



State of Utah

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Lieutenant Governor

Department of
Environmental Quality

L. Scott Baird
Interim Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQP-105-19

August 2, 2019

Laura Bunte
Advanced Program
US Environmental Protection Agency
OAQPS, C304-01
4930 Old Page Road
Durham, North Carolina 27703

RE: Utah Ozone Advance Update

Dear Ms. Bunte:

The State of Utah and the Duchesne and Uintah counties joined the Environmental Protection Agency's (EPA) Ozone Advance Program in June of 2012. To meet the Ozone Advance guidance requirements, the State of Utah is providing a written document summarizing all actions and activities taken since the last annual update was provided July 31, 2018, as required by the ozone advance guidance document.

An area within Duchesne and Uintah counties was officially designated as a marginal nonattainment area for ozone on August 3, 2018. Though it was hoped that some early action, scientific research and increased communication among stakeholders would assist in attainment, the ozone standard was exceeded several days in the winter of 2019. It appears unlikely that the Uinta Basin nonattainment area will achieve attainment by the August 3, 2021, deadline.

It is still the State of Utah's desire to continue to look for opportunities to improve the wintertime ozone issue and to prepare for the potential bump up to a moderate classification, which would then make the Uinta Basin ineligible for the ozone advance program. The following provides a summary of actions taken and the status of activity in the Uinta Basin. We look forward to continued collaboration with the Ute Tribe and EPA to proactively address high levels of ozone in the Uinta Basin.

If you have any questions about Utah's Ozone Advance Program please contact Sheila Vance at (801) 536-4001.

Sincerely,

A handwritten signature in blue ink, appearing to read "Bryce C. Bird". The signature is stylized with a large, sweeping "B" and "C".

Bryce C. Bird
Director

cc: Chris Dresser, US EPA
Mike Natchees, Ute Tribe
Uintah County Commissioners
Duchesne County Commissioners

Utah Ozone Advance Update

I. Introduction

On May 21, 2012, Governor Gary Herbert requested that the Environmental Protection Agency (EPA) enroll Duchesne and Uintah counties in the Ozone Advance Program. On June 4, 2012, EPA formally accepted Utah into the program. On July 2, 2013, the Ute Indian Tribe of the Uintah and Ouray Reservation also requested to enroll in the Ozone Advance Program and was also accepted by EPA. On June 30, 2014, the State of Utah provided a Path Forward Letter to EPA. An update on activities in Uinta Basin (the Basin) was provided to EPA on July 31, 2018. The State of Utah continues to coordinate with the Ute Tribe and EPA and appreciates the opportunity to work in partnership with both parties to improve air quality in the common airshed of the Uinta Basin.

EPA's guidelines for Ozone Advance state that participants should stay in communication periodically throughout their tenure in the program. In addition, each year from the time the Path Forward was sent to EPA, a summary of the status of the area's measure and programs undertaken under Ozone Advance, current air quality, stakeholder meetings/events and other information should be provided to EPA via letter or e-mail. The State of Utah, in conjunction with the Ute Tribe, have continuously taken a proactive approach to understand and potentially reduce ozone levels in the Basin. As the nonattainment designation for the Basin has been classified as marginal, the Basin still qualifies for participation in the Ozone Advance Program. A marginal classification does not require the formal development of a State Implementation Plan (SIP) and as such the Ozone Advance Program will provide a framework to continue the development of potential emission reduction strategies in the Basin and assist in efforts to achieve attainment of the ozone standard.

II. Background

Unexpectedly high ozone levels were measured in the Basin during the middle of the 2010 winter when ozone levels are typically low. This has led to a new area of scientific study in the Basin and similar areas like the Upper Green River Basin in Wyoming. The Basin has continued to experience periods of high ozone levels during wintertime inversions since 2010. The Basin is a rural area and the primary source of emissions is the oil and gas extraction industry.

The jurisdictional issues can be complicated in the Basin with the sources spread out over federal, state, and tribal lands. Each entity has their air agency with jurisdictional control and regulations that can apply in different situations. It is therefore important that these agencies, the Ute Tribe, EPA, and State of Utah, work together and collaboratively to proactively reduce ozone levels in the Basin.

