from upper Texas coast. The Texas Governor's Division of Emergency Management stated that the number of evacuees would be more than double when compared to Hurricane Gustav. The reason behind that statement was the fact that the Houston area was a place of refuge during Hurricane Gustav, and now that area was being directly impacted by Hurricane Ike.

Additional shelters were identified under the same specifications as they were for the previous evacuation, and were entered into the Disaster Evacuee Registration application. During the Hurricane Ike response the application was utilized once again for evacuee registration, shelter census updates, background checks, family unification and shelter resource management. Over 2500 evacuees were provided meals and a place to shower and sleep.

The storm surge and electrical outage impacts from Hurricane Ike were so significant that it delayed residents from returning home for almost 10 days. After a few days, the Fort Worth Independent School District (FWISD) was contacted to start enrolling school-aged children into school. A query was run against the database so that the number of school children including their age could be provided to the FWISD.

The repatriation process for Hurricane Ike was much easier than Hurricane Gustav because it did not require bus route planning. Emergency Managers in the Houston area collaborated and established three staging areas where buses could transport evacuees. A total of 34 buses with around 1500 people were taken to the Houston, Beaumont or Harris County hub.

Conclusion

In Fort Worth the use of geospatial technology for registering and tracking evacuees as well as logistical management was essential for effective and efficient operation of mass care shelters during Hurricanes Gustav and Ike. The Disaster Evacuee Registration application and centralized database proved to be invaluable throughout both the efforts of response and recovery. Moreover, a few improvements to the application would increase its worth even more. First by upgrading the application to a more current technology such as ASP.net 2.0 or higher so that a robust mapping capability could be implemented so geographical displays could be created online. Secondly, to enhance reporting capabilities by enabling users to not only select their own criteria, but have the ability to export it to a format of choice. Thirdly, by providing more levels of security by providing field-level and function-level permissions and increasing the protection of the login process The combination of the Disaster Evacuee

Registration application and GIS professionals familiar with City GIS resources and Emergency Operations Center functions provided Fort Worth with a resource that proved to be essential in shelter operations.

