Chapter 14 – Government Performance and Results Act (GPRA) Measures

Government Performance and Results Act (GPRA) Measures

The 1993 Government Performance and Results Act (GPRA) holds federal agencies accountable for using resources wisely and achieving program results. GPRA requires agencies to develop plans for what they intend to accomplish, measure how well they are doing, make appropriate decisions based on the information they have gathered, and communicate information about their performance to Congress and to the public. ORD's MYPs include annual performance metrics which are used to meet GPRA requirements. The metrics are the annual performance measures (APMs) and annual performance goals (APGs) found in the ORD MYPs. This chapter lists the AMAD's Annual Performance Measures (APMs) that contribute to the Annual Performance Goals (APGs) identified under the Long Term Goals (LTGs) in the ORD MYPs supported by AMAD research. Table 14.1 presents the AMAD APMs for 2004 through 2008 that support EPA Goal 1 Clean Air and Global Climate Change. These APMs are found in the Clean Air Research MYP and the Global Change Research MYP. Table 14.1, also lists the AMAD APMs for 2004 through 2008 that support EPA Goal 4 (Healthy Communities and Ecosystems). These APMs are found in the Ecological Research MYP.

Table 14.1 AMAD Annual Performance Measures in Support of EPA Goal 1 Clean Air and Global Climate Change and EPA Goal 4 Healthy Communities and Eco Systems		
2004		
2004 AIR APG 36 Provide evaluation of observation based models and analyses.		
APM 231	Report on recommendations for monitoring strategy improvements for States to use observations-based methods in their O_3 NAAQS implementations.	2004
2004 ECO APG 64 Environmental managers can appropriately assess risks and evaluate outcomes of management decisions at different watershed scales.		
APM 268	Implementation in MIMS of statistical aggregation tools to construct seasonal and annual average air concentrations and deposition for application to multimedia problems	2004
2004 ECO APG 65 Environmental managers can assess risks to ecosystems, using modeling tools that incorporate advanced models for atmospheric, land surface, and instream processes.		
APM 265	Demonstration of coupled deposition, plant, and soil models to improve dry deposition modeling.	2004
2004 AIR APG 71 Provide Air Quality Modeling tools to OAR which are capable of addressing the long range transport, complex air chemistry, and local scale issues for at least 6 HAPs.		
APM 216	Report on the addition of the next set of air toxics chemicals to the CMAQ's modeling ability for use in air toxics assessments.	2004
APM 317	Provide initial linkage of CMAQ model results at neighborhood scales with human exposure models.	2004
2004 AIR APG 144 Develop an updated set of State Implementation Plan (SIP) tools, in assessing source emissions, ambient PM levels, and population exposures.		
APM 219	Test CMAQ model predictions against a years trace gas and PM measurements from the speciation network and Supersites to build confidence in the CMAQs use by states in their PM NAAQS implementations.	2004
APM 337	Evaluate Models-3/CMAQ for particulate matter using episodic data.	2004
2004 ECO APG 153 Modelers have the necessary understanding of biogeochemical processes controlling nutrient cycling in watersheds to improve the scientific basis for risk management decisions.		
APM 266	Evaluation of significant uncertainties in modeling nitrogen cycling to support multimedia management strategies	2004

