NOAA's National Weather Service
Office of Science and Technology

Damage Assessment Toolkit

Status Report

Dario Leonardo/OSIP IWT Lead
Ira Graffman/GIS Lead
Storm Damage Assessment
OST/SEC/Support Branch
May , 2012

Project Team

Paul Kirkwood – SRH – Prototype IT Administration 

Parks Camp – SR (TLH) – DAT Developer 

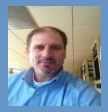
Keith Stellman – SR DAT Developer 

Kris Lander – CR Developer 

Jay Laseman – CR developer 

Ira Graffman – NWSHQ GIS specialist 

John Ferree – OCWWS – OSIP / Field Liaison 

Dario Leonardo – NWSHQ OSIP IWT 

Background Information

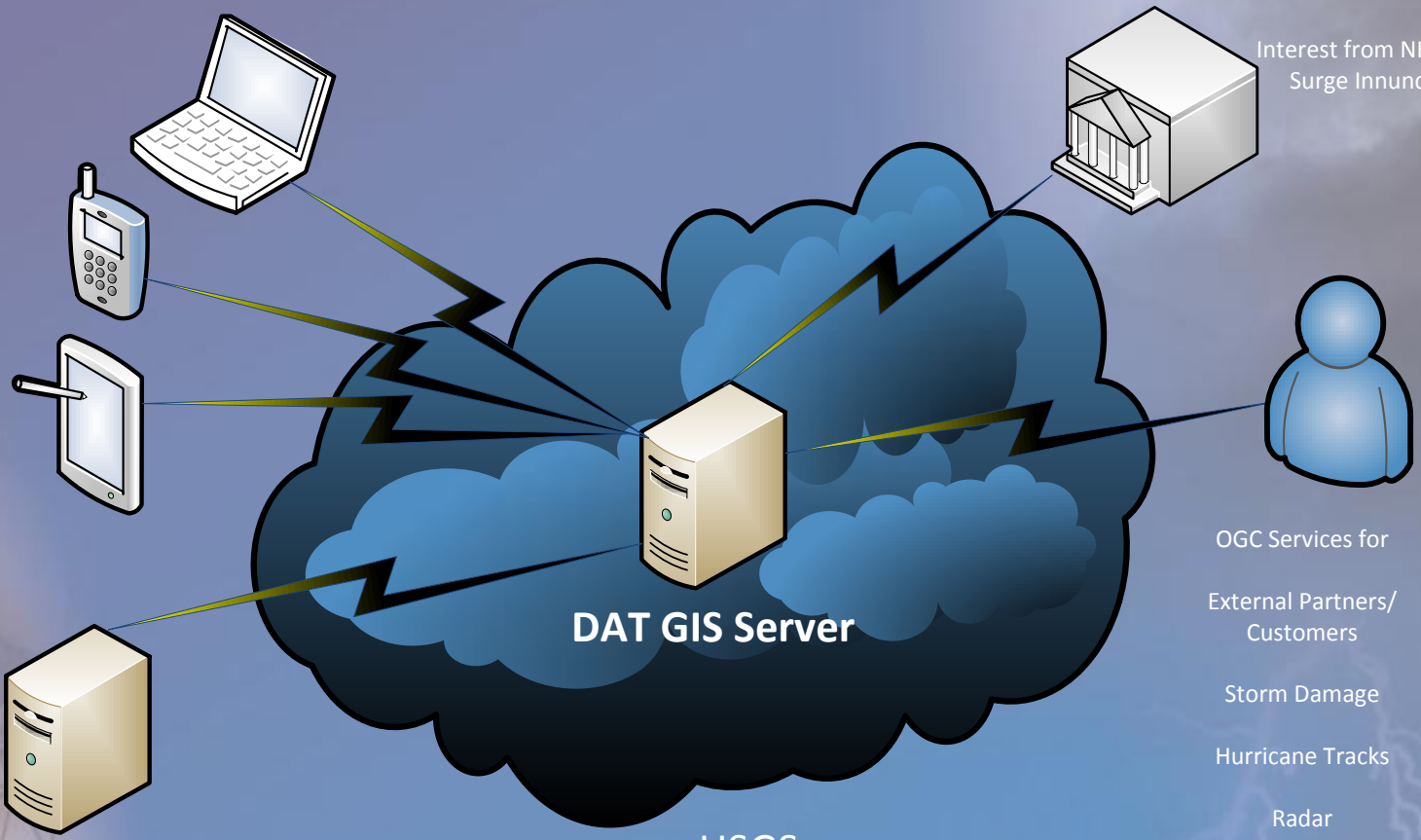
Project Origin

- 2005 Storm Damage Survey on GPS device
- 2009 Project enters OSIP (SON – PP)
- 2011 IWT formed to transition project

Goals

- *Reduce preparation time for site deployment*
- *Reduce perishable damage data collection time*
- *Improve damage survey data collection consistency*
- *Improve delivery of geospatially-accurate data to core partners and the public*

Role in NOAA Enterprise



DAT contributes to a Weather Ready Nation

Enhancing IDSS: Partners want to know what we know

- *Combining DAT collected and quality controlled data with other NWS storm data results in comprehensive situational awareness*
- *Help to better prepare our communities for extraordinary events*
- *Provides a time saving collaborative tool for pilot project Emergency Response Specialists*

Next Generation Dissemination Requirements

- *Deploying DAT via the Cloud as an NWS wide IT tool is the realization of NWS delivering knowledge "anytime anywhere via a scalable, agile, and cost-effective infrastructure"*
- Technologically relevant customer/partner support to deliver *cutting-edge science*

Field Testing

Over the course of the last 2 years, the following focal points have led the Beta testing of DAT at their WFOs

