Demonstrating cross-regulation compliance for utility emission sources using a centralized database and opsEnvironmental software: a case study of Colorado Spring [sic] utilities Environmental Data Management System

Jim Nolte
The University of Montana

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Demonstrating Cross-Regulation Compliance for Utility Emission Sources Using a Centralized Database and opsEnvironmental® Software

A Case Study of Colorado Spring Utilities Environmental Data Management System

By

Jim Nolte

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Approved By

Bill Chaloupka
Chairman, Board of Degree Program

Dean of the Graduate School

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The permitting requirements of Title V of the Clean Air Act demand that facilities be able to demonstrate compliance with air emission standards on a regular basis over hourly, daily or monthly time periods. Toxic Release Inventory reporting requirements also require yearly air emission data applicable to the same pollutants. This need to demonstrate real-time compliance and maintain data for multiple regulations translates into more stringent record keeping requirements for most utilities at both the corporate and plant level. It also means that managers and operating personnel need quick access to operating data as well as emissions data for criteria pollutants, hazardous air pollutants, and TRI toxic releases. For large utilities, with increasing demands on existing staff and financial pressures to reduce costs, environmental data management must be converted from disparate hard copy systems to electronic and interactive systems.

This paper presents a case study describing the experience of a large utility (Colorado Springs Utilities) in implementing an environmental data management system for the purpose of tracking and monitoring compliance with Title V Operating Permits and TRI reporting requirements. The implementation program consisted of evaluating and choosing an appropriate electronic tool (Environmental Software Products' opsEnvironmental software); gaining buy-in from corporate and plant personnel; designing and developing the facility models in opsEnvironmental using a "multi-module approach; coordinating consistent emission calculations for hazardous air pollutants (HAPs) and TRI chemicals, entering and validating test data; rolling out the electronic data management system at the facilities; and training personnel on use of the system. Conclusions will summarize the outcome of CSU’s opsEnvironmental implementation and discuss the implementation drawbacks and limitations.
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1. Introduction

1.1 Current Regulatory Requirements for Utilities

After nearly a decade of acrimonious and often stalemated debate the 101st Congress overwhelmingly authorized sweeping reform with amendments to the Federal Clean Air Act (CAA) in November of 1990. This major re-drafting included 11 titles consisting of provisions for nonattainment, mobile sources, hazardous air pollutants, acid rain, operating permits, stratospheric ozone depletion and enforcement. These permitting requirements, all coordinated under Title V of the Clean Air Act, demand that utility facilities demonstrate compliance regularly over time periods as short as hourly, daily or monthly. This need to demonstrate real-time compliance translates into more stringent record keeping requirements for most utilities at both the corporate and plant level.

In May of 1997, the Environmental Protection Agency (EPA) required that seven new industry groups, including utility companies, comply with Toxic Release Inventory (TRI) reporting requirements. Facilities covered under TRI reporting requirements are required to report data concerning the presence and release (both routine and accidental) of hazardous toxic chemicals. Until this time, TRI reporting requirements applied only to facilities in the traditional manufacturing sector.

Both Title V of the Clean Air Act and TRI reporting requirements mandate that utility companies provide information on which pollutants are released, what quantities are released, plans for monitoring the releases and the steps being taken to reduce these

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releases. This litany of requirements across regulations has left utility companies like CSU struggling with the management of their environmental compliance data.

1.2 CSU's Facility and Departmental Structure

In 1999, CSU had four Title V facilities along with fifteen other facilities or sources that required annual air emissions data. The four Title V facilities were also required to report TRI toxic releases. Both regulations, Title V and TRI, required that toxic release to air be tracked and reported. Title V operating permits required that Air Pollution Emission Notices (APENs) be filed which detailed emission calculations for release of six criteria pollutants and a list of other hazardous air pollutants (HAPs). For TRI, toxic releases to air, land, and water were required to be tracked and reported. The toxic releases to air reported for TRI are ostensibly the same releases reported under the HAPs reporting requirement of Title V. With the need to track and report on similar toxic release for both regulations, CSU needed a way to store and report data for both regulations.

To manage the integration of their environmental data for these facilities CSU needed a software tool and database to manage, maintain, and share compliance data. In July of 1997, CSU identified four facilities that were required to report TRI chemicals. In 1998, CSU had one Title V operating permit and was negotiating the terms of three others. During the negotiation of the remaining three permits, draft permits were issued for public and technical review. These permits were used to begin the implementation of
a data management system for CSU. Data for the additional fifteen non-Title V facilities
was also going to be stored in the database along with all permit and facility information.

Before 1998, data for all CSU facilities was stored in different locations in separate databases and spreadsheets. Different CSU departments were responsible for environmental data from CSU facilities. The Electric Department was responsible for data from three of the Title V facilities. The Water Resources Division was responsible for the fourth facility. The Permitting Services Group was responsible for maintaining records of all permit information, calculating emissions for APEN purposes for all facilities, plus generating daily calculations for one of the Title V facilities. These three departments and their sub-departments were responsible for maintaining CSU’s compliance data.

1.3 Industry Need and CSU’s Choice for Compliance Software

The quantity and complexity of regulatory requirements for air emissions and toxic release poses a difficult challenge for utility companies in meeting their regulatory compliance responsibilities. In order to demonstrate compliance, utility companies must collect, store and manage large amounts of environmental data. Across the utility industry, this effort is conducted plant by plant or department by department - creating many disparate databases, spreadsheets, and hard copy reports. In addition to being inefficient, this lack of a collaborative effort many times produces inconsistencies in reported figures. This extensive data management task combined with an ever-growing list of environmental compliance requirements has left many utility companies
scrambling for ways to comply efficiently and cost-effectively with the myriad of environmental regulations.

Faced with this concern, Colorado Springs Utilities (CSU) decided to re-architect their environmental data management system. In its first phase, CSU’s environmental data management system will store and maintain environmental compliance data for both Title V permits and TRI reporting requirements. Subsequent phases will include the integration of Title IV Continuous Emissions Monitoring (CEM) data and National Pollution Discharges Elimination System (NPDES) data. The goals of maintaining cross-regulatory compliance data in one central location are to reduce record-keeping efforts, generate more consistent and reliable emissions reports, and reduce the cost of regulatory compliance.

