

Guidance on Resource Management Dashboards



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Photo courtesy of the Federal Emergency Management Agency

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Link to Interactive Guidance Tool - <http://arcg.is/0rf1TX>

1 Introduction

The purpose of this Guidance is to provide a consistent framework and functional specifications for developing and using location-enabled dashboard technology to support resource management. The Guidance on Resource Management (RM) Dashboards was designed to support all public safety disciplines and all types & scales of incidents. Example RM Dashboards are provided for several disciplines to illustrate how the consistent framework can be applied to different missions. Please be sure to use the interactive web-based version of this Guidance available at <http://arcgis.com/Orf1TX>.

This Guidance was developed with input from local first responders and other local, state, tribal, and federal public safety stakeholders. NAFSA Foundation is grateful for the time and expertise provided by first responders and public safety stakeholders from the following agencies and organizations:

- International Association of Fire Chiefs
- National Emergency Management Association/Emergency Management Assistance Compact
- International Association of Emergency Managers
- California Governor's Office of Emergency Services
- New Hampshire National Guard
- Alabama National Guard
- City of Nashua, NH
- Virginia Beach Fire Department / Virginia Urban Search & Rescue Task Force 2
- Illinois Mutual Aid Box Alarm System
- Texas Division of Emergency Management
- Florida Division of Emergency Management
- Federal Emergency Management Agency
- US Forest Service

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Glossary of Key Terms

- **Resource Management:** Managing resources to meet incident needs. Resources refers to: personnel, teams, task forces, facilities, equipment, and/or supplies.
- **Location-enabled Technology:** Technology-based tools that use location-based data or maps. Commonly referred to as: geospatial, GIS, or geographic information systems.
- **Data Analysis:** Process of inspecting, transforming, and modeling data to discover useful and actionable information.
- **Situational Awareness:** Being aware of the conditions, variables, and other events present in a defined area.

2 Decision Support Tools for Resource Management

Q: Why use technology for incident level resource management?

A: Location-enabled technology supports the use of real-time data analysis to inform decision making when managing resources in an event.

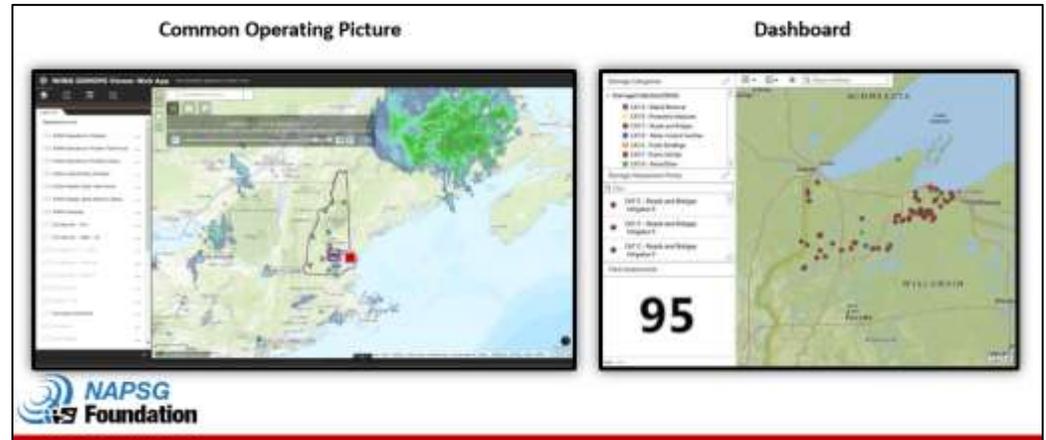
The use of data and analysis-driven tools allows you to make more informed decisions about how you:

- Pre-assign resources to specific tasks and areas in anticipation of incident response
- Allocate and assign your resources and personnel during operations
- Assess unmet resource and personnel needs using core situational awareness information on the incident
- Determine when resources need to be requested through mutual aid and how to best assign mutual aid resources

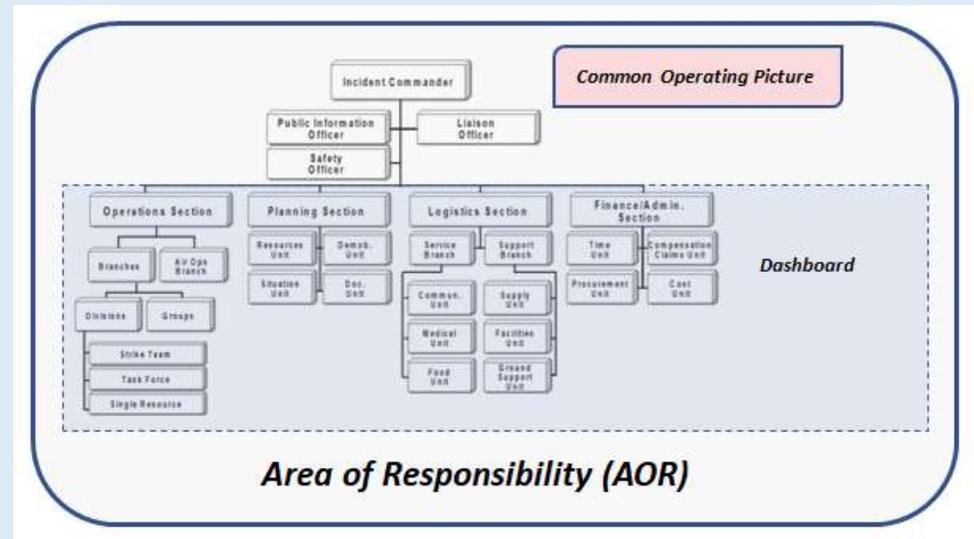
RM Dashboards are intended to be developed and used by agencies for the management of their own resources. They can be extended to support multiple agencies that have mutual aid agreements and elect to provide visibility on each other's resources through a dashboard.

COPs are commonly referred to as viewers or User Defined Operating Pictures (UDOPs). While COPs, viewers, and UDOPs are not the same, for the purposes of this guidance they are referred to generally as COPs.