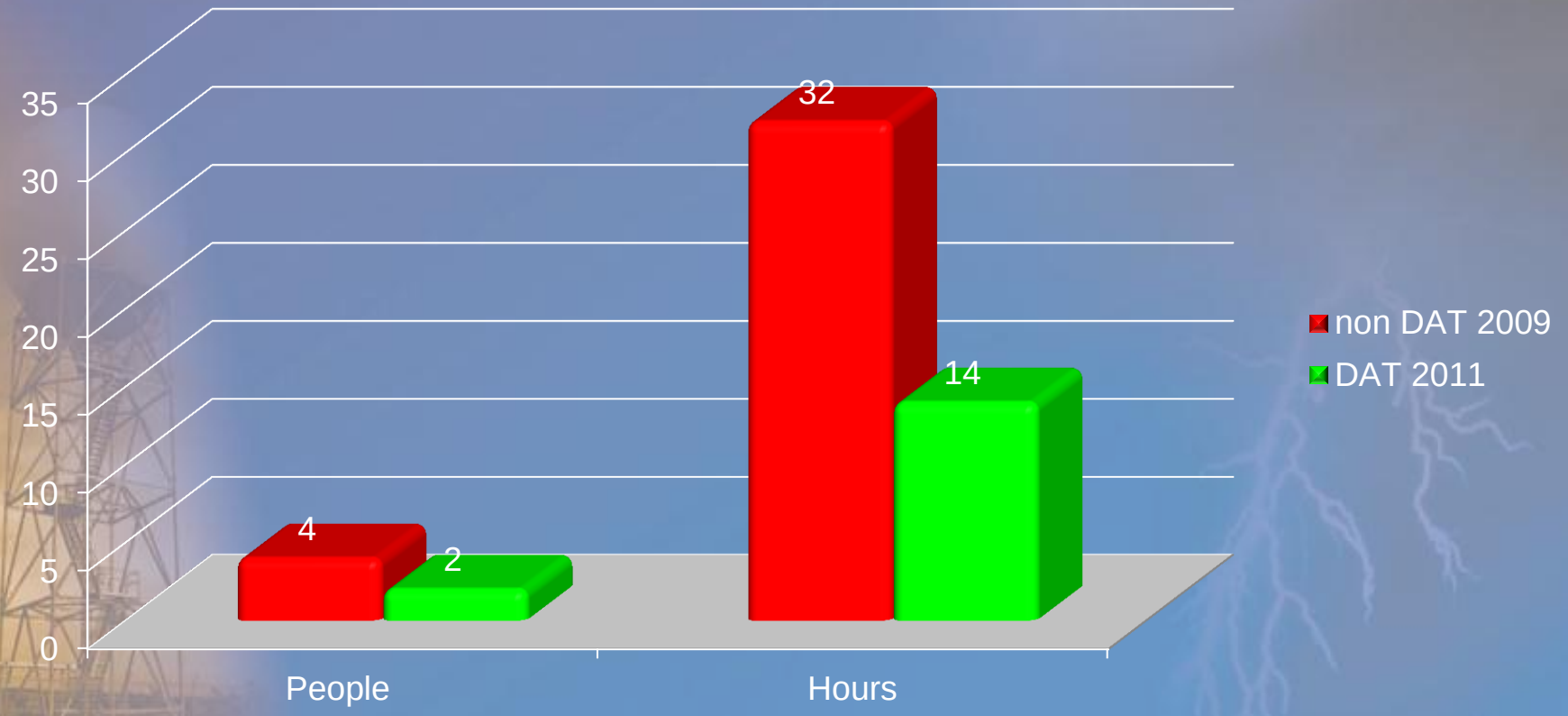
GLD: David Floyd
LSX: Ron Przybylinski
OAX: Jay Laseman
JKL: Buddy Whorrall
LOT: Stephen Rodriquez
FGF: Rick Hozak
GID: Michael Moritz
LBF: Teresa Keck
ILX: Darrin Hansing
ABR: David Hintz

TOP: Chad Omitt
FWD: Mark Fox
SHV: Keith Stellman
TLH: Parks Camp
AMA: Krissy Scotten
LUB: Jody James
LZK: John Robinson
OUN: Richard Smith
TSA: Ed Calianese
LCH: Roger Erickson

LIX: Frank Revitte
BHM: John Deblock
MOB: Jeff Garmon
ALY: Steve DiRienzo
CAE: Steve Naglic
CAR: Noelle Runyan
CLE: Gary Garnet
ILM: Steve Pfaff
ILN: Mary Jo Parker
RLX: Jamie Bielinski

Damage Collection Comparison

Shreveport CWA
October 29, 2009 22 Tornados
April 27, 2011 27 Tornados



Time Savings

1551 = Average Annual Number of Tornados (2007-2010)

Approximately ½ of tornado events require overtime to complete storm reports = 775 annual average

Data Collection Team

- ***2 people per team, avg 1 team per event***
- ***Annual savings ~ $58,162 (Low estimate…)***

Report Generation

- ***8 hours per event for Warning Coordination Meteorologist***
- ***Annual saving ~ $654,646***

Alternatives Analysis

Two Alternatives Analyses were completed for OSIP

- Analysis # 1 for the overall Damage Assessment Process (OSIP Stage 3)
  - *DAT was selected as best option*
- Analysis # 2 Most Recent for transitioning the field prototype to national operations (OSIP Stage 4)
  - *Government Systems*
    - Alternative A = NWS Internet Dissemination System (NIDS)
    - Alternative B = NOAA Web Operations Center (WOC)
  - *Commercial Cloud Options*
    - Alternative C = Esri Cloud
    - Alternative D = USGS facilitated GeoCloud

Alternatives Analysis

Government Systems

Alternative A = NWS Internet Dissemination System

- Implementation Costs = $142K - $197K
- O&M Costs = $135K- $189K/yr + 3% annual increase
- Operating Systems = Linux or Windows
- Could not guarantee implementation schedule requested by DAT

Alternative B = NOAA Web Operations Center (WOC)

- Implementation Costs = $300K (estimated)
- O&M Costs = $190K (estimated)
- Operating Systems = Linux or Windows
- Could not guarantee implementation schedule requested by DAT

