

**WESTERN REGIONAL AIR
PARTNERSHIP**

**EMISSIONS DATA
MANAGEMENT SYSTEM**

**QUALITY ASSURANCE
PROJECT PLAN**

DRAFT

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-and-

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Background

The Western Regional Air Partnership's (WRAP) Emissions Forum developed a consistent approach to regional emission tracking to meet the requirements for State Implementation Plan (SIP) and Tribal Implementation Plan (TIP) development and periodic review and updates. The central regional emissions inventory database and associated software, the Emission Data Management System (EDMS), facilitates the data collection efforts for regional modeling, 309 tracking and resulting data analyses. The WRAP-based emissions data management system enables State and Tribes to obtain information needed for SIPs and TIPs and will provide information for public consumption. The EDMS is the central repository for the data from the WRAP region that will be used initially for air quality modeling in pursuit of meeting the requirements of the United States Environmental Protection Agency's (EPA) regional haze rule (RHR).

This Quality Assurance Project Plan (QAPP) specifies the data quality objectives of accuracy, completeness and representativeness to be employed in compiling the regional haze emission inventories for the WRAP region. The EDMS does not involve any laboratory analyses or sampling. Most inventory data are derived (measured, analyzed and inventoried) by the data providers before loading it into the EDMS. The data in the inventory are mostly estimated from emission factors and activity data, models or in some cases are from actual measurements. The EDMS provides a storage and management vehicle for the emissions data, not as an origination point for emissions and related data.

A1 Title and Approval Sheet

Program Title Emissions Database Management System

Lead Organization Western Regional Air Partnership

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Effective Date This Quality Assurance Project Plan (QAPP) is effective
from October 1, 2004 forward.

QAPP Category IV

Contract Numbers WRAP 30204-78

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A4 Project/Task Organization

The primary contact for the project is Mr. Tom Moore, the Technical Oversight Committee Staff Support/Technical Coordinator for the WRAP. The WRAP EDMS is managed by a steering committee staffed by air quality professionals from WRAP entities and the EPA. The committee members consist of:

Don Arkel, WestStar
Alice Edwards, Alaska
Mark Fitch, Arizona
Lee Gribovicz, Wyoming
Bob Gruenig, NTEC
Sara Kelly, ITEP
Pete Lahm, USDA
Brock LeBaron, Utah
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Dennis Schwehr, West Associates
Doug Solomon, EPA
Michael Sundblom, Arizona
Lee Tooly, EPA
Michael Uhl, Clark County, Nevada

E.H. Pechan and Associates, Inc. maintains a corporate QA/QC policy that requires that all work performed be documented, defensible, of known acceptable quality and consistent with contract requirements. This policy is implemented through an integrated three-tiered approach that includes corporate, department, and project elements. At the corporate level, Pechan management provides oversight of the QA/QC program and approves and enforces the overall program. To assist in implementing these functions, Pechan maintains a corporate QA/QC unit that monitors the program, prepares guidelines, and conducts independent program audits.

Pechan's EDMS Project Manager, Mr. David Holoman, directs all development tasks for the project. Mr. Holoman will ensure that all support staff are familiar with and understand the data quality objectives, and the procedures to be followed for meeting the objectives, as well as the requirements of the QA plan (e.g., completion of QA/QC forms).

Agencies and entities within the WRAP will be providing the data to the EDMS, which the EDMS will compile into one or more inventories as specified by the data providers. Staff from these entities will also review the results of the inventory compilations.

A5 Problem Definition/Background

SIPs and TIPs for regional haze mitigation must contain emission inventories. Related emission inventories are needed for air quality modeling of regional haze. Inventories prepared for SIP/TIP submittal and for use in modeling are prepared in different formats, but both should be derived from the same or comparable input data. Furthermore, regional modeling will encompass states outside the WRAP region, so inventory methods will have to be coordinated with other regions. 2002 has been chosen as the baseline year for regional haze modeling. In order to demonstrate progress in improving visibility, it will be necessary to forecast emissions for future years and be able to develop and analyze trends between forecasted and actual inventories in the future.

