Integrating GIS in Wide Area Searches

Debbie Briedwell
Missouri State Emergency Management Agency

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Boone County Fire District MO-TF1

From Katrina to Ike

Evolution of GIS Utilization by the FEMA Urban Search and Rescue Response System

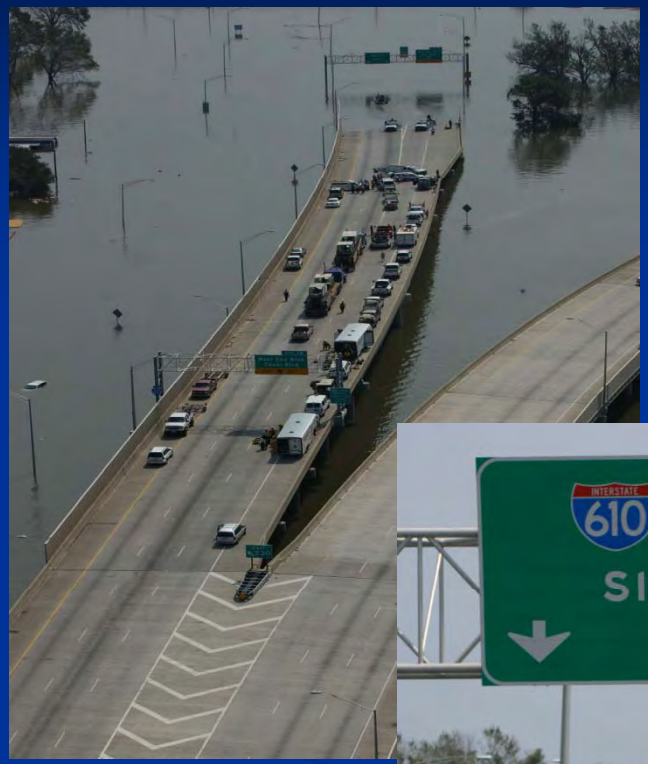
US&R Task Force Locations

Concept of Operations

- Type 1/3 Task Force
- 70/28 Person multi-faceted/cross-trained personnel
- 10/6 person support team
- 80,000, 40,000 pounds of equipment
- Standardized equipment training and procedures
- National Incident Management System (NIMS) compliant

Concept of Operations

- 24-hour Operations, variety of staffing options
- Self-sufficient for first 72 hours or more
- Resupply after 72+ hours through Incident Support Team Logistics (IST)
- Responses within 6 hours of activation for air travel, 4 hours for over-the-road ground travel

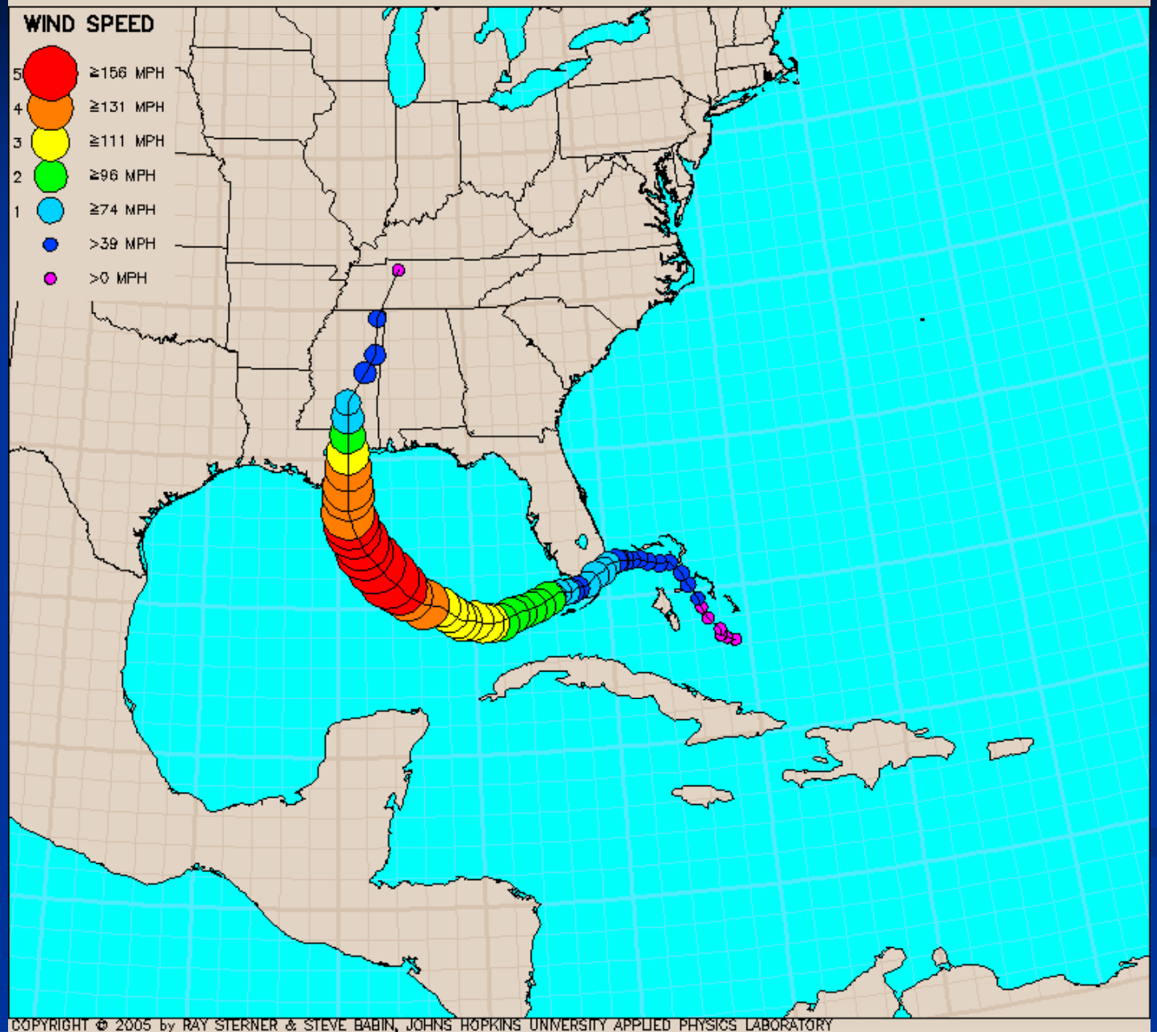


Katrina Timeline

- 8/25/2005: Florida landfall
- 8/27/2005: FEMA US&R Program activation
- 8/28/2005: Katrina Category 5; FEMA US&R assets stage in Shreveport, LA
- 8/29/2005: Katrina makes landfall as a Category 3 Hurricane (125 mph sustained winds) FEMA US&R IST Advance Element enters New Orleans mid-afternoon; remaining US&R assets arrive around midnight
- 8/30/2005 (daylight) FEMA US&R teams begin rescue operations

Hurricane Katrina

21:00 Tue August 23, 2005 to 15:00 Tue August 30, 2005 UTC



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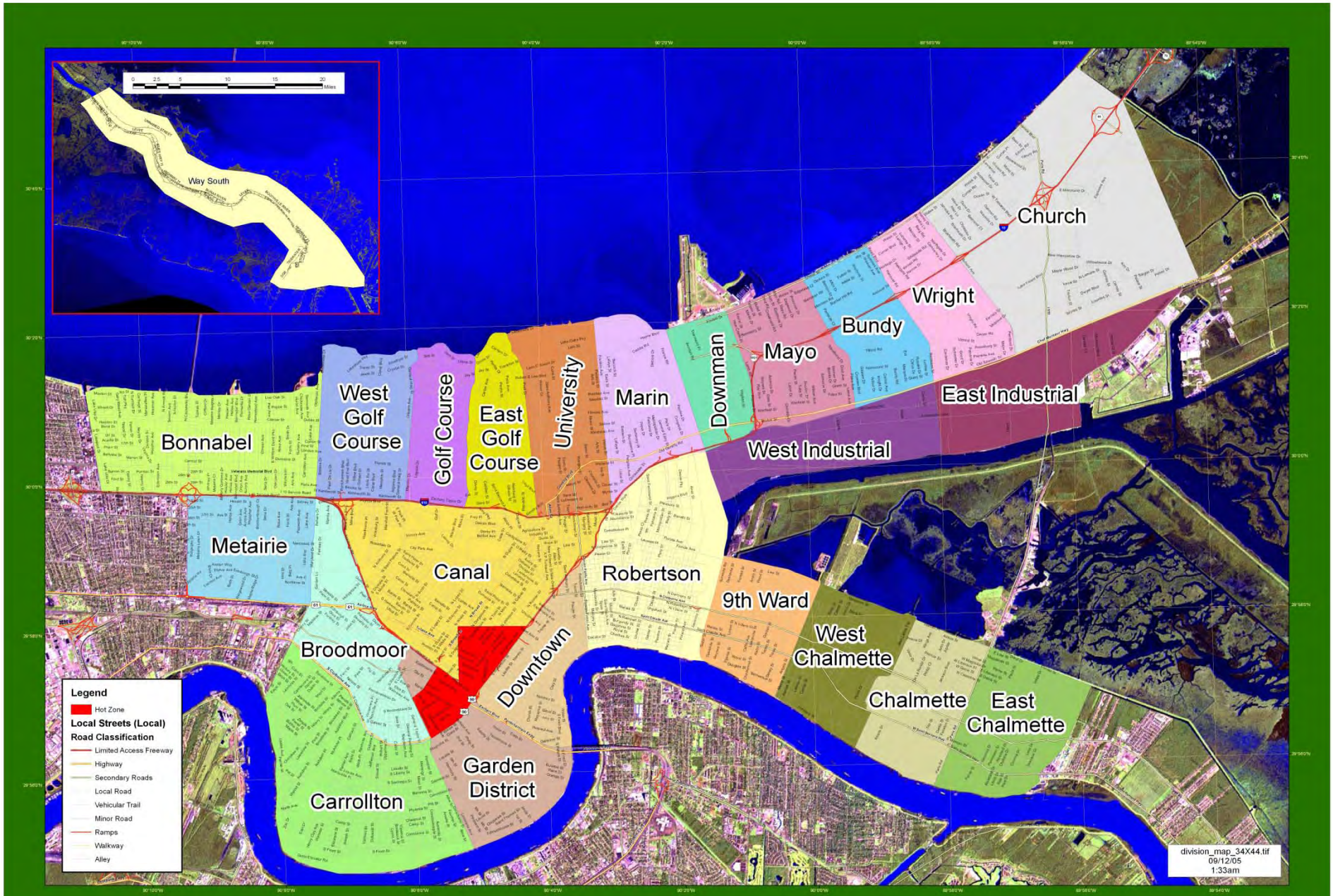
Issues

- Little Intelligence/Data for Region Available to IST
- Commercial Paper Maps Only
- No Standardized Large Area Search Procedures
- Marginal GPS Capabilities/Standardization of Data Processing
- No Map Reproduction Capabilities

OPERATING HOURS
MONDAY THRU SATURDAY
6:00AM – 9:00PM
SUNDAY
9:00AM – 7:00PM
ENTRANCE
ONLY–PLEASE
PULL FORWARD
TO OPEN PUMP

