

**QUALITY ASSURANCE PROJECT PLAN
FOR NON-ROAD AND AREA SOURCE BASE YEAR AND FUTURE YEAR EMISSIONS
INVENTORIES**

**Contract Number S-2009-06-01
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**Prepared by
E.H. Pechan & Associates, Inc.
3622 Lyckan Parkway, Suite 2005
Durham, NC 27707**

**Prepared for
Southeastern States Air Resource Managers, Inc.
526 Forest Parkway, Suite F
Forest Park, GA 30297-6140**

Approvals Signature (required prior to project start):

John E. Hornback
SESARM Executive Director, John Hornback

Date: 8-7-09

Ronald Methier
SESARM Project Coordinator, Ronald Methier

Date: 8-7-09

Danny France
EPA Region 4 QA Manager, Danny France

Date: 8/12/09

Andy Bollman
Pechan Project Manager, Andy Bollman

Date: July 29, 2009

Kirstin Thesing
Pechan Technical Lead, Kirstin Thesing

Date: July 29, 2009


Stephen Roe
Pechan QA Officer, Area Sources, Stephen Roe

Date: July 30, 2009

Jim Wilson
Pechan QA Officer, Nonroad Sources, Jim Wilson

Date: August 3, 2009

Approvals Signature Page (continued)



EPA Technical Project Officer, Brenda Johnson

Date: 9-1-09



EPA Technical Project Officer, Michele Notarianni

Date: 8-27-09

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This project will not require the development of primary data, but will instead utilize existing data sources to compile an emissions inventory of industrial and commercial/institutional (ICI) area source fuel combustion source categories. Therefore, this Quality Assurance Project Plan (QAPP) addresses all elements required by “QAPP Requirements for Secondary Data Research Projects,” (EPA, 1999). Although many of the required QAPP elements do not apply for this project, this document is organized using the format specified in the U.S. Environmental Protection Agency’s (EPA) overall QAPP guidance documents – “EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5” (EPA, 2001), and “EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5” (EPA, 2002). Pechan has determined that a QAPP element does not apply to this project where a section heading is followed by the statement “This element is not applicable to this project.”

1.0 PROJECT MANAGEMENT

1.1 Title and Approval Page (EPA QA/R-5 A1)

See page 1.

1.2 Table of Contents (EPA QA/R-5 A2)

See page 2.

1.3 Distribution List (EPA QA/R-5 A3)

Name: John E. Hornback

Title: Executive Director

Organization: Southeastern States Air Resource Managers, Inc.

Contact Information: 526 Forest Parkway, Suite F, Forest Park, Georgia 30297-6140; (770) 785-7978;
hornback@metro4-sesarm.org.

Name: Ronald C. Methier

Title: SESARM Project Coordinator

Organization: Southeastern States Air Resource Managers, Inc.

Contact Information: 526 Forest Parkway, Suite F, Forest Park, Georgia 30297-6140; (770) 785-7978;
ronmethier@comcast.com.

Name: Andy Bollman

Title: Pechan Project Coordinator

Organization: E.H. Pechan & Associates, Inc.

Contact Information: 3622 Lyckan Parkway, Suite 2005, Durham, NC 27707; (919) 493-3144, ext. 116;
andy.bollman@pechan.com.

Name: Stephen Roe
Title: Pechan Quality Assurance Officer/Area Sources
Organization: E.H. Pechan & Associates, Inc.
Contact Information: P.O. Box 470009, Celebration, FL 34747; (407) 864-1895;
stephen.roe@pechan.com.

Name: Jim Wilson
Title: Pechan President and Pechan Quality Assurance Officer/Nonroad Sources
Organization: E.H. Pechan & Associates, Inc.
Contact Information: 5528-B Hempstead Way, Springfield, VA 22151; (704) 813-6700, ext. 102;
jim.wilson@pechan.com.

Name: Brenda Johnson
Title: Technical Project Officer for Fine Particle and Ozone Technical Work
Organization: U. S. Environmental Protection Agency – Region 4
Contact Information: 61 Forsyth Street SW, Atlanta, GA 30303; johnson.brenda@epa.gov

Name: Michele Notarianni
Title: Technical Project Officer for Regional Haze Technical Work
Organization: U. S. Environmental Protection Agency – Region 4
Contact Information: 61 Forsyth Street SW, Atlanta, GA 30303; notarianni.michele@epa.gov

1.4 Project Organization (EPA QA/R-5 A4)

The following summarizes the organizations and individuals that will be participating in guiding/performing technical work under this project.

SESARM Project Coordinator – Ronald Methier will be the responsible official for this project overseeing the overall project and budget, as well as tasking Pechan with work required to complete this project. He will communicate project needs to Pechan’s project coordinator.

Pechan Project Coordinator – Andy Bollman will have overall responsibility for assigning appropriate personnel to complete the tasks included in this plan. He will ensure that the project budget is adhered to. He will communicate with the SESARM Project Coordinator on work accomplished in this plan and any problems or deviations that need to be resolved. He will be responsible for documenting the project via the Work Plan, QAPP, monthly progress reports, technical memoranda, and draft and final inventory reports. He will also serve as the technical lead on inventory tasks related to area source categories.

Pechan Quality Assurance Officer/Area Sources– Stephen Roe will perform or oversee the performance of all area source-related QA/QC responsibilities for this project. Mr. Roe will work closely with the Pechan Project Coordinator and technical staff to ensure the integrity of the data gathering process and results.

Pechan President and Quality Assurance Officer/Nonroad Sources – Jim Wilson will perform/oversee the performance of all nonroad source-related QA/QC responsibilities for this project. Mr. Wilson will

work closely with the Pechan Project Coordinator and technical staff to ensure the integrity of the data gathering process and results. Mr. Wilson also has the overall responsibility for compliance with the corporate quality assurance plan and commitment of firm resources to successful contract performance.

Pechan Technical Lead/Nonroad Sources – Kirstin Thesing will oversee all work related to the nonroad mobile sector tasks for this project. She will ensure that the task budget for nonroad tasks is adhered to. She will coordinate with the Pechan Project Coordinator in documenting the nonroad tasks under this project via the Work Plan, QAPP, monthly progress reports, technical memoranda, and draft and final inventory reports. She will also communicate with the Pechan Project Coordinator concerning any problems or deviations that need to be resolved with SESARM.

Pechan Technical Staff – Jonathan Dorn, Viola Glenn, Melissa Spivey, and John Van Bruggen will be responsible for compiling the required data inputs, computing the emission estimates from these inputs, and organizing the estimates into the inventory formats required by SESARM.

