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POLLUTION RESPONSE IN POST DISASTER RECOVERY- BEST PRACTICES FROM HURRICANE SANDY

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Operational Planning is the controlled process of quickly transitioning from chaos to calm; the ability to quell the unknown and create an environment of known, manageable hazards. The most notable challenge during all-hazards operations is moving emergency response operations forward in a concerted effort in somewhat nebulous and demanding environments, yet in accordance with all-hazards frameworks, laws and standing agency policies. Hurricane Sandy post-disaster response operations provided just the right test for that capability- an austere environment, an expansive geographic area, joint agency operations and latent hazards.

Nevertheless, Hurricane Sandy post-disaster response operations, particularly those supporting Emergency Support Function 10 (ESF-10), proved infinitely successful, largely due to the deliberate operational planning and data processing methodologies developed to establish the clearest possible operational picture. Developed protocols, established later as a best practice, combined federal policies and regulations on pollution response operations and disaster response into a single operating standard for ESF-10 pollution response activities in support of Coast Guard Sector New York Unified Command operations in New York and New Jersey. Environmental response operations encompassed eight geographic Divisions and included thousands of potential pollution sources. This paper highlights specific methodologies for analyzing and prioritizing threats post-response, coordinating efforts across a joint-agency landscape and mounting an expeditious and efficient environmental response campaign in a concerted, unified manner.

INTRODUCTION:

Operational Planning for natural disasters is a unique challenge to federal, state and local emergency managers when preparing and responding to communities' devastated by coastal storms and riverine flood waters. Operational Planning is the controlled process of quickly transitioning from chaos to calm; the ability to quell the unknown and create an environment of known, manageable hazards. The most notable challenge during chaos transition is moving emergency response operations forward in a concerted effort in chaotic and dynamic environments, yet in accordance with all-hazards frameworks, laws and standing agency policies. As emergency managers look to address new Federal Interagency Operation Plans (FIOPS), the National Contingency Plan and associated Area Contingency Plans, Industry Plans and Area Committees provide a sturdy whole-of-government and whole-of-community plan. Hurricane Sandy post-disaster response operations provided just the right test for that capability- an austere environment, an expansive geographic area, joint-agency operations and thousands of latent hazards.

Hurricane Sandy post-disaster response operations, particularly those supporting Emergency Support Function 10 (ESF-10), proved successful, largely due to the deliberate operational planning and data processing methodologies developed to establish the clearest possible operational picture, which was readily accessible and transparent for agency partners and senior officials. Developed protocols, established later as a best practice, combined numerous federal policies, frameworks and regulations on pollution response operations, and both New Jersey and New York Mission Assignments into a unified command operation for ESF-10 pollution response activities throughout the Port of New York and New Jersey Area Contingency Plan geographic area. The overall maritime to shore side environmental response operations included eight geographic/political divisions and encompassed thousands of potential pollution sources, either actively discharging or threatening to discharge or release oil or hazardous substance into the marine environment throughout the region. This paper highlights specific methodologies for analyzing and prioritizing threats post-response in a region devastated by natural disaster, coordinating efforts across a joint-agency landscape and mounting an expeditious and efficient environmental response campaign in a concerted, unified manner.

Hurricane Sandy was the largest Atlantic hurricane in recorded history and the second most devastating, exceeded only by Hurricane Katrina (NOAA 2013). The devastation wrought by Hurricane Sandy spanned much of the eastern seaboard, causing the most severe damage to coastal infrastructure and communities in the New York and northern New Jersey region of the United States. Damage included major oil discharges in the Port of New York and New Jersey from three oil facilities, lost cargo from dozens of facilities, thousands of displaced vessels, vehicles, containers and various hazardous materials. Further, the impacts to the maritime infrastructure greatly contributed to the constrained fuel supply in the region post-storm.

INITIAL RESPONSE ACTIVITIES AND CHALLENGES:

Once search and rescue operations were complete, U.S. Coast Guard priorities transitioned rapidly to Marine Transportation System (MTS) recovery and marine environmental response (MER) operations. These operations consisted of efficiently reconstituting maritime infrastructure and commerce, ensuring homeland security, and protecting the public and marine environment from threats of pollution. Due to the variety and complexity of missions being coordinated post-landfall, a separate Unified Command was established for marine environmental response operations, whereby the Coast Guard Sector New York Commander designated the Commanding Officer of the Atlantic Strike Team as the Incident-Specific Federal On-Scene Coordinator (FOSC). Additionally, the Atlantic Area Incident Management Assist Team (IMAT) and the majority of National Strike Force resources along with qualified FOSC Representatives from 45 Coast Guard commands mobilized to provide surge capacity to the State of New York and New Jersey.