Alternatives Analysis

Commercial Cloud Solutions

Esri Cloud

- Implementation Costs = $325K or more
- O&M Costs = $130K/yr + additional development services
- Operating Systems = Windows on Amazon Cloud
- Assured compatibility with other Esri software in DAT solution

USGS facilitated GeoCloud

- Implementation Costs = $119K
  - *14K year 1 and 30K year 2 for USGS*
  - *75K for C&A*
- O&M Costs = $54K + 3% annual increase
- Operating Systems = Windows on Amazon Cloud
- Requires NWS AA signing an Memorandum of Understanding with USGS

Cost Comparison

Analysis: (more details available in backup slides)

- ***Total costs for FY12 -13 are as follows:***

NIDS / Linux	NIDS Windows	**USGS GeoCloud**
$247,447	$355,127	**$119,609**

- ***Total estimated costs for FY14-18:***

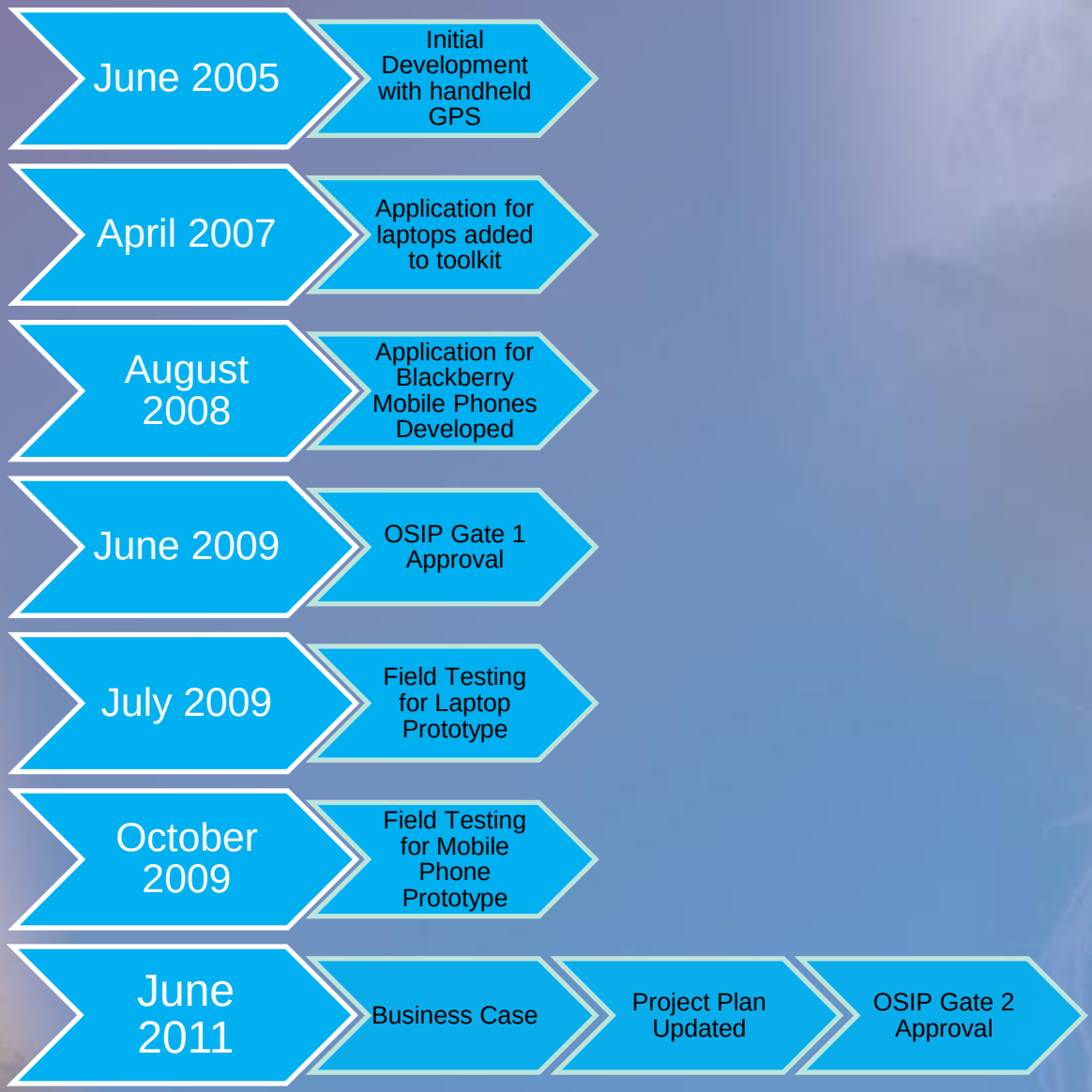
NIDS / Linux	NIDS Windows	**USGS GeoCloud**
$735,886	$1,025,931	**$307,428**

