
National Oceanic and Atmospheric Administration
Office of Response & Restoration
Final Report to the Bureau of Safety and Environmental Enforcement

Geographic Response Plans:
Development, Deployment, and Use in
NOAA's Environmental Response Management Application (ERMA®)

NOAA's Ocean Service
Office of Response and Restoration
Seattle, Washington



Geographic Response Plan Development, Deployment and Use in NOAA's Environmental Response Management Application (ERMA®)
BSEE IAA No. E14PG00064

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Introduction

Geographic Response Plans (GRPs) are the initial source of operational information for environmentally or economically sensitive sites when responders arrive on-scene at an oil spill or other environmental emergency. The plans are mandated under the Oil Pollution Act of 1990 and managed in the United States by regional Area Committees that include representatives from agencies such as the United States Coast Guard (USCG), the United States Environmental Protection Agency (USEPA), the National Oceanic and Atmospheric Administration (NOAA), States, Tribal partners and local agencies. However, other than the general descriptions of GRP development in the USCG 2012 Area Contingency Planning Process Job Aid¹, there are no specific guidelines that provide consistency on the information in the plans or how they should be displayed spatially.

The Department of Interior Bureau of Safety and Environmental Enforcement (BSEE) reached out to NOAA's Office of Response and Restoration (OR&R) to leverage the organization's mandate and experience with the spatial representation of GRPs. One of the principle 24/7 Federal response organizations, OR&R's mission is to provide scientific and technical support to the USCG for emergency response. OR&R also specializes in information and data management for oil spill planning and responses, and has worked extensively with USCG and State responders around the country. This national-level experience has provided extensive familiarity with the gaps in available digital response plan data and the need for this guidance.

This project supports BSEE requirements to notify and provide digital copies of Oil Spill Response Plans for Offshore Facilities to the USCG, identified in the USCG 2012 Area Contingency Planning Process Job Aid. BSEE is leveraging NOAA's Environmental Response Management Application² (ERMA) Common Operational Picture (COP) as a visualization and distribution platform for regional GRP data and the related Area Contingency Plan (ACP) process. ERMA is a web-based portal with a vast library of natural resource and oceanographic data that can be used to answer a variety of environmental questions and concerns. OR&R uses ERMA as a decision support tool for planning, response, and damage assessment, and to provide situational awareness to NOAA, the USCG, and other federal, state, and local agencies and partners.

As part of this project's Inter-Agency Agreement between BSEE and NOAA, NOAA has developed and implemented a methodology for capturing existing GRP data into common data structures and formats compatible with both desktop and web-based Geographic Information Systems (GIS) tools including ERMA.

NOAA has produced the following results and recommendations that are discussed in this final report:

- I. A national inventory of GRP data
- II. Standard data attribution and symbology
- III. Development of an ERMA GRP Tool

I. NATIONAL INVENTORY

Initial inventory efforts

One of the first efforts undertaken for this project was to pursue an understanding of the GRP status across all USCG Districts, Sectors, and States. A national inventory of GRP and associated data was completed by NOAA with the particular focus to understand the available coverage of GRP data, the format and data structure of these data, the presentation and symbolization of the data, and the overall consistency of the data from Sector to Sector and State to State.

It became readily apparent that there was no comprehensive national coverage of GRPs, that the data were not readily available, that they existed in multiple formats, and that a diverse number of details were tracked by the various response plans. The scope of data covered by these GRPs ranged from simple tracking or identification of individual environmental or economically sensitive sites to complex collections of sensitive sites, booming strategies, staging areas, boat ramps and access points. They could also include related emergency services such as hospitals, police/fire, schools, nursing homes, and infrastructure.

A decision was made to examine only the sensitive sites themselves and their related tactics and strategies, and not to include the broader ACP facilities and services. The diversity of this broad collection of ACP features was beyond the scope of the project and it was decided that this would dilute the effort and undercut the stated goal of collection and deployment of GRP data in ERMA. Furthermore, many of these infrastructure features are included in ERMA as standard base data. This choice allowed NOAA to focus the inventory effort to the identification and collection of the GRP sites themselves.

The New ERMA GRP Inventory

As part of the standard base data collected for each of the eight regional ERMA sites, over the past several years GRP and ACP data have been acquired where available in digital format. When NOAA began this project, however, it became more apparent that there existed significant gaps in digital GRP coverage.

NOAA worked with States, Regional Response Teams (RRTs), USCG Districts and Sectors, and the USCG Academy (USCGA) to inventory and capture their existing GRP data. We discovered that there were a wide array of developers with different criteria and particular areas of concern for defining sensitive sites and resources of regional concern. There has also been a significant investment of time and money in developing these sites and related strategies, but this development has been hampered by a lack of national direction and systematic criteria. Even the definition of what a GRP is or what these sensitive sites are called has been a stumbling point. GRPs can be called plans or strategies (GRP vs GRS), priority sites, or sensitive sites depending on the region. This simple convention is only the first of the difficulties in the effort to develop national consistency. This overall reality has greatly complicated the development of consistent standards for GRP designation and information content and resulted in a loose set of regional standards at best.