The degree of regional impact, environment damage caused by the storm and potential for further environmental impact resulting from response actions made operations particularly challenging. Over 50 major marinas, both privately and municipally owned, were impacted by the passing of Hurricane Sandy and displaced hundreds of vessels which posed significant threats to the marine environment. To help manage the geographic expanse of the response and span of control of resources, marine environmental response operations were divided into two primary branches consisting of 8 geographic divisions located throughout New Jersey and New York. Federal response activities were funded through an Emergency Support Function, ESF-10 for Oil and Hazardous Materials Response under the Robert T. Stafford Act. Funded operations included:

- Assessments of all shoreline for the purposes of overseeing environmental protection activities in accordance with Area Contingency Plan for identified environmentally sensitive areas (ESA).
- Assessments of potential pollution threats posed from vessels, vehicles and containers within the intertidal zone.
- Response to all hazardous substances and oil discharges threatening to release or discharge into the intertidal zone.

Although each objective is inextricably linked to one another, this paper focuses on best practices developed for the first three- Assessment of the Environment, Assessment of the Threat, and Development or Response Methods.

Response Area and Jurisdiction:

One of the first priorities of the Unified Command was to establish appropriate response jurisdictions. The Coast Guard and Environmental Protection Agency (EPA) Region 2 agreed upon operational boundaries for Hurricane Sandy response between the EPA and USCG ESF-10 pollution response as the Spring Tide line (also known as the high-high tide) of navigable waterways and their tributaries. The USCG, therefore, responded to all threats in the water and along adjoining shorelines, including wetland areas, whereas the EPA, in coordination with the states, responded inland of the high-tide mark. However, the EPA provided an On-Scene Coordinator as field personnel to support the Coast Guard's ESF-10's Unified Command. Responses to pollution threats whose locations were in question were briefed back to the Incident Command Post. This ensured coordination and de-confliction of USCG, EPA, and State of New York, and New Jersey response jurisdictions and assets to align response actions with proper mission assignments and state funding desires. In these cases, often the most readily available and best-suited asset would respond.

Operational Limitations & Constraints:

ESF-10 versus ESF-3 Mission Assignments. Debris removal is not an authorized action under ESF-10 Oil and Hazardous Substance Response Mission Assignments unless the debris is contaminated by oil or hazardous substances, thereby posing a threat to the marine environment from contaminants in a harmful quantity. Most simply stated, the authorities and jurisdiction for pollution removal activities do not change merely due to a Stafford Act declaration; the National Oil and Hazardous Substance Contingency Plan (NCP) still applies as the primary construct for response activities. Non-contaminated Debris removal is typically an ESF-3 function with the U.S. Army Corps of Engineers as the Primary federal lead.

As a rule, ESF-10 operations included *only the actions necessary* to abate the pollution threat to the environment. To avoid potential liability, removing pollution from a vessel, vehicle, or intermodal container *in-situ* should be the preferred method. If it became necessary to conduct more extensive pollution abatement operations during an all-hazards response, On-Scene Coordinators (OSC) had and must carefully consider the restrictions of ESF-10 and the NCP for removal of uncontaminated debris, e.g., salvage and debris recovery operations, to avoid expending non-reimbursable resources. This jurisdictional limitation was a difference from past operations where ESF-3 debris recovery options were available and assigned to the U.S. Army Corps of Engineers and the USCG FOSC for action, as was the case in both Hurricane Rita and Katrina.

One of the more interesting dynamics of the response was the demonstrated connectivity between the National Response Framework and the NCP. The Unified Command, as designated FOSC for

MER activities, simultaneously oversaw both Responsible Party-managed on-site clean-up activities from the "Big Three" oil facilities as well as NRF ESF-10 activities for oil and hazardous substance removal. The "Big Three" referred to medium and major discharges from Phillips 66, Shell Motiva, and the Kinder Morgan, each affecting the Arthur Kills waterway. Both responsible party managed cleanup operations as well as ESF-10 operations were conducted under the construct of the NCP; the first being guided by the Oil Pollution Act of 1990 (OPA 90) Facility Response Plans and overseen by the FOSC, but the latter coordinated under the framework of the NRF.