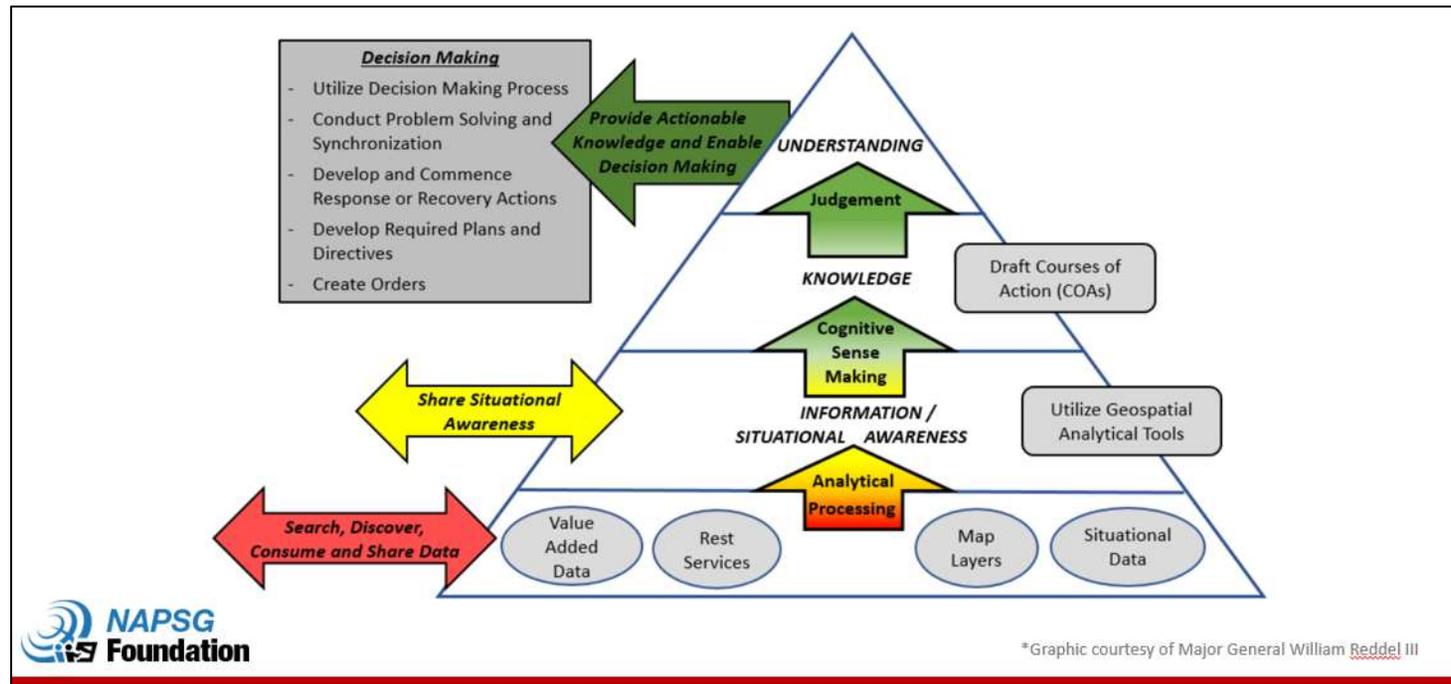
Both COPs and Dashboards can be tailored to meet the unique requirements of any specific section or role in the Incident Command System. COPs are most commonly designed to support a higher-level of situational awareness. Dashboards tend to be more granular and support sections and operators. However, dashboards can be tailored to support mission specific decision at the Command level as well.



Decision Support Tools in the Incident Command System (ICS)



In the ICS, the Resources Unit is within the Planning Section. The Resources Unit has the responsibility to evaluate resources currently committed to an incident, the impact that additional responding resources will have on the incident, and anticipated resource needs. This Unit is also responsible for tracking the status of resources supporting the incident. As such, RM Dashboards are most commonly used by staff in the Planning Section and Resource Unit.



The development and use of technology to support resource management is guided by knowledge management and the path to decision making. Applying location-enabled technology for resource management is an art in creating actionable awareness and knowledge.

1. It All Begins with Data

The pathway to creating actionable knowledge begins with the collection of data. Data can be in multiple formats: REST Services, map layers, field collected data, and situational data. When available, dynamic data should be used instead of static data. This allows decision makers to use the most current information. REST Services are an example of dynamic or live data feeds. Data intended for use in RM Dashboards should be provided in interoperable formats, especially those that are dynamic or live. Discuss with your GIS staff the options for using and providing dynamic and interoperable data feeds in your RM Dashboard.

2. Developing Information for Situational Awareness

Data once analyzed becomes information. The goal is to take data, analyze it, turn it into information, and develop sharable situational awareness.

3. Developing Knowledge

Knowledge can be formed when given adequate information, incorporating experience, and/or when considering view points from a variety of perspectives.

4. Decision Making

The final phase is the process to obtain understanding and enable decision making. Problem solving and synchronization are also critical parts of the decision-making process.

4 Basics of Resource Management Dashboards

Below is an example of a basic dashboard used to support resource management and mission operations for Search & Rescue (SAR) in a recent event.

Data and information that populate an RM Dashboard can come from a multitude of sources. They often include data coming-in from the responders (or relevant staff) through field data collection applications and other reporting mechanisms.

A location-enabled RM Dashboard is a tool that informs decision making by presenting results on the following:

1. Real-time analysis on the status of resources

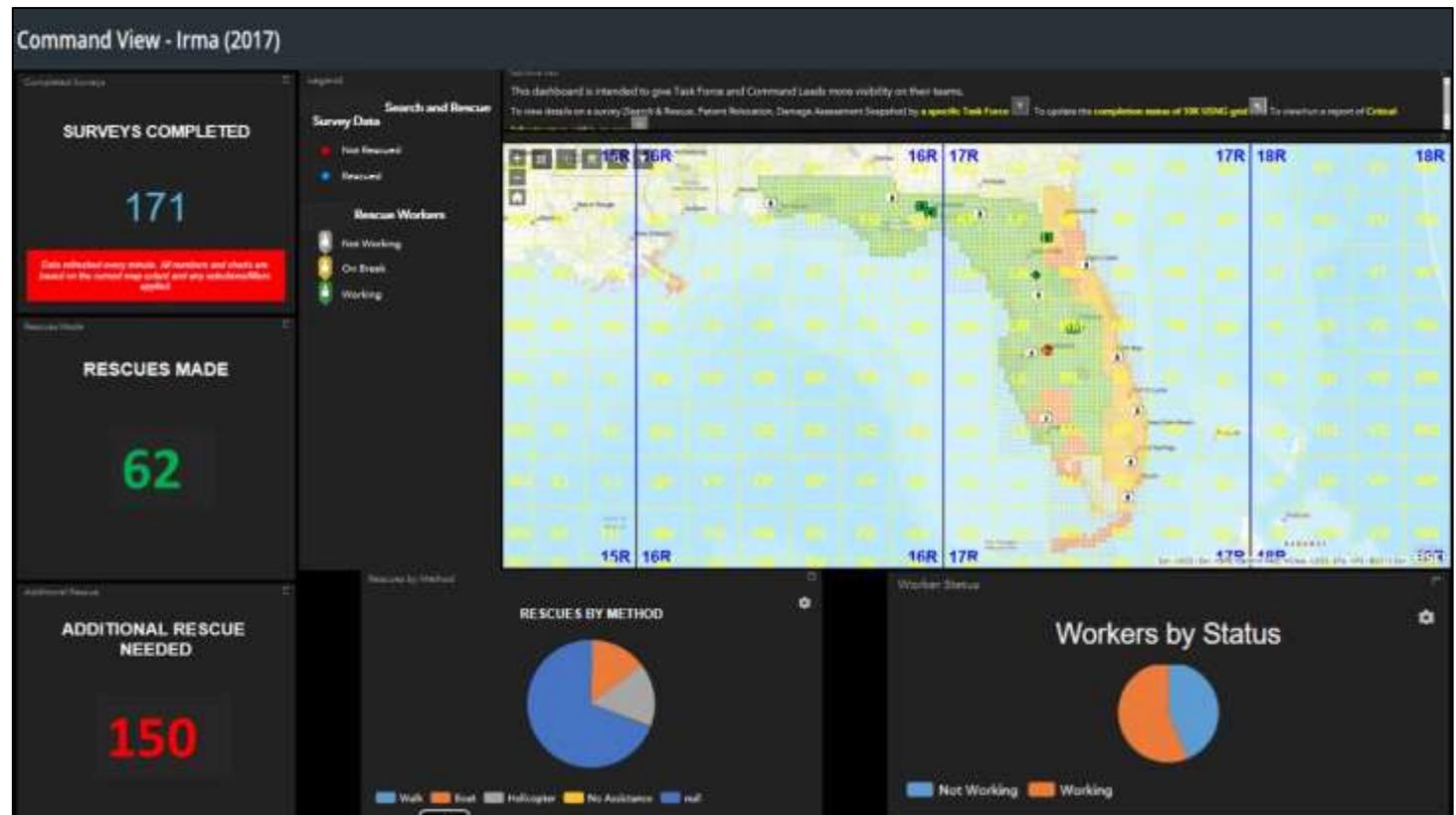
- Example: Status of Rescue Workers on the map and real-time analysis in a pie chart

2. Status of mission operations

- Example: US National Grid (USNG) areas cleared of SAR requests appear in **Green** on the map. Areas in **Orange** and **Red** are still in need of SAR.