- ***Initial 2 yr cost saving over NIDS of $127,838***

Benefits of DAT

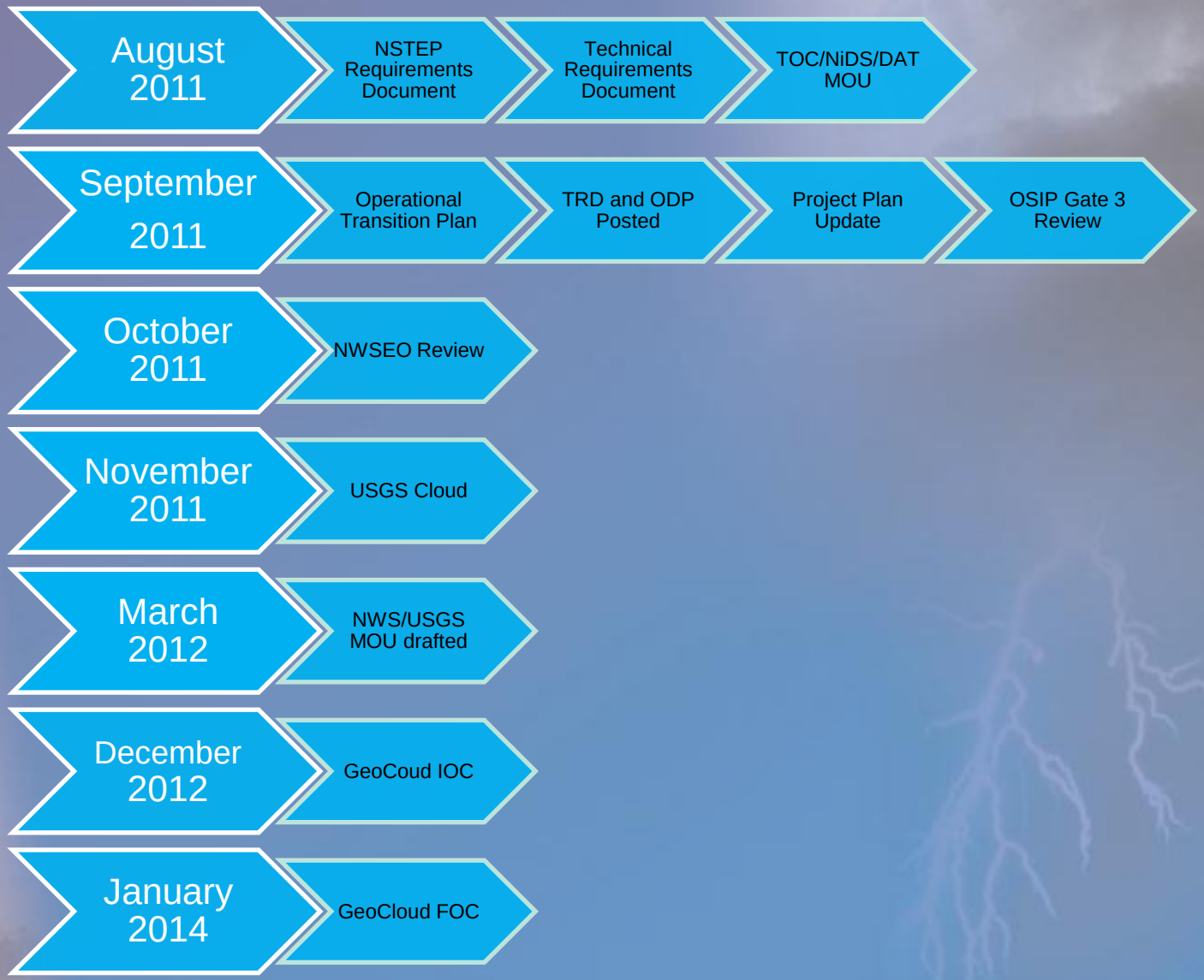
- Complies with NWS' implementation of an enterprise approach to information technology (IT) solutions as a method for identifying and implementing efficiencies directed by the President
- The US Chief Information Officer has directed a shift to a "Cloud First" policy, shift to consolidated IT frameworks and develop a strategy of shared services
  - *Leveraging the USGS GeoCloud enables the NWS to comply with this direction*
- Promotes sharing of resources and costs between agencies maximizing tax payer investment

Project Timeline



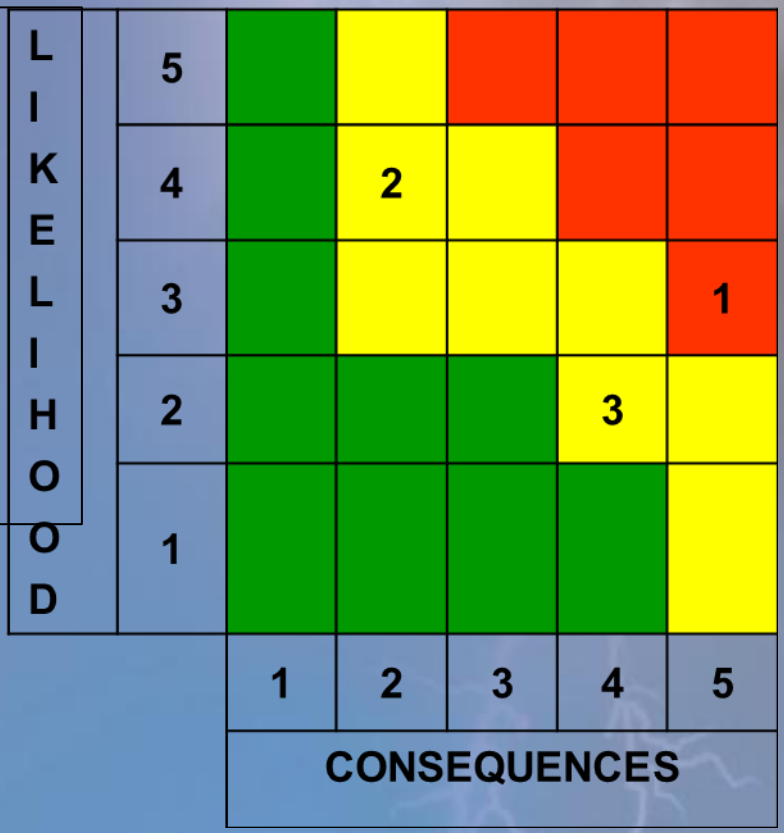
Project Timeline

continued



Risk Management

Trend	Rank	Approach	Risk Title
↑	1	M	GIS Licensing
↔	2	W	Security Delays
↔	3	M	NWS/USGS GeoCloud Not Approving MOU



Criticality	Trend	Approach
Critical	↑ Improving	M - Mitigate
Moderate	↓ Worsening	W - Watch
Low	↔ Unchanged	A - Accept
	☼ New	R - Research

Milestones in Danger

Milestones

- C&A of DAT application in the Cloud – 6/15
- Transition to operational hosting environment – 12/1

Mitigation Strategy

- Engage management to assist with funding project
- Task security assessment
- Open communication by USGS/NWS with ESRI

Issues

Budget and Policy

- Shrinking budget environment
- Security Policy for Cloud and Mobile Devices is NOT complete