III. Technical Studies

Ozone is typically a summertime pollutant because the chemical reactions that create it are fueled by sunlight. Wintertime ozone is less common and the mechanisms that form ozone during winter months in the Basin are not well understood. When wintertime ozone was first measured in the

Uinta Basin, the State of Utah began working with researchers and other government agencies to determine the extent of the ozone problem, the chemistry that leads to wintertime ozone, and the ozone precursors that are contributing to the problem. This ongoing technical work has been the primary focus of Utah's Ozone Advance Program because a good understanding of how ozone is being formed in the winter is necessary to identify the best strategies to solve the problem.

- Significant research has occurred over the last four winters that has laid the technical groundwork for Utah's ozone strategy. The research has improved the understanding of meteorological conditions in the Basin, the effect of local emissions versus transported emissions, and cold-pool chemistry. The research has indicated that volatile organic compounds (VOC) are the most significant precursor in the Basin; therefore, the emission reduction strategies are currently focused on VOCs.
- In February of 2015, the results of the 2014 wintertime ozone study were released. This study looked at quantifying the contribution of nitrous acid (HONO) and formaldehyde (HCHO) to the chemical reactions responsible for ozone formation. Prior studies in the Basin showed that the radical chemistry that drives ozone production is dominated by HONO and formaldehyde. Key findings were nitrous acid (HONO) does not appear to be a major source of radicals during the winter episodes. Ozone formation at the Horse Pool study site is sensitive to VOC reductions, and these results also suggest that NO_x reductions, either by themselves or in conjunction with VOC reductions, would lead to ozone reductions at Horse Pool. These findings are not sufficiently robust to apply as Basin-wide control strategies, but they provide additional data on possible control options. Formaldehyde and other aldehydes are the dominant radical sources in the Basin. Aromatic VOCs, including toluene and xylene, while less abundant than other VOC species in the Basin, are also particularly important sources of radicals. The recommendations for further study were to compare radical sources in areas where oil production dominates with locations where natural gas production dominates. The 2014 study measurements were focused in an area of natural gas dominance. The emission inventory needs to be improved as there appears to be some biases that need correcting which led to the development of a comprehensive 2014 emission inventory discussed in section IV.
- The Utah Division of Air quality (UDAQ) seeks to maintain the regulatory ozone limits within the basin without impeding continued development. As such, the UDAQ developed a model projecting future-year emission inventories in the oil and gas sector accounting for both growth within the sector as well as production decline due to the natural lifecycle of production wells. Additionally, the model accounted for the impact of regulatory policy development on a year to year basis. Researchers at the University of Utah (U of U) improved upon the model initially developed by the UDAQ by better accounting for variability in decline among wells, as well as producing more accurate month-by-month production estimates. The project utilized a model developed at the U of U using the software R that has proven accurate for the Uinta Basin, as a tool for the UDAQ. UDAQ updated the growth and decline model with updated source data from UDOGM (previously oil and gas well data contained in the model ranged from 1900 through 2015; now the available data extends through 2018). This software has been recently deployed

by the Bureau of Land Management (BLM) and the Western Regional Air Partnership/Western States Air Resources Council (WRAP/WESTAR) for oil and gas projections in the Uinta Basin related to localized and regional modeling.