To manage and maintain environmental data stored in one location, CSU chose to implement Environmental Software Providers’ (ESP) opsEnvironmental® software suite. The opsEnvironmental software consists of a suite of modules, each equipped with the tools necessary for storage and retrieval of environmental data for distinct utility emission source requirements. The opsEnvironmental modules are opsAir® for Title V air compliance, opsFormR® for TRI reporting, opsWater® for NPDES permits, opsCEMRW® for CEM data, and opsCompliance® for coordinating distributed compliance activities and automating required record keeping. CSU’s initial implementation included using opsAir to manage and maintain Title V permit requirements, opsFormR for TRI reporting and opsCEMRW for tracking CEM data. Each opsEnvironmental module was built within
one centralized database, configured to share facility data across modules, and designed
to calculate emissions for Title V and TRI reporting requirements.

This paper focuses on the current Title V and TRI compliance requirements
facing Colorado Springs Utilities and how opsEnvironmental was designed and
developed to meet CSU's compliance needs. Discussion will include the requirements of
the Title V and TRI regulations and how CSU will maintain a centralized database for
their environmental data. Details of the design, development and implementation of
opsEnvironmental will be explained. And, in conclusion, the results of the initial
implementation will be summarized with discussion of implementation drawbacks and
future enhancements to the process.
2. Current Regulatory Compliance Situation for Utilities

2.1 Clean Air Act – Titles IV and V

A closer look at the regulatory requirements for utilities affords a better view of the complexity of regulatory compliance for electric utilities. The Clean Air Act of 1990 contains eleven titles, including provisions for nonattainment, mobile sources, hazardous air pollutants, acid rain, operating permits, stratospheric ozone depletion, and enforcement. The scope of this paper will include a discussion of Titles IV and V, with Title V being the provision designed to pull together the permit aspects of other titles of the Clean Air Act.

Titles IV and V of the Clean Air Act define compliance standards designed to reduce air emissions. Title IV, Acid Deposition Control, outlines goals for reducing emissions of sulfur dioxide (SO2) and nitrogen oxides (NOx), principally from electric utilities that burn coal or oil. To achieve these goals, the title establishes a number of programs and standards including a permit system for enforcement along with penalties for noncompliance, a cap on annual SO2 emissions, and limits on NOx emissions. The programs of Title IV also require the installation of Continuous Emissions Monitoring (CEM) and Continuous Opacity Monitoring (COM) systems to track quarterly, daily, and hourly compliance with the SO2 and NOx limits.

Title V, Operating Permits and New Source Review, pulls together all pollution source compliance requirements from other Clean Air Act titles, including permits requirements from Title IV. The Title V permitting program calls for five year, renewable

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operating permits for all major sources. These permits must list all emission points, include compliance schedules and include any monitoring, record keeping, or reporting requirements. Owners of sources must certify that the source is in compliance each year. Title V also includes permit fees. Any source that emits or has the potential to emit more than 100 tons of any regulated air pollutant per year is required to have a Title V operating permit. Also, any source that emits or has the potential to emit more than 100 tons per year of a hazardous air pollutant, or more than 25 tons per year of a combination of hazardous air pollutants, is required to have an operating permit. This includes older sources that before were never required to obtain an air pollution permit. Ultimately, the intent of Title V is to group all applicable Clean Air Act regulatory requirements together into one permit to make it easier for the source owner, the regulatory agency, and the public to determine if the source is in compliance.

2.2 Toxic Release Inventory (TRI) Reporting Requirements

In 1997, the breadth of regulatory requirements widened for electric utilities when they were included in the Toxic Release Inventory (TRI) reporting program of the Superfund Amendments and Reauthorization Act (SARA) Title III, also known as the Emergency Planning and Community Right-to Know Act (EPCRA).^ EPCRA was a response to public concern that followed two major releases of toxic gases in 1984, one in Bhopal, India, and another in West Virginia. These incidents heightened concern that emergency response agencies adjacent to facilities using toxic or hazardous materials be

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more aware of those substances and trained in preventing public exposure should an accident occur.

TRI reporting requirements under EPCRA require that electric utilities and other regulated industries report data about the presence and release (both routine and accidental) of hazardous toxic chemicals. The TRI program mandates the annual submittal of data sheets (Form R) describing the total amounts of individual substances released to the air, land or water, transferred off-site for disposal, or otherwise moved off a facility.¹

The TRI reporting requirements apply to owners and operators of facilities that (1) have 10 or more full-time employees and (2) combust coal or oil for the purpose of generating electricity for distribution in commerce. An owner or operator of a covered facility must submit a Form R report for each listed toxic chemical that the facility "manufactured," "processed," or "otherwise used" in excess of the applicable activity threshold during the reporting year.² The thresholds for "manufacture" and "process" that trigger a reporting obligation are 25 pounds per year. The threshold for "otherwise use" is 10,000 pounds per year. A covered facility that exceeds an activity threshold for a TRI chemical must submit TRI report for that chemical, regardless of whether the facility has any releases or off-site disposals of the chemical.

Currently, the list of TRI chemical contains more than 650 specifically listed chemicals, as well as 28 chemical categories.³ Some of the chemicals are listed with

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³ The chemicals and metal subject to TRI reporting are listed in 40 C.F.R. § 372.65
certain qualifiers related to the form or concentration of the covered chemical. Utilities must calculate activity thresholds for all applicable TRI chemicals at each facility. For those releases that exceed threshold calculations, release calculations must be submitted on a “Form R.”

Utility facilities required to file either a Form R or Form A must do so for each chemical that exceeds one or more of the activity thresholds. These reports must be submitted annually on or before July 1 covering activities occurring during the prior calendar year. The reports must be filed with both EPA and the designated state agency.

Form R identifies the amount of a listed toxic chemical the reporting facility released or disposed on-site into the air, water, or ground, as well as the amounts transferred off-site for disposal. The Form R also requires information about the maximum amount of a toxic chemical on-site at any time during the reporting year, as well as amounts of a TRI substance that was treated or recycled on- or off-site. Form R also requires a facility to prove information about its pollution prevention activities with respect to the chemical being reported.

Form A is a reduced reporting requirement applicable to toxic chemicals that have exceeded an activity threshold but have been released or otherwise managed in small amounts. Form A requires only that the facility identify the chemical that exceeded an activity threshold and a certification stating that activities and releases of a chemical fall within the limits set for the reduced reporting option.