A6 Project/Task Description

The Emissions Data Management System (EDMS) is required to support state and tribal regional haze implementation plan development. This system is to be used for technical and policy evaluations by Western Regional Air Partnership (WRAP) members, stakeholders, and other interested parties in the region. This Internet web page-based system is to be capable of:

- Receiving and storing emissions data in United States Environmental Protection Agency (EPA)-compliant emissions reporting formats commonly used by various agencies and sources with little or no additional effort;
- Receiving and storing EDMS-specific emissions information;
- Producing user-specified reports (including model-ready input);
- Performing user-selected quality control and assurance (QA/QC) tests;
- Allowing data queries and graphic display; and
- Presenting this information as geographic information system (GIS) displays, flat files, air quality model-ready input files, and in other formats.

The purpose of the EDMS is to be the home of emissions inventories that are the basis for emissions control and management programs to be adopted by states and tribes through their regional haze implementation plans. The EDMS will be able to provide output files for emissions analyses and air quality modeling applications.

The EDMS is also to receive, store, process, and display combinations of the emissions and activity data, as well as emissions calculation methods used to estimate emissions inventories. The display capabilities will include GIS functionality; tabular, and flat file data formats; graphs and charts; and the ability to capture these displays in user-defined report formats.

The detailed project description for this project can be found in the “EDMS Scope of Work”, a copy of which can be found in Appendix A of this QAPP.

A7 Quality Objectives And Criteria For Data

The main data quality objectives for the project include:

Accuracy – To achieve this objective, the procedures/calculations used in calculating emissions will be checked and verified. Sample calculations will be documented. Emission calculations will be spot-checked by the project manager;

Completeness – As part of the quality control (QC) process the data providers or the data analyst may find and indicate any significant missing sources for a particular county or jurisdiction;

Representativeness – Emission inventories will be loaded into the EDMS using data determined to best represent the WRAP region during the 2002 calendar year, given the project schedule and resources. Similar to completeness checks, the EDMS will rely on review by the data providers to ensure that the area-specific data represent local activity and conditions;

Comparability – The EDMS data will be able to be easily compared to the other existing inventories. Significant differences between these inventories can be evaluated.

A8 Special Training Requirements/ Certification

Users of the EDMS should be familiar with emission inventory data and how it is collected and used. However, the web-based application will be available to the public and will not require any prior knowledge of emission inventories. An on-line user manual, document and frequently asked questions (FAQ) page on the web-application's site will help guide users through the interface and with viewing the data.

No special training or certifications are required to use the software to view the data. Data providers will be given a training course to learn how to load data and track its progress through the EDMS QA/QC procedures through becoming a part of a versioned inventory. Data extraction will also be covered in the one-day training course.

The EDMS training program is described in Section V.B. of Appendix B, the Software and Hardware Development Plan.

A9 Documentation And Records

Pechan maintains a records management system to ensure that completed work meets EPA documentation requirements. Pechan also maintains a record-keeping plan to identify and file information. The company assigns unique control numbers to all documents and records prepared for and delivered to all clients. These numbers link the materials to the correct contract and work assignment and are used to store the materials in hard copy and electronically in chronological order. The records management coordinator at each Pechan office location assigns the control numbers and maintains these files. Pechan's Contracts Administrator also stores hard copy or electronic versions of all documents and records submitted as contract deliverables as part of the company's contract files.

The Pechan Project Manager will be responsible for the following document and records management activities:

- Determining all deliverables under a project, including work plans, progress reports, and all technical products;
- Determining the time lines for various stages of the document (that is, outline, draft, and final);
- Determining the appropriate review cycle (internal versus external review);
- Determining the appropriate reviewers; and
- Ensuring that all documents and records are incorporated into Pechan's filing system and are distributed to the appropriate recipients.