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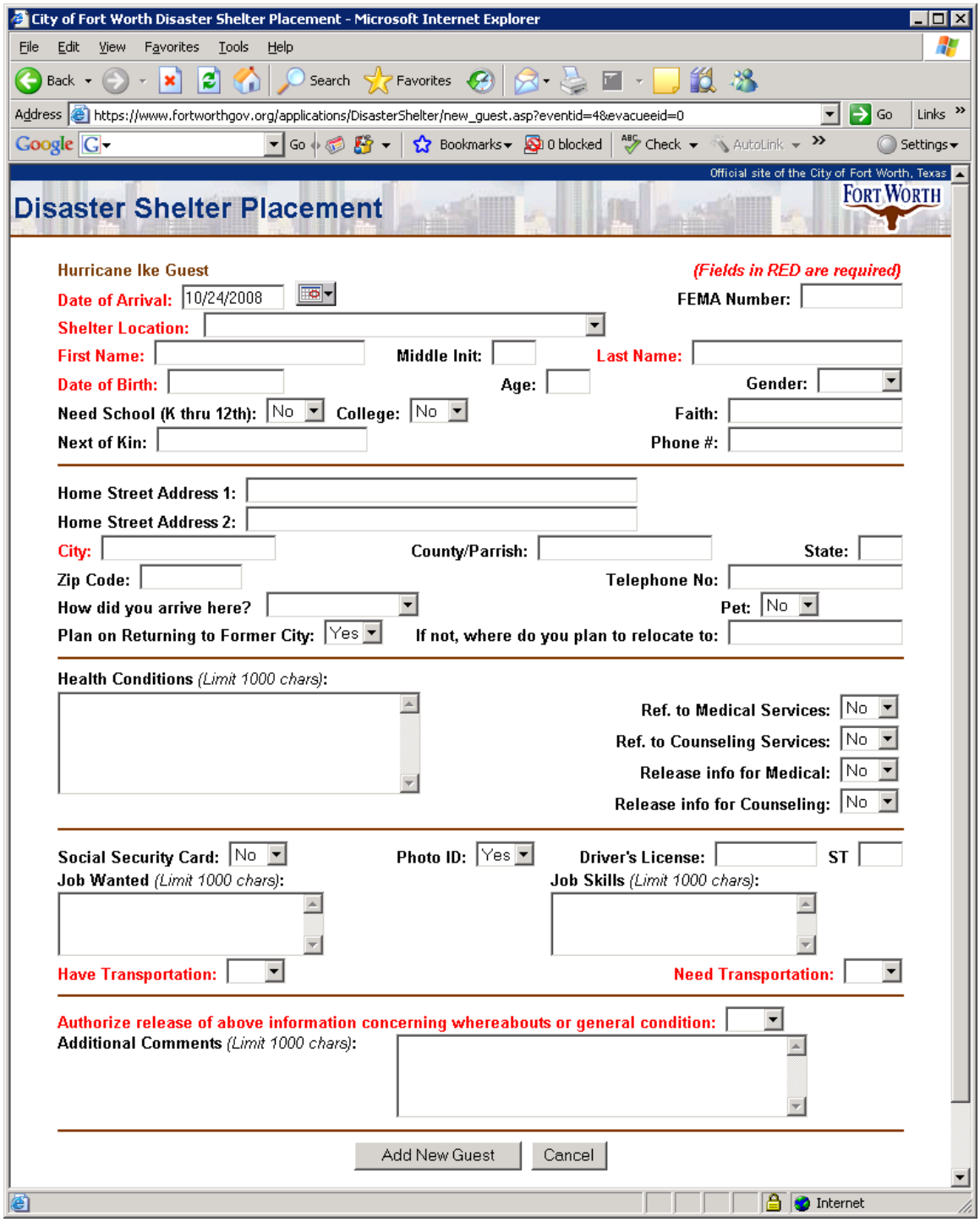


