TABLE OF CONTENTS

The FEMA Geospatial Standards of Operation (SOP) document has been prepared to facilitate the dissemination of Geographic Information Systems (GIS) services and products during emergency events. This document provides guidelines for the organization and management of GIS data, use of models and production of cartographic products and services. Additionally, proper internal and external communication channels for both producing and sharing these products are addressed and outlined. The intended audience for this document includes all staff assigned GIS positions in the event of an emergency, including field, first response and all Emergency Operation Centers that activate during an emergency from the national, regional and field-levels.

FEMA continues to expand the application and use of geospatial information across the response, recovery, planning, and mitigation program areas. The *Remote Sensing Standard in Federal Disaster Operations, Standard Operating Procedures* (dated June, 1999) is the only approved guidance for the Geospatial Cadre. This 11 year-old doctrine is outdated in technology, terminology, organization, and procedural use. Updating this guidance will unify operations at Regional, Head Quarters and Joint Field Offices across multiple program areas. Geospatial technologies provide significant support to decision makers in disaster events. Updating this guidance will ensure unity of effort, streamline production efforts, and increase information sharing within the Incident Command System.

FEMA’s mission is to support U.S. citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards.

FEMA's responsibilities in the areas of hazard mitigation and emergency management include, but are not limited to, mitigation, preparedness, response, and recovery functions. Among its principal functions and activities, FEMA establishes policy for and coordinates civil defense and civil emergency and disaster planning of all Executive Agencies; assists State and local governments in the coordination of mitigation, preparedness, response, and recovery activities; develops and executes programs and policies for fire prevention and control; manages the National Earthquake Hazard Reduction Program and the National Flood Insurance Program; and

serves as the coordinator of all Federal Agencies and Departments responsible for emergency assistance.

FEMA was established by Reorganization Plan No. 3 of 1978 and placed into effect by Executive Orders 12127 of March 31, 1979 (44 Federal Register 19367) and 12148 of July 20, 1979 (Federal Register 43239). On March 1, 2003, the Federal Emergency Management Agency (FEMA) became part of the U.S. Department of Homeland Security (DHS).

IV. Organization and Responsibilities

A. Organizations

1. Joint Field Office (JFO)

The Joint Field Office (JFO) is the primary Federal incident management field structure. The JFO is a temporary Federal facility that provides a central location for the coordination of Federal, State, tribal, and local governments and private-sector and nongovernmental organizations with primary responsibility for response and recovery.

The Geospatial Information System Unit (GISU) at the Joint Field Office (JFO) is organized within the Planning Section. The leader of this Unit is generally the Geospatial Information System Unit Leader (GISL), who reports to the Planning Section Chief. In smaller disasters, such as recovery only disasters, the Unit may be led by a Geospatial Information System Managers (GIMG). This Unit is staffed by Geospatial Information System Specialists (GISP), and when needed, Remote Sensing Specialist (RMSP).

When large or Geospatially complex disaster occur, the GISL may determine the need for Geospatial Information System Managers (GIMG)s to oversee specific functions within the GISU. This organization helps the GISL to manage a complex event by defining roles and responsibilities. It also maintains compliance with span of control in a GIS Unit with a large number of staff.

In an incident with a complex or extensive Remote Sensing mission, the GISL may deploy a Geospatial Information System Manager with a Remote Sensing specialty. Similarly, in an incident with a large or complex database or systems mission, the GISL may deploy a Geospatial Information System Manager with a Geospatial Database and System specialty.

Although many of the staff members in this GIS Unit are FEMA employees, some positions may be staffed by other Federal Agency employees. When assigned within the GIS Unit, these staff members are integrated into the team. They are eligible to supervise other staff and perform functions normally assigned to FEMA staff. However, contractors cannot directly supervise Federal employees. Support from other Federal Agencies is funded through Mission

Assignments that must be executed through the Operations Section. Requests for Mission Assignments to secure Federal geospatial staff are submitted to the Operations Section on an Action Request Form (ARF).

The GISL is responsible for determining the appropriate organizational structure and staffing requirements for the incident. Staffing of individual positions is determined by the magnitude and scope of the disaster and evolving requirements of the Planning Section, as approved by the Planning Section Chief. Many experienced GISLs have developed best practices for GIS Unit organization for large or complex events. Some chose to organize by the function within the GIS Unit (such as map production, data management, etc), some organize by the function within the operation (such as Infrastructure, Emergency Services, Individual Assistance, Planning, etc), and some organize with a combination of these approaches. Each disaster has different requirements and emphases, and the GISL must design the organization to meet the needs of the event. The structure and requirements of the GISU change as the disaster progresses, and the GISL must update the GISU organization and staffing levels accordingly.

4. Regional Response Coordination Center (RRCC)

Each of FEMA's regional offices maintains a Regional Response Coordination Center. Federal department and agency personnel, including ESF primary and support agency personnel, staff the RRCC as required to provide needed resources and policy guidance to support an incident and coordinate with the National Response Coordination Center. This team coordinates initial Federal and regional and field response efforts, and maintains connectivity with State emergency operations center, state fusion centers, and other Federal and State operations and coordination centers.

The Geospatial Information System Unit (GISU) at the RRCC is organized within the Planning Section. The leader of this Unit is generally the Geospatial Information System Unit Leader (GISL), who reports to the Planning Section Chief. This Unit is staffed by Geospatial Information System Specialists (GISP), and when needed, Remote Sensing Specialist (RMSP).

Because of staff availability in the early stages of an event or because of Regional or RRCC space constraints, the GISU is generally smaller and less complex at the RRCC than in the Joint Field Office (JFO). Each Region maintains procedures for their RRCCs. These or other Regional plans and documents may establish the initial organization structure for the RRCC, particularly for no-notice events.

The GISL is responsible for determine the appropriate organizational structure and staffing requirements for the incident. Staffing of individual positions is determined by the magnitude and scope of the disaster and evolving requirements of the Planning Section, as approved by the Planning Section Chief.

6. Response

This section will explore the capability and requirements for the Geospatial Information Unit in Response. The primary audience for this document is the GIS Specialist performing GIS work in a Response environment at a Joint Field Office (JFO) or Regional Response Coordination Center (RRCC).

As the size and complexity of a disaster increases, mapping demands expand to support the protection of life, property, and resources. Response planning for geospatial capabilities should cover hardware, software, and GIS skill-sets. These skills may be different from those needed for other phases of the disaster management lifecycle; requiring a higher technical and management skill level and as well as experience in modeling and remote sensing, to adequately support operations.

Response Phase

The Response Phase of the disaster management lifecycle occurs immediately after a large event and includes such life-sustaining and live-saving activities as:

- Emergency Services Branch activation in Operations
- Disaster Medical Assistance Team Deployment (ESF-8)
- Search and Rescue Operations (ESF-9)
- Commodity Distribution and Logistics ISB Activation (LOGISTICS)
- Evacuations, Mass Care and Shelters (ESF-6)
- Critical Infrastructure Assessment and Restoration (ESF-3/12)

The length of the Response Phase depends on the scale of the Incident. Level-3 Events, or those with minimal Federal involvement, may not have any Response Phase; while Level-1 Catastrophic Events may have a Response Phase that lasts 4-6 weeks!

Other characteristics of the Response Phase include:

- Establishment of the Unified Coordination Group
- 12/24 hr Operational Period with Day/Night shift
- Interim Operating Facilities (IOF)
- Identification of the Incident Area (ICS-201) and Damage Assessment

- Limited Communications

The Response Phase has the most time-sensitive support requirements for life-saving and life-sustaining missions with the most limited resources.

The local mobilization of the first responders in the disaster area includes a first wave of emergency services, such as firefighters, police and emergency medical services (0-12hrs post-event).

The response phase of an emergency may commence with search and rescue and medical assistance (0-48 hrs post-event) but in many cases the focus will quickly turn to fulfilling the basic humanitarian needs of the affected population (>72 hrs post event) and reestablishment of Critical Infrastructure.

The Sanitation, Water, Energy, Telecommunications, Transportation (SWEATT) models are often used to track the restoration of this key infrastructure in the Response Phase.

Role of the GIU in Response

The role of the GIU in the Response Phase is critical in supporting both Operations and Planning. The Operations Section is provided life-saving and life-sustaining Decision Support, while Planning and the Unified Coordination Group are provided key Situation Awareness on inter-sectoral issues and ESF missions.

GIS Specialists must have knowledge of:

- Incident Command System (ICS) structure and procedures to operate within the chain of command on an incident.
- Knowledge of the organizational structure and how to request services and support.
- Understanding of the general expectations of the Unified Coordination Group and Planning/Operations Section during an incident.
- The GIS Specialist must be able to communicate, needs to prioritize and adjust workloads, and bring in additional staffing as needed.
- Monitor one's own physical, emotional, and mental limits.
- Follow safe working practices and procedures, as well as identify and report unsafe working conditions, as safety is the first priority
- Perform the role of GIS Specialist in "incident conditions," which may include long hours (12- to 16-hour operational periods, day and night) and in close quarters shared with other personnel.
- Must be able to work well in stressful conditions and maintain a professional demeanor.
- Must be available to travel away from home for 14 days or longer

Responsibilities

The GIS Specialist is responsible for the following:

- Collecting, processing, and disseminating incident-related geospatial data
- Creating new data as needed for incident operations
- Incorporating data from (GPS) units and other sources
- Keeping informed of any hardware, software, or data difficulties and concerns
- Providing maps and other products as requested by staff or leadership
- Complying with and maintaining standardized data structures
- Creating necessary products using defined symbology
- Properly documenting data and archiving work
- Dissemination of GIS data and products through FTP sites, web, sharepoint and file servers
- Manage the delivery of GIS products, projects, and data to other personnel on the incident or within the agency
- Complying with demobilization procedures

Key management functions of the GIU Leader in Response include:

- **GIU Priorities**- Establishment of immediate GIU request/support priorities in alignment with the Incident Action Plan (IAP) and Incident Objectives (ICS-202). Operational triage/expectations management may be required for situations where some of the lower priority requests may be unmet.

Projects should follow the chain of command and be prioritized by above impact to:

- Life-Saving Activities
- Life-Sustaining Activities
- Mitigation of Impacts/Protection of Property
- Situation Awareness for Executives

Attendance at the daily Senior Staff Meeting or Tactics meeting may be required for the GIUL by the Planning Section Chief to align GIU support requirements

- **SITSTAT Coordination** –Effectively manage Minimum Essential Datasets (MEDS) and Essential Elements of Information (EEIs) collected through the Information Collection Plan (ICP). The development of templates for collecting the dynamic event data from the (15) ESFs every operational period, especially for complex mission areas, will need to be developed to be interoperable with geospatial products and web services.

- **Immediate Production Requirements** – In order to meet the requirements of Response, the GIU will need to complete certain high-priority projects IMMEDIATELY, when requested. Often, the GIU has established a request process and provided a 1-day return on GIS Requests in normal day-to day operations. This procedure WILL be altered for requests in Response, per above – with requests for any Emergency Services Branch, FCO and SCO as the highest priority. The Chain of Command and Org-Chart (ICS-207) will help establish priorities for product development where 20-minutes or less for turnaround may be common.

- **Identification of Limiting Factors** - such as staff, hardware, software licenses, data structure and information management will need to be IMMEDIATELY identified. Solutions for these issues may need to be proposed and coordinated through the Planning Section Chief. Negotiation for additional floor space, IT Support and movement of equipment will also need to be coordinated with JFO Logistics and the Planning Section Chief- as the GIU may be relocated several times and have unique Logistical requirements**.**

- **Remote Sensing Coordination** - will need to begin between the GIU/FEMA Region and State with the NRCC Remote Sensing coordinator. Identification of 1) potential areas of impact (AOI), 2) Critical facilities impact, 3) coordination with Program of ESF team leaders to support missions and should be in alignment with joint state and UCG priorities.

- **Defining the Incident Area** – As noted above, a key characteristic of Response is the definition of the Incident Area. This area will focus Operations, and identify 1) The greatest population impacts, 2) Critical Infrastructure impacts, 3) ESF mission support priorities. Sometimes these authoritative sources may conflict or agency models may be surpassed by ground-truth. It is in these cases that the GIU must work with the correct SMEs (e.g. USGS for Earthquakes; NWS for Weather events) to validate, deconcflict and 'paint-the-picture' of the incident area.

- **Generate, Deconflict and Validate Event Data** – Generating event specific 'point' datasets are a common requirement for the GIU in Response. Some common field situations can occur with multiple sources providing conflicting information, some authoritative and some not, with some hardcopy and some digital. Most may be in need of geocoding, and will need to be integrated into a single, authoritative, validated point dataset. Some examples include FEMA Facilities, Field Medical Hospitals (FMS), ESF-3 Generator Placement, Resource/Commodity/Team locations; all are essential datasets to develop a Common Operations Picture (COP).

Communications

The GIS Specialist needs to maintain timely and effective exchange of information between the leadership, planning and other groups within the agency, or ICS structure. When communicating with incident personnel and technical staff it is imperative that the GIS Specialist maintain a professional demeanor and often communicate complex information in simple common language.

When communicating within the incident, it is essential that the GIS Specialist follow the ICS chain-of-command at all times. Incident communications, such as requests for materials, maps, or information, are tracked using a GIS Map Request Form.

Whenever there is more than one GIS Specialist on an incident, one of them may be designated as the "lead" to coordinate and communicate with the SITL and PSC.

Remote sensing

If a major disaster or emergency is declared, or when FEMA is able to support requests with pre-disaster surge funding, requests for support will be submitted to the FEMA National Response Coordination Center (NRCC) Remote Sensing Coordinator (RSC), Chris Vaughn (Christopher.Vaughan@fema.gov) at FEMA Headquarters in Washington, DC. This process follows the FEMA Remote Sensing in Federal Disaster Operations SOP, June 1999.

In certain events, the Interagency Remote Sensing Coordination Cell (IRSCC) will be established to support the FEMA Remote Sensing Coordinator to assist with the synchronization of federal remote sensing activities pursuant to a major disaster or emergency. The IRSCC processes remote sensing requirements submitted by operations centers, FEMA regions, Joint Field Offices (JFO), State, Tribal and Local disaster coordinators, Federal Departments or Agencies, and DHS leadership via the FEMA NRCC RSC.

Hazard Models

Hazards US (HAZUS) is a risk assessment software tool developed by FEMA for analyzing potential losses from floods, hurricane winds, and earthquakes. In an event, the FEMA headquarters Mapping and Analysis Center (MAC) is responsible for producing HAZUS runs of record for FEMA, including data and maps, using standard operating procedures.

SLOSH (Sea, Lake, and Overland Surges from Hurricanes) measures storm surge heights and winds from historical, hypothetical and predicted hurricanes. Access to the NOAA deterministic surge maps runs during an event for an event can be found at http://www.nhc.noaa.gov/ftp/. NOAA also produces a probabilistic surge product, which is available at http://www.weather.gov/mdl/psurge/.

The Interagency Modeling and Atmospheric Assessment Center (IMAAC) is the sole resource for creation, coordination and dissemination of atmospheric transportation and dispersion modeling products for Chemical, Biological, Radiological, and Nuclear (CBRN) events for the Federal Government.

The IMAAC responds to major releases when state or local assets are overwhelmed. The National Atmospheric Release Advisory Center (NARAC) at Lawrence Livermore Laboratory (LLNL) is currently the primary provider of IMAAC products. These products will represent the federal position during an event in which federal coordination is required. The IMAAC can be directly contacted 925-424-6465, Monday – Friday, 7:30 AM – 4:30 PM (PST). At all other times the call will be handled by Emergency Duty Officer who will alert the on-call staff member and you will have a response within 15 minutes.

GIU Products in Response

Completing GIU requests in a Timely and Accurate manner is of the highest priority. Some tactical guidance for GIS Specialists in Response include:

- Lock Down Issues – follow an issue to the end result, as they will accumulate if there is no follow through.
- Minute by Minute Tasks – tasks may be constantly accumulating 24 hours a day. Develop method for tracking this e.g. sticky-notes, smartphone notes
- Geospatial Unit Leader Oversight for ALL Life-Saving or Life-Sustaining Activities – results may be required immediately and products may be life sustaining. The Geospatial Unit leader MUST coordinate and follow each of these tasks to completion, even if it involves working well over projected time frames through overnight efforts or significant overlap in shifts.
- Quick Identification of Emergent Issues and Preemption of Critical Projects – without the geospatial unit, “Situation Awareness” may never happen, or at least will be less structured. The unit must set the operational tempo or “battle rhythm” of the response effort through development of key products. This may also involve ‘deconflicting’ information and coordinating with multiple ESFs for a ‘Common Operational Picture’ to be developed.
- Black-Out Period – from the time of landfall or event “ground-zero” a period of operational black-out will require proactive effort for defining the situation. From this, operational issues will quickly form and require IMMEDIATE

support. The Common Operational Picture will develop here as the incidents unique footprint becomes more clearly defined.

Common Products

Common products for Response can be broken into (6) ICS Operational Branch/Section level GIU support areas:

Emergency Services Branch

Supports DCE/Emergency Services US&R/DMAT Response Operations (Level-1), Resource Tracking (Level -2) and Logistics (Level -3). This is the most critical support for meeting the Response Operations Emergency Services Branch mission support, and is accordingly expanded first when a new incident or support requirement arises. Key products include:

- Search and Rescue Grid/S&R Operational Plan Support
- Points of Distribution (PODS)/Drop Points/ISB Locations
- Water Bladder/Canteen Locations
- Fuel/Fuel Depots
- Commodity/Team/Resource Locations
- Medical Sector Impacts/Field Medical Stations
- Disease Vector Control
- Public Health Surveillance
- Security Operations
- Private Sector restoration
- HAZMAT Recovery

NGA can be mission assigned for forward operations support (DMIGS) to ESF-9 with additional NGA Geospatial Analyst deployed by the GIU if needed.

External Affairs

Supports Community Relations, Public Information and External Affairs and Congressional. Management of projects require demographic data experience. Outreach products e.g. animations, 3d ArcScene projects, KML distributions for public release, social networking/media will be coordinated form this team. Key products include:

- Demographic Analysis
- Population Impacts
- Social Media/VGI based impact assessment

Tech & Natural Hazards and Mitigation Branch

Interdisciplinary project coordination and natural and technological hazards science coordinate with subject matter experts (SMEs) and disciplinary experts for authoritative models to define incident area e.g SLOSH. Key products in Response include:

- SLOSH/NWS Models/ Meteorological Products
- IMAAC Models
- Peak Ground Accelerations (PGA)/Ground Velocity (PGV) models for Earthquakes
- Area of Impacts (ICS-201)
- SME Coordination for Hazard/Damage Assessment/Structural/Area of Impacts
- Depth Grids
- Floodplain extents

NOAA, USGS or other Natural/Technological SME can be deployed to lead this are in the GIU.