The EDMS provides a platform for documentation of inventory data submittals and updates that can be later accessed by the data providers and regional modeling center. In addition, the EDMS provides data separation by year, inventory type (e.g., submitted, remediated, gap-filled, modeling) and version. Full record-level auditing and logging are used in the EDMS Oracle database to ensure data integrity, provide a trail of changes to each record and provide a means to restore data if is mishandled or incorrectly changed by a specific data provider.

B1 System Design

A detailed system design for the EDMS project was completed and is included as Appendix B, the Software and Hardware Development Plan.

B2 Data Collection Methods

Import

EDMS accepts inventory data that is NIF 3.0 compliant in Access and ASCII format. This data is the same as the data traditionally submitted to the EPA for the NEI. EDMS will accept EDMS-specific data (Activity Detail and Fire Detail data) in Access or ASCII fixed-width format. The details of the input format that will be accepted can be found in Appendix D.

The import application validates the structure of the submittal. If the structure is invalid, a message is returned to the data provider to indicate that the data submittal could not be read. In addition, a notation is created in the EDMS database indicating failure to read the submittal.

If the structure of the submittal is valid, the data is imported into a holding area for quality review. The quality review will include confirming valid values, range checks and mandatory required fields. This stage is considered the QC (Quality Control) stage. The QC checks that are performed are listed in Appendix E. After the quality review has been completed, a report is returned to the data provider.

Each submittal of the data through the system is logged. When the data has been accepted, the data administrator is notified through a report that a submittal is ready to incorporate into the database.

The biogenic inventory will be prepared by the WRAP Regional Modeling Center (RMC). The biogenic emissions are currently being generated at RMC using the Biogenic Emissions Inventory System (BEIS) model on a 36-km grid system for each hour. Using the Sparse Matrix Operator Kernel Emissions (SMOKE) Modeling System, the RMC will convert the emissions to a county level and aggregate them to annual temporal resolution. Appendix I shows the proposed format for inputs from the RMC. Data providers will have the ability to replace emissions estimates modeled by RMC with their own emissions estimates if desired. Data stored by the EDMS at the county/annual level is not an input to the biogenic model. Accordingly, there is no current provision to feed data provider overrides of biogenic data back to RMC.

The windblown dust inventory will be prepared by the RMC. The windblown dust emissions are currently being generated at RMC on a 12-km grid system. Using SMOKE, RMC will convert the data to county-level. The RMC will report the windblown dust inventory spatial resolution at the county or NAR level and the temporal resolution will be annual in Phase I.

B3 Data Security, Access And Auditing

Auditing

Each table in the system has an associated audit table to track all modifications to the table. The audit table contains one record for every new addition and two records for every change (the “before” copy and the “after” copy), and a copy of every deleted record from the main table. The audit table contains a timestamp field to indicate when the change/addition/deletion occurred, a primary key to indicate uniqueness, and a field to indicate the type of change that occurred.

User Security

The EDMS is protected by security features designed to ensure the integrity of collected data. Users require a User ID and Password. The registration process collects the email address of each user so that users can be proactively advised of significant EDMS events.

The EDMS will have a wide variety of users that can be classified or categorized into multiple user types. It is envisioned that there will be several EDMS user types all with potentially different reasons to use EDMS. Some anticipated user groups will include (but are not limited to):

- State Emission Inventory Staff;
- State Modeler;
- Public;
- State Regulatory/Policy Analysts;
- Western Tribe Representative;
- Federal Land Manager;
- WRAP Staff; and
- Other RPO Specialists

Functionality is granted to users based on their security level. Functionality, in order of increasing complexity, includes being able to view data, view reports, write ad-hoc reports, extract data and provide database administration. Access to the Import feature is conditionally based on the user’s association with data provider status. Security features are managed through the application. Tables have been created which store information related to the user's role (as discussed above).

A user is validated upon login to the application. If the user does not exist in the system or provides an incorrect password, the user is not permitted to log in. If the user is a valid user, the associated role information is selected from the user/role table. This information controls which forms are available and the specific functionality that is available on those forms.

Management of security is managed through an administration module of the application by the data administrator.