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In spite of this wide spread uniqueness, NOAA has inventoried and captured GRP data for 38 USCG Sectors and States covering the continental United States, Alaska, Puerto Rico and U.S. Virgin Islands, Guam, and the Northern Mariana Islands.

USCG District	USCG Sector	In ERMA	Date (Creation/Update)
One	Northern New England	Yes	2014
	Boston	Yes	2016
	Southeastern New England	Yes	2016
	New Haven/New London	In Process	TBD
	New York	In Process	TBD
Five	Long Island Sound	In Process	TBD
	Maryland NCR	Yes	2016
	Delaware Bay	Yes	2016
	Hampton Roads	Yes	2011
Seven	North Carolina	Yes	2016
	Charleston	Yes	2015
	Jacksonville	Yes	2011
	Key West	Yes	2011
	Miami	Yes	2011
	San Juan	Yes	2011
Eight	St. Petersburg	Yes	2011
	Mobile	Yes	2011
	New Orleans	Yes	2015
	Corpus Christi	In Process	TBD
	Houston/Galveston	In Process	TBD
	Lower Mississippi River	NA	NA
Nine	Ohio Valley	NA	NA
	Upper Mississippi River	NA	NA
	Buffalo	Yes	Draft in review/2016
	Detroit	Yes	Draft in review/2016
Eleven	Lake Michigan	Yes	Draft in review/2016
	Sault Sainte Marie	Yes	Draft in review/2016
	Humboldt Bay	Yes	2013
	San Francisco	Yes	2013
Thirteen	Los Angeles/Long Beach	Yes	2013
	San Diego	Yes	2013
	Puget Sound	Yes	2016
Fourteen	Columbia River	Yes	2016
	North Bend	Yes	2016
	Honolulu	NA	NA
Seventeen	Guam	Yes	2016
	Anchorage	Yes	2014
	Juneau	Yes	2014

Table 1: Available GRP data in ERMA. Data listed as being “In Process” are expected to be available in ERMA within the next 3 – 6 months. Data identified as “NA” are not available and not expected to be available in ERMA in the foreseeable future. “Draft in review” data are not publicly available in ERMA, but will be made available as soon as the review is complete.

These GRP data are available for viewing in each of the eight regional ERMA sites. ERMA also provides the ability to download the data or link directly to data services for use in other applications.

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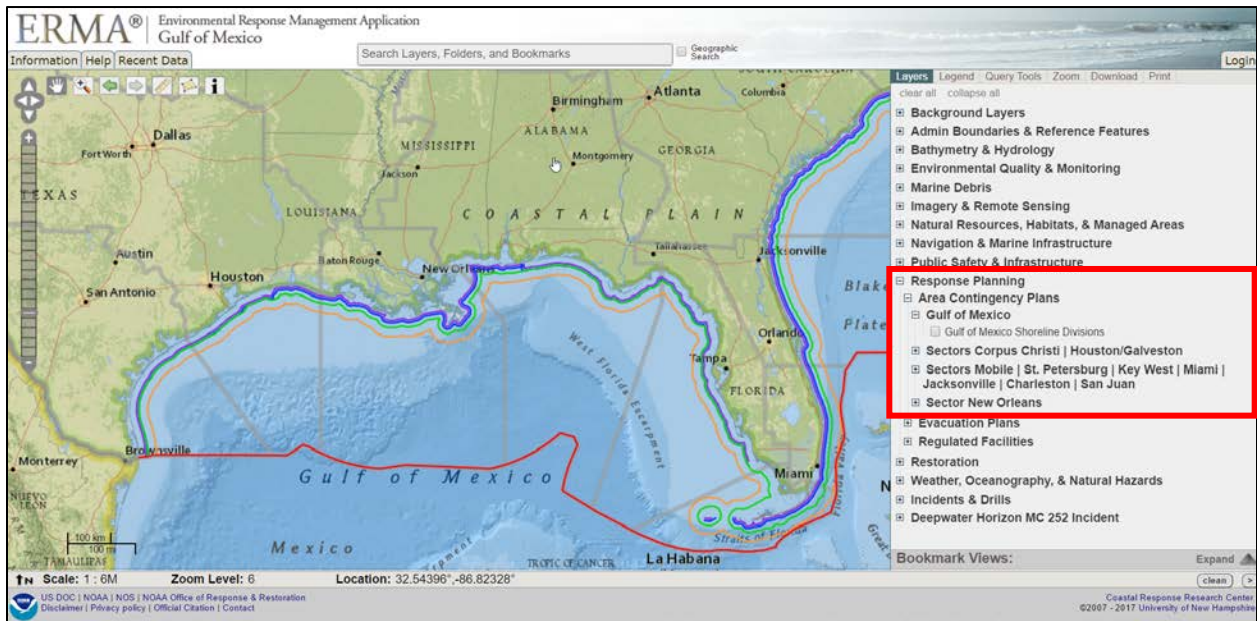


Figure 1: Regional Gulf of Mexico Public ERMA site and GRP data structure

In the example above, the Gulf of Mexico ERMA Table of Contents is shown with the “Response Planning” folder expanded to show the available ACP and GRP data for the USCG Gulf of Mexico Sectors. This standard structure is mirrored in each ERMA site to provide a consistent means to access and leverage GRP data easily and effectively. Furthermore, ERMA uses a set of tools called “Bookmark Views”, located at the bottom of the Table of Contents, to provide pre-assembled interactive map collections of data for quick access to topics of interest.