Since the first report was published in 1987, the Toxics Release Inventory Public Data Release has provided the public with data on reported chemicals. The TRI Public
Data Release provides numbers that characterize the magnitude of a particular substance that is released.
3. **Overview of CSU’s opsEnvironmental Design and Implementation**

3.1 **Overview of the Design Process**

The process for implementing CSU’s EDMS system included phases for design, implementation, and training. During the design phase a baseline analysis of CSU’s current environmental tracking systems was conducted and included in a design plan for CSU’s opsEnvironmental implementation. The design plan for CSU’s EDMS included information gleaned from a series of interviews with CSU employees and examination and review of existing software, databases, spreadsheets and other data currently used by CSU. Based on the information collected for the design plan preparation was begun to design and implement CSU’s EDMS supported by opsEnvironmental.

The design plan phase of this project involved analysis comparing CSU’s current management of its environmental data with requirements specified in Title V permits and TRI regulations. The design also took into consideration opsEnvironmental functionality. Based on CSU’s current environmental data management needs and opsEnvironmental functionality, a design plan was developed that outlined and defined data processing workflows, identified tools, methods, and practices to be implemented, and determined methods and practices that will no longer be necessary.

The implementation phase included the creation of an Implementation Plan that detailed the facility model structure, report definition, air emission equations, data migration from the old systems, and a schedule for completion. Also included in this phase was a schedule for training both corporate and plant personnel. Implementation and
training were coordinating to coincide with the culmination the completion of the opsEnvironmental implementation.

3.2 Business Requirements for CSU’s opsEnvironmental Implementation

To successfully implement opsEnvironmental, CSU defined a set of core business requirements. First and foremost CSU needed to facilitate compliance with regulatory requirements. Demonstrating compliance with state and federal regulatory requirements was a detailed and complex process. To make this process more efficient they need their opsEnvironmental to organize and automate their compliance processes. The following is the list of CSU business objectives identified to ensure the successful completion of their opsEnvironmental implementation:

1) Reduce the effort required by corporate personnel to collect and evaluate data and to maintain the record keeping system.

2) Develop and maintain a centralized, accessible location for all data required by Title V operating permits and TRI reporting requirements. Rather than recording information on disparate database, spreadsheets and paper reports at various locations in the Colorado area, the EDMS needed to provide operating and emissions data that would be quickly accessible to both plant and corporate personnel.

3) Be able to access data quickly. The system must be intuitive and easy-to-use, so that a variety of users with varying degrees of computer proficiency, from plant personnel to corporate environmental management to executive
management were able to access data quickly.

4) Be able to immediately access compliance data. Users should be able to check compliance status daily, weekly, monthly, or whatever time interval is needed. This capability should be available at the plant as well as in corporate offices.

5) Have the flexibility to tailor the system to the particular operating environment at each of the 4 Title V facilities. No two of CSU’s facilities are the same, and therefore the system had to accommodate the variations between facilities.

6) Include a tickler system capable of reminding users to collect, record, or report compliance data prior to its due date. The tickler system must be able to send electronic notification to users that some particular task is needed, such as data collection or report generation. The tickler system should be able to notify users when a data point is out of compliance, or near a permitted limit.

7) Evaluate data trends. Users should be able to collect periodic data and then graph the data to check performance indicators and relate trends back to actual operating conditions. For example, if a particular pollutant emission level is significantly increasing compared to the previous year and the increase may cause permit limits to be exceeded, the user could immediately check operating procedures, equipment efficiencies, fuel usage, and other parameters to determine where the problem is and decide how to correct it.
8) Provide accurate report generation. The system should be able to generate reports on emission inventories and compliance tracking, as well as facility reports such as odor and fugitive dust complaint logs, excess emissions reports, equipment specification reports. The system should also generate all the required TRI reports: Form R’s, Threshold, End-Point Analyses, Mass Balance. The system should also be able to replicate any other types of reports required for a particular facility.

9) Provide validation of data. The system should have some data validation capabilities, such as error checking, prevention of data input into illegal fields, testing equations for accuracy, etc.

10) Reduce the amount of paper copies required. The system should have the capability to store data in such a way that data is both retrievable and secure, thus reducing the necessity to store paper copies.

11) Be year 2000 compliant. Data in non-compliant applications will be migrated to opsEnvironmental. The opsEnvironmental system must have complete functionality on and after January 1, 2000.

Once opsEnvironmental was fully implemented, all data required for Title V and TRI reporting will reside in one database. The only periodic data entry will be monthly entry of parameters, such as fuel usage, fuel characteristics, operating hours and chemical usage. Other data such as emission factors and emission control efficiencies can be entered as needed. The opsEnvironmental system will be customized for CSU to perform all the required emission calculations and report the data for the required periodicity. By simplifying the data entry and using a single common system for all calculations, CSU
will eliminate erroneous or conflicting calculations and decrease the opportunity for input errors across departments. Because there will be less effort involved in maintaining compliance reports and data, CSU staff will be able to allocate more hours to other projects.

Figure 1 illustrates the flow of data from its original source to the centralized database. At CSU, the Electric group will enter plant operational data and fuel analysis data from the fuels lab. Permitting services will enter all permit information. And, the water department will enter all Solids Handling and disposal facility (SHDF) fuel data.
For $\text{SO}_x$ and $\text{NO}_x$ emissions, an electronic link to opsCEMRW will allow direct access to CEM data via the Data Acquisition and Handling System (DAHS). Users will be able to access all data according to their privilege level and produce Title V and TRI reports.

### 3.3 CSU’s Current Environmental Data Management

Currently, CSU’s environmental compliance data resides in various electronic and paper formats in multiple locations. Data is maintained in spreadsheets and databases at the individual facilities and compliance reports are generated from these electronic sources and are maintained at these different locations. The Environmental Management Information Tracking System (EMITS) database is used only for the George Birdsall power plant facility and provides daily average emissions at the Birdsall facility. This database is located at the Permitting Services Department. A second database, the Environmental Data Management System (EDMS) is also located at the Permitting Services but is not integrated with EMITS. The EDMS database provides emissions inventories for all other CSU facilities and is used to calculate APEN fees.\(^7\) A third data source located at the Permitting Services Department is an Excel spreadsheet containing various permit information for CSU facilities. Another Excel spreadsheet contains TRI calculations. CSU’s current data management is shown in Figure 2.

