

The Development of Oil and Gas Production Site and Midstream Facility Emissions Inventories in Wyoming, and the Submittal of Inventories to the EIS

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ABSTRACT

The Wyoming Department of Environmental Quality (WDEQ) Air Quality Division's (AQD's) staff is continuing the process of developing and improving oil and gas minor source emission inventories for production sites and midstream facilities in Wyoming. This process includes: the refinement of the Microsoft Excel[®] inventory workbooks developed by AQD staff for each source at production and midstream oil and gas facilities; generating tank flashing emission equations; developing and populating data systems; and reporting emissions to the U.S. Environmental Protection Agency (EPA).

Excel workbooks developed by the AQD staff are provided to the operators for reporting actual emissions from production and midstream facilities back to the AQD. Where possible, equations have been programmed into the individual worksheets within the Excel workbooks to aid operators in completing the inventories.

The process for generating storage tank flashing equations involves requesting operators to supply extended hydrocarbon analyses, generating field-wide oil and gas analyses by AQD staff from the operator submitted hydrocarbon analyses, and then creating the field and formation specific tank flashing equations.

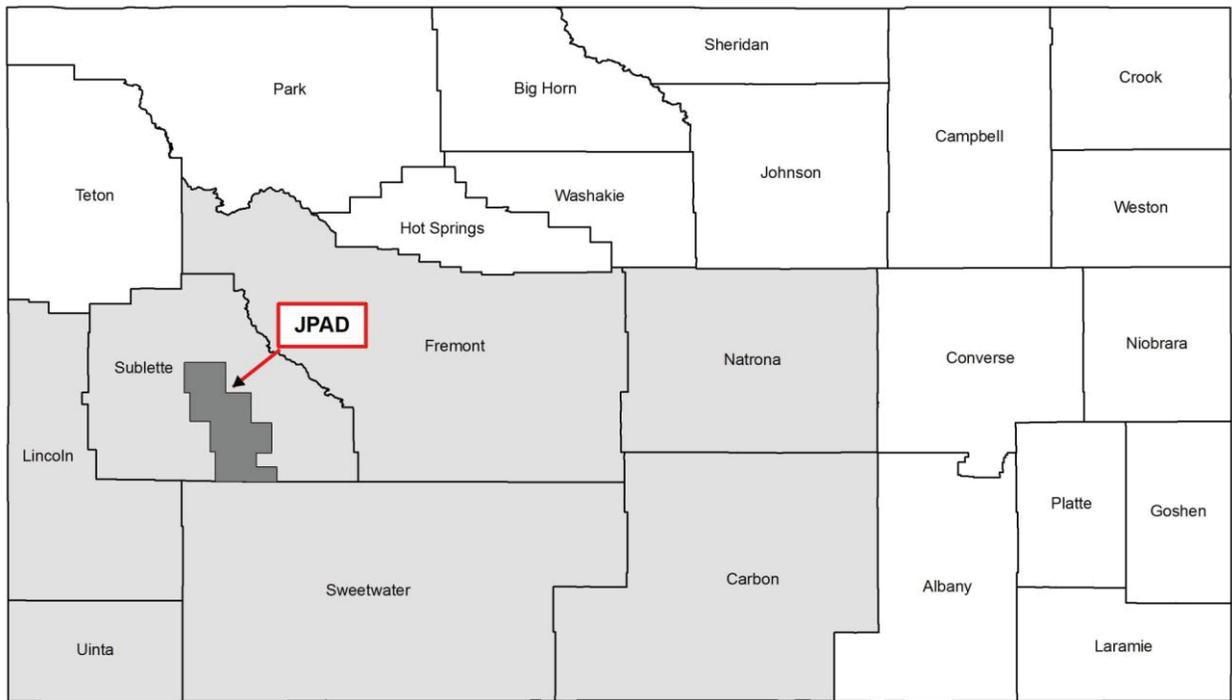
Developing and populating data systems, involved the creation of the Oil and Gas Emissions Reporting (OGER) data system which stores production and actual air emissions data on a well-by-well and source-by-source basis. The process of uploading production site emissions data to the OGER system, entering oil and gas midstream emissions data into the Wyoming Inventory System of Emissions (WISE) data system, and the current development of the Inventory, Monitoring, Permitting, and Compliance Tracking (IMPACT) database will minimize the number of databases in use.

Finally, reporting emissions to EPA consists of submitting data from the OGER data system over the exchange node network to EPA's Emissions Inventory System (EIS) as county wide area sources, and the submittal of the emissions data from the WISE data system through EPA's exchange node network to EPA's EIS as point sources.

INTRODUCTION

Calendar year 2011 marks the eighth consecutive year in which the AQD has requested operators in the oil and gas production and midstream industries to submit an annual emissions inventory. For calendar years 2008 and 2011, the inventory request was state-wide to meet National Emissions Inventory (NEI) requirements. During the other six years, the inventory request was focused on production and midstream operations first for calendar year 2004 in the Jonah Field and Pinedale Anticline Development (JPAD) Area within Sublette County as noted in Figure 1, and then later expanded for calendar year 2008 to include the Upper Green River Basin (UGRB) located in southwestern Wyoming. Inventories are designed to report actual emissions on a source-by-source basis regardless if it is a production site or a midstream facility. Inventory templates have been and continue to be developed by the AQD staff in Microsoft Excel[®] (Excel) workbooks, and are modified on an as needed basis.