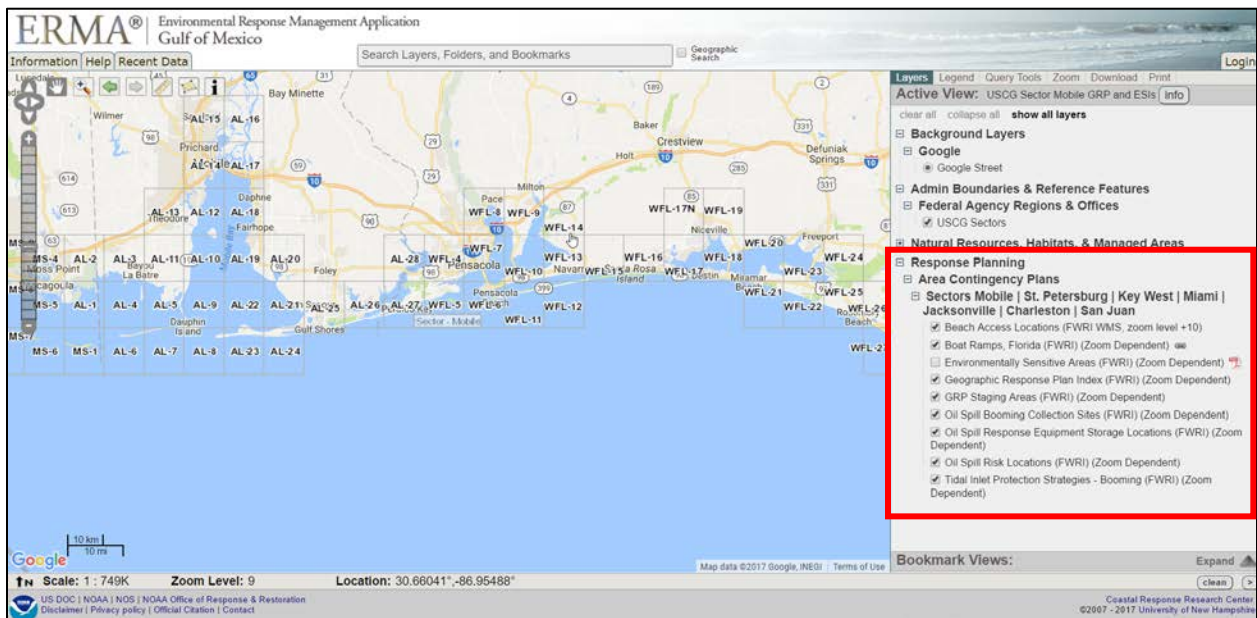


Figure 2: Regional Gulf of Mexico ERMA site “Bookmark View” for Sector Mobile

In the example above, ERMA displays the “Bookmark View” for the USCG Sector Mobile GRP data. This view provides a shorter, targeted collection of layers rather than showing the full Table of Contents. These spatial “Bookmark Views” provide the user a streamlined view into an individual Sector’s data and helps the Area Committees, Regional Response Teams and other interested users with regional planning. These GRP views are publically available for all Regional ERMA sites where data have been finalized and officially released. Please see the ERMA Technical User Guide³ for more information on the setup and tools available in ERMA.

II. CONSISTENT DATA ATTRIBUTION & SYMBOLOGY

In assessing the opportunities for standards development, or even consistent recommendations for future updates, it became apparent that the major consistent theme in GRPs is their inconsistency. In the Gulf of Mexico for example, where some of the most comprehensive digital GRPs exist, there are three distinctly different GIS formats and content requirements. Across the country it was found that there is no clear set of criteria for defining what a GRP is, what information should be captured to represent the GRP, or how this information should be presented. While having locally-curated datasets may work at that level, many responders work all over the country or rotate frequently so having consistency improves their understanding of the area and the immediate work that needs to be done.

While the regional inconsistencies in GRP data and structure present real challenges for the USCG and other responders nationally, the development of these regional GRPs represents a significant financial and staff investment by these partners. It should not be expected that these inconsistencies will be remedied quickly. The District, Sector, and State efforts spent in planning and execution has resulted in operational products across the country that provide responders with an initial strategy to pursue in the first hours and days of an incident. Therefore it is not practical to expect these groups to re-invest hard fought resources in the restructuring of existing GRP data products immediately. However, as these planners continue the process of exercising, testing, and updating GRP sites there are several recommendations on development and symbolization that should be considered. Also, in those few locales where GRPs may not exist, a recommended standard should be developed. The USCG will be a key champion of this process and will need to provide leadership and direction on how these efforts proceed.