Physical Security

The EDMS is physically housed at UNC at Chapel Hill (UNC-CH) Computing Center. The UNC-CH Information Technology Services (ITS) offers a number of security services to maintain network security. The Security Office seeks to improve computing security of campus systems in order to prevent interruption of business, preserve vital data, and maintain privacy. The office employs security practices that protect the reputation of UNC, limit liability and costs, and reasonably balance cost against risk.

Proactive and preventive services include:

- Network management;
- 24x7 network monitoring and intrusion detection for both inbound and outbound internet traffic;
- Border router filtering to limit certain malicious traffic;
- Advice and documentation concerning best practices (see <http://www.unc.edu/security>);
- Campus site licenses for secure software including Secure CRT;
- Network vulnerability assessments for departmental systems; and
- Security assessment of new production services.

ITS also offers incident responses when a security incident occurs. Incident response services include:

- 24x7 incident response reporting, control center staff, remedy tickets, and e-mail services;
- Immediate network isolation of compromised systems;
- Campus risk assessment of new threats and coordination of incident response, including coordination with public safety, legal, and human resources departments when necessary;
- Incident triage and advice concerning risk management and forensic and recovery procedures;
- Vulnerability audit when systems are ready to return online;
- Coordination and reporting of incident responses with source and/or target sites; and
- Complying with legal requests for information such as subpoenas and public records requests.

Security is only as strong as policy. The Computing Policy Office seeks to develop effective computing policies in areas such as public record and privacy, security, accessibility for the disabled, appropriate use, and copyright. Policies can be found at <http://www.unc.edu/policy>. The office tracks developments concerning federal and state

legislation and regulations, such as the Health Insurance Portability and Accountability Act (HIPAA), to insure that policy and practices are developed in accordance with legal requirements.

B4 Reporting And Analysis Functions

Reports

The EDMS includes a series of standard summary reports broken down by source type, geographic location, and pollutant. It also includes a series of reports designed specifically to meet the RHR emissions tracking and reporting requirements. The RHR reports will include special reports for CAC, pre-trigger SO₂ stationary sources, mobile sources, fire sources, and windblown dust sources. An analysis of current EDMS reports appears in Appendix F. It is important to note that it is anticipated that as the amount and type of data in the system increases, more standard reports will be added.

Exports

EDMS produces NIF 3.0 compliant exports of data in ASCII format.

The EDMS has the ability to produce model-ready input files for such models as SMOKE using the annual data stored in the system. Users will designate the parameters required to identify the data to be included in the export. The export prepares data files and makes them available either through direct download or the data administrator. SMOKE is currently the only pre-defined model export format.

A converter to export data from the EDMS from NIF to IDA (the common format for SMOKE outputs) is included. The NIF is a relational, fixed-position format that contains specific records within each source type file and relates each record by using common data fields, or “keys”. SMOKE does not require as much detail as is provided within the NIF format for processing the emissions. Instead, SMOKE only needs a fraction of the total information of the NIF. To save processing time and storage space, SMOKE uses a different format, the Inventory Data Analyzer (IDA) format for the input files that retains only the important information needed by SMOKE for preprocessing the emissions. Separate files are created for each source.

WRAP and RMC advise that prior experience has demonstrated the difficulty in keeping track of what data is contained in a file, and what assumptions and scenarios were involved in the data generation. To this end, a meta-data approach with detailed comment in the file was agreed to, as well as an intelligent-filename approach. Specific filenames will be used to transfer data to the RMC. Based on data selected from the EDMS, the filename can be generated such that the filename describes the data in the file with the following general format:

Sector – Year of Data – Data Version – Organization – Spatial Resolution – .dat

This approach will allow data files to be identified easily and readily.

The EDMS system administrator can prepare data exports that arise from special analyses that transcend the capabilities of the EDMS interface. These analyses can be requested by the WRAP contract administrator. The resulting data can be forwarded to the requestor in an agreed-upon format.