Individual Assistance Branch

Supports Evacuations, Mass Care, Sheltering Individual Assistance, Direct Housing Programs and VOLAG. The main products for Individual Assistance rely on data from EMMIE and EOMMR reports server for Individual Assistance Teleregistrants. Special emphasis on tracking displaced populations. Key products include:

- Evacuations
- Shelters
- Special Needs Shelters
- 'Kitchen' Feeding Areas
- FEMA Teleregistrations
- Displaced Populations
- Temporary/Interim Housing
- DRC Locations
- Damage and Housing Impacts
- Hotels/Motel Housing

Infrastructure Branch

Supports Public Assistance, Infrastructure, Power, HAZMAT/Environmental Special Considerations and Debris mission. Projects from the ESF-3 and ESF-12 missions will occur most frequently in Response. Subject matter expertise in the natural sciences as well as experience in civil engineering is required. Key products include:

- Debris Estimates/Damage Assessment
- Power Restoration Status/Impacts
- Generator Placement/Prime Power
- Transportation Damage/Status
- Telecommunications Status
- Sewar/Water Infrastructure Impacts
- Ports/Waterways/Levee Impacts
- Blue Roof Mission Status
- Critical Infrastructure Impacts
- Schools
- Environmental Impacts

The USACE PRT Team can often be deployed as lead for this area within the GIU.

Planning Section

Supports special projects and senior executive summary products and high-priority project requests, and special geographic reference products. The Planning Section support lead will often develop prototype projects for cyclic map requests used in daily Executive Briefings. Key products include:

- PDA Maps
- Declaration Maps
- Governors Requests
- Executive Briefing Products

It should be noted that a key priority for the GIU will be to construct ArcGIS Server services through rapidly turning the above 'dynamic event data' into authoritative content for integration into the interactive SAVER2 web mapping application.

7. Recovery ..... [page #]

This document identifies many of the GIS business processes and information needs of the FEMA Recovery mission. Further input from Justin Warren, Eamonn Bethel, Michelle Bonifas, Noé Hatchuel, and Seth Spoelman at HQ would be tremendously helpful. Even more so, will be the input from our Region and JFO GIS staff who support our Recovery missions at the field level. At the HQ level we don't have many standard GIS products, our role is more of providing policy and data Subject Matter Expert (SME) support to Region and JFO GIS staff, so detailed SOPs will have to be left to the Region and JFO practitioners.

Here is a brief overview of the data, information, and analysis Recovery needs to perform its mission.

1) General disaster/event jurisdictional, demographic, and critical infrastructure impact, predicted (pre-event, for example, projected hurricane path) and actual. This will enable Recovery to assess needs and allocate resources more quickly and efficiently.

2) Status and metrics for Recovery program operations. Information and analysis derived from FEMA enterprise information management systems, including NEMIS and EMMIE, will provide situational awareness to help gauge the progress of recovery at the State and County level:
    a) # of IA applicants
    b) # of IA applicants receiving the maximum award
    c) # of IA applicants with residence destroyed
    d) # of IA inspections
    e) # of IA applicants needing rental assistance
    f) # of PA Project Worksheets and project amounts
    g) $ PA Project Worksheets funded

3) Situational awareness of Mass Care efforts including:
    a) Shelter capacities, status, # of inhabitants from FEMA NSS and ARC NSS.
    b) Feeding Sites
    c) Other sites, including Health Services, Social Services, Logistics.

4) Disaster Recovery Center planning, reporting, and analysis. As FEMA's prime tool for public outreach to disaster survivors, Recovery needs to assess the status of its DRC efforts to determine that all communities are being served quickly and efficiently. Also, increased visibility of DRC activities and locations will increase field use of DRC Manager ensuring the most accurate information is delivered to disaster survivors through FEMA.gov/DRC Locator.

5) Identify housing needs and shortfalls. An analysis of NEMIS rental assistance payments and RIMS Housing Portal available rental resources can help determine the location of housing need vs. available housing.

6) Identifying areas inaccessible for inspection. A comparison of applicants and inspections performed may help identify areas inaccessible to inspectors. This was an issue in the 2008 Midwest floods.

7) Monitoring the progress of Temporary Housing missions. Recovery needs visibility of every phase of Temporary Housing missions, initially ensuring disaster survivors are provided a housing solution quickly, and finally helping them move from FEMA temporary housing units into permanent homes.

8) GIS Environmental and Historic Preservation (EHP) reviews for PA PW project sites and IA DHOPS facilities.

In addition, Recovery has a need for geospatial analysis tools, which may be available to specific departments. For example:

1) IA NPSC has a need for viewing applicant inspections with post-disaster imagery to QA field inspections.
2) PA needs to determine if Project Worksheet Sites have facilities which have had repetitive damage which may be shown by a web mapping tool showing historical PWs.

9. Preparedness

This section will explore the capability and requirements for the Geospatial Information Unit in Preparedness. The primary audience for this document is the GIS Specialist performing GIS work for the Preparedness Division at a regional office.

Role of the GIU in Preparedness

The role of the GIU in the Preparedness is critical in supporting both the planning efforts.

Responsibilities

The GIS Specialist is responsible for the following:

- Collecting, processing, and disseminating related geospatial data
- Creating new data as needed for planning exercises and missions
- Incorporating data from numerous external sources
- Keeping informed of any hardware, software, or data difficulties and concerns
- Providing maps and other products as requested by staff or leadership
- Complying with and maintaining standardized data structures
- Creating necessary products using defined symbology
- Properly documenting data and archiving work

- Dissemination of GIS data and products through FTP sites, web, sharepoint and file servers
- Manage the delivery of GIS products, projects, and data to other personnel within the agency

Communications

The GIS Specialist needs to maintain timely and effective exchange of information between the leadership, planning and other groups within the agency, or ICS structure. When communicating with FEMA personnel and technical staff it is imperative that the GIS Specialist maintain a professional demeanor and often communicate complex information in simple common language.

GIU Products in Preparedness

Completing GIU requests in a Timely and Accurate manner is of the highest priority. Some tactical guidance for GIS Specialists in Preparedness include:

- Lock Down Issues – follow an issue to the end result, as they will accumulate if there is no follow through.

- Minute by Minute Tasks – tasks may be constantly accumulating 24 hours a day. Develop method for tracking this e.g. sticky-notes, smartphone notes

- Geospatial Unit Leader Oversight for ALL Life-Saving or Life-Sustaining Activities – results may be required immediately and products may be life sustaining. The Geospatial Unit leader MUST coordinate and follow each of these tasks to completion, even if it involves working well over projected time frames through overnight efforts or significant overlap in shifts.

- Quick Identification of Emergent Issues and Preemption of Critical Projects – without the geospatial unit, "Situation Awareness" may never happen, or at least will be less structured. The unit must set the operational tempo or "battle rhythm" of the Preparedness effort through development of key products. This may also involve 'deconflicting' information and coordinating with multiple ESFs for a 'Common Operational Picture' to be developed.

- Black-Out Period – from the time of landfall or event "ground-zero" a period of operational black-out will require proactive effort for defining the situation. From this, operational issues will quickly form and require IMMEDIATE support. The Common Operational Picture will develop here as the incidents unique footprint becomes more clearly defined.

Common Products

Common products for Preparedness can be broken into 2 categories, Planning and Technological Hazards. Interdisciplinary project coordination and natural and technological hazards science coordinate with subject matter experts (SMEs) and disciplinary experts for authoritative models to define incident area e.g SLOSH. Key products in Preparedness include:

- SLOSH/NWS Models/ Meteorological Products
- IMAAC Models
- Peak Ground Accelerations (PGA)/Ground Velocity (PGV) models for Earthquakes
- Area of Impacts (ICS-201)
- SME Coordination for Hazard/Damage Assessment/Structural/Area of Impacts
- Depth Grids
- Floodplain extents
- Exercise Plans
- Critical Infrastructure
- HAZMAT Locations and Recovery
- Fuel/Fuel Depots
- Nuclear Power Facilties
- Health and Human Services needs and concerns
- Public Health Surveillance
- Security Operations
- Private Sector restoration

10. Mapping and Analysis Center (MAC)

The Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), Information Technology Services Division (ITSD), GIS Solutions (GS) is the organizational home of the Mapping and Analysis Center (GSB-MAC).

The GSB-MAC is FEMA's Enterprise-Wide GIS solutions, services and geospatial analysis operation whose customers comprise all aspects of the overall homeland security emergency management mission. To successfully fulfill this mission, the GSB-MAC has a staff of highly-skilled digital cartography and geographic information systems (GIS) specialists. The staff plans, budgets, designs, acquires, implements, maintains and operates various geospatial applications, geospatial data holdings, and special-purpose hardware and software suites in a controlled space at FEMA Headquarters.

The role of the GSB-MAC is to provide mapping and analysis support to all organizations within FEMA. The GSB-MAC is focused on map support for the emergency management mission, including catastrophes, disasters, emergencies, special events, exercises, and other training. In addition, the GSB-MAC is often tasked with providing ad hoc support on a one-time, recurring or ongoing basis. The GSB-MAC does not support flood insurance rate mapping.

For GIS Mapping Support, please contact the GSB-MAC:

FEMA GSB-Mapping and Analysis Center 500 C Street, SW Rm 419 Washington, DC 20472	GSB-MAC: (202) 646-2597 NRCC GIS Desk: (202) 646-2486 E-mail: FEMA-MACMAPS@dhs.gov

For flood insurance maps, please contact the FEMA Map Service Center:

FEMA Map Service Center P.O. Box 1038 Jessup, Maryland 20794-1038	Tel: (800) 358-3823 Fax: (800) 358-9620 E-mail: FEMA-MSCservice@dhs.gov

PURPOSE

This document describes the procedures by which the NRCC and GSB-MAC collaborate to produce custom maps. The GSB-MAC Product Request Form (see Attachment) is the vehicle by which the GSB-MAC provides services to the disaster management community including all partnering Emergency Support Functions (ESF). During NRCC activation, the GSB-MAC operates in close collaboration with the Planning Section. The Planning Section is responsible for collecting, evaluating and disseminating situation information to support planning and decision-making. It is the information link within the NRCC and between the HSOC and the field. The Section facilitates action planning for the NRCC Manager with all sections and prepares the national-level Situation Report (SITREP), briefings and special reports, and information displays for the NRCC.

When the GSB-MAC is supporting the NRCC, all other mapping and geospatial tasks are handled at a lower priority. However, agency-wide customers, under support contracts, may have dedicated resources to meet their organization's unique requirements during response/recovery activation.

HOURS OF OPERATION AND POINTS OF CONTACT

IF YOU NEED GIS/MAPPING TO SUPPORT EMERGENCY RESPONSE/RECOVERY ACTIVATION AFTER HOURS PLEASE CONTACT THE NRCC MANAGER FOR GSB-MAC AUTHORIZATION.

Hours of Operation:
During routine operations, the GSB-MAC is staffed from 8:00 a.m. to 5:00 p.m. During NRCC activations, GSB-MAC operations are extended to accommodate NRCC GIS and field operations requirements. These expanded hours of operation are determined by the NRCC Manager.

Points of Contact:
During NRCC activation, the Planning Section is the primary point-of-contact (POC) for GSB-MAC support. The GSB-MAC accepts GIS requests through the "NRCC GIS

Coordinator" or through the "Planning Section Chief." Please direct any questions about prioritizing GIS requests to the NRCC GIS Coordinator. The GSB-MAC uses event/incident data provided by the NRCC Planning Section's Situational Status Unit for the creation of GIS products and analysis to meet mission specific objectives..

NRCC GIS Coordinator: The NRCC GIS Coordinator, assigned from GSB-GSB-MAC, serves as a dedicated liaison working within the Planning Section during NRCC activations. The NRCC GIS Coordinator is the primary POC for all GIS-related activities between the NRCC, field operations and the GSB-MAC. The role of the NRCC GIS Coordinator is to facilitate the proper completion of the GSB-MAC Product Request Form as well as monitor the status of work requests to product delivery. During NRCC activation, the NRCC GIS Coordinator can be contacted during specified hours of operation via email at FEMA-NRCC-giscoord@dhs.gov or by telephone at (202) 646-2486 or (202) 646-2828.

Planning Section Chief: The Planning Section Chief is the second POC for the NRCC for mapping requests during NRCC activation. If the NRCC GIS Coordinator is not readily available, contact the Planning Section Chief. Contact information is available through the NRCC Team Roster located at:

http://bulletinboards.fema.net/FEMA%20Emergency%20Response%20Teams/messagelist.htm

NRCC Manager: The NRCC Manager is an alternate contact, primarily for staffing and schedule planning. During disaster operations, the NRCC Manager can be contacted during NRCC hours of operation via email at FEMA-NRCC@dhs.gov or by phone at x2424.

Other FEMA contacts can be found at the following web site:

http://bulletinboards.fema.net/FEMA%20Emergency%20Response%20Teams/messagelist.htm

REQUESTS FOR PRODUCTS

GSB-MAC Product Request Procedures:

All map products produced by the GSB-MAC in support of NRCC activities, for disaster or daily work, must be initiated by a completed GSB-MAC Product Request Form. The standard GSB-MAC Product Request Form is available in digital format on the NRCC Share folder (//Q:\E. ESF05 PLANNING SECTION\MACMAP_Request_Forms - GIS SOP) or by request. To receive a copy of the digital GSB-MAC Product Request Form, send an email to FEMA-GSB-MACMAPS@dhs.gov.

The NRCC GIS Coordinator will coordinate all NRCC and field operations product requests to the GSB-MAC. Any external requests (or requests that adversely affect GSB-MAC support to the NRCC), will be prioritized by the Planning Section.

Completing the GSB-MAC Products Request Form:
The GSB-MAC Product Request Form is designed to capture basic information that will enable the NRCC GIS Coordinator, GSB-MAC Operations Manager, and the GSB-MAC GIS Analysts to provide the best map product possible in a timely manner. As a general rule, GSB-MAC product requests are completed within **2 hours** of the time that the GSB-MAC has received the product request, verified the form for completion, and essential data are available. This means that the NRCC GIS Coordinator and/or GSB-MAC Operations Manager have vetted the request and sent it on to the GSB-MAC for tasking.

GSB-MAC Product Request Form Submission:

When the NRCC is activated for disaster response/recovery, the map requestor must submit a completed GSB-MAC Product Request Form via email (or other mechanism specified below under communications) to the NRCC GIS Coordinator. Requests for maps containing data that are unique, owned by the requestor or that is event related should be included as a spreadsheet or compatible format (comma delimited, MS Excel, MS Access, etc.) or in a GIS shapefile or similar geospatial file format when available. If data that is to be incorporated into the requested map product is located on an external web site, include the URL and a short description of the web site along with the downloaded data. The NRCC GIS Coordinator will verify and validate the request and associated data before forwarding to the GSB-MAC for tasking. In the absence of the NRCC GIS Coordinator, map requests and data can be submitted directly to the GSB-MAC Operations Manager. The NRCC GIS Coordinator or GSB-MAC Operations Manager will be able to provide assistance and guidance as required for completing a GSB-MAC Product Request Form, defining the data layers or evaluating data to be mapped. For examples of standard map products, please see appendix I.

Communications:

Completed Map Request forms must be submitted to (in order of preference):

- NRCC GIS Coordinator FEMA-NRCC-giscoord@dhs.gov; (202) 646-2486; NRCC Area B (During NRCC activation)
- FEMA-GSB-MACMAPS@dhs.gov (preferred for non-disaster support)
- GSB-MAC Operations Manager in Room 419 (Non-disaster joseph.workman@dhs.gov)
- By Phone to the GSB-MAC Operations Manager at (202) 646-2597 or (202) 646-3823
- Via Facsimile on (202) 646-3402

*Note**:* All faxed requests must be followed-up with a phone call to the GSB-MAC Operations Manager to be sure they have been received. The GSB-MAC Operations Manager can be contacted at (202) 646-2597 or (202) 646-3823.

DELIVERY AND WEB UPLOAD

Product Delivery:

Options for product delivery are provided on the GSB-MAC Product Request Form. The NRCC GIS Coordinator or GSB-MAC Operations Manager will write a Delivery Notice/Letter to accompany the final map/data product on its delivery to the map requestor. When the product has been delivered successfully, a receipt confirmation will be obtained indicating delivery has occurred. The NRCC GIS Coordinator or the GSB-MAC Operations Manager will follow-up with the map requestor to ensure the product was received and meets the operational need.

Electronic copies of GSB-MAC products are available through email, online at the GSB-MAC's GISMAPS web site, on the FEMA HQ FTP site, or via overnight courier.

Accessing the FEMA HQ FTP Site:

Access to the HQ FTP site must be granted for each user by FEMA IT Help Desk. If you currently do not have permissions granted or are having technical problems accessing the FEMA HQ FTP site, contact the FEMA Help Desk via e-mail HQHELPDESK@dhs.gov or direct by phone at 202-646-4357, toll free 888-HLP-FEMA (888-457-3362). Request access to the following IP address ftp://166.112.193.65.

Posting Maps to the Web:

A large number of the GSB-MAC's map/data products get posted to www.gismaps.fema.gov. The site has maps categorized by latest (last 30 days), current year, or archive. The maps are also organized by disaster number or other standard operational naming conventions (i.e., Hurricane Katrina). The web site gismaps.fema.gov includes Imagery Derived Products (IDPs) organized by disaster number. This web site also includes maps from the NRCC, ROCs, JFOs, DFOs and other organizations upon request. The Planning Section will inform ROCs and DFOs of requirements to provide their products to the GSB-MAC for web posting.

The NRCC GIS Coordinator will notify the FEMA Web Team of which GSB-MAC product requests to post. The GSB-MAC Web Administrator uploads the products and notifies the FEMA Web Team. The FEMA Web Team then updates the index pages and posts the data to the web site. The GSB-MAC Web Administrator then reports the successful posting to the GSB-MAC Operations Manager and the map requestor.

STANDARD PRODUCTS

NRCC Briefing Book:

- Disaster Declaration – Designated Counties
- Congressional Districts
- Demographics Profiles
- Population and population density

- Housing Units
- Median Household Income
- Median Housing Value
- Persons with Public Assistance
- Status and Tracking
  - Teams - NDMS, MERS, CR, etc.
  - Commodities – Food, Generators, Supplies, etc.
- Transportation Networks/Evacuation Routes
  - Roads, Airfields, Ports
  - Air Assets, Marine Assets, Trucks
- Medical Facilities
  - Hospitals
  - Clinics
  - Nursing Homes
- Disaster Recovery and Distribution Centers
- Shelters, Shelter Status

General:

The following standard products are in addition to those products listed above.