Development Recommendations: Attribution and Symbology

Common attribution and symbology are key to providing a useful GRP product that will provide support to the first 24 – 48 hours of an incident when these pre-planned tools are most important. Consistent GRP attribution of key information should enable the Coast Guard and other responders to make reasonable decisions for action throughout a response. Attribution must provide information that will support these decisions and NOAA has developed a list of 10 suggested core GRP attributes for new or updated datasets. This list should include specific locational information on the resources at risk, and detailed strategies and response tactics to be applied in current environmental conditions, such as real-time weather, currents, and tides. As always, these strategies must be flexible to meet the actual

conditions at the time that the plans will be implemented. An example of a reasonable attribute list includes the following:

- **GRP Name**
- **Strategy Name**
- **Creation Date**
- **Review Date**
- **Resources Protected**
- **Latitude (Decimal Degrees)**
- **Longitude (Decimal Degrees)**
- **GRP Status (None, Staged, Deployed)**
- **GRP – Link (hyperlink to soft copy pdf documents and maps)**
- **Address (Street Address)**
- **Description/Notes**

Standard map representation of these sites and strategies is also critically important to provide a timely communication of conditions, status and overall situational awareness to Unified Command and others in the command post. As stated above, many responders arrive at an incident from other regions so having nationally consistent map representation increases the level of understanding for critical decision making. Working for the USCG District 7, the State of Florida Fish and Wildlife Commission has developed a comprehensive symbol set that covers the southeast and Caribbean regions. Additionally, the NUKA Corporation has developed a well-known and respected symbol set as a contractor to the State of Alaska and several northeast states. The following graphics show examples of GRP symbology that greatly facilitate understanding and use of identified resources potentially at risk from potential oil spills and hazardous materials releases.

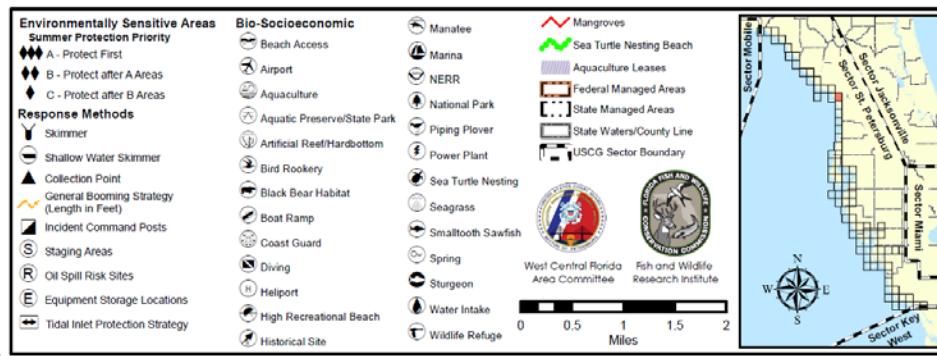


Figure 3: GRP Symbology Example One: USCG District 7 (Developed by Florida Fish and Wildlife Commission)



Figure 4: GRP Symbology Example Two: GRP Features and Tactics for Alaska and Massachusetts. (Developed by NUKA Inc.)

These example symbol sets represent a very useful library of consistent map representation that can effectively communicate situational awareness and be used in GIS maps or in a common operational picture. ERMA symbology has been enhanced so that the user can create custom symbology and will soon incorporate the NUKA symbols as part of its symbology library for representing GRP features, allowing the data manager to code GRP data in ERMA with a consistent symbology from region to region.

III. ERMA GRP TOOL

In support of these types of recommendations, ERMA has implemented an enhanced Draw Tool and support for the new NOAA Environmental Sensitivity Index (ESI) data structures to facilitate GRP work. ERMA supports a freeform drawing tool on its mapping interface that has been enhanced specifically for GRP development and collaborative review. It includes a workflow to tag newly drawn GRP features with the core attributes recommended above, and to save them as draft or for external review. Once finalized they can be symbolized using the new GRP symbol library. ERMA also hosts all of the regional ESI data, nautical charts, and other important base data to assist the planner or responder in deciding the best placement for their GRPs.