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\(^7\) Air Pollution Emission Notice (APEN) fee for the state of Colorado.
Data sources for these databases and spreadsheets include plant operating reports, Electronic Data Reports (EDR) from the Continuous Emission Monitoring Systems, data found in the Graybook\(^8\), the fuel labs reports, mine analysis reports and permit

\(^8\) CSU's "Graybook" is a statistical publication that contains fuel consumption data.
information. Wastewater information is maintained in the Wastewater Environmental Information Retrieval System (WEIRS) system.

CSU’s current management of these data sources and database and spreadsheets often results in inconsistent fuel consumption data and emissions calculations. This problem is directly related to data stored and maintained in different locations and originating from different sources. The current system of data management also creates a duplication of effort, with fuel usage data being entered multiple times in plant operating reports, Graybook, spreadsheets and databases.

3.4 CSU’s opsEnvironmental Approach

By implementing opsEnvironmental, CSU plans to fully integrate their environmental data management system. To integrate all data management operations CSU will use three modules of opsEnvironmental - opsFormR, opsAir, and opsCEMRW. Each of these modules will be integrated to share data across all modules. This approach is called a “multi-module” approach. In a multi-module approach, data models are constructed in one module and then the model structure is shared across other modules. For a more detailed discussion on this approach see Chapter 5. The use of the multi-module approach allows the model developer to seamlessly share data across modules. To users of the opsEnvironmental system, a particular facility model will appear to be only one model but in reality its is a combination of three models, an opsAir model, opsFormR model, and a shared model, built within two modules.
The multi-module approach for developing models within opse\textit{Environmental} included the creation of a shared model for each facility (Figure 3). The shared model allowed for data integration between the \textit{opsAir} and \textit{opsFormR} models. For example, three models were created for the Drake facility: the \textit{opsAir} model containing emission factor data and air emission equations for reporting criteria air pollutant emissions. The \textit{opsFormR} model contained emission factor data and emission equations for TRI reporting and hazardous air pollutant (HAP) emissions. And, the shared model containing fuel consumption and standard facility data was shared with the other modules for their calculation and reporting purposes.

\textbf{Figure 3: \textit{opsAir}/\textit{opsFormR} Multi-module Approach for a Facility}

This approach centralizes CSU's fuel data, emission inventories, and record keeping in a single database, reducing CSU labor requirements and inconsistencies in regulatory compliance reports.
For CSU’s implementation, the opsFormR models were created first. Then shared models were created in opsFormR and then included in the opsAir models.\(^9\)

In conjunction with CSU staff, two consulting firms completed the data analysis and model development work. One consulting firm was responsible for completing the opsFormR models. The other firm was responsible for completion of the opsAir models and integrating the two modules. This effort required significant coordination between all involved parties. Nomenclature for parameters used within the models was established in the opsFormR models. Close coordination of nomenclature and calculations was very important in providing consistent data results.

The initial phase of implementation consisted of building prototype models for the Martin Drake power plant facility. This prototype was used to test validity of the approach. Test data from 1998 was compared to known data in both opsAir and opsFormR in the prototype model. This multi-model prototype was then fully tested before the models for the last three facilities were created.

When all the models were built and the initial system complete, users of the system were able to enter parameters for fuel usage, fuel characteristics, operating hours and chemical usage. Users were able to quickly access emissions inventory data for sources at each facility. Users were also able to access TRI data for all chemicals that are manufactured, processed or otherwise used at the facility. The TRI data was available to users either directly on-line in the system or through predefined report formats designed

\(^9\) For the technical procedure for sharing data between modules and including database models within other models see ESP’s technical documentation.
to compliance specifications. Users were also able to create ad hoc management reports as needed.

Examples of reports that were designed in opsAir are Air Pollution Emission Notices (APENs), 12-month rolling averages, PM compliance reports, SO\textsubscript{2} compliance reports, criteria pollutant emissions reports, and HAP emissions reports. Since some of these reports (e.g., APEN reports) required information from both opsForm\textsuperscript{R} and opsAir, it was critical that these models were tested in the prototype for compatibility. Users were also able to create their own ad hoc reports for specific queries to the database. Having all the environmental management information in a single location simplified the reporting structure.

Because the ops\textit{Environmental} suite of products is Y2K compliant, data tracking and reports for facilities modeled in the system allowed CSU to meet Y2K IT requirements. There are additional CSU facilities that were considered outside the scope of work for this project that may no be Y2K compliant.

Permit information entered in the system will generate ticklers via email to remind users of data entry and reporting requirements. Ticklers will also be created to notify certain users that a particular TRI chemical has exceeded threshold levels or that a criteria pollutant is nearing its permit limit.

In addition to viewing the facility models, other levels of access to the data were defined. Power plants employees needing only to see data relevant to their facility were only given privilege to view and edit data specific to their plant. Corporate employees
were granted privilege to view all CSU plant data via a corporate view or corporate model "roll-up".

A preliminary list of users for the opsEnvironmental system was identified during the interviewing of key personnel. Although it is anticipated that there may eventually be as many as 40 people using opsEnvironmental, the initial implementation involved approximately 15-20 people. The level of access for each user was be determined during the implementation phase of the project. Access levels were defined according the following table:

Table 1: opsEnvironmental Privilege Levels

<table>
<thead>
<tr>
<th>User</th>
<th>Corporate</th>
<th>opsCEM/R</th>
<th>Corporate</th>
<th>opsForm/R</th>
<th>Corporate</th>
<th>opsAir</th>
<th>Drake</th>
<th>Nixon</th>
<th>Birdsall</th>
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</tr>
</tbody>
</table>

After each model was completed, appropriate CSU personnel were trained how to navigate through the Windows style tree structure of facility models, how to enter data through the data entry screens, and how to generate reports. It is anticipated that data entry time per month will range from 10 to 30 minutes a month depending on facility size and data entry requirements. Report generation time will depend on the number of reports, report complexity and the speed of the individual PC and connecting printer. However, in most cases, reports can be generated and printed in one to three minutes.
4. The *opsEnvironmental* Software – Features and Functionality

*opsEnvironmental* was developed to address corporate needs from the power, gas transmission, and oil production industries. Specifically, *opsEnvironmental* was designed to address air regulatory compliance for these industry groups. With this need, *opsEnvironmental* began with modules for compliance tracking, SO$_2$ and NO$_x$ allowance tracking, and air emission calculations. As the needs of the development group expanded, ESP created additional modules to manage data for TRI, NPDES, and CEMs reporting requirements. Today the *opsEnvironmental* software suite consists of five software modules used for tracking a variety of environmental data.

