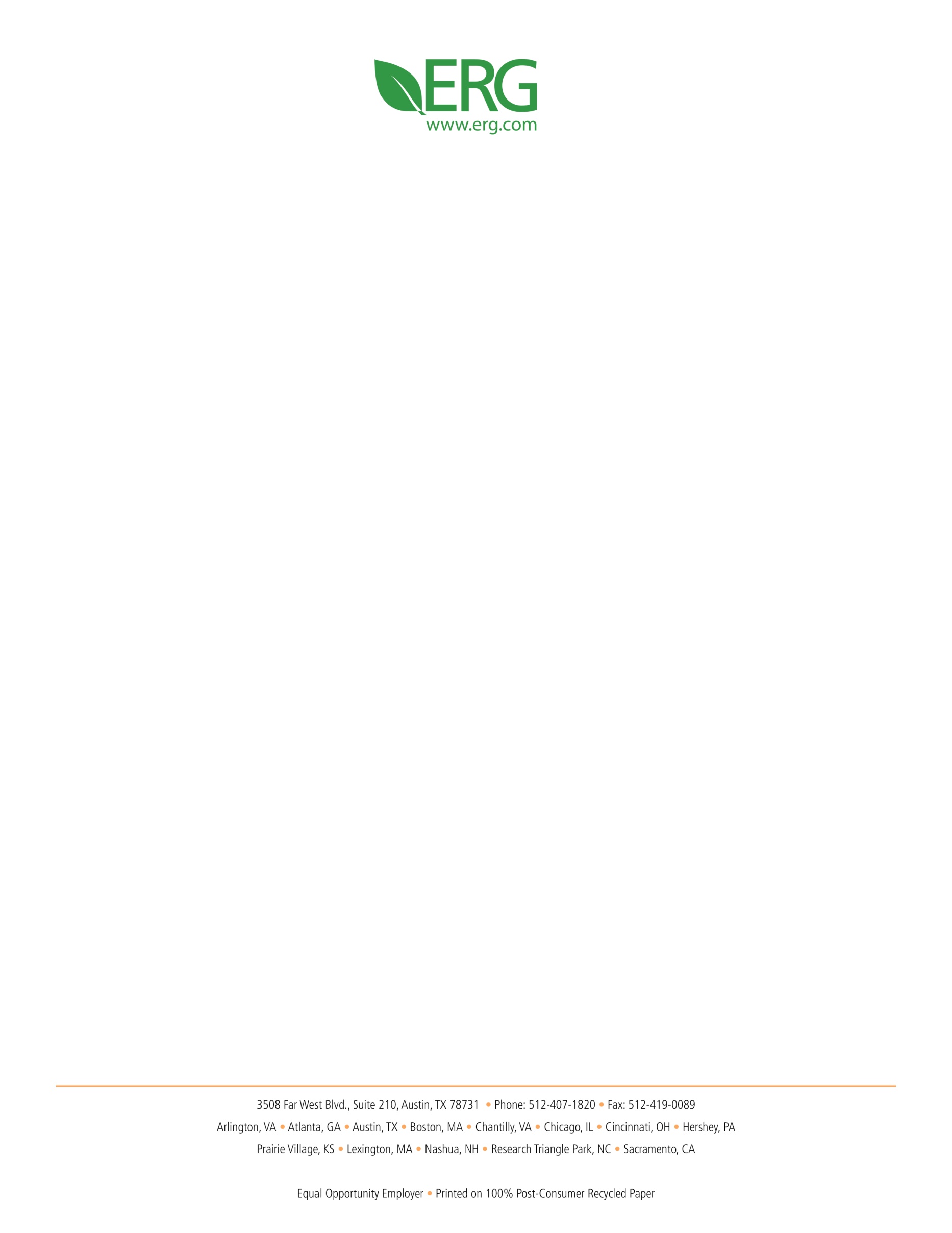
****

**MEMORANDUM**

**TO:** Laurel Driver/US EPA

**FROM:** Heather Perez and Richard Billings/ERG

**DATE:** August 22, 2012

**SUBJECT:** Category 1 / Category 2 Commercial Marine Activity Spatial Allocation

1. **Introduction**

The U.S. Environmental Protection Agency (EPA), issued Work Assignment 2-04, “Improving Category 1 / Category 2 Commercial Marine Activity and Emission Estimates” under EPA Contract Number EPA-EP-D-11-006, to Eastern Research Group, Inc. (ERG) to support the development of the 2011 commercial marine vessel and aircraft components of the National Emission Inventory (NEI).