3. Unmet operational needs and their location

- Example: Real-time analysis result on the number of Additional Rescues Needed



4. Basic situational awareness information

- This can include information such as: event forecast, area of impact, and [critical infrastructure](#) in and around the area of impact
- Situational Awareness information in an RM Dashboard should be limited to the most critical information for the specific mission it supports. It does not replace the COP.
- Example: Fueling stations are visible and are [symbolized](#) to indicate their open/closed status so that leaders know where to send their teams for fuel when needed

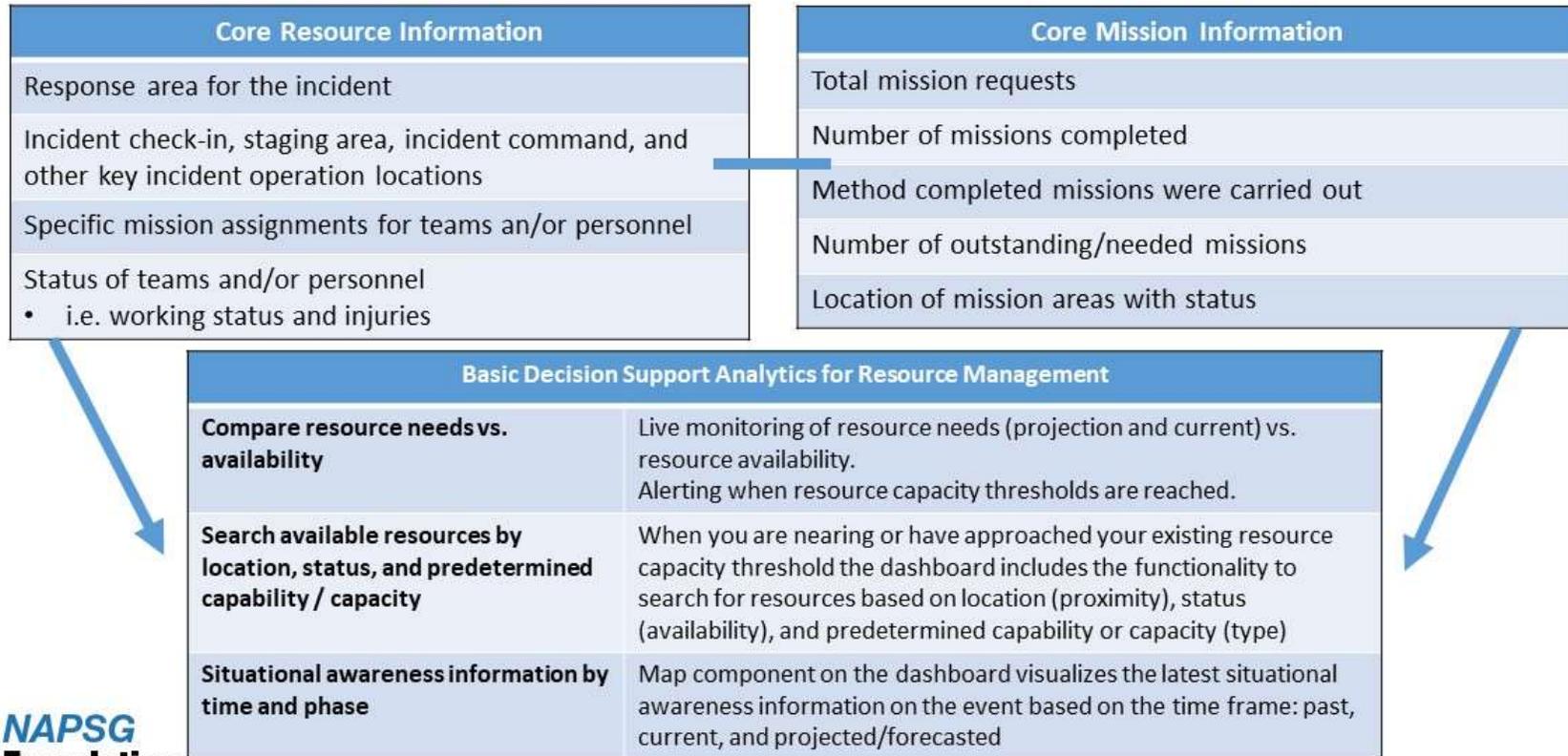
5 Information Needs for Resource Management Dashboards

When assessing what information is needed to include in an RM Dashboard, **consider these information requirements as a starting point.**

Start with basic information requirements about your agency's resources, missions, and the types of incidents you commonly support.

Next assess the types of analysis is needed in managing your agency's resources.

Keep in mind that incident-level RM Dashboards are not intended to replace higher level situational awareness applications such as COPs. As such, RM Dashboards include *only* the most critical situational awareness data layers relevant to first responders on the ground.



6 Metrics for Resource Management Dashboards

Defining resource management metrics is a key first step in developing and using location-enabled RM Dashboards. Metrics are unique to the types of missions an agency carries out and the types of resources that they manage. Below is an example of an RM Dashboard with metrics visualized to support mass care operations and resource management in an earthquake event.

1. Define the top level for the entire mission

- **Metric:** Total number of people needing shelter
- **Data & Analysis:** Automated analysis of the total population in the most affected areas - visualized as red and orange areas on the map
- Shelter capacity needs could also include specific metrics around the shelter needs for access and functional populations, populations requiring pet friendly shelters, etc.

2. Indicate progress in resourcing to meet the mission requirement using a gauge

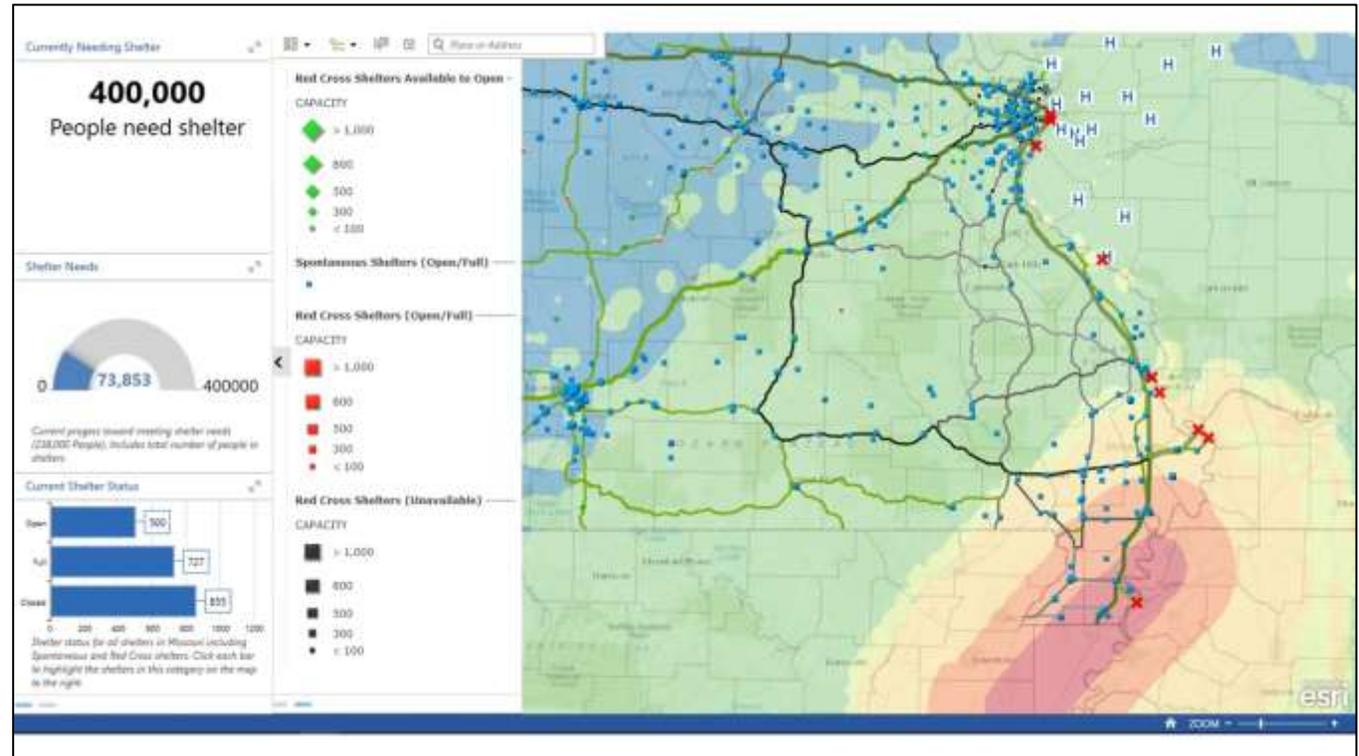
- **Metric:** Total capacity of open shelters in the area vs. total number of people needing shelter
- **Data & Analysis:** Automated analysis of the total capacity of open shelters from the live shelter data feed included on map