Figure 1-1 displays the relationships and lines of authority/communication for all key project staff.

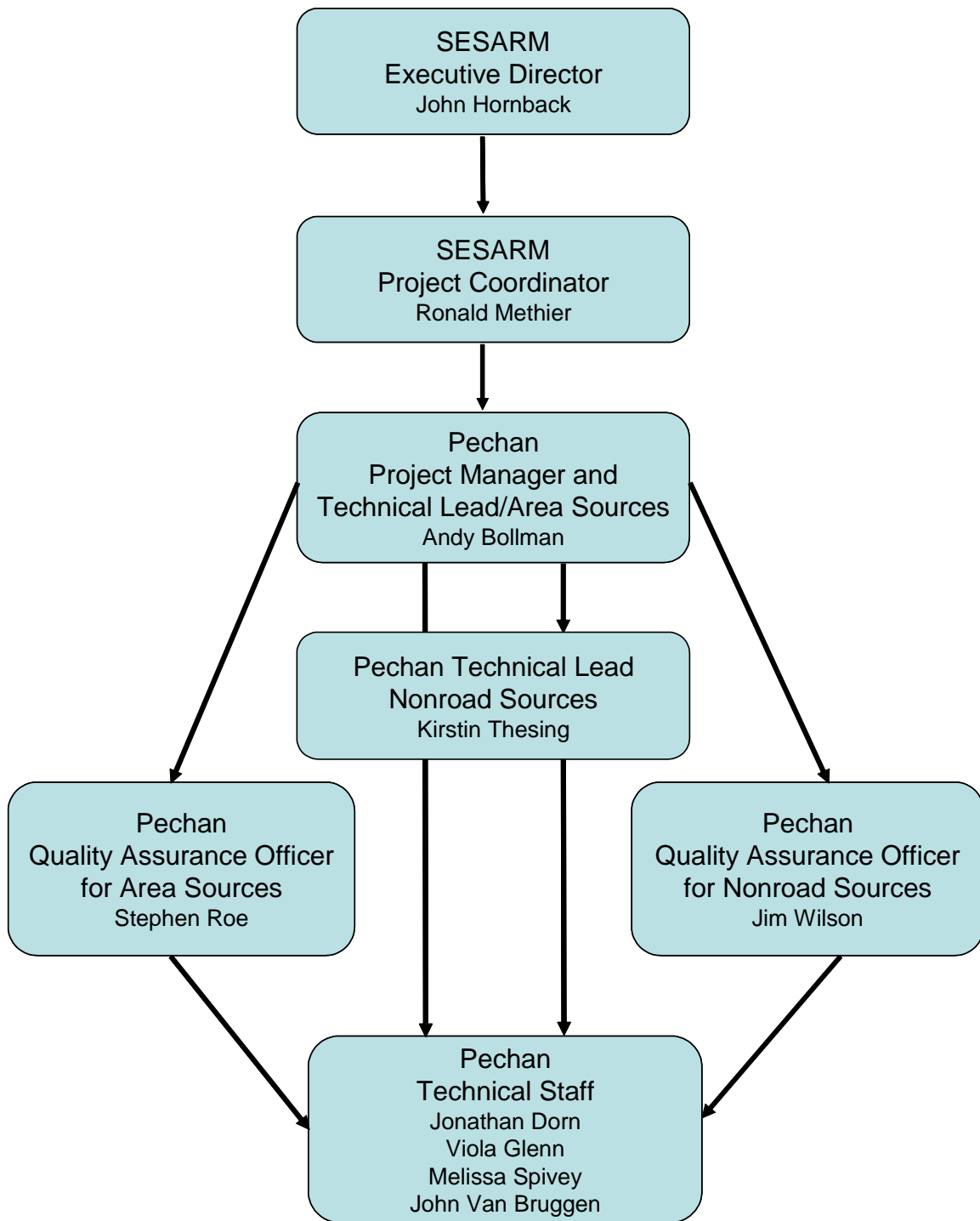


Figure 1-1. Area and Nonroad Mobile Source Inventories Project Organization Chart

1.5 Problem Definition/Background (EPA QA/R-5 A5)

The Southeastern States Air Resource Managers, Inc. (SESARM) was formed to coordinate and support the local and state air pollution control agencies located in the southeastern states of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee. In the coming years, these local and state air pollution control agencies will be required to model emissions and air quality for the purpose of planning for achievement of the particulate matter (PM) National Ambient Air Quality Standards (NAAQS), the Ozone NAAQS, and Regional Haze Rule requirements. Comprehensive base and future year emission inventories for area and nonroad mobile sources are needed to support these planning efforts. The emissions inventories will need to include all primary and precursor emissions necessary to accurately model fine particles and ozone, including ammonia (NH₃), carbon monoxide (CO), nitrogen oxides (NO_x), particles with a diameter less than 2.5 micrometers (PM_{2.5}), particles with a diameter less than 10 micrometers (PM₁₀), sulfur dioxide (SO₂), and volatile organic compounds (VOCs) for area and nonroad mobile source categories.

1.6 Project/Task Description and Schedule (EPA QA/R-5 A6)

The objective of this project is to estimate base year and projection year county-level area and nonroad mobile source emission inventories for the states of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, West Virginia and Virginia. The base year inventory(ies) will be developed consistent with the Environmental Protection Agency's (EPA's) criteria for emission reporting. Candidate base years for inventory development are 2006, 2007, and 2008. In consultation with its participating agencies and EPA, SESARM will decide which year to use as the base year before the inventory work begins. This project will also include development of emissions inventories for at least one future year. SESARM will select the future modeling year or years as appropriate to support fine particle, ozone, and regional haze objectives. This project will also include development of emissions inventories for future year control strategies to support modeling and assessment of controls necessary to assess the extent of NAAQS attainment and progress toward achieving regional haze goals. The technical approach to this project will be performed in 4 tasks.¹ The approach to performing each of these tasks is detailed below.

Task 1. Project Management and Reporting

This task entails all management-related activities for this project including: the preparation of a final project work plan, a quality assurance project plan (QAPP), and monthly progress reports; staffing the project and providing needed resources; review and quality assurance (QA) of all work products; cost tracking; and interaction with the SESARM Project Coordinator and Contract Officer. Project management activities may also include, where necessary and/or appropriate: database administration, and/or any other specific Contract or Contract Amendment requirements.