Table 14.1 AMAD Annual Performance Measures in Support of EPA Goal 1 Clean Air and Global Climate Change and EPA Goal 4 Healthy Communities and Eco Systems		
2005		
2005 AIR APG 69 Provide updated tropospheric ozone precursor measurement methods, emission based air quality models, observation based modeling methods, and source emissions information to guide the next round of State Implementation Plan (SIP) development to attain the NAAQS		
APM 124	Updated CB4 chemical mechanism included in Models-3/CMAQ	2005
APM 130	Provide updated Models 3/CMAQ	2005
2005 AIR APG 76 Provide updated scientific information on VOC reactivity to guide control strategies/policies		
APM 131	Report on The Scientific Basis of New, Updated Reactivity Policy.	2005
2005 ECO APG 114 Methods for assessing ecological condition are demonstrated in the Mid Atlantic region		
APM 551	Report on evaluation, spatial, and temporal analyses of downscaled regional meteorological simulations and completion of "model-ready" MCIP-processed MM5 regional climate simulations for reference period and future climate change scenario	2005
2006		
2006 AIR APG 129 NATA Metals and Aldehydes: By 2006, upgrade air quality models; generate source emission factors, models, and new measurement techniques; provide dose-response assessment values and exposure estimates; and evaluate risk management options for metals and aldehydes, particularly those of greatest concern		
APM 64	Update CMAQ modeling system to include toxic adehydes and metals.	2006
APM 65	Evaluate a refined air quality model to provide mercury deposition to water and terrestrial surfaces	2006
2006 AIR APG 131 Provide updated AQ models, including the most advanced meteorological driver, for use in developing SIPs for ozone and other co-occuring pollutants in a "one atmosphere" manner		
APM 123	Present CMAQ workshops and training to States, EPA Program Offices, academia, and industry, sponsored through CMAS	2006
2006 AIR APG 189 Deliver to OAR and states an updated air quality model with improved atmospheric chemistry and processing speed, and improved data on emissions and ambient concentrations used as inputs to the model, for use in preparation and evaluation of SIP development, application, and compliance determination.		
APM 500	Deliver to OAR and States an updated CMAQ release for SIP development with improved performance in predicting nitrates and organics and increased processing speed	2006
2007		
2007 ECO APG 114 A quantitative evaluation of the direct effects of climate change on regional emissions and air quality will be available to air quality managers in States, and EPA Regional and Program Offices		
APM 87	Air Quality Simulations: Conduct numerical air quality simulations using as input regional climate modeling, emissions modeling, and driver scenarios	2007
2007 AIR APG 131 Provide updated AQ models, including the most advanced meteorological driver, for use in developing SIPs for ozone and other co-occuring pollutants in a "one atmosphere" manner		

Table 14.1 AMAD Annual Performance Measures in Support of EPA Goal 1 Clean Air and Global Climate Change and EPA Goal 4 Healthy Communities and Eco Systems		
APM 85	Meteorology incorporation of Weather Research and Forecast (WRF) met model into CMAQ modeling system	2007
2007 ECO APG 303 Modelers have the necessary understanding of the behavior of pollutants in the atmosphere and in watersheds to predict ecosystems exposures		
APM 192	Assessment of annual nitrogen deposition (oxidized and reduced) to Tampa Bay to characterize the deposition and to provide guidance to the State of Florida on potential contributing sources (Bay Regional Atmospheric Chemistry Experiment)	2007
2008		
2008 AIR APG 7 Provide improved measurement systems, data to better quantify and estimate emissions, concentrations, and exposures, and health effects information to indoor and ambient hazardous air pollutants		
APM 397	Enhance air quality and exposure modeling tools to address finer scale air toxics concentrations and exposures	2008
2008 AIR APG 8 Provide advanced air quality models that incorporate the latest atmospheric and emissions data, to OAR and states		
APM 398	CMAQ model system release and evaluation, including improved capability for aerosol processes, especially secondary organic aerosol production	2008
2008 AIR APG 10 Develop modeling systems that couple air quality and meteorology models for better estimates and forecasts of ambient ozone and PM 2.5		
APM 399	Develop and test a prototype 2-way coupled WRF-CMAQ modeling system.	2008
2008 ECO APG 37 Methods developed and demonstrated for modeling and mapping ecosystem services related to wetlands, nitrogen cycling, and water quality including demonstrations at multiple spatial scales in place-based research areas.		
APM 400	Provide improved deposition algorithms for sulfur, nitrogen and mercury for the FY 08 release of CMAQ.	2008

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

DEC 1 2 2008

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: OAQPS/AQAD Response to Selected NERL/AMAD Annual Performance Measures Completed in FY08

FROM: Richard A. Wayland, Director
Air Quality Assessment Division
Office of Air Quality Planning and Standards

TO: Dr. S.T. Rao, Director
Atmospheric Modeling and Analysis Division
National Exposure Research Laboratory

I am writing to express my appreciation for the valuable research and development efforts by ORD/NERL's Atmospheric Modeling and Analysis Division (AMAD). The Air Quality Assessment Division (AQAD) within the Office of Air Quality Planning and Standards (OAQPS) is responsible for providing critical technical assessments and input to support programs and policy efforts across the Office of Air and Radiation (OAR) and the Agency. We have established a very successful partnership across our divisions in bringing the best science into our air quality assessments. Therefore, the tools and models developed by AMAD are critical to AQAD's day to day work in support of the Agency's mission to improve air quality and reduce harmful human and environmental exposures.

