Memo

To: Phil Lorang, Chair, SAEWG

From: Dennis Beauregard
Date: October 15, 2003
Subject: EIIP Planning for FY-04

This memorandum is intended for distribution to SAEWG members to provide some background information on potential projects for funding by the Emission Inventory Improvement Program (EIIP) during FY-04.

Available Operating Funds

As you are aware, EIIP has approximately $690,000 that has not been allocated to specific projects. The breakdown is $361,582 of STAG funds and 328,075 of EPA (EPM) funds. All but $100,000 have been placed on EFIG contracts. We left $100,000 in reserve to allow for movement of funds to other contractors or organizations should the need arise.

Active Projects (in order of descending EIIP funds):

Project Title	Funding ($1000)	Notes	Status
Kansas City LDGV Mobile Source PM Fine Testing.	500	OTAQ lead. EIIP funds providing for speciation of tailpipe samples.	Bids under review by technical and cost panels. Contractor selection expected shortly.
Nonroad Model Single City Pilot Study	255	OTAQ lead. Results will validate/refine NONROAD Model (equipment population, activity, emissions).	Final ICR development underway. OMB approval expected late - early January.
Fugitive Dust Model Enhancement	175	ORD lead. Adding meteorological data and	Project underway.

NH3 emissions module.

Literature review to construct speciation profiles for VOC and PM (including organic and elemental carbon splits).	150	EFIG lead on AQ modeling needs; ORD lead on source receptor needs analysis needs	Workgroup formed. Draft work product received for AQ modeling project.
Emission Inventory Training Courses	150	EFIG lead. EI fundamentals, PM Fine and Toxics courses being developed jointly with EOG.	Worgroup formed. To be completed early FY-04.
Toxics Top-Down Validation Approaches	100	LADCO lead. Tools to facilitate comparison of ambient air quality data with emission inventory data.	Will follow MOBILE6 Top Down Validation Study.
Toxics QA Tools	100	EFIG lead. QA tools for identifying outliers and comparing toxics and criteria pollutant inventories.	Project underway.
Updating Paint Manufacturing Guidance Document	75	ESD lead. EIIP funding for contract to improve theoretical approach. Coordinated with National Paint and Coatings Asociation.	Draft update of EIIP guidance to be available, shortly.
Locomotive Emissions Guidance	60	Grant to SESARM with SCDHEC project lead.	Contract awarded. Coordinated with OTAQ.

NH3 Emissions from Animal Husbandry	50	ESD project lead. Project will integrate several new sources of information/analysis, including recommendations from the NAS committee on air emissions from CAFOs.	Workgroup formed. Draft report to be released shortly.
Improve Techniques for Estimating Emissions from Manmade Stationary Sources of Ammonia.	50	EFIG Lead. Update of stationary source portions of Battye report.	Project underway. Draft work products under review by workgroup.
Development of Model Plant Files for Water9	40	ESD project lead. Model plant files will facilitate use of Water9 model.	Project completed.
Quality Assurance Software	40	EFIG lead.	Project completed - QA software and User's Guide received from contractor.
Annual EPA Emission Inventory Conference	35	Funds provided by EIIP for up-front expenses with possible recovery after conference.	This is the second year of support from EIIP.
Commercial Cooking/Charbroiling	30	Improve per capita numbers.	SOW under development.
Documentation of data and methods used for development of the NEI	30	EFIG Lead.	Project completed.
Completion of Process Classification Code System (PCC) System Design	30	ARB to lead	On hold.
Wildfires Workshop	25	To explore available emission estimation approaches	In progress.

NH3 State of the Science Paper	20	ORD to lead with EFIG assistance	Work assignment developed.
Residential Wood Combustion Activity Workgroup	15	MARAMA lead. Funding for support of workgroup activities.	Draft report available.
PM 2.5 and HAP Emission Reductions from School Bus Retrofit Programs	15	Grant to Puget Sound Clean Air Agency for development of software tool.	Project underway. To be completed during FY-04.