- Using funds provided by the Utah State Legislature in 2016, UDAQ, TriCounty Health, and the Bingham Research Center at Utah State University Uintah Basin (USU) collaborated on the Storage Tank Emissions Pilot Project (STEPP), using infrared imaging of fugitive organic compound emissions from storage tanks at well pads. Between August and October 2016, approximately 400 natural gas and oil well pads in Duchesne and Uintah Counties were visited, and an infrared imaging camera was used to detect emissions of hydrocarbon gases to the atmosphere from liquid storage tanks on the well pads. Even though these tanks were equipped with emissions controls, the camera was able to detect one or more infrared-visible emission plumes at 39% of the well pads. The emissions control devices are designed to capture hydrocarbon gases before they can be emitted to the atmosphere and either convert them by combustion to carbon dioxide or recover them. Most of the plumes observed were emitted before they reached the control device. Therefore, the problem observed appears to be not so much a failure of the control devices themselves but a failure to adequately deliver escaping gases to the control devices.
- Based upon the results of the above STEPP work, the 2017 Utah Legislature provided funding for the establishment of an *ULend* program in the Basin. This program loans a state-of-the-art infrared (IR) camera to oil and gas operators that will allow them to inspect their equipment for possible fugitive VOC emissions. An IR camera is very expensive piece of equipment that many smaller operators may not be able to afford that is now available to them for no cost to assist in the discovery of VOC leaks early. This identification and then corrective action to fix leaks reduces emissions that can contribute to the formation of ozone in the Basin. *ULend* will provide training in the camera's use to program participants. Operators utilizing the borrowed cameras will be asked to share some simple data: basic facility information, date of site visit, specific leak location, how the leak was addressed, and associated costs with UDAQ. This data will be used solely for research purposes and not compliance actions. This program benefits both operators and UDAQ as early detection of leaks reduces loss of saleable product, eases the burden of costs associated with compliance, and data collected will help target regulations that are effective at reducing VOC emissions without applying undue or unnecessary burden on industry. Since the last ozone update, UDAQ has seen an increase in use of the camera by the industry and USU, who has utilized the camera for research and studies. There has been about a 37% utilization rate of the camera between the industry and USU. Also, a full-time compliance inspector in the Basin, is able to use the camera for inspections when it is not being utilized by others.
- In the winter of 2018, a joint venture with the Ute Tribe, EPA, BLM, and UDAQ utilized the USU Bingham Research Center to manage an aerial survey project. The project was to carry out an aerial infrared camera-based survey of leaks from a large percentage of the oil and gas facilities in the Basin. Oil and gas operators were engaged in the project and supplied information on any potential leaks identified via the aerial survey. The USU conducted a ground survey with an infrared camera on sites where the aerial survey was

conducted to provide a comparison in results to the aerial survey. A final report was released in November of 2018. Some conclusions from the study included:

- Cold temperatures lead to poor contrast between emission plumes and the ground, reducing the detectable emission rate of infrared optical gas imaging cameras used from an aerial platform.
- Ground-based infrared camera surveys can detect much smaller emissions than aerial surveys.
- Well pads with detected emissions during the ground and aerial had higher oil and gas production, were younger, were more likely to be oil wells (aerial survey only) and had more liquid storage tanks per pad relative to the entire surveyed population.
- The majority of observed emission plumes were from liquid storage tanks (76% of all observed plumes), including emissions from pressure relief devices like pressure relief valves and thief hatches on the tank or from piping that connects to the tanks.
- Well pads with control devices (combustors or vapor recovery units) to reduce emissions from tanks were more likely to have detected emissions, had more detected emissions per pad and were more likely to have emission plumes that were qualitatively categorized as large.
- A composition study was conducted in the Basin in the Fall/Winter of 2018-19. As research has shown that control of VOCs is most effective in reducing ozone creation, it is important to identify the specific species that make up the VOC emissions. Speciated data improves the ability to estimate emissions in the Basin both for permitting and inventory purposes. Additionally, the data can improve the accuracy of the chemistry used in the photochemical model UDAQ relies on to identify and test control strategies. UDAQ collected raw gas and pressurized liquid samples from 78 wells across the Uinta Basin that are representative of the major geological formations within the Basin. Specific analyses included the composition of the pressurized liquid and raw gas samples (C1 to C10 and BTEX), simulation of flash gas using VMG software (C1 to C10, BTEX and Gas-Oil Ratio), Reid vapor pressure and API gravity. The samples were collected and analyzed by a third-party contractor, Alliance Source Testing (AST). A modified flash gas analysis was developed and compared to VMG simulations for 5 of the 78 wells, serving as a validation exercise to the modeled composition. Staff from the USU accompanied AST on this effort and collected 10 pressurized liquid samples to analyze the gas evolved from the samples for concentrations of a suite of carbonyls. Additionally, USU compared leak rates estimated by the software program purchased as part of the *ULend* program with their custom-built high flow emissions measurement system. They used the *ULend* infrared camera to detect any organic emissions from equipment at the well site, then used both the UDAQ purchased software and the USU high flow system to estimate rate of emissions. USU would perform the emission estimate study at all 78 well sites sampled by AST.