¹ This contract also allows for SESARM to obtain Pechan's services in up to three additional tasks: (4) Special Emissions Inventory Development Project; (5) Alternative Control Strategy Emissions Inventories; and (6) Alternative Projection Year Emissions Inventories. These tasks are not described in this QAPP because the contract currently does not include funding for these tasks, and do not have scopes that are clearly defined yet.

Pechan prepared a final project work plan that provides detailed information on the methods and approaches that will be used in the project (Pechan, 2009). Pechan will not begin work on any remaining project tasks until the SESARM Project Coordinator approves the work plan and costs in writing.

Pechan also prepared and submitted a draft QAPP on June 22 that covers development of the required emission inventories. The QAPP addresses the following tasks: data collection and compilation from the SESARM states and other sources, inventory review, revisions and corrections, documentation, and data archival. The draft QAPP was reviewed by SESARM and its participating agencies. Pechan prepared a revised QAPP (this document) that incorporated comments/changes requested by the SESARM Project Coordinator. No work will be performed on remaining project tasks until the SESARM Project Coordinator approves the QAPP in writing.

Pechan will also regularly communicate with the SESARM Project Coordinator as well as participate in monthly conference calls to discuss project progress and provide insight, background, and suggestions within our areas of expertise. Pechan will inform SESARM by telephone of any problems that may impede project performance, along with any corrective actions needed by Pechan or SESARM to solve the problem. Brief, but informative, monthly progress reports will be submitted by the 15th of each month describing all work performed during the preceding month. Pechan will also attend two 1-day meetings during the project in a major city in the Southeast with up to two staff attending each meeting.

Task 2. Base Year Emissions Inventories

For this task, Pechan will develop at least one base year inventory characterized by source classification code (SCC), and consistent with EPA emissions inventory reporting requirements. SESARM, after consultation with its participating agencies, will decide on the base year to use prior to official initiation of the inventory development effort. Pechan's base year emission inventory approach will first be based on available S/L/T data, but will also take advantage of additional (and, in some cases, better) data that will be available from current Pechan inventory efforts (e.g., development of the 2008 nonpoint and nonroad source NEI).

For both area and nonroad sectors, Pechan will first access available S/L/T and EPA inventory data for the SESARM base year (or the available year nearest to the base year). Pechan will review any documentation that is provided on the methods that were used to develop these emissions data. Pechan will then identify whether there are source categories and/or pollutants that appear to be missing from the S/L/T data by comparing these data to area/nonroad source emission inventories and inventory methods developed by the Eastern Regional Technical Analysis Coordination (ERTAC) group and those Pechan has developed to support recent/ongoing emission inventory efforts, including, but not limited to the 2008 nonpoint and nonroad source NEI. Pechan will document the results of these analyses in Technical Memoranda for review by SESARM. These memoranda will also identify any additional efforts that may be necessary to improve confidence in the available emission estimates and/or emissions data.² The SESARM Project Coordinator will then instruct Pechan as to how to proceed in compiling the draft base year inventory.

² Such efforts may include the development and application of control and/or growth factors to account for changes in emission activity and emission rates between the year of available data and the base year selected by SESARM.

Pechan will provide the draft area source and nonroad source inventories to SESARM for review. SESARM will determine the level of stakeholder review required for each source sector. Pechan will incorporate comments submitted by SESARM and submit final inventories in accordance with project schedules.

Pechan will document the base year inventory data sources, methods, results, SESARM-prescribed revisions, and any special tasks performed to develop the base year inventory in a draft base year emissions report. Draft emissions data will be summarized in tables for the entire SESARM region, and for each individual S/L/T area, by pollutant and source category. The draft report and emission summaries will be organized by major sector. Pechan will also provide the inventory data electronically, formatted as requested by the SESARM Project Coordinator. The submittals will include spreadsheets in Microsoft Excel format with data summaries for SESARM review, emissions summaries consistent with EPA emissions inventory reporting requirements, and as requested by the SESARM Project Coordinator, emissions data prepared for emissions modeling input files. Emissions data in electronic format will be provided by state/county for all pollutants (CO, NH₃, NO_x, PM_{2.5}, PM₁₀, SO₂, and VOCs). Pechan will incorporate comments from the SESARM Project Coordinator on the draft submittals into a final set of base year emission inventories and a final base year inventory report.

The SESARM base year emissions data will also be archived on a data website, and Pechan will be responsible for providing electronic data formatted as directed by the SESARM Project Coordinator for the SESARM data archive. Pechan will also submit emissions model output files for specific source categories where models are used to develop emission estimates.

Non-CERR Base Year Emissions Inventories (Contingency)

Depending on the base year selected by SESARM and the year for which emissions data are available, it may be necessary for Pechan to forecast/backcast available emissions data to the base year. If such forecasting/backcasting is necessary, Pechan will prepare a Technical Memorandum that will discuss the proposed methods and data sources for forecasting/backcasting emission estimates to the base year selected by SESARM. Pechan anticipates that the preferred growth and control factor data source will be data provided by S/L/Ts.

Task 3. Projection Year Emissions Inventories

To project emissions from the base year to the modeling year (currently identified by SESARM as either 2012 or 2013), Pechan will review, summarize, and recommend methods and growth and control factors consistent with SESARM's objective to develop future year base case and control strategies for demonstrating attainment with the PM_{2.5} and ozone NAAQS and to meet reasonable progress obligations for improving visibility. These methods and factors will include the control technologies and associated percentage reductions, rule effectiveness, rule penetration values, growth rates, and energy efficiency factors used to generate the future year base case and control strategy emissions inventories. Additional information and expectations are provided in the following sub-sections.

Area Source Projection Year Emissions Inventories

Pechan will begin work under the area source portion of this task by compiling available area source growth and control factors and related documentation from S/L/Ts. Pechan will compare the strengths and weaknesses of these data with: (1) emission activity growth factors that Pechan is currently developing for EPA as improvements to the EGAS forecasting methodologies/data; and (2) control factors Pechan developed in support of emission projections for the Second Prospective Analysis of the Cost and Benefits of the Clean Air Act Amendments of 1990.³ Pechan will also analyze additional data sets for potential use in this effort, including post-2005 growth and control factors Pechan developed for a recent Lake Michigan Air Directors Consortium (LADCO) emission projection improvement project, and control factors applied in past VISTAS emission projections and recent EPA regulatory analyses.⁴

Pechan will prepare a brief Technical Memorandum for SESARM that clearly describes the data sources that Pechan proposes to use in developing recommended growth and control factors, along with a discussion of why these were selected over alternative data sources. Pechan will recommend where additional analyses might be appropriate to improve confidence in growth and control factors. This memorandum will also include a crosswalk between growth indicators and base year area source categories, and identify the applicability of control factors by source category. When possible, Pechan will update the emission activity growth rates from the recommended data sources to reflect the likely effects of the recent economic recession. Pechan will incorporate any SESARM feedback on this memorandum in preparing the growth and control factor data in Microsoft Excel spreadsheets (unless otherwise specified) for review by SESARM and S/L/Ts.