Proposed Projects

STAPPA & ALAPCO Emissions and Modeling Committee

On August 5, 2003, the Emissions and Modeling Committee of STAPPA and ALAPCO discussed potential projects for EIIP funding during FY-04. It's questionable whether EIIP is the proper venue to address some of the concerns heard during the call, but since the list is short, it is presented here in its entirety. Additional suggestions from follow-up e-mail are also included in the list:

1. **Review of FIRE SCC and Emission Factor Combinations:** There are problems with point source emission factors in the Factor Information REtrieval (FIRE) database since there is not always a single factor and Source Classficiation Code (SCC) combination. One example is NOx combustion at New Source Performance Standard (NSPS) affected units - it's not uncommon to have several NOx emission factors for the same source and control equipment configuration. One approach to addressing this is to add another digit to the SCC to allow designation of each combination. This would save states from having to review and delete combinations not needed each time the FIRE database is loaded into state databases

   NOTE: Several years ago, EIIP started a project to develop Process Classification Codes (PCCs) that would replace SCCs. This project was not completed.

2. **Use Technology Transfer to add Emission Factors to FIRE:** EPA should consider adding emission factors for "like sources" to FIRE. As an example, assign NOx emission factors from combustion sources to other similar combustion sources lacking factors. State and local agencies make these determinations now and having EPA make the assignments would promote consistency.

3. **Emission Categories With Highest Uncertainty:** EIIP should focus on source categories with the most uncertainty. Those include Wildland Fires, Ammonia and Area Source Solvents

4.   **Dairy Ammonia Emissions Model Project:** There is an increasing emphasis on regional air quality issues such as regional haze, and $PM_{2.5}$. Ammonia emissions play a key role in both fine particulate formation and visibility reduction. Dairy operations are a major source of ammonia emissions. Since current dairy inventories ignore the role of meteorological parameters in ammonia emissions and the emission factors in use are not representative of the farming operations in the United States, ammonia emissions are one of the most uncertain categories in emission inventories nationwide. Much of the dairy ammonia information available today is based on information from European dairies. The proposed project would continue current efforts to obtain dairy ammonia measurements conducted in the USA and refine an ammonia emissions model based on the measurements.

Current Project: Region 10 is currently involved in a project to develop a dairy ammonia emissions model that will operate in the Sparse Matrix Operating Kernel Emissions (SMOKE) framework. The project is being accomplished through a small 105 grant ($26K) with Washington State University (WSU). While the contract work is being done by the Civil and Environmental Engineering Department, it has attracted the attention of Agricultural Sciences staff as well. The voluntary collaboration within WSU and among the state agency sponsors can result in a good, dynamic tool for estimating and modeling dairy ammonia emissions.

The current project makes use of measurements already conducted at WSU. The existing measurements were conducted at the WSU dairy, primarily in the summertime. Further measurements of other ecosystems plus measurements reported in the literature as well as measurements conducted by Environment Canada will be used to develop a module that makes use of temperature and, potentially, relative humidity Mesoscale Model 5 (MM5) data to predict ammonia emissions into the atmosphere. This project is somewhat unique in that it makes use of measurements conducted in the USA.

It is planned to model emissions from three general areas: waste system, housing, and slurry application. Most of the model parameters have been defined. The attached *.pdf file is a draft flow diagram showing the expected waste system and housing modeling process. The slurry application calculation process is more difficult to define and has not been completed.

Request for Additional Funding: The current dairy measurements were conducted in eastern Washington where the climate is predominantly dry. An additional $50,000 would allow measurements to be taken at a dairy in western Washington where the climate is much wetter and dairy practices are different. It would also allow for examination of seasonal differences. The extra funding would also help to more fully integrate the ammonia model into SMOKE. Together, the extra measurements and refinement of the ammonia model will produce a good tool that can be used within the SMOKE environment to estimate dairy ammonia emissions for $PM_{2.5}$ and regional haze air quality modeling.