Significant efforts by AMAD in support of AQAD and OAQPS include the following four Annual Performance Measures (APM) completed this past fiscal year:

1) APM #397: Improved Hybrid Air Quality Modeling Approach,
2) APM #398: CMAQ Model System Release and Evaluation, including Improved Capability for Aerosol Processes, especially Secondary Organic Aerosol Production,
3) APM #399: Develop and Test a Prototype 2-Way Coupled WRF-CMAQ Modeling System, and
4) APM #400: Improved Estimates of Air-Surface Exchange in CMAQ.

In addition to the four APM transmittals, AQAD also has also benefited greatly from AMAD work on wildfire and windblown dust emissions. AMAD has been a leader in the development and evaluation of procedures to integrate satellite detection and classification of fires with state-of-the-art wildfire emission estimation methods. This collaboration with NASA, NOAA, USDA Forest Service, DOI, and OAQPS facilitated development of the first national model-ready emissions inventory that relied on satellites to detect and classify fires. This research was a key part of OAQPS' effort to provide a technologically improved and highly cost effective estimate of wildfire emissions within the National Emissions Inventory. AMAD has also made significant progress in the development of a model to estimate windblown dust emissions. Evaluation of this model within the CMAQ model system has shown it to be a promising tool that, with refinement, can significantly advance our capability to estimate windblown dust emissions, forecast windblown dust events, examine claims of exceptional wind events and provide closure to the mass balances of PM2.5 and PM Coarse.

As we reflect upon our successful partnership in emissions and atmospheric modeling, I want to highlight the strong foundation that our past and ongoing collaborations serve for working together to address the Agency's future challenges such as climate change and near-roadway exposures among others. The complexity of these future challenges will require that we establish new partnerships in order to develop the needed tools and models and provide credible and policy-relevant technical assessments. An excellent example is our recent joint presentation to Steve Page and Larry Reiter about our new partnership in the climate arena to address climate-air quality interactions. We will also need similar coordination and joint efforts in the area of near-field modeling to address emerging needs in the public health and exposure communities. We look forward to our continued collaborations that are essential to successfully support the programs and policies needed to solve our current and future environmental problems.

The remainder of this memorandum provides specific response to each of the four APMs completed by AMAD this past fiscal year.

APM #397 "Improved Hybrid Air Quality Modeling Approach"

The development, testing, and evaluation of new methods to enhance our capabilities to deliver fine-scale primary PM2.5 and air toxic concentration estimates for exposure assessments is critically important. The hybrid approach described in this APM was first identified as part of a joint retreat across AQAD and AMAD in 2005 and was subsequently developed in collaboration across our divisions. The research and publications listed here were important first steps in informing the modeling community of this technique to develop spatial gradients by combining outputs from CMAQ photochemical model and our AERMOD dispersion model. We in AQAD have since learned more from our recently completed multipollutant modeling effort in Detroit and shared those findings with ORD staff across NERL (both AMAD staff and those working on DEARS project). In short, the hybrid approach is an extremely time and resource intensive method for conducting urban scale assessments across multiple sources. In addition, for specific applications like near roadway efforts, we need to improve the characterization of mobile emissions and near-field modeling science to credibly estimate these concentration gradients and appropriately inform exposure studies.

We agree that continued collaboration in this area is important and mutually beneficial to our offices. It is clear that additional research and development efforts are needed to meet the complex near-source impacts for human health and ecosystem assessments. We look forward to talking more formally with AMAD to define those areas in need of new or enhanced research efforts to address these near-field issues. These efforts range from more focused and closer coordination in the development of Gaussian dispersion models like AERMOD to the development and evaluation of formal techniques within photochemical models like CMAQ (e.g., plume-in-grid, source apportionment, etc). Our successful partnership with development and application of the CMAQ model is an excellent example for us to emulate as we move forward together to address these near-field issues.

APM #398 "CMAQ Model System Release and Evaluation"

We rely heavily on the CMAQ model in conducting air quality modeling in support of EPA programs and policies. Most recently it was used for estimating health benefits as part of the Regulatory Impact Analyses for the revised O3 NAAQS final rule and OTAQ's Locomotive and Commercial Marine final rulemaking. The recently released "multi-pollutant" version of CMAQ with enhanced characterization of SOA is essential to our ability to perform multi-pollutant policy and regulatory analyses such as that required by the upcoming Renewable Fuel Standards rulemaking. The continued support of scientific improvements and evolution of this modeling system to meet upcoming policy needs is critical to OAQPS, OAR and the Agency.