After revising the draft growth or control factors based on SESARM or S/L/T comments, Pechan will apply these factors to the area source base year inventory. Pechan will summarize the resulting projection year emissions in Microsoft Excel spreadsheets for review by SESARM and S/L/Ts, and incorporate revisions into a revised base case projection year inventory reflecting any feedback that is provided.

Non-road Mobile Source Projection Year Emissions Inventories

EPA's NONROAD/NMIM generates forecast year inventories for any given projection year up to 2040. For this project, Pechan does not plan to adjust the growth assumptions inherent in NONROAD, which are based on a linear extrapolation of historical equipment populations for the 1989-1996 time period. Pechan will coordinate with EPA OTAQ to establish that the NMIM County Database for the select forecast year incorporates the most representative information, where input parameters related to fuel and other control programs can be predicted. For example, future year input values related to fuel sulfur levels will be revised as needed.

Pechan will estimate locomotive and commercial marine growth based on the applicable transportation sector fuel consumption forecasts, as published in the Department of Energy's *Annual Energy Outlook*.

³ Although the contract states that use of ERTAC information should also be considered, Pechan is not aware that ERTAC is planning to review/identify preferred area source growth and control factors.

⁴ The LADCO study provides control factors from a 2005 base year for the following area source categories: VOC solvent categories, portable fuel containers, residential wood heating, and stage II vehicle refueling.

Growth factors for aircraft will be based on the LTO projections from the Federal Aviation Administration's Terminal Area Forecasts. Pechan will document the growth assumptions used and will provide the resulting growth factors for SESARM and stakeholder review.

In developing representative control factors for nonroad engines, it is necessary to account for the appropriate level of rule penetration due to fleet turnover and the phase-in of new, cleaner engines. EPA's NONROAD model automatically generates controlled inventories for the year in question by factoring in these components, as well as emissions control efficiency. In addition, EPA's NONROAD2008 model now incorporates the effects of all Federal nonroad standards promulgated to date, including the September 2008 standards for small gasoline land-based and recreational marine engines. The EPA recently proposed renewable fuel standards. If these standards are to be modeled in the base case nonroad inventory, Pechan will implement any necessary post-processing adjustment to NMIM model output.

In preparing emission forecasts for the LADCO states, Pechan established procedures for developing year-specific control factors, including rule penetration and control efficiencies, for locomotives and commercial marine categories. These control effectiveness factors were based on emission reduction impacts as reported in regulatory support documents for previous Federal locomotive and commercial marine rulemakings. In a June 2008 rulemaking, EPA finalized more stringent emission standards that apply to newly-built, as well as remanufactured, locomotive and marine diesel engines. Near-term Tier 3 standards, as well as long-term Tier 4 standards, modeled on EPA's clean nonroad diesel engine program, now apply. Pechan will update the reductions as needed in light of these recent standards for locomotives and Category 1 & 2 engines, considering the forecast year selected by SESARM. Pechan does not anticipate accounting for emission reductions related to aircraft engine standards established by the International Civil Aviation Organization (ICAO) because information on reductions is not available, and these reductions are believed to be minimal.

Similar to the area source sector, Pechan will prepare a brief Technical Memorandum describing the recommended growth and control factors for nonroad mobile sources. Pechan will incorporate any SESARM feedback on this memorandum, and will prepare the final growth and control factor data in Microsoft Excel spreadsheets for review by SESARM and S/L/Ts. After revising the draft growth or control factors based on SESARM or S/L/T comments, Pechan will apply these factors to the nonroad mobile base year inventory. In the case of NONROAD model sources, Pechan will perform the appropriate year NMIM model run. Pechan will summarize the resulting projection year emissions for review by SESARM and S/L/Ts, and will reflect any comments in a revised base case projection year inventory.

Preparation of Reports and Data Summaries

Pechan will prepare draft and final reports documenting the work conducted to prepare a projection year base case emission inventory. The projection year base case inventory report will document the data sources, methods, and results for each sector and state, along with any major uncertainties that could affect the results. Each sector will be documented separately within the report and will clearly delineate where data were provided by SESARM agencies and where Pechan made modifications to or developed the data. Projection methodologies, growth factors, and control factors will all be explicitly provided in

the documentation. An executive summary will be included providing a brief overview and summary of the projection year emission inventory, with a comparison to the base year inventory. The projection year inventory report will include emission summaries at the sector level for each individual S/L/T area as well as the entire SESARM region. Pechan will also prepare table and graphical summaries, including emission density plots and bar charts, presenting emissions totals for the SESARM region by state, major sector, and pollutant. In addition, Pechan will prepare county-level maps for each state by major sector and pollutant displaying percentage differences from base year emission levels.⁵

Pechan will also provide SESARM with projection year inventory data, formatted as requested by the SESARM Project Coordinator. This deliverable will include spreadsheet summaries in Microsoft Excel format for SESARM agency review, emission summaries consistent with EPA emissions inventory reporting requirements, and as requested by the SESARM Project Coordinator, emissions data prepared for emissions modeling input files. Pechan will also supply SESARM with emissions model output files for specific source categories where models are used to develop projection year inventories. Data will be provided by county by state for all pollutants (CO, NH₃, NO_x, PM_{2.5}, PM₁₀, SO₂, and VOCs) for the area and non-road mobile engine source categories.

SESARM will then facilitate an appropriate level of EPA and stakeholder review of the projection inventory deliverables. Pechan will make the necessary changes to the emission projections and projection report, and deliver a final report incorporating the comments from SESARM. Pechan will provide SESARM with electronic copies of the final report and a data archive in the format directed by the SESARM Contract Officer. Once the report and data are posted on SESARM's data website, Pechan will verify that the correct files and file identification information have been posted.

Task 7. Data Display and Archival.

Pechan will provide at least one electronic copy of all input files and output files for emissions models used to develop the emissions inventories (e.g. NONROAD and CMU ammonia models) and any supporting technical analyses to the SESARM Project Coordinator and S/L/T agencies.