B5 Quality Control

There are two types of quality procedures in the EDMS system. The first is Quality Control. This is the process of diagnosing data and reporting errors to the data provider. This type of quality procedure does not alter data; it only reports errors. The second type of quality procedure is referred to as Quality Assurance. There are two types of quality assurance procedures – basic data remediation and gap filling. Basic data remediation resolves straightforward data compliance issues, while gap filling adds emission information to the system.

The Quality Control validations appear in Appendix E. These validations diagnose data only; they do not change data. Quality Assurance Data Remediation steps appear in Appendix E.

Quality Assurance Gap Filling refers to procedures that add data to the system. Because gap filling requires a manual review of the data for the purposes of appropriate comparisons, it is recommended that these gap-filling measures are carried out at the data provider level using EPA- or RPO-developed data whenever possible and the data then submitted through the normal data provider submittal channels. Alternatively, data providers may provide information concerning their submittals to the data administrator regarding known gaps. Reports can also be developed which can assist the data provider and data administrator in analyzing inventories for potential gaps, and making special requests for data to be exported and reimported from inventories existing in the EDMS system. A potential scenario for gap filling could work as follows:

1. A data provider provides a submittal which does not contain NH₃.
2. This submittal is applied to Inventory B.
3. A gap-filling report indicates that this pollutant is not present at a particular grouping level (state level, for example).
4. The data provider knows that it would be appropriate to bring forward the NH₃ emissions from a previous year's inventory (an inventory that exists in EDMS as a production database, Inventory A, for example).
5. The data provider exports the NH₃ data Inventory A in NIF 3.0 format, reviews the data and alters dates or other information as appropriate.
6. The data provider imports this data as a submittal, indicating that the data should be applied to Inventory B.

Some types of quality issues that may require gap-filling at the provider level could include:

- Generating the complete set of PM pollutant codes where only a subset is provided;
- For all inventories - bringing forward from previous data versions county level data where not provided by the submittal;

- In Point source inventories, bring forward sites that are in operation that may be missing from a submittal;
- Filling in facility state information where missing;
- In NonPoint source inventories - filling in pollutants from previous data versions that were not provided by the data provider for certain SCCs;
- Replacing or augmenting data submitted by data providers with modeled SCC information; and
- Back-filling incomplete pollutant inventories.

Fire is a special case of data calculation/gap filling for this system. The Fire sector harbors information on five fire types: wildfires, prescribed burning, wildland fire use, agricultural burning, and rangeland burning. The Fire sector is intended to be a current repository of fire activity information, allowing users to input data in temporal periods as small as one day. The Fire sector requires a unique format for importing data into the EDMS due to the emissions calculation capability of this sector. The Fire data input format is detailed in Appendix D.

Emissions from fires will be estimated by using a calculation routine that will be contained in and administered by the EDMS. In the EDMS, emissions are calculated for the Fire sector only. As fire data is imported into the EDMS, it will first go through a QC procedure followed by a QA procedure that will include gap filling, subject to WRAP guidance. In particular, the EDMS will calculate the emissions estimates where they are not provided. A White Paper describing fire emissions calculations appears in Appendix B of the Hardware Software Development plan referenced as Appendix B in this document.

B6 System/Application Testing

The EDMS code and database will be thoroughly tested and reviewed before each update release. All enhancements to the code and database will go through a test cycle as dictated by the test plan. The EDMS test plan is included in Appendix C of this document. The test plan includes the following three elements of systems testing:

Test Approach sets the scope of system testing, the overall strategy to be adopted, the activities to be completed, the general resources required and the methods and processes to be used to test the release. It also details the activities, dependencies and effort required to conduct the System Test;

Test Planning details the activities, dependencies and effort required to conduct the System Test;

Test Conditions/Cases documents the tests to be applied, the data to be processed, the automated testing coverage and the expected results.

B7 Hardware Design And Specifications

The EDMS Software and Hardware Development Plan contains the specifications for the hardware to be used for the EDMS. The EDMS system is divided between multiple computer hardware, each with a specific purpose for its function. A web server houses, servers and runs the ASP-based web application code. Multiple data servers work in conjunction to server the emission inventory data through Oracle database management system software. The EDMS Software and Hardware Development Plan is included in Appendix B to this QAPP document.