Figure 1. Jonah and Pinedale Anticline Development (JPAD) in Wyoming



Along with obtaining air emissions data, the need exists for real time production information from the Wyoming Oil and Gas Conservation Commission (WOGCC) for use by the AQD to manage the environmental impacts of this rapidly growing industry. Using Web services previously developed by the WOGCC, data is pulled from the WOGCC well information system through the WDEQ Exchange Network OpenNode2 and up-loaded into the AQD's Oil and Gas Emissions Reporting (OGER) system. This data is then used to assist the AQD in understanding air quality impacts of emissions from the oil and gas production sector in a more timely fashion than was previously possible. This timelier access to information allows AQD staff to make better decisions faster and more accurately.

In addition to establishing a Web service interface to the WOGCC, a secure data flow was established from the AQD's Wyoming Inventory System of Emissions (WISE) data system to the EPA's Emissions Inventory System (EIS) for the National Emissions Inventory (NEI) reporting. Completing this task on time allowed the AQD to meet the reporting milestone date of June 1, 2010, for the 2008 NEI. A concurrent task to the development of the Web service from the WOGCC to the AQD was the development of the OGER data system which was needed to store the actual emissions and real time production information. Additional enhancements then allowed for the development of a system to upload production site actual emissions inventories reported to the AQD in Excel workbooks developed by the AQD staff into the OGER system, and the development of a second data flow that allows the AQD to submit area source inventories from the OGER system to the EIS.

Ongoing inventory initiatives by the AQD, which will be used to improve upon the current inventory format, include: the continued development of field and formation specific emissions equations on a speciated hydrocarbon basis to determine emissions from tanks, well venting, fugitives, and pneumatic sources; the further refinement of current tank flashing equations to include working-standing-breathing losses, and the determination of flash gas flow rates from tanks to control devices such as flares; the pre-loading of well facility and production information into the Excel inventory workbooks developed by the AQD staff on a per company basis to reduce the burden placed on industry for completing the inventories; and the further evaluation of emissions from dehydration units to determine if equations can be developed for the dehydration units that are similar to the equations being developed for storage tanks. As funding becomes available in the future, the AQD may also explore the option of including the minimum system requirements for the EIS into the OGER data system and modifying the EIS data extract through the WDEQ Network node in order to submit production site inventories as point sources instead of area sources.

BACKGROUND

With the technological advances in hydraulic fracturing in the oil and gas industry, the Upper Green River Basin (UGRB), and specifically the Jonah Field and the Pinedale Anticline Field in southwest Wyoming, has become one of the fastest growing natural gas production areas in the United States over the past decade. The Jonah II Record of Decision (ROD) issued in April of 1998 and the Pinedale Anticline Project Area (PAPA) ROD issued in July of 2000, both by the United States Department of Interior – Bureau of Land Management (BLM), authorized the drilling of 450 and 700 new wells, respectively. The Jonah Infill ROD issued in March of 2006 authorized the additional drilling of 3,100 new wells in the Jonah field, while the PAPA Supplemental Environmental Impact Statement (SEIS) ROD issued in September of 2008 allowed for a total of 4,399 wells to be drilled on 600 well pads. This resulted in an estimated 515 total wells being drilled each year from 2005 through 2008.

Since the mid 1990s, the AQD has been actively issuing permits for oil and gas production sites under the New Source Review (NSR) permitting regulations for minor sources. The Oil and Gas Production Facilities Chapter 6, Section 2 Permitting Guidance document was developed for this process and has been modified multiple times by the AQD's NSR staff since its first issuance. A proactive

initiative to the pending issuance of the Jonah Infill ROD was the fourth update to the AQD’s Oil and Gas Production Facilities Chapter 6, Section 2 Permitting Guidance document which addressed emission control thresholds for new wells in the JPAD area. Another proactive initiative taken on by the AQD was the implementation of a well-by-well air emissions inventory for all oil and gas exploration and production activities associated with wells in the JPAD area.

The inventory development for the JPAD area was focused on the aspects of the exploration and production of oil and gas with inventories developed on a well-by-well basis. Even though there were major source compressor stations located within the JPAD area, these inventory formats were not used as most were hard copy (paper) forms which required manual data entry into databases. Instead the AQD staff looked at the list of sources within NSR permits and compared those to the large emissions sources in the production fields to produce a list of sources to be inventoried. An Excel workbook template was then developed by the AQD staff to aid operators in compiling total emission from the production sites. The first inventory collected was for calendar year 2004 in the JPAD area that covered 1,440 wells. The sources and pollutants in the 2004 “annual” JPAD inventory are shown in Table 1.