3. Bar chart indicating status of total resources

- **Metric:** Number of shelters open, full, and closed
- **Data & Analysis:** Automated analysis of the total number of shelters in the area based on status

4. Map [symbols](#) indicating resource type, status, and capacity

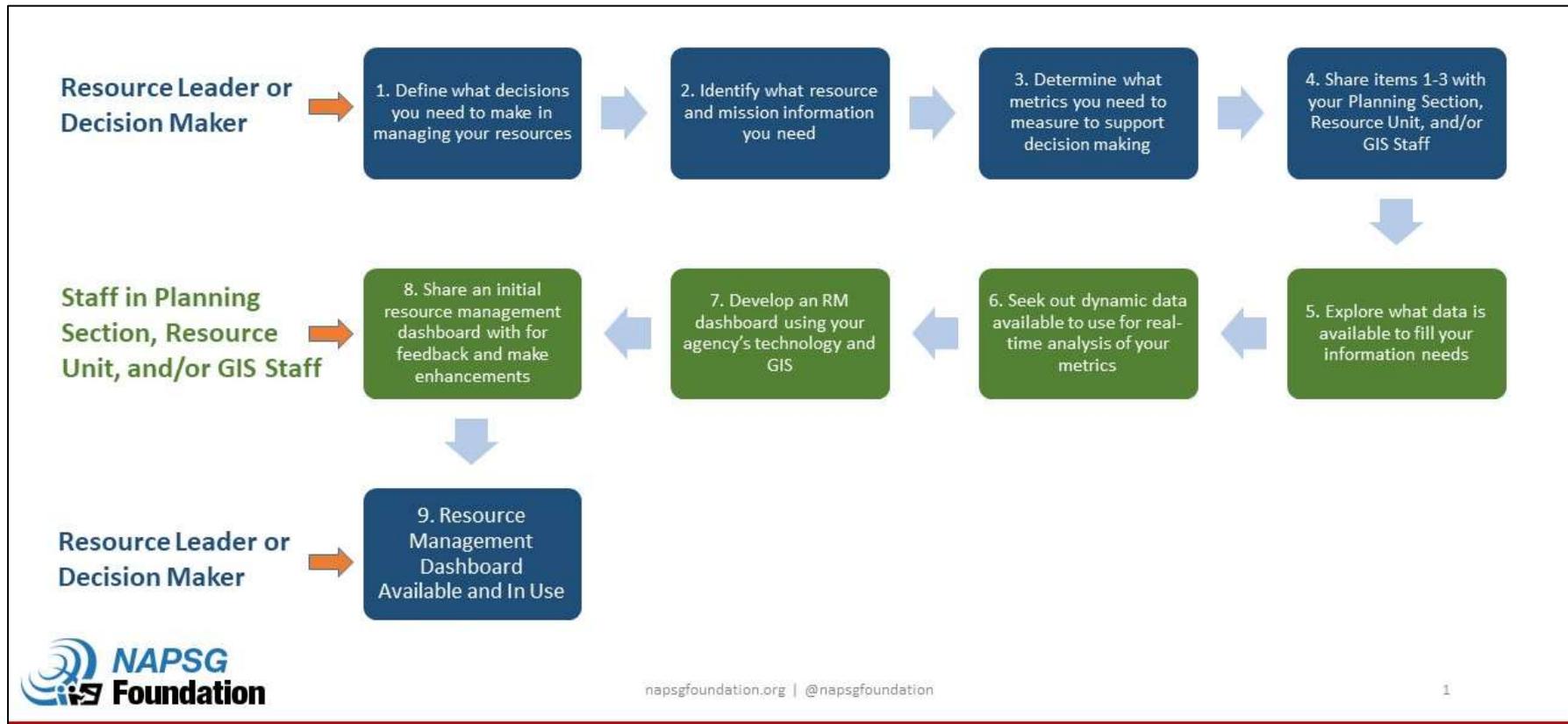
- **Metric:** Location of shelters by type and their capacity and status
- **Data:** Shelter data feed based on location of all types of shelters using symbols to visualize status and capacity on the map



7 Steps to Build a Resource Management Dashboard

Multiple location-enabled or GIS software can be used to build RM Dashboards. Technology commonly used by the public safety community for this purpose include Web App Builder and Operations Dashboard. Web-enabled open source GIS platforms also offer comparable functionality and templates that ease local data integration and configuration.

Follow the steps below to get starting in building an RM Dashboard for your agency and mission requirements.