B8 Requirements For Backup Tapes, Disk Space

The EDMS Software and Hardware Development Plan contains the specifications for the backup procedures and database sizing needs for the EDMS project. The EDMS Software and Hardware Development Plan is included in Appendix B to this QAPP document.

C1 Assessments And Response Actions

All of the performance and system audits described in this plan, training sessions and QC reviews are planned to be performed, as contractual and funding limitations allow. The activities included in the QC reviews, training sessions and workshops constitute routine performance and system audits.

In addition to the standard reports, the database administrator will use tools outside of the EDMS to review and assess the database. If any deficiencies are noted during the QA process, they will be documented and reported to the technical contact for the EDMS for remediation. It is the responsibility of the any and all EDMS entities conducting emission inventory analytical activities to develop and implement internal proficiency, training, and QA audit "checklists".

C2 Reports To Management

Monthly progress reports (MPR's) are normally required under the current scope of work for the contract and are highly recommended for those participating in the EDMS program. MPR's would be provided electronically to the WRAP EDMS Steering Committee in order to document project status, any significant data issues, timeliness of scheduled activities, any significant QA problems, or other issues, and provide recommended solutions, if applicable.

D1 Data Review, Verification And Validation

Data verification and data validation are key steps in the transition from the implementation phase to the assessment phase. EPA provides a comprehensive guidance document, entitled "*Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8, 2001)*". The purpose of this guidance is to explain how to implement data verification and data validation, and to provide practical advice and references. This guidance describes an array of data verification and data validation practices in order to promote common understanding and effective communication among environmental data validators, and data users.

Although data verification and data validation are commonly-used terms, they are defined and applied differently in various organizations and quality systems. Without attempting to preempt other meanings or approaches, the EDMS will generally follow EPA's informal guidance on this topic and incorporates the following definitions:

Data Verification is confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. Data verification is the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual requirements.

Data Validation is confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. Data validation is a specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set.

Data meeting each of the applicable Data Acceptability Criteria contained in Appendix E are accepted for inclusion in the EDMS database. Data which do not meet these requirements are excluded from being entered into a production database until remediation/gap-filling can be performed.

D2 Verification And Validation Methods

All data reported to the EDMS will be subject to checks for errors in transcription, calculation, and computer input. Field data are initially validated by built in checks in the EDMS which alerts the person reporting the data immediately of outlier values for verification. These checks are described in Appendix E of this document. For emissions data, when the data are reported to the EDMS, if an outlier or other question arises with the data, the data manager refers the data in question to the appropriate WRAP EDMS technical support person who verifies the data. Usually, the individual who reported the data is contacted directly to resolve any discrepancies. When the EDMS data analyst is satisfied with the accuracy of the emissions data in question, he or she completes the transaction as guided. The data analyst will follow the EDMS standard operating procedure for data processing.

D3 Reconciliation With User Requirements

There is not a specific decision that is made as a result of the data collected under this project. The EDMS data, and data collected by other organizations, will be subsequently analyzed and used by the WRAP entities for air quality assessments, SIPs, TIPs, permit decisions, and numerous other purposes.

Establishing and Utilizing Screening Levels/Criteria/Guidelines

Typically, data quality objectives require the comparison of emission measurements to established air quality standard criteria or screening levels. This allows regulators to identify airsheds where pollution controls may be needed as well as to determine the effectiveness of controls already in place. These same data are useful for comparative analyses of data between stations and over time, and to characterize air quality conditions.

APPENDIX A – Scope of Work

[EDMS Scope of Work](#)

APPENDIX B – Software and Hardware Development Plan

[EDMS Software and Hardware Development Plan](#)

APPENDIX C – System Test Plan

[EDMS Beta Test Plan](#)

APPENDIX D – Input Formats

[EDMS Input Formats](#)

APPENDIX E – QC/QA Listing

[EDMS QC/QA and Gap Fill Protocol](#)

APPENDIX F – Reports Listing

[EDMS Standard Reports Listing](#)