Without ESF-3 assignments for wet debris recovery from outside federally maintained channels, if a vessel, vehicle, or intermodal container required lifting or transport from their current position, the actions were only be taken at the concurrence of the ESF-10 Unified Command. The Unified Command only authorized the lifting or moving a vessel if the action was required to protect the public, responders, or the environment. In one case of note, a moderate sized recreational vessel was pinned beneath a public roadway bridge; during the storm surge, the vessel had become lodged atop a natural gas pipeline. To ensure protection of the public, responders and the environment, the vessel was lifted from the gas line and moved to a non-threatening location for future abatement. In this as in any case, actions were documented by photo log and on an ICS-214, Unit Log. Through consistent documentation of response activities, the Unified Command ensured operational decisions regarding jurisdiction and application of lawful authority were captured and made part of the historical record of the response.

Vessel disposition under ESF-10 response actions. In the absence of ESF-3 debris removal authority, the Unified Command considered final vessel disposition for each mitigated vessel prior to commencing operations. Without foresight as to vessel disposition, each abated vessel would be re-deposited into the marine environment, likely to remain for many months to come before removal action could be taken by private owners/operators or marinas. The best case scenarios included establishing shore-side staging or aggregate storage areas within local municipal jurisdictions (county or city) for damaged or displaced vessels to be stored after pollution removal operations. This process best leveraged local sheriff or city ordinances for abandoned property rights. In areas where this was most successful, deliberate relationships were built between the private, township, state, and federal parties in advance, establishing pre-designated sites for damaged vessel storage after pollution abatement. Once pollution removal activities were completed under ESF-10, private marinas or local townships would take custody of vessels no longer able to remain afloat.

Environmental impact concerns. Access to vessels within marsh and wetland areas also represented a challenge to the response. While the pollution threat of a displaced vessel was often the most immediate threat to the environment and surrounding waterways, it was important to carefully consider the entire environmental picture in response planning. Removing fuel from vessels, in some cases, would have required invasive actions into the surrounding habitat, which was especially important to note when working in environmentally sensitive marsh areas. Given the potential intrusive nature of salvage operations, it is in the best interest of the environment to remove both the fuel and displaced vessel at one time rather than mobilizing twice, once to remove the fuel and once to salvage the vessel.

To aid in decision making and protect environmentally sensitive areas during operations, the Environmental Unit under the leadership of The National Oceanic and Atmospheric Administration (NOAA) developed Best Management Practices (BMP) for recovery of vessels from marsh areas and other sensitive environments. The Planning Section evaluated and incorporated BMPs into all tactical planning. For example when accessing stranded vessels deep within marsh terrain, there was

a concerted effort to implement Best Management Practice (BMP) of waiting for marshes to harden from freezing temperatures enabling less intrusive access by foot and equipment to stranded vessels without disturbing the soft ground of marshes.

OPERATIONS AND OPERATIONAL PLANNING

Although numerous best practices were developed during the response, the remainder of this paper will focus on those within four operational framework processes of note. These framework areas represent the operational process used:

- Inventory the targets to be abated and/or recovered (Developing the Operating Picture)
- Categorize all targets by condition and location (Determination of Priority Areas)
- Determine the general technique and type of equipment to be employed during abatement activities (Best Case Model)
- Establish priority for selected target abatement.

Developing the Operating Picture:

After the storm, the normal reporting mechanism of spills and potential hazmat via phone calls from concerned citizens to spill hotlines was inadequate due to crippled communication infrastructure, disruption of normal activity and dislocation of a significant portion of the population. This created an added layer of complexity as the most essential task immediately following a crisis event is establishing a clear operational picture and creating an environment of known patterns. Without other functioning channels of information into the unified command, daily NOAA satellite imagery became an initial piece of the developing operational picture. Additionally, helicopter over flights and aerial observations by NOAA Scientific Support Coordinators helped focus the operational picture and guide field teams conducting "boots on the ground" assessments. The collective imagery provided real-time aerial overview of the operations area allowing the Planning Section and Operations Section to develop tactical plans based on potential high-impact areas. NOAA imagery was carefully studied and included daily in the ICS-204 daily work assignments during the assessment phase to aid Rapid Assessment Task Forces in validating field-level impacts. The initial imagery assessment was then updated based on results of field surveys and inputted into a common operating picture. As a result, each operational period's plan was developed based on recent and near real-time field data which allowed the Operations Section to focus scarce resources on areas of greatest need.