The primary difference of *opsEnvironmental* from other commercial environmental software was that *opsEnvironmental* enables a user to define a facility as a series of emission points or sources that are tied to industry-specific operations and equipment types. This allows emission inventories and compliance tracking to be tied back to specific Title V sources. Some of the primary distinguishing features of *opsEnvironmental* are:

1) *opsEnvironmental* was developed using a Microsoft Explorer® style “tree” interface. This familiar way to visualize and document relationships in the data is the primary user interface.

2) The *opsEnvironmental* reporting feature allows any data in the *opsEnvironmental* database, or any external database accessed by *opsEnvironmental*, to be extracted quickly by plant personnel, environmental
staff or corporate management without the need to understand the opsAir
database table structures. This eliminates the need for database managers to be
constantly “on call” for report generation. In addition, the use of powerful report
writers, such as Crystal Reports®, can be dramatically simplified by eliminating
the need to understand the opsEnvironmental database structure.

3) opsEnvironmental was developed to be compliance oriented. The unique
“version control” capabilities enable users to document changes to equipment,
methods, and libraries over time, and then to look at data or run reports for any
past periods which reflect the proper configuration at that time. In addition, a
sophisticated tickler system provides timely electronic warning for actions that
need to be accomplished as well as a complete record of when compliance
actions were accomplished.

4) With opsEnvironmental, the user can develop customized equipment-
specific equations to be used in emissions calculations. If an equation changes
due to changes in equipment or operating scenarios, the first version can be
saved and opsEnvironmental will automatically retrieve the correct equation if a
report is generated over a time period spanning both versions of the equation.

5) With opsEnvironmental, users can generate emission inventories across any
sources, emission types, or time ranges. Data can be exported into spreadsheets
and databases for external analysis or imported from ASCII files for use within
opsEnvironmental. Report formats can be created, saved, and easily retrieved
using data across any time period. With the link to Crystal Reports, reports can
be formatted for submittal to any regulatory agency.

6) In addition to the option of importing ASCII files, data can be entered into
the opsEnvironmental database via electronic data entry screens (see Figure 2)
which are easily created and customized for facilities or individual pieces of equipment.

7) Users can maintain a complete list of federal, state and corporate requirements and link them to specific facilities or equipment in opsEnvironmental (see Figure 3). Lists of action items to be accomplished and their status can be maintained as well as a tickler system to remind users of compliance commitments.

8) Documents, spreadsheets, drawings, scanned images, procedures, or any other electronic file can be linked to opsEnvironmental via an electronic file drawer. These documents can be easily retrieved by selecting an icon on the opsEnvironmental “tree” structure.

By using opsEnvironmental, utility companies and other customers have a data management tool for coordinating distributed compliance activities and automating their record keeping requirements. opsEnvironmental provides companies with a uniform interface, facility and equipment management, and database and network interfaces. It also allow for sharing of compliance data, opsEnvironmental functions and features, and report generation. With these features, opsEnvironmental provides companies a well-integrated environmental data management tool.
5. **opsEnvironmental Customization - System Design and Development**

5.1. **Facility Model Design**

Using an opsEnvironmental multi-module approach, the CSU model structure was designed to allow for opsAir and opsFormR modules to share CSU TRI and Title V environmental data. To do so, three models were created for each facility: a [TRI] model, a [Shared] model, and an [Air] model (Figure 1). For example, the Martin Drake facility has models named Drake [TRI], Drake [Shared] and Drake [Air]. The [TRI] models contain data, calculations and reports for TRI reporting purposes. The [Air] models contain data, calculations, and reports for Title V reporting purposes. And, the [Shared] model contains just data necessary for both TRI and Title V.

The shared models exist for structural reasons only and will not be viewable to users, except administrators. Ultimately, in the list of models, CSU personnel will see only [TRI] models and [Air] models specific to their department, security, and access settings. Below is a table (Table 2) of models created for CSU:

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10 Title V facilities will consist of three models whereas non-Title V facilities will one consist of one [Air] model. Shared models for these other facilities may be added at a later time.
Table 2: Facility Models Created for CSU

<table>
<thead>
<tr>
<th>Title V Facility Models</th>
<th>Non-Title V Facility Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drake [TRI]</td>
<td>Fontanero [Air]</td>
</tr>
<tr>
<td>Drake [Shared]</td>
<td>Las Vegas [Air]</td>
</tr>
<tr>
<td>Drake [Air]</td>
<td>Memorial Hospital [Air]</td>
</tr>
<tr>
<td></td>
<td>Municipal Airport [Air]</td>
</tr>
<tr>
<td>Birdsall [TRI]</td>
<td>Police Operation Center [Air]</td>
</tr>
<tr>
<td>Birdsall [Shared]</td>
<td></td>
</tr>
<tr>
<td>Birdsall [Air]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other Models</td>
</tr>
<tr>
<td>Nixon [TRI]</td>
<td></td>
</tr>
<tr>
<td>Nixon [Shared]</td>
<td>CSU Permits [Additional]</td>
</tr>
<tr>
<td>Nixon [Air]</td>
<td></td>
</tr>
<tr>
<td>SHDF [TRI]</td>
<td></td>
</tr>
<tr>
<td>SHDF [Shared]</td>
<td></td>
</tr>
<tr>
<td>SHDF [Air]</td>
<td></td>
</tr>
</tbody>
</table>

5.2 Data Objects and Classes

The opsAir software uses an object-oriented approach for data relationships. Using this approach, individual objects were created for facility information, fuel inputs, equipment, emission factors, permits, and reports. These objects were then grouped together by emission source and facility. The organization of these objects was displayed in a Windows™ style tree structure that can be viewed through the opsAir Object Navigator. Through the Object Navigator, users were able to “drill down” through each level of the tree to see the data associated with each group of objects (Figure 4). For example, in the Drake model in Figure 4 a user is able to drill down from the facility object, through the Drake [Shared] Boiler #6 equipment group, to the Drake [Shared]
Coal #6 (Drake_Coal) object (coal input object) and the Drake [Air] Coal #6 object (emission output object for Title V).

