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State Innovation Grant
Missouri Department of Natural Resources
St. Louis Air Quality Management Plan (AQMP)
1st Quarter 2011 Progress Report

This quarterly report includes:
1. A short summary of the work performed during the reporting period.
2. Description of progress on completing individual tasks and milestones reached.
3. Summary of grant expenditure.
4. Planned next quarter activities.

List of the Tasks Worked On

The key tasks worked on in this quarter were:
1. Collected some emissions data for the 2007 St. Louis Modeling,
2. Determined size and coverage of 4km and 1km modeling domains for ozone and toxics/$PM_{2.5}$, respectively (Task 6.1.3),
3. Evaluated meteorological data (WRF) performance,
4. Continued to develop local-scale toxics inventory and ozone and $PM_{2.5}$ inventories (Task 4.1), and
5. Participated in on-going community outreach.

Description of Progress on Completing Individual Tasks

The activities planned in this quarter were designed to continue development of technical data necessary for implementation of the AQMP. Below is a summary of tasks worked on.

Emissions Data Collection for the 2007 St. Louis Modeling

ENVIRON/ERG team has started collecting information of available emissions data relevant to the St. Louis SIP modeling. So far they have identified the following data sources:

- CenSARA – CenSARA is currently developing a 2007 point source inventory as part of the Ozone Technical Workshare. A file transfer protocol (FTP) drop-off site has been established to facilitate this process. Relevant point source data have so far been obtained from Kansas, Louisiana, Oklahoma, and Texas.
- Midwest RPO/LADCO – The 2007 draft base C inventory is nearing completion. The inventory includes all sectors except fires, and consists of a mixture of 2007 and 2008 inventory data. This data will be used as a reasonable approximation of the 2007 emissions.
- VISTAS – The 2007 base year Southeastern Modeling, Analysis, and Planning (SEMAP) Project emissions inventory is nearing completion. As of April 4, the only portions of the inventory that had not been completed were the point sources (limited to partial reporting

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EGUs) and area sources (remaining reconciliation between point and area sources due to the incomplete partial reporting EGU point sources). It is expected that the SEMAP inventory will be completed by the end of April 2011.

- MARAMA/MANE-VU – With the exception of on-road motor vehicles, the 2007 MARAMA/MANE-VU regional emissions inventory and documentation is posted on the MARAMA website and FTP site.
- WRAP – Currently, WRAP inventories only exist for the 2002 base year and the 2018 projection year. A 2008 inventory will be developed as part of the WestJumpAQMS study; however, this work will not be initiated until July 2011. In lieu of the 2008 WestJumpAQMS inventory, it was recommended that data from version 1 of the 2008 National Emissions Inventory (NEI) be used.
- Canada – As far as can be determined, a comprehensive 2007 inventory for Canada is not available. It is proposed that an existing 2006 inventory be used as a reasonable approximation of the 2007 Canada emissions.
- Mexico – ERG previously developed the first-ever county-level national emissions inventory for Mexico. ERG subsequently developed future year county-level emission projections for the years 2008, 2012, and 2030. It is proposed that the 2008 projections be used as a reasonable approximation of the 2007 Mexico emissions. Only emissions from those Mexican states which lie within the St. Louis modeling domain will be used.

Modeling Domains Determination

The request for proposal (RFP) states that the modeling domain for the chemical transport model (CTM) will consist of four levels of grid nesting: (1) a 36-km continental U.S. (CONUS) domain; (2) a 12-km central/eastern U.S. domain; (3) a 4-km St. Louis urban area domain; and (4) a l-km domain that would be narrowly focused around the core St. Louis metropolitan area. The RFP also notes that the ozone modeling would use the 36/12/4 km domains and the 1-km domain would be used for $PM_{2.5}$ and air toxics modeling.