Table 1. Original Oil & Gas Sources and Pollutants from the 2004 JPAD Inventory

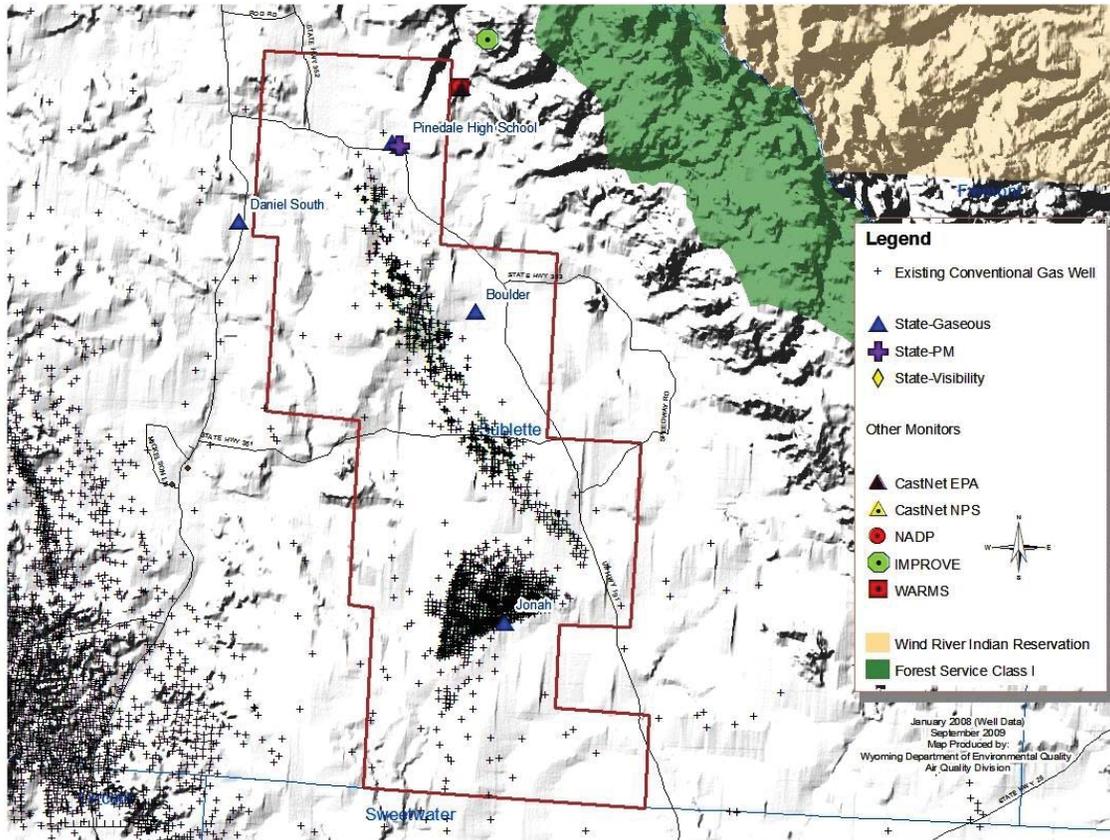
•8 Sources	•8 Pollutants
1) Drill Rigs	1) Nitrogen Oxides (NO _x)
2) Wellhead Engines	2) Sulfur Dioxide (SO ₂)
3) Process Burners	3) Total Volatile Organic Carbons (VOCs)
4) Condensate Storage Tanks	4) Benzene
5) Dehydration Units	5) Toluene
6) Pneumatic Pumps	6) Ethylbenzene
7) Well Venting	7) Xylenes
8) Well Completions (VOCs)	8) Total BTEX

As a result of the growth in production and the corresponding rise in ambient concentrations as noted by the Federal Reference Method (FRM) ambient monitors in and around the JPAD area, as noted in Figure 2, an oil and gas “wintertime” (February 1 – March 31) inventory was first requested in 2007 for all oil and gas production sites and midstream facilities located within Sublette County. This inventory is only required to be completed by production and midstream oil and gas operators as there are fewer than 25 other point source facilities located in Sublette County compared to the nearly 3,600 production sites inventoried. All of the other point source facilities in Sublette County are small gravel pits with very low particulate matter (PM₁₀) and nitrogen oxides (NO_x) emissions. In addition to only reporting production for two (2) months, emissions for the “wintertime” inventory are calculated in tons per day (TPD).

On February 21, 2008, the Federal Reference Method (FRM) Boulder monitor recorded an 8-hour ozone concentration of 122 ppb (parts per billion). The ambient standard at the time was 0.8 ppm (0.8 parts per million or 80 ppb). With multiple days where the ambient concentrations exceeded the level of the ozone standard during February and March of 2008, the annual JPAD oil and gas emissions inventory was expanded to include all oil and gas production and midstream sources located within the current ozone non-attainment area in southwest Wyoming known as the Upper Green River Basin

(UGRB). A map showing the boundary of the ozone non-attainment area is shown in Figure 3. Additionally, since calendar year 2008 was the third year in the triennial inventory reporting period, the inventory format used for the JPAD area was expanded to conduct a state-wide inventory for the 2008 NEI.

Figure 2. Ambient Monitors near the Jonah Field and Pinedale Anticline in Sublette County



By the time the AQD sent out the triennial inventory request for calendar year 2011, the number of inventoried sources and pollutants had grown considerably to include all the sources and pollutants noted above along with the additional sources and pollutants listed in Table 2.