Comparison of the marine vessel component of the 2008 NEI with those developed by several large ports has shown that the NEI estimates for vessels equipped with Category 1 and 2 (C1/C2) propulsion engines are roughly an order of magnitude larger than estimates developed for local port authority inventories. EPA suspects that these differences are the result of the simplistic method of spatially allocating commercial C1/C2 emissions from national totals to local areas. In the case of commercial Cl/C2, these allocations assigned 75% of emissions to in‑port and 25% underway. The in-port emissions were allocated to the 150 largest ports only on the basis of the cargo tonnage of these ports.

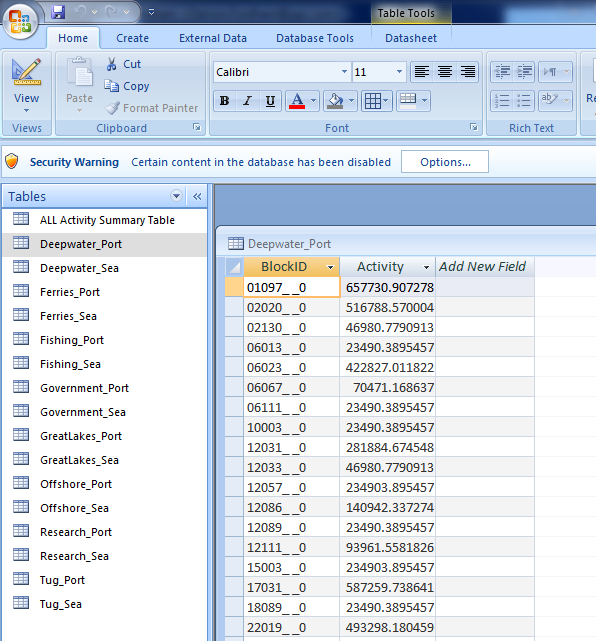
The purpose of this WA is to apply the previous work done by ERG and reported in "*Category 2 Vessel Census, Activity, and Spatial Allocation Assessment and Category 1 and Category 2 In-port/At-sea Splits,"* (Census Report) February 16, 2007, and the accompanying database to produce spatial allocation factors that more appropriate assign activity and emissions to ports and shipping lanes for NEI. It is believed that the data compiled in this report more accurately represent port and underway activities as noted in Table 1.

| **Table 1. Category 1 and Category 2 In-port/At-sea Splits from 2007 Census Report** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Type** | **In port %** | **At Sea %** | **Port Activity** | **Sea Activity** | **Total Activity** |
| Deepwater | 0.01 | 0.99 | 26,661,592.13 | 2,639,497,621.30 | 2,666,159,213.43 |
| Ferries | 0.65 | 0.35 | 951,790,535.43 | 512,502,596.00 | 1,464,293,131.43 |
| Fishing | 0.05 | 0.95 | 170,642,038.79 | 3,242,198,737.03 | 3,412,840,775.82 |
| Government | 0.59 | 0.41 | 850,445,219.50 | 590,987,355.93 | 1,441,432,575.43 |
| GreatLake | 0.01 | 0.99 | 13,932,438.55 | 1,379,311,416.06 | 1,393,243,854.61 |
| Offshore | 0.04 | 0.96 | 592,889,591.96 | 14,229,350,206.98 | 14,822,239,798.93 |
| Research | 0.01 | 0.99 | 5,754,084.17 | 569,654,333.04 | 575,408,417.22 |
| Tugs | 0.17 | 0.83 | 1,346,461,152.91 | 6,573,898,570.10 | 7,920,359,723.01 |

Section 2.0 describes the methodology used to develop the spatial allocation data for C1/C2 vessels, and Section 3.0 provides the references used in this study.