ENVIRON has acquired the June through September 2007 WRF model outputs for the 36/12 km domains. ENVIRON informed us that since the 36/12 km WRF have already been completed, it was not possible to run a 2-way nest between the 12- and 4-km domains. In addition, a 4-km grid spacing domain would have a 3:1 nesting ratio compared to the 12-km coarse domain. Moreover, a nested 1-km grid spacing domain would have a 4:1 nesting ratio compared to the 4-km domain. However, using the more standard 3:1 ratio from the 4-km domain would produce a 1.33-km grid spacing domain.

A decision between 1-km and 1.33-km grid spacing was needed from MDNR for ENVIRON to move forward. After consulting with ENVIRON and IEPA, the 1.33-km grid spacing was selected based on the following:

1. The WRF development team at UCAR/NCAR recommends using only odd grid spacing for two-way nesting of real-data applications (3:1 or 5:1 ratios). One-way nesting may use even grid spacing ratio,

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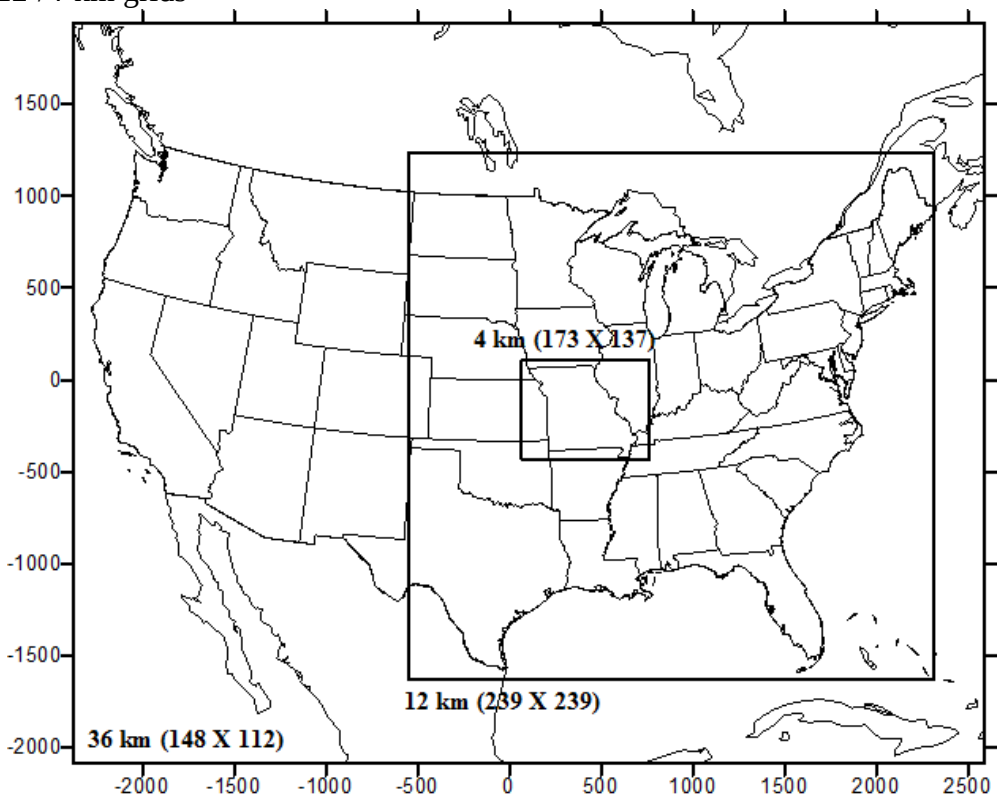
2. At grid spacing scales about 5-km or less, there is little demonstration improvement in model skill when using two-way nesting compared to one-way nesting, and
3. There will be more CPU and desk space issues with 1-km as compared to 1.33-km grid spacing.

The modeling domains are shown in figure 1 and their parameters are as follows:

- 36-km (148 X 112) which covers the continental U.S.,
- 12-km (239 X 239) which covers central/eastern U.S.,
- 4-km (173 X137) which covers most of Illinois and all Missouri, and
- 1.33-km (38 X 38) which encompasses the I-70/I-270/I-255 ring freeways encircling the St. Louis City center.