Inventory data will be archived on a common SESARM data website. Pechan will promptly provide the electronic inventory data for posting to the website. Pechan will assist SESARM and other contractors in keeping the website up-to-date. When a new version of the inventory is developed, previous versions of the inventory will be moved to an archive section of the website so that it is clear which data sets are the most recent. The procedures for data archive will be clearly described in the draft and final inventory reports.

Table 1-1 presents the schedule of project milestones/deliverables.

⁵ Pechan can also develop emission density maps, bar charts, and difference plots by source category. However, this effort would require additional resources beyond those currently funded for this task.

Table 1-1. Schedule of Deliverables and Other Milestones

Task	Task Description/Deliverable	Schedule Date
1	Project Management and Reporting	
	• <i>Draft Work Plan and QAPP</i>	June 22, 2009
	• <i>Final Work Plan and QAPP</i>	July 31, 2009 ^a
	• <i>Monthly Conference Calls & Progress Reports</i>	Ongoing
2	Base Year Emissions Inventories	
	• <i>Draft base year emissions inventories and report</i>	November 6, 2010 ^b
	• <i>Final base year emissions inventories and report</i>	December 31, 2010 ^{b,c}
3	Projection Year Emissions Inventories	
	• <i>Draft projection year emissions inventories and report</i>	February 12, 2010 ^b
	• <i>Final projection year emissions inventories and report</i>	March 31, 2010 ^{b,c}
4	Special Emissions Inventory Development Project (Contingency)	
	• <i>Special inventory improvement products (to be defined)</i>	To be determined
5	Alternative Control Strategy Emissions Inventories (Contingency)	
	• <i>Future year control strategy inventories (to be defined)</i>	To be determined
	• <i>Draft report</i>	To be determined
	• <i>Final report</i>	To be determined
6	Alternative Projection Year Emissions Inventories (Contingency)	
	• <i>Draft projection year emissions inventories and report</i>	To be determined
	• <i>Final projection year emissions inventories and report</i>	To be determined
7	Data Display and Archival	
	• <i>Data archival of the emissions inventories specified herein</i>	December 15, 2010

^a Assumes SESARM transmittal of comments on draft Work Plan and QAPP by July 20, 2009.

^b Ability to meet schedule is heavily dependent on timeliness of SESARM and state/local agency input, including, but not limited to, quick approval of Work Plan/QAPP, selection of base year, transmittal of state/local base year emissions data, response to Pechan questions/need for technical guidance.

^c Assumes SESARM transmittal of comments within 3 weeks of Pechan submittal of draft inventory/report.

1.7 Quality Objectives and Criteria for Measurement Data (EPA QA/R-5 A7)

As noted in EPA’s QAPP guidance, “when a study is to be based either entirely or in part on secondary data (data that was previously collected for a different intended use)...this section of the QA Project Plan is used to explain the criteria for determining which sources of data are sufficient to support the goals of the current project.” (EPA, 2002 at page 19). Therefore, the following discussion presents the criteria that we will use to determine which data sources will be utilized to meet project objectives.

The objective of this project is to develop county-level criteria pollutant emission estimates for area and nonroad mobile sources in ten southeastern states. Pechan anticipates largely relying on emissions data that have been developed from S/L/T agencies and EPA. However, data from these sources will be supplemented by data developed by Pechan where such data will significantly improve upon data quality. The main data quality objectives that Pechan will evaluate to ensure that data meet project objectives are:

- **Completeness** – As part of the emissions data review by Pechan, as well as S/L/T agencies, Pechan will seek to determine whether the source provides complete data. For example, for each area and nonroad source category, Pechan will compare the S/L/T base

year inventory data to the latest NEI to identify counties that appear to be missing source categories and/or pollutants;

- Representativeness – Quality assurance checks on data content will be used to identify data that exceed typical ranges, and data not passing these checks will be forwarded for review by S/L/T agencies. These inventory data will be corrected or supplemented with additional pollutant data as approved by the S/L/T agencies. In addition, all growth factors will be reviewed to identify any outlier values (extremely large projected increases or decreases) and any such values will be double-checked for validity; and
- Comparability – The base year emissions inventory will be compared with the most recent version of the NEI, and growth and control factors will be compared with factors used in past projection efforts, including those used in EPA’s recent peer-reviewed Section 812 study. Significant differences will be evaluated. Where the reason for the base year inventory difference is not obvious (e.g., use of much different activity data), Pechan will send the inventory comparisons to the appropriate S/L/T agency for review and guidance on how to make adjustments approved by the S/L/T agency. Where the reason for the growth and control factor difference is not obvious (e.g., a new more stringent regulation has been promulgated), Pechan will confirm the validity of the basis for the estimate with the data source developer; and
- Accuracy – Pechan’s QA Officers will ensure that all of the procedures/calculations that a Pechan staff member develops and applies to correct existing data or to supplement existing data will be checked for accuracy and completeness. The procedures/calculations will first be tested on a data sample and the results will be reviewed to ensure that the procedures/calculations are applied as intended and that the results are as expected. Adjustments to the procedures/calculations will be made if the results indicate flaws in the initial procedures/calculations. The procedures/calculations will be applied to the entire inventory after the procedures/calculations have been tested for accuracy. Sample calculations will be documented covering all procedures.

To further ensure that data for this project are sufficient to meet project objectives, Pechan will provide SESARM and S/L/T agencies with the opportunity to review and comment on Pechan’s evaluation of alternative data sources/recommended data sources via Technical Memoranda and review of draft emission estimates.

1.8 Special Training Requirements/Certification (EPA QA/R-5 A8)

Pechan personnel that will contribute to this project have considerable emission inventory development experience, including area and nonroad source emission inventory development for EPA’s 2008 nonpoint and nonroad source NEI. In addition, Pechan staff has prior knowledge of most of the data sources that will be utilized in this project. Therefore, there are no special training or certification requirements associated with this project.

However, all members of the project team will receive training on the data collection formats, documentation methods, and reporting procedures that will be used during this project. This training will ensure that all personnel collect, document, and record emissions data in a consistent manner. Pechan's Project Coordinator is responsible for providing this training. In addition, all project personnel will be required to review the QAPP and become familiar with the QA procedures that will be applied during the project.