Determination of Priority Areas:

The Operations Section of the Incident Command used environmental and incident response information from the Emergency Response Management Application (ERMA) to maintain their common operating picture. As targets were identified in the field, technical specialists inputted field assessment data into ERMA. The management application was used to overlay response targets, GIS imagery of environmentally sensitive areas and aerial imagery of the impacted areas. The resultant multi-layer geographic ERMA mapping was readily accessible to interagency stake holders and allowed the Federal and State On-Scene Coordinators to prioritize threat-areas and allocate resources for pollution mitigation activities, as appropriate.

Developing a Best-Case Model:

The Best-Case model is simply the developed management process which repeatedly produces the desired end-state. The Best-Case process for the removal of pollution from a vessel, vehicle, or intermodal container included the following elements:

Assessment- Field assessments (over flight, on-water, and land-side) were conducted of the entire response area to gain appreciation of the highest impacted areas. A secondary assessment was conducted on-water or via landside for each target to determine the likely pollution threat and jurisdiction to expend ESF-10 funds for potential pollution abatement.

Advertising- Once a threat was determined to exist, the target was documented. Placing a notification sticker on the vessel notified the owner/operator of potential pollution removal activities and encouraged self-action on the part of the owner/operator, where possible.

Liaison- A deliberate partnership with public, private and municipal marinas, in addition to city and state governments enabled the ability to store vessels post-pollution mitigation activities. Liaison with local authorities is a priority for any ESF-10 operation. In many cases, ESF-10 funding will be focused on the removal of spilled oil and hazmat, however most personal property rights, ownership determination and ability to manage debris streams for derelict property rest with local authorities. Connecting owners with locations of displaced property enabled personal insurance or private funds to resolve many area of concern and alleviated the authorities from having to commit funding to remove the threat.

Preparation- As a standard, all documentation pertinent to the vessel's condition and ownership was in place prior to commencing activities. This included, but is not limited to, pictures, vessel profiles, specific target identification data, and any additional miscellaneous documentation including ICS-214, contractor dailies, insurance information, vessel transfer documentation, etc.

Removal- Removal of pollution threats included the removal of oils, batteries, and hazardous substances, pollutants or contaminants that posed a threat to the marine environment. All removal activities were conducted in accordance with the NCP.

Transition of custody- As noted above, ideally, custody was arranged in advance with the state, municipality, owner or marina for further action immediately following mitigation activities.

Establish Priority for Target Abatement:

All vessels were removed based on priority. The priority by which they were removed was a combination of methodologies including the traditional net environmental benefit analysis combined with analytical data processing. To ensure a consistent application of decision making, NOAA, the Operations Section and the Environmental Unit created a matrix for analysis of potential pollution threats. The matrix combined common elements of risk, including vessel condition, presence of pollutants and environmental conditions. The result was a general assignment of risk.

HIGH THREAT	MEDIUM THREAT	LOW THREAT
Known Threat/Known or Probable High Quantities of Oil	Unknown Threat/Nominal Potential or Actual	Unknown Threat/ Nominal Potential or Actual
Active Discharge of Oil	Not Discharging	Not Discharging
Close Proximity to Threatened Endangered Species/ESA	Close Proximity to Threatened Endangered Species/ESA	Not Near ESA/Threatened Endangered Species
Significant Damage to Vessel	Intact/Some Damage	Intact

Table 1, Target Priority Matrix

The risk values noted in Table 1 were further evaluated against field survey data collected by operational response teams. This process also enabled the ESF-10 Unified Command to brief higher authority FEMA and State Agency personnel on mission assignment funding and the rough order of magnitude cost for the next operational period. Although not required daily, the detailed database enabled preemptive buy-in from state partners that the proposed operations were the most cost effective and the best use of the 25% state cost share that was required as part Stanford Act funding.

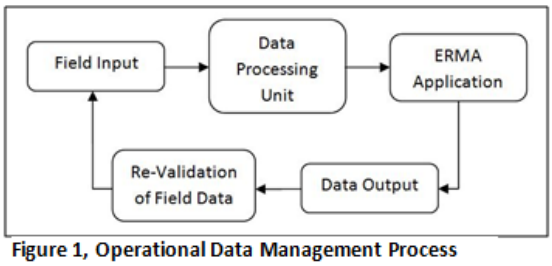

Figure 1, Operational Data Management Process

As data was brought in by field task forces using specifically developed field assessment forms, the information was logged and tracked. Further, pictures were cataloged by geo-specialists provided by NOAA. The functions of the Data Processing Unit and ERMA specialists were different than those of the traditional field observer and display processor role, respectively. The Data Processing Unit was able to remain micro-focused on vessel abatement whereas Situation was able to maintain a larger scale focus. Once data was received, it was given to NOAA to be inputted into ERMA. The ERMA output and subsequently the output of the Operational Data Processing Unit included key data elements that were revalidated the following operational period, accommodating the clearest, most accurate operating picture.