Table 2. Additional Oil & Gas Sources and Pollutants from the 2011 UGRB Inventory

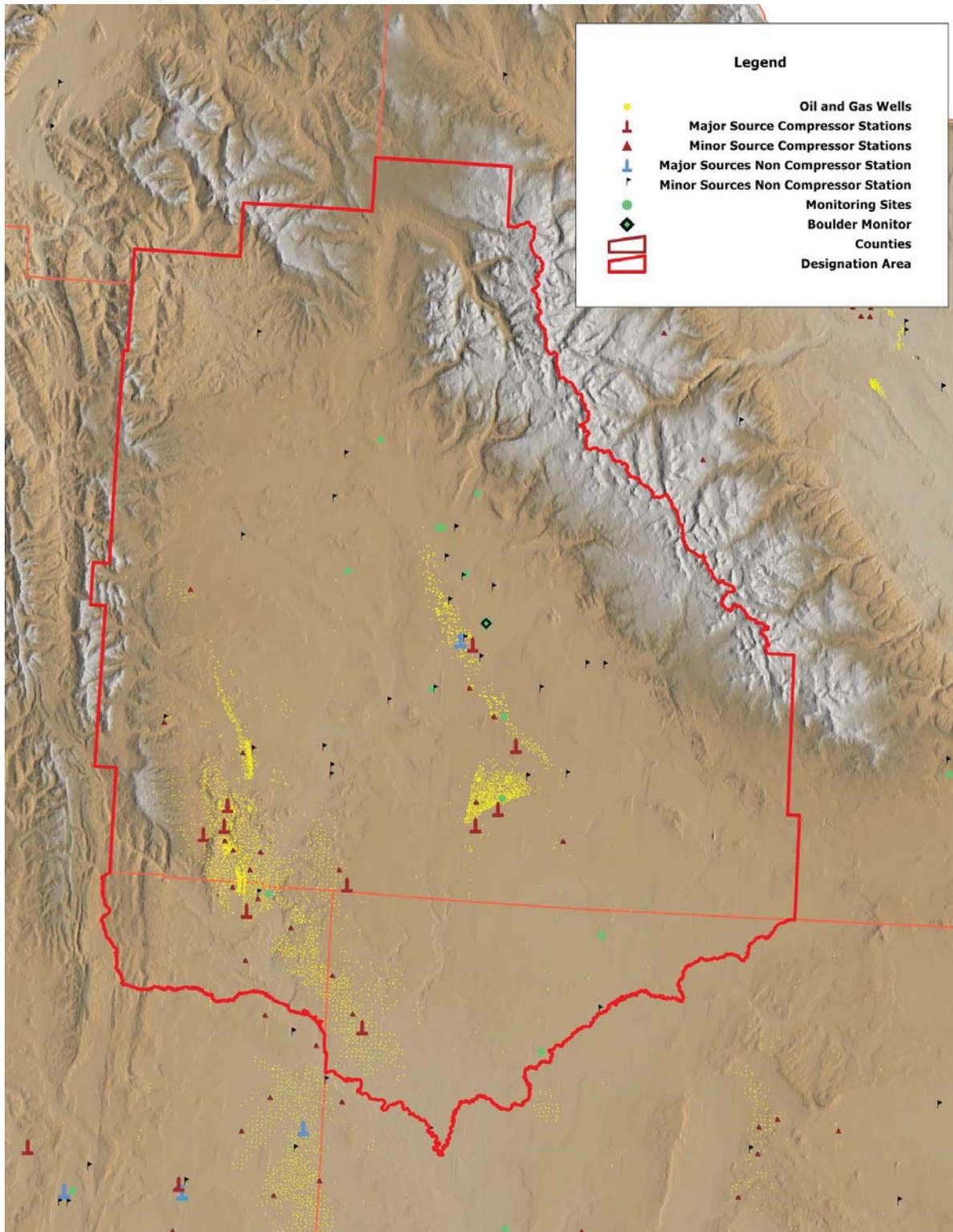
•9 Additional Sources

- 1) Completion/Workover Engines
- 2) Pneumatic Controllers
- 3) Fugitives
- 4) Truck Loading
- 5) On-road Mobile VMTs
- 6) Non-road Engines
- 7) Pipeline Compressor Engines
- 8) Pipeline Bulk Terminals
- 9) Produced Water Disposal Facilities

•20 Additional Pollutants

- 1) Speciated Hydrocarbons (19 total)
- 2) Total Hazardous Air Pollutants (HAPs)
- 3) Speciated HAPs (8 total)
- 4) Carbon Monoxide (CO)
- 5) Hydrogen Sulfide (H₂S)
- 6) Formaldehyde (HCOH)
- 7) PM₁₀ particulate matter
- 8) PM_{2.5} particulate matter

Figure 3. Upper Green River (UGRB) Ozone Non-attainment Area



Of the twenty (20) additional pollutants added to the inventories over the past eight (8) years, the following should be noted: of the nineteen (19) speciated hydrocarbons, seventeen (17) are VOCs; of the eight (8) speciated HAPs, only one (1), H₂S, is not a VOC with the seven (7) VOC HAPs being benzene, toluene, ethylbenzene, xylenes, n-hexane, 2,2,4-trimethylpentane, and formaldehyde; formaldehyde is the only HAP tracked that is not naturally occurring in produced oil or gas, but is

formed during the combustion of natural gas in fuel fired equipment with the majority coming from lean burn compressor engines; all PM_{2.5} emissions are assumed to be condensable emissions from fuel fired equipment.

Of the eight (8) previous sources and the nine (9) additional sources currently being inventoried, the following should be noted: AQD staff has internally developed all inventory forms in Microsoft Excel 2003 or Excel 2007; a separate Excel workbook was developed by AQD staff for operators to use in reporting emissions from drill rigs; a single separate Excel workbook has been developed for the non-production site facilities (compressor stations, pipeline bulk terminals, gas plants...); each Excel workbook contains separate sheets for each source (heaters, tanks, dehydration units...), along with detailed sheets listing instructions for completing the inventories, comments by the operators, a facility summary sheet, and a field-wide total emissions sheet.