FEMA
2113
POLICE



Hurricane Katrina

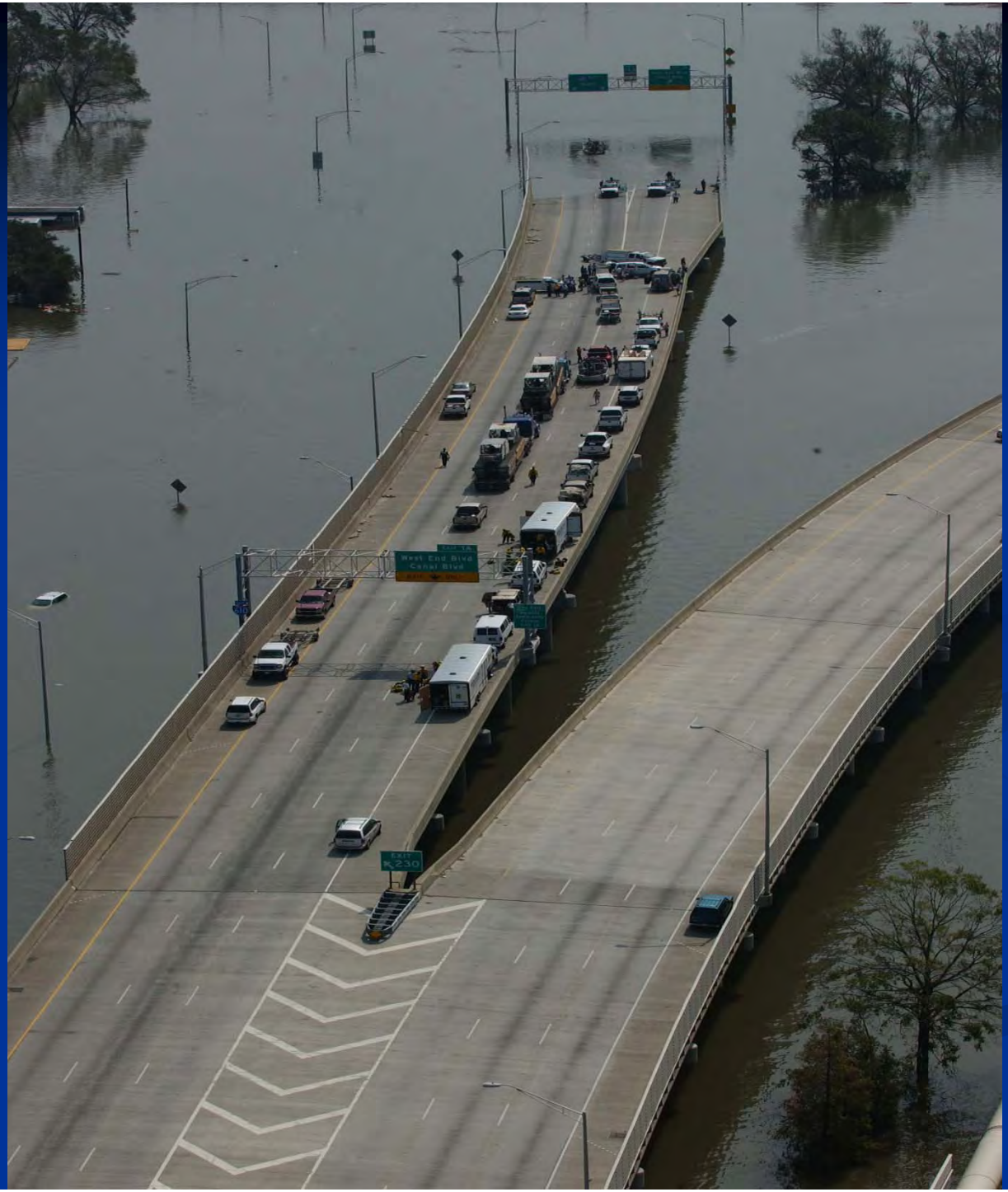
FEMA Search and Rescue Divisions

0 0.5 1 2 3 4 Miles

N

USGS
science for a changing world
National Wetlands Research Center
Lafayette, LA
337-266-8500

SAM'S CLUB
Entrance
N912JP
SHERIFF
JPSO


West End Blvd
Canal Blvd
EXIT
230

INTERSTATE
610
EAST
Slidell
West End Blvd
Canal Blvd
EXIT ONLY
EXIT
35
M.P.H.
AUG 30 2005

610 EAST
Slidell
EXIT 1A
West End Blvd
Canal Blvd
EXIT ONLY
EXIT
35
AUG 30 2005

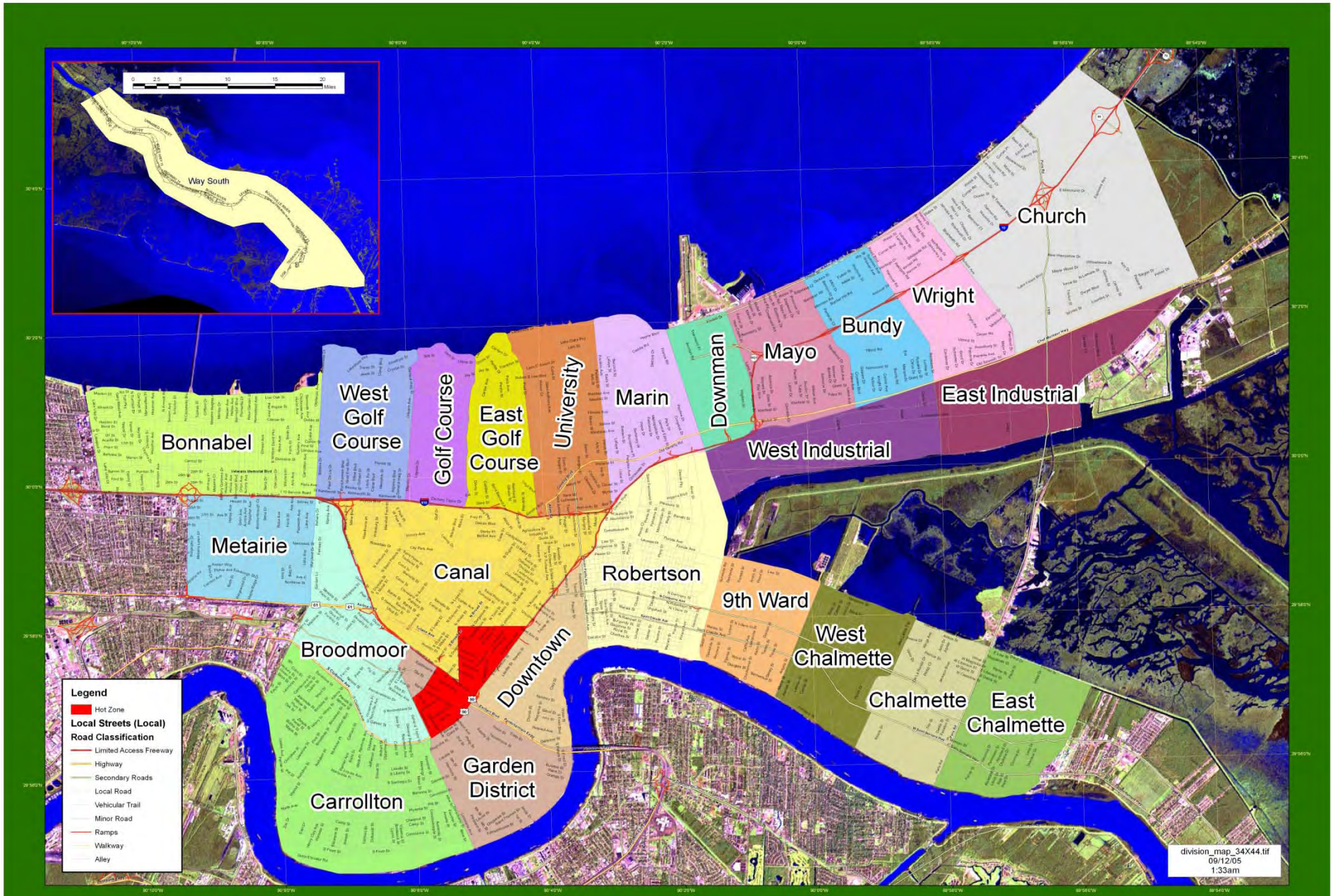
Hurricane Katrina SAR ICP/Base Camp of Operations

SEP 4 2005
NM-TF1
U-HAUL

SEP 4 2005

New Issues

- Limited GIS Capability
- Workflow Issues
- Geocoding Issues
- Reproduction and Printing



Hurricane Katrina

FEMA Search and Rescue Divisions

0 0.5 1 2 3 4 Miles

N

USGS
science for a changing world
National Wetlands Research Center
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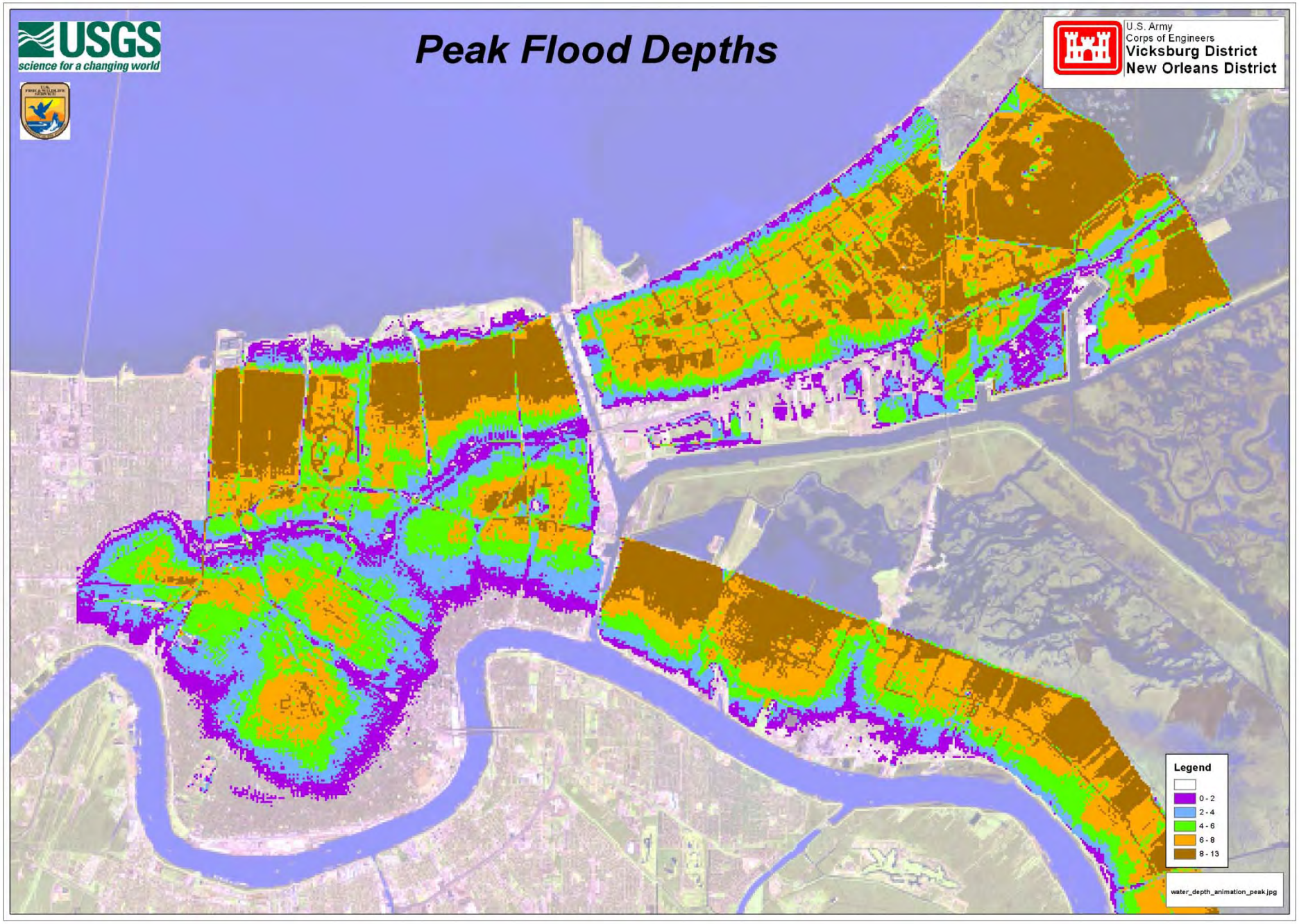
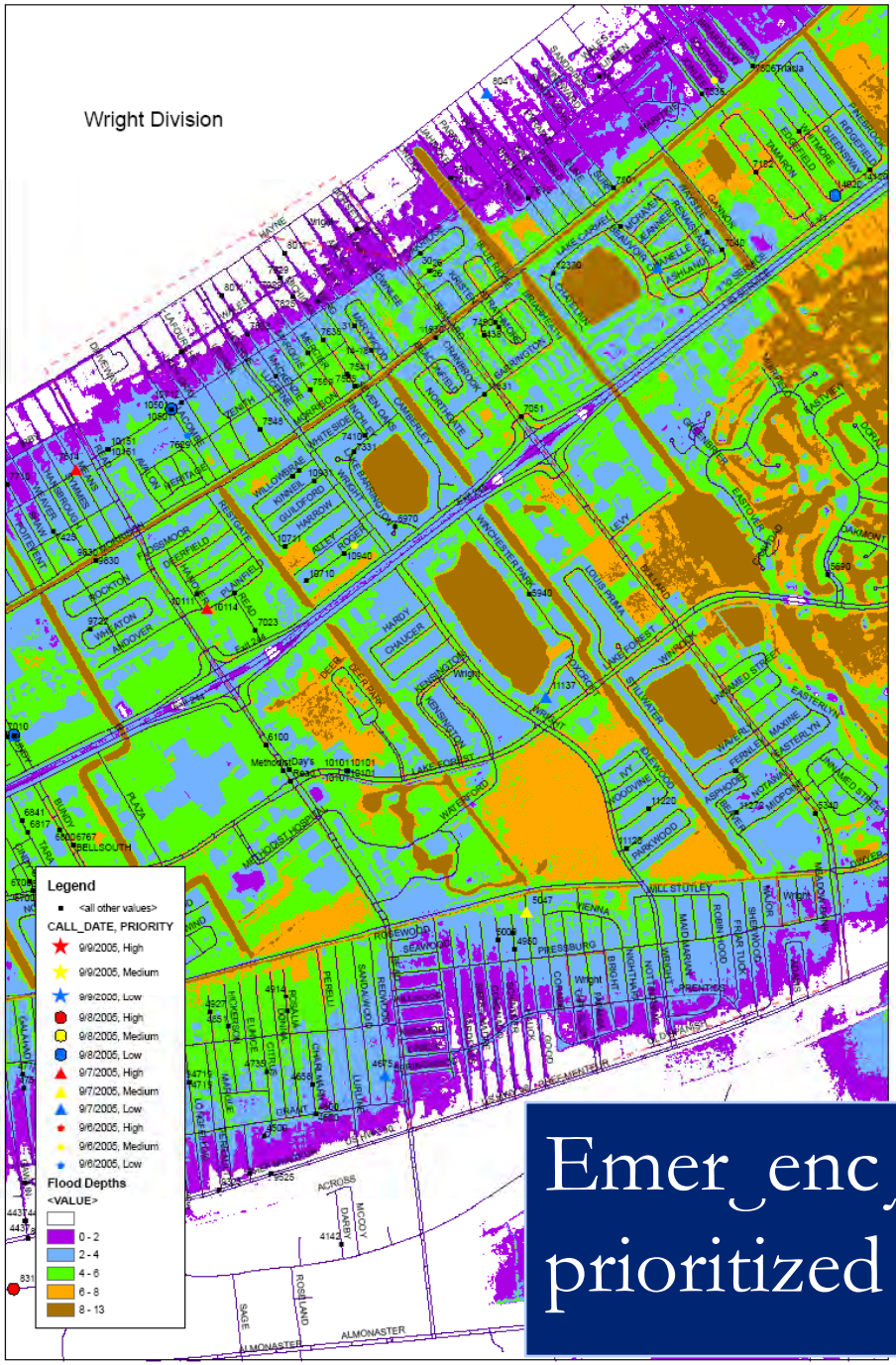
337-266-8500