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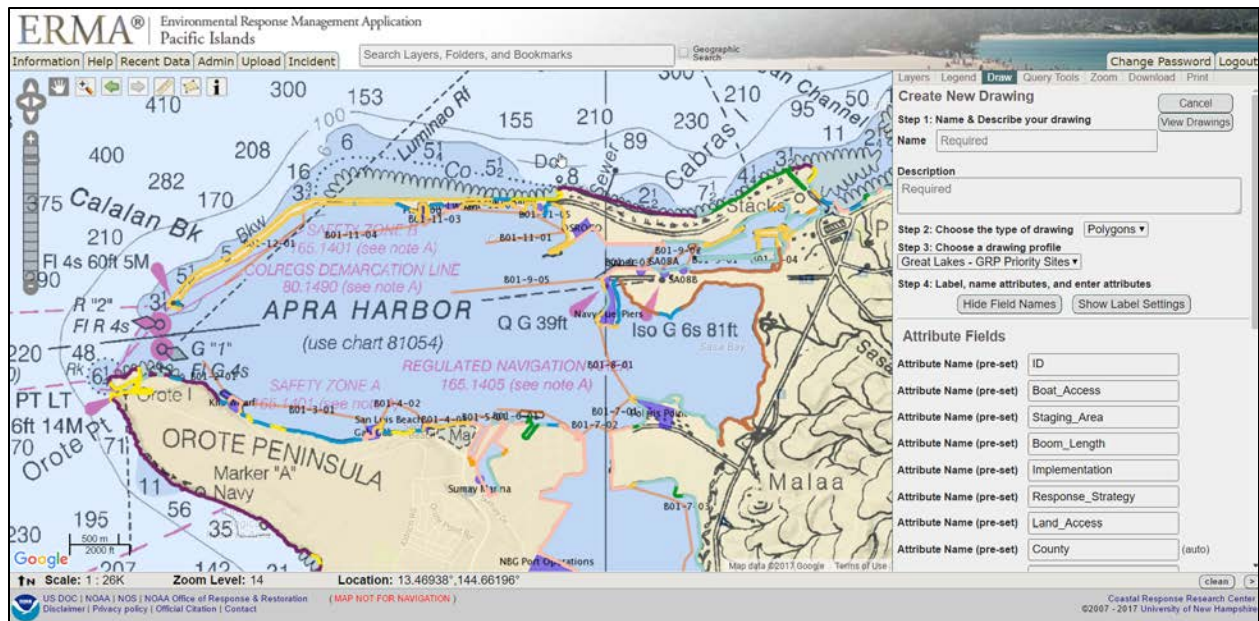


Figure 5: Pacific Islands ERMA “Draw” tool and the GRP Priority Sites drawing profile.

The ERMA Draw tool and related GRP Priority Sites drawing profile allow the user to draft new or update existing GRP features using the proposed standard attribution and structure. Once saved, the drawing appears on the map, but it can still be edited on-the-fly as needed, which is helpful during the review process. This drawing tool has been used extensively by Sector Guam and District 9 in the Great Lakes for developing their GRPs.

Communications of Findings and Recommendations

Throughout this 2-year project, NOAA has worked to socialize these findings at a variety of meetings, conferences, and workshops as well as at USCG and Industry-led full-scale exercises and actual incidents. NOAA has worked with, and presented to, the following agencies and States to identify national GRP holdings in ERMA:

USCG: Marine Environmental Response (MER); U.S. Coast Guard Academy (USCGA); Sector Guam; Sector Delaware Bay; Sector Hampton Roads; District 9

National and Regional Response Teams: NRT Edison; RRT1 and RRT2

States: California, Delaware, Florida, Georgia, Louisiana, Maine, Massachusetts, Oregon, South Carolina, Texas, Washington

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The Tank Barge Argo incident on Lake Erie in November 2015 proved a valuable testing ground for the USCG to create GRPs in ERMA, and for NOAA staff and response partners to see firsthand how ERMA’s tools could be enhanced for future GRP development.

USCG Sector Guam GRP Development

Sector Guam worked closely with NOAA and the Pacific Islands Scientific Support Coordinator (SSC) to leverage ERMA base data and drawing tools to create GRP sites and strategies for Saipan, Guam, Rota, and Tinian. Map features depicting boom placement, at risk spill zones, skimmers, and staging areas were created using the ERMA tools. On the USCG Sector Guam Homeport website, the public can now find the final GRP PDF documents that show detailed information such as booming strategies, environmentally sensitive areas, and points of contact. The documents’ maps that show the GRP information were all created in ERMA⁴.