Figure 4: Drill Down Through the Object Navigator

The object-oriented layout of data for each facility from the [Air] model perspective was created. Each model has a similar layout consisting of facility, group, equipment, emission factor, report, reference, data entry, permit information, and tickler objects.
Objects used in the models were developed from ops*Environmental* classes. These classes are displayed in the class manager (Figure 5). A class, in its most simple definition, is a category of objects. For CSU, standard classes are available from both ops*Air* and ops*FormR*. Also user-defined classes were created for CSU’s specific needs. For example, ops*Environmental* provides standard facility, equipment, data entry, reference, tickler, and administration classes. An example of one of these is the tickler class shown in Figure 5. From these standard ops*Air* classes, individual classes were created. For example, from the standard ops*Air* equipment class, individual objects for boilers, coal handling, ash handling and cooling towers were created. An example of one of these is the Ash Silo classes shown in Figure 5.

**Figure 5: ops*Environmental* Classes**

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Below is a list and brief description of the type of objects that were created for each model.

**Facility Objects:**
The facility objects contain general information about the facility such as the facility name, address, location, contact persons, identification numbers, etc. This information is used in the header portion of the APEN report and for general reference. All data for a facility is grouped beneath the facility object.

**Group Objects:**
The group object’s main function is to group equipment objects according to APEN emission sources. For example, the *Drake [Air] Ash Handling* group object has the *Drake [Air] Ash Silo (S202a,b,c,d,e)* and *Drake [Air] Ash Wet Unloader (S202f)* equipment objects grouped below it (Figure 6). These two equipment types are grouped together because they are considered one APEN emission source.

Along with the equipment objects, emission factor objects were also grouped with the appropriate equipment objects. In Figure 6, emission factor objects containing the emission factors for these particular equipment types are grouped together. Also, in Figure 6 other grouping objects like *Drake [Shared] Boiler #5* contain APEN fuel and process information and stack data for the APEN report.
Equipment Objects:
The equipment objects contain air emission calculations, variable units of measure, control efficiency information, and other associated APEN and Title V report data. These objects organize the emission expressions, variables and fuel usage for calculation of air emissions for equipment types. These objects also contain information for data-driven ticklers.

Emission Factor Objects:
The emission factor objects contain the appropriate emission factors (required by the Title V permit) for equipment types. Emission factor objects were associated with equipment objects in order to work in conjunction with the appropriate equipment data (Figure 6). In Figure 6, the AP-42 emission factors for air emission from ash handling operations are listed in the CSU AP-42 Ash Handling object.
Other custom emission factor objects will be created as needs arise from the issuing of Title V permits for Drake, Nixon and SHDF. The prototype model was developed using the current emission factors and 1998 data. Emission factors and equations used for calculating air emissions from a particular facility were verified with CSU before completion of that facility's model.

**Report objects:**
The report objects contain specific report criteria in a template form. The report template contains the opsRover report definition, name and location of the Crystal Reports™ file, report date/time ranges, groups, objects, and parameters. The reports were created in a separate model and then included into the appropriate models.

**Reference Objects:**
The reference group of objects contains lists of expressions, units of measure, and agency names, as well as the emission factor objects. There are reference object groups for both opsFormR and opsAir. These reference objects are only viewable for administration and any other designated users.

**Data Entry Objects:**
Data Entry objects contain the data parameters required for periodic entry by CSU plant personnel. Data entry objects were created for fuel usage, boiler, cooling tower, coal handling, ash handling, and permit data at each facility. Figure 7 shows an example of an opsAir coal usage data entry form for Drake. Below are tables of data fields to be entered on the data entry forms (Table 4).
Table 4: Tables of Data Entry Fields

Monthly Drake Fuel/Operational Data

<table>
<thead>
<tr>
<th>Unit</th>
<th>Date/Time</th>
<th>Total Coal Burned (tons)</th>
<th>Total Gas Burned (1000 ft³)</th>
<th>Total Hours Operation (hours)</th>
<th>Average Coal Sulfur (%)</th>
<th>Average Coal Ash (%)</th>
<th>Average Coal HHV (btu/lb)</th>
</tr>
</thead>
</table>

Monthly Nixon Fuel/Operational Data

<table>
<thead>
<tr>
<th>Unit</th>
<th>Date/Time</th>
<th>Total Coal Burned (tons)</th>
<th>Total Oil Burned (gallons)</th>
<th>Total Hours Operation (hours)</th>
<th>Average Coal Sulfur (%)</th>
<th>Average Coal Ash (%)</th>
<th>Average Coal HHV (btu/lb)</th>
</tr>
</thead>
</table>

Monthly Birdsall Fuel/Operational Data

<table>
<thead>
<tr>
<th>Unit</th>
<th>Date/Time</th>
<th>Total Oil Burned (gallons)</th>
<th>Total Gas Burned (1000 ft³)</th>
<th>Total Hours Operation (hours)</th>
<th>Average Oil Sulfur (%)</th>
<th>Average Oil Ash (%)</th>
<th>Average Oil HHV (btu/lb)</th>
</tr>
</thead>
</table>

Monthly Drake/Nixon Coal/Flyash Processed

<table>
<thead>
<tr>
<th>Plant</th>
<th>Date/Time</th>
<th>Total Coal Processed (tons)</th>
<th>Total Flyash Processed (tons)</th>
<th>Total Flyash Sold (tons)</th>
<th>Total Bottom Ash Processed (tons)</th>
</tr>
</thead>
</table>

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### Method 9 Opacity Data Entry Screen

<table>
<thead>
<tr>
<th>Plant</th>
<th>Date/Time</th>
<th>Unit or Process</th>
<th>Reason for Method 9</th>
<th>Method 9 Opacity Average Value</th>
<th>Opacity Reader</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Drake/Nixon Upset Condition/Excess Emission Entry Screen

<table>
<thead>
<tr>
<th>Unit</th>
<th>Date/Time</th>
<th>Upset or Excess</th>
<th>Pollutant</th>
<th>Value</th>
<th>Reason</th>
<th>Person Filing Report</th>
<th>CDPHE Verbal Notification Date/Time</th>
<th>CDPHE Written Notification Date/Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Permit Objects:**

Permit objects contain all the parameters necessary for all the different types of permits for CSU facilities. These permit objects were grouped together by facility. So, for Drake, all the permit information will be stored under the Drake Permits group. Then, drilling down, the user will see all of the permits applicable to the Drake facility (Figure 8).