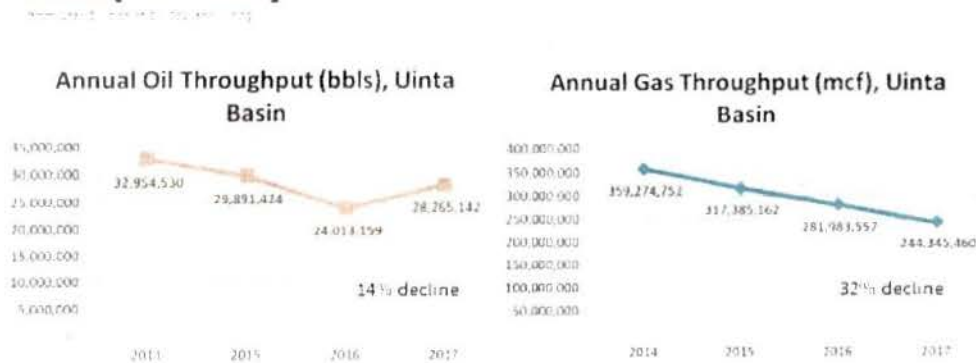
IV. Emission Inventory

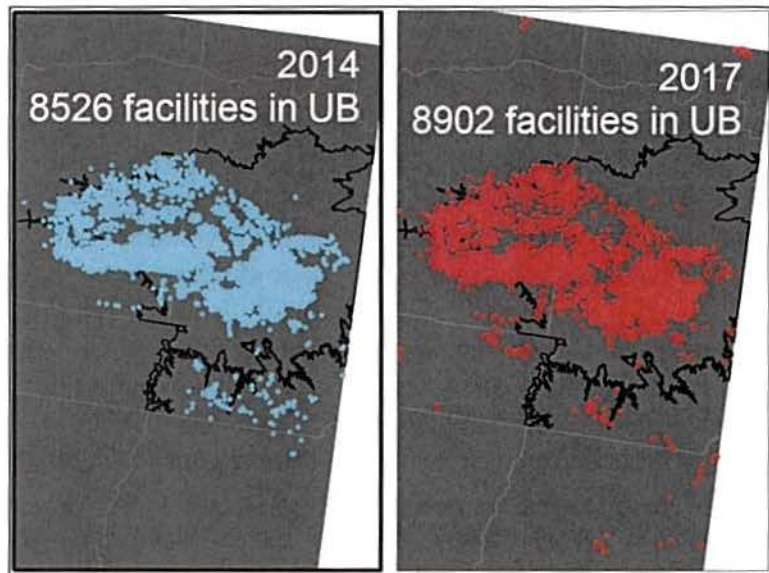
As the wintertime ozone studies were developed and executed, it was determined that there was a need to develop a comprehensive and detailed oil and gas emission inventory. For almost a decade, the 2006 WRAP Phase III oil and gas emissions inventories were relied on for the Basin, the main oil and gas producing region in Utah. Although these inventories were projected forward using up-to-date annual production and drilling activity data from the region, the inventories still lacked the ability to capture the technological advancements that occurred over the period.

In 2013, UDAQ started working to develop an up-to-date and improved oil and gas emissions inventory for the Basin. This process involved the cooperation of various stakeholders, including operators from the Uinta Basin, Western Energy Alliance (WEA), EPA, BLM, and the Ute Tribe. In 2015, an emissions inventory workbook and request for completion was sent to each operator in the Uinta Basin active in 2014. In 2016, the data was compiled into a 2014 Uinta Basin oil and gas emissions inventory database. In addition to the collected inventory, UDAQ worked to determine and collect supplemental data needed to create a truly comprehensive 2014 inventory, including additional equipment categories not addressed through the workbook request.

For 2017, UDAQ was able to collect the data in accordance with a new state inventory rule, R307-150-9, that addresses oil and gas sources within the entire state, not just the Basin. Lessons learned from developing the 2014 oil and gas inventory were incorporated into the workbook for 2017 to further enhance the accuracy and completeness of the 2019 inventory. Again, the inventory for the Basin was coordinated with the Ute Tribe and EPA, so the inventory was able to reflect oil and gas emission sources on both Indian lands and State lands. The inventory has been submitted to EPA as part of the 2017 National Emission Inventory requirement; however, some refinements may continue to be made. The current inventory indicates a slight increase in VOC emissions and slight decrease in NO_x even with a decline production. The following charts summarize some initial findings from the 2017 oil and gas emission inventory and analysis is still on-going.