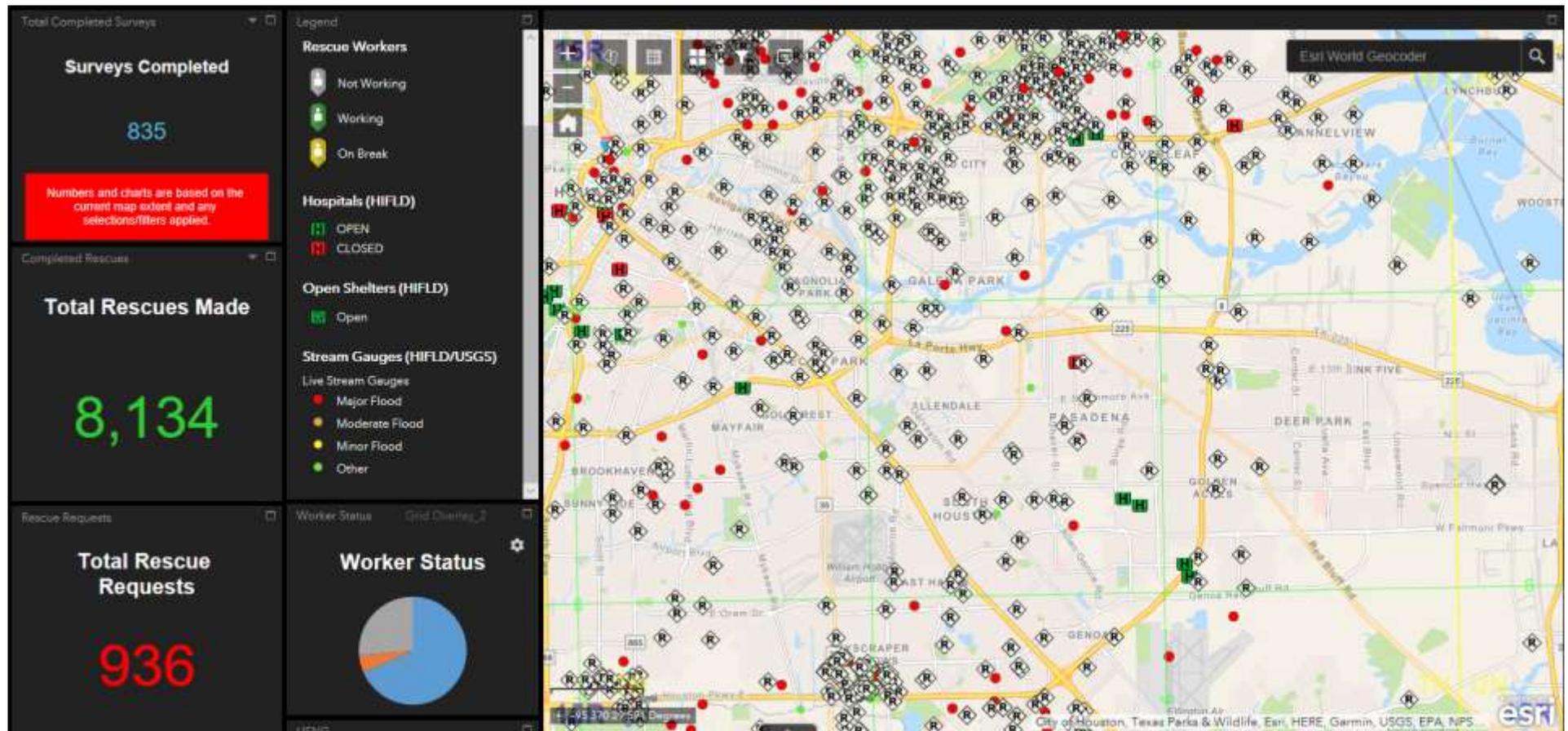
For Agencies that do not have dedicated GIS Staff: Most of the GIS technology solutions used for RM Dashboards are template-based. There are multiple mechanisms by which agencies without dedicated GIS Staff can acquire the technical support to develop and configure an RM Dashboard for their mission(s):

- Request support from their jurisdictional GIS or IT department
- Procure contracted GIS support
- Partner with a local University with a GIS department or program, and seek support from a student intern
- Seek grant funding to hire GIS support through the appropriate mechanisms in your agency or jurisdiction

8 Explore a Model Resource Management Dashboard

This is a model RM Dashboard developed to support the Search and Rescue mission that you can interact with to get a feel for a live example.

This web-based RM Dashboard that can be explored online at <http://arcg.is/2wnBQ7x>.



9 Technical Tutorial on RM Dashboard Development

Step 1 – Review sections 1 through 8 of this Guidance document

Prior to building an RM Dashboard, all staff involved in the process should review sections 1 through 8 of this Guidance document thoroughly.

- **Resource Leaders & Decision Makers** are responsible for determining the requirements based on information needed to drive decision making prior to and during an event.
- **Planning Section, Resource Unit, and/or GIS Staff** should explore what data is available to fulfill the information needs determined by Decision Makers. Following this, they should seek out dynamic data available to use for real-time analysis of the selected metrics.

Step 2 – Developing Your RM Dashboard

The intent of an RM Dashboard is to provide a real-time depiction of the key metrics decision makers need based on their mission requirements.

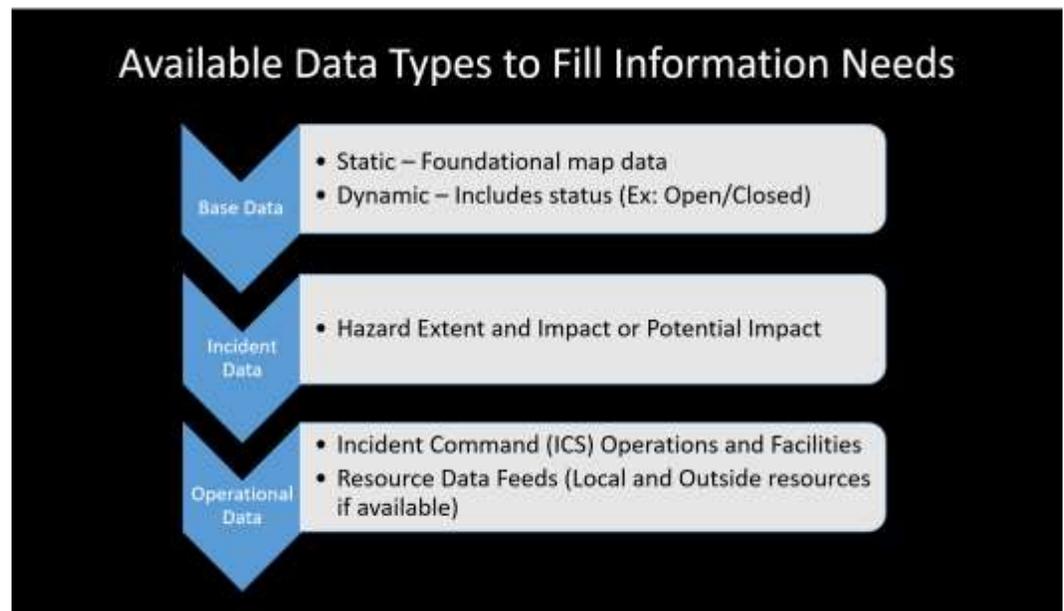
An RM Dashboard presents results of dynamic data analysis through charts, graphics, and interactive maps in formats that ease understanding.

- **Mission Specific** - Personnel, teams, task forces, facilities and equipment
- **Event Driven** - Response to a flood, wildfire, HazMat incident, etc.

Step 3 – Determine What Information and Data to Include

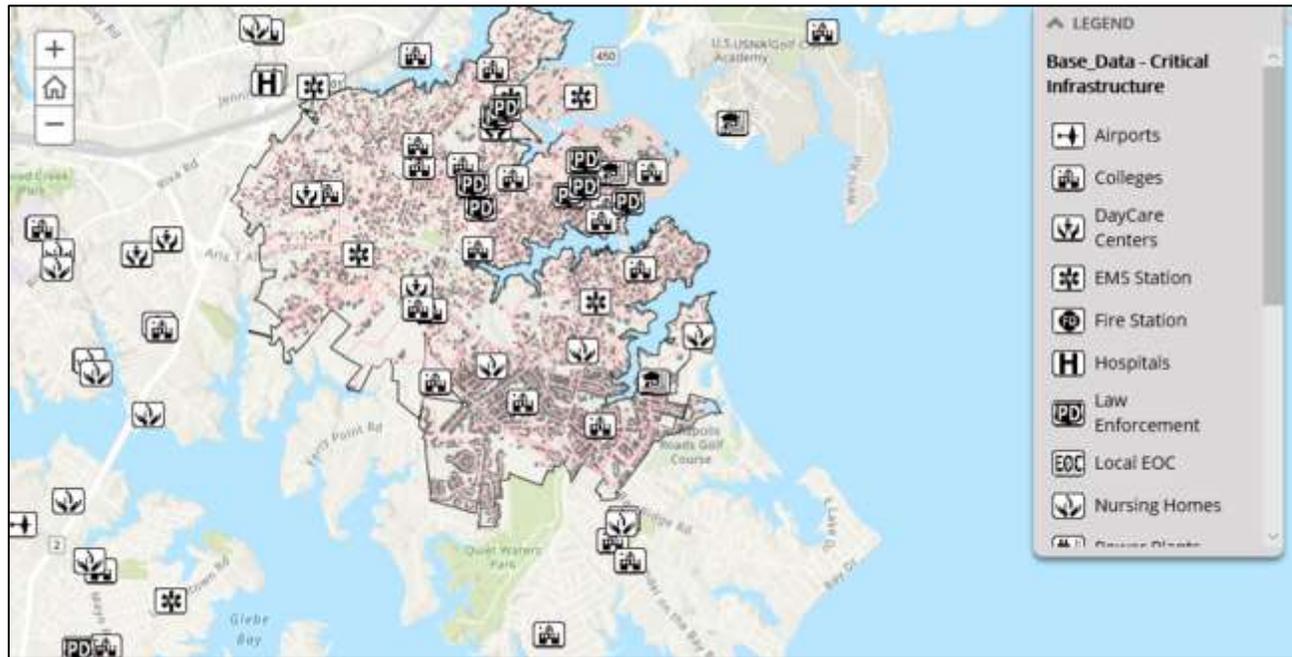
Start with basic information requirements about your agency's resources, missions, and the types of incidents commonly supported.