I would like to commend AMAD for their development of this enhanced version and coordination with us throughout this development process. Air Quality Modeling Group (AQMG) staff was kept informed on science and process issues as AMAD researchers worked through the development and testing of CMAQ v4.7. An important aspect of this coordination was the implementation of an incremental testing procedure to identify and understand the effects of the individual science updates. AMAD staff then presented results of the incremental testing and details of the science improvements in various seminars and public forums. This exchange of information as part of the testing and evaluation process was invaluable to AQMG staff as they prepared for the use of this model in regulatory and policy applications. We urge AMAD to formalize this type of incremental testing and evaluation process for future releases and extend the formal evaluation to an annual simulation with reporting on the comparison back to the results from the previous official version of CMAQ.

APM #399 "Development of Coupled WRF-CMAQ System"

Modeling capabilities to address the linkage of climate and air quality are necessary to inform the successful development of future programs and policies in both areas. Climate and air quality are closely linked from both the scientific and policy perspectives. Thus, in order to support the future policy development and ensure the efficiency of integrated climate and air quality strategies, an improved scientific knowledge on the interactions of air quality and climate is essential. Conventional global climate and regional climate-air quality modeling systems were developed in separate ways to address either air quality or climate/meteorology without the capability to address this important issue of climate-air quality interactions.

NERL's development of an integrated modeling system that effectively couples air quality with meteorology provides a scientifically sound framework to assess the interactions of climate and air quality. This work is a critical part of our new partnership in the climate arena to address climate-air quality interactions and eventually incorporate these tools into our regulatory modeling assessments. The preliminary modeling results of the WRF-CMAQ prototype conducted by NERL showed a great potential in improving the understanding of the direct effects (i.e., changes in radiation) and semi-direct effects (i.e., changes in boundary layer meteorology-temperature, vertical mixing, etc. induced by changes in radiation) of air pollution on regional climate. We are highly encouraged by the continued development of this "coupled" modeling system and its expansion to address the indirect effects of air pollutants on regional climate (e.g., effects of aerosols on clouds, precipitation, etc.). Continued efforts on this important AMAD project will allow OAQPS to learn from the development and evaluation of this "coupled" modeling system to inform the policy dialogue on integrated climate and air quality strategies and co-benefit analyses.

APM #400 "Improved Estimates of Air-Surface Exchange in CMAQ"

The development, testing, and evaluation of improved, state-of-the-science estimates of ammonia and mercury air-surface exchange to assess pollutant loadings to ecosystems and to improve estimates of air pollutant concentrations is critically important. This research-grade, bi-directional flux module was originally planned to be included as part of the official release of CMAQ v4.7 as described in APM #398. However, this past spring we were informed that this module was preliminary and would not be included in the standard operating mode of the model's public release version. We are in the midst of using the new release of CMAQ v4.7 for analyses in support of the Risk and Exposure Assessment for the NOx/SOx secondary NAAQS review. NERL is aware of our plans for using this version of CMAQ to obtain estimates of nitrogen deposition that does not include a fully operational version of the bi-directional flux module.

The work completed under this APM is expected to allow for estimation of more credible nitrogen and mercury concentrations and deposition and would have been greatly beneficial for use in our ongoing modeling efforts. However, unlike the process for the development of CMAQ v4.7, we have not been kept fully informed on the development, testing, evaluation, and plans for release of CMAQ with an operation-grade, bi-directional flux module. Consistent with past practice, before we can apply this model version for our policy/regulatory applications we will need more information from NERL on: (1) the scientific basis for this module, (2) results of testing and evaluation, (3) caveats/cautions for potential users, and (4) procedures for use of this module in CMAQ.

Since our first use of CMAQ for regulatory applications in the Clean Air Interstate Rulemaking, our divisions have worked closely on the timing and content of the release of new versions to CMAQ in order to avoid unnecessary disruption of our regulatory analyses and providing mixed signals to the community on the scientific underpinning of our rules. Therefore, we look forward to follow up discussions on this development effort to improve our understanding of this bi-directional flux module within CMAQ. When this work is completed, we can then follow our well-established process to move forward towards the component's use for our future regulatory/policy applications.