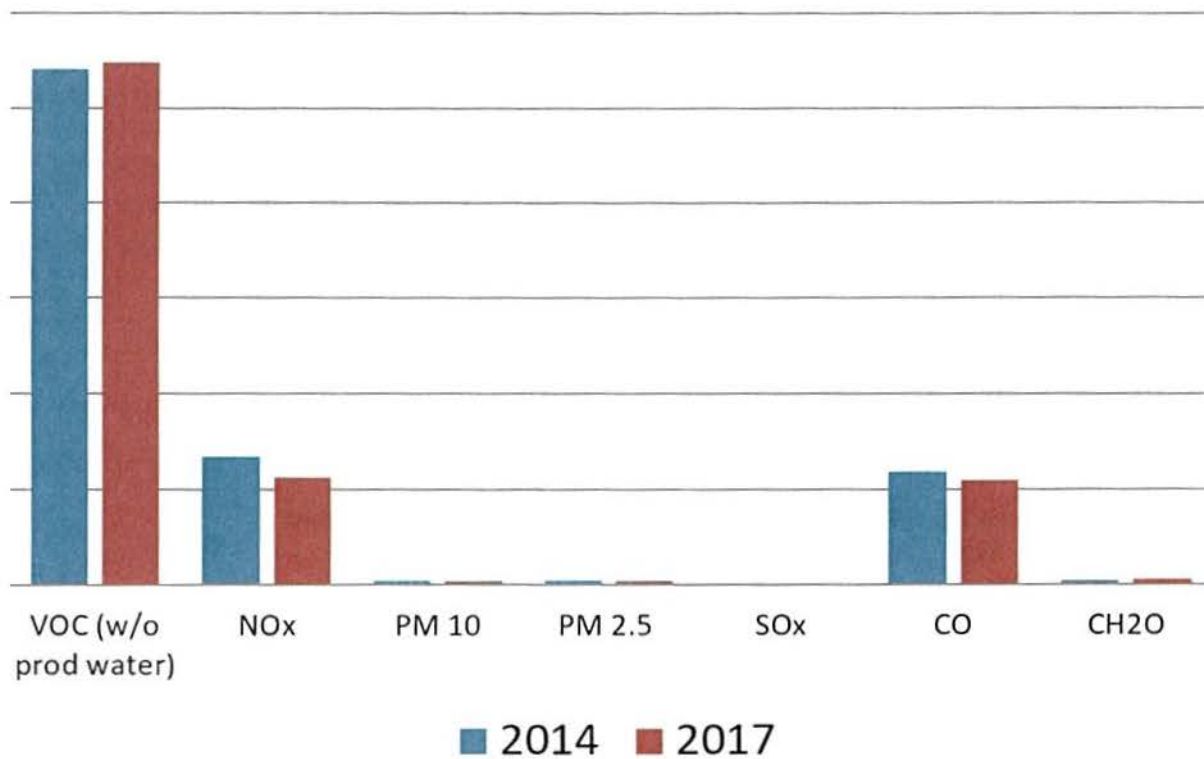
Production Decline in Uinta Basin: 2014 to 2017