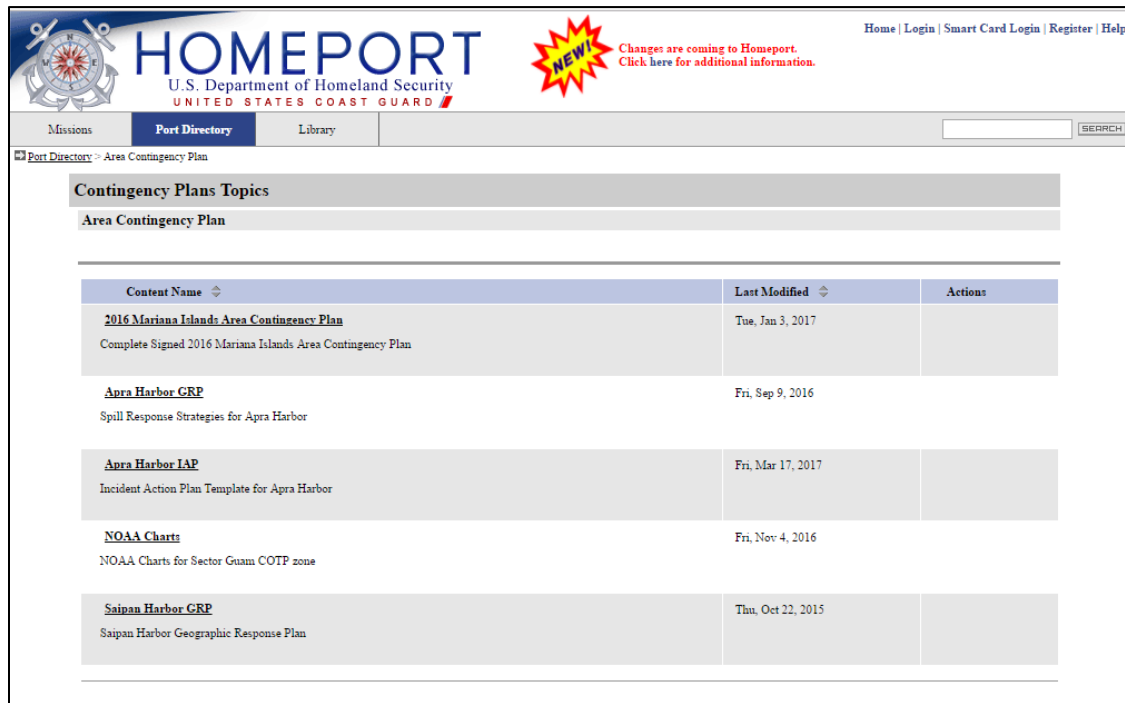


Figure 6a: Sector Guam GRP “soft-copy” PDF documents for GRP sites created in Pacific ERMA available on USCG Homeport

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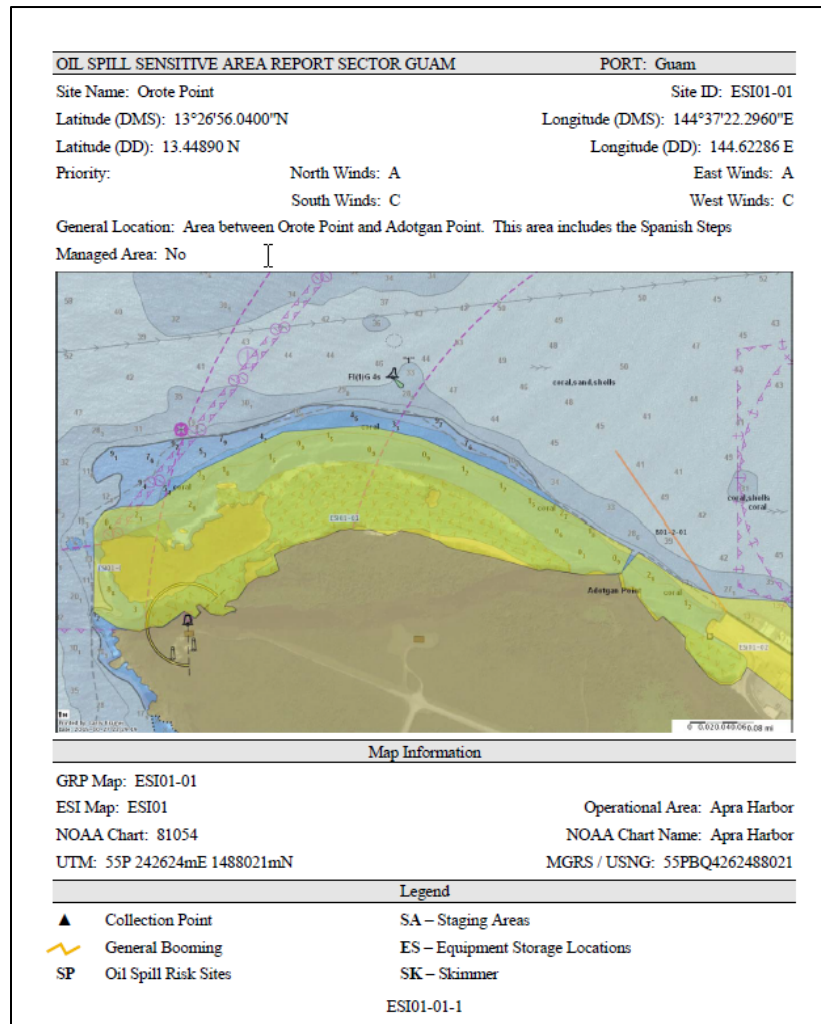


Figure 6b: Sector Guam GRP “soft-copy” PDF documents for GRP sites created in Pacific ERMA available on USCG Homeport

USCG Great Lakes Sectors GRP Development and Workshop

NOAA and the Great Lakes SSC worked closely with USCG District 9 to develop a self-maintaining process for creating simple, consistent GRP strategies for all of the Great Lakes Sectors. This resulted in the first digital Great Lakes GRPs consisting of Priority Sites, Staging Areas, and Boat Ramps for each Sector. It also included providing the District with a framework to maintain and update these GRPs in-house so that the data in ERMA can be updated beyond the period of this project and at minimal cost to the USCG or NOAA. The GRP process that was developed in the Great Lakes represents a potential standard approach for the creation, maintenance, and posting of GRP data in other areas of the country or protectorates under USCG jurisdiction.