**2.0 Development of Category 1 / Category 2 Spatial Allocation Data Set**

The Category 1/Category 2 (C1/C2) Census Report provides an estimate of port and underway horsepower hours by vessel type, as noted in Figure 1. In the study, these estimates of activity were assigned to an appropriate grid or shipping lane based on vessel type and available traffic data.



**Figure 1. Example Data file from C1/C2 Census Report**

The activity for port and underway operations for all C1/C2 vessel types were aggregated and used as a weight factor for each allocation block and vessel operations using the following equation:

SAiJ = AiJ/∑AiJ

Where:

SAiJ = Spatial activity factor for vessel type *i* operating in block *J*

AiJ = Census Report activity for vessel type i in block J

I = Vessel type (e.g., tug, ferry, fishing) and operation (i.e., port, underway)

J = Specific spatial block

The shapefile created for the census report served as the starting point for developing the NEI EIS shapefile; as a result, the shape IDs from the C1/C2 dataset were easily matched to shape IDs in the EIS dataset; this allowed us to preserve the vessel-specific spatial allocations developed in the Census Report. A few additional revisions were necessary to ensure that the Census Report data could be used for EIS data submittals.

* Underway activity in federal waters was allocated in the Census Report to lease block polygons from the Bureau of Ocean Energy Management. These activity data were summed into the large polygons used to represent federal waters in the NEI.
* Port activity was allocated in the Census Report to shipping lanes near the port. The NEI uses a shapefile representing port locations and boundaries for port-associated activity, so the C1/C2 activities needed to be reassigned to the NEI port shapefiles. C1/C2 port activity was summed to the county level and then allocated to ports within each county based on polygon area. This approach ensured that activity was appropriately assigned to the detailed boundaries of the larger ports as well as smaller ports, which are represented by small circles.

For counties with port activity that did not have ports in the NEI shapefile, GoogleEarth was used to identify a suitable port location for each county, and small circles were created to represent the location of these additional port activities. Seventy-five new ports were created for inclusion in EIS.

* As most of the underway activity for offshore oil and gas platform support and research vessel occurs in federal waters ERG developed a new spatial allocation for these vessels using highly detailed Automated Identification System GPS location data for the Gulf of Mexico to quantify activity in both federal and state waters. This allocation data were mapped against EIS shapes to obtain the percentage of support and research vessel activity within each shape.
* Fishing activity data from the National Marine Fisheries Service for state waters (0-3 miles from the coast) and federal waters (3-200 miles from the coast) by state were used to modify the spatial allocation of fishing underway activity. Activity from 0 to 3 miles from the coast for each state was allocated to all underway shapes within the state based on shape area. All activity in the 3-200 mi was assigned to the appropriate federal water block nearest the state.

The spatial allocation files developed for this project are intended to be applied to 2011 C1/C2 emissions estimates develop by EPA’s Office of Transportation and Air Quality to develop the 2011 NEI dataset.

**3.0 References**

2011 Gulf of Mexico Vessel Data. AIS Data and Analytics, PortVision, AIRSYS, Inc. <http://www.portvision.com/products/ais-data-analytics.aspx>. Feb 2012.

NOAA, National Marine Fisheries Service; 2010 U.S. Landings by Distance from Shore, 2012. <http://www.st.nmfs.noaa.gov/st1/commercial/landings/ds_8850_bystate.html>

U.S. Environmental Protection Agency/ Office of Transportation and Air Quality; *Category 2 Vessel Census, Activity, and Spatial Allocation Assessment and Category 1 and Category 2 In-port/At-sea Splits,* February 16, 2007

U.S. Environmental Protection Agency, *Documentation for Commercial Marine Vessel Component of the National Emissions Inventory Methodology (NEI),* March 30, 2010, <http://www.epa.gov/ttn/chief/net/2008inventory.html>.