Again, I want to express my appreciation for the efforts of the AMAD staff and the successful partnership between our divisions. I look forward to AQAD's continued collaboration with AMAD as we work together to address the Agency's current and future challenges.

cc: David Mobley
Kenneth Schere
Alice Gilliland
Tom Pierce
Rohit Mathur
Val Garcia
Rich Scheffe
Lydia Wegman
Steve Page
Larry Reiter

Chesapeake Bay Program

410 Severn Avenue, Suite 109, Annapolis, Maryland 21403. 410-267-5700. FAX 410-267-5777. Toll free 800-968-7229

December 1, 2008

Dear Dr. Larry Reiter:
This is to acknowledge the essential assistance provided to the Chesapeake Bay Program (CBP) by the Community Multiscale Air Quality (CMAQ) modeling team. The Chesapeake Bay Program relies on an integrated modeling system of airshed, watershed, estuary, and living resource models in order to provide information to decision-makers working to find cost effective, equitable, and achievable approaches to restoration of the Chesapeake. The CMAQ Model is a key component of our assessment of the restoration actions needed.

Atmospheric deposition of nitrogen is a major load to the Chesapeake, estimated to be a quarter of the total nitrogen load delivered from the watershed to the Bay. Direct atmospheric deposition to the Bay's tidal waters further raises the atmospheric deposition load to about a third of the Bay's total nitrogen load. Since 1992, the Chesapeake Bay Program has relied on the Regional Acid Deposition Model (RADM) and the Extended RADM to provide estimates of atmospheric dry deposition of nitrogen as well as management scenarios of nitrogen emission controls. This decade and a half of support has been key to our success in estimating nitrogen loads to the Chesapeake.

To achieve the Bay water quality standards of dissolved oxygen, chlorophyll, and water clarity, which were designed to protect living resources, reductions of all nitrogen load sources are necessary. These nitrogen load reductions have been characterized as E^3, or everyone, doing everything, everywhere to reduce nitrogen loads from point, nonpoint and air sources. Being able to correctly characterize the air loads gives decision-makers needed information on to relative size of the different load sources, and the relative costs of control.

An example of the importance of the CMAQ modeling can be found in the 2003 CBP Allocations of nutrient reductions. These reductions called for about a 50% decrease in nitrogen loads from the high-water mark of nutrient loads in the mid-1980s, reducing the average annual nitrogen load to about 175 millions of pounds. The six States of the Chesapeake Bay Program were close to resolution of the division of loads, but could only reach resolution of allocations down to 183 million of pounds of nitrogen. It was the assistance provided first by the Extended RADM, and later by CMAQ, which was able to estimate that an additional eight millions of pounds nitrogen would be provided by the Clear Skies Initiative (which later evolved into the Clean Air Interstate Rule (CAIR) and with the recent court action will be further modified). This knowledge of planned atmospheric nitrogen reductions allowed EPA managers to "adopt" the "orphan" eight million pounds of nitrogen needed to close the deal on the 2003 CBP Allocations. Without the support of both the Extended RADM and CMAQ's analysis of CAIR, the Chesapeake Bay Program would have had considerable difficulty in developing plans which would allow us to meet the Bay water quality standards mandated by State and Federal law.

The CMAQ Model continues to provide key support to the Bay Program as we move forward to assess management actions needed to meet water quality standards in the year 2030 despite the continued high growth in the region. Most recently the Community Multiscale Air Quality modeling team has provided key information on the influence each of the watershed states has on the nitrogen loads delivered to the Bay. This information created the basis for a management decision rule for allocating state emission reductions that are beyond the national rules to watershed deposition reductions that can count as state allocation reduction credits. The essential nature of this information goes far toward answering the decision-makers three key questions of 1) “What are my loads?” 2) “How do they compare with other loads?” and 3) “What can be done to control them?”.

This is only the most recent contribution that the CMAQ team has made to our work and we thank you for this long and fruitful assistance and collaboration.

Sincerely,

Lewis C. Linker
CBP Modeling Subcommittee Chair

cc: Dr. S.T. Rao

Tampa Bay Estuary Program

March 23, 2007

Dr. Lawrence Reiter, Director
US EPA National Exposure Research Laboratory
Mail Drop D305-01
Research Triangle Park, NC 27711

Dear Dr. Reiter:

Working through the Tampa Bay Estuary Program, Tampa Bay's research and resource management community has adopted the restoration of underwater seagrasses as a long-term natural resource goal and indicator of the overall health of Tampa Bay. Water quality targets and associated nitrogen loading goals have been developed and adopted to support attainment of the seagrass restoration goal. The load reduction targets have subsequently been accepted by Florida DEP and US EPA as nutrient TMDLs for Tampa Bay.