- Imagery Derived Products of flooding, damage, etc.

Hazards

- All Hazard Overview
- Stream Gauge and Weather Warning
- Wildfire Overview

Hurricane

- Rain Fall
- Slosh (When available)
- Storm Track Overview (Hurrevac)
- Wind Buffer Map

Commonly Requested:

- Individual Assistance and Business Assistance Applicants
- National Flood Insurance Program (NFIP) Data
- Other Assessments/Products

Summary:

- All map requests must be submitted via the standard GSB-MAC Product Request Form
- As a general rule, all map requests are to be submitted through the NRCC GIS Coordinator
- Priorities are set by the NRCC GIS Coordinator in consultation with the GSB-MAC Operations Manager regarding work load and staff availability

- NRCC Manager is the only person who can request, and subsequently authorize, funding to extend the working hours for the GSB-MAC to support NRCC activation

11. Urban Search and Rescue (USAR)

Emergency Support Function (ESF) #9 – Search and Rescue (SAR) rapidly deploys Federal SAR resources to provide lifesaving assistance to State, tribal, and local authorities, to include local SAR Coordinators and Mission Coordinators, when there is an actual or anticipated request for Federal SAR assistance.

During incidents or potential incidents requiring a unified SAR response, Federal SAR responsibilities reside with ESF #9 primary agencies that provide timely and specialized SAR capabilities. Support agencies provide specific capabilities or resources that support ESF #9. Federal SAR response operational environments and the Primary Agencies are classified as:

Structural Collapse (Urban) Search and Rescue (US&R)
Primary Agency: Department of Homeland Security (DHS)/Federal Emergency Management Agency (FEMA))

Maritime/Coastal/Waterborne Search and Rescue
Primary Agency: DHS/U.S. Coast Guard (USCG)

Land Search and Rescue
Primary Agency: Department of the Interior (DOI)/National Park Service (NPS); Department of Defense (DOD)

SAR services include distress monitoring, incident communications, locating distressed personnel, coordination, and execution of rescue operations including extrication and/or evacuation, along with providing medical assistance and civilian services through the use of public and private resources, to assist persons and property in potential or actual distress.

Past US&R deployments realized the benefit of the National Geospatial-Intelligence Agency (NGA) providing mobile GEOINT support. Base on our experience, requests for NGA support has become a standard mission assignment when the Urban Search and Rescue Incident Support Teams and task forces are deployed.

In addition to NGA's support, a Technology Ad-Hoc Work Group was recently formed to address technology-related issues that impact the National US&R Response System. The research and corresponding recommendations developed by the US&R Technology Ad-Hoc Work will initially focus on emerging technologies related to reconnaissance and search operations, including GIS requirements. The Work Group is evaluating standardization of mapping protocols; symbology; information sources; data/map dissemination and mobile applications.

All ESF-9 Primary Agencies developed the Catastrophic Incident Search and Rescue (CISAR) Addendum (Version 2.0) to the National Search and Rescue Supplement (NSS):

http://www.uscg.mil/hq/cg5/cg534/nsarc/CISAddendum2.0_Nov09.pdf

Because CISAR requires a multiagency, coordinated response from so many different SAR organizations, establishment of a standardized way to communicate position information became a critical issue to ensure SAR responder safety and facilitate effective SAR coordination and communication.

As a result, a Geo-referencing Matrix was developed and included in the Geo-referencing section of the CISAR Addendum. The Geo-referencing Matrix uses latitude/longitude, the U.S. National Grid and the Global Area Reference System (GARS) and explains how SAR responders and Planners will/should use each system for planning, coordination and information sharing. Primarily, the Geo-referencing Matrix utilizes the U.S. National Grid for land SAR responders and Latitude/Longitude for aeronautical SAR responders, but also explains how communicating position information between these two systems is coordinated.

One other problem that has been routinely encountered is how to communicate latitude and longitude coordinates. The Geo-referencing matrix standardizes how this coordinate system is spoken.

Standard Latitude/Longitude format for CISAR operations

The standard Latitude/Longitude format for CISAR operations is Degrees, Decimal Minutes (DD° MM.mm').

Latitude is always read and written first noting "North" since the U.S. is North of the Equator. Longitude is always read and written last noting "West" since the U.S. is West of the Prime Meridian.

Speaking Latitude and Longitude

For example, 39° 36.06'N by 76° 51.42'W, should be stated as per the following:

"Three nine degrees, three six decimal zero six minutes North by seven six degrees, five one decimal four two minutes West."

The words, "degrees," "minutes," and "decimal" must to be spoken.

National SAR Committee
CISAR Geo-referencing Matrix

Georeference System User	United States National Grid	Latitude/Longitude DD-MM.mm[1]	GARS[2]

[1] During CISAR operations (and to avoid confusion) Latitude and Longitude should be in one standard format: DD-MM.mm. If required, use up to 2 digits to the right of the decimal. If required, allow 3 digits in the degrees field for longitude (i.e., DDD-MM.mm). Do not use leading zeros to the left of the decimal for degrees or minutes that require fewer than the maximum number of possible digits to express their

	(USNG)		
Land SAR Responder[3]	Primary	Secondary	N/A
Aeronautical SAR Responders[4]	Secondary	Primary	Tertiary
Air Space Deconfliction[5]	N/A	Primary	N/A
Land SAR Responder/ Aeronautical SAR Responder Interface.[6]	Primary	Secondary	N/A
Incident Command: Air SAR Coordination Land SAR Coordination	 Secondary Primary	 Primary Secondary	 N/A N/A
Area organization and accountability[7]	Secondary	Tertiary	Primary

B. Responsibilities

value. The minimum number of digits is always one, even if it is a zero. (Example: Recommended: 39° 36.6'N 76° 51.42'W; Not Recommended: 39° 36.600'N 076° 51.420'W)

[2] GARS: Global Area Reference System.

[3] Land SAR Responders use U.S. National Grid; however, a good familiarity with latitude and longitude is necessary to ensure effective interface between Land and Aeronautical SAR Responders (Note: Land SAR includes SAR on flooded terrain).

[4] Aeronautical SAR Responders will use latitude and longitude for CISAR response. However, aeronautical SAR responders that work directly with Land SAR responders should understand the U.S. National Grid system for effective Land SAR/Aeronautical SAR interface.

[5] Air space deconfliction will *only* be implemented and managed using Latitude and Longitude.

[6] Aeronautical SAR Responders working with Land SAR Responders have the primary responsibility of coordinating SAR using USNG. However both groups must become familiar with both georeference systems.

[7] Describes the requirement for providing situational awareness of CIS operations geographically to Federal, military, state, local and tribal leadership.

Further information on geo-referencing during a catastrophic incident can be found at the National SAR Committee website at www.uscg.mil/nsarc.

I. Operations and Procedures

A. Capability Description

1. GIS

A Geographic Information System (GIS) is a computer-based system used for Collecting, Managing, Storing, Querying, Analyzing, Displaying and Outputting geographic data for solving problems and making decision. The Primary components of a GIS include Data, Hardware, Software, Human Resources, and Policies and Procedures. In the simplest terms, GIS is the merging of cartography, statistical analysis, database technology and computer science.

In the Federal Emergency Management Agency, GIS is used to support making key decisions and providing Situation Awareness. In 1992, Hurricane Andrew would be the first full scale field deployment of a GIS. GIS became essential to supporting Urban Search and Rescue in Hurricane Andrew. The Shuttle

Columbia Recovery Effort (2003) was also an important milestone for GIS. Operational planning was directed through geospatial products and statistical analysis – making the GIS the center of Operations support!

A Geospatial Information Unit (GIU) is currently deployed in most medium-large scale Stafford Act declarations.

B. Coordination and Requesting Support

This section will explore the coordination and management functions of Geospatial Information Unit at the Joint Field Office (JFO). The primary audience for this document is the GIS Specialist/Geospatial Information Unit Leader (GIUL) providing GIS support in a Response and Recovery environment at the Joint Field Office (JFO) or Regional Response Coordination Center (RRCC).

GIU Coordination and Management are essential to effectively support the Incident Objectives and ensure that the GIU Production Priorities are met in a timely and accurate manner.

GIU Production begins with the GIS Request form, which is available for submission at the GIU to ALL members of the joint Federal/State disaster response. The request is evaluated, prioritized and assigned by the GIU Manager, and completed by the lead GIS Specialist. Most production ends with a hardcopy or digital Geospatial product which can then be disseminated, as required.

GIU Management includes (3) types of requirements: staff and resource management; internal data structure and file management and ensuring Quality Assurance (QA), and standards in project management. Besides timeliness and accuracy for supporting GIU customers, an effective and streamlined GIU operation is also a key priority!

This section will look at GIU Production and the GIS Request process along with product dissemination; as well as GIU Management with a focus on resources, products and strategies for management of an interagency and interdisciplinary team in a disaster response environment.

The Internal Data Structure and file management conventions will be developed in a separate section.

GIU Production

GIU Production generally supports (3) types of GIS Requests: 1) cyclic projects at daily or operational period update cycles, 2) intermittent updated projects, and 3) unique project requests. In a large event, it would not be uncommon for +20

simultaneous projects (per Operational Period) to be supported by the GIU. These projects are all maintained on the project task assignment 'White-Board' or within the GIU Project Management Database when required:

- **Cyclic** projects or those developed every operational period, are used during periods of operational activity that requires constant situation awareness and a Common Operational Picture (COP). These projects are often used within Executive Briefings, and are the best candidates for integration with Interactive Web Mapping through SAVER2. These projects require a large amount of initial coordination to develop data and templates, and then they are updated regularly with little further development. However – there may be a large number of these projects in the early stages of Response and Recovery, requiring significant resources to support.

- **Intermittent products** involve activity that is constant, though irregular. Map updates involve source data and formats that may be relatively unchanging, but require intermittent coordination for new revisions and updates. Some examples include the Declarations status map, and Damage Assessment maps. These projects require more coordination on the Geospatial unit side, as they are often the most common and can often 'evolve' and change as a mission support area progresses from Response to Recovery.

- **Unique** projects will not require many revisions, and are designed for decision support, or unique issues which will change or be resolved. These are often 'one-time' projects which may involve significant focus for a short amount of time, and often have limited distribution. Alternatively, they may be reference products based on static information such as demographic or geographic data that are developed once.

Typing GIS Requests and projects is useful as it can help gauge the level of GIU resources needed to support production!

Direct GIS Requests

GIS Requests can be made with a hardcopy form, as presented below, or through web-based systems such as SharePoint, if available. Critical elements of information include (1) Contact Information, (2) Time and Date Required, (3) Priority, (4) Project Description and Print Requirements, (5) Data, and (6) Administrative Component.

The Request sheet is a critical stop-gap between customers, and the technical process for product development. With a single point of reference for each request, even complicated requests in the midst of response activity can be recorded and tracked, with project detail worked out.

Fig. 1 – GIS Request Form

The GIS request process begins when the GIS Request is received within the GIU. The Production Support/Admin Assistant, if deployed, can work with the customer initially to complete the GIS Request form.

In the process of learning the project details, the GIS Manager can work with the Production Support/Admin Assistant to determine feasibility of the project along with verifying the project request against existing products and determining restrictions/security issues. The project is then assigned to a lead GIS specialist for completion.

Fig. 2 – GIS Request Process

Project Assignment

The assignment of the lead GIS Specialist is a key step and can often be directed to one of (6) ICS Operational Branch/Section level GIU support areas within the GIU.

In alignment with the DHS GeoCONOPS, these areas help to focus GIU support and align similar projects to a single accountable lead within the GIU. They also help to build relationships with proactive support by establishing key Points of Contact (POCs) for the JFO staff requestors. The GIU Support area also enables management of complex event data and geodatabases.

Depending on the size and scope of the incident, not all areas may be fully active or even required within the GIU. However, with the principles of ICS, the GIU Lead should dedicate resources and expand and contract as required to support ICS Operational Branch/Section level areas.

Branch/Section level GIU support areas include:

1. **Emergency Services Branch** - Supports DCE/Emergency Services US&R/DMAT Response Operations (Level-1), Resource Tracking (Level -2) and Logistics (Level -3). This is the most critical support for meeting the Response Operations/Emergency Services Branch support, and is accordingly expanded first when a new incident or support requirement arises.

2. **External Affairs -** Supports Community Relations, Public Information and External Affairs and Congressional. Management of projects requires demographic data experience. Outreach products e.g. animations, 3d ArcScene projects, KML distributions for public release, social networking/media and crowd source/Volunteered Geographic Information (VGI) will be coordinated from this team.

3. **Tech & Natural Hazards and Mitigation Branch -**Interdisciplinary project coordination and natural and technological hazards science coordinate with subject matter experts (SMEs) and disciplinary experts for authoritative data and models to define incident area. Areas include NFIP, Floodplain, and development of depth grids, SLOSH, etc…

4. **Individual Assistance Branch -** Supports Evacuations, Mass Care, Sheltering Individual Assistance, Direct Housing Programs and VOLAG. The main products for Individual Assistance rely on data from EMMIE and EOMMR reports server for Individual Assistance Teleregistrants. Special emphasis on tracking displaced populations is important for Response.

5. **Infrastructure Branch -** Supports Public Assistance, Infrastructure, Power, HAZMAT/Environmental Special Considerations and Debris mission. Projects from the ESF-3 and ESF-12 missions will occur most frequently in Response. Subject matter expertise in the natural sciences as well as experience in civil engineering is recommended.

6. **Planning Section -** Supports special projects and senior executive summary products and high-priority project requests, and special geographic reference products. The Planning Section support lead will often develop prototype projects for cyclic map requests used in daily Executive Briefings, and integrate web services for Common Operational Picture (COP) ArcGIS Server services for SAVER2.

Often a complex GIS request may require additional resources to support – which can be assigned in coordination with the GIU Manager to the project into a 'Task-force' if required, under the lead GIS Specialist.

Below is an example from a recent event that illustrates a fully scaled GIU Org-Chart with ICS Operational Branch/Section level GIU support areas within the GIU, in alignment with the DHS GeoCONOPS.

Fig. 3 – ICS Operational Branch/Section level GIU support areas within the GIU

Some project requests may require further coordination with the requestor or other Subject Matter Experts (SMEs) to develop.

Other projects may be unfeasible for other reasons, to include: (1) duplication of existing project with minimal changes as a special request, (2) limited GIU resources, (3) restriction of data such as with the Privacy Act of 1974, (4) misrepresentation of authoritative data/or limitations of intended use, or (5) large and frequent graphic mass-production.

The GIU will generally establish a GIS Request turnaround of 1-day in normal day-to day operations, depending upon project requirements. This procedure WILL be altered for requests in Response, with requests for any Emergency Services Branch, FCO and SCO as the highest priority. In order to meet the requirements of Response, the GIU will need to complete certain high-priority projects IMMEDIATELY, when requested.

Managing customer expectations along with establishing time and resource requirements for production is a key step in defining a project's scope and effectively supporting the mission.

Project Tracking and Management

Tracking a single project to completion is most often the responsibility of the GIS Specialist to which it is assigned. The Geospatial Unit Leader should keep oversight of major request activity and ALL key Life-Saving or Life-Sustaining products, as well as projects for Senior Executives.

In addition, the development of a GIS Administrative/Project Management database can record hardcopy project requests for long-term analysis of productivity- This goes a long way towards justifying resources and additional staff to the Planning Section Chief!

Project Management Database and Tools

FEMA Project Management Databases developed for the Geospatial Unit have focused on the archival requirement for maintaining records of GIS requests. Every incident will require some level of project management tools for tracking current requests and for managing GIU resources and assignments, as well.

Project Management tools should maintain the GIS Requests in a digital archival format and allow for task assignment for new requests, and may include:

1. Concurrent digital request entry immediately after paper request submission.
2. Queuing of requests for 'assigned' lead GIS Specialists
3. Immediate assignment of priority and security review
4. Request status tracking and completion
5. GIU Management reports and products to include:

    - **Production Statistics, Trends and Graphs** – for reporting to Planning Section and FEMA HQ with presentation of major trends for projects and products for program support, requests by week, etc…
    - **Map Catalog/Index** – This product is placed at the customer reception area of the GIU and contains common maps produced for the JFO. This product is helpful for working with customers to generate a GIS Request. The index identifies key information of products.
    - **Map Placement Floor Plan** – to track locations and update cycles of JFO maps that are physically placed. A large JFO can contain dozens of hard-copy maps that may need to be updated regularly.
    - **Geospatial Unit Priorities (ICS-202)** - To keep track of overall goals and objectives of the GIU in accordance with the Incident Objectives and task assignments.
    - **Project Taskings (ICS-204)** – 36'' X 72'' large format plot of daily assignments to serve as a 'white board' when there are numerous, coincident projects requiring tracking.
    - **Geospatial Unit Contacts/Distribution Lists/Call-down list (ICS-205/203)**– This should contain contact information of all GIS Requestors, GIU staff +emergency contacts, and other Federal/State/Local GIS community active in the response.
    - **Geospatial Unit Org-Chart (ICS-207) –** The GIU Org-Chart is one of the key reports required by Planning, along with the emergency call-down information. Providing this to Planning a soon as there are staff changes in the GIU should keep their information up-to-date!
    - **Geospatial Unit Staffing Plan** – This product will track staff deployments, plan for leave, and future operations.
    - **GIU Meeting Schedule (ICS-230)** – The GIU may require attendance at various meetings within the operational period, as well as regular Planning Section and GIU Meetings. Teleconferences also would be included in this document, to include the GIU Conference call.
    - **Geospatial Unit Logistics, Hardware and Software Tracking –** This should be an inventory of all FEMA-FF-143 Logistics requisitions, hardware inventory, software licensing inventory, and physical supplies such as ink and paper.

There is no current standard for a FEMA GIU Project Management Database; however several prototype systems have been implemented in (1) MS Access, (2) Web-based ASPx (3) SharePoint. As unique requirements for the GIU will dictate what tools are actually required, The ICS form designations above are provided as a guideline only.

Production Statistics, Trends and Graphs

Production Statistics, Trends and Graphs are used for reporting to Planning Section and FEMA HQ with presentation of major trends for projects and products for JFO support.

'Projects' are measured as unique *.mxds or other project file formats which require development by GIU. 'Products' are determined by output, and are represented by *.pdf or other digital archival file formats and print-quantity information if available.

Fig. 4 –GIU Support: 'Projects' example

Fig. 5 –GIU Support: 'Products' example

Map Catalog and Floorplan

The Map Catalog is a hardcopy set of all common maps placed at the entrance to the Geospatial Unit, near the Map Table; which should include all commonly requested maps available for customers. The catalog is organized by support areas, and major project categories.