Inventory Types and Formats

Annual JPAD inventories were requested to be submitted by oil and gas operators to the AQD starting with calendar year 2004. These inventories were developed by AQD staff in Microsoft Excel 2003[®] workbooks, and consisted of a single large table (one sheet within the workbook) per company. In addition to emissions, operators reported API numbers, well name, well pad name, latitude and longitude coordinates, the production field, production rates, and if the tanks or dehydration units were controlled. Emissions were reported on a tons per year (TPY) basis for each source, a total per well, and a total per company.

With the continued growth in the total number of wells came a corresponding increase in actual emissions and ambient concentrations. Of concern was the increase in the ambient concentration of ozone during the winter months. Elevated levels of ozone were monitored around the JPAD Area during February of 2005 and 2006. To better evaluate and understand these events, the AQD conducted a comprehensive monitoring study of meteorological conditions and ambient pollutant concentrations known as the Upper Green Winter Ozone Study (UGWOS) during the months of February and March of 2007. As a result, the AQD requested oil and gas production and midstream operators to submit a “wintertime” oil and gas emissions inventory covering the months of February and March of 2007 to correspond with the detailed monitoring data being collected.

Similar information requested in the annual inventories for 2004 through 2006 was requested in the 2007 “wintertime” oil and gas inventory. In addition to only reporting production for two (2) months, emissions for the “wintertime” inventory are calculated in tons per day (TPD), and the wintertime inventory was expanded to include all oil and gas operators in Sublette County, Wyoming instead of only those operators in the JPAD area. With the 2007 “wintertime” oil and gas inventory, the Excel 2003 workbook was expanded by the AQD staff from a single table on a single sheet to multiple tables on seven separate sheets.

A key addition to the “wintertime” oil and gas inventories was the development of a detailed drill rig inventory Excel workbook by AQD staff starting in 2008. Information required on the drill rig

inventories include, but are not limited to: operator reported emissions from each engine and boiler associated with each rig; the name and location of each well drilled during the specified inventory period; start and end drilling dates; total hours of operation for each drill rig engine and boiler on a per well drilled basis; and total fuel consumed by each drill rig on a daily basis. The detailed information collected from drill rig inventories assists the AQD in determining whether or not emissions from any rig is contributing to any increase in the ambient concentrations which may be recorded by one of the monitors in the area.

The format of oil and gas production and midstream inventories has stayed basically the same since calendar year 2008. The most notable change made by AQD staff was to list each source (heaters, tanks, well head engines, dehydration units...) on a separate sheet within the Excel workbooks. Emission factors are used and equations have been created to help operators calculate actual emissions where possible. As an example, the AQD NSR staff uses AP-42 emission factors for calculating emissions from heaters. The AQD inventory staff then programmed in equations into the worksheets using the AP-42 emissions factors to calculate emissions from each heater, leaving firing rates and hours of operation as the only inputs needed to be entered by operators. Likewise, hours of operation, total horsepower, and tested or permitted emission rates in terms of grams per horsepower-hour (g/Hp-hr) are the operational inputs needed to calculate emissions from engines as the AQD staff, again, programmed the equations into the worksheet to calculate the actual emissions. The 2008 “annual” oil and gas inventory was the first inventory in which the AQD staff included equations in the Excel sheets to determine uncontrolled flashing emissions from storage tanks. The equations in the spreadsheet then calculate emissions in pounds per hour (lb/hr) and tons per operational period (tons per year for annual inventories, or tons over two months for “wintertime” inventories) with the only inputs being the total amount of oil produced and the operating pressure of the separator.

As previously noted, Federal Reference Method (FRM) ambient air monitors around the JPAD area recorded multiple days where ambient concentrations exceeded the level of the then 8-hour 0.8 ppm ozone standard. On March 12, 2009, Governor Freudenthal submitted a recommendation to the EPA that the agency should designate the Upper Green River Basin (UGRB), including all of Sublette County and portions of Lincoln and Sweetwater Counties, in southwest Wyoming as an ozone non-attainment area. An associated major change was made to the calendar year 2008 annual inventory to expand the inventory from sources in the JPAD area to all sources located in the then proposed ozone non-attainment area. With this expansion, several thousand additional oil or gas production sites, along with several natural gas compressor stations, were included in the inventory. Since these additional inventory sources are located in either western Sublette County (non-JPAD area of Sublette County), or portions of Sweetwater or Lincoln Counties, the inventory name was also changed to the UGRB to be consistent with the proposed ozone non-attainment designation submitted to EPA, and to avoid confusion with previously submitted oil and gas inventories for the area.

The most recent changes made to the UGRB inventory format was for calendar year 2011. There was confusion by operators with the worksheet labeled pneumatic pumps on previous inventories. Some operators were submitting emissions for all pneumatic devices, while others were only submitting emissions for pneumatic pumps. To clarify this, an additional worksheet labeled pneumatic controllers

in the Excel inventory workbook was created for reporting emissions from pneumatic controllers. Thus there is now one sheet for pneumatic pumps and one sheet for all other pneumatic devices. Additionally, to gain information on PM_{2.5} emissions, all operators were required to submit PM_{2.5} emissions from all sources for the first time. Finally, for previous inventories, even though the forms had always been developed in Microsoft Excel 2007[®], they were converted back to the Excel 2003 version so that operators did not have to upgrade their software. With the changes made to the inventory for calendar year 2011, the “Facility Summary” worksheet within the workbook exceeded the maximum number of columns allowed by the Excel 2003 version. Therefore, from this point forward, all oil and gas production site and midstream inventories are required to be in the Excel 2007 format.