It should be noted that ENVIRON has originally proposed a smaller 4-km domain (110 X 110) which roughly covered two thirds of IL and one half of MO. However, the AQMP members decided to expand the 4-km domain to cover all of MO state in anticipation of the new ozone NAAQS coming this July, as the new standard is expected to cause new nonattainment areas. ENVIRON concurred with the expanded grid.

(a) 36-/12-/4-km grids



(b) 4-/1.333-km grids

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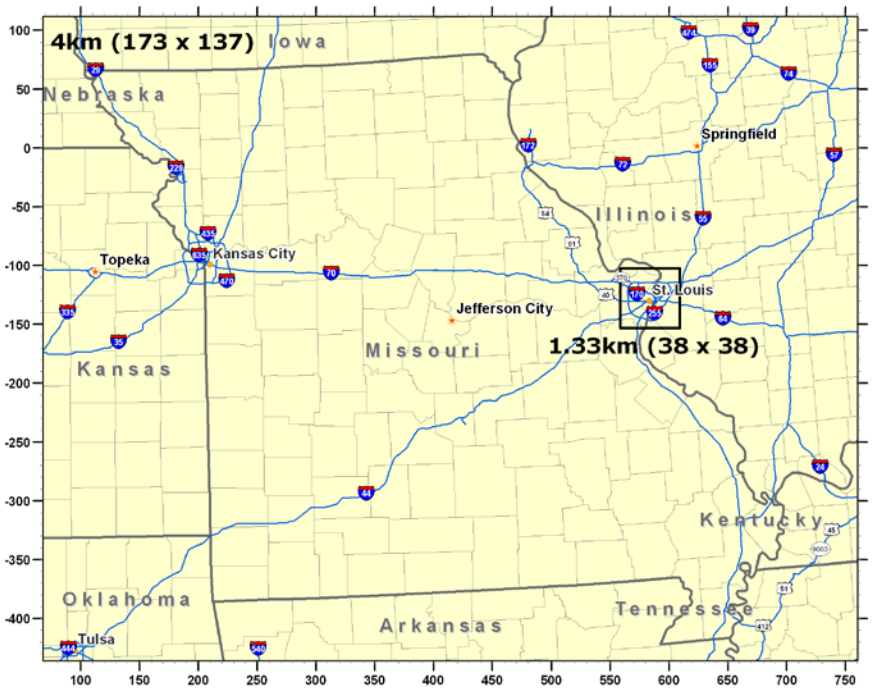

Figure 1. CTM modeling domains for the 2007 St. Louis SIP modeling.

Evaluation of the Meteorological Data (WRF) Performance

A preliminary performance evaluation for the Iowa Department of Natural Resources' 2007 WRF simulation was conducted to determine whether the 12-km WRF simulation is suitable to be used for initial and boundary conditions for the nested 4-/1.33-km WRF simulations to be performed by ENVIRON. Overall, the evaluation showed that the 12-km WRF model performance is acceptable for St. Louis modeling purposes.

Local-scale Toxics Inventory and Ozone & PM2.5 Inventories

The Air Program continued working on the development of St. Louis air toxics inventory. All of Illinois' 2008 criteria pollutants and toxics raw emission inventories files were converted to formats that are supported by the SMOKE emission model. SMOKE emission model was run for these files to make sure the conversion process was successful. Report outputs from SMOKE were compared to the raw data to make sure no emissions were lost. Missouri's 2007 point and area sources emission inventories that include criteria and toxics pollutants are nearly complete.

In addition, the Air Program prepared input for the on-road emission model (MOVES). These inputs will be given to ENVIRON and will be used to generate on-road emissions photochemical ready files. The following input files are ready to be shipped to ENVIRON:

- Age distribution files,
- Meteorological data,
- Source Type Population, and
- Highway Performance Monitoring System Vehicle Miles Traveled

Community Outreach

On March 29, staff presented at an East-West Gateway Air Quality Advisory Committee meeting a comparison of the 2009 National Air Toxics Trend Station (NATTS) ambient air toxics monitoring data to the 2005 National-Scale Air Toxics Assessment (NATA) model estimates of these air toxic concentrations in one unique St. Louis City census tract. The comparison showed overall good agreement between the NATTS ambient air toxics monitoring data and the 2005 NATA model estimates of these air toxic concentrations. This comparison provides further insight of the capability of computer air dispersion models and actual ambient air toxics monitoring to identify chemicals of concern in the ambient air of St. Louis City.