- **Base Data** - Foundational Data
- **Incident or Event Data** - The specific hazard, potential or actual impact of an event
- **Operational Data** - Related to operations of a specific Emergency Support Function (ESF) in an event



Step 4 – Explore Available Base Data

Base data typically refers to static GIS data layers such as: Imagery, Political Boundaries, Streets, Addresses, Parcels, Critical Infrastructure, Census Data, and hydrography which provide the foundation for our maps. Provided below is an example map that displays some of the base data that may be used in an RM Dashboard.



It is important to note the following:

- States and locals generally have the best available data and are considered the authoritative sources for most base data
- Not all base data is relevant for every mission or hazard
- Example - Relevant infrastructure base data for an RM Dashboard supporting ESF 6 - Mass Care might include only the following:

Hospitals	Dialysis Centers
Urgent Care Facilities	Social Work Services
Assisted Living Facilities	Addiction Services
Pharmacies	In-Patient Mental Health Centers
Physical Therapy Practices	Family Assistance / Reunification
Trauma Centers	Public Schools (Sheltering)

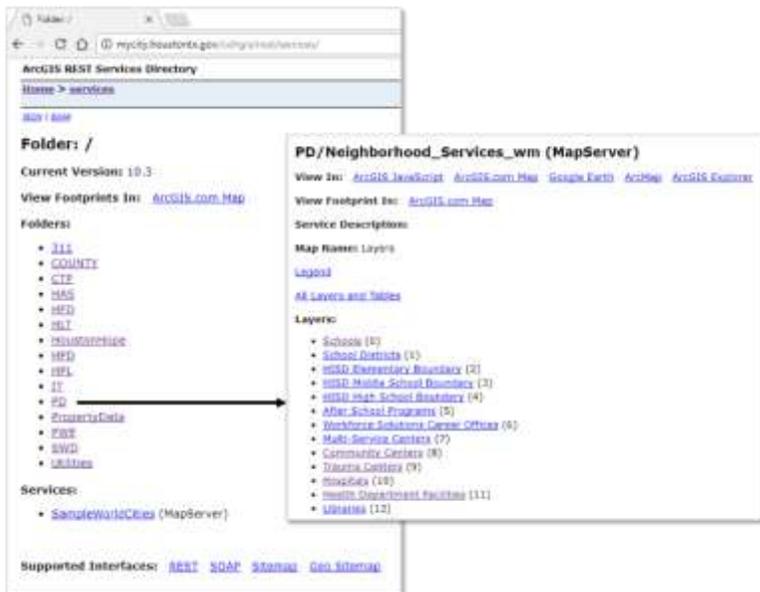
Step 5 – Local Data Authority

GIS Staff - Best available data likely resides on your enterprise database on your internal network. Many jurisdictions are now making their data available in the open on the web for easy public consumption. This is also a great way to pull-in data for neighboring jurisdictions that may be impacted by an event or may be providing support via mutual aid.

Planners/Operators - Anyone can visit an open data site such as this one developed by the City of Houston, explore available data, and download or consume the data directly into their own applications via a REST Service.

Search Data

1. Perform a search for base data relevant to ESF 6.
Copy data source (URL)
Hospitals: <http://bit.ly/2z2YXlh>
2. Explore additional content available



Step 6 – Add Base Data to Your Map

Add datasets found in local open data sites to a Web Map in the ArcGIS Online Platform.

On the right: A web map pre-configured with the locally available base data. We will walk through adding the 'Hospitals' data layer.

1. Log in to your ArcGIS Online Organization and open a new or existing map.
2. 'Add Layer from the Web'
3. Paste URL from Local Open Data Site
4. 'Save' your map

Step 7 – Additional Data Resources to Fill Information Needs

Search other online resources when data requirements cannot be filled locally.

To the right: Access the Homeland Infrastructure Foundation-Level Data (HIFLD) Open Data Site and search for “Urgent Care Facilities”.

Additional Data Resources might include:

- **HIFLD** - National Level Infrastructure geospatial data <https://hifld-geoplatform.opendata.arcgis.com/>
- **Data.GOV** - Datasets shared by 160+ Agencies and Sub-agencies from all levels of Government, NGO's, the Private Sector, Educational Institutions, and numerous other organizations.

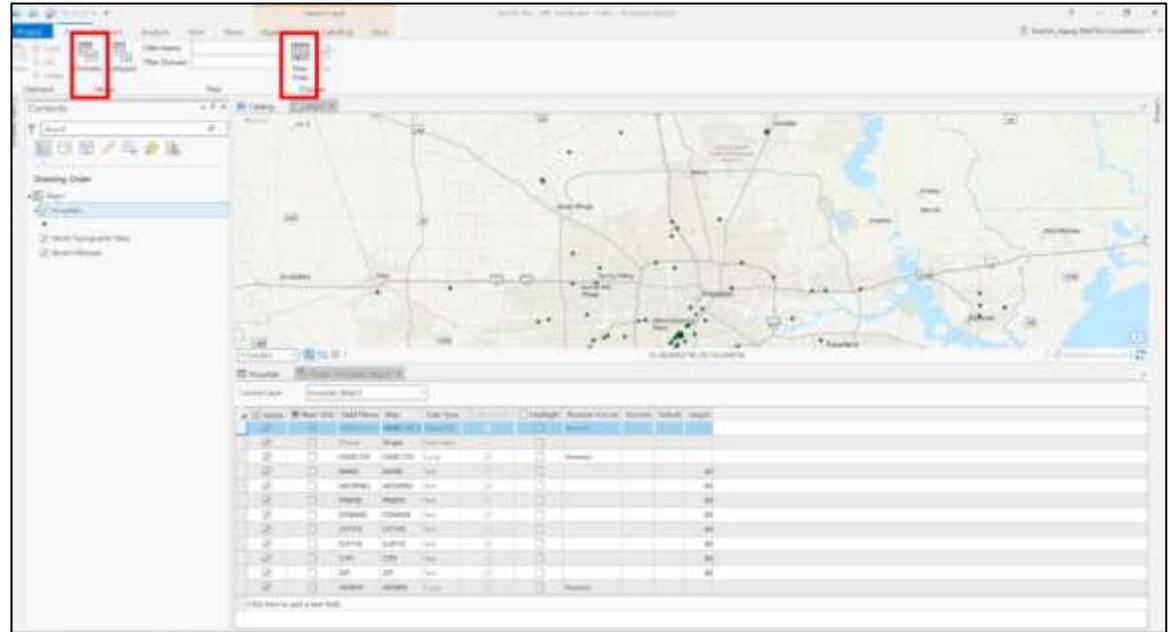


Step 8 – Key Information for Decision Makers

Next, determine what information is needed by your decision makers for each of these data sets and add additional fields to capture this information in ArcGIS Pro.