The Map Catalog is updated frequently by the Prod. Support/Admin Assistant. Along with the Map Catalog and Index, the JFO Floorplan is maintained to identify large-format product placement and is managed in coordination with SITSTAT.

All product placement in key areas is coordinated with SITSTAT, to maintain Situation Awareness and reduce coordination to a single point of contact.

Fig. 8 – Dynamic Product Placement Report – Map Catalog Index

The Map Catalog is indexed to the JFO Floorplan. Information included in the Map Catalog Index may be: (1) Operational Support Area, (2) Map Name, (3) Size, (4) JFO Section (from floorplan) data, (6) updated date, a (7) numerical ID, (8) link to PDF, and (9) type of product.

Fig. 9 – JFO Floorplan with Map Catalog Index

Geospatial Unit Priorities and Project Taskings

The GIU may be required to track recurrent high priority and cyclic projects with a virtual, or actual, 'white-board' placed prominently in the GIU workspace. In addition, clearly indicating the GIU priorities in a large format print with prioritized task list may be required.

It is essential to track information such as: (1) Request ID, (2) Contact Information, (3) Title, (4) Time/Date of most recent update, (5) Current Status, (6) GIS Specialist Assigned, (7) Priority, and (8) Data Source/info.

In a large GIU, and for a complex event, multiple projects may be occurring simultaneously. The Geospatial Unit Priorities and Project Taskings will help the unit keep a-pace of the Response operational tempo!

Geospatial Unit Contacts and Distribution Lists

The GIU will be required to collect critical contact information on all individuals that make requests of the GIU, coordinate with the GIU, as well as for GIU staff to support development of the emergency call-down list.

Key elements of information for a contact list include: (1) Name, (2) Agency, (3) Title, (4) Address, (5) Phone, (6) Email, and (7) Coordination Notes. In addition, GIU Staff will be required to provide this information as well as personal contact information and hotel location to the Planning Section, Documentation Unit Leader who will generate the emergency call-down list.

The distribution email lists should be developed, as required, for (1) Internal GIU Staff, (2) Internal JFO GIU Notifications, (4) Internal Product distribution, (5) External GIS Coordination, (6) External Remote Sensing Coordination, (7) External Product Notification/Distribution. Product distribution will be handled in more depth in the following section.

Geospatial Unit Org-Chart and Staff Plan

The GIU Org-Chart is a key product that helps the GIU clearly define staff assignments and manage span-of-control. The org-chart should be kept up-to-date with GIU staff changes and provided to the Planning Section Chief as soon as changes occur within the unit.

The Planning Section will often manage check-in, staffing plans, call-down lists for the GIU when changes are indicated in the GIU org-chart. See fig. 3 for Org-Chart example.

Fig. 10 – GIU Staffing Plan

The GIU Staffing Plan should include a day-by-day record of individual staff deployments, leave and demobilizations. Staff should be identified as (1) FEMA, (2) OFA, (3) STATE, or (4) CONTRACTOR.

GIU Meeting Schedule

The GIU may require attendance at various meetings within the operational period, as well as regular Planning Section and GIU Meetings. Teleconferences also would be included in this document, to include the GIU Conference call.

It is recommended that a daily GIU Conference call be established immediately, often by FEMA HQ MAC. The conference call may include FEMA, State, Local and OFA GIS community activity involved in the event.

Attendance at the daily Senior Staff Meeting or Tactics meeting may be required for the GIUL by the Planning Section Chief to align GIU support requirements.

Geospatial Unit Logistics, Hardware and Software Tracking

The GIU should maintain accurate inventories of GIU resources to include FEMA LIMS barcodes for all accountable properties, software licenses and physical supplies such as ink and paper.

Tracking GIU FEMA FF-143 logistics requisitions to completion is often a key task to ensure that the GIU is well supplied and capable to meet mission requirements.

Some key guidance on submitting requests include:

- Submission of ALL small FEMA-FF-143 as ‘Micropurchaes’ (<$3000) if possible.

- Coordination with Contracting/Supply Unit for Large requests (>$3000)
- Separation of key requests into individual FEMA-FF-143 submissions
- Tracking in IFMIS for 40-1 status, to include Comptroller for signature
- Coordination with Planning Section Chief for Delegation of Authority for submission of 40-1, if required.

Requesting Staff Resources

The following are general recommendations for augmenting a GIU with additional staffing resource for a JFO or RRCC to include:

- Deployment of FEMA DAE, CORE or PFT staff
- Mission Assignment of Other Federal Agencies
- Local Hires and Voluntary Support
- Contract Support

FEMA Staff Resources

The FEMA ADD system provides information on 'Available' GIS Specialist, 'Remote Sensing Specialists', 'GIS Managers', or 'GIU Leaders' for deployment. The relatively low number of these staff resources in FEMA is ALWAYS a limiting factor in deployments.

Any operation should have at least ONE fully-qualified GIS Manger or Geospatial Information Unit to guide Response Operations. If none are available the US Army Corps of Engineers are also suited for these leadership positions. FEMA Resources:

- Can be available for deployment in 72-Hours
- Can come with Regional GO-KITS including data software and basic equipment
- Often come with their own regional plans for integrating other State, Local or Federal Agency resources
- Can stay for the duration of the event with low overhead
- Can interface with FEMA IMAT and Planning and provide leadership
- Can informally coordinate with other regions and GIS Community

Mission Assignments

The first source for Geospatial Unit OFA staffing comes from the Mission Assignment process. The Mission Assignment of another federal agency allows for the subject matter expertise of that agency's Geospatial Analysts to be located within the Geospatial Unit. For MOST operations, the following sequence of federal agency's can be assigned to support the unit in coordination with the Planning Section Chief and Operations:

1. **The US Army Corps of Engineers (ESF-3)** - The USACE can provide subject matter experts from the Planning Response (PRT) Team that can assist in Infrastructure restoration and repair, and general Geospatial Unit activity. They can be deployed for 30-60 day periods within Response with optional extensions determined on a case-by case basis

2. **National Geospatial intelligence Agency (ESF-9/5)** – NGA can support response operations for 1-2 weeks or longer if needed, in the role as Imagery Analysts or as Geospatial Analysts to provide Operations support. NGA can be mission assigned for forward operations support (DMIGS) to ESF-9 with additional NGA Geospatial Analyst deployed by the GIU if needed.

3. **US Forrest Service (ESF-4)** – The USFS can be mission assigned to the Geospatial Unit through its cadre of Red-Card Certified GIS Specialists (GISPs). These specialists are familiar with front-line incident management from the wildland fire community and emergency response through the ICS system. They are often deployed for 2-week periods and require overlap to ensure continuity.

4. **NASA, USGS, NWS/NOAA and OFAs (ESF-5)** – The Mission Assignment of other federal agencies can be explored. NASA has been assigned to support Response Operations in the role as Remote Sensing Coordination, and NOAA's

Coastal Services Center teams have been involved both as Mission Assignments and as support under their agency mission authority. USGS can be Mission Assigned to support remote sensing coordination.

The Mission Assignment process usually works best if initiated before or immediately after the event occurs. Frequent requests for 1) changes in Mission end date and 2) the obligation of more funds and 3) continued justification of response assets in recovery will require attention through the Unit Leader in coordination with the Planning Section Chief and Operations.

Local Hires and Local/State Support

The local hire process allows FEMA Admin to work with local agencies to interview and hire local GIS Specialists. These often require a lengthy background investigation, unless a representative from OPM Security is present at the JFO. This process, along with the scarcity of qualified GIS specialists often makes this solution better for long-term recovery than response operations. Local hires can be furnished through contact with:

- Local Employment Office
- Local Universities or Geospatial Programs at the University
- State Geospatial Community
- References from other ERT Team members or FEMA Staff

Often, if FEMA Human Resources has available positions, the opportunity to become a DAE may be available for Local Hires remaining at an operation for the long-term.

State/Local Support can be provided through:

- The State Geospatial Community for short-term surge support
- Invitational Travel – This allows for the employee to be reimbursed though their agency through supporting the response effort, and reimbursed by FEMA for travel and overtime
- AmeriCore – The VOLAG coordinator can support staffing through coordination with the AmeriCore for staff. This may come through a Mission Assignment.
- The State Emergency Management Agency – can provide support under the FEMA-State agreement, or informally. Often in Response operations, the two geospatial Units can work co-located to support requirements.

Contract Support

Mechanisms for support of the Geospatial Unit can come from formal contracting for services, as well. Hazard Mitigation Technical Assistance Program (HMTAP) or National Public Assistance Technical Assistance Contracts (NISTAC) contracts have often been the funding vehicles for these services. Contracted services under these contract mechanisms must be dedicated to support program areas from which they originate, while in the GIU.

All contracts must be made in accordance with Federal Acquisition Guidelines (FAR) for procurement of services and support according to GSA Contracting procedure. This will mostly be handled by JFO Logistics/Supply Unit.

Some contracting companies that have previously been awarded contracts to support JFO operations include:

- **Newlight** – has supported set-up of DEGS server from the DISC
- **Baker** – has supported the Mapping Analysis Center with Geospatial Support and Floodplain Managmnet
- **Dewberry and Davis** – As NISTAC contractors can support infrastructure and debris operations.
- **CDM/FLEUR** – Have supported Environmental Special Considerations GIS Support
- **URS** – As NISTAC contractors can support infrastructure, debris operations and Environmental Special Considerations
- **IEM –** has supported Geospatial operations
- **WESTON –** Have supported ESF-10/3 with field debris data collection
- **Local Contracting –** Local companies can be identified and contracted through 60-1 to provide temporary services, especially if they are doing business within a local impacted area.

Contactors often come with restrictions on personal hardware use, and often cannot have access to sensitive data. In addition, they often do not have their own hardware of software, and according to OCS policy, can only connect their equipment to the FEMA 'Dirty' T1 line.

Plans for contractors should be made for as long as justifiable, as the contract will need to be reevaluated after its term is complete.

Product Distribution

The preceding sections have focused on the process and resources required to successfully complete GIS projects within the GIU. This section will focus on GIU 'products' and their dissemination – the successful result of a GIS Project's completion!

GIU Products can be divided into (2) categories, Hardcopy and Digital products:

- **Hardcopy Products** – are the first type of products and include maps, plots and physical products requested from a GIS Request.

After notification of completion of a GIS Request, hardcopy products are received by the customer in the GIU to 'close-the-loop' on the GIS Request Process.

Strategies for distribution of large, hardcopy map caches may be required when multiple Area Field Offices (AFOs), Incident Command Posts (ICPs) or Disaster Recovery Centers (DRCs) require support. Coordination with Logistics Section and Courier to determine timetable for map cache delivery is suggested.

Fig. 11 – Large Hardcopy map-cache distribution from the Shuttle Columbia Recovery Effort

- **Digital Products** – are the second type of products and include graphical output of projects such as *.pdf and other common graphic formats, as well as tabular reports and summaries of data.

ArcGIS Server web services or data should be considered separate from products, though are closely related and will be discussed in a later section. It is important to note that a robust interactive mapping capability, such as SAVER2 may alleviate the need for excessive map distribution.

External and Internal Coordination

An average GIU can generate thousands of digital and hardcopy 'products' within the lifecycle of an event. Determining the most relevant and representative product set for current operations is a very important role for the GIU.

GIU Products are divided into the following (3) areas, in accordance with their distribution requirements:

- **ALL Maps** – The majority of projects that these originated from were 'one-time' unique requests, or legacy versions of 'cyclic' and 'intermittent' project development that will reside on the GIU server archive. The GIU Server contains a full archive of all products produced, and so contains 'all of the maps'. These include sensitive products not for general distribution. These maps are often archived to the FEMA Regional GIS office in the event of demobilization and they also may be required to document decisions at a later event.

- **COMMON Maps –** The common maps are the subset of all of the maps that represent current operations for the Command and General Staff. They also include regularly requested hardcopy maps that may be in the Map Catalog or on the GIU Map Table**.** 90% of the hardcopy products plotted/printed for customers as 'reprints' and for the JFO Floor Plan update are within this category. These products are also often copied to the JFO 'Common Drive' and generally do not contain sensitive information.

- **KEY Maps -** These are often the most critical products representing the incident, as a subset of the common maps, and are often distributed to senior staff as soon as complete. These products are considered for Record Retention Policy Act as well as HSIN/sharepoint upload. These projects are often used within Executive Briefings, and are the best candidates for integration with Interactive Web Mapping through SAVER2.

Fig. 12 – Internal and External Product Distribution

In the above graphic GIU 'projects' are represented in light blue, while 'products' are presented in dark blue. Note that any project can be RESTRICTED by GIS Requestor or GIU leader depending upon data and intended use.

Internal and External distribution requires a large resource overhead for management by the GIU, as often multiple locations for distribution are required on a regular or cyclic basis.

Geospatial products are distributed internally through (1) direct requests for reprints, (2) individual reprints from the common drive, (3) reference to map catalog for reprint.

Products distributed externally to FEMA HQ and the AFOs within the FEMA Firewall employ the HQ FTP Site/DRT_IN. Products distributed externally to DOD and OFA/State agencies outside of the FEMA firewall generally employ mailing lists with FTP links.

Internal product distribution includes all activity within the Joint Field Office (JFO) for both hardcopy and digital product distribution. Some examples include:

1. Maintaining the GIU Map Table with Common Maps (Hardcopy).
2. GIS Requests when providing customer products (Digital/hardcopy)
3. Update the JFO Floorplan and SITUNIT areas with Common Maps (Hardcopy).
4. Update the 'COMMON' Drive with Common Maps (Digital).
5. Update the 'PLANNING' Drive with Key Maps for Executive Briefing (Digital).
6. Update the Documentation Unit with Key Maps for Record Retention Policy (Hardcopy).
7. Email notification to Internal Distribution list of Common or Key Map updates (Digital).
8. Digital (compressed) copies of Key maps to Senior Staff, by email request (Digital).
9. Update JFO Sharepoint Site with Key and Common Maps (Digital)

External product distribution may includes all activity external to the JFO, to include the greater FEMA community (within the firewall) and outside of the firewall to Other Federal Agencies, State, Locals and DOD. This may include:

1. Common Maps to DRT_IN or other FTP site internal to FEMA Firewall (Digital)
2. External Distribution by email to contacts with Common or Key Map updates (Digital)
3. Uploading Key Maps to HSIN → Emergency Management Community Portal (Digital)
4. Regional Sharepoint site with Key and Common Maps (Digital)
5. Hardcopy map caches to field locations (Hardcopy)
6. External to firewall FTP site for Common Map distribution (e.g. state FTP, Floodmaps.com) (Digital)
7. Key or Common Maps to Intelipedia (Digital)

It is important to note that a large amount of product distribution can be automated through MS DOS BATCH files, especially for internal distribution to the JFO and within the FEMA Firewall. An interactive mapping capability, such as SAVER2 may also alleviate the need for excessive map distribution.

In addition, physical email of digital files should be avoided unless directly requested. Large files (over 5-MB) should not be emailed, and generally emails above 1-MB should be discouraged. Compression of *.pdfs and other file formats may often reduce significantly the total file size!

Limited and intermittent communications in a disaster environment, along with the need for critical information distribution make internal and external product distribution a key GIU mission requirement.

Product Templates (LAUREN)

Product development for the GIU employ a number of standards and template. The use of standards and templates keeps JFO support interoperable among different support products for differing programs.

Fig. 11 – Map Template

Several Critical Elements of Information and are required in Project Development:

- STUDY AREA – Displays most of the features for the main map theme request
- INSET MAP –OR- AREA OF DETAIL – This is the place where complicated thematic interaction can be displayed at a larger scale for clarity, and/or a small scale overview map can be placed
- CITATION - Project information includes the JFO and DR Number, the AUTHOR and TEAM, DATE, TIME, MXD. The MXD should be developed by NAME of project and Requesting PROGRAM or ESF according to the above standard.
- MXD - naming convention should follow above guidelines and match all PDFs, and should easily be tracked.
- CARTOGRAPHIC - Seals, scale, lists, reports and other cartographic features.

- DISCLAIMERS - Regarding the use of IA , other sensitive data or FOUO designation and as requested by customer. See below.

- SOURCE – Reference the dataset or program if developed from EVENT data.

- BACKGROUND - LIMITATIONS- information if the project is developed from EVENT data and there are conditions of use.

- TITLE – This is often up to the requestor, though may include reference to the DR number and event. Also, a subtitle may be included which states the time, or other special reference material.

Several best practice standards should be employed in EACH project developed to maintain the interoperability of Geospatial Unit staff with each project and to ensure transparent project management and reporting by coordination.

These standards include:

- LAYER FILES - Appropriate layering and symbology practices developed for each symbology type
- ODBC - Connectivity to geodatabase and JOINS to simplify project architecture
- DEFINITION QUERIES - Apply these tools versus subsets whenever possible
- LEGEND – Use the Legend tool, and name layers appropriately for automated legend development and maintenance.
- LABELS – Maintain annotation for labels in annotation feature classes and expressions for complicated labeling.

Symbology and Layering (SETH)

Several FEMA Standards are employed in symbology and layering. These include:

1. **NSDI – ANSI -** Standards for data archival, transfer and metadata. - http://www.esri.com/library/whitepapers/pdfs/metadata-and-gis.pdf.

2. **FGDC - HSWG** - Product development should follow the guidelines of the Homeland Security Working Group – Symbology Reference - http://www.fgdc.gov/HSWG/ref_pages/Operations_ref.htm

3. **FEMA RX SOP –** This guide contains much of the background on approved symbology **- H:\ADMIN\GIS-SOP Update05_01_022.doc**

4. **FEMA HQ SOP** – This guide contains the background on approved symbology- **H:\ADMIN\MAC%20Production%20Catalogue_09_2003.pdf**

5. **ICS SYMBOLOGY –** This is the symbology currently used for most facilities, teams and resource tracking in ICS.

Fig. 12 – ICS Symbols

Layering for Geospatial products should be developed in order of increasing spatial dimension. In other words, polygon data should be presented first, then linear data, then point and finally annotation.

When scoping a project, it will quickly become apparent if complicated symbology and layering interactions will be possible for presentation. Some factors for the team to consider:

- Will scale allow for better presentation? Product print size?
- Can the symbology size be reduced?
- Using fewer symbols, colors and patterns will ALWAYS make the product easier to understand.
- Can an inset be used to present close-ups of complicate areas?
- Can annotation be removed, or replaced with symbology to illustrate the same thing?
- Has the symbology been followed for EVERY version of similar products? Will this make the product series more or less confusing, if not?

Disclaimers

The appropriate disclaimers are important for geospatial products. Disclaimers can reinforce the credibility of products, verify the intention and integrity of requestor's data, and control information.