EPA's Office of Transportation and Air Quality (OTAQ):

Commercial Marine Inventory Development

5. **Estimate Category 2 commercial marine engine populations and develop an allocation method ($100 K)**

    EPA's current approach for estimating Category 2 marine diesel propulsion engine emissions relies on a study performed for our 1999 rulemaking. In this study, population estimates were constructed from the number of commercial U.S.-flag ships greater than 100 gross registered tons listed in Lloyds Maritime Information System (LMIS) database of registered vessels. An obvious concern with this approach is that it is not clear how inclusive LMIS is, particularly for non-ocean-going vessels. In addition, this approach does not consider emissions from Category 2 engines on foreign vessels that operate in U.S. waters. Furthermore, no geographic allocation of Category 2 vessels exists.

    The purpose of this project is to estimate the population of Category 2 marine diesel engines that are used for propulsion purposes on vessels operated in United States port areas and allocate these to commercial ports. This will provide refined national and allocated port-specific population and activity estimates for ships equipped with Category 2 propulsion engines, allowing states, local agencies, and EPA to develop a more precise estimate of Category 2 marine diesel engine emissions.

6. **Characterize commercial marine vessel inter-port activity and develop a modeling method** (**$150 K -** OTAQ is funding the project at this level but supplemental funding could be used to apply the developed methodology to additional inter-port areas).

    A critical need for better defining commercial marine vessel (CMV) emissions is to improve the characterization of CMV inter-port (i.e., between ports) activity. This includes identifying the locations where inter-port ship operation take place, the amount of time spent during inter-port transits, and the number and types of CMVs engaged in this type of activity, including the size of the vessel (in gross tons or feet), engine size (if available) and country of origin.

    The purpose of this project is to define inter-port areas, develop a method to estimate interport Category 2 and 3 CMV activity, and apply the methodology to selected inter-port areas to improve the accuracy of CMV inter-port activity estimates.

7. **Conduct an analysis of commercial marine vessel emissions transport and develop a modeling method** (**$75 K -** OTAQ is currently working with OAQPS/NOAA to identify potential models and define the approach).

    Currently, OTAQ knows of no means with which to estimate how CMV emissions are distributed via predominant wind patterns in a given nonattainment area. Understanding the pollutant transport issue is key in determining how far off the coast EPA, states, and local agencies should consider CMV emissions as impacting air quality on land.

The purpose of this project is to develop a methodology to estimate CMV criteria emissions transport from areas off the U.S. coasts, and on the Great Lakes in order to determine their impact on air quality on land. The methodology would then be applied to coastal areas including, at a minimum, the West Coast, East Coast, Gulf Coast and Great Lakes.

8. **Deploy SPOT on commercial marine vessels in select ports to characterize activity and NOx emissions ($100 K)**

   The purpose of this project is to improve the current estimates of commercial marine emission factors, by measuring emissions under real world conditions. Vessels representing Category 1, Category 2, and Category 3 would be selected. This would be a pilot program to develop and refine the methodology.

   Aircraft Inventory Development

9. **Develop an interface between EDMS and MOVES ($40 K)**

   FAA developed the Emissions and Dispersion Modeling System (EDMS), a combined emissions and dispersion model for aircraft. This project would add a two-way interface between EDMS and EPA's planned MOVES model. The interface would allow the ability for EDMS to connect automatically with MOVES to obtain GSE emissions, and for MOVES to connect automatically with EDMS to obtain aircraft emissions.

10. **Update EDMS to include historical aircraft activity data for commercial aircraft activity by airport and aircraft type; and GA, air taxi, and charter activity ($15 K)**

    The current structure of EDMS requires the user to input activity data for the airport(s) of interest. This project would add historical aircraft activity data by airport to EDMS. This would include commercial aircraft activity by airport and aircraft type, as well as general aviation, air taxi, and charter activity. This version of EDMS would be used for the project described in 1) above.