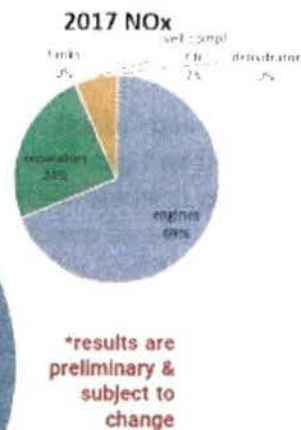
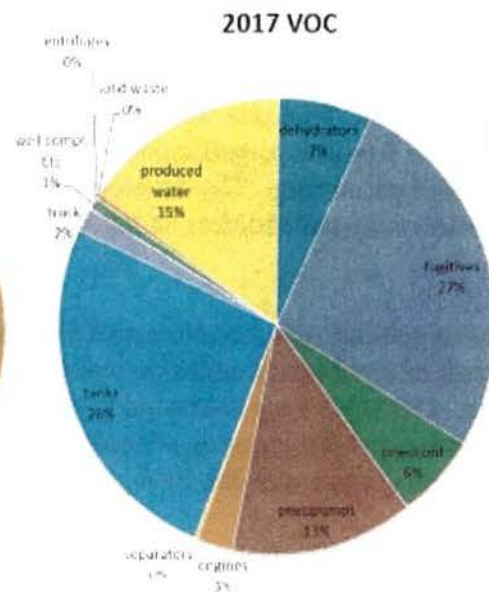
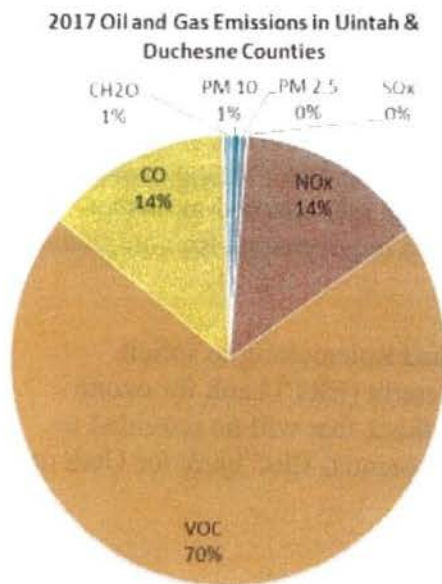
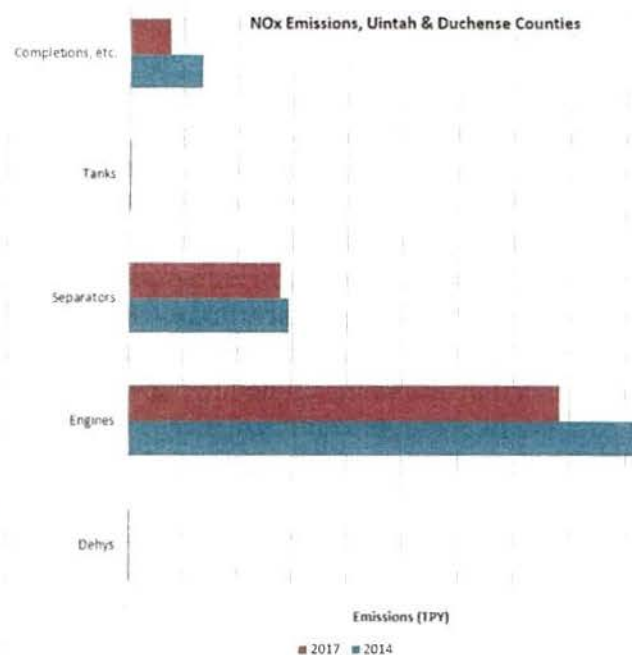
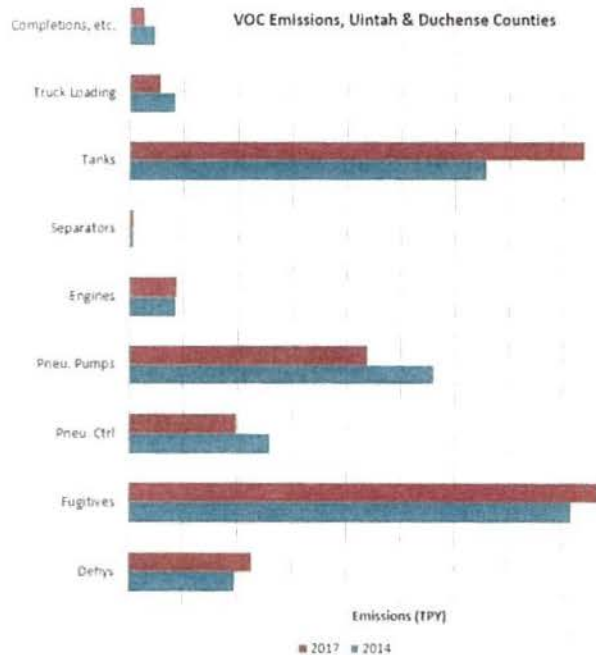




Uintah & Duchesne Counties' Emissions (TPY)

Produced Water/Solid Waste Emissions REMOVED





The 2017 inventory will most likely represent the baseline inventory required by the 2018 designation of the Uinta Basin as an ozone nonattainment area. Therefore, ensuring that this inventory is as complete as possible is very important as the state, Ute Tribe, and EPA begin planning efforts to achieve attainment. DAQ will be reaching out to stakeholders to obtain their input and suggestions to help ensure completeness of the emissions inventory.