New Orleans Before and After Hurricane Katrina

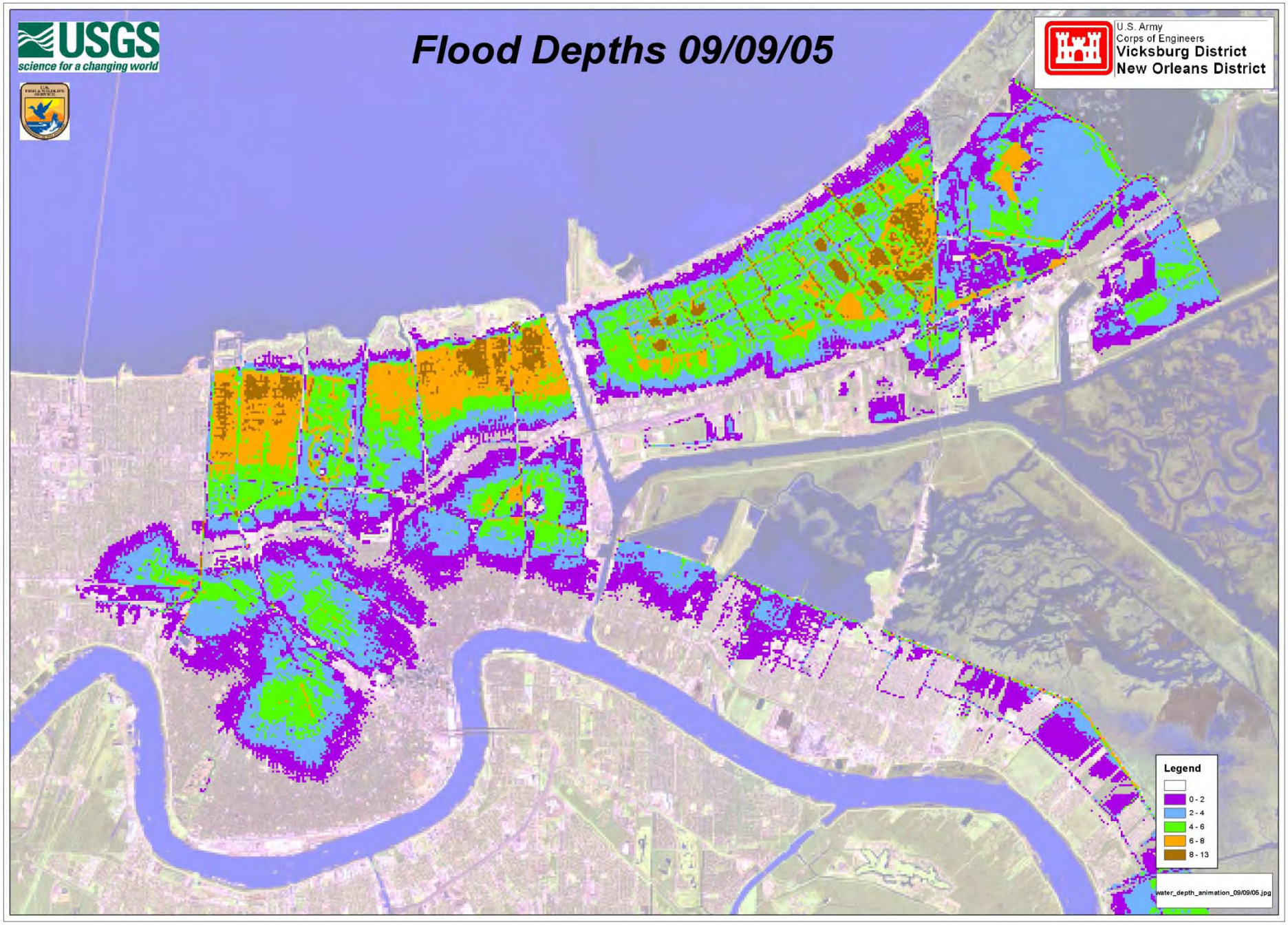

Peak Flood Depths
USGS
science for a changing world
U.S. Army
Corps of Engineers
Vicksburg District
New Orleans District
Legend
0 - 2
2 - 4
4 - 6
6 - 8
8 - 13
water_depth_animation_peak.jpg

CALL_DA	CALL_TIME	PRIORITY	SITUATION	OTHER_DATA	VICTIM	VICTIM_STR	CITY	CROSS_	PARISH	VICTIM_PHO	LON	LAT
9/9/2005	11:55:00 AM	Medium	No contact since storm	does not know if evacuated emphasema	Ervin Freeman-11/11/	1313 Alver Street	New	cross str	Orleans	504-944-5919	W90 02 08.68	N29 58 04.64
9/9/2005	11:50:00 AM	Low	No contact since storm	USCG contacted by Sharon Casseal in Peachtree, GA victim is diabetic	Kenneth Smith	172 Willow Lane	Port Sulphur		Plaquem	314-539-2276 or	W92 39 46.49	N31 54 40.79
9/9/2005	11:45:00 AM	Low	No contact since storm		unknown	12101 Lake Forest Blvd senior complex on 9th floor	New Orleans		Orleans	504-243-2141	W89 56 10.85	N30 02 42.60
9/9/2005	11:40:00 AM	Low	No contact since storm	father is VA Veteran with diabetes, high blood pressure, and in remission from throat cancer. Last contact was a month ago.	Donald Turner	410 Taylor Street	Kenn	Webster	Jefferson		W93 27 50.66	N32 59 23.58
9/9/2005	11:35:00 AM	Low	Trapped in house		Gail Harris	3100 Rue Park Fontane	New Orleans		Orleans		W90 00 35.59	N29 55 22.52
9/9/2005	11:30:00 AM	High	Trapped in house	Go Get them out of house: Grandmother and Uncle	Theresa Driscoll Mark Driscoll	2409 Pecan Drive	Chalmette		St Berna	(504)-271-1242	W89 57 11.25	N29 56 09.19
9/9/2005	11:05:00 AM	High	Welfare Concern	She said her brother Darrel Coleman was dead and she doesn't know about her other brother Raymond Coleman.	Raymond Coleman	2827 Metro Politan Street	New Orleans		Orleans		W90 02 15.41	N29 59 10.72
9/9/2005	10:55:00 AM	High	Trapped in house	73 YOA - on meds - wife was rescued by family but they would not let them back in to get him	Earl Balthazar	4800 Majestic Oak - a house	New Orleans		Orleans	504-241-1682	W90 00 57.78	N30 01 05.99
9/9/2005	10:55:00 AM	Medium	Welfare Concern	elderly woman, stroke victims, trouble walking, wheelchair bound, 4 children ages 12, 10, 5,3, 4 Adults Stranded	Alma Flowers	704 No. Elm Street Apt C	Metar	This apt	Jefferson	504-738-3759	W91 11 12.68	N32 24 50.38
9/9/2005	10:35:00 AM	High	Trapped in house	They need someone to go get them out of there house b/c 3 adults are elderly and the 27 year old is staying with them	John McKnight Adam Smith Beatrice Powell John Smith	3212 Roberta Street	Metarie		Jefferson		W90 12 14.23	N30 00 19.11
9/9/2005	10:25:00 AM	Low	No contact since storm	Has a dog with her. Journalist.	Agusta Collins 59 yea	926 Philip Street New Orleans	New Orleans		Orleans	504-586-8772	W90 04 35.34	N29 55 39.36
9/9/2005	10:25:00 AM	High	No contact since storm	Diabetic, Pancreas Disease. He is Hispanic Male 5'5 150 lbs	Ronald Mendoza	514 1/2 S Scott St	New Orleans		Orleans	504-304-0673	W90 06 06.50	N29 58 10.08
9/9/2005	10:20:00 AM	Low	Welfare Concern	Haven't talked to her since storm	Beth Langley (50)	2442 Headwaters Drive	Slidell		St Tammany		W89 50 06.67	N30 20 17.99
9/9/2005	10:10:00 AM	Medium	Treme Community Center	a group of people trapped at a community center; this family has a 12 yr old asthmatic patient without medication; he is ill	Jerome Smith; Cynthi	1400 St. Phillips	New	near a s	Orleans	none	W90 04 07.53	N29 57 53.03
9/9/2005	10:05:00 AM	Low	No contact since storm	turned in by Bell South employer; this is an employee that has not been heard of	Carolyn J. Earl	433 Bounty Street	New	none kn	Orleans	504-393-2714	W90 43 22.96	N29 35 28.98
9/9/2005	10:05:00 AM	Low	No contact since storm	12 yr old boy with asthma and no medication in household	Rhonda Edwards	2426 St. Philip St	New	North Bn	Orleans	none	W90 04 39.51	N29 58 15.03
9/9/2005	10:05:00 AM	Medium	No contact since storm	Hasn't heard from them since the hurricane	Joe Henson, Joy Hen	23 Jay Place	New Orleans		Jefferson	504-431-3101	W90 14 15.40	N29 57 08.24
9/9/2005	9:55:00 AM	Low	No contact since storm	none	Marcia B. Breland	54431 Jim Stuart Road	Angie	none kn	Washing	985-848-5113	W89 59 11.56	N30 55 24.89
9/9/2005	9:50:00 AM	High	Welfare Concern	No Contact w/ her Brother since Tuesday 08/30/05	NOPD Officer Sidney	1826 Anette Street	New Orleans		Orleans	504-450-3131/66	W90 03 47.79	N29 58 32.58
9/9/2005	9:45:00 AM	High	Medical Emergency	She is a mental health patient. She is attempting suicide. She is with her family and 15 neighbors. She is trying to get her hands on her father's pain pills. The last time she was contacted was last night.	Jalisa Pinkley 1							
9/9/2005	9:45:00 AM	High	No contact since storm	none	Robert A. Stans							
9/9/2005	9:35:00 AM	Low	No contact since storm	reported by an employee at Bell South checking on his employees	Leslie M. Hull							

Emer¸enc¸ calls were prioritized and mapped.