Financial Report

The following items were billed to the grant during the 1st quarter 2011.

Expenditures as of 03-31-2011		
CATEGORY	**CURRENT PERIOD EXPENDITURES**	**CURRENT CUMULATIVE**
PERSONAL SERVICE	12,437	71,623
FRINGE	5,090	29,487
CONTRACTUAL	0	0
INDIRECT	4,892	27,172
SUPPLIES	0	0
OTHER	0	0
TRAVEL	0	113
TOTAL EXPENDITURES	**22,419**	**128,395**

Next Quarter Activities

The activities in the 2nd quarter of 2011 will further the implementation of the St. Louis AQMP. The Air Quality Advisory Committee will meet to continue discussions about the implementation of the AQMP. In addition, discussions will be held regarding health-based evaluation metrics under the AQMP and the other ancillary air quality issues to be included in the AQMP evaluations. Review and discussion of the modeling protocol submitted by ENVIRON will commence. Development of a local-scale toxics inventory for the pollutants identified in the AQMP will continue. Base Case 2007 MOVES runs will also begin.

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Table - Schedule Changes of Major Project Tasks

	Task Name	Task Description	Outputs Expected	Start Date	End Date	Complete	Comments
1	AQMP Work Plan	Development of AQMP plan including input from both states, regional Offices, OAQPS, and stakeholders	Submit workplan to USEPA	10/07	1/08	Yes	Submitted on 1/15/08
2	Summary of Current Status	Development of AQMP document that provides the current status of St. Louis with respect to current air quality, planning activities, problems, outreach efforts, SIP history	Submit summary to USEPA	1/08	6/08	Yes	Final draft summary was submitted on 5/22/08
3	Conceptual Model	Development of AQMP document that provides the conceptual model for the project including discussion of individual pollutant formation, planning activities/outreach and policy issues	Submitted conceptual model to USEPA	5/08	9/08	Yes, submitted in January 2009	Conference calls are on-going
3B1	Draft Quality Assurance Project Plan (QAPP)	Development and submittal of draft QAPP for creation and implementation of the St. Louis AQMP	Submittal of draft QAPP for the project to USEPA	10/08	1/09	Yes, Submitted a draft to EPA, 12/08	
3B2	Final Quality Assurance Project Plan (QAPP)	Development and submittal of QAPP for creation and implementation of the St. Louis AQMP	Submittal of final QAPP for the project to USEPA	1/09	3/09	pending	EPA Region VII is continuing review of the final QAPP and will provide additional specific comments on the

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	Task Name	Task Description	Outputs Expected	Start Date	End Date	Complete	Comments
							QAPP
4	Additional Analyses for Efforts affecting Air Quality	Development of the tools necessary to begin the AQMP technical work including air toxics inventory creation, quality assurance, and subsequent analyses, emission model training and construct/data transfer, and photochemical model training/transfer (including air toxics)	Detailed under each sub-task			On-going	With the ENVIRON contract in place we expect modeling training /data transfer will commence later this year
4.1	Air Toxics Inventory	Obtain and process for use air toxics inventory information from Missouri/Illinois sources along with EPA National Toxics Inventory database for point, area, and mobile sources as a template for AQMP use	Template to develop air toxics inventory for use in photochemical modeling and inventory analyses	7/08	10/09	on-going	Work continues and staff has received air quality emission data from Illinois to proceed and continues work on the Missouri data. Staff has converted IL emission data to SMOKE format and started running SMOKE emission model for some of the emission categories (area, point, etc.)