1.9 Documents and Records (EPA QA/R-5 A9)

Pechan will distribute copies of both the Work Plan and QAPP, once approved, for use in this project to all project team members. In addition, project staff will be provided with copies of Task 2 and Task 3 Technical Memoranda that detail proposed base year and forecast year emission inventory development procedures. The Pechan Project Coordinator will be responsible for ensuring that each staff member receives a copy of each document.

We will document each of the data sources that are used in this project via the final base year and projection year reports (as well as interim project memoranda). These documents will include descriptions of each data source, and all manipulations that were performed on the data. We will ensure that all workbooks/databases use consistent formats for recording data inputs, calculations, and emission estimates across source categories within each sector and across all geographic areas. We will maintain back-ups to allow for version control as original data are manipulated during the course of the project so that we always have a backup of the original data to identify where any QA problems originated. Methodology write-ups will include sample calculations indicating exactly how each of the unique calculations was performed. Pechan's QA coordinator will review these descriptions for accuracy and completeness via hand calculations. The written descriptions of the methods and sample calculations will also be submitted to SESARM for review and comment via the Task 2 and Task 3 memoranda. This will provide SESARM with the opportunity to provide feedback on the clarity and level of detail provided to ensure that the final inventory reports will be as clear and transparent as possible.

Pechan will also keep SESARM notified of project progress/issues via monthly progress reports.

Pechan will retain all project data/documents/workbooks/ in electronic format on Pechan's North Carolina office's "projects" computer server throughout the duration of the project. For security, Pechan performs regular daily back-ups of the files on this server to a separate Pechan computer. Pechan will retain electronic versions of the project files on the North Carolina server for a minimum of 1 year after the project end date. Pechan will subsequently create a permanent archive of all project files on DVDs. These DVDs are stored indefinitely in project binders located in Pechan's North Carolina office.

2.0 DATA GENERATION AND ACQUISITION

2.1 Sampling Design (Experimental Design) (EPA QA/R-5 B1)

This element is not applicable to this project.

2.2 Sampling Methods (EPA QA/R-5 B2)

This element is not applicable to this project.

2.3 Sample Handling and Custody (EPA QA/R-5 B3)

This element is not applicable to this project.

2.4 Analytical Methods (EPA QA/R-5 B4)

This element is not applicable to this project.

2.5 Quality Control Requirements (EPA QA/R-5 B5)

This element is not applicable to this project.

2.6 Instrument/Equipment Testing, Inspection, and Maintenance (EPA QA/R-5 B6)

This element is not applicable to this project.

2.7 Instrument/Equipment Calibration and Frequency (EPA QA/R-5 B7)

This element is not applicable to this project.

2.8 Inspection/Acceptance Requirements for Supplies and Consumables (EPA QA/R-5 B8)

This element is not applicable to this project.

2.9 Data Acquisition Requirements (Non-Direct Measurements) (EPA QA/R-5 B9)

Pechan expects to largely rely on three main data sources in developing base and forecast year inventories for SESARM:

1. Data supplied by S/L/T agencies;
2. Data currently being developed by EPA/Pechan in support of the 2008 NEI; and
3. Data previously developed by EPA to support regulatory analyses.

In the case of base year inventory development (Task 2), Pechan will largely rely on a combination of inventory data supplied by S/L/T agencies and inventory data being developed to support the 2008 NEI. As a general rule, it will be assumed that S/L/T agency data will take precedence over NEI data. However, Pechan will identify cases where the NEI data may have advantages over the S/L/T data with respect to representativeness (e.g., reflecting emission activity levels in the base year of interest, rather than levels for a different year), completeness (e.g., coverage of pollutants); or accuracy (e.g., use of a new/improved emission estimation methodology). Pechan will provide these assessments for SESARM

review in the Task 2 technical memoranda, and will incorporate SESARM's comments in compiling the base year inventory data.

To the extent that new base year emission estimates will be developed under this contract, Pechan will follow SESARM's instructions to utilize emission estimation guidance from ERTAC wherever available.⁶ To the extent that such guidance is not available for a source category for which new emission estimates are to be developed, Pechan will utilize data and procedures that have been generally accepted in past EPA sponsored emission inventory development studies, including methods defined by Emission Inventory Improvement Program (EIIP) guidance, and methods used to develop the NEI. To the extent that Pechan recommends data sources and/or methods other than those identified by ERTAC/EPA, Pechan will clearly document (in a Task 2 technical memorandum) the reasons why the recommendations are expected to result in a more representative, comprehensive, and accurate set of emission estimates. Pechan will only begin calculating emissions after receiving SESARM's approval.

In the case of forecast year area source inventory development (Task 3), Pechan will rely on emission activity growth and emission control factors supplied by S/L/T agencies, growth factors that Pechan is currently developing for EPA, and control factors that EPA has developed to support regulatory analyses. Pechan will compare each of the available data sources with respect to the data quality objectives noted in Section 1.7. The results of these comparative analyses, including Pechan's data source recommendations by source category, will be documented in the Task 3 technical memorandum for SESARM review. Pechan will incorporate any comments from SESARM before compiling the necessary growth and control factors.

Pechan will rely on the growth and control factors and forecast procedures from EPA's nonroad sector emissions model (NONROAD model) to forecast most nonroad source category emissions.⁷ Pechan will estimate locomotive and commercial marine growth based on the applicable transportation sector fuel consumption forecasts published in the Department of Energy's *Annual Energy Outlook*. Growth factors for aircraft will be based on the landing and take-off projections from the Federal Aviation Administration's Terminal Area Forecasts. Both of these sources have been used in past EPA projection analyses. Pechan will update existing locomotive and commercial marine control factors, which reflect forecast emission changes from past EPA regulatory analyses, to incorporate more stringent standards promulgated in June 2008. Pechan will coordinate as necessary with EPA in updating these control factors. Pechan will document the nonroad source growth and control assumptions in the Task 3 Technical Memorandum that will be submitted for SESARM review.

2.10 Data Management (EPA QA/R-5 B10)

Pechan will manage the data used in this project to preclude introducing errors that would result in an inaccurate emissions inventory. It is expected that all data inputs will be available from electronic data sets. After obtaining the necessary data, Pechan will convert the original data into the necessary formats, which include EPA's Consolidated Emissions Reporting Schema (CERS). Pechan will ensure that the conversion of the original data was performed correctly via quality assurance checks that the total values

⁶ Note that EPA emission inventory personnel are participating in the ERTAC guidance development process.