Emer¸enc¸ calls were prioritized and mapped.


USGS
science for a changing world
Flood Depths 09/09/05
U.S. Army
Corps of Engineers
Vicksburg District
New Orleans District
Legend
0 - 2
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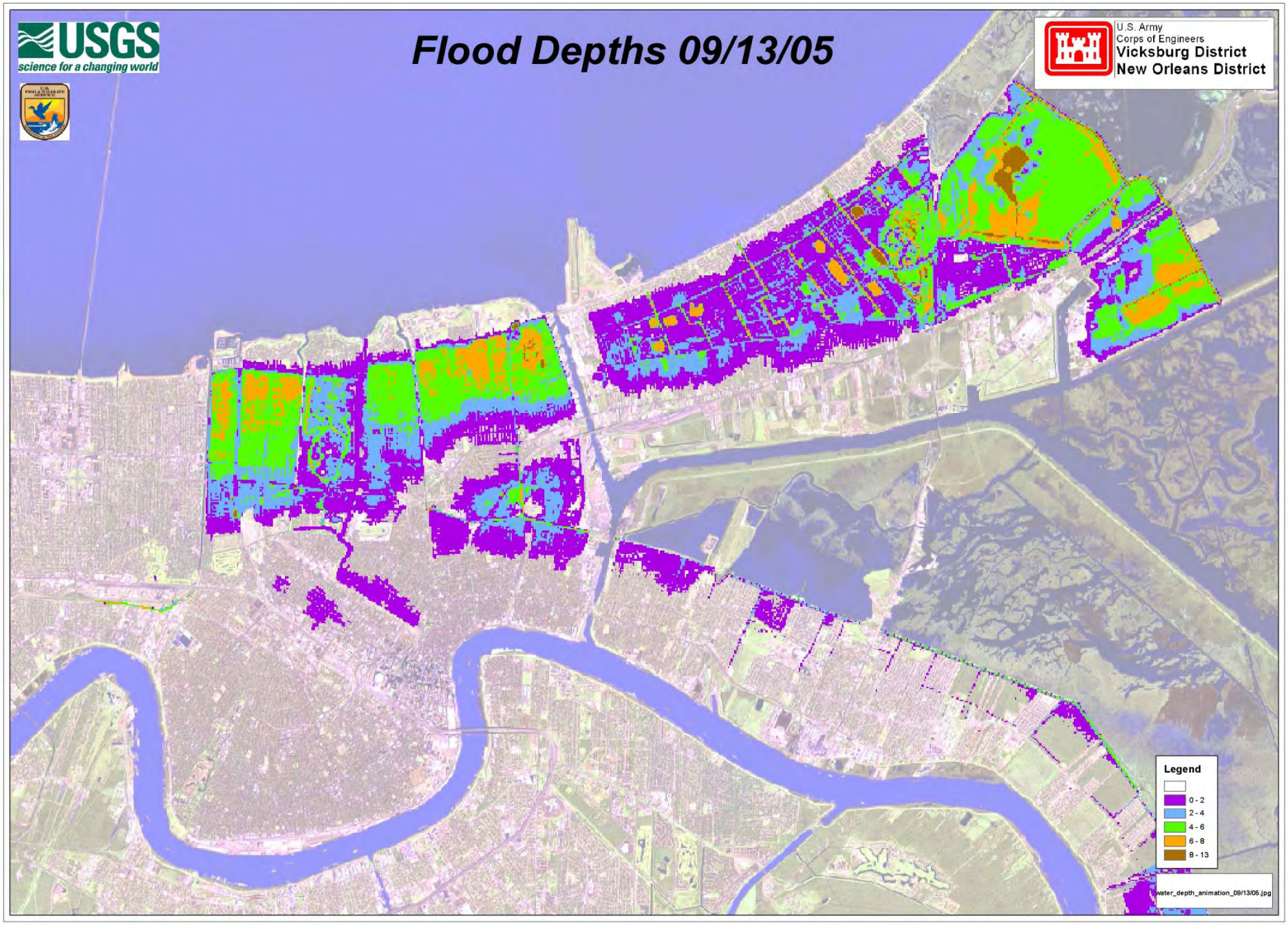
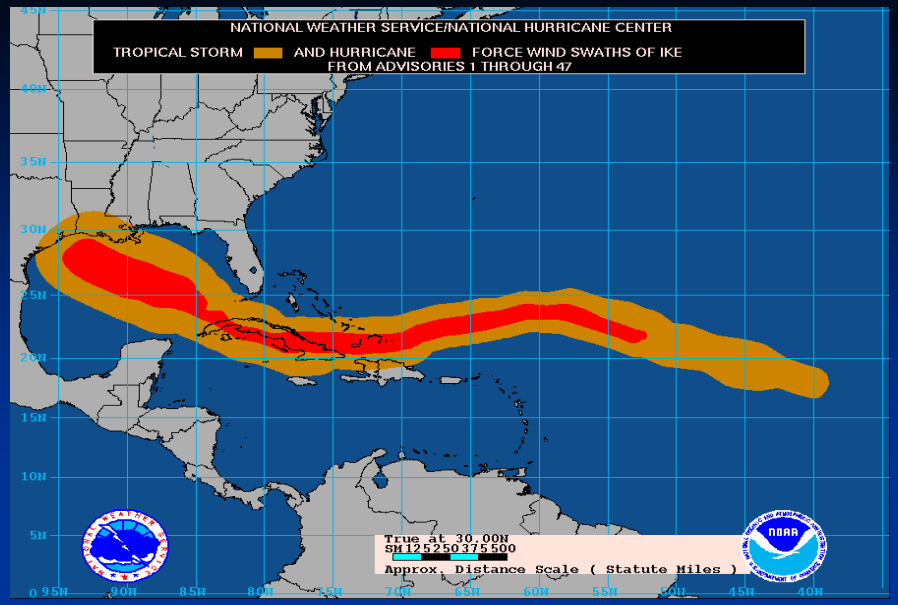
4 - 6
6 - 8
8 - 13
water_depth_animation_09/09/05.jpg


USGS
science for a changing world
Flood Depths 09/13/05
U.S. Army
Corps of Engineers
Vicksburg District
New Orleans District
Legend
0 - 2
2 - 4
4 - 6
6 - 8
8 - 13
water_depth_animation_09/13/05.jpg

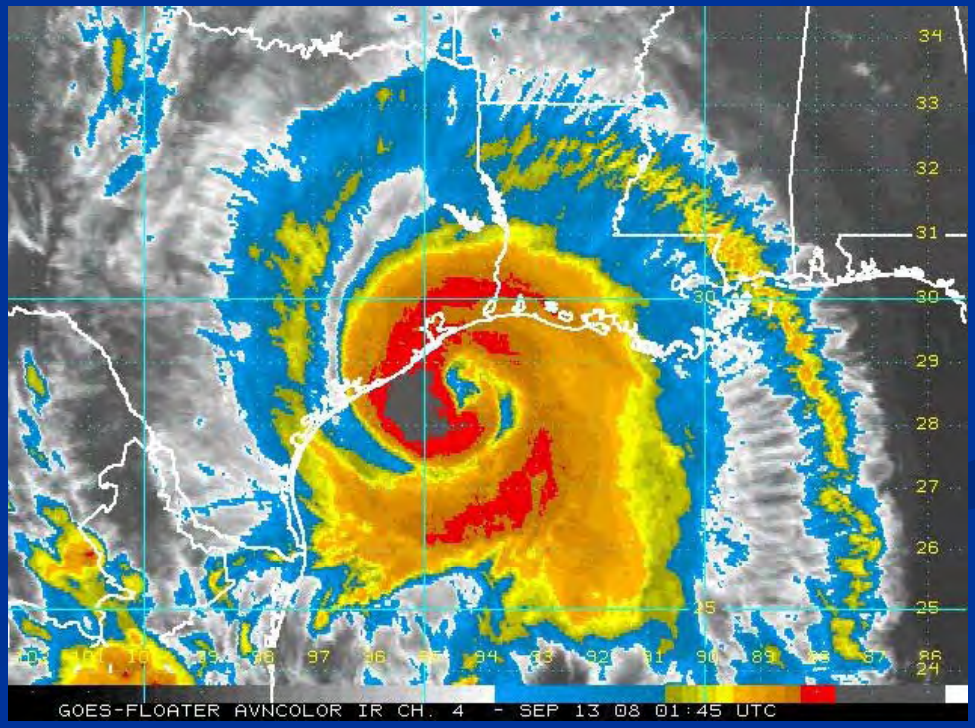
Solutions / Lessons Learned

- Utilization of the National Geospatial-Intelligence Agency (NGA)
- Domestic Mobile Integrated Geospatial-Intelligence System (DMIGS)
- Data Warehousing
- GPS/GIS Integration
- Standardized Workflow Procedures