Engineering

- Multiple platforms (problem for personal devices only)

Cultural Challenges

- “My app is best”
- Non-development region buy-in

Future

- DAT application to run on multiple Mobile Operating Systems
- Damage Assessment Teams ability to use their personal devices to conduct surveys
- DAT and AWIPS run from the same Tablet Device

Back-up

Partner Benefits

- **FEMA/DHS**
  - *Utilizes storm damage assessment reports to prepare for disaster assistance. Information of damage impact made available the same day shortens the time before FEMA can deploy with assistance (food, clothing, shelter, etc)*
- **American Red Cross**
  - *Advanced notification of the level of damage and casualties can help to estimate the amount of blood to deploy to Triage locations*
- **EPA**
  - *Utilizes storm damage assessment reports to better assess ecological damage and the funding decisions required for environmental cleanup*
- **DOD**
  - *Army Corp of Engineers, US Marine Corps use web services for warnings and situational awareness (require OGC web map services)*

Societal Benefits

- **Internal NWS**
  - *Greater efficiencies - decrease forecaster time / improve quality storm damage data*
  - *Ability to compare Tornado touchdowns to warning areas (via shapefiles) to apply verifications*
- **External NWS**
  - *Provide public and partner agencies with NWS collected information to use in disaster response and communication.*
  - *Standardization of the data sets and data collection methodology allow WCMs to train Emergency Managers in advance of how to interpret the data.*

References

- National Weather Service, cited 2012 - April 3rd Severe Weather Outbreak. Available online at http://www.srh.noaa.gov/fwd/?n=april32012sum
- National Weather Service, cited 2012 - Tornado Outbreak and Severe Weather. Available online at http://www.erh.noaa.gov/iln/events/20120302
- National Weather Service, cited 2012 - Information for the Tornado Outbreak of May 24, 2011. Available online at http://www.srh.noaa.gov/oun/?n=events-20110524
- National Weather Service, cited 2012 - Pertinent Geographic Information Systems (GIS) Data from the March 2, 2012 Tornado and Severe Weather Event. Available online at http://www.srh.noaa.gov/bmx/?n=event_03022012gis

References

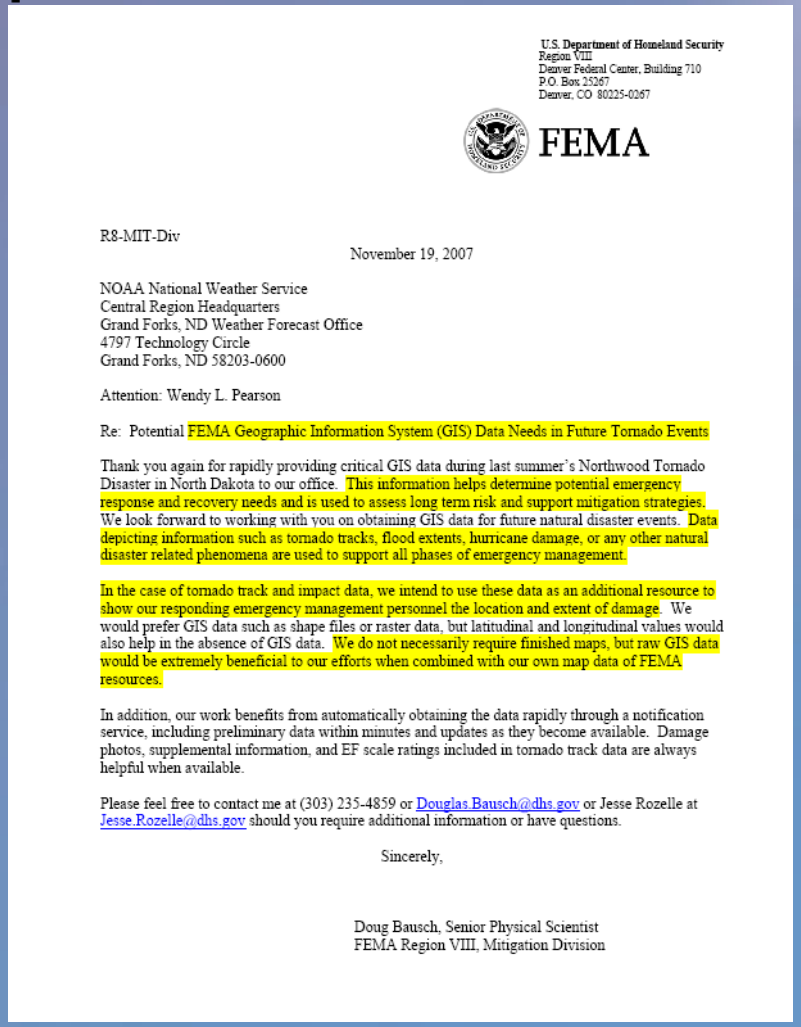
- *Obama, Barack, 2011 - Promoting Efficient Spending, Executive Order 13589, of November 9, 2011, Federal Register, Vol. 76, No. 220, 2 pp. Available online at http://www.gpo.gov/fdsys/pkg/FR-2011-11-15/pdf/2011-29683.pdf*
- *Kindra, Vivek, 2010 - 25 Point Implementation Plan to Reform Federal Information Technology Management, 35 pp. Available online at at http://www.cio.gov/documents/25-Point-Implementation-Plan-to-Reform-Federal%20IT.pdf*
- *Maier, C, 2011 - Post Storm Data Acquisition, National Weather Service Office of Climate, Water and Weather. NWS Instruction 1604. Available online at http://www.nws.noaa.gov/directives/sym/pd01016004curr.pdf*

References

- *Blackberry, cited 2012 - Government Agency Uses Blackberry Solution, with Freeance Mobile App and GPS, to Streamline Strom Survey Work. Blackberry Customer Success Story, 2 pp. Available online at http://us.blackberry.com/newsroom/success/USNWS_final.pdf*
- *Leonardo, Dario, 2011 – Damage Assessment Toolkit Business Case Analysis. NWS OSIP Project 08-024, 16pp. Available online at https://osip.nws.noaa.gov/osip/projectDetail.php?projectid=07-012*