Once data had been processed, the information was passed through ERMA where the information is inputted and layered against a GIS display. Data output maps were given to each Task Force the following operational period for information validation during the upcoming field

activities. Data was again inputted, revalidated and therefore presented the most up-to-date operating picture possible.

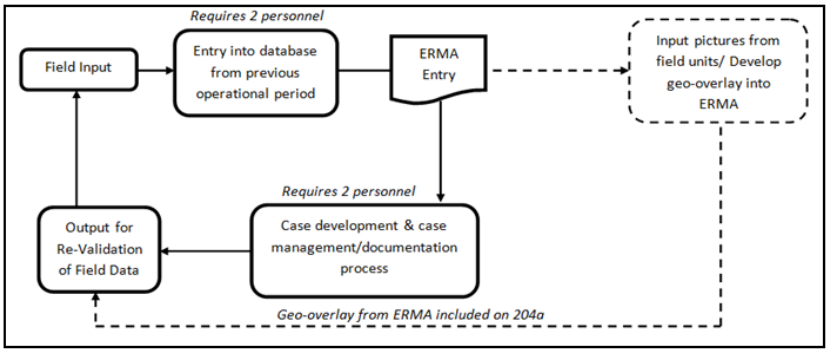

Figure 2, Data Incorporation Process

SUMMARY:

Despite the challenges faced during initial response operations, including sensitive ecosystems and limited response authorities and funding, Hurricane Sandy post-disaster activities proved tremendously effective. First, from a financial standpoint the combined Mission Assignments were authorized for $11.5 million, $6.5 million dollars was obligated, with an overall state cost share of just over $1.6 million combined for both the State of New York and New Jersey. This funding enabled over 150 personnel from the Coast Guard and supporting agencies to provide readily available resources to the impacted New Jersey and New York area. These personnel resources were crucial to manage and direct over 1,500 contractors engaged in pollution mitigation. Further, of particular note was post-storm Oil Pollution Act of 1990 success of the response to the "Big Three" industrial spills. At each of these sites, Federal and State Official provided oversight to a magnificently managed industry response based on NCP facility response plans. In total, industry committed over $220 million dollars to mitigate the pollution threat from their facilities. The commitment by industry allowed federal and state to focus resources on other high priority threats, and those without an identifiable owner.

Second, the variety of response operations the FOSC faced during post-disaster response operations required the simultaneous balancing of multiple response constructs (NCP and NRF) to mitigate threats in a managed process depending on whether a known Responsible Party stepped forward or if the threat was from a non-responsive or unknown source (i.e., unknown tank). Ultimately, all response operations were conducted using the core construct of the NCP. The same jurisdictional authorities were employed during post-disaster operations as would normally be employed during traditional NCP operations. The Unified Command's advanced decision making and delineation of lines of jurisdiction and authority are what differentiated operations in Sandy from others. Clear expectations amongst the Unified Command were established early and were maintained throughout the operations. Likewise, the same level of documentation and response oversight were maintained during all operations to ensure accurate cost accounting, tracking of expenditures, any cost recovery and historical accuracy.

Deliberate operational planning and data processing methodologies, coupled with more traditional environmental risk analysis methods helped deliver consistent and accurate assessments of field threats. Although a significant number of threats were resolved by private insurance, good corporate citizens and property owners, 589 sites required proactive clean up without delay. All 589 sites were mitigated in 45 days of aggressive operations. The finely tuned operation picture and the resultant data also served to establish the clearest briefing tools to partner agencies, political officials and higher agency authority. Coupled with real-time imagery and environmental data overlay, the Unified Command was able to quickly mitigate a vast array of threats either discharging or threatening to discharge or release oil or hazardous substance into the marine environment throughout the region. It is likely the approach and methodologies used during the Hurricane Sandy Response for analyzing and prioritizing threats post-response, coordinating efforts across a joint-agency landscape and mounting an expeditious and efficient environmental response campaign will greatly enhance future all-hazard operations.

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