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The Great Lakes GRP exercise began in the summer of 2016 when the Sectors and Marine Safety Units were requested to fill out standardized spreadsheet templates that would be the basis for their Priority Sites, Staging Areas, and Boat Ramps prior to a District-wide GRP workshop in September of 2016. Because these features did not previously exist, the NOAA recommendations gleaned from the national inventory process were implemented. The previously identified minimum attribution and proposed standard symbology were used to shape and define the Great Lakes plans. Additionally, as in Guam, GRP PDF documents and maps are being produced directly from ERMA. The District developed their own GRP document template to capture standard text and photos that describe resources at risk, strategies and tactics, and ERMA maps to represent each designated GRP⁵.

GRP	Cleveland Lakefront	GRP #	GRP01
Protection Priority Sites / Ranking:	Rocky River (A), Cuyahoga River (A), Euclid Creek (C)		
LOCATION INFORMATION			
State: Ohio	County: Cuyahoga		
CONTACT INFORMATION			
FWS Ohio Ecological Services field office (614) 416-8993; ODNR Coastal Resources (888) 644-6267; Ohio State Historic Preservation Office at (614) 298-2000;			
RESOURCES AT RISK CHARACTERISTICS			
Managed Areas:	Wendy Park, Gordon Park, Cleveland Lakefront State Park, Cleveland Lakefront Nature Preserve, Euclid Beach, Villa Angela and Wildwoods Parks, Voinovich Bicentennial Park.		
Shoreline Type:	The shoreline consists of solid, sheltered and exposed man-made structures; gravel and sand beaches; riprap, and vegetated low banks. The most sensitive shoreline are the vegetated low banks, especially if water levels are high or water is piled onshore by winds.		
Sensitive Habitat:	Vegetated low banks.		
Wildlife:	<p>Birds: Peregrine falcon (ST), Kirtland’s warbler (FE/SE), Piping plover (FE/SE), red knot (FT/ST), American bittern (SE), black-crowned night-heron (ST), and great egret (SSC) may also be present in the area. Waterfowl: scaup, mallard, mergansers, and Canada goose. Diving birds and gulls may include Caspian tern, double-crested cormorant, herring gull, laughing gull and brown pelican. Raptors: present and foraging in the area may include bald eagle and osprey. Shorebirds: present may include killdeer, spotted sandpiper, and willet. Wading birds: present in marshes and vegetated areas may include great blue heron and green heron. Belted kingfisher, may be present and foraging along creeks.</p> <p>Fish: Cisco (SE), brook trout (ST), and lake sturgeon (SE) may be present in nearshore waters. Other fish species present in nearshore waters, many of which represent important game species, may include: bluegill, crappie, white bass, rock bass, largemouth bass, smallmouth bass, lake whitefish, white perch, yellow perch, freshwater drum, walleye, carp, channel catfish, northern pike, rainbow smelt, gizzard shad, emerald shiner, alewife, and trout.</p> <p>Mammals: Muskrat may be present throughout the area.</p> <p>Insects: Canada damer (SE), a dragonfly, may be present along vegetated shorelines.</p> <p>Plants: Richardson’s Pondweed (ST) may be present in shallow waters.</p>		
Federally Threatened / Endangered Species:	Birds: Kirtland’s warbler (FE); piping plover (FE); red knot (FT); Mammals: Indiana bat.		
Socio-Economic Resources:	The Cleveland water intake crib is located at 41° 28’ 29.63” N, 81° 44’ 19.68” W, approximately two miles northwest of the Port of Cleveland entrance. The Stadium East artificial reef is located at approximately 41° 35’ 55.78” N, 81° 33’ 48.68” W, near the mouth of Euclid Creek. The area has high vessel traffic associated with commercial ports, recreational marinas, and docks. Recreational fishing occurs along most of the lake front east of the Cleveland Harbor breakwater.		
SPILL RESPONSE			
Predicted Behavior:	Surface lake currents tend to follow the wind direction more closely than currents at depth. Along the Lake Erie shoreline, there’s a general west to east flow of approximately .25 (1/4) knots; however, that can vary significantly due to winds. The overall predominant wind direction is from the south and southwest with wind coming from this direction about 55% of the time, but there’s significant seasonal variances: a		

Figure 7a: Sector Cleveland GRP “soft-copy” PDF documents for GRP sites created in Great Lakes ERMA