⁷ The EPA recently proposed renewable fuel standards. If these standards are to be modeled in the base case nonroad inventory, Pechan will implement any necessary post-processing adjustment to NMIM model output.

reported in both data sets match.⁸ Pechan will run all S/L/T submitted data through available EPA quality assurance software to check for format and content errors.⁹ Pechan will also prepare emission summaries and summary comparisons with previous inventories to evaluate whether the emissions data compiled in this effort are complete and/or suggestive of potentially suspect values. Pechan will also add fields that will be populated to track the source of data for each emission record (e.g., state supplied versus EPA 2008 NEI-supplied), and to track the version of the inventory (e.g., draft versus final).

Jonathan Dorn, Viola Glenn, Melissa Spivey, and John Van Bruggen will perform all manipulations of the data, at the direction of the Project Coordinator (Andy Bollman) and Nonroad Sector Technical Lead (Kirstin Thesing). Stephen Roe and Jim Wilson will perform QC audits for each transformation/calculation step. We do not anticipate that there will be any confidentiality concerns with use of any of the data required by this study. Pechan controls access to all computers via log-in procedures that allow access after entering the appropriate computer password. This procedure will maintain data security on this project by restricting access to all project data/documentation.

3.0 ASSESSMENT AND OVERSIGHT

3.1 Assessments/Oversight and Response Actions (EPA QA/R-5 C1)

This project incorporates scheduled events that will ensure that necessary activities are being conducted as planned. The following are scheduled activities that necessitate regular review of project progress by SESARM:

- Project Work Plan – provides opportunity for SESARM to comment on approach and schedule for performing each required task;
- Monthly Progress Reports – provides SESARM with a report on the status of all tasks/deliverables for the preceding month, and identifies any problems that may have been encountered and how they have or will be resolved (these reports are submitted to SESARM by the 15th of each month);
- Task 2 and Task 3 Technical Memoranda – provides SESARM with the opportunity to comment on details of the approach for developing a comprehensive set of area and nonroad mobile source base year and forecast year emission inventories;
- Draft Base Year and Projection Year Reports – allows SESARM to review/comment on Pechan's documentation of the methods, data sources, and results of all emission inventory development efforts; and
- Draft Base Year and Projection Year Inventory Files – provides SESARM with the opportunity to review all draft emission estimates and provide feedback for incorporation into the final inventories.

⁸ In the case of updates supplied for the NMIM County Database, Pechan will convert data provided in Excel/Access format to NMIM's MySQL format as needed.

⁹ The EPA is currently transitioning to an in-house system of quality assurance via the Emission Inventory System (EIS). It may be necessary to convert CERS inventory data into the National Emission Inventory Format (NIF) to allow for use of EPA's NIF Format and Content checking software unless EPA provides Pechan with the access to the QA tools in the EIS.

Pechan will also participate in periodic conference calls with SESARM, as needed, to review the status of work, discuss any project issues, and make any decisions about how these issues will be addressed. In addition, Pechan staff will attend up to two project meetings to inform SESARM and its stakeholders of progress and receive feedback on project issues.

As part of the process for achieving each of the above milestones, Pechan will perform its own internal review of each deliverable to ensure that all data are acceptable for use in this project and that all necessary steps have been performed as planned. Stephen Roe and Jim Wilson will ensure QA via spot checks of each data transformation/calculation step, and they will immediately inform the Pechan Project Coordinator (Andy Bollman) of any QA issues that are identified. Mr. Bollman and Ms. Thesing will direct project staff to identify the extent of the issue (is it limited to a single calculation or more widespread—perhaps across an entire state and/or source category?) and make necessary corrections. Mr. Roe and Mr. Wilson will then perform additional spot checks of the resulting corrected data/calculations to ensure that all necessary corrections were made.

In addition, Pechan staff will review the resulting emission estimates for identification of potential anomalies. Project staff will prepare multiple emission summaries (e.g., state-level by pollutant, state-level by pollutant and source category) comparing the new base year emission estimates with previous inventories. If there are significant differences in the emissions estimates, Pechan will review the data to determine if the differences are caused by differences in methodologies/data sources, or if revisions need to be made to the estimates prepared in this project.

Pechan will also use available EPA inventory quality assurance tools on the SESARM emissions inventory to identify any format, duplicate record, referential integrity, or data content issues that do not comply with EPA specifications. Pechan will correct any errors identified by these QA tools.

3.2 Reports to Management (EPA QA/R-5 C2)

The associated reports described in section 3.1 represent Pechan's planned documentation on the status of the project, results of data quality evaluations, and identification of any significant QA problems and recommended solutions.

4.0 DATA REVIEW AND USABILITY

4.1 Data Review, Verification, and Validation Requirements (EPA QA/R-5 D1)

Pechan will review all data before it is compiled into the base year inventories. This review will ensure that the data have been transmitted correctly (e.g., from SESARM state and local agencies to Pechan), and internally processed (converted to CERS format) correctly. These reviews will include comparisons of pre-processed emissions with post-processed emissions.

Pechan will also verify that each data set contains all necessary information for SESARM to model emissions and air quality for PM, ozone, and regional haze. This will include verification that emissions data are provided for the complete list of pollutants for each source category. In cases where a pollutant is not reported for a given source category, Pechan will compare this study's list of pollutants for the

category to the list associated with the 2008 NEI, as well as review EPA emission factors from WebFIRE to ensure that the pollutant is not emitted and/or there are no data available for estimating that pollutant's emissions. Similarly, Pechan will verify that each data set provides emission estimates for each county. Any missing counties will be documented in Pechan's Task 2 Technical Memoranda to facilitate verification by SESARM agencies that the particular emission activity does not occur in these counties.

In performing quality assurance of S/L/T updates to the NMIM County Database (NCD), which provides key input data for NMIM, Pechan will first review the submittals to determine the geographic and temporal coverage of the updates (i.e., subset of counties, entire state, portion of the year, entire year). In cases where data for certain months (i.e., portion of the year) are provided, Pechan will verify that the updated data can be reasonably merged with default data for the remaining months. Pechan will also generate comparisons of updated and default NCD values. Pechan will coordinate with the relevant S/L/T agency to verify any values identified as potentially suspect. Where additional questions arise concerning the accuracy of fuel parameter data provided by S/L/T agencies, Pechan may consult with EPA/OTAQ to obtain feedback on the data submissions. In addition, Pechan will review all revised NONROAD model external data files submitted by S/L/T agencies for use in the NMIM model runs.