As for many coastal systems, atmospheric deposition is a major source of nitrogen loading to Tampa Bay. Reduction strategies in our TMDL implementation plan include actions addressing atmospheric deposition sources and pathways to ensure progress towards maintaining our long-term nutrient reduction targets.

Results of the CMAQ-UCD model will provide resource managers in Tampa Bay with 1). greatly improved estimates of both direct and indirect deposition of nitrogen to the bay and watershed; 2). estimates of the relative contribution from local sources, including mobile, power plants and other sources; 3). estimates of reductions associated with several power plant upgrades in the Tampa Bay watershed; and 4). estimates of reductions in deposition due to the 2010 CAIR regulations.

CMAQ-UCD modeling results are crucial to the improvement of successful science-based management strategies for Tampa Bay, including those for TMDL implementation, and would not be available to us except through the application of the model by scientists working in NOAA's Atmospheric Sciences Modeling Division in partnership with US EPA. Robin Dennis in particular has made every effort to ensure that the results of the modeling are directly applicable to TBEP's needs for improved understanding of atmospheric deposition to the bay and watershed.

Sincerely,

Holly Greening

Holly Greening, Senior Scientist

cc: Robin Dennis

T A M P A B A Y E S T U A R Y P R O G R A M
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Estuary Program

October 8, 2007

Dr. S. T. Rao and Dr. D. Mangis
U.S. Environmental Protection Agency
Office of Research and Development
National Exposure Research Laboratory
Atmospheric Modeling Division (MD E243-02)
109 T.W. Alexander Drive
Research Triangle Park, North Carolina 27709

RE: Product Evaluation Questionnaire Reponse for NERL APM #192 entitled "Assessment of annual nitrogen deposition (oxidized and reduced) to Tampa Bay to characterize the deposition and to provide guidance to the State of Florida on potential contributing sources (Bay Regional Atmospheric Chemistry Experiment)"

Dear Drs. Rao and Mangis:

Please find below my responses and comments on the above mentioned NERL product.

	Excellent	Good	Poor
How useful was the information provided?	X		
Rate the technical quality of the product:	X		

	Yes	No
Has or will this research product be used to effect rule-making decisions?	X	

The results of the CMAQ model application for Tampa Bay will have immediate use in the development of implementation plans for existing nutrient TMDLs for Tampa Bay. The Tampa Bay Estuary Program is coordinating a public/private Nitrogen Management Consortium Action Plan to address nutrient impairments and resource-based nitrogen reduction targets. Atmospheric deposition of nitrogen is the largest source type contributing to nitrogen loading to the Bay, and the results of this work have been and will continue to be critical in the development of appropriate nitrogen management actions to meet long-term targets and address impairments.

These results will also be used by EPA Region 4 and the Florida Department of Environmental Protection in the development of TMDLs for nutrient impairments in waterbodies within the Tampa Bay watershed, scheduled for 2008 and 2009.

As an aquatic ecologist and resource manager, I am very appreciative of the detail and formatting style used by Robin Dennis in reporting the results of a complex state-of-the-science air chemistry, transport and deposition modeling effort. He took great care in addressing the resource-based questions that I had as an end user, in preparing and reporting the analyses and results in a form that I can use directly in the development of TMDL implementation plans for existing and future projections. Mr. Dennis was in contact with me throughout the model development to ensure that the results would be provided and presented in the most useful terms for my needs.

Other comments or suggestions for improvement:

I have no suggestions for improvement for this project, but I would urge ORD to use this experience and methodology (i.e., extensive contact between model developer and end user throughout the development of results and reporting) as an outstanding example of developing and delivering complex modeling results to end users. I would be pleased to assist in letting others know of how effective and useful this effort has been, from my perspective as an end user.

Sincerely,

Holly Greening

Holly Greening
Senior Scientist
Tampa Bay Estuary Program

cc: Marc Russell
Tom Welborne, EPA Region 4 and TBEP Policy Board
Dick Eckenrod, TBEP Executive Director
Tom Atkeson, FDEP BRACE coordinator
Robin Dennis