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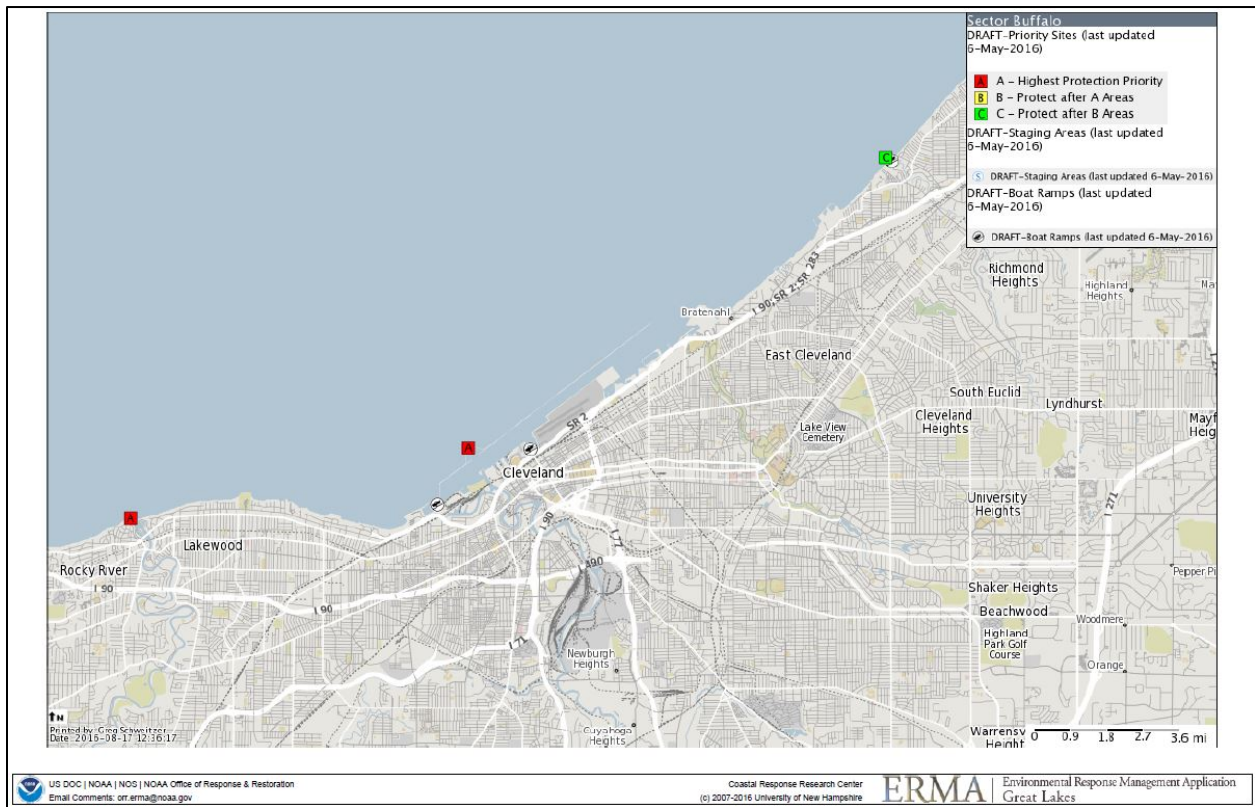


Figure 7b: Sector Cleveland GRP “soft-copy” PDF documents for GRP sites created in Great Lakes ERMA

Six months after the GRP workshop, this process is working successfully and the first annual review and update coordinated by the District is underway and will result in new and improved coverage for all of the Great Lakes. The Great Lakes Sectors all now have draft GRPs in ERMA, and future updates will be included as they become available.

CONCLUSIONS

The utility of a common operational picture tool to provide situational awareness is driven by the data available for each specific scenario or incident. GRP data are critical for an effective initial strategy at the time of an incident. This project has facilitated the update and expansion of the GRP holdings available for use in ERMA, significantly enhancing the utility in the first 24 to 48 hours of a response. Furthermore, this project has allowed NOAA to look at opportunities to continue this process and support partners' development and maintenance of GRP and related data across any and all USCG Districts, Sectors, and States.

While it is difficult to impose a standard onto a national effort and process like GRPs, the Great Lakes District methodology for developing and maintaining GRP data is an effective model that is working and could be applied to other areas of the country.

ERMA provides a very useful web application to look not only at GRP development in a planning context, but to also provide a very effective platform for the USCG and other response agencies to access these data and use them in an active response.

NOAA will continue to support the USCG efforts to standardize these development processes, particularly as identified in the USCG 2012 ACP Job-Aid. NOAA will also help to support the championing of the USCG headquarters effort to meet their requirements for GRPs and ACPs nationally. Using ERMA as a national portal for these critical data provides a 24/7 access point for the USCG and partners, and provides effective response decision making at the time of an incident.

References

¹ USCG Area Contingency Planning Process Job Aid, USCG Office of Marine Environmental Response Policy (CG-MER), December 1, 2012

² NOAA ERMA. 2017. Web Application: Environmental Response Management Application, National Oceanic and Atmospheric Administration. Retrieved: [April, 1, 2017], <http://response.restoration.noaa.gov/maps-and-spatial-data/environmental-response-management-application-erma>

³ NOAA ERMA Technical User Guide.
https://erma.noaa.gov/ERMA_Basic_User_Guide_v2_0_FINAL_May_2016.pdf

⁴ Guam Home Port Full GRP Document.
https://homeport.uscg.mil/mycg/portal/ep/programView.do?channelId=-17389&programId=12623&programPage=%2Fep%2Fprogram%2Feditorial.jsp&pageTypeId=16440&BV_SessionID=@@@@0027952745.1492485466@@@@&BV_EngineID=cccdadgmehemdfcngcfkmdfhdfgl.0

⁵ Great Lakes GRP Templates and Full GRP Example.
Appendix One: GRP_D9_Cleveland_Lakefront
Appendix Two: SLM_Priority Strategy_Master_2017_020314
Appendix Three: Sector_Name_Priority_Status_Sites.xls