V. New Federal and State Control Measures

The Utah Air Quality Board adopted amendments to three existing rules and six new rules to support facilitated permitting and increased information requirements for oil and gas sources located on State lands. The rules were proposed in September of 2017, and were adopted in January of 2018. The rules were developed to improve the permitting, compliance, and emission inventory processes for oil and gas sources. The rules were intended to increase efficiency while ensuring that air requirements are being met statewide. Included in the rule changes was a shift to a 'permit-by-rule' (PBR) approach for oil and gas well sites in lieu of issuing individual permits. These new rules incorporated the current Best Available Control Technology (BACT) requirements that are being applied to New Source Review (NSR) permits. BACT is required in both attainment and nonattainment areas. To be consistent with current permitting requirements, the PBR will apply statewide.

In the period since the last ozone advance update, the registration requirement for the new oil and gas rules have been fully implemented and the registration requirement deadline has passed. Generally, there has been a positive response to the registration process in lieu of minor source permitting. UDAQ is continuing to do outreach to oil and gas producers to encourage registration and has also updated the process of registration to be more user friendly. This has allowed UDAQ's compliance branch to perform more inspections as they have now broadened their inspection schedule to include all oil and gas sites and not just those with permits.

The UDAQ also added a rule to the Utah oil and gas rule series to control the flaring of associated gas from oil and gas well production. This rule was developed at the request of oil and gas operators as it would allow some facilities to participate in the permit-by-rule and registration approach in lieu of minor source permitting. The development of this rule resulted in further communication and cooperation with stakeholders and also clarified requirements for compliance inspectors.

EPA has taken the initiative to publish Advance Notice of Proposed Rulemaking to solicit feedback on the establishment of a voluntary emission reduction credit (ERC) bank for ozone precursors, VOCs, and NO_x. UDAQ is very interested in the feedback that will be provided to EPA and will utilize that information for planning purposes for a potential ERC bank for Utah or the possibility of a combined ERC bank with the EPA.

VI. Air Monitoring and Public Notification

UDAQ operates several monitors in the Basin, and real time data are available to the public. UDAQ has also developed a smartphone app to provide real-time monitoring information to the public. Additionally, UDAQ has worked with the Ute Tribe and now includes tribal monitors in the Basin on the UDAQ website and the smart phone app. Therefore, forecasting and trending of monitoring data are available for the public to plan their activities to minimize the potential impacts from and to air pollution.

In 2017, the USU Bingham Research Center partnered with UDAQ to provide email alerts when ozone exceeding EPA standards is forecast for the Uinta Basin. The purpose of these alerts is to

provide the oil and gas industry with real-time information about air quality in the Basin so they can act to reduce emissions of ozone-forming pollutants. Any interested party can sign up on the USU Bingham Research Center webpage and they will receive the following alerts:

- two days in advance of when moderate air quality is forecast (unless there is no snow on the ground, or unless you opt to only receive email if exceedance days are forecast),
- two days in advance of when ozone exceedance days are forecast (unless there is no snow on the ground), and
- when an inversion episode ends (or if one was forecast but did not materialize).

This alert system was utilized extensively during the winter of 2019 as there were several high ozone events in the Basin this past winter. Currently there is not a method to quantify any potential reductions in emissions or effect on ozone values measured. This alert system in coordination with UDAQ's issuance of unhealthy air days warnings via the phone app and website, operators can take actions to reduce ozone precursor emissions and residents are aware of potential unhealthy air and take precautions as needed.