The below are examples of Mass Care resource locations and the types of status and operational information that might be needed for an ESF-6 Resource Unit.

The table below can be used as a starting off point but depending on your geography and the event, additional information as requested may be needed.



Information Need	Attribute 1	Attribute 2	Attribute 3	Attribute 4	Attribute 5
Hospitals	Status - Open / Closed	Damage Status - No Damage/ Operational - Minor Damage/ Partially Operational	Operating Issues - Electricity - Water / Sanitation - Staffing	Types of Services - Trauma Level - Blood Bank - Morgue - ICU	Capacity / Bed Availability
Urgent Care		- Moderate Damage/ Non-Operational		Capacity / Bed Availability	
Assisted Living Facilities		- Severly Damaged/ Non-Operational			
Pharmacies					
Physical Therapy Practices					
Dialysis Centers					
Social Work Services					
Addiction Services					
In-Patient Mental Health Centers					
Family Assistance / Reunification					

Going back to the Open Data Sites, selecting download will bring the dataset local for editing. Remember to filter if you are using the HIFLD Open Data Site to narrow down the data to make it more manageable. For the Hospitals, we are interested in the City of Houston so we can just hit download the shapefile.

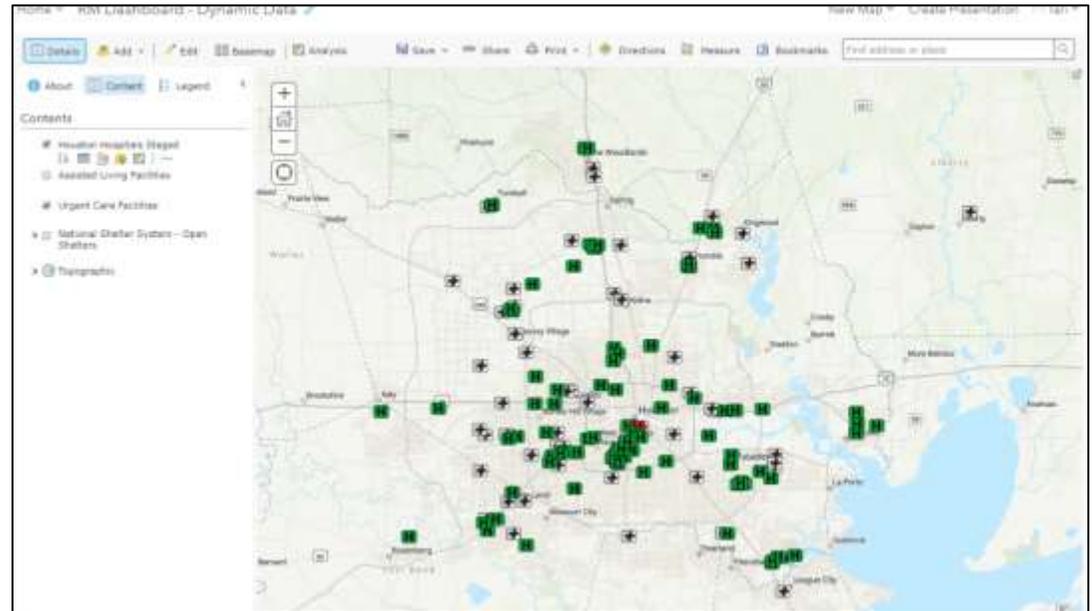
Step 9 – Dynamic Data for Real-Time Analysis

Real-time feeds can provide basic situational awareness information for use in automated and rapid analysis.

Examples include, but are not limited to:

- Weather (i.e. precipitation, storm track, stream gauges, watches/warnings, etc.)
- Road Closures
- Hospital Status
- Shelter Status
- Power Outages
- Evacuation
- Crowdsourced data

Below is a short list of some of the dynamic data feeds available to pull into your RM Dashboard. Keeping in mind, that not all Flood related feeds may be beneficial to the mission your RM Dashboard is configured to support.



Hazard Event	Example Live Feed Data
Flood	Floodplains or HAZUS Runs, SLOSH Model Outputs, Depth Grid Model Outputs, Flood extent, Stream Gauges, Precipitation https://nowcoast.noaa.gov/arcgis/rest/services/nowcoast/
Hurricane	Forecasted Track, Wind Swath, SLOSH Model Outputs, Stream Gauges https://nowcoast.noaa.gov/arcgis/rest/services/nowcoast/
Earthquake	Area of Impact (Shake intensity), Critical Facilities affected, Collapsed Buildings, People needing shelter, Public Alerts (US Geological Survey or USGS) https://earthquake.usgs.gov/arcgis/rest/services/eq
Wildfire	Current Fires, Wildfire Perimeter, Wind speed and direction, Red Flag Warnings (Geospatial Multi-Agency Coordination Group or GeoMAC) https://www.geomac.gov/services.shtml

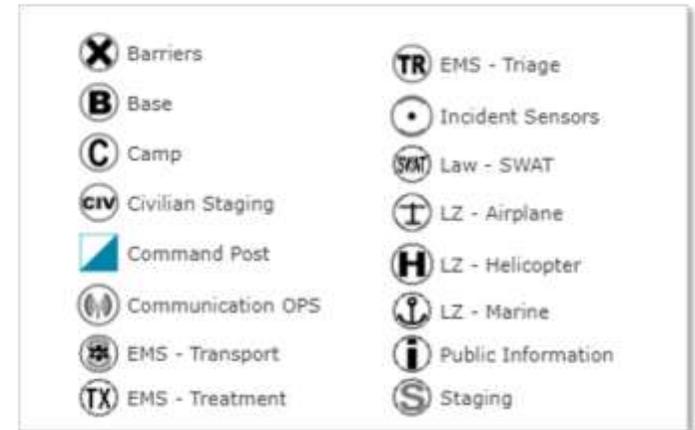
The Esri Disaster Response Program Live Data Feeds is an additional resource for dynamic disaster related data - <http://disasterresponse.maps.arcgis.com/home/index.html>

Step 10 – Operational / Incident Command Information

GIS Staff can pre-stage an empty layer, that is [pre-symbolized](#), to easily add in locations for Incident Operations. This information can be added to the map manually as it becomes available or consume this feed to the RM Dashboard from another authoritative source.

NAPSG Foundation provides empty pre-configured, pre-symbolized layers, such as the below, that can be exported and amended and used in your own environment.

Potential Incident Command Features are pictured to the right.



Step 11 – Mission Operations: Resource Management

When developing a database of local resources, which includes personnel, teams, task forces, facilities, equipment, and/or supplies; it is important that a minimum level of information is entered. Understanding what metrics will drive decision making will inform what data fields are critical and what attributes should be available for those data fields.

The example to the right is an RM Dashboard created for Search and Rescue missions in support of Hurricane Harvey. It includes a data entry field for how rescues were performed with a standardized pick list of options (i.e. walk, boat, vehicle, helicopter, etc.), were necessary to track the types of missions being executed. A large percentage of a certain type of rescue might prompt additional resources with that capability.



In this case, field teams were the source of many of the dynamic data feeds tracking resources. GIS staff worked with decision makers to understand what information needed to be collected, what metrics and analytics would be done to turn this data into actionable information.