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**Figure 7: CSU opAir Data Entry Form**

![Data Entry Form](attachment:DataEntryForm.png)
**Tickler objects**

Tickler objects, combined with action item objects, will serve to remind CSU personnel of tasks to be completed, completed tasks, and pertinent permit dates. Action item objects contain information about a single task to be completed. Tickler objects contain information necessary to send notification to users about the state of the action items.
5.3 Required Reports

Ten types of reports were created in opsAir for CSU facilities. The reports will are listed below in Table 5:

<table>
<thead>
<tr>
<th>Report Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title V Facilities</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>APEN (Page 1)</td>
</tr>
<tr>
<td>2.</td>
<td>HAPs (Page 2)</td>
</tr>
<tr>
<td>3.</td>
<td>Compliance Monitoring Report (semi-annual)</td>
</tr>
<tr>
<td>4.</td>
<td>Annual Compliance Certification Report</td>
</tr>
<tr>
<td>5.</td>
<td>Criteria Emissions Report (twelve-month rolling total)</td>
</tr>
<tr>
<td>6.</td>
<td>Daily Emissions Report (Birdsall)</td>
</tr>
<tr>
<td>7.</td>
<td>Opacity Log Report</td>
</tr>
<tr>
<td>8.</td>
<td>Excess Emissions Log Report</td>
</tr>
<tr>
<td>9.</td>
<td>Permit Information (by facility)</td>
</tr>
<tr>
<td>10.</td>
<td>Drake/Nixon CEMS Downtime Log Report</td>
</tr>
<tr>
<td>11.</td>
<td>APEN (Page 1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-Title V Facilities Generating APENs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Facilities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Permit Information (by department and type)</td>
</tr>
</tbody>
</table>

For non-Title V facilities, the HAPs reports were not created because the HAPs for these facilities will not be in an opsFormR [TRI] model. For this implementation, [TRI] models were not created for non-Title V facilities. The Criteria Emissions report (twelve-month rolling total) was not developed for the non-Title V facilities because it was not required. Daily Emissions reports were only created for Birdsall to replace the EMITS Daily Emissions report. Other Daily Emissions reports may be created by CSU at
a later date. Permit Information reports were created for all CSU facilities represented in the database.

CSU reports consist of an opsAir report template object, a Crystal Reports® file (.rpt), and an MS Access® data file (.mdb). The opsAir report template contains the opsRover report definition, name and location of the Crystal report file, report date/time ranges, groups, objects, and parameters. The Crystal report file contains the report design and MS Access data file location. The MS Access data file contains the report date/time range and database fields queried for the report. Each of these report items work together to generate the CSU opsAir reports. Depending on user access, CSU personnel are able to run any of the reports listed above from a CSU opsAir workstation.

5.4 Tickler System

The CSU database was developed in order for CSU to create various ticklers and data-driven ticklers. Ticklers are system generated email notifications that are executed when a particular action occurs in the database. For the initial implementation, data entry ticklers were created for the plant personnel at Drake, Nixon, Birdsall, and SHDF facilities. These data entry ticklers will be monthly email reminders that data entry is required. Ticklers were also created to notify managers if the data entry for a particular month has not been completed by a certain time.

Ticklers were also created for non-Title V permit report due dates, permit renewal dates, and permit expiration dates. If the permit data is missing or incomplete then
ticklers were not created for those permits. Permit ticklers for Title V facilities may be implemented by CSU at a later date.

Data-driven ticklers were not part of this implementation. However, the CSU database will be developed with the necessary object/class structure so that CSU will be able to implement data-driven ticklers in the future.
6. **Implementation of CSU’s opsEnvironmental Data Management System**

6.1. **Implementation Schedule, Installation, and Training**

An implementation plan was created to outline the opsEnvironmental implementation at CSU. It restates the requirements of CSU and describes how opsEnvironmental meets those needs. The implementation plan, delivered in the second quarter of 1999, incorporated CSU’s comments and corrections to the design plan and refined the details about task assignments, resources, project control, measurements, schedules, change management plan, work structure breakdown, quality assurance/control, dependencies and milestones.

Project implementation began soon after acceptance of the implementation plan. The first facility modeled was the Martin Drake power plant because it presented a fairly complete set of the modeling objects required.

When the Drake model was completed, extensive testing was done to assure that the model and its associated calculations were accurate and complete. Required reports were generated. The model was presented to CSU for critique and suggested refinements. When the Drake model was finished and accepted, the other models were built and tested. Following the completion of the facility models end-user documentation was provided along with user training.
6.2 Quality Assurance

Quality assurance was an essential part of CSU’s implementation of \textit{opsEnvironmental}. Corporate personnel needed assurance that users have confidence in their data management system when it is being used to produce emission inventories and compliance reports. It was important to ensure that a facility model had been configured correctly, that it produces accurate results, and that any changes were monitored and validated.

CSU dedicated enough server space to allow for a test database/production database system. This configuration meant that when an upgrade of the software or an interim release was received from the software vendor, the test database was upgraded first. All new features, as well as some of the more important existing features (report generation; use of data entry screens; correct emissions calculations), can be tested before moving the upgrade or interim release over to the production database.

Another quality assurance check used was to validate the new models with 1998 plant operational data. Since the results for the 1998 emission inventories were known, using the facility’s 1998 data in the \textit{opsEnvironmental} model and then running the 1998 emission inventory report was a reliable check on the accuracy of the equations and calculations used in a facility model.