Supporting Documents

- **FEMA request for NOAA GIS Data**



U.S. Department of Homeland Security
Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, CO 80225-0267

FEMA

R8-MIT-Div

November 19, 2007

NOAA National Weather Service
Central Region Headquarters
Grand Forks, ND Weather Forecast Office
4797 Technology Circle
Grand Forks, ND 58203-0600

Attention: Wendy L. Pearson

Re: Potential FEMA Geographic Information System (GIS) Data Needs in Future Tornado Events

Thank you again for rapidly providing critical GIS data during last summer's Northwood Tornado Disaster in North Dakota to our office. This information helps determine potential emergency response and recovery needs and is used to assess long term risk and support mitigation strategies. We look forward to working with you on obtaining GIS data for future natural disaster events. Data depicting information such as tornado tracks, flood extents, hurricane damage, or any other natural disaster related phenomena are used to support all phases of emergency management.

In the case of tornado track and impact data, we intend to use these data as an additional resource to show our responding emergency management personnel the location and extent of damage. We would prefer GIS data such as shape files or raster data, but latitudinal and longitudinal values would also help in the absence of GIS data. We do not necessarily require finished maps, but raw GIS data would be extremely beneficial to our efforts when combined with our own map data of FEMA resources.

In addition, our work benefits from automatically obtaining the data rapidly through a notification service, including preliminary data within minutes and updates as they become available. Damage photos, supplemental information, and EF scale ratings included in tornado track data are always helpful when available.

Please feel free to contact me at (303) 235-4859 or Douglas.Bausch@dhs.gov or Jesse Rozelle at Jesse.Rozelle@dhs.gov should you require additional information or have questions.

Sincerely,

Doug Bausch, Senior Physical Scientist
FEMA Region VIII, Mitigation Division

Field Reports

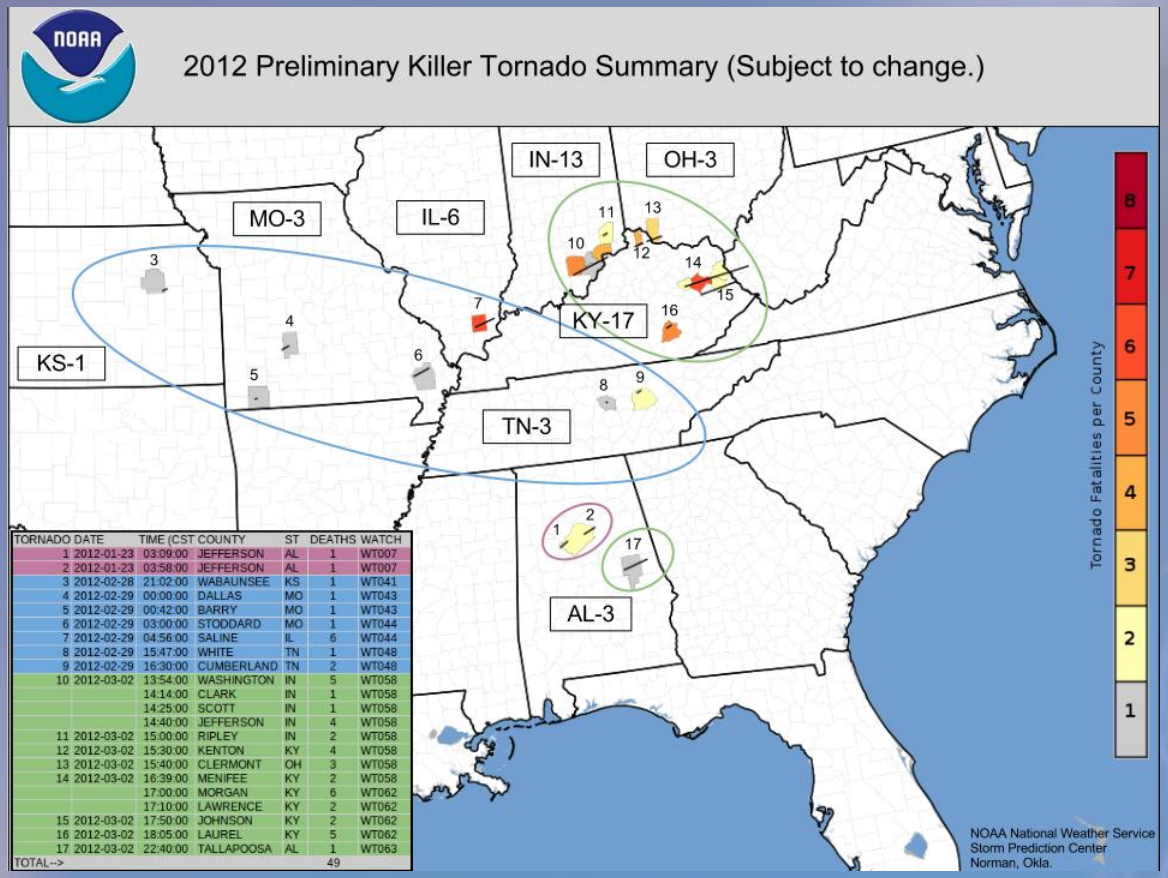
- **Comments & Quotes**
  - *During a visit to the Birmingham WFO on Saturday, April 30, both NOAA Administrator Jane Dr. Lubchenco and U.S. Representative Bachus were impressed by a demonstration of the DAT prototype*
  - *Experienced SRH damage assessor used application and spent 4-5 hours doing what normally would have taken 3-4 days to accomplish*
  - *Damage area surveyed as the assessor walked through the impact area. The tornado path was updated at the WFO as the assessor walked the impact area*
  - *Quote from the GIS focal point for the City of Lancaster TX: "At the risk of sounding like a total GIS dork, this is awesome!!! Thank you so much for sharing your data & expertise."*
  - *Mass media outlets had access to the data within hours rather than days*