Flashing Equations

As part of the AQD’s NSR permitting program, all new or modified production site permits require liquids and gas analyses to be part of the permit application process. The NSR program then began a process to develop field wide flashing equations for the JPAD Area to assist in the evaluation of emissions in these rapidly growing gas fields. Using the ProMax[®] software developed by Bryan Research & Engineering, Inc. (BR&E), multiple speciated hydrocarbon analyses from the same field and formation combination are entered into the program. Constrained by production ratios acquired from the Wyoming Oil and Gas Conservation Commission (WOGCC), along with temperature and pressure recorded on the speciated hydrocarbon analyses, ProMax yields flashing emissions for each speciated hydrocarbon analysis entered. These emissions are then averaged to produce an emissions factor equation, which will calculate uncontrolled storage tank flashing emissions with inputs of total barrels of oil produced and the operating pressure at the separator.

Three (3) different equations were developed for operators in the UGRB depending on the producing field and formation combinations. These equations included one for production in the Jonah Field, another for production from the Pinedale Anticline Field, and a third for production from the La Barge and Big Piney areas in western Sublette County, Wyoming. These equations were first used in the 2008 triennial emissions inventory in the UGRB. Since no other equations had been developed at that time, operators in the remaining portions of Wyoming had to calculate tank flashing emissions on their own using an approved software program. For consistency, any program allowed to be used for calculating tank flashing emissions for permit applications were allowed to be used for inventory purposes.

The WDEQ-AQD began a project in early 2011 to develop similar equations for all producing field and formation combinations in Wyoming. To make this a manageable project, AQD staff first separated production into twenty (20) main groups, and then fifty-two (52) emission factor groups. These 52 groups are in addition to the three (3) groups already established for the UGRB, thus a total of fifty-five (55) groups exist. Each field in Wyoming, as defined by the WOGCC, was then placed into one of the 55 emission factor groups.

In a letter from the AQD dated June 1, 2011, a single oil sample in addition to a single gas sample was required to be collected from every field and formation in Wyoming by every owner of a

then currently producing well. The results of the extended hydrocarbon analyses were then provided to the AQD for use in developing additional storage tank flashing equations. Extended hydrocarbon analyses include the hydrocarbon mole percent for each hydrocarbon between C₁ (methane) and C₁₀₊ (decane +), BTEX (benzene, toluene, ethylbenzene, and xylenes) components, any other components such as nitrogen (N₂), hydrogen sulfide (H₂S), and water (H₂O), the fluid temperatures and pressures when sampled, and the well's field and formation information, along with well location and API number. Based on these analyses, equations were developed to determine uncontrolled and speciated hydrocarbon flashing emissions from storage tanks. In addition to tank flashing emissions, the composite gas analyses are used to determine emissions from pneumatic pumps, pneumatic controllers, well venting and blowdowns, and fugitive sources. The composite gas analyses are also to be used as inputs for determining emissions from glycol dehydration units.

The request for speciated hydrocarbon analyses has been more challenging than originally anticipated by the AQD. Due to an insufficient number of usable analyses, speciated flashing equations have not been developed for every field and formation combination. As more usable analyses are received, the AQD will continue to develop inventory equations for other emission factor groups. Currently equations are developed for only eight (8) of the fifty-five (55) emission factor groups.

Databases – WISE View

In August of 2007 the AQD's Wyoming Inventory System for Emissions (WISE) database was placed into production. The contractor employed by the AQD developed this database using Microsoft SQL Server and the Delphi programming language. Both a desktop client version and a .Net web version of the inventory system were developed. The contractor created SQL Server tables for the AQD to record all data required by EPA in order to submit point source inventories for NEI purposes. Manual data entry is required to enter point source emissions into the WISE database regardless of the facility type. Inventory request letters are generated based on the contact information in the Air Quality Data System (AQDS) permitting and compliance database and not the WISE database. The AQD's NSR permitting group has established the majority of facilities in the WISE database. Any facility not in the WISE database when point source inventory information is received is then created by the inventory staff. After the facility information is entered or updated in the WISE database, the actual emissions data can then be entered. All oil and gas midstream facility emission inventories are entered into the WISE database.

Air emissions from the WISE system can be exported into a pre-NIF file, and then submitted to EPA to meet NEI requirements as was done to meet the 2007 NEI requirements. When EPA amended the air emissions reporting requirements under 40 CFR Part 51, Subpart A in December of 2008, the format for submitting inventory data to EPA was changed to the Consolidated Emissions Reporting (CERS) Extensible Markup Language (XML) format.

To meet this new challenge the WDEQ applied for, and received, an EPA Exchange Network grant. Separated into multiple tasks, the WDEQ awarded a contract to upgrade the WDEQ Exchange Network Node to the latest version of the OpenNode2 open source Node solution compliant with

version 2.1 of the Exchange Network Node specifications. A second contract was awarded to an AQD Contractor to establish two secure data flows from the AQD's WISE database to EPA's newly established Emissions Inventory System (EIS), and develop a new database for storing production and emissions data for oil and gas production sites that was later named OGER. A first data flow pulls facility inventory data from the SQL Server tables in the WISE database, converts it to the required CERS XML format, and submits the information to EPA's EIS to meet NEI requirements. A second data flow pulls actual emissions inventory data from the SQL Server tables from the WISE database using the same process. The first inventory submittals to EPA using the newly established data flow to the EIS was for the calendar year 2008 triennial point source facility and emissions inventories. This system continues to function and was used by the AQD to submit the major source inventories to EPA for calendar years 2009 and 2010, and will be used to submit the 2011 triennial inventory to EPA.