Common disclaimer used in the Geospatial Unit include:

THE PRIVACY ACT OF 1974, 5 USC § 552a -- As Amended – All data presented in the Individual Assistance map products require a disclaimer.

"Individual Assistance program data is protected under THE PRIVACY ACT OF 1974, 5 USC § 552a -- As Amended, as is intended FOR INTERNAL USE ONLY. All distribution of these products outside of the JFO must be coordinated with the Individual Assistance officer PRIOR to release."

Most map products developed at 1:100,000 scale are greater will not require this disclaimer, though this should be verified with the Individual Assistance officer, as well.

FEMA OGC General Disclaimer – This disclaimer is often referenced in a shorter statement as, 'see OGC General Notice'

Notice from FEMA's General Counsel:

"THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. USE OF THESE MATERIALS CONSTITUTES ACCEPTANCE OF THIS DISCLAIMER OF LIABILITY."

"The authors of this software have used their best efforts in its preparation. These efforts include the development, research, and testing of the theories and programs to determine their effectiveness. HOWEVER, neither the authors nor the U.S. Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors, or their employees, make any warranty express or implied, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information apparatus, algorithm, product, or process disclosed, or represent that its use would not infringe on privately owned rights."

GENERAL DISCLAIMER - Special issues at the JFO may require development of specific disclaimers. These are worded in coordination with program personnel who are involved with the final products.

Often, special datasets used with term or conditions require an MOU disclaimer for use of products. This often involves (1) restrictions on distribution of map products to only authorized parties, or (2) written designation as SENSITIVE or FOR INTERNAL USE ONLY.

"This product is intended FOR OFFICIAL USE ONLY. All distribution of these products must be coordinated with the ESF-5 Planning Section PRIOR to distribution. See FEMA OGC General Disclaimer for terms of use of these products."

The Environmental Special Considerations Data in ENVAS usually requires this special disclaimer in coordination with other source agencies.

"Map Products and Data Developed through the ENVAS Application are designated SENSITIVE, and are for INTERNAL USE ONLY. Per the conditions of the Memorandum of Understanding and Use Agreements with Source Agencies, Distribution of these Products is RESTRICTED.

FOR OFFICIAL USE ONLY (FOUO) or LAW ENFORCEMENT SENSITIVE - designations require coordination and approval through the Planning Section Chief and FCO. Data involving sensitive resource placement or internal operations for which data must be released through official channels can be coordinated with the Planning Section Chief and FCO.

Generally the stamp "FOR OFFICIAL USE ONLY" or "LAW ENFORCEMENT SENSITIVE" is placed in large font on the map product.

Hardware and Software (DREW + MACC)

The Geospatial unit originally deployed (1) DEGS suite which includes:

- (1) RAID-5 500GB 800Mhz Server
- (3) Dell Precision 650 Workstations
- (3) Viewsonic Flat Screen Monitors
- (1) HP Designjet 1055CM Plotter
- (3) Licenses of ArcView Desktop

In addition several pieces of hardware have been or will be purchased to support operations:

- (5) Dell M70 Laptops
- (1) HP Designjet 4000 Plotter
- (1) ProLiant 380 3 TB Server - ORDERED
- (2) SeaGate 400GB External Hardrrives
- (1) Laci 1 TB External Harddrive – ORDERED

Purchased software includes:

- (2) ArcEditor Licenses
- (2) Adobe Professional

The overall strategy for maintaining surge operations has employed a number of 'work-around' methods.

1. Use of DISC office laptops for interim support while awaiting reception of hardware from purchasing.
2. Use of ESRI's Hurricane Response Temporary Use Licenses for (15) seats http://gis.esri.com/events/assist/index.cfm?eventID=106
3. Use of Internal vs. External T1 for downloading data and FTP access due to firewall restrictions in the INTERNAL FEMAT1 LAN.
4. Purchase of UPS units for surge protection. These can no longer be shipped, and will require purchase at each event.

With current hardware and software licenses, after the projected return of the DEGS, the Geospatial Unit will need to purchase an additional (3) ArcEditor Licenses to maintain the current operational level.

FEMA HQ has committed (1) license of ArcInfo and (1) License of ArcEditor for long term use in the transitional closeout center. Please see the RRCC Surge Plan section for recommendations for increasing these resources.

Administrative and Maintenance Requirements (DREW + MACC)

Administration of the FEMA Geospatial unit is performed through the ITC and his staff in Logistics. A number of support mechanisms are in place for the unit:

1. **Dedicated Staff** - During the response phase of FEMA-1606-DR-TX the ITC determined that a dedicated IT staff support the geospatial unit on a 24/7 basis. This support was essential during overnight efforts where administrative problems required immediate support.
2. **Delegation of Administrative Role** – The ITC can delegate administrative responsibility to other staff at the JFO, though not usually below the Branch or Section chief level. This can sometimes be critical if there are no resources

available for immediate support. ITS and OCS security can be reestablished immediately through altering the revealed administrative authentication keys. This is usually reserved for life-sustaining mission critical requirements.

3. **Contractor Support** – The FEMA HQ ITS DEGS Administrator can assign one of the contractors from Indus to support in emergencies.
4. **Help Desk Request –** As operations have transitioned towards transitional recovery, the help desk ticket has proved to be the most often utilized means for administrative support.

Maintenance tasks for the Geospatial Unit should be completed as required. These include:

1. **Monthly** - DEFRAG of all workstations and laptops in the unit
2. **Monthly** - Check on critical updates, patches and security releases from Microsoft and ESRI
3. **Monthly** - Replication or file transfer to FEMA RVI RRCC
4. **Monthly –** Shut down of server and restart
5. **Weekly** - Backup of Geospatial unit File server
6. **Weekly –** Assessment of supplies for Designjet 1055CM and 4000PS
7. **Weekly –** Check of administrative logs in Server 2000 for critical issues
8. **Weekly –** Assessment and removal of 'Dump' data
9. **As Needed –** Removal of personal folders and data
10. **As Needed –** NEMIS Authentication for new hires

DEGS Deployment

The intended length of deployment for the DEGS is for a (6) month period. A DEGS Suite was deployed in support of FEMA-1606-DR-TX. Most of the equipment for this suite will either be retired or returned within the next few months. To request another DEGS, in support of new response operations, the following steps must be followed:

Steps in Ordering/Delivering GIS Support

1. Geospatial Unit Leader makes recommendation to Planning Section Chief for deployment of a suite
2. Planning chief coordinates with ITC for justification and signatures for request
3. DISC receives a TIMACS request from ITC
4. FEMA Project Officer (PO) processes Form 40-1 to acquire funds
5. Prepare Statement of Work (SOW) based on type of support requested – suite setup, GIS Analyst level, suite readiness –
6. Provide copy of SOW to On-Call GIS Support contractor and request a cost estimate
7. Provide copies of SOW and cost estimate to JFO POC
8. Acquire names from the Disaster Field Office (JFO) for official signatures on the 40-1 to approve funds
9. JFO POC informs JFO Comptroller of funds needed for Task Order (TO)
10. Complete 40-1 (NEMIS Tracker) and route for signatures
11. PO tracks routing of 40-1
12. FEMA PO prepares Requisition for Cost Estimate memorandum for the FEMA Contracting Officer (CO) and provide it along with copies of the cost estimate and SOW to the CO
13. FEMA PO asks FEMA COTR to inform the contractor that funds are available and can deploy contractor staff (expedite)
14. Official Task Order (hardcopy) is provided to contractor COTR and FEMA PO
15. FEMA PO informs JFO Tech Services Branch and/or Planning Section Chief when to expect the arrival of the contractor staff
16. Contractor Hardware Engineer sets up the GIS suite and ensures it is operating properly before leaving the JFO
17. GIS Suite checkout is performed by the contractor after it is returned to the Disaster Information Systems Clearing (DISC) FEMA PO informs JFO who and when to expect the arrival of the contractor staff
18. GIS Suite is ready for next deployment

Reception and return of the DEGS GIS Suite must be coordinated with the Accountable Property Officer (APO). Any damaged or missing items must be noted upon reception or return. All repairs must be coordinated through FEMA Logistics and the DISC.

Key coordination tasks for the DEGS upon arrival include:

- Coordination with ITC for assignment of **Static IP address** for server within the JFO Intranet on the NEMIS Domain. Obtain a block of static IP addresses for the plotter and printers in the unit.
- Update of all **critical security patches** and virus software updates. Running active client side anti-virus software.
- Network traffic and bandwidth issues must not interfere with JFO activity. Coordinate **Isolating Geospatial Unit** hardware on subnet, with GIS server set up through DHCP to assign dynamic IP addresses to hardware within unit.

For more information on administration of the DEGS server and other maintenance tasks please consult: Field Administration Guide to GIS Suites.doc from FEMA RX GIS.

4. Software

Desktop/Laptop

Software	Software Package	Vendor	License Type
GIS Software Track	ArcGIS Desktop (Info or Editor)	ESRI	DHS-ELA
	ArcInfo Workstation	ESRI	DHS-ELA
	ArcGIS Tutorial Data	ESRI	DHS-ELA
	ArcGIS desktop VBA Resource for Developers	ESRI	DHS-ELA
	Crystal Reports - Packages w/ESRI Install Media	ESRI	DHS-ELA
	ArcSDE Personal for SQL Server Express	ESRI	DHS-ELA
	ArcExplorer	ESRI	DHS-ELA
ESRI Desktop Extensions			
	Military Anlayst	ESRI	Free -Add on
	MOLE	ESRI	Free -Add on
	Grid Manager	ESRI	Free -Add on
	3-d Analyst	ESRI	DHS-ELA
	Spatial Analyst	ESRI	DHS-ELA
	ArcScan	ESRI	DHS-ELA
	ArcGIS Schematics	ESRI	DHS-ELA
	Geostatistical Analyst	ESRI	DHS-ELA
	Maplex	ESRI	DHS-ELA
	ArcGIS Network Analyst	ESRI	DHS-ELA
	Publisher	ESRI	DHS-ELA
	Workflow Manager	ESRI	DHS-ELA
Optional Desktop Extensions			
	PLTS Foundation	ESRI	DHS-ELA
	PLTS GIS Reviewer	ESRI	DHS-ELA
	ArcGIS Engine Runtime	ESRI	DHS-ELA
	Engine Runtime 3-D Extension	ESRI	DHS-ELA
	Engine Runtime Network Extension	ESRI	DHS-ELA
	Engine Runtime Geodatabase Update	ESRI	DHS-ELA
	Engine Runtime Maplex Extension	ESRI	DHS-ELA
	Engine Runtime Schematics Extension	ESRI	DHS-ELA
	Floodplain Delineation Toolbox		
	Watershed Delineation Toolbox		
Third Party GIS Ext./Add-ons			
	Xtools (current Version)		Free Download

	Bing Maps API	Microsoft	DHS-ELA
	EasyCalc		Free Download
	ET GeoWizards	ET Spatial Tech.	Free Download (trial)
	Hawth's Tools		Free Downloand
	Hurrevac 2010	SeaIsland Software	Free for Government Use
	Hurrevac 2000	SeaIsland Software	Free for Government Use
Non-GIS Software			
	Oracle Database Client	Oracle	Free
	Oracle SQL Developer (Current Version)	Oracle	Free
	Microsoft Office (Current Version)	Microsoft	FEMA Image
	Mircrosoft SQL Express	Microsoft	Free
	Adobe Photoshop (Current Version)	Adobe	End User Purchase
	Adobe Illustrator	Adobe	End User Purchase
	Adobe Acrobat Pro (Current Version)	Adobe	End User Purchase
	WS_FTP (Pro)	Winzip	Free Trial Ver (Pro-purchase)
	Roxio		
	Google Earth Pro	Google	FEMA-ELA
	Slosh Display	NOAA	Free Download
	HAZUS (Current Version)	FEMA	Free
	Mozzilla FireFox	Mozzilla	Free
	7-Zip		Free
	Microsoft Visual Studio	Microsoft	End User Purchase
	Notepad ++		Free
	Microsoft .NET Framework (current version)	Microsoft	Free
	VPN Client (FEMA Laptop Image)	CISCO	Enterprise
	Symantic End Point Protection (FEMA Image)	Symantec	Enterprise
	Windows 7 OS	Microsoft	Enterprise

5. Metadata

A metadata record is a file of information, usually presented as an XML document, which captures the basic characteristics of a data or information resource. It represents the **who, what, when, where, why** and how of the resource. Geospatial metadata commonly document geographic digital data such as Geographic Information System (GIS) files, geospatial databases, and earth imagery but can also be used to document geospatial resources including data catalogs, mapping applications, data models and related websites. The current Federal standard for geospatial data is the *Content Standard for Digital Geospatial Metadata*. *(FGDC)*

Whenever possible, full metadata for all new or event-specific data, GIS files or earth imagery should be created in compliance with Federal standards using ESRI's metadata tool. Anything that is going to be publically available on the www.fema.gov site must have full metadata.

Sometimes during the response to an incident there is not sufficient time or resources to create fully compliant metadata. For these times, metadata must be created with the following minimum elements:

- Abstract
- Title
- Originator
- Publication Date
- Process Description
- Geographic Coordinate System Name
- Horizontal Datum Name
- Security Classification
- Time Period (Currentness, Date and time)

Procedures for using ESRI's metadata tool to create the minimum acceptable metadata:

These fields are in the following order:

Menu (at very top of editing window)

Tab

Field

Required Fields:

Identification

General

Abstract

Citation

Title

Originator

Publication Date

Time Period

Currentness Reference

Calendar Date

Time of Day (if appropriate)

Data Quality

Process Step

Process Description

Spatial Reference (may be filled out already)

General

Geographic Coordinate System Name

Horizontal Datum Name

Security

Security Classification

D. Data…….. [page #]

1. Structure

This section will explore the establishment and management of the geospatial directory structures of the Geospatial Information Unit at the Joint Field Office (JFO).

The Geospatial Information Unit directory structures span from the internal file structure of the GIU Server, through enterprise database management systems and web-services to the external directory structures for management of dynamic event data collection on the FEMA JFO Common Drive and Planning Drives.

The goal is to manage dynamic event data with a file directory structure while supporting the migration of authoritative datasets to enterprise platforms such as ArcGIS SDE, File Geodatabases and eventually to host ArcGIS Server services.

The establishment of a Geospatial Information Unit directory structure is one of the first and most important steps in managing a GIU. Without a structure that is simple and utilitarian but flexible, the resource and time requirements for proper management can quickly become untenable!

Internal File Structure

Internal file directory structure conventions are used to manage incident data on the GIU Server, and are based on the National Wildland Fire Coordination Group (NWFC) GIS Standard Operating Procedures Project (GSTOP-2006).

Modifications have been made for the FEMA GIU conventions to support multi-hazard incidents and the interagency nature of the Joint Field Office (JFO) with the requirements for collecting and managing dynamic event data.

The GIU Leader will generally supervise development and management of directory structure organization. Directory organization and maintenance by the GIU Leader should occur: after 1-day in Response; then after 1-week at the JFO; then after 1-month for Recovery; and then 6-months to Long Term Recovery Transition.

It is recommended that the GIU leader manage the first (3) levels of the Geospatial Directory Structure in coordination with the lead GIS Specialists in the (6) ICS Operational Branch/Section level GIU support areas for subdirectories assigned.

<u>Level-1 Root Directory Structure</u>

The Level-1 Root Directories contain key locations for (1) Event Data, (2) Static Data, (3) Admin, (4) Graphics, (5) Projects, and (6) !Working files.

Fig. 1 – Level-1 GIU Server Root Directories

Common conventions for management of Incident data hold that internal DATA directory structure begins with (2) Level-1 root directories:

- **EVENT** – data includes all of the most dynamic data and ONLY includes data unique to the incident. Some examples may include data collected to support ESF missions, data used to define the incident area or ICS Geographic Divisions/ICS-204, or data used to represent natural hazards and impacts. Most incident data is received by the GIU in incremental updates through source documents, *.shp files, File geodatabases and other formats used to develop and manage authoritative source datasets.

- **STATIC** – data includes copies of regional datasets, national datasets such as HSIP Gold, Navtech, and other state datasets that will not be modified. Static data may be collected within the incident, as required, but will not be incident specific. Some examples include: county parcel data, utility data, or facility information that may be used to support the incident.

It is also recommended that the following additional main directories are placed on the Level-1 root directory. Note that they will not contain ANY official data:

- **ADMIN -** The admin folder is the location of most of the documents and forms for GIU management. It also contains information on JFO plans that impact the Geospatial Information Unit, and GIU Project Management tools. The (3) main subdirectories included under the ADMIN directory are 'DOCS' which contain documents; 'SYSTEM', which will contain critical software, expressions, batch files and patches; and 'CONTACTS' which will contain all GIU contact info.

- **!WORKING –** Every staff member within the GIU should have a subdirectory assigned to them under '!WORKING' to manage personal documents, data and temporary files. Once finalized, data from the '!WORKING' directory should be migrated to Event directories as soon as official and complete by the lead GIS Specialist. These personal subdirectories should be removed upon demobilization of GIU Staff.

- **PROJECTS –** Include *.mxd and other project files that are directly related to GIS Requests. The PROJECTS directory should mirror EVENT for major subdirectories, as PROJECTS will often have a one-to-one relationship with EVENT and GRAPHICS. Special subdirectory for 'PRODUCTION' mxds for ArcGIS Server web services may be required.

- **GRAPHICS –** Include all of the *.pdf or other output Product files from GIS Projects. The GRAPHICS directory should mirror EVENT for major subdirectories, as GRAPHICS will often have a one-to-one relationship with EVENT and PROJECTS. Subdirectories for 'SECURE' products may be required, for limited distribution products, and 'ARCHIVE' subdirectories may be required to manage large product sets, and to keep current operational products easily identifiable. This will also allow for BATCH file automation for product distribution.

<u>Level-2 Branch Directory Structure</u>

The next (2) levels for consideration of GIU Management include (1) Branch Level subdirectories that relate to operational area or key projects, sectors, and functions supported by the GIU on Level-2, and (2) Mission Level subdirectories include key project data for each Branch area organized on Level-3.

Several conceptual distinctions in directory structure should be identified for defining major Level-2 file subdirectories by:

1. '*Operational*' relevance – This includes directories which have a direct relation to JFO Operational Support areas in the GIU. These types of directories are most often found in the 'EVENT' directory. These directories also included 'elevated' subdirectories which require dedicated support and key projects. For example, 'Environmental' is at the Same Level as 'Infrastructure' in the GIU file directory structure but one is subordinate in the JFO Org-chart; why: because operationally their requests load to the unit may be equivalent.

2. '*Functional'* relevance – include common sectoral and disciplinary areas like 'Damage', 'Meteorological' data or 'Imagery' in one major directory. Other examples may be the classifications of HSIP Gold by sector. 'STATIC' datasets are either 'Functional' or 'Geographic.