11. **Characterize aircraft emissions in cooperation with ORD, by supplementing existing work ($150 K)**

    A critical need for aircraft model development is PM emission factors for large commercial aircraft engines. The few emission factors that are currently in existence for these engines were developed in the 1960s. They are poorly documented, most likely unrepresentative of today's commercial aircraft engines, and are in dispute by industry and the FAA. Lacking new engine PM test data, the FAA is developing a methodology using engine smoke, i.e., smoke number. Unfortunately, the new FAA method estimates only the non-volatile PM (mostly black carbon) portion of the total particulate mass, without accounting for the very important volatile hydrocarbon portion of the emissions. Therefore, the EPA has begun a multi-year program to test aircraft engines that will measure all of the PM generated, as well as provide new information on hydrocarbon speciation for toxic air pollutant analyses. The initial sampling campaign will be

conducted on a DC-8 aircraft equipped with relatively new General Electric CFM-56 engines at NASA's Dryden Flight Research Center in the spring of 2004. These tests are extremely expensive, i.e., $350,000 to $400,000 per test. This project would supplement these aircraft PM emission characterization work sponsored by EPA to ensure the program is fully funded and completed as planned.

Locomotive Inventory Development

12. **Deploy SPOT on locomotives to collect idle data, switch and commuter activity data, and emissions as a function of grade ($200 K)**

   For locomotives, the most critical data gaps related to activity data are time in idle for all locomotive categories and activity data for yard (switch) and commuter locomotives. From an emissions perspective, the effects of grade have not been accounted for. The proposal will recommend collection of these activity and emissions data at the local level, using SPOT units.

Emission Factor and Inventory Group (EFIG):

Wildland Fire

13. **Support to USFS to build a GIS-based fuel loading coverage database of the US that all stakeholders can use for fire EI's ($50k)**

   USFS (Seattle) has completed (by October, 2003) an initial compilation of Fuel Characterization Classes (FCC's) for the US. These can be used with the recently enhanced Emissions Production Model (EPM) and associated fuel consumption & fire behavior models to estimates emissions from wildland fire (both wild and managed). The EPA has identified the need to have a national integrated GIS product of FCC's at a 1 km resolution so the emissions models can be used without firsthand knowledge of fuel type and availability in the fire affected area. The USFS agrees with this needs determination. This project will provide greatly improved fuels information over that available in the National Fire Danger Rating System. The data will be current (NFDRS is very dated) and the number of fuel types will increase from 21 to 251, greatly improving fuels characterization. This funding request ($50k) is the minimum needed.

   Note: We anticipate this project will be cost-shared with the Joint Fire Sciences Program and the national Fire Plan. The fuels coverage database could be further enhanced to include activity fuels (altered fuels availability due to e.g., logging, infestation, hurricane damage) and additional validation for an additional $50k - $100k total).

14. **Support to EPA-ORD to integrate the BlueSky fire emissions and modeling system with modular emissions processors and grid models (e.g., SMOKE & CMAQ). ($70k)**

   It is our goal to be able to do fire emission estimates using real time meteorological conditions and to model those impacts in a multi-source, multi-pollutant platform using

grid models. USFS (Seattle) has successfully implemented (in the Pacific NW) an integrated smoke modeling framework named BlueSky. BlueSky uses interchangeable components to input fire characteristics, estimate emissions, estimate smoke dispersion using a puff model and output results, primarily to support smoke forecasting and smoke management applications. Its emission estimation capabilities are state-of-the-art, but its puff modeling capability is a limitation.   Another modeling system, the Community Smoke Emissions Model (CSEM) was developed to estimate fire emissions as input to regional grid-based modeling analyses. CSEM's emission estimation capabilities lag current practice, but its output is designed to interface with emission processing / grid models.   The EPA and the USFS recognize that BlueSky and CSEM contain complementary features which, if combined, will provide state-of-the-art emissions estimation that interfaces with emission processing / grid model platforms. The resulting product will be modular and independent of the emission processor so it can be used in SMOKE, OpEM, etc.