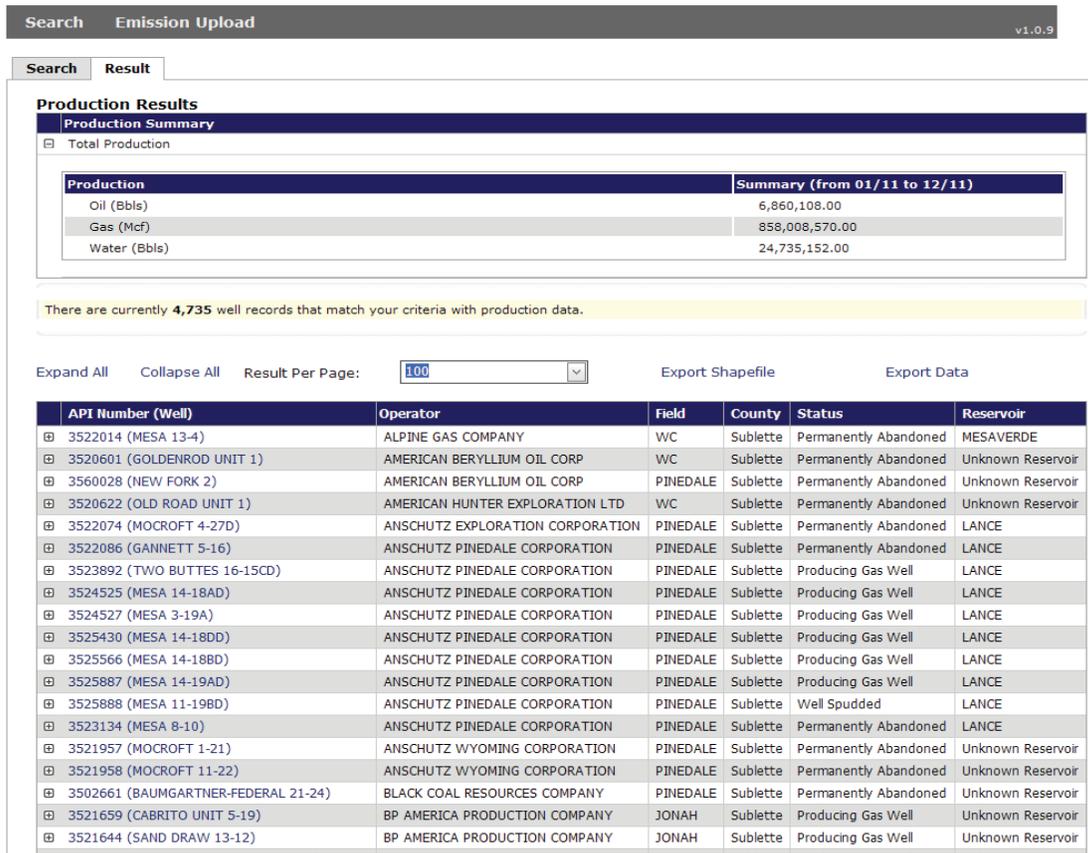
Databases – OGER

When first developed, the WISE system contained more than twenty-five thousand (25,000+) facilities as point sources of which approximately twenty thousand (20,000) were oil or gas production sites. Each time a facility search was done in the WISE database there was an extremely slow response time as the search cycled through all facilities every time. It was determined that if all of the production site point source information was archived and then removed from the WISE database that the system would see a greatly increased response time. With production site inventories no longer being stored in the WISE database, a new and updated system was needed for this specific sector.

A task set before the AQD Contractor in the second contract was to establish a new system for compiling data from production sites. Using existing Web services previously developed by the Wyoming Oil and Gas Conservation Commission (WOGCC), a secure data exchange was established using the WOGCC Web services and the WDEQ OpenNode2, which enables the WOGCC to provide WDEQ with production data updated on a daily basis to the AQD's Oil and Gas Emissions Reporting (OGER) system. A variety of information is provided by the Web services including, but not limited to, well names, locations, production rates, API numbers, and producing formations as shown in Figure 4. Benefits of the OGER system include a more rapid and streamlined process for determining production totals on a well, field, company, or county basis than by utilizing the WOGCC Web site.

Along with storing production information, the OGER system was designed to store actual emissions on a source-by-source and well-by-well basis in accordance with each well's API number. The first release of the OGER system was designed for manual data entry only. This is a very time consuming process due to the number of producing wells in Wyoming. An additional task set before the AQD Contractor in a contract amendment was for the development of a system which would upload inventory data from the facility summary worksheet in the Excel inventory workbooks developed by the AQD staff, into the OGER system as a text file. The system has been designed to store actual emissions based on the type of inventory being collected for the UGRB, either an "annual" inventory or a "wintertime" inventory.

Figure 4. Production Summary from the AQD's OGER Data System.