3. '*Geographic'* relevance - e.g. keeping all of the geographic data, such as NAVTECH, Streetmap USA, or 'Boundary' in one directory because they all have Geographic extent and sourcing in common. STATIC' datasets are either 'Functional' or 'Geographic.

These directories should be assigned to a lead GIS Specialists in one of the (6) ICS Operational Branch/Section level GIU for day-to-day management.

It is a useful convention for Level-2 and Level-3 subdirectories to use acronyms in ALL CAPS to represent subdirectories to Level-3, as these will be used in naming conventions later and as references for projects.

The specific subdirectories under the (2) root data directories will vary depending upon the incident for Level-2 subdirectories. However, many incidents will have common subdirectories that are recommended for the GIU as illustrated below.

Fig. 2 – 'EVENT' Root Directory and Common Level-2 and Level-3 Subdirectories.

1. **BOUNDARY –** This is a common occurring 'Geographic' Level-2 directory, and will often contain analysis results that are geographically based. It is important to note the 'Static' directory may also contain a 'Boundary' Level-2 directory which contains the base data.

2. **DAMAGE** – This folder contains damage assessment information from the PDA damage, RNA, State or support agencies like NGA. Also, tools such as search grids and specific subsets of damaged structures or vehicles would reside here. Common Mission Level subdirectories may include 'NGA' for NGA Damage Assessments, or 'STRUCTURES' for identified structural impacts, 'GPS' for field GPS Damage data collection. This is an example of a 'Functional' Level-2 directory.

3. **DECLARATION –** Data that tracks the status of the Presidential Disaster Declaration, Governors Requests, dates of declaration and PDA status will be located here. While much declaration information is available through enterprise ODBC access, local copies of this information should reside in the GIU. This is an example of an 'elevated' Level-2 Operational directory from Planning.

4. **ENVIRONMENTAL** – This folder contains all environmental data relevant to the incident. A 'Static' Level-2 subdirectory for 'ENVIRONMENTAL' should also contain the file geodatabases that stores all of the state and regional environmental datasets used to support Project Worksheet review through the Environmental Historic Preservation (EHP) group. This is an example of an 'elevated' Level-2 Operational directory from the Infrastructure Program.

5. **EXT_AFFAIRS** - Supports Community Relations, Congressional, Public Information and External Affairs data. This is an example of a Level-2 Operational directory for ICS Operational Branch/Section level GIU support area in External Affairs. Common Mission Level subdirectories include, 'CONG' for Congressional, 'COMMUNITY' for Community Relations, 'DEMOG' for demographic analysis and 'CS-VGI' for Crowd source/Volunteered Geographic Information.

6. **INDIVIDUAL**- Supports Evacuations, Shelters, Individual Assistance Programs, Direct Housing Programs and VOLAG. This is an example of a Level-2 Operational directory for ICS Operational Branch/Section level GIU support area in Individual Assistance. Common Mission Level subdirectories include, 'EvAC' for evacuations, 'SHELTER' for Shelter data, 'APPS' for IA Teleregistrations, 'HOUSING' for IA Direct Housing, 'DRC' for Disaster Recovery Center data (if not available through enterprise RUT Tracker), 'SBA' for Small Business Administration.

7. **INFRASTRUCTURE**- Supports Public Assistance, Infrastructure, Power, HAZMAT/Environmental Special Considerations and Debris mission. This is an example of a Level-2 Operational directory for ICS Operational Branch/Section level GIU support area in Infrastructure. Common Mission Level subdirectories include, 'DEBRIS' for Debris Mission, 'GENERATORS' for ESF-3 Prime Power Mission, 'BLUE ROOF' for ESF-3 Blue Roof Mission, 'POWER' for tracking Power status with ESF-12, 'HAZMAT' for tracking ESF-10 HAZMAT recovery, 'SEWER' or 'SWEATT' for tracking infrastructure restoration, and repair for Sewar, Water, Energy, Telecom, Transportation. Note that the 'Environmental' Mission has been 'elevated' to Level-2 subdirectory.

8. **METEOROLOGICAL** – This folder contains the combined weather related data characterizing the event. Depending on the type of incident, 'METEOROLOGICAL' may be changed to represent the specific natural hazard and scientific discipline involved. This is an example of a Level-2 Functional directory that is often assigned to the ICS Operational Branch/Section level GIU support area in Mitigation/Natural Hazards. Common Mission Level subdirectories include 'INUNDATION' for flood extents, models such as, 'HAZUS', 'SLOSH', 'HURREVAC', 'IMAAC', 'QPF' for precipitation forecasts as well as gauge data from the 'USGS'.

9. **MITIGATION** – Supports Long Term Mitigation Projects and interdisciplinary project coordination. This is an example of a Level-2 Operational directory for ICS Operational Branch/Section level GIU support area in Mitigation/Natural Hazards. Common Mission Level subdirectories for Mitigation include program data for 'NFIP, 'REPLOSS', 'HPA', 'HMGP', or 'RISK' assessment may be included.

10. **OPERATIONS_ES** – Supports DCE/Emergency Services US&R/DMAT Response Operations (Catastrophic events), Resource Tracking (Major events) and Logistics (Minor Incidents). This is the most critical support for meeting the Response Operations Emergency Services Branch mission support. This is an example of a Level-2

Operational directory for ICS Operational Branch/Section level GIU support area in Emergency Services/Logistics. Common Mission Level subdirectories include 'GRID' for US&R search and rescue status grid, 'MEDICAL' for ESF-8 field medical activities, 'IMT' for support of Incident Management Teams from ESF-4, 'DOD-USNG' for support of Title 10 and Title 32 military operations, 'AIROPS' for support of Air Operations, 'USCG' for support of U.S. Coast Guard Missions. Note that 'FACILITIES' and 'AFO' support have been 'elevated' to Level-2 directory as tracking federal operations support facilities is a key task, as well as supporting 'AFO' operations..

11. PLANNING - Supports special projects and senior executive briefing products and high-priority project requests, and special geographic reference products. This is an example of a Level-2 Operational directory for ICS Operational Branch/Section level GIU support area in Planning. Common Mission Level subdirectories include 'SITSTAT' for SitStat support. 'RESOURCES' for Resource tracking data, 'EXECUTIVE' for executive product support. 'LTR-ESF14' for Long-Term Recovery is also considered an 'Elevated' Planning directory along with 'DECLARATION'.

12. IMAGERY- is an example of a Level-2 Functional subdirectory. The management for this directory is assigned to the Remote Sensing Specialist and includes raw and derived imagery products used to support the incident. Common Mission Level subdirectories include specific source datasets such as 'RADARSAT', 'DIGITALG' for Digital Globe, 'WORDVIEW', or 'AERIAL' for aerial imagery collection. A Mission Level subdirectory for 'FOOTPRINTS' should also be included that contains *.shp files and graphics of the extent of coverage, time of collection and other pertinent information.

The lead GIS Specialist assigned to one of the (6) ICS Operational Branch/Section level GIU support areas will be assigned by the GIU Leader to manage the Level-2 subdirectories that are relevant to their support area.

The above 'EVENT' directories identified should cover 60-70% of expected file management requirements for Level-1/2 directories. However, the GIU Leader should maintain flexibility to scale requirements as needed.

'STATIC' directories for Level-2 will NOT include any operational directories. The majority of Level-2 subdirectories for the "STATIC' root directory will include 'Functional' and 'Geographic' data.

Fig. 3 – 'STATIC Root Directory and Common Level-2 and Level-3 Subdirectories.

In the example above, the following common directories are identified:

1. **BOUNDARY** - is a Geographic Level-2 directory that contains subdirectories organized by geographic extent. Geographic boundaries such as 'CITIES', 'DISTRICTS' or 'REGIONAL' may also be included in addition to the Level-3 subdirectories identified, if required.

2. **CRITICAL**-is a functional Level-2 directory and contains Critical Infrastructure data from HSIP GOLD, or other authoritative sources.

3. **DEMOGRAPHICS** - contains CENSUS data and is functional.

4. **ENVIRONMENTAL** - contains Environmental data collected form various state and federal agencies to support the EHP project review of Public Assistance project worksheets. It is important to note that this 'functional' directory not be confused with the Operational directory in the 'EVENT' directory. The 'ENVIRONMENTAL directory in 'STATIC' will contain data that is not incident specific.

5. **HAZUS** - is a Geographic Level-2 directory which will contain the geographic and census data from the HAZUS Geodatabases. Event specific HAZUS runs should be stored in the EVENT subdirectory under MITIGATION.

6. **STREETMAP** – is a Geographic directory and contains the latest Streetmap USA ESRI data

'STATIC' subdirectories will come predefined on the GIU Server from DEGS deployment, or will be received from Regional GIS Go-Kit upon establishment of GIU. 'STATIC' Level-2/3 subdirectories should be managed ONLY by the GIU Leader and/or their delegate.

Level-3 Mission Directory Structure

Mission Level subdirectories include key event data for each Branch area organized by ICS Operational Support Area missions.

For Example, 'Debris mission' within the Level-2 'INFRASTRUCTURE' branch directory would be represented by 'DEBRIS' in the Level-3 subdirectory; and the 'Housing mission' within the 'INDIVIDUAL' Branch directory for Individual Assistance program, would be 'HOUSING' for the Level-3 subdirectory.

These directories are managed on a day-to day basis by GIS Specialists, and will have a common structure, represented below.

Fig. 4 – Example 'Mission' Level Subdirectory for 'HOUSING'' (Level-3)

1. **Archive'–** This is the main folder for versioning different sets of the same data. A common standard is to use the NSDI data format for versions in the archive, if temporal. If not temporal, simply storing old versions in the root of the 'Archive' subdirectory will work. A key subdirectory is 'Dump' which contains temporary files and others that are suitable for removal.

2. **'Source'** folder – this is the end location of all component files for project development that may include *.doc, *.xls or *.shp files that contain DATA used in generating the event dataset. These files often have utility in

tracking down errors and referring to sources for data for later issues. A key subdirectory includes 'Docs' which are specific metadata and reference information.

3. **'Subsets'** – this is a functional subset of the main dataset that is required for analysis; the output of analysis or other project files. Generally subset data have a descriptive name like e.g. outlines, or buffer. As they are actual datasets, they may contain a recursive 'archive', 'source' subdirectories within.

Often, the successful development of Mission Level data is the first step in generating an authoritative event dataset. This will then allow for regular update and replication with the GIU ArcGIS SDE service, and eventually ArcGIS Server web-services!

Data and Directory Management

Many projects can be developed from the default datasets within the EVENT and STATIC directories. However, in the event of the development of new data, several important standards must be followed:

- Adhering to GIU naming conventions
- Developing SHORT acronym or abbreviation for new Level-2/3 directory
- Archival and restructuring of source datasets
- Migration to enterprise database management systems e.g. File Geodatabase and ArcGIS SDE

New data is often developed first in the GIS Specialists '!WORKING' directory, and then transferred to the EVENT subdirectories when finalized.

Management of dynamic event data often requires developing and maintaining authoritative datasets with Subject Matter Experts (SMEs).

Dynamic event data can range from flat *.xls and *.shp files through Personal and File Geodatabases and ODBC connectivity to management of SDE and ArcGIS Server Services hosted by the GIU.

Fig. 5 – Management of Dynamic Event Data

As indicated above, it is recommended that a SHORT abbreviation or acronym be developed to identify the dataset. This will be used in project reference and in naming conventions. The above list illustrates several common Branch and Mission Level data acronyms and abbreviations.

File Geodatabase Development , SDE and ArcGIS Server

A File Geodatabase will support migration of dynamic event data into the enterprise database management system and can allow for:

- Management of 'look-up tables' and 'join tables'.
- Replicating enterprise databases to improve local performance.
- Establishing MASTER dynamic event datasets to represent authoritative content for the incident
- Support replication transactions to ArcGIS SDE
- Seamless updates with MXDs from ODBC connections
- Development of schema for future data collection

It is recommended that a File Geodatabase be developed for each branch level directory that relates to the (6) ICS Operational Branch/Section level GIU support areas.
It is also important to note that many datasets will bypass the entire file directory stage – as with access of ODBC connections to the FEMA EOMMR Reports Server, FEMA RIV RUT Tracker or FEMA HQ MACC ArcGIS SDE services.

The File Geodatabase is a critical stop gap for managing data in an austere field environment where limited connectivity and enterprise systems may be inoperable!

SETH AND MEL MAY NEED TO INSERT SDE STANDARDS HERE TO INCLUDE SCHEMA KEY DATASETS AUTOMATION AND AGENCY ODBC + SAVER2 + ESTABLISHMENT OF ARCGIS SERVER SERVICES/REST

Managing ArcGIS Server REST services is a key function is disseminating authoritative information from a Joint Field Office (JFO).

The SAVER2 platform will allow for integration of ArcGIS Server REST services from multiple field operations into a Common Operational Picture (COP).

External File Structure

Geospatial support activity relies on the regular input of data from ERT components, FEMA Programs and the Planning Section to support updating 'cyclic' projects.

In a large event, the need to constantly manage incoming datasets may require development of an 'External File Structure' on the JFO COMMON Drive.

In The Response Phase, issues such as establishing (1) a single point of contact, (2) standard template for ESF reporting, (3) standard file formats, (4) INPUT reporting deadlines, (5) contingency plans for working with hard-copy, fax, alternate sources and conflicting information, and (6) Reporting to Planning Section on the status of the project by the GIU, may be required.

```
 \---GIS_TRANSFER
        | +---DATA DROP OFF
        |    +---DEBRIS
|       |        +---021606
|       |        +---ARCHIVE
|    +---DRCs
|    +---FACILITY
|    +---HOUSING
|    +---PODS
| +--- GRAPHICS DROP OFF
        |    +--- 021706
        |    +--- ARCHIVE
```

Fig. 3 – The INPUT and OUTPUT file structure Directory for the 'COMMON' drive

The INPUT and OUTPUT file structure can be located on the 'PLANNING' Drive or the 'COMMON' Drive. The 'DATA DROP OFF' directory can facilitate data transfer INPUT to GIU by the ESFs, Planning Section and FEMA Programmatic groups involved in Cyclic project requests.

The OUTPUT directories include 'GRAPHICS DROP OFF' or other directories as needed to manage With daily operational period reporting requirements for Executive Briefings, Summaries, IAP, and SITREP.

The establishment of an External File Structure is conducive to automation of data 'copy' and reporting for the GIU on current status, which can aide in project management.

Naming Conventions

New Branch and Mission level data should follow the following convention for 'Prefix' and 'Date' and be required for *.shp, *.dbf, *.pdf, *.mxd, and *.mdb files and other graphics and data files:

1. [BRANCH]_[MISSION][NSDI_DATE(YEAR-MONTH-DAY)][SUFFIX\]][EXTENSION]

An example: IA_APPS20050930.shp

Note – only ONE word or acronym should be used for each part of the convention. Also, at times of rapid production, an optional [HOUR-MINUTE] can be added to the National Spatial Data Infrastructure (NSDI) Date string. This can ease in identification for versioned products and in sorting for production statistics.

New Subsets of Program level data should follow the following convention:

2. [MISSION]_[SUBSET][NSDI_DATE(YEAR-MONTH-DAY)][SUFFIX][EXTENSION]

An example: APPS_ELIG20051002.shp

As the dataset is an expansion of the original theme, the MISSION will be the first part of the convention. In cases where there are multiple directories i.e. past Level-3, the last (2) directories of the 'subset' should be used.

The following 'suffix' conventions should be used, when required.

3. **[_MASTER]** = Can be used to represent authoritative datasets ready for replication to ArcGIS SDE and ArcGIS Server Services and use by other GIS Specialists not familiar with the data and for those who are not Subject Matter Experts

An example: APPS_ELIG20051002_MASTER.shp

4. **[_C]=** Compressed file below 1-MB. These are often suitable for email, but may not contain high enough resolution for plotting.

An example: APPS_ELIG20051002_C.shp

5. **[ATTRIBUTE]** = information from a specific attribute in the tabular data associated with the file. Examples may include '_ZIPS' for Zipcode, '_CUR' for Current Address field. Often the result for a look-up table or join table.

An example: APPS_ELIG20051002_ZIPS.shp

6. **[STATISTICS]** = from a specific statistical operation on data. Often the result for a look-up table or join table.

An example: APPS_ELIG20051002_SUM.shp

7. **[VERSION]** = indicated by a letter or number designation fro versions of the same projects export

An example: APPS_ELIG20051002_a.shp

It is important to note that the reality of supporting complex project requirements under tight timelines often make the time and resource requirements necessary to adhere to a strict naming convention a challenge. The GIU Leader should maintain flexibility to scale requirements as needed.

2. Authoritative Sources

Data is required for every geospatial product. The quality of this data dictates the overall value of these products and the level of support available. Without valid authoritative sources and core standards for data management, the investment in hardware, software, and labor can be immediately undermined. This section defines the term "Authoritative" as it relates to geospatial data and provides background on basic data standards for the DHS GeoCONOPS, Section 2.2 Geospatial Data, page 22 – 24 and Appendix B: Authoritative Data

Matrix, page 85. In addition to this, FEMA will be assembling lists of specific data and data sources associated with each hazard-type.

E. Layout

All maps should have a legend, scale bar, north arrow and title. The title describes the map, its purpose, and who it was produced for in addition to the geographic location depicted on the map. If applicable, the title or legend should provide the date and time for the data, e.g. for continually updated or time sensitive products. All maps should also include a signature with filename, path, and date of the .mxd. The signature may include a user name and phone number if there are multiple GIS staff making maps. Maps may include a vicinity map if space allows and the map is a larger scale than state level. FEMA Standard disclaimers are included as applicable. State, FEMA or other official seals may be included at the GISL or GISM's direction.

* See Lauren McLane for layout example

F. Modeling..... [page #]

1. Authoritative Sources

Predictive Modeling involves integrating known demographic and geographic characteristics with one or more predictable characteristics expected to be generated by a specific event. The product of this integration is a model predicting the effects of the event on the environment.

The ability to predict and project consequences with reasonable accuracy allows decision-makers to initiate preparations for identifying and mobilizing those resources typically required for responding to the expected damage. The ability to prepare in advance of an actual event (or before actual damage assessments can be performed) can significantly reduce the time required to deliver critical resources to affected areas.

9.a Authoritative Sources – Models and Decision Support Tools

The Federal Government has not officially established in written policy a single authoritative source for models or decision support tools, with the exception of aerial dispersion models. The Interagency Modeling and Atmospheric Assessment Center (IMAAC) is the single point for coordination and dissemination of Federal dispersion modeling and hazard prediction products that represent the Federal position during an incident which requires federal coordination. The IMAAC also responds to major releases when state or local assets are overwhelmed. The National Atmospheric Release Advisory Center (NARAC) at Lawrence Livermore Laboratory (LLNL) is currently the primary provider of IMAAC products.