15. **Continue co-support of and preparation for a workshop on fire emission estimation methods and data needs ($60k)**

The RPO's (WRAP, others), EPA, USFS & DOI are planning a workshop for stakeholders in Spring, 2004 to develop consensus on as many fire inventory issues as possible. The major focus of the workshop will be to consider a range of fire event types, sizes and sensitive area proximity and decide, to the extent possible: 1) data needs and collection protocols; 2) appropriate emission estimation tools (and default assumptions); 3) data quality objectives needed to estimate fire emissions; and 4) methods for projecting fire emissions in future years.

In FY-03, this project developed temporal profiles for wild and prescribed fires and made significant progress on defining data needs for fire emissions estimation and estimation methods. This is being accomplished thru a series of conference calls that are discussing and framing the issues. Based on these calls, most issues will be highly focused prior to the workshop and some will include tentative recommendations. These calls will enable the workshop to be more inclusive and productive.   Funding in FY-04 will continue these calls, prepare materials for the workshop and provide technical support and documentation of the workshop. Note: The WRAP will co-fund the workshop (tentatively matching the requested amount), including facilitation of workshop / breakouts. Also, the estimated cost will only fund limited followup on issues not resolved at the workshop.

Training and QA/QC

16. **Enhanced QA/QC for HAPs and PM/VOC Comparison for CAP/HAP ($25 K)**

Originally started in FY03, this is a follow-on work assignment to complete the QA/QC enhancements. Due to unexpected difficulties in developing the interface, the work assignment was not completed in FY03 and used more hours than originally expected. Currently, the tool is being beta tested by several states and EPA. The tool, although

originally targeted for HAPs, includes criteria air pollutants (CAPs) as well. The states will be able to create "Top X" reports based on facility, county or source category level, by pollutant. These reports will contain min, max, std dev, total emissions and % of contribution. The states will also be able to create year to year comparison files. Reactions to the beta testing has been very positive. This follow-on work assignment will address the comments received through the beta test and look into additional functions, such as:

- Top X by Region
- Emission Density Reports
- Mapping Capabilities
- Comparison reports for VOC HAP to VOC and PM HAP to PM in a CRITHAP Inventory
- Frequency Histograms - provide graphical representations of the distribution of the emissions and illustrate distortion and spread of data
- Pollutant contributions within a single source category could be evaluated to identify pollutants that are wrongly associated with a specific source category
- Capability to do year-to-year comparisons using different versions of NIF
- Ability to export into spreadsheet format.

A report on the findings from the task under the current project to do a PM/VOC comparison for the CAP/HAP inventory will be available in a few weeks.

17.   **Create a emissions graphical QA tool that is similar to that proposed for OPEM ($80 K).** There are no funds under the current OPEM effort for such a tool. The graphical QA tool could be used for any modeling platform that a state decides to use (SMOKE, OPEM, EMS)

18.   **Provide funding to provide training and additional tools to states about how to efficiently QA and submit their NEI data ($50 K).** These trainings would be on-site at each state, or perhaps coordinated through the RPOs at a single site for each RPO.

19.   **Emission Inventory Training for states/locals/tribes ($60 K).** Would provide for contractor support to conduct training on PM and HAP inventories during 2nd quarter of FY-04 for state, local and tribal air agencies. Training would be conducted at regional office sites in conjunction with visits planned by EFIG to discuss draft National Emission Inventory (NEI) 2002 plan.

20.   **Enhancement of PM and HAP training modules ($150 K).** Training modules developed with EIIP support will address methods for developing PM and HAP emission inventories but lack specificity on some source categories. These modules will benefit from additional details on techniques for developing higher quality, locally derived emission estimates which will be developed under this proposal.

   Miscellaneous

21. **Emission Inventory Conference for 2005 ($35 K).** EIIP has co-funded this conference for the past two years and without EIIP assistance, the conference is in serious jeopardy for 2005.

22. **Address Comments on Paint Manufacturing Document Update ($15 K).** The current project will yield an updated paint and ink manufacturing document and a new guidance document on batch processes. Both documents will require workgroup and external reviews. Additional funding will be helpful to address comments received on the drafts and develop final guidance documents.