In addition to developing the emissions inventory upload system for the OGER database, the amended contract with the AQD Contractor included a task to develop a geographic information system (GIS) interface for querying data. Several different oil and gas project boundaries, along with all county boundaries in Wyoming, have been placed on a map, with more detailed information showing up on the map as the user zooms in. Thus the first layer shows only county boundaries, Interstate and U.S. Highways, and rail lines, while zooming in will show the exact locations of oil and gas wells based on latitude and longitude coordinates. Project boundaries include the JPAD area, and the UGRB ozone non-attainment designation area, among others. More project boundaries can be added as needed. Figures 5 show current boundaries in OGER while Figure 6 shows well locations along with the JPAD and UGRB Ozone non-attainment project boundaries.

A final task under the contract amendment with the AQD Contractor was to design a secure data flow from the OGER system to the EIS. To meet NEI reporting requirements, the AQD needed a way to report oil and gas production site emission to EPA. With the inventory data already stored in a single database, the decision was made to develop a nonpoint data flow from the OGER system to the EIS. Total production site emissions for each county in Wyoming are summed, converted to the CERS XML format required by EPA, and then submitted through the WDEQ OpenNode2 to the EIS. The nonpoint format for submitting production data to the EIS was chosen as the OGER system is not designed at this time to track all information needed to meet the minimum system requirements of the EIS to submit emissions on a point source basis such as stack parameters and source classification codes (SCCs), among other requirements.

The AQD currently has a maintenance contract with the AQD Contractor to cover enhancements to the OGER system. A few maintenance items have been found by AQD staff the more the OGER system is used. Currently, the AQD Contractor is modifying the facility summary upload from the Excel inventory workbook to reflect the modifications made to the inventory workbooks for the calendar year 2011 inventory request which included adding PM_{2.5} as a pollutant to track, and including pneumatic controllers as a separate source of emissions. A future modification to the OGER system currently being discussed is the process of populating the inventory Excel workbooks with data from the OGER system prior to requesting oil and gas production operators complete a new inventory. By doing this the AQD could further reduce the burden placed on the industry for completing the annual UGRB inventories.

Databases – IMPACT

The AQD currently has multiple databases in use with three (3) major databases in the main office and at least one main database in use by each of the five (5) AQD compliance districts. This adds up to no fewer than eight (8) distinctly different databases in use by AQD staff on a daily basis. As such, identical data can be entered into multiple databases, which not only leads to a duplication of effort, but can also lead to erroneous data being entered into the databases. The AQD has contracted the work of designing the Environmental Inventory, Monitoring, Permitting And Compliance Tracking (IMPACT) system currently being developed by a different AQD Contractor. IMPACT will eventually combine multiple databases, eliminate legacy systems such as WISE and AQDS, while potentially incorporating other systems such as OGER or the AQD compliance district databases.

Only the first few tasks have been completed which is the beginning of a full facility inventory for submitting facility information to EPA's EIS. Even though the IMPACT system currently only contains a few data elements for each facility (e.g. company and facility names, facility contacts, mailing and physical addresses...) the nearly three thousand major and minor facilities in Wyoming will be imported into the system as a starting point. As legacy systems such as WISE are replaced by the IMPACT system, data flows through the network node can be easily rerouted from the legacy systems like WISE to the IMPACT system. The ultimate goal of the IMPACT system is to replace as many of the legacy systems as possible provided the resources are available for continued development.

The WDEQ is currently developing a Department wide user authentication and electronic signature process (Env-ITE) to allow industry and the public to submit and view certain data stored in various databases within each Division including the AQD. Once the Env-ITE system is operational, the Industry portal for the IMPACT system that has already been tested will be placed into service. This will allow industry staff to upload or modify information within the IMPACT system.

CONCLUSION

For the past eight years the WDEQ-AQD has been requesting air emissions inventories from oil and gas production and midstream operators. Each year the AQD reviews the current inventory format to determine what improvements can be made. Based on data requirements needed by the AQD,

inventory requests to the operators have been modified to meet those requirements. These requirements include the development of a “wintertime” inventory to provide data needed to correspond with detailed ambient monitoring data and for ozone modeling in the UGRB ozone non-attainment area. Inventories have also been modified over the years to ensure all sources of emissions are inventoried and all pollutants are inventoried. Examples of these modifications to the Excel inventory workbook include adding in a pneumatic components worksheet as an emission source in addition to the existing pneumatic pumps worksheet, and including in PM_{2.5} as a pollutant for the 2011 triennial actual emissions inventory request for oil and gas production and midstream operators.

In order to gain an understanding of the different sources of emissions, the AQD’s Emissions Inventory (EI) staff has consulted with others in the development of the oil and gas inventories. One process was to review NSR permits and consult with the AQD’s NSR oil and gas permitting staff to understand the sources at well sites, emissions calculated, and limits set in permits. The EI staff has also taken multiple trips with the AQD’s Inspection staff, and with industry representatives, to help understand the oil and gas production process, and ensure all sources of emissions are being tracked and calculated appropriately.

With inventories becoming more complex each year, the AQD continues to look at ways to reduce the burden placed on the oil and gas operators. One example is the development of the field and formation specific tank flashing equations based on composite hydrocarbon analyses. Future inventory improvements include the completion of the field and formation inventory project, the preloading of facility information into the current Excel inventory workbooks developed by the AQD staff, and the further development of the OGER and IMPACT data systems.

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