The use of class definitions and equation and emission factor libraries also served as a quality control measure. Use of class definitions ensures that the same information is entered, and the same calculations are used, for the same types of equipment or sources. Once a change is made in one of the reference libraries (equation or emission factor
libraries), that change is made in every instance in which that library is used. For example, if the emission factor for SO\textsubscript{2} changed, and that change was made in the emission factor library, that emission factor would be updated in each model where it is used in a calculation. The uses of these types of reference libraries help eliminate the possibility of errors in re-entering standard information into the ops\textit{Environmental} program across various models.

\textit{opsEnvironmental}'s security functionality was used to ensure that only certain individuals make changes to a model. If changes are made, the audit trail feature automatically logs who has made a change to a particular object and the date the change was made. \textit{OpsEnvironmental} also has the capability of preventing users from entering invalid data on data entry screens. If a range of values has been established for a parameter data cannot be entered outside the valid range.
7. **Summary - Implementation Outcomes and Project Limitations**

CSU chose to implement ops*Environmental* as their data management and compliance-tracking tool for activities required under the Title V of the Clean Air Act and EPCRA TRI reporting regulations. The implementation of ops*Environmental* successfully met the business requirements outlined by CSU at the commencement of the project. CSU now has quick and easy access to compliance data across any requested time period. All of their emissions calculations are based on one central source of facility data, increasing their emission calculation consistency. Also, calculation of emissions and retrieval of other compliance data requires less effort by corporate and plant personnel. Report generation is readily available and is quick and accurate. The tickler system provides the ability to electronically remind users of important compliance commitments, tracks when action items have been completed, and allows CSU to evaluate data trends and make proactive decisions based on those trends. It also reduces the amount of paper copies generated and successfully meets the year 2000 compliance requirement.

While the implementation successfully met CSU's business requirements, some drawbacks and limitations were experienced. One drawback was managing project outcome expectations. While efforts were made to manage project expectations, some project members were less satisfied by the outcome due to their own specific expectations. Efforts were made to manage changes to the scope of work but not adequately communicated to CSU staff. To avoid this drawback, it would be advantageous to clearly and definitively express changes in scope and schedule through
rescoping meetings and weekly project timelines. This strategy was successfully applied late in the implementation, creating increased satisfaction of project outcomes.

A second drawback experienced was the introduction and reintroduction of new project members midway through the implementation. These mid-project arrivals brought in different expectations and different ways of managing the project. A way to avoid this would be to convolve meetings when project members are added or change and present to them the status of the project, restate the goals and objectives, and explain how the goals and objectives will be achieved.

One of the limitations to implementing the opsEnvironmental database was that the Title V operating permits for the four facilities were all different and all approved at different times. The disparity and timing of the approval of the Title V permits caused setbacks to project deadlines. Each Title V was negotiated separately, and as each one was approved CSU learned new information that would result in a change to the next Title V permit. For example, one of CSU's Title V permits was approved with a requirement of providing daily average emissions of criteria pollutants. This requirement proved to be quite difficult for CSU to demonstrate compliance because CSU did not always have daily fuel data and emission calculations. So, in subsequent Title V permits for the other facilities, CSU argued successfully to only be required to provide monthly fuel data and emission calculations. Because of disparity between the Title V permits on this issue, opsEnvironmental had to be reconfigured for one facility so that daily fuel data and emissions calculations were performed. For future Title V permits, CSU intends to
correlate these permits so that managing compliance data will be individualized to each facility.

Related to this issue, the lack of communication between the regulatory agencies and CSU presented certain limitations. While consultants were not directly aware of how CSU and the regulatory agencies communicated, it seems that if CSU communicated their concerns to the regulatory agencies regarding their issues with complying with both Title V and TRI regulations, they might have been able to create an easier data management situation. To minimize this limitation, both utility companies and regulatory agencies should maintain open dialog regarding the compliance requirements of these two regulations and work together to achieve agreeable compliance solutions.

Because opsEnvironmental is such a flexible and powerful software application, it provides users with many implementation options. Conversely, this flexibility means that the learning curve is steep for designing, developing, maintaining, and maximizing the capabilities of opsEnvironmental. Without opsEnvironmental software experience, implementation requires an extended commitment of personnel time from both the IS department and environmental services department. This was a serious issue at CSU. Much more design and development effort was needed upfront than was originally planned. This was an unanticipated drawback to using opsEnvironmental. CSU corporate personnel were concerned with the additional time needed to complete the project and also were concerned with how extensive ongoing and maintenance and support would be. For example, CSU estimates it will need up to one quarter full time employee for ongoing maintenance. This would include time to make changes to individual models as facility
operations change, to test and upgrade the system when new versions of the software are released, and to support users in the field when questions or problems arise.

In addition to concerns about maintenance and support, CSU was concerned about maintaining the sharing of data for Title V and TRI reporting. It took significantly more time than expected to coordinate methodologies for reporting air emissions for Title V and TRI. Both regulations allow for different methods of calculating air emissions as well as the use of different emission factors. Even though CSU decided to use the same methodologies and emission factors for both Title V and TRI reporting requirements, demonstrating and maintaining this in the database proved difficult and labor intensive. This concern lead to consideration of maintaining two separate databases, particularly because this was a major concern for CSU. Maintaining two separate databases in the same location potentially could reduce the maintenance time of integrating data and calculations between the two ops modules. Of course, the time required to maintain two separate databases would need to be considered with this alternative solution.

Further study and investigation is needed to determine the outcome of the recommendations for avoiding the drawbacks and limitations to using opsEnvironmental as an environmental data management tool. Analysis of using a different approach would also be valuable. Evaluation of an implementation using a data management system that did not to centralize all environmental data and reporting requirements in one database would provide valuable comparison information for this study. Studying implementation of a system that allows users to access their multiple, disparate external data sources through one software tool would yield results that could help others decide on a software
solution. Using a system that provides a single relational view of data from multiple heterogeneous data sources could be as effective as a centralized database solution. Comparing implementation results, time to completion, and system maintenance results would be valuable to other companies making decisions on a successful approach for managing their environmental data.
Bibliography

Code of Federal Regulations, Title 40. Chapter 1. EPA Subchapter C, Air Programs, Part 70 – State Operating Permit Programs.


http://www.cpdhe.state.co.us


McClean, Brian J.  1993.  "Guidance on Coordinating Title IV/Title V Permitting Schedules."  Memorandum to Air, Toxics, and Wastewater Division Directors.  EPA.  Acid Rain Division.