Field Reports

- **Comments & Quotes**
  - *Quotes from DAT Users include: "With any luck, this tool will become the standard" from Jim LaDue (OCWWS WDTB) and "We need this tool yesterday" from Jim Stefkovich (WFO BHM MIC)"*
  - *Greg Carbin – SPC: Following the March 2, 2012 Kentucky tornado event - "We do not have shapefiles of the tracks. Part of the problem resides with the way the offices are providing survey information"*
  - *"If anything, this most recent event is more difficult to track because it covers three NWS Regions with somewhat disparate ways of compiling and disseminating the track, damage, and fatality information"*
  - *"Until the regions and WFOs use a common format in providing the geographic information, we may have to wait for the Storm Data deadline (60 days after the end of the month) to acquire this data and then have it made into a shapefile"*

DAT DATA

- **March 2nd Tornado report**



TORNADO	DATE	TIME (CST	COUNTY	ST	DEATHS	WATCH
1	2012-01-23	03:09:00	JEFFERSON	AL	1	WT007
2	2012-01-23	03:58:00	JEFFERSON	AL	1	WT007
3	2012-02-28	21:02:00	WABAUNSEE	KS	1	WT041
4	2012-02-29	00:00:00	DALLAS	MO	1	WT043
5	2012-02-29	00:42:00	BARRY	MO	1	WT043
6	2012-02-29	03:00:00	STODDARD	MO	1	WT044
7	2012-02-29	04:56:00	SALINE	IL	6	WT044
8	2012-02-29	15:47:00	WHITE	TN	1	WT048
9	2012-02-29	16:30:00	CUMBERLAND	TN	2	WT048
10	2012-03-02	13:54:00	WASHINGTON	IN	5	WT058
		14:14:00	CLARK	IN	1	WT058
		14:25:00	SCOTT	IN	1	WT058
		14:40:00	JEFFERSON	IN	4	WT058
11	2012-03-02	15:00:00	RIPLEY	IN	2	WT058
12	2012-03-02	15:30:00	KENTON	KY	4	WT058
13	2012-03-02	15:40:00	CLERMONT	OH	3	WT058
14	2012-03-02	16:39:00	MENIFEE	KY	2	WT058
		17:00:00	MORGAN	KY	6	WT062
		17:10:00	LAWRENCE	KY	2	WT062
15	2012-03-02	17:50:00	JOHNSON	KY	2	WT062
16	2012-03-02	18:05:00	LAUREL	KY	5	WT062
17	2012-03-02	22:40:00	TALLAPOOSA	AL	1	WT063
TOTAL-->					49	

PDA Interface

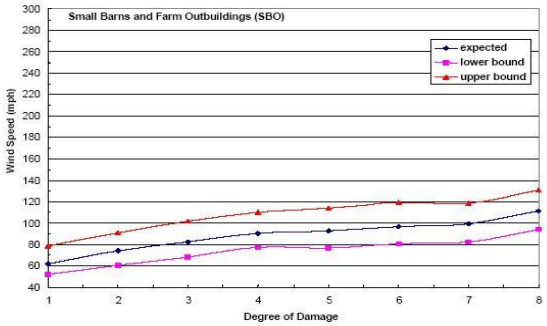
1. SMALL BARNS AND FARM OUTBUILDINGS (SBO)

Typical Construction

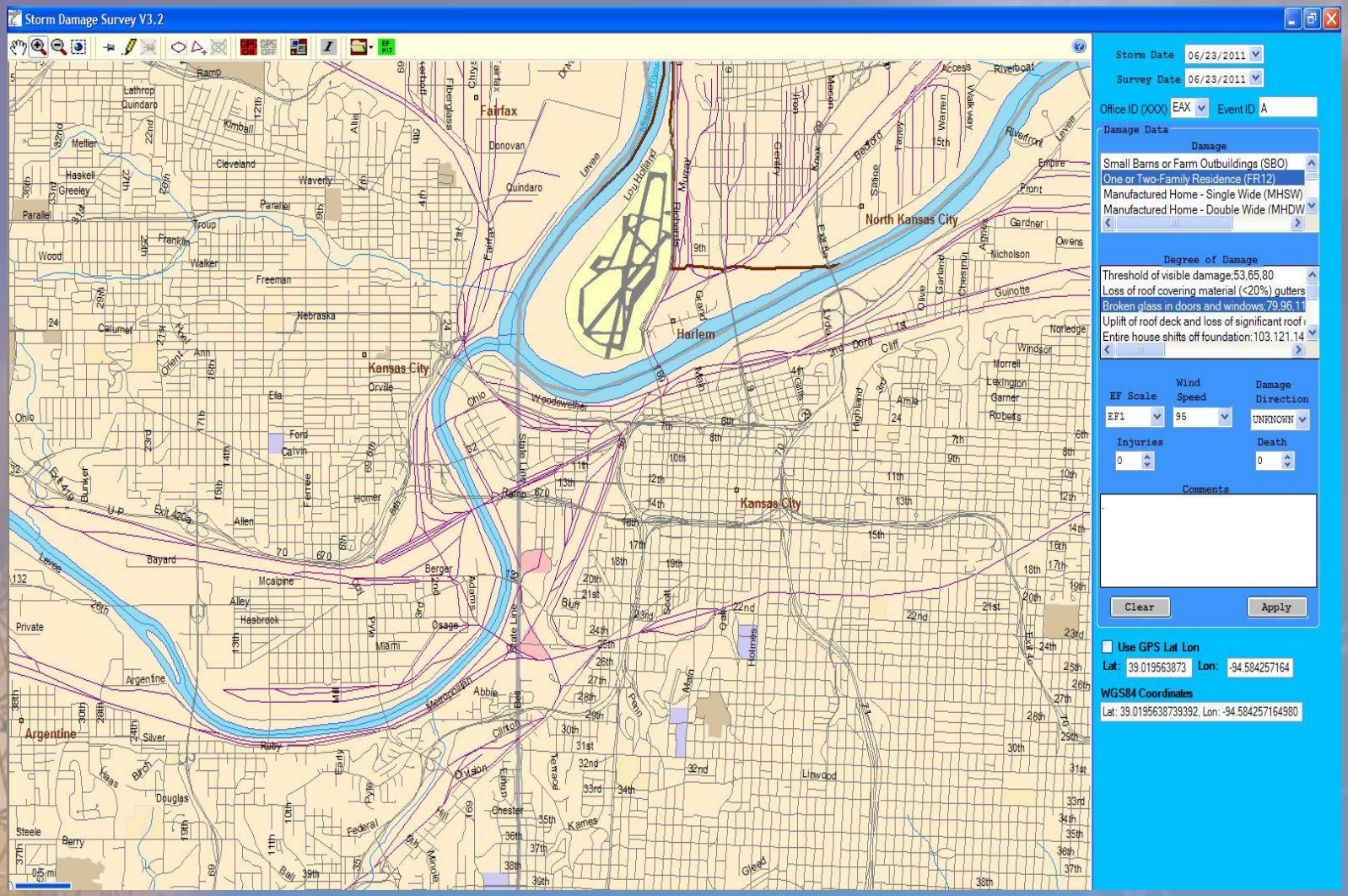
- Less than 2500 sq ft
- Wood or metal post and beam construction
- Wood or metal roof trusses
- Wood or metal panel siding
- Metal or wood roof
- Large doors