In addition, this study's emissions estimates will be evaluated for representativeness by comparing them with emission estimates from the most current version of the NEI. For nonroad source categories modeled in NMIM, Pechan will verify the emissions output by comparing to NMIM emissions output Pechan developed for EPA. Pechan has run NMIM for each of the potential base years for this project (2006, 2007, and 2008). Pechan will prepare the following emission summaries and flag suspect values:

- By pollutant and emission type (i.e., exhaust, evaporative, and refueling emissions) for the entire SESARM region;
- By state, pollutant, and emission type; and
- By SCC, pollutant, and emission type for the SESARM region.

Pechan will review whether the flagged values are explained by changes to NMIM inputs provided by S/L/T agencies or other known model changes. Any remaining suspect values will be discussed with EPA's Office of Transportation and Air Quality (OTAQ) to see if there were additional changes to the models or inputs in NMIM that explain the discrepancies identified.

Under Task 3, Pechan will also verify that area and non-NMIM nonroad source emission growth factors have been developed for each source category/county in the base year inventory. Emission control factors will be verified by SESARM S/L/T agency review of draft values that will be provided in documentation prepared under Task 3. The representativeness of this study's emission activity growth factors will be evaluated by comparisons with growth factors developed from a recent EPA projections study.¹⁰

¹⁰ Pechan is currently supporting efforts to develop updated growth factors to support an EPA analysis of regulatory options for addressing the remanded Clean Air Interstate Rule (CAIR). It is believed that these growth factors should be available in time for use in this comparison.

The following section provides further details on the methods that will be used to perform the data verifications/validations.

4.2 Verification and Validation Methods (EPA QA/R-5 D2)

If they are made available to Pechan, we will utilize EPA's EIS quality assurance tools to assist in data verification and validation. If these tools can not be made available, Pechan may need to first convert data sets into NIF format, and then run the converted files through EPA's NIF Format and Content checking software. This tool checks for invalid entries (e.g., source classification codes), and includes routines that compare annual emission values and other fields against a range of "normal" values that are based on percentiles from previous inventories. Pechan will summarize any potential QA issues for S/L/T agency review, and will incorporate any corrections that are provided.

Pechan will also ensure that PM emission estimates are reported in a consistent, valid manner. For example, Pechan will ensure that:

- The following equations are true:
PM10-FIL + PM-CON = PM10-PRI
PM25-FIL + PM-CON = PM25-PRI; and
- The following comparisons are true:
PM10-PRI >= PM10-FIL
PM25-PRI >= PM25-FIL
PM10-PRI >= PM-CON
PM25-PRI >= PM-CON
PM10-FIL >= PM25-FIL
PM10-PRI >= PM25-PRI.

For any NEI-supplied data for this study, Pechan will perform spot calculation checks to ensure the accuracy of the emission estimates incorporated into this study. These spot checks will prioritize the largest-emitting source categories. Any necessary corrections will then be performed and documented.

A percentage difference threshold of 30 percent will be applied to S/L/T updates for the NCD to identify potentially suspect values for review. Pechan will flag S/L/T-supplied values that differ by more than 30 percent from their default NCD values, and these entries will be discussed with the appropriate S/L/T agency to ensure that they are correct before running NMIM. In reviewing NONROAD external data files, Pechan will also ensure that the revisions are consistent with the required file structure. Updated input data values included in these files will also be compared to default values for accuracy (e.g., where county allocation factors need to be added to the corresponding state total), as well as reasonableness.

Pechan will also verify and validate S/L/T-supplied emissions data by comparing emission values with available emission estimates from the most recent NEI. These comparisons will first be developed by source category and state. Comparisons of the percentage allocation of emissions will be performed separately. Because it is not yet clear what base year SESARM will choose for this effort, it is not possible to identify the percentage difference threshold that will be used to flag potentially suspect

values when this study's emission estimates and growth and control factors are compared to values compiled in recent similar efforts (the further away the comparison year, the greater the percentage threshold that would be employed).¹¹ However, all differences that are flagged as potentially significant will be evaluated. Where the reason for the difference is not obvious (e.g., use of much different activity data), Pechan will send the data comparisons to the appropriate S/L/T agency for review and request guidance on what adjustments are necessary.

For the nonroad source categories covered by NMIM, Pechan will flag new emission estimates developed in this study that are more than 20 percent higher or lower than the values estimated for the same year in earlier NMIM runs Pechan performed for EPA. These comparisons will be developed for the following:

- By pollutant and emission type (i.e., exhaust, evaporative, and refueling emissions) for the entire SESARM region;
- By state, pollutant, and emission type; and
- By SCC, pollutant, and emission type for the SESARM region.

4.3 Reconciliation with User Requirements (EPA QA/R-5 D3)

We will compile potentially suspect entries identified from the methods described above for review by S/L/T agencies. Pechan will incorporate any revisions that are provided. For any remaining potentially suspect entries, Pechan will investigate potential explanations for these entries (e.g., there is no emission factor for a missing pollutant for a given source category). To the extent that any data sets/individual entries report numerous suspect entries that remain unexplained, Pechan will notify SESARM and develop recommendations for improvements, which may include development of new emissions data. As noted earlier in Section 2.9, such recommendations will follow ERTAC emission estimation guidance wherever such guidance is available. To the extent that such guidance is not available, Pechan will develop recommendations that use procedures that have been generally accepted in past EPA sponsored emission inventory development studies, including methods defined by Emission Inventory Improvement Program (EIIP) guidance and methods used to develop the NEI. The results of the data verification/validation process will be documented in the final base year inventory/forecast reports. These reports will also provide a discussion of any limitations concerning use of the final emissions inventory data for its intended purpose.

¹¹ However, Pechan plans to assume no more than a 20 percent per year difference as acceptable.

5.0 REFERENCES

EPA, 1999: U.S. Environmental Protection Agency, National Risk Management Research Laboratory, “QAPP Requirements for Secondary Data Research Projects,” Washington, DC, July 1, 1999.

EPA, 2001: U.S. Environmental Protection Agency, Office of Environmental Information, “EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5,” EPA/240/B-01/003, Washington, DC, March 2001 (Reissued May 2006).

EPA, 2002: U.S. Environmental Protection Agency, Office of Environmental Information, “Guidance for Quality Assurance Project Plans, EPA QA/G-5,” EPA/240/R-02/009, Washington, DC, December 2002.

Pechan, 2009: E.H. Pechan & Associates, Inc. “Non-Road and Area Source Base Year and Future Year Emissions Inventories, Final Work Plan,” prepared for SESARM, July 10, 2009.