Step 12 – Information to Support Mission Operations and Manage Resources

GIS Staff working with their Resource Units can identify the basic information requirements about their resources, mission and the types of incidents they commonly support.

Going back to our **ESF 6 Mass Care example**, on the right are examples of the types of information a Resource Unit supporting Mass Care may be interested in tracking.

The data fields should be configured to allow decision makers to know what equipment and personnel are available for deployment and where gaps might exist and resources might be needed from mutual aid partners.

- Naming your resource consistent with **NIMS resource typing** is important for ensuring the right resource is requested/deployed. Tools such as the Resource Typing Library Tool (RTLTL) exist to ensure proper resource typing.
- It is important to note that organizations have different internal requirements for setting resource status. If you are consuming data feeds from a mutual aid partner ensure that you understand their status field.

Shelters	Shelter Status	Shelter Capacity	Shelter Type	Estimated requirement/need	Current Population	Resources Available	Shelter Services Requested / Deployed	Concerns / Shortfalls	Shelter Restrictions
Estimated requirement/need:	# of shelters (Open, Potential, Standby, Closed, Closed – Flooded, Closed – At Capacity)	# of Population	General, Warming/ Cooling/ Cell Phone Charging/ Medical, First Responder			(# blankets, comfort/ hygiene kits, enhanced cots, standard cots, portable toilets)	Shelter Assessment Teams, Registration Teams, Behavioral Health Services		Pet Friendly, Special Needs, Male Only, Last Resort

Resource kind/ type/ Mission Ready Packages (MRPs)	Resource Status/ Availability	Deployment time (minimum lead time and maximum deployment time)	Resource cost	Home Location and Present Location	Contact & Owner Information	Last update time/date for each resource
<ul style="list-style-type: none"> • Consistent with NIMS resource typing definitions. • Maintained by resource owners • Available prior to an event and is required within 0-12 hours from initial incident. • Mission Ready Packages (MRP) and info is viewable to initiate EMAC requests? 	<ul style="list-style-type: none"> • Response availability of a given resource • Availability for what type/level of mutual aid • Ex: available, assigned, or out of service. 	<ul style="list-style-type: none"> • How long (or how fast) it will be until the resource arrives at staging and can be employed in operations. • Includes variables associated with time to deployment and travel time to the assigned area. 	<ul style="list-style-type: none"> • Start of reimbursable time for resources; • Personnel Pay: Salary, overtime, backfill, and other employee-related costs; • Travel/Transportation: Identifies Travel costs; • Equipment Rates: Ties to standardized regional, state, or Federal rates such as FEMA's equipment rates. 	USNG, Lat Long, or Address	Point of contact for the resource and the ownership information including contact.	Time/Date stamp for last update of the resource attributes

Facilities:

- Shelters
- Feeding Locations
- Reunification Centers
- Points of Distribution
- Donation Centers
- Pets and Animals

Personnel / Teams / Task Forces and Equipment:

<https://rtlt.preptoolkit.fema.gov/Public>

Step 13 – Configuring a Resource Management Dashboard

After informational needs have been assessed and filled as available, the next step is to **begin your design** of an incident-level RM Dashboard. Here you will seek to:

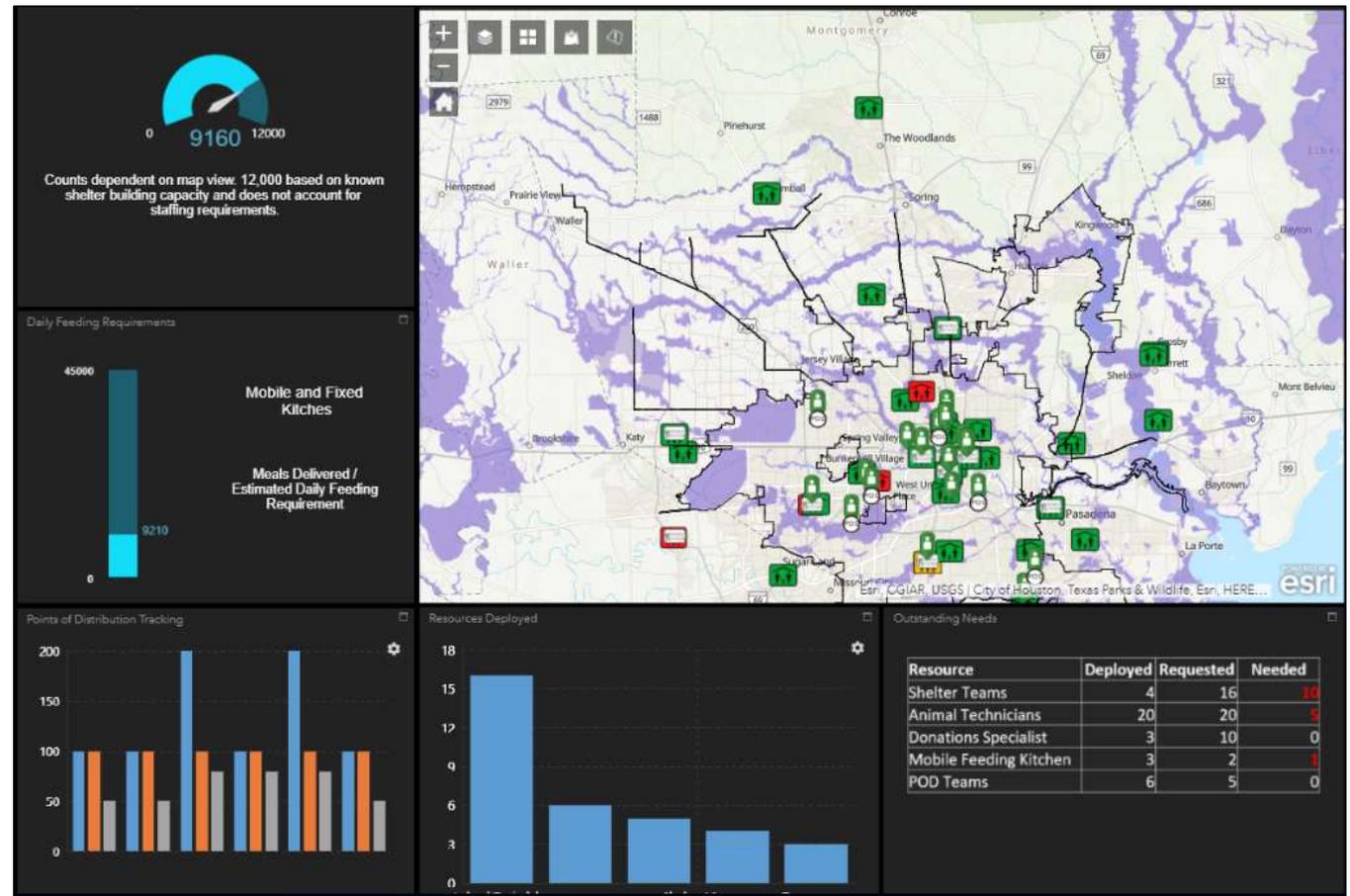
Display the most pertinent information in your map

- Layers turned on at start
- Layers turned on when zoomed in
- Layers available to be turned on
- Pop-ups list essential and readable information
- USNG

Identify needed metrics (counts, summaries, etc.) in the widgets

Assess what functionality is needed, for example:

- Perform Search - Address, Location Name, USNG
- Apply Filter(s) - View only a subset of data
- Edit - Update Data as needed
- Situational Awareness - Identify Critical Infrastructure, Demographics, Resources, etc. in a given area
- Reporting - Generate a report



Link to Interactive Guidance Tool - <http://arcg.is/Orf1TX>