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	Task Name	Task Description	Outputs Expected	Start Date	End Date	Complete	Comments
4.1.1	Emission Model Construct Transfer/Training *	EPA-OAQPS has developed an emission modeling construct to process air toxics inventory information from a wide variety of sources that is critical for use in this project; transfer of this construct from OAQPS along with guidance and support for use	Transfer of information from EPA-OAQPS and trained technical staff (with guidance from EPA)	7-8/08	1-3/09	N/A	EPA-OAQPS has told us there is no construct to transfer. This will require a thorough review of the methods utilized by EPA and training for the staff mentioned in the workplan, but will require additional effort to begin the modeling process
4.2	Photochemical Modeling Transfer/Training **	EPA-OAQPS has developed (is developing) an air quality (photochemical) model to evaluate ozone, PM, and air toxics using the same model/inputs; transfer of this model to allow for a comprehensive evaluation of all relevant pollutants in St. Louis	Transfer of information from EPA-OAQPS and trained technical staff (with EPA guidance)	10/08	4-6/09	N/A	Same as 4.1.1
5	Creation of AQMP*	Development of the plan entails considerable public outreach, incorporation of technical information, policy discussions between the	The AQMP submitted to USEPA	12/07	12/09	N/A	The AQMP development is proceeding. The development of the conceptual

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	Task Name	Task Description	Outputs Expected	Start Date	End Date	Complete	Comments
		relevant agencies and stakeholders, and ultimately decisions about what are air quality priorities in St. Louis (how can we reach them)					model has lead to the discovery of policy issues that need to be addressed in the coming months.
5.1	Public Outreach/ Education*	Meetings with local community to begin the education process about AQMPs; meetings with AQMP team, stakeholders and internal management to discuss technical policy issues related to the AQMP; formal public comments/hearing on the plan	Meeting summaries; documented revisions to the AQMP; Missouri Air Conservation Commission adoption of the AQMP	12/07	12/09	on-going	Two meetings of the Air Quality Advisory Committee in St. Louis were held and the AQMP is an on-going topic with discussion regarding progress and upcoming developments
5.2	Incorporation of Technical Information**	Incorporate experience with model constructs and processes from Task 4 into the AQMP structure	Discussion within the AQMP about problems/solutions, concepts to be included, start of documentation regarding transfer of data to others	4-6/09		on-going	
5.3	Prioritization of Air Quality Issues in St. Louis**	Decisions by the agencies with substantive stakeholder input regarding the prioritization of air quality problems within the area, resource allocation,	Discussion within the AQMP about resources, air quality priorities, funding issues, etc.	8/09	10/09	Draft, This task is on-going as new standards	At this point, the key focus areas are the 2010 ozone standard and the air toxics

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	Task Name	Task Description	Outputs Expected	Start Date	End Date	Complete	Comments
		staffing, etc.				are promul-gated. It is complete for now, but will change in the future.	evaluation necessary for inclusion. The new SO2 standard is problematic for the St. Louis area and will ultimately be part of control decisions using the multi-pollutant paradigm
6	Development of technical Analysis Tool*	The AQMP will dictate that the area will continue to address air quality problems and the methodology utilized for environmental control decisions (include technical products that will be considered)	Technical outcomes (reports, memoranda, etc.) designed to inform decision-making on environment control in St. Louis	12/08	10/12		
6.1	Development of "Next Generation" Emission Inventory and Modeling database*	After the modeling constructs are implemented, the next step is the generation of new SIP technical products including criteria pollutant and toxics inventory creation, processing of emissions and other input data for use in the air quality modeling system (meteorological, air quality,	Detailed in each subtask	12/08	10/12		