Access to the IMAAC for an event involving a hazardous release to the atmosphere is through direct contact at **925-424-6465**. This phone is staffed Monday – Friday, 10:30 AM – 7:15 PM (Eastern). At other times, the call is answered by the Emergency Duty Officer, who will forward the request to the on-call staff, who will return the call within about 10 minutes.

The IMAAC also provides subject matter experts to assist with understanding the nature of and the consequences associated with significant atmospheric releases of nuclear, radiological, chemical, or biological material. The IMAAC is also available through the *IMAAC Web* (https://imaacweb.llnl.gov/web/signIn.html), which serves as an electronic distribution system for modeling products, and through which some users run simulations using the NARAC modeling system. An account is required for the IMAAC Web, and can be applied for at https://imaacweb.llnl.gov/web/support/requestAccount.html;jsessionid=F4566E8B2D6FF7C8A6480F1D4BD95130.

Other authoritative sources for modeling and decision support tools are in this table.

Software or Model	Description	Source	Access	
Natural Hazards				
HURREVAC (HURRicane EVACuation)	Emergency manager's tool to track hurricanes and assist with evacuation decision making	FEMA	http://www.hurrevac.com/ Restricted for use by the official government emergency management community (Federal, State, local)	D to
HAZUS-MH (HAZards US Multi-Hazard)	Risk assessment software program for analyzing potential losses from floods, hurricane winds, and earthquakes	FEMA MAC	http://www.fema.gov/plan/prevent/hazus/ No constraints	F ru H of th A (M he
SLOSH (Sea, Lake, and Overland Surges from Hurricanes)	Measures storm surge heights and winds from historical, hypothetical and predicted hurricanes	NOAA	http://www.nhc.noaa.gov/HAW2/english/surge/slosh.shtml GIS files and animated GIF images will be made available when hurricanes threaten land areas at http://www.nhc.noaa.gov/ftp/	

US Army Corps of Engineers Modeling Services	Hurricane response resource requirements for Debris (cubic yards), Water and Ice commodity needs (truckloads), numerical estimates of people and households affected, and temporary roofing and housing needs	USACE	Terry Siemsen, USACE Terry.s.siemsen@usace.army.mil	R th in ag M A
FARSITE	Wildfire behavior and growth simulator that incorporates both spatial and temporal information on topography, fuels, and weather.	USFS	http://www.firemodels.org/index.php/national-systems/farsite	O pr be ar sh F th be fi m de
Other Models				

NISAC (National Infrastructure Simulation and Analysis Center	Congressionally mandated source of expertise on critical infrastructure interdependencies and the consequences of disruption. Supported by Sandia National Labs and Los Alamos National Labs under DHS Infrastructure Protection	DHS Infrastructure Protection	FAIT - http://www.sandia.gov/nisac/fait.html FASTMap - http://www.sandia.gov/nisac/FASTMap.html All models run by Sandia analysts. http://www.sandia.gov/nisac/contact.html Generally run for immanent hurricane events. List of pre-produced analyses at http://www.sandia.gov/nisac/analyses.html Generally can be found on HSIN's Emergency Management Portal.	
GNOME (General NOAA Operational Modeling Environment)	Oil spill trajectory model	EPA	Used by EPA for oil spill response	

9.b Coordination

It is essential that predictive modeling efforts be coordinated. The use of slightly different data sets can produce vastly different outputs. This can lead decision-makers in different directions. The Geospatial Information System Unit staff must assure that a set of data is agreed upon and used whenever a model is run. A better solution would be to have one organization, location and expert run the model with mutually accepted data and then share the outputs with all use

G. Continuity of Operations

The Continuity of Operations Plan (COOP) is a contingency plan that must be created for every Joint Field Office (JFO). This plan describes the how the JFO will relocate, maintain essential operations, and reconstitute its operation if necessary. It is coordinated and written by the Planning Section.

The Geospatial Information System Unit Leader (GISL) is responsible for coordinating with the Planning Support Unit Leader to ensure that the GIS Unit's considerations are included in the COOP plan. Specifically, the COOP plan should ensure that the Geospatial equipment and data are secured, and that the GISU is able to reconstitute and continue supporting the operation as required. This may also be accomplished by backing up the server to a remote location and making arrangements to access GIS ready computers at the Regional Office, RRCC or other location. In some instances, this may require the GISL to be responsible for physically moving the equipment including computers and server(s) out of the JFO when a COOP is initiated to ensure that GISU operations can continue.

H. Training and Exercises

Required Training provides a direct link between training and job performance to provide for responder performance. Required Training cannot be challenged.

Position Task Books (PTBs) can be initiated prior to attendance and successful completion of Required Training. However, Trainees cannot become fully qualified for the position until Required Training has been successfully completed. A Trainee must be qualified in the prerequisite position(s) before a PTB can be initiated. Agency equivalent courses, and courses that are interchangeable as identified by the Response Geospatial Coordination Training Team, may be substituted for required courses.

<u>Response GIS Specialist</u>

REQUIRED TRAINING: Bachelor of Arts or Equavalent Experience

REQUIRED EXPERIENCE Successful position performance of at least one (1) year of specialized experience as a GIS Specialist. Specialized experience should include planning, directing, organizing, and exercising control in order

to ensure that geospatial programs comply with legal and regulatory requirements and meets customer needs. Knowledge of the concepts, principles, techniques, and practices of Geographic Information Systems (GIS) and its integration with IT systems. Knowledge of safety and security regulations, practices, and procedures. Ability to plan, organize, and direct the functions and staff of a small to medium sized organization. Ability to communicate effectively, both orally and in writing. Knowledge of the interrelationships between geospatial database management and GIS design disciplines involved in the management of environmental, infrastructure, and critical defense assets. Knowledge of database systems related to CAD/GIS projects.

Other Training:

Introduction to ICS (I-100)

At Will Training:

Please take the Independent Study classes recommended below. These will give you a broad overview of how FEMA works in disasters and better enable you to understand your client's requests.

Recommended courses to get up to speed with specific FEMA programs:

Disaster Basics

A Citizen's Guide to Disaster Assistance (Human Services Overview)

Introduction to Hazard Mitigation (Mitigation Program)

Introduction to the Public Assistance Process (Public Assistance)

Coordinating Environmental and Historic Preservation Compliance (Public Assistance)

Public Assistance Operations I (Public Assistance)

1. On-line Training Requirements.....[page #]

I. Documents and Records

The Federal Records Act (FRA) of 1950 is the statute governing Federal records, and is the basis for the Federal Government's policies and procedures for their creation, maintenance, and disposition. FEMA Records Management Program (FD 181-1, September 2, 2009), is the implementing directive within FEMA for the provisions and requirements of the FRA. The Planning Section, specifically the Documentation Unit, is designated as the official File Custodian for all records under the auspices of the official agency filing system.

The Geospatial Information System Unit is responsible to provide the Documentation Unit with one (1) 8.5 x 11 inch color copy of all maps created by the GISU no later than the closing of the Joint Field Office. The product name used by 5400.2 is "Geospatial Products/Displays", and the reference is ADM-43. These records are retained by the National Archives and Records Administration (NARA) permanently. GISU staff at the RRCC must transition all files, including electronic or color copies of all maps created by the RRCC GISU to the JFO GISU.

Effective April 15, 2004, the National Archives and Records Administration (NARA) released guidance applicable to digital geospatial data records that have been appraised and scheduled for permanent retention at NARA. NARA, in consultation with agencies, determines specific disposition instructions through the records scheduling process. Currently, FEMA does **not** require permanent retention of digital geospatial data records.

Archiving remote sensing data?

J. Volunteers

In some events individuals, groups or companies volunteer geospatial goods, services and personnel. Usually this happens in large or high visibility events. These volunteer efforts should be coordinated to reduce duplication of effort. FEMA sponsors a website called AidMatrix, http://www.aidmatrixnetwork.org/fema/, which is activated in an emergency to match volunteers and other resources with those in need. Many States have agreed to use in the AidMatrix site during a large response. The GISL should determine if the AidMatrix is activated for an event

through the Individual Assistance Branch in the Operations Section. FEMA is restricted from accepting volunteers, but should support the identification and placement of volunteers in the affected State or local geospatial operations.

K. Crowd Sourcing and Volunteered Geospatial Information

Background

The emergence of social media may prove to have one of the greatest potentials in relaying communications, information and services for disaster survivors. Over the last 3-years, Crowd Sourced information and Volunteer Geographic Information (VGI) have led directly to the growth of world-wide crisis mapping community and have directly intervened in saving lives, protecting disaster survivors and providing essential communications and resources in world-wide emergencies!

It is important to know that social media are often not 'authoritative' and often subject to error, but can sometimes represent the best available information immediately after or during an event. This is a relatively recent phenomenon, as traditional media sources have, until the advent of social media, supplemented 'authoritative' sources with this 'real-time' information. Much current effort has been made in one-way 'outreach' with social media, but now the capabilities of two-way feedback within an event have started to evolve.

The potential of these capabilities has not gone unnoticed by the senior management of the Federal Emergency Management Agency. Administrator Fugate has said, "Social Media can and will be used by FEMA for all phases of Emergency Management." The geographic component of social media is often referred to as Volunteered Geographic Information (VGI). In the Geospatial SOP, several theories and applications for disaster response along with examples will be provided. The Agency's Web 2.0 Policies and Procedures for Private, Personal Information (PPI) will also be identified.

Theory

In order to successfully implement a social media based geospatial product, several important theories of VGI should be identified:

- '**Intentionally' collected VGI vs. 'Derived' VGI** – Intentionally collected VGI if often found in the context of a specific site or application, designed to collect one thing. For example, SAHANA, is designed to collect only volunteered hospital/medical information. Twitter, as well, can be subset by hash tags (#hashtags mark keywords in a 'tweet') to find # hospitals, #food, etc…

  Derived VGI is not related to 'content' but more to 'location' and statistical relationships. For example, the Joint EU Research Council (JRC) and USHAHIDI used a set of SMS message location tags in Haiti and the density of responses to estimate damage–without considerations of the content of the SMS message. This may be the best way to handle Private Personal Information (PPI) as well, is it is not considered in the analysis.

- '**Unary and 'Relational' Content Information** – The content of VGI information can also be classified into two useful tiers for Geospatial Analysis. Unary information, or information related to single objective things, places, or events- is very useful for Emergency Managers. For example, identifying the location of a structure; a picture of a flooded area; an area used for commodity distribution are all examples of unary information.

Errors resulting in 'False Positives' from whether the Unary VGI information is 'True' or 'False', are often difficult to determine. One useful rule of thumb is to rank VGI that appears more frequently with a greater deal of confidence than one that appears infrequently. Also, as Unary information is often objective, it may also be validated from secondary sources.

Relational content information deals with people and things and their relations to services, requests and situations. The prime example for this Relational content type are Search and Rescue operations performed in Haiti through the SMS; where requests of person x at position y who need z were identified. Another example would be donations management, and the Red Cross 'needs-wants' Google Docs Open Spreadsheets donations management tool. Relational content are also very important in communication, and quite simply are the social communication aspect of VGI that relate best to Emergency Management.

The third type of information, Qualitative content, or personal statements and observations will not be considered for analysis, as this is most likely consideration for PPI protections.

- **'Any-to-one' and 'Any-to-Many' Data Models** – The traditional relational database used within GIS need to account for the open-ended content structure of most VGI sourced data. Establishing Ontologies, or key words and relationships representing a context will be important in building relevant datasets. For examples, developing a query that includes #food; #water; #groceries; #commodities; #kitchen; #canteen can be grouped to indicate all VGI on the 'Commodity Distribution' Twitter activity. A dataset that represents this open ended content subsetted through a query could be considered 'Any-to-One'. The rationale for the 'Any' designation is that there is an unlimited possibility of publically sourced content, much of which is not relevant to the query definition – but may have unexpected utility for other issues.

Applications and Examples in Emergency Management

Several important applications in disaster response and examples should be identified that the GIU can explore. The examples below illustrate some VGI based approaches to traditional operational issues:

- Providing Key Situation Awareness – In the Tea Fire (2008) in Santa Barbara, CA several community reporting sites were set up with Google Earth. On the positive side, community members were able to post photos with GPS coordinates and statements regarding the fires progression and their evacuation in near real time.

  The sites generated some confusion, however, as how to handle false positive entries on evacuations and spot fires created potential false messaging to the public. It is important here to note how authoritative information on evacuations should be the ONLY source for this messaging; but as the site is public, any messages can be posted.

  The resulting lessons learned led to further 'crowd-policing' of content for accuracy, and incorporation of Official messages into user interface. A derived VGI analysis or use of the unary content of photos and GPS information may be more useful than taking the content at face value in cases where there is conflicting information.

  The International Network of Crisis Mappers (CM*Net) and The Crisis Mappers Network is the largest and most active international community of experts and skilled volunteers engaged at the intersection between humanitarian crises, technology and crisis mapping.

  Through leveraging mobile platforms, computational and statistical models and geospatial technologies to power effective early warning for rapid response to complex humanitarian emergencies, the Crisis Mappers Network aims to integrate situation awareness and response for International Humanitarian Aid.

- Damage Assessment and Commodity Distribution – As mentioned, the Joint EU Research Council (JRC) and USHAHIDI used SMS message location tags in Haiti and the density of responses to estimate damage in Port au Prince–without considerations of the content of the SMS message. The application of this approach, through measuring the correlation of 'density hot-spots' of SMS activity to commodity distribution, and 'centers-of-gravity' for distribution point could also be employed.

  A second effort in Haiti was made by The Worldbank and a worldwide social network of scientists (GEOCAN) and a web-based Virtual Disaster Viewer (VDV); a 'social' web system allowing pre- and post-event very high spatial resolution imagery to be used for damage assessment.

  50-cm GeoEye-1 imagery, collected the day after the earthquake, was made publicly available by Google. A Grid of 500 × 500-meter subsets of the Port-au-Prince area were each assigned to one of the team of over fifty volunteer remote sensing scientists. Within only 48 hours, GEOCAN identified more than 5,000 completely collapsed buildings across an area of 133 km2.

- Common Operating Picture – Project Epic/Tweek the Tweet has developed a Social Media based 'Common Operating Picture' for catastrophic events with the Google Earth API and Twitter. 'Tweak the Tweet (TtT)' is a hashtag-based syntax to help direct Twitter communications for disaster events. Use requires modifications of Tweet messages to refer to #location, #status, #unmet needs, #offers of support, #damage, #photos, #shelters and other elements of emergency communications. TtT has been deployed for multiple events during 2010 and 2011, including the Haiti earthquake, the Chile earthquake, the Oil Spill, the Four-mile Canyon file in Boulder, the Queensland floods, Cyclone Yasi, and a variety of other weather emergency events.

  ESRI also creates 'mash-ups' of social media through their Social Media Maps powered by ArcGIS Online. The ESRI Social Media Maps includes feeds from USHAHIDI, photos from Flikr, YouTube and RSS feeds from Earthquake Magnitudes from USGS, and others.

- US&R SMS/Emergency Services – As mentioned, one of the major turning points in the integration of crowd sourced VGI into emergency services occurred after the Haiti Earthquake (2010). Through Coordination by USHAHIDI with the (2) national telecom providers in Haiti and then though MapAction, who were tasked to support the United National Operations Support Coordination Center (OSOCC) for International Urban Search and Rescue; SMS messages from trapped Haitians were able to be routed to US&R for immediate rescues. In a saturated bandwidth environment, SMS transmission uses a smaller amount of the frequency allocation and is often more successful than voice transmissions.

  The medical sector in Haiti was also supported through VGI provided by SAHANA and InSTEED, who developed a web-interface to identify pre-event medical infrastructure, field medical aid stations and requests for services. In the medical sector, incorrect information can mean the difference between life and death. Concerns have been voiced by emergency managers about how SAHANA medical infrastructure information may conflict with the authoritative medical sectoral data of a jurisdiction or cause confusion. While authoritative sources should ALWAYS be used if available, in cases where these datasets do not exist or impacts are so severe as to where the pre-event sectoral footprint is destroyed – coordination with the appropriate SMEs is recommended and there may be no choice!

- Resource Tracking/Blue Force Tracking - Blue force tracking (BFT) systems enable military commanders or civilian authorities to ascertain the real-time location of personnel and other assets in the field. Tools such as the Google Latitude, which provides a persistent-location based check-in or a check-in based model with Foursquare and Facebook Places offer voluntary GPS location tools from GPS enabled smartphones for social networks.

  OpenStreetMap.org provides another key part of the Resource/Logistics process through the creation and access of free geographic street data developed through a distributed voluntary 'check-out' web-client for digitizing areas where street data may be unavailable or restricted through licensing.

