Task 1. 2011 CMAQ Modeling

Objective: To develop and evaluate a CMAQ modeling platform for the 3SAQS.

Description: We will supplement the 3SAQS CAMx 2011 version A (3SAQS_CAMx_2011a) modeling platform with a CMAQ modeling platform (3SAQS_CMAQ_2011a). We will create CMAQ version 5.0.2-ready inputs from the same source data used to create the CAMx inputs. Details of the data collection and processing tasks include:

- Initial/Boundary Conditions (ICBC) - We will generate the CMAQ ICBC inputs using the same MOZART data and software used to generate the 3SAQS 2011 CAMx input files. The only difference will be in the final format conversion step of processing these data; for this task we will output the ICBC data in CMAQ-format.
- Meteorology – CMAQ-ready 2011 meteorology data are currently available. UNC has already processed the 3SAQS 2011 WRF data through MCIP
- Emissions – Similar to the ICBC data, we will make a slight change to the final SMOKE processing step for the 3SAQS 2011 emissions to output the data in CMAQ-ready format. Some of the sectors, such as biogenics, will need to be run through a CAMx-to-CMAQ post processing tool. Rather than convert all of the CAMx natural emissions data to CMAQ-ready format, we will prepare the land use data required for estimating CMAQ in-line lightning, seasalt, and windblown dust emissions.

We will use CMAQ to conduct an annual air quality simulation for 2011 on all three 3SAQS 36/12/4 km nested modeling domains. We will use AMET to conduct a model performance evaluation of the CMAQ results, focusing on monitors in the three-state region. In addition to the model-to-observations comparisons, we will use AMET to compare the 3SAQS 2011 CAMx and CMAQ results.

Following completion