Hurricane Ike

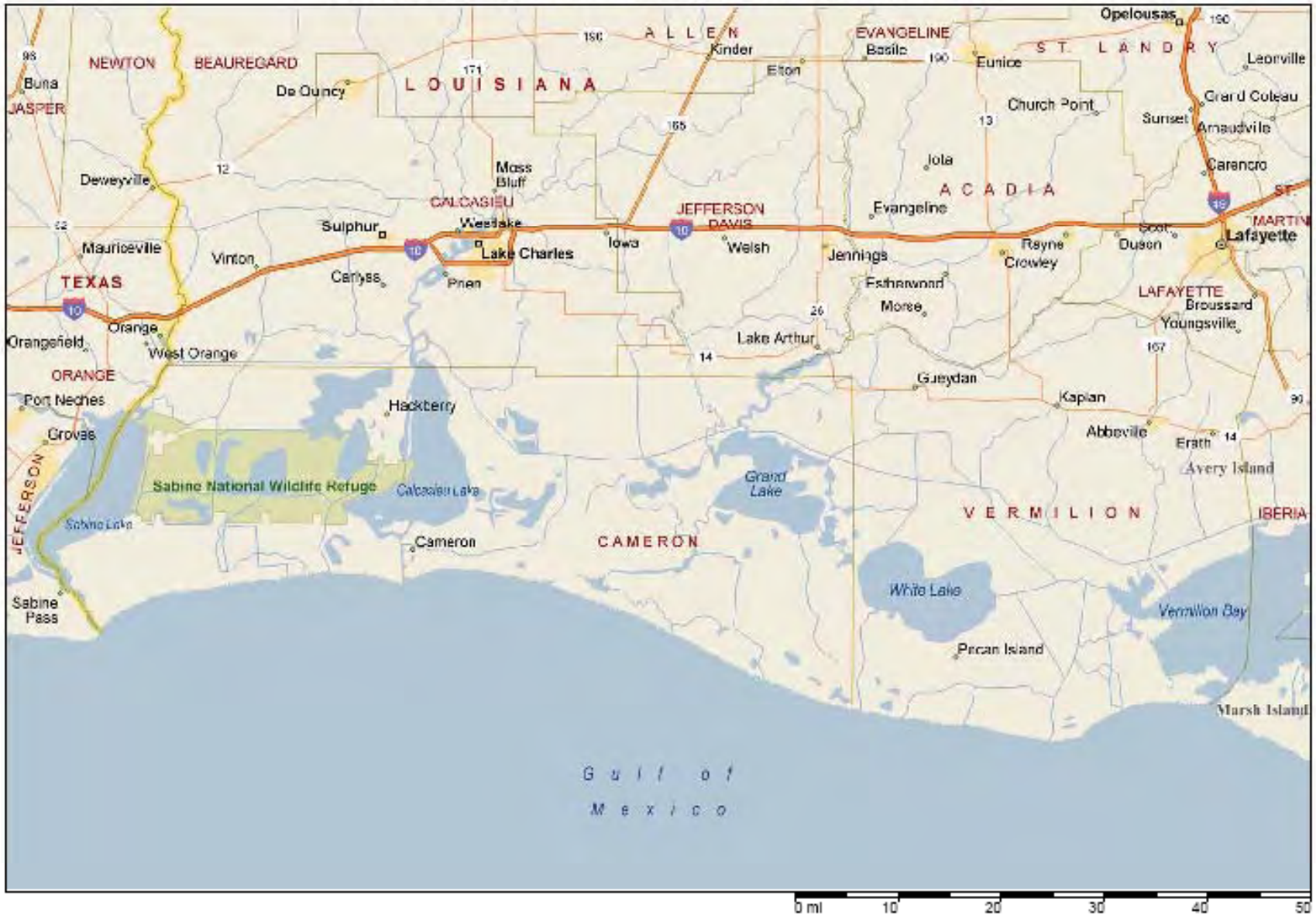
September 2008



Hurricane IKE

- First true test of the system since Katrina
  - Wide Area Search as a concept
  - Documentation was expected, scrutinized, and delivered
  - GPS use was the standard
- Insatiable hunger for information by all

Calcasieu and Cameron Parishes, Louisiana, United States



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USGS
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USGS
USGS

The Process

- Rules of Engagement
- Search definitions
- GPS Utilization
- GIS Utilization
  - Hasty GIS
  - Technical GIS
    - NGA and USGS
    - Forward GIS Team
    - Base Camp GIS Team

Lake Charles West
Sulphur
Prien
Carlyss
Lake C
Hackberry
Calcasieu River
Moss Lake
Intracoastal Waterway
East Pass
Calcasieu Ship Channel
Calcasieu Lake
Lake Charles
Lake Charles Regional
Sabine Nat'l Wildlife Refuge
Southland Field
USGS

Calcasieu Point
Calcasieu Area of Operations
USGS

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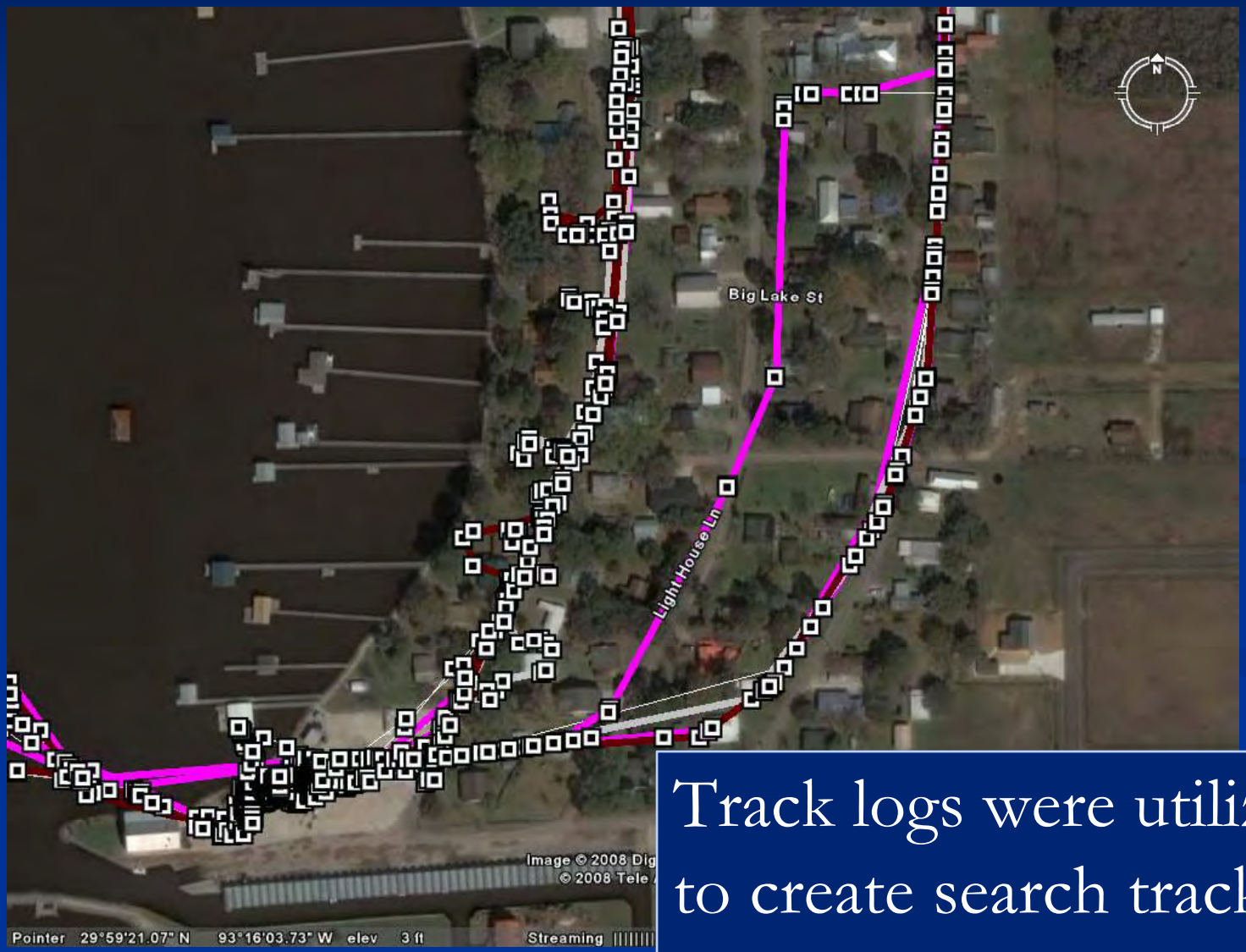
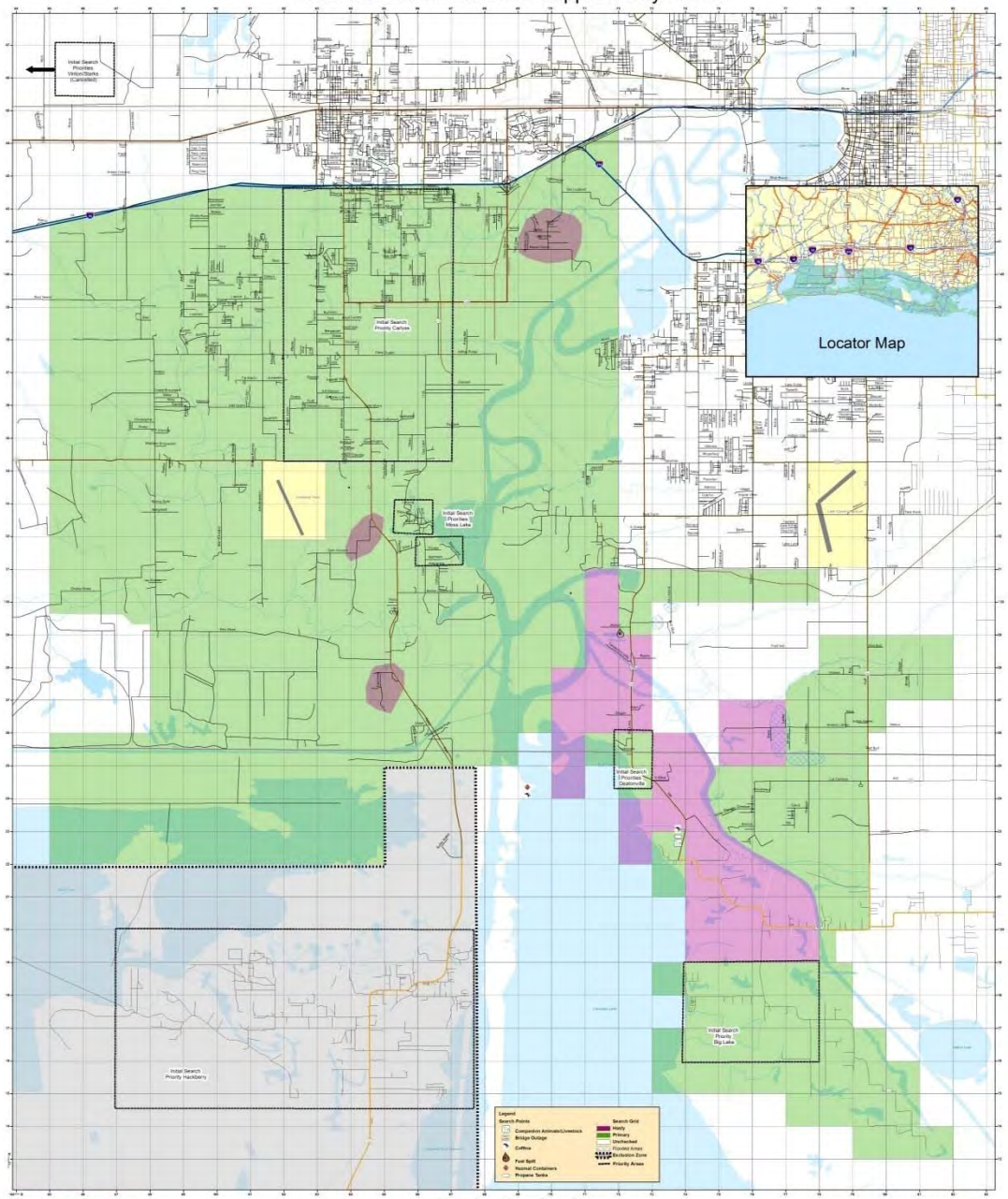


Track logs were utilized to create search tracks.

Hurricane Ike Search Status

State and Local Searches Supported by FEMA



USGS
science for a changing world

1000-meter grid, US National Grid
North American Datum 1983
Grid Zone Designation 15R
100,000-m Square Identification VN, VP