Appendix B: Contacts

Federal Geospatial Data Committee Contacts by State
https://www.hazards.fema.gov/contacts/statecontacts/

eg. Montana

Federal Geospatial Data Coordination Contacts by State

Select a State
Montana

Corrections or comments?
miphelp@riskmapcds.com

Contacts for Montana

FEMA Region Representative

FEMA Region VIII
Doug Bausch
Denver Federal Center, Bldg. 710, Box 25267
Denver, CO 80225-0267
(303) 235-4859
Douglas.bausch@dhs.gov

FEMA Regional Flood Map Modernization Geospatial Lead

Douglas Bausch
Denver, CO
(303) 235-4859
Douglas.Bausch@dhs.gov

FEMA Regional Support Center (RSC)

BakerAECOM Regional Support Center 8
355 Union Boulevard, Suite 200
Lakewood, CO 80228-6509

RSC8 Lead: David Jula
djula@mbakercorp.com
(720) 514-1101

FEMA RSC Geospatial Lead

Mike Garner
Lakewood, CO
(720) 514-1105
mgarner@mbakercorp.com

State National Floodplain Insurance Program (NFIP) Coordinator

Traci Sears-Tull
Montana Dept. of Natural Resources and Conservation (MTDNRC)
1424 9th Avenue
Helena, MT 59620
(406) 444-6654
ttull@mt.gov

State Flood Mapping Coordinator

Millie Heffner
Montana Dept. of Natural Resources and Conservation (MTDNRC)
1424 9th Avenue
Helena, MT 59620
(406) 444-6656
mheffner@mt.gov

State GIS Coordinator

Stewart Kirkpatrick
Information Technology Services Division
Montana Department of Administration
Weinstein Bldg., Suite 2
101 North Rodney
Helena, MT 59601
(406) 444-9013
skirkpatrick@mt.gov

US Forest Service

Kim Foiles, Computer Scientist
US Forest Service Region 1
Federal Building, 200 East Broadway
P.O. Box 7669

Missoula, MT 59807
406-329-3546 Fax: 406-329-3359
kfoiles@fs.fed.us

US Geological Survey Liaison

Lance Clampitt
Geospatial Liaison for Montana
U.S. Geological Survey
USGS Northern Rocky Mountain Science Center
2327 University Way, Suite 2
Bozeman, MT 59715
406-994-6919
lscampitt@usgs.gov
http://liaisons.usgs.gov/geospatial/Montana/

Environmental Protection Agency

Paul Riederer, GIS Coordinator
(303) 312-6635
riederer.paul@epa.gov
Paul Riederer, IRM Branch Chief
(303) 312-6635
riederer.paul@epa.gov
Denver, CO

US Census Bureau

Jim Castagneri, Mark Hellfritz, Chuck Rose, Katy Rossiter, Jan Jacobs
Denver Regional Office
6900 W. Jefferson Avenue, Ste. 100
Denver, CO. 80235-2032
(303) 264-0202 or 1-800-852-6159
denver.regional.office@census.gov

US Army Corps of Engineers

David Fox
Seattle District Office
(206) 764-6083
david.f.fox@nws02.usace.army.mil

Jon Kragt
Omaha District Office

(402) 221-4614
jon.e.kragt@nwo02.usace.army.mil

Farm Service Agency

Danielle Price, GIS State Specialist
Gallatin County Farm Service Agency
3710 Fallon St
Bozeman, MT 59718-1911
(406) 587-6940
danielle.price@mt.usda.gov

Natural Resources Conservation Service

Tom Potter
State GIS Contact
thomas.potter@mt.usda.gov
(406) 587-6968

Bureau of Land Management - GIS/mapping/remote sensing

Corla Debar (mapping)
(406) 896-5146
corla_debar@blm.gov
Kathie Jewell (GIS/remote sensing)
(406) 896-5144
kathie_jewell@blm.gov

Bureau of Land Management - Geographic Coordinate Data Base

Mike Birtles, GCDB Team Lead
Montana State Office
5001 Southgate Drive (MT 926)
Billings, MT 59101
(406) 896-5363
Mike_Birtles@blm.gov

Appendix C: Web Resources

Data Sources and Web Mapping Applications
http://sierrafire.cr.usgs.gov/fire_gis_webpage.htm

ESRI Mapping Center

http://mappingcenter.esri.com/index.cfm?fa=resources.cartoFavorites

Internet Resources for Cartographic Information, Maps, and Spatial Data
http://www2.lib.udel.edu/subj/maps/internet/

Geospatial Data, Michigan State University
http://www.rsgis.msu.edu/resources/gist/links.php

The world's top Geographic Information Systems **websites**

http://allwebhunt.com/dir-wiki.cfm/Top/Science/Social_Sciences/Geography/Geographic_Information_Systems

Appendix F: Acronyms and Abbreviations

National Response Framework Acronyms
https://esw.fema.net/esw/ORR/sig/dmse_saver/FEMA%20Geospatial%20SOP%20Library/GIS_Strategic_Plan/National%20Response%20Framework%20Acronyms.mht

DHS GeoCONOPS Acronyms and Abbreviations
Appendix G Acronyms, pages 155 – 159, Version 2.0, July 2010

Appendix G: Memoranda of Understanding (MOUs)

National Response Framework
http://www.fema.gov/emergency/nrf/

DHS/DOI MOU, signed March 2006

Memorandum of Understanding
Between the
Department of the Interior
Acting Through the U.S. Geological Survey
and the
Department of Homeland Security
Pertaining to
Geospatial Information and Remote Sensing
for Homeland Security

PURPOSE

This Memorandum of Understanding (MOU) describes the partnership and responsibilities of the participating organizations to create and maintain geospatial information needed to support homeland security for the Nation.

The participating organizations are the United States Geological Survey (USGS), a bureau of the Department of the Interior (DOI), and the Department of Homeland Security (DHS). This MOU describes how these organizations will cooperate to create and provide a compatible, complementary, nationally consistent set of geospatial and remote sensing data and information requirements to meet the nation's homeland security needs. The intersection of DOI's mission for mapping and remote sensing, conducted through the USGS, and DHS' homeland security missions, makes the DOI-DHS partnership critical to providing comprehensive geospatial information in support of Federal, State, tribal and local organizations responsible for homeland security missions.

AUTHORITIES

This MOU applies to geospatial information and remote sensing for homeland security covering the United States, including U.S. territories. The provisions of the MOU are in accordance with the Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135, the Intelligence Reform and Terrorism Prevention Act of 2004, Pub. L. 108-458, 118 Stat. 3638, HSPD-7, OMB Circulars A-16, A-25, A-119, and A-130, and Executive Order 12906.

The USGS' authorities for providing emergency geospatial information are also set forth in the National Response Plan, an implementation of the Robert T. Stafford Disaster Relief and

FEMA/USGS MOU

MEMORANDUM OF UNDERSTANDING
BETWEEN THE

THE DEPARTMENT OF HOMELAND SECURITY'S
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

AND THE
DEPARTMENT OF THE INTERIOR'S
U.S. GEOLOGICAL SURVEY (USGS)

1. Purpose

The purpose of this Memorandum of Understanding (MOU) is to establish a formal working relationship between the U.S. Geological Survey (USGS) and the Federal Emergency Management Agency (FEMA). This MOU replaces the MOU between USGS and FEMA establishing the framework for the pursuit of activities of mutual interest dated December 13, 2000. It does not supersede any existing MOU presently established between subservient regional, area, or program offices of the two agencies.

2. Background

2.1. Federal Emergency Management Agency

FEMA's mission is to support U.S. citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards.

FEMA's responsibilities in the areas of hazard mitigation and emergency management include, but are not limited to, mitigation, preparedness, response, and recovery functions. Among its principal functions and activities, FEMA establishes policy for and coordinates civil defense and civil emergency and disaster planning of all Executive Agencies; assists State and local governments in the coordination of mitigation, preparedness, response, and recovery activities; develops and executes programs and policies for fire prevention and control; manages the National Earthquake Hazard Reduction Program and the National Flood Insurance Program; and serves as the coordinator of all Federal Agencies and Departments responsible for emergency assistance.

FEMA was established by Reorganization Plan No. 3 of 1978 and placed into effect by Executive Orders 12127 of March 31, 1979 (44 Federal Register 19367) and 12148 of July 20, 1979 (Federal Register 43239). On March 1, 2003, the Federal Emergency Management Agency (FEMA) became part of the U.S. Department of Homeland Security (DHS).

2.2. U.S. Geological Survey

The USGS mission provides for "The classification of the public lands and the examination of the geological structure, mineral resources, and products of the National Domain." Among its broad responsibilities and efforts are identification, assessment, and monitoring of potentially hazardous areas; development of capabilities to predict the time, place, and the severity of hazardous geologic, hydrometeorologic, biologic, and chemical conditions or events; and dissemination of the findings and their implications, including the provision of technical and scientific advice to public officials. The USGS also maintains Bureau-wide efforts intended to educate the public about natural hazards. The USGS serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

The USGS has delegated Federal responsibility to provide notification and warnings for earthquakes, volcanoes, and landslides. In addition, USGS data-collection networks provide real-time information needed by other agencies to issue forecasts and warnings related to a variety of hazards. For example, the USGS seismic network support the National Oceanic and Atmospheric Administration (NOAA) tsunami warnings; the USGS streamgage network supports NOAA flood forecasts; the USGS geomagnetic observations support solar storm forecasts; USGS biologic monitoring of wildlife diseases enhances assessments of potential human pathogens such as the H1NI versus; and USGS geospatial and remotely-sensed information supports a broad spectrum of disaster-response activities and operations from an "all-hazards" perspective.

The USGS was established by the Organic Act of March 3, 1879 (20 Stat. 394, 43 U.S.C. 31 et seq.).

3. Cooperation and Coordination

3.1. General

In light of the respective missions and the common goal to reduce the loss of life and property from natural disasters, the FEMA and the USGS recognize the need to maintain coordination at a level that ensures efficient use of organizational resources, consistent with the principles of each Agency. FEMA and USGS cooperation may include USGS participation in mitigation and emergency response activities related to flood, earthquake, landslide, volcano and other hazards. Additionally, FEMA may participate in USGS programs, initiatives, and activities. Overall, the

FEMA and the USGS agree, to the extent set forth below, to coordinate their activities and programs as they relate to areas such as:

- Hazard and Risk Assessments
- Mitigation and Risk Reduction
- Preparedness
- Response and Recovery
- Land-Use Planning
- Economic Development

3.2. Coordination of Specific Activities

The FEMA and the USGS agree to encourage, coordinate, and enhance ongoing relationships between both entities and to hold periodic partnership meetings both at the national and regional levels. Efforts in this area will focus on, but are not limited to, identifying/assessing natural hazards and associated risks, and the shared development of risk-assessment models and hazards information, particularly as they relate to FEMA's mission.

As the need is identified, specific annexes to this MOU will be developed to ensure that mutual responsibilities and concerns are addressed.

3.2.2 Priority areas for FEMA and USGS coordination and cooperation include:

Operational Response - Develop policies and procedures that establish working relationships to ensure an effective, coordinated response to a potential or existing geologic or hydrologic hazard.

Prediction/Warning –Working together and with other agencies, such as NOAA's National Weather Service, develop policies and procedures for early and coordinated dissemination of information to appropriate Federal, State, and local officials related to the potential occurrence of a natural hazard.

Public Information and Education - Develop policies and procedures to produce, disseminate, and implement programs that provide the general public with information to use in making decisions on how to prepare for and respond to a prediction, warning, or occurrence of a geologic or hydrologic hazard.

Long-term Mitigation - Develop policies and procedures that support hazard assessments and mitigation techniques. Develop mechanisms for acquiring, applying and transferring information related to hazard assessments and mitigation techniques; assisting in their implementation and use; evaluating their effectiveness; and, recommending improvements and alternative techniques for implementation of mitigation measures.

Data collection and preservation - Develop policies, technical methodalogies, and administratve proceduress to acquire, assess, disseminate, or preserve information or information content that can be derived from the study of geologic, hydrometeorologic, or biologic, conditions before, during, or after an imminent or declared disaster or emergency.

3.2.3 Areas of Existing Relationships:

This MOU is intended to promote and vitalize collaboration between FEMA and USGS and new annexes and agency agreements are envisioned to address specific areas. However, where existing arrangements and relationships have been successful, they are expected to continue in force. Areas where relationship already exists include:

Technical Assistance -FEMA and USGS agree to provide technical assistance to each other on a mutually agreeable basis. Requests for technical assistance may be initiated either at the headquarters or field levels.
Geospatial Data - FEMA and USGS agree to continue the coordination of geospatial data development and distribution.
Training and Education - FEMA and USGS agree to coordinate, and where possible, share, training and educational programs.

4. Financial Vehicles

4. 1 Funding

Cooperative activities under this MOU shall be subject to the availability of funds and/or resources. This MOU shall not be construed to obligate any particular expenditure or commitment of funds and/or resources. Funds and/or resources may be provided by either party to the other party to support activities under this MOU when authorized by statute, for example, Section 402 of the Stafford Act, 42 U.S.C. § 5170a, or the Economy Act, 31 U.S.C. § 1535, and when consistent with applicable regulations.

Either agency may request services under this MOU on a reimbursable or non-reimbursable basis. FEMA is precluded from funding those activities that are otherwise the role and responsibility of the USGS and/or other agencies under separate authorities. FEMA may provide funds through Mission Assignments and/or Interagency Agreements (IAAs). A Mission Assignment may be used in the early stages of a declared major disaster to expedite federal efforts. Pre-Scripted Mission Assignments (PSMAs) will be developed by the USGS and FEMA will be added to this MOU as an annex as they are finalized in coordination with FEMA headquarters. An example PSMA is included as Exhibit 1. An IAA is appropriate for activities that extend beyond the initial response phase, and is beneficial in providing a more detailed scope of work once the initial period for the Mission Assignment is complete. See 44 C.R.F. 206.208(d). An example IAA is provided as Exhibit II. However, if a Federal standard interagency form (URL: http://www.fms.treas.gov/finstandard/reference.html) is developed, that form may be used.

4.2 Points of Contact

Each agency shall identify an individual representative to serve as a point of contact for matters relevant to this MOU.

4.3 Annexes

Activities under this MOU shall be implemented through annexes that describe specific activities, programs, and projects. These annexes shall be incorporated into this MOU when signed by the appropriate regional or program officials and registered with the contact representatives identified below

4.4 Notification

Each agency will endeavor to inform its employees and constituents of this MOU through its newsletters, internet and intranet websites, and other communications methods and tools.

4.5 Authorities

The authorities of the USGS to enter into this MOU include:

- Public Law 99-591 provides in Fiscal Year 1997 and thereafter that USGS has permanent authority to "prosecute projects in cooperation with other agencies, Federal, State and private" (43 U.S.C. 36c).
- The USGS Organic Act of March 3, 1879, as amended (43 U.S.C. 31 et seq.).

- Public Law 95-124, the National Earthquake Hazards Reduction Act of 1977, as amended (42 U.S.C. 7701 et seq.). National Response Plan (NRP), December 5, 2004.
- Departmental Manual (900 DM 5), Department of the Interior, *National Response Plan (NRP) Coordination*, January 4, 2006.
- National Response Framework, March 2008.

- Standard Operating Procedure for National Response Framework Activations, *Emergency Support Function #11 – Natural and Cultural Resources and Historic Properties Protection*, January 29, 2008.
- Public Law 102-285, the National Geologic Mapping Act of 1992.
- Executive Order 12906, *Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure*, April 13, 1994.

The authorities of FEMA to enter into this MOU include:

- The Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended (42 U.S.C. 5121, et seq., 42 U.S.C. 4001, et seq.).
- The National Flood Insurance Reform Act of 1968, as amended (42 U.S.C. 4001 et seq.).
- Public Law 95-124, the National Earthquake Hazards Reduction Act of 1977, as amended (42 U.S.C. 7701 et seq.).
- Public Law 93-498, The Federal Fire Prevention and Control Act of 1974, as amended (15 U.S.C. Section 2201, et seq.
- Homeland Security Act of 2002, Public Law 107-296 (6 U.S.C. 101 *et seq.*), November 25, 2002.

- Homeland Security Presidential Directive 5 (HSPD-5), *Management of Domestic Incidents*, February 28, 2003.
- Homeland Security Presidential Directive 8 (HSPD-8), *National Preparedness*, December 17, 2003.
- National Incident Management System (NIMS), March 1, 2004.
- National Response Plan (NRP), December 5, 2004.
- National Response Framework, March 2008.
- Executive Order 12906, *Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure*, April 13, 1994.

5. Duration and Termination

This MOU becomes effective on the date of execution, and shall remain in effect for 5 years unless terminated by providing 30 days advance written notification by either agency to the other. This MOU may be amended or extended by written mutual agreements. This MOU supersedes all previous National MOUs between FEMA and USGS.

(signed)	*(signed)*
Marcia K. McNutt	W. Craig Fugate
Director	Director
U.S. Geological Survey	Federal Emergency Management Agency
_____	_____
Date	Date

Exhibit 1: Example of a pre-scripted mission assignment (PSMA) for data collection and preservation.

Title: ESF #5 USGS, High-Water Marks (FOS/DFA)

Block II – Assistance Requested:
Request United States Geological Survey (USGS) locate and flag high-water marks to support the functions of ESF #5 in support of disaster operations in response to [*incident/DR# and state*].

Block IV – Statement of Work:
As directed by and in coordination with FEMA, the USGS will deploy personnel to flooded areas to locate and flag the High Water Marks (HWMs), document the location (latitude/longitude) and quality of each mark, photograph each flagged mark, and deliver the HWM data in a digital format.

USGS personnel will identify HWMs and rate the quality of those marks per USGS standard protocols. A description of each high-water mark will be tabulated including quality of the mark, type of mark, and location information of the mark. USGS HWM flagging will be performed consistent with FEMA protocols (0.025 feet vertical accuracy). Personnel will flag marks using standard USGS techniques such as applying USGS HWM tablets to trees/telephone poles/other wood structures, driving survey stakes into the ground where marks are left on ground surfaces, and applying survey paint on concrete/steel structures. USGS will document, for each flagged HWM: a general geographic description of the mark referenced to local landmarks, the latitude/longitude of the mark, the quality of the mark, and any pertinent field notes concerning the mark. Digital photographs will be taken of each mark. Digital files containing these data will be delivered to FEMA. Refer to the FEMA Region V/USGS Midwest Area MOU dated August 18, 2010 for additional information for the declared event.

This activation may include overtime and administrative costs.

Equipment purchases are not authorized under this Mission Assignment.

MA task orders will be issued for specific personnel requirements, location(s), dates, and duration of assignment(s).

Agency POC: _____, phone _____.

Total Cost Estimate: $

Based on:
Overtime: up to 44 hours per week, 12 hours/7 days, less regular 40-hour week

Lodging and per diem at _____ per day for _____ days = _____

Travel: $_____ per person x # = $_____

Transportation at Duty Station: $_____

Note: Total estimated costs are for planning purposes only. Federal agencies will be reimbursed ONLY for actual costs incurred. The mission-assigned agency is responsible for ensuring that the activity was properly authorized, goods were received, and services were provided. The agency must also ensure that the costs are reasonable and supported by documentation maintained by the respective agencies.

ADDITIONAL INFORMATION:

The purpose of this effort is to flag and record critical HWM data from which the extent of flood inundation can determined ~~that can accurately provide the extent of flood inundation~~ so that critical analysis can be performed immediately to support response, recovery, and mitigation efforts. The immediate use of this data is to protect life and property – in the immediate aftermath of flooding, inundated areas contain dangers including structurally compromised buildings, contamination from chemicals and human and animal waste, and compromised electrical and gas utilities. The HWM data can be overlain on maps to quickly identify the inundated areas to protect responders, damage assessment teams, and the public from those dangers and to take quick action to remediate property damage in those areas.

HWM data can also be used in the mid- to long-term for purposes of establishing a recurrence interval for this event and for assessing immediate mitigation options. Settlement of flood insurance claims can be greatly accelerated if the extent and depth of flooding is mapped and referenced to the addresses of flood victims.

It is imperative to identify and flag HWMs immediately following the recession of flood peaks as these data are highly perishable – HWMs are easily degraded and destroyed by rain, other environmental factors, and human activities. Once HWM data are lost it is not possible to

Appendix J: DHS GeoCONOPS

DHS GeoCONOPS, ver 2.0, July 2010

DHS_GeoCONOPS_v2_0_8_5x11.pdf