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	Task Name	Task Description	Outputs Expected	Start Date	End Date	Complete	Comments
		etc.)					
6.1.1	Development of Request for Proposal (RFP) for Air Quality Modeling Contract**	After the "new" modeling constructs have been transferred, an RFP will be created for assistance in the development of the emission inventory and modeling databases for the AQMP process; the contract will be for $169,973 (this amount will not fund the whole effort; assistance only)	Completed RFP for modeling assistance	12/08	3-5/09	Complete 11/10	Originally, $100,000 was allocated for this task but additional fund needed to generate 4km/1km metrological data and on-road emissions using MOVES for Missouri, Kansas, Oklahoma states.
6.1.2	Selection of Contractor/Contract Agreement**	Evaluation of the RFP and completion of the contractor selection culminating in the negotiation and finalization of the contract	Documentation of contract process and selection of contractor for this project and final contract for use	7/09	9/09	Complete 1/11	ENVIRON was selected based on its technical expertise and experience
6.1.3	Selection of Modeling Database (year, domain, etc.)*	Selection of the new modeling inventory year and database including domain size(s) for evaluation of criteria pollutants and air toxics (the outcome of this task will drive the remainder of the process and will need to be thoroughly discussed with EPA OAQPS and the Regional Offices and	Technical document detailing decision and rationale	9/10/09		On-going	Many of these choices have been made including domain size(s), but some of the remaining decisions will have to wait until EPA has finalized the new 8-hour

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	Task Name	Task Description	Outputs Expected	Start Date	End Date	Complete	Comments
		will be based on available EPA guidance for the new NAAQS)					ozone standard
6.1.4	Development of Baseyear Emission Inventory**	Obtain available emission inventory data from states, regional planning organizations, and EPA for criteria and air toxics pollutants (e.g. National Toxics Inventory); develop Missouri/St. Louis information then, process these data to develop the model-ready inventory database for the project (majority of contract funding will be expended here)	Model-ready emission inventory database	Early 2010	Mid 2011	On-going	Contractor started collecting available data from states, RPOs and EPA
6.1.5	Development of Other Baseyear Inputs	Development of air quality, metrological, and other photochemical modeling inputs (some of contract funding will be expended here)	Model-ready database	Early 2010	Mid 2011	On-going	Contractor obtained the 2007 36-/12-km WRF meteorological model outputs; Contractor is determining usefulness of data for 4-/1.33-km domains.
6.1.6	Baseyear Air Quality Modeling*	Development of air quality model that sufficiently predicts the monitored concentrations to be used in control strategy development (iterative process with inventory and other input	Air quality model ready for consideration of control strategy development	Mid-2010	Late-2011	On-going	

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	Task Name	Task Description	Outputs Expected	Start Date	End Date	Complete	Comments
		development)					
6.1.7	Development of "Attainment" Year Emission Inventory	Obtain available growth and control projection information from sources in 6.1.4; develop Missouri/St. Louis information; process data for inclusion in photochemical model	Model-ready future year (base) emission inventory database	Mid-2011	Late 2011	On-going	
6.1.8	Control Strategy Sensitivities*	Evaluate control strategies designed to achieve air quality goals in the photochemical model	Data used to support control decisions	Late 2011	10/12	On-going	
6.1.9	Air Toxics Reporting**	Detailed evaluation of air toxics exposure to the citizens of the St. Louis area based on the findings of 6.1.7 and 6.1.8.	Separate technical memorandum evaluating air toxics exposure in St. Louis	Late 2011	10/12	On-going	
6.2	Monitoring Data Evaluation	On-going evaluations of ambient monitoring data in the St. Louis area utilized to identify problems and potential source contributions for all pollutants, including air toxics in 6.1.9	Reports regarding monitoring data	10/08	10/12	On-going	
7	Transfer of AQMP Data/Procedures to Other Agencies**	Task is designed to allow other regulatory agencies to evaluate the benefits/problems of the multi-pollutant AQMP approach through the plan itself and a narrative regarding issues associated with this approach compared to the	Report on the efficacy of the project including problems and solutions	7/12	10/12	On-going	

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	Task Name	Task Description	Outputs Expected	Start Date	End Date	Complete	Comments
		current approach					
8	Project Reports	Task is designed to provide quarterly and project completion reporting	Quarterly status reports to Region VII and final report documenting activities supported under the grant	1/09	10/12	On-going	

* Portions of this task funded buy SIG

** All task funded by SIG