VII. Future Emission Reduction Strategies

The Basin was designated as a marginal nonattainment area effective August 3, 2018. In the first year of nonattainment designation, the basic requirements required are that general conformity applies (not enough population for transportation conformity) and that an emissions inventory is collected along with an emissions statement. General conformity is applicable to federal government projects, so it does not apply to UDAQ. The emissions inventory requirement is met by the oil and gas emissions inventory collected as discussed in section IV and existing emissions statements meet the requirement. The Basin will now be required to permit major sources under the nonattainment new source review requirements within 36 months from designation. Offsets for VOCs and NO_x will be required for new or modified major sources at a ratio of 1.1 to 1. Development of nonattainment new source review will be a main focus in the upcoming year for UDAQ.

The inventory continues to be a major focus of UDAQ. Though it has been essentially completed, the importance of ensuring its accuracy and completeness is vital for future planning and rule-making. Because the winter of 2019 saw very high levels of ozone, it is likely that the Basin will see a redesignation to a moderate classification. Thus, 2017 will serve as the baseline year and will probably be the starting point for the additional regulatory requirements of a moderate nonattainment area. UDAQ will be sharing the details of the emissions inventory with stakeholders to receive feedback on the current inventory and on what may be missing. The inventory will most likely drive any future regulatory action.

With the now consistent funding from the Utah State Legislature for air quality research, UDAQ can now better plan for potential research in the Basin. Two projects were chosen to fund this year, both designed to prepare UDAQ for improved ozone modeling in the near future. The first project will implement updated land use data for the Uinta Basin into the weather research and forecasting model; this will improve the simulated meteorology in the photochemical model for ozone. The second project includes a Basin-wide monitoring campaign for carbonyls,

formaldehyde, a suite of VOCs, etc., testing of several low-cost air monitors that could be deployed in the Basin, and several photochemical model runs using data from the previously mentioned monitoring campaign and UDAQ's new speciation profiles from the Uinta Basin Composition Study. These two projects will continue to expand our understanding of ozone formation in the Uinta Basin.

As the design value for the Basin has actually increased in value, the UDAQ is actively searching for actions to take. The first steps will be:

- reviewing the 2017 emission inventory and focusing on the emission sources that, with potential controls, will have the most impact on reducing ozone formation,
- understanding the results of the composition study discussed in Section III and how UDAQ can potentially better estimate emissions based upon the sample results,
- researching what regulations other states with oil and gas emission sources have in place,
- beginning a stakeholder process, both internal and external to UDAQ, to elicit feedback on potential control technologies or other regulatory action to reduce emissions of ozone precursors, and
- working on a potential ERC bank that can include minor sources as they are the majority of sources in the Basin.

VIII. Stakeholder Involvement

EPA's Ozone Advance Guidance highlights the importance of stakeholder involvement in the development of emission reduction strategies. This is consistent with Utah's long-standing process to encourage stakeholder input when developing rules and state implementation plans. This continued with the development of the associated gas flaring rule that was developed and adopted.

As the Basin has a fairly complex jurisdictional make up that can complicate air pollution regulation, it is vital that the Ute Tribe, EPA, and state air agencies are in communication and work together on solutions for the current ozone exceedances that are occurring in the Basin. The UDAQ has regularly met with the Ute Indian Tribe's Air Quality Division however these meetings have stopped due to other interactions between the State and Tribe that do not involve air quality that have required these meetings to no longer occur. Regular communication with Region VIII EPA however ensures information gathered through scientific studies, permitting of sources and compliance inspections are shared with them and ultimately the Ute Tribe. The ability to move the Uinta Basin back into attainment of the ozone standard will require the shared resources of these agencies and similar regulatory approaches for the reduction of emissions.

This past year saw the development of the Uinta Basin Ozone working group. This group was formed to provide a collaborative forum to help facilitate attainment of the ozone standard in the Basin. The group includes representation from local Basin government, the UDAQ, EPA, the Ute Tribe, USU, industry, environmental advocates, and other experts. This group has provided a valuable platform to present regulatory information, research study results, explore voluntary

actions during ozone events, and open lines of communication for exchange of ideas and thoughts. This will be a valuable outreach tool for upcoming requirements and actions.

Additionally, the UDAQ regularly attends the Division of Oil, Gas and Mining's quarterly collaborative meetings which are held in Duchesne. These meetings allow the UDAQ to formally present information on current air quality issues and concerns as well as have informal interactions with members of the oil and gas industry, local citizens, local government officials, and local elected officials.