DOD*	Damage description	EXP	LB	UB
1	Threshold of visible damage	62	53	78
2	Loss of wood or metal roof panels	74	61	91
3	Collapse of doors	83	68	102
4	Major loss of roof panels	90	78	110
5	Uplift or collapse of roof structure	93	77	114
6	Collapse of walls	97	81	119
7	Overturning or sliding of entire structure	99	83	118
8	Total destruction of building	112	94	131

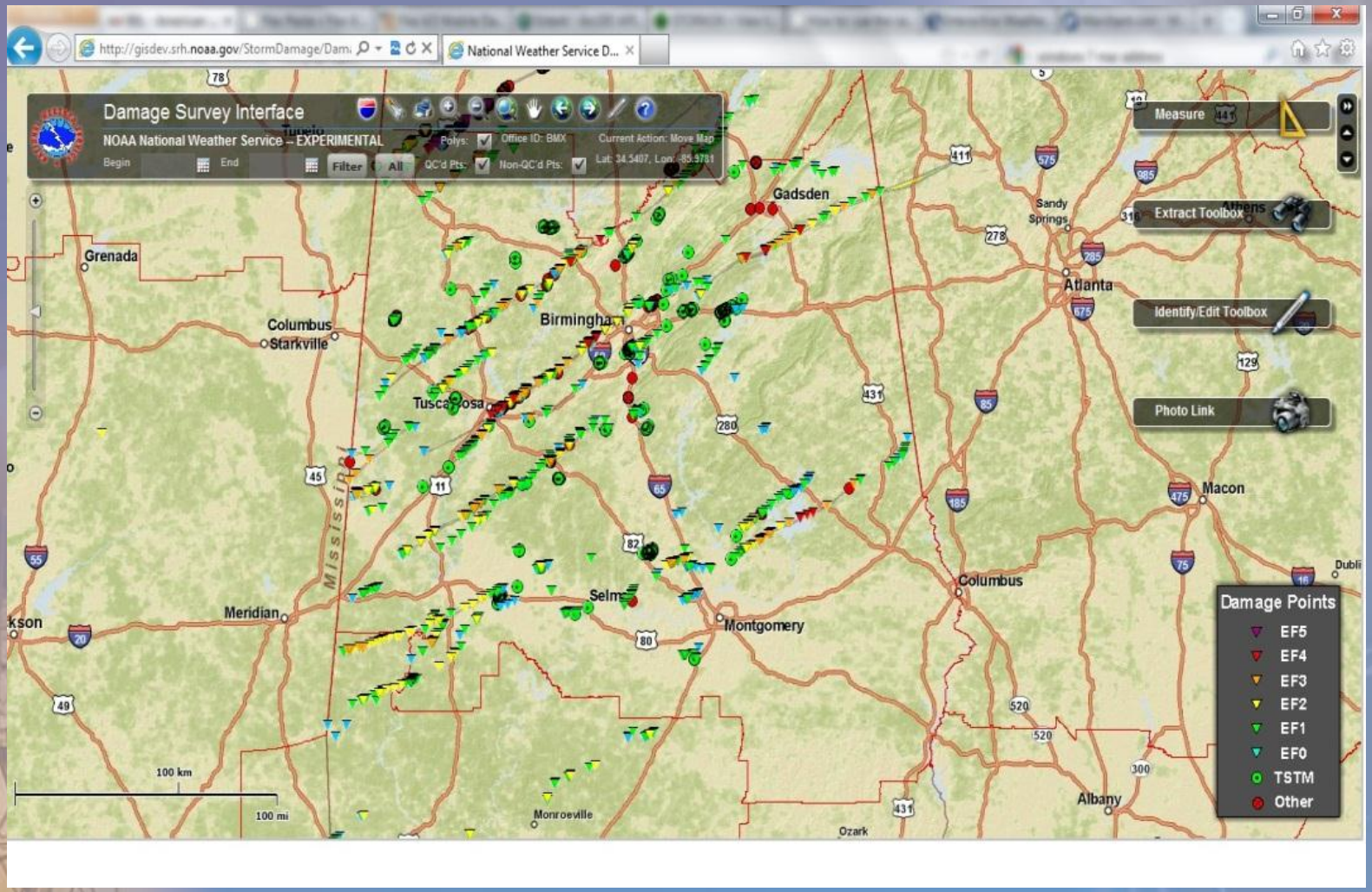
* Degree of Damage



Laptop Interface



Quality Control (QC) Interface



Training

Web based training module

- *4 training sessions provided since Jan 2011*
- *20 or more WFOs from various regions attend each training session with attendance of approximately 40-60 participants*