NUMBER OF HURRICANE GUSTAV GUESTS IN CITY OF FORT WORTH AREA SHELTERS

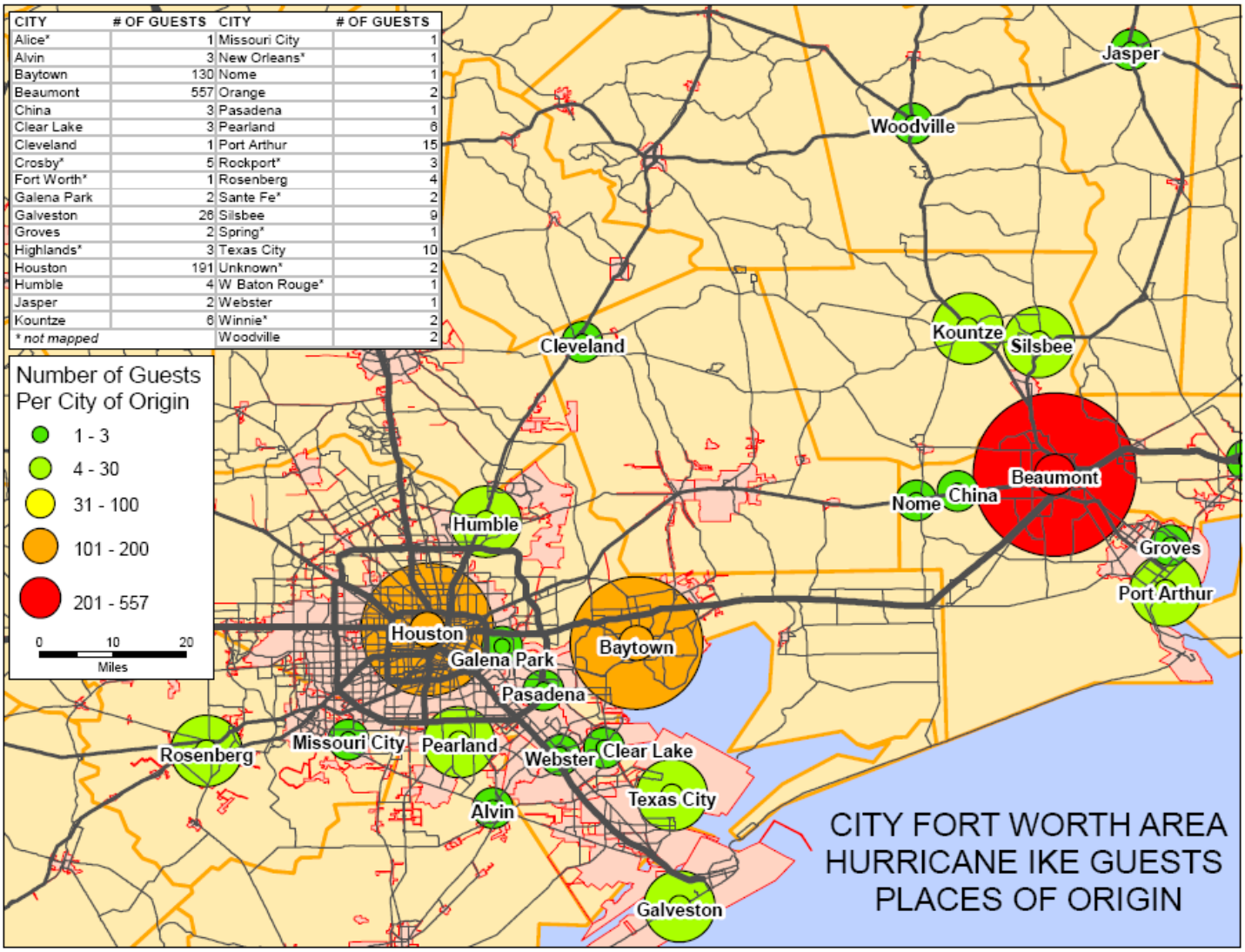
Tuesday, September 2, 2008 10:00am

Number of Guests Per City of Origin

- 1 - 6
- 7 - 16
- 17 - 48
- 49 - 92
- 93 - 178

0 25 50 Miles

CITYNAME	# of GUESTS	CITYNAME	# of GUESTS	CITYNAME	# of GUESTS	CITYNAME	# of GUESTS
Amelia	1	Houma	3	Lockport	5	Raceland	48
Avondale	5	Jeanerette	11	Marrero	2	Schriever	1
Basile	5	Jefferson	3	Mathews	1	Scott	10
Baton Rouge	8	Jennings	3	Metairie	15	Sulphur	5
Beaumont	36	Kenner	2	Morgan City	5	Terrytown	8
Carlyss	4	Labadieville	12	Napoleonville	76	Thibodaux	178
Cut Off	1	Lafayette	24	New Iberia	6	Welsh	1
Grand Isle	5	Lake Charles	27	New Orleans	92	Westwego	3
Gray	1	Laplace	4	Orange	3		
Gretna	8	Larose	3	Paincourtville	4		
Hammond	4	Leesville	9	Port Arthur	16		



CITY	# OF GUESTS	CITY	# OF GUESTS
Alice*	1	Missouri City	1
Alvin	3	New Orleans*	1
Baytown	130	Nome	1
Beaumont	557	Orange	2
China	3	Pasadena	1
Clear Lake	3	Pearland	6
Cleveland	1	Port Arthur	15
Crosby*	5	Rockport*	3
Fort Worth*	1	Rosenberg	4
Galena Park	2	Sante Fe*	2
Galveston	26	Silsbee	9
Groves	2	Spring*	1
Highlands*	3	Texas City	10
Houston	191	Unknown*	2
Humble	4	W Baton Rouge*	1
Jasper	2	Webster	1
Kountze	6	Winnie*	2
* not mapped		Woodville	2