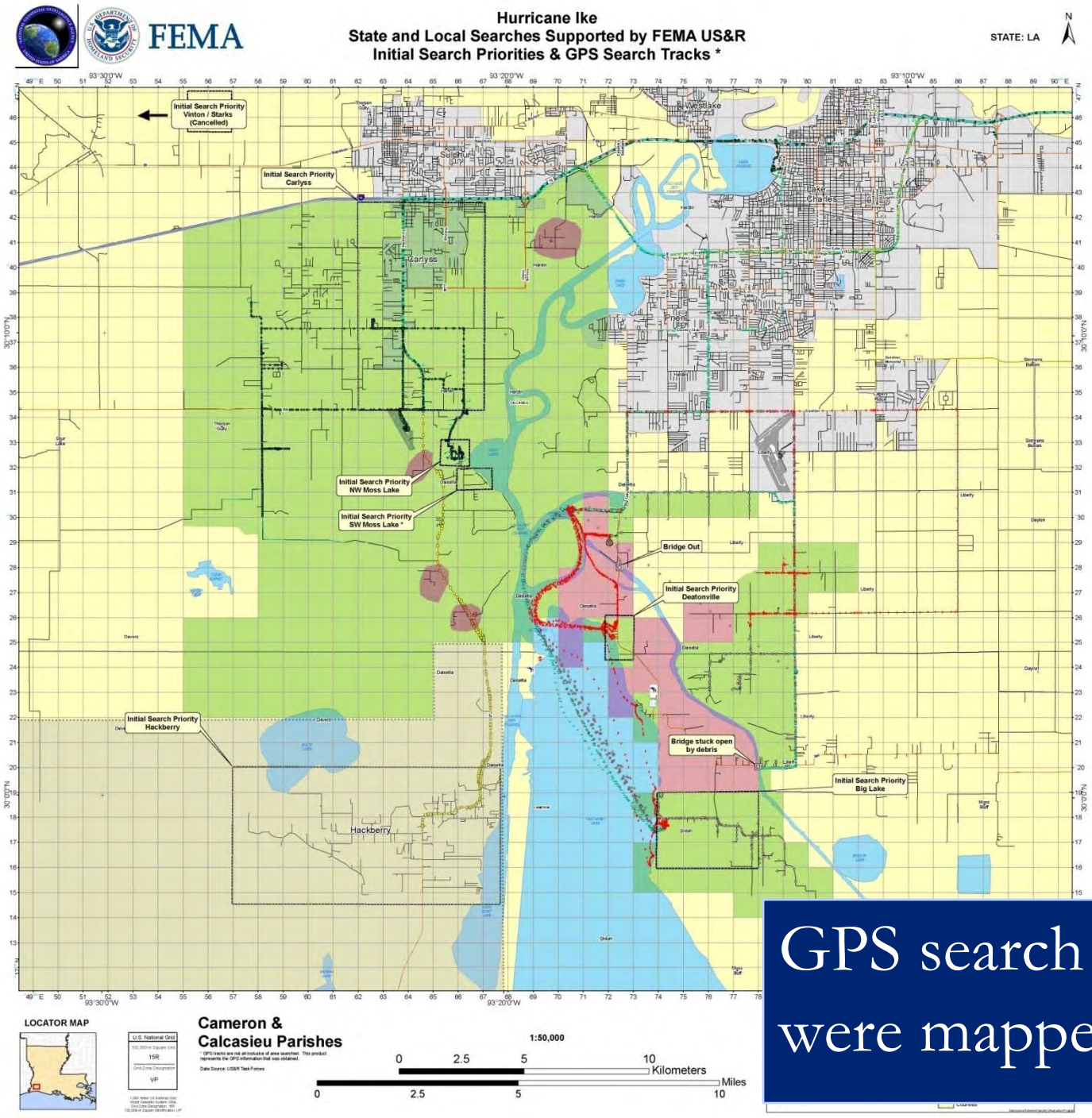
0 1 2 3 4 Kilometers

0 0.5 1 1.5 2 Miles

September 16, 2008

USGS_SRV091508_050

N



GPS search tracks were mapped.

Solutions / Lessons Learned

- Define a standard search process/definitions
- Use GPS devices
- Move toward forward GIS teams
- Utilize the NGA, the USGS and others
- Continue to work on standardized workflow procedures
- Data warehousing/data acquisition is getting better
- We still need to do better

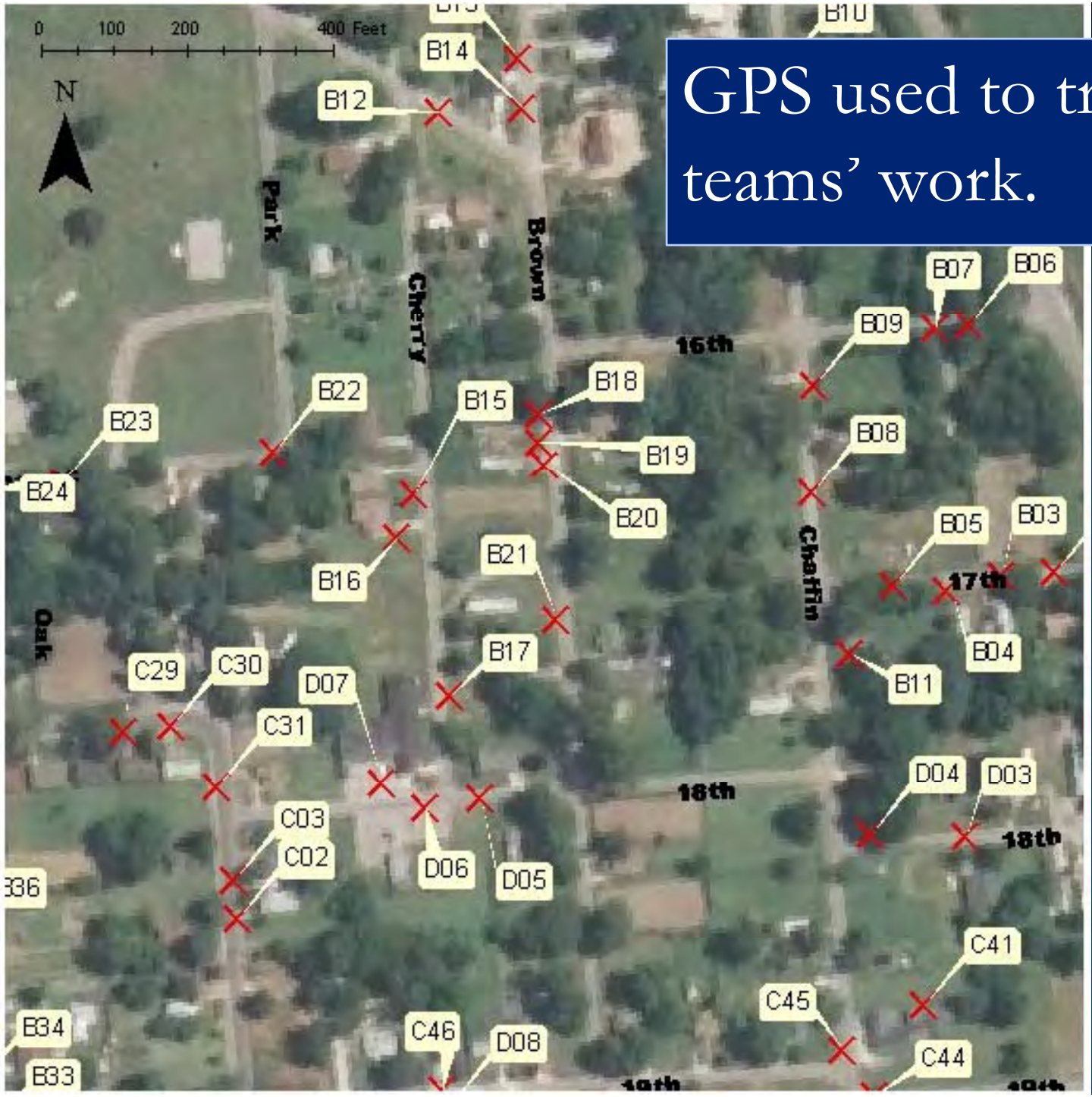
Where Do We Go From Here?

- Standardize wide area SAR/Reconnaissance/ Damage assessment, etc. process
- Standardized the search process/GPS search symbology/Search maps
- Standardized the data collection process
- Hasty GIS vs Technical GIS
- Forward GIS teams
- Rugged integrated technology (GPS, Photo)

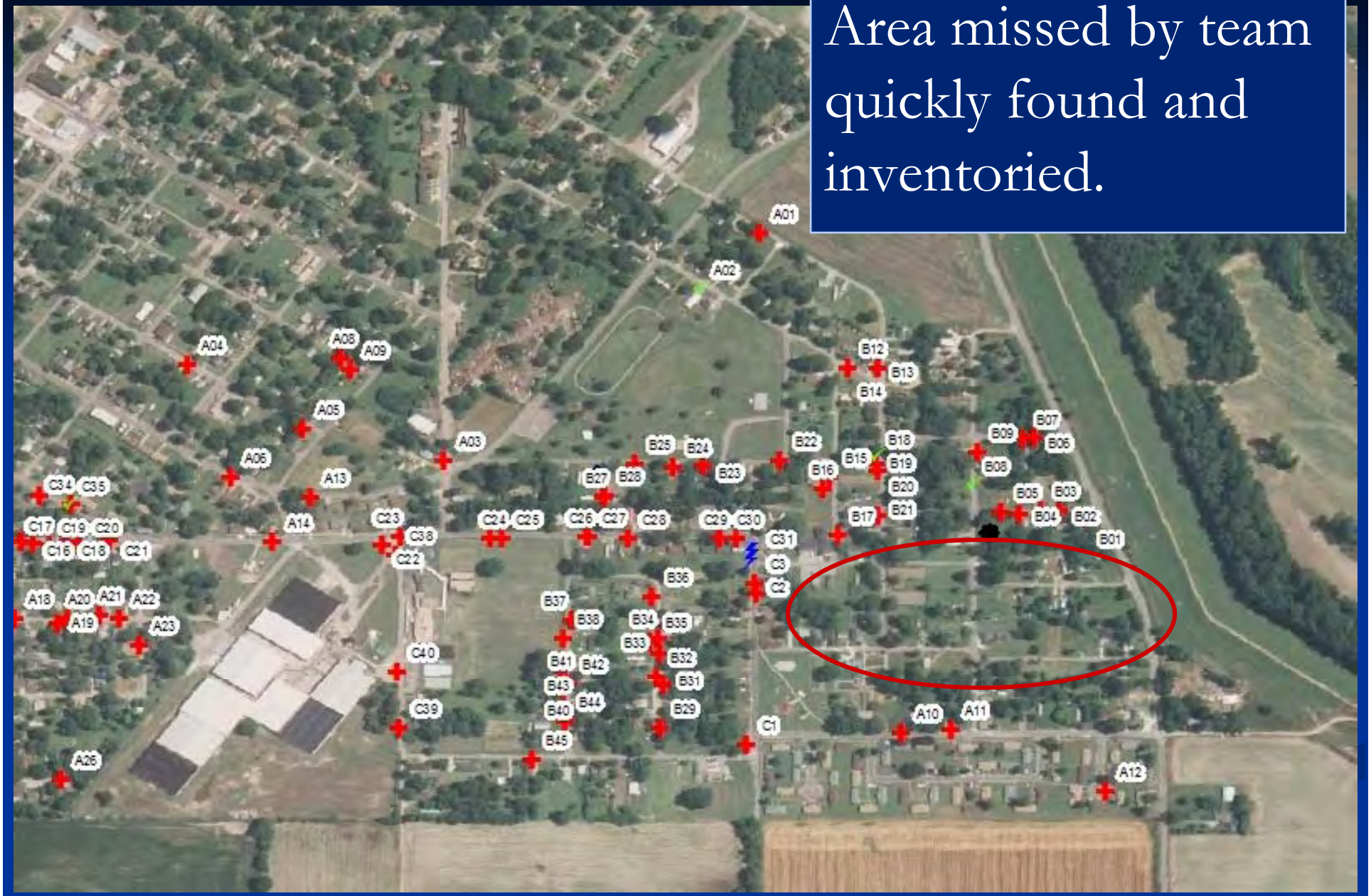
Caruthersville, Missouri
2006
2006/ 4/25

Few house numbers,
Few street signs

GPS used to track teams' work.

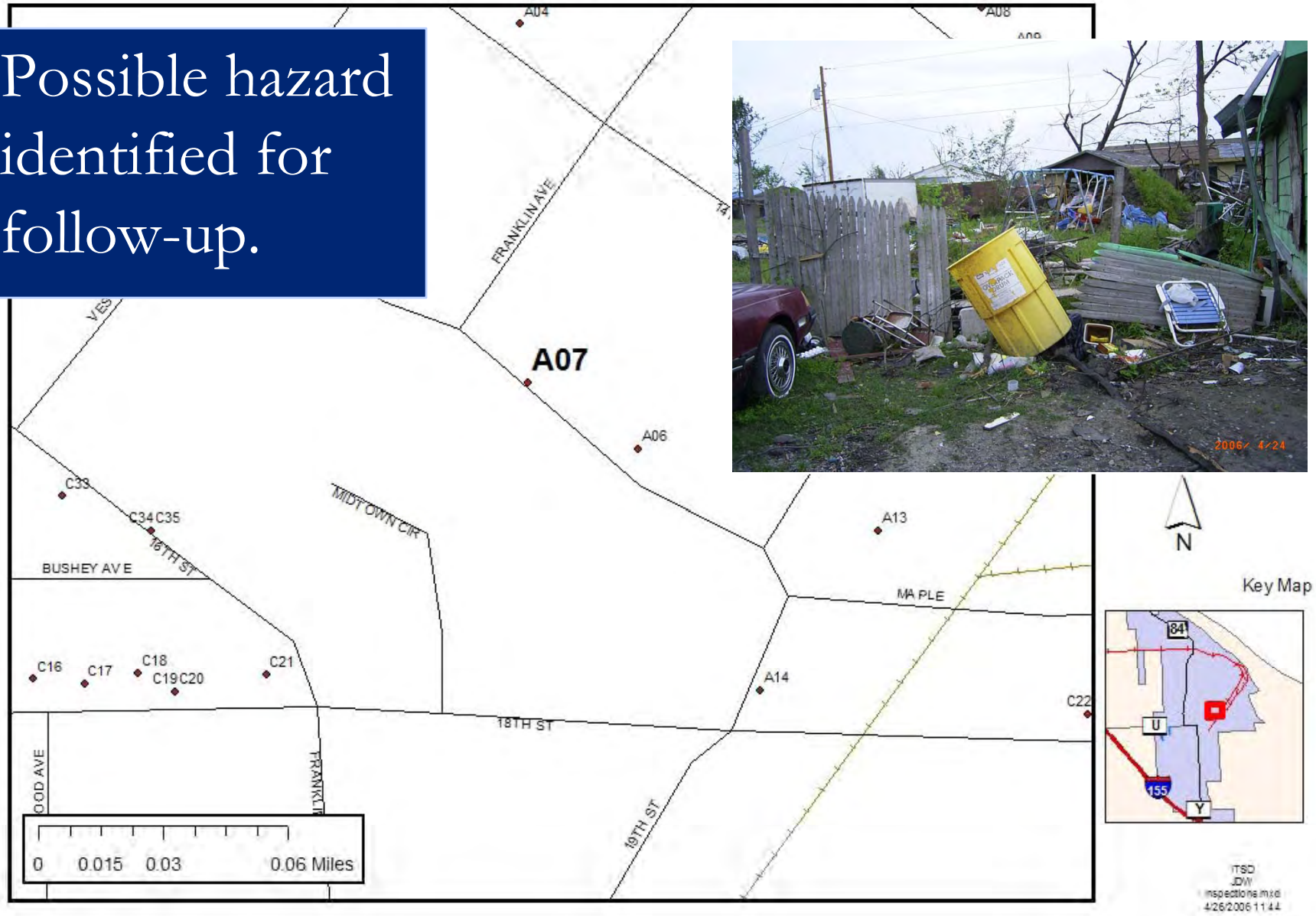


Area missed by team quickly found and inventoried.

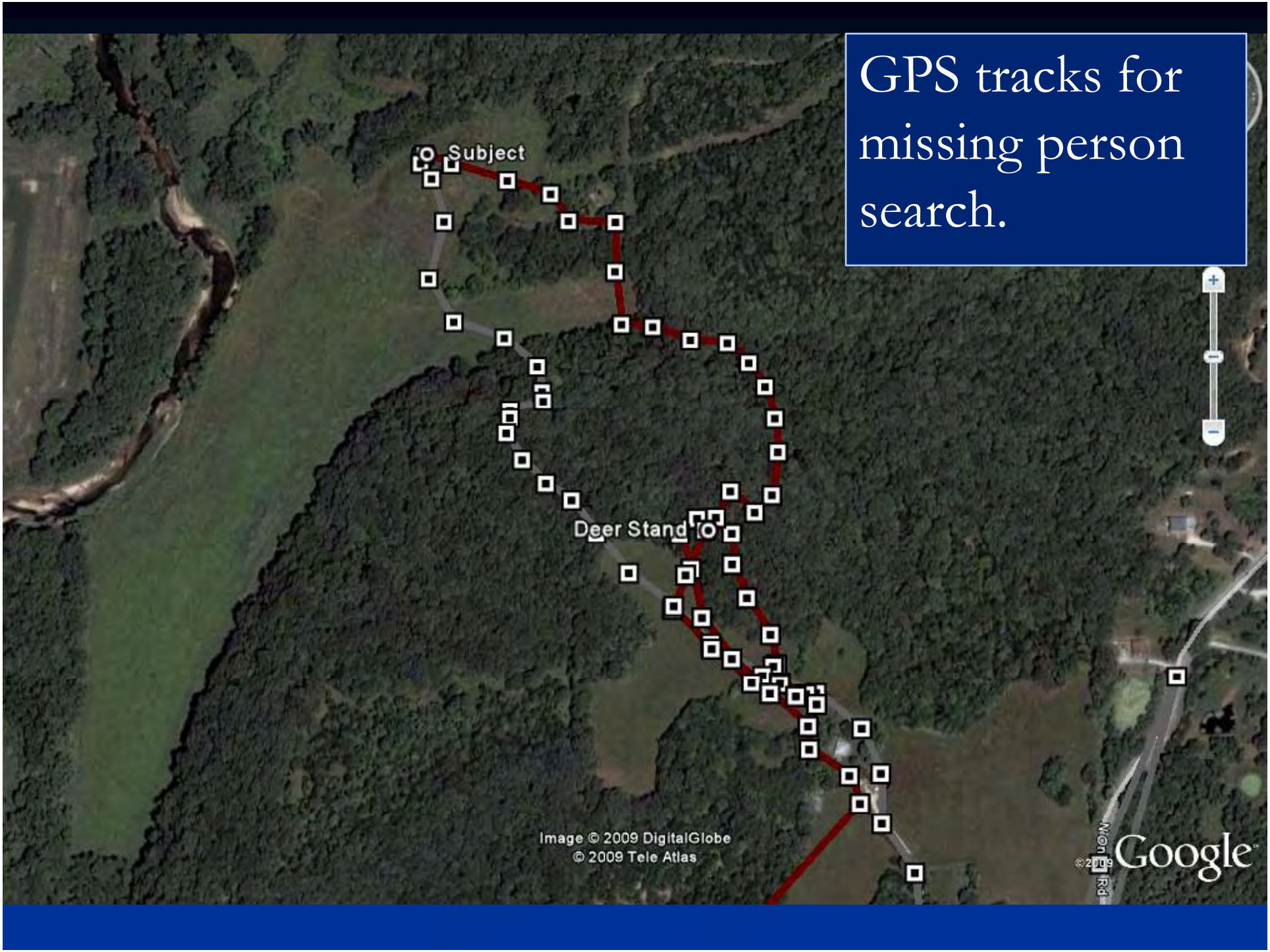


Caruthersville - A07 - Potentially Hazardous Site

Possible hazard identified for follow-up.



Report of body seen in Missouri River. Track logs used to show areas searched.

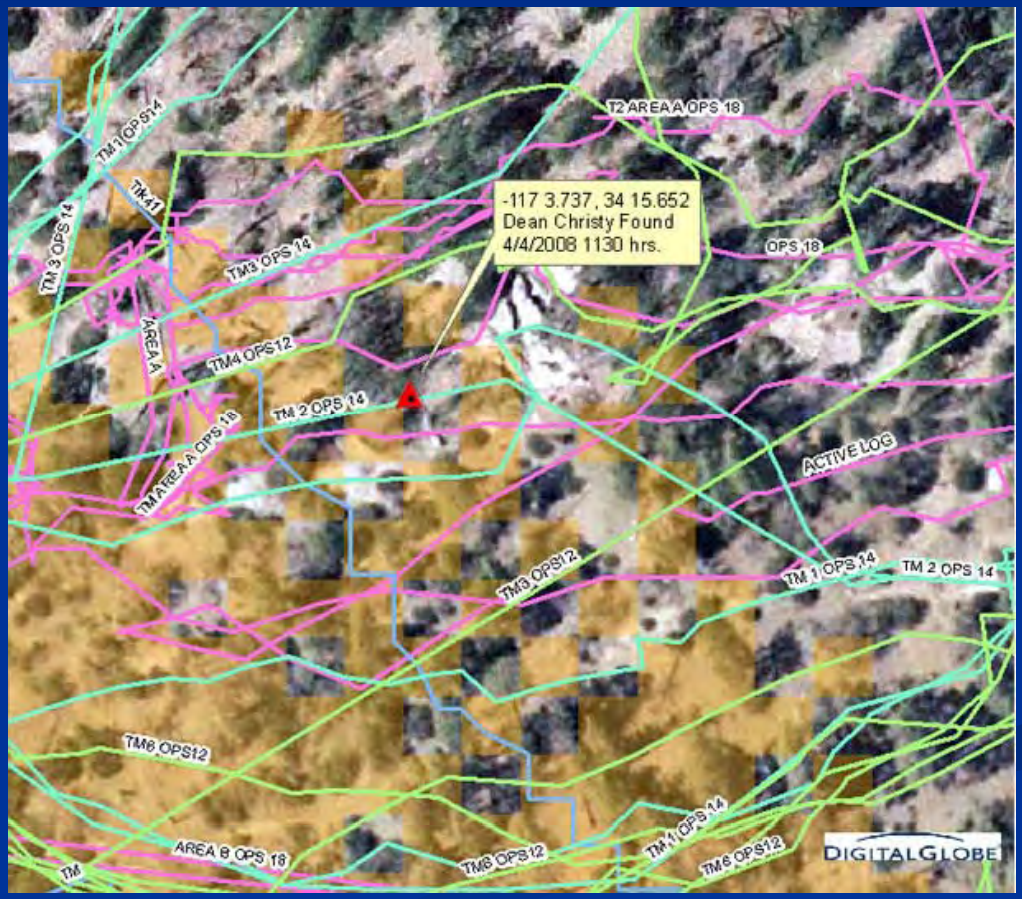


GPS tracks for missing person search.

Wilderness Search and Rescue

Awareness Level

- GPS track log
  - The new standard of documentation
    - One of the few objective measurements of search quality and quantity
    - Requires very little end user knowledge

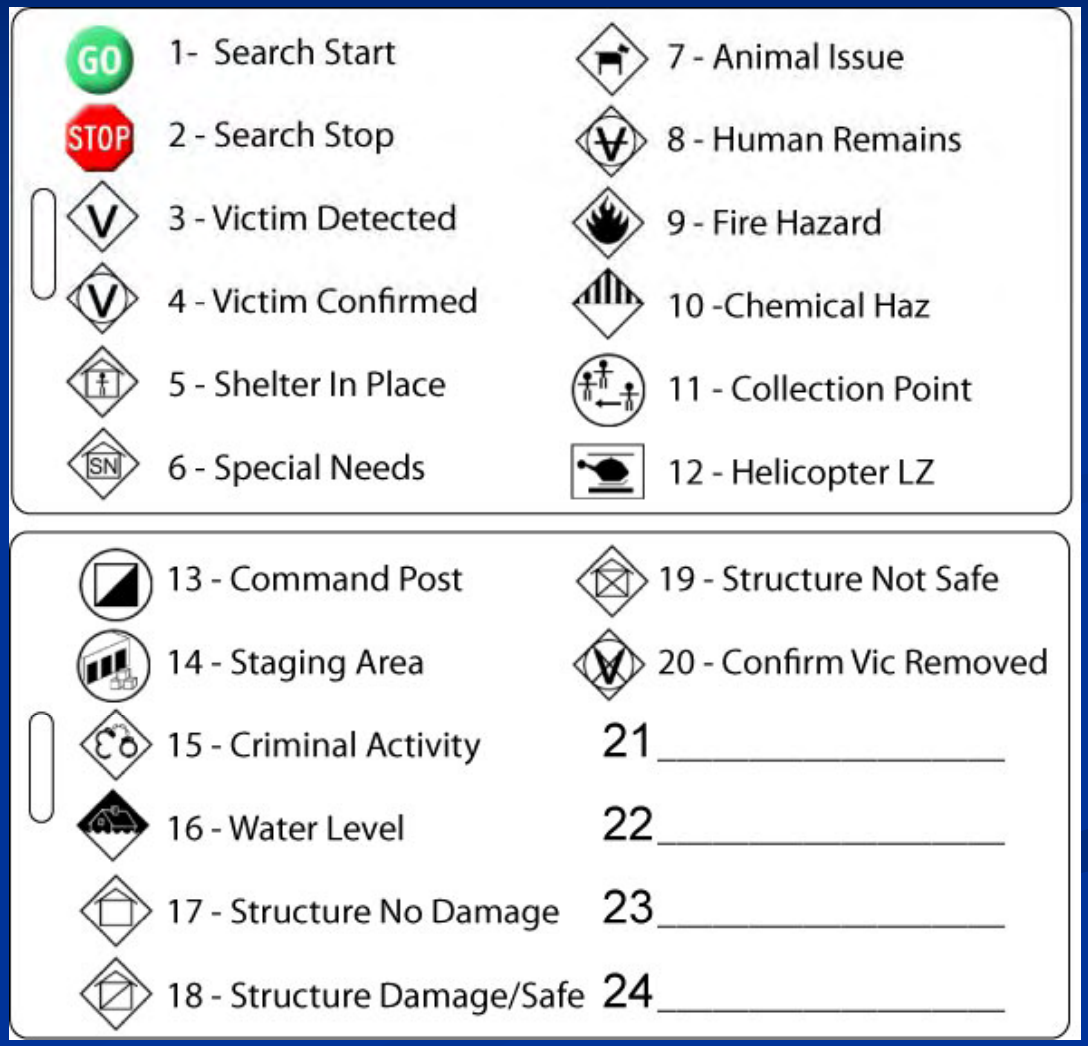


WAS Team Needs

- Quickly deployable and flexible
- User Friendly
- Standardized data collection
  - Tracks
  - Waypoints
- View data in map
- GPS data from multiple units
- Share data with other users
- Freeware or low cost

Quick-Reference Tags

- Standard symbols for Wide Area Search created.
- Printed on ID Badge material for field staff to reference.



GPS Integration

- Load symbols into GPS unit

GPS Integration

- Load symbols into GPS unit
- Collect tracks and waypoints during search

Mark Waypoint
8 – HUMAN REMAINS
Location
N 39°02.239'
W094°41.401'
Elevation
1081 ft
Delete
Goto
Map
OK
QUVRP
1.2 mi
mapsource
30 mi
32 sec
30 mi
14 am

GPS Integration

- Load symbols into GPS unit
- Collect tracks and waypoints during search
- Download field data
  - Use GPS software
  - GPX format
- Convert GPX to KML
  - GPX2KML uses custom symbols in KML

Comment field allows for team name to be added to data.

Icons can be URL or file location.

Icon can be created by waypoint name if custom symbols were not available in GPS receiver.

GPX to KML Converter - MO Task Force 1

File Action Help

Profile | Icons

Profile: MO-TF1 Garmin 60 Save

GPX Input File: copy 2-20-10\fema training\matt gps course_2009\mo-tf1_squad 1.gpx ...

<?xml version="1.0" encoding="UTF-8" standalone="no" ?>

KML Comment: 3-10-10_MOTF1_Weber_Primary

☑ Use input file name and path to create output file

KML Output: copy 2-20-10\fema training\matt gps course_2009\mo-tf1_squad 1.kml ...

Opening GPX File...
32 Waypoints processed,
7 Tracks processed,
KML file created!
CSV file created!

Process

Basic

Open

KML Icon Path: https://gis.dps.mo.gov/MERISMAP/ICON/TF_GE/ ...

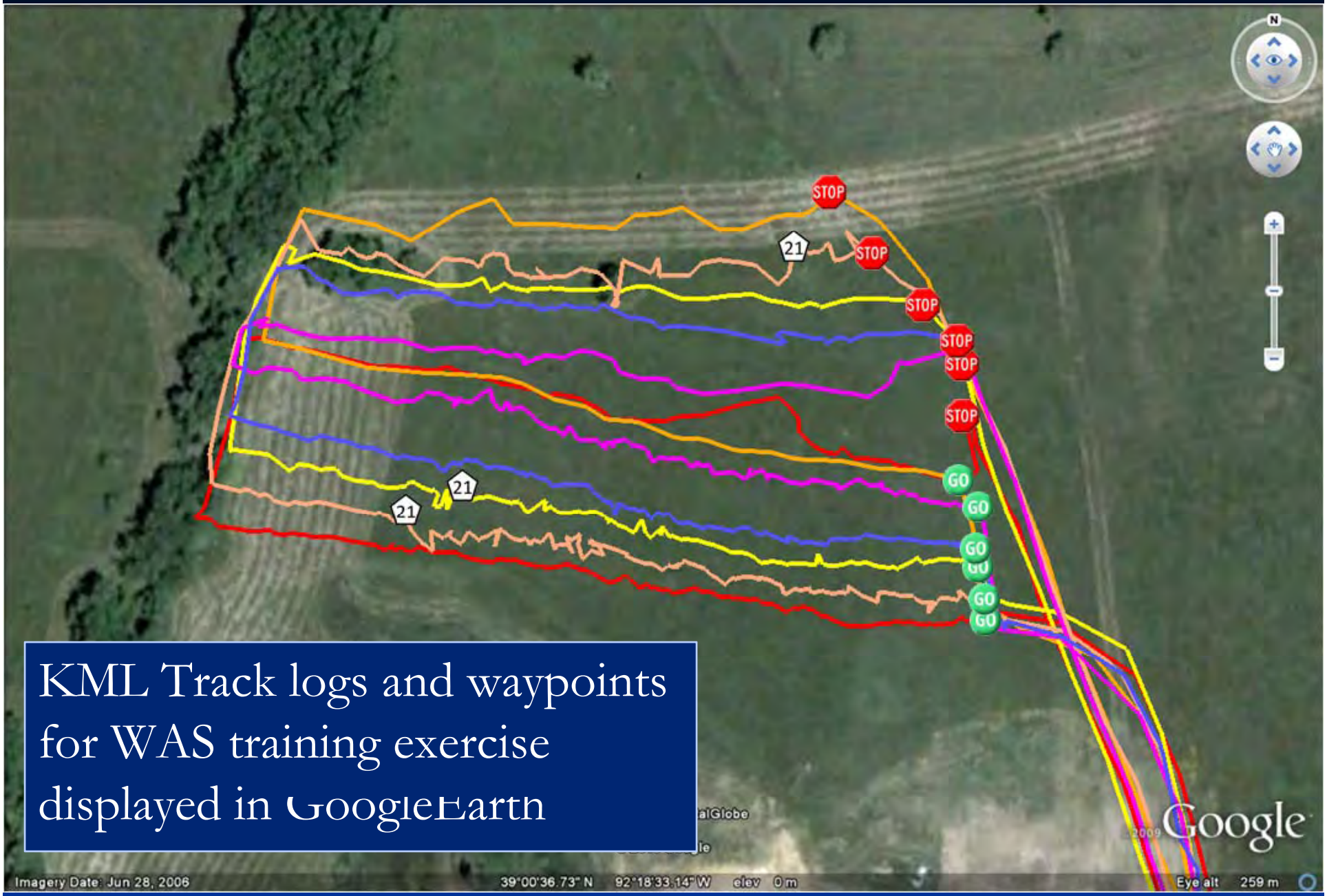
Select KML Icon By
☑ Waypoint Symbol ☐ Waypoint Name

Convert
☑ Waypoints ☑ Tracks

Include in each Placemark
☑ Waypoint Name ☑ Symbol Description
☑ KML Comment: ☑ Input and Output File Name

GPS Integration

- Load symbols into GPS unit
- Collect tracks and waypoints during search
- Download field data
  - Use GPS software
  - GPX format
- Convert GPX to KML
  - GPX2KML uses custom symbols in KML
- Open KML in GoogleEarth

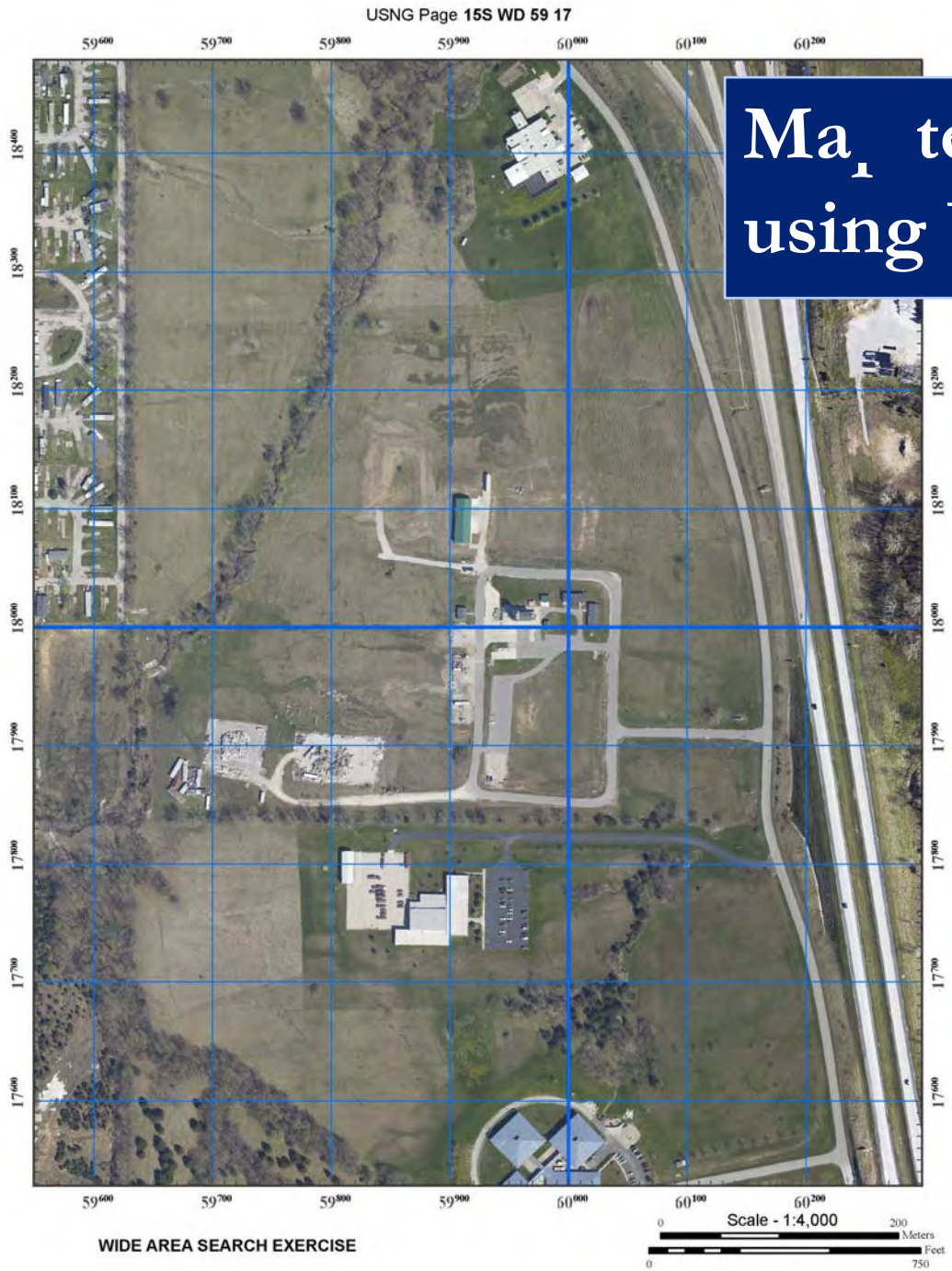


KML Track logs and waypoints for WAS training exercise displayed in GoogleEarth

Other Projects

- Detailed WAS Protocol document
- Grid mapping templates

Ma[illegible] tem[illegible] lates using USNG



Other Projects

- Detailed WAS Protocol document
- Grid mapping templates
- Portable base layers for mapping
- ISRID database mapping
- Resources website
- Email list for WAS/GIS

Getting Started

- Learn GPS unit basics
  - Create and Find Waypoints
  - Tracks – clearing, starting/stopping
- Learn USNG
- Training
  - Facilities collection
  - Practice using GoogleEarth, USNG, GPS, etc
  - Exercises
- Integrate into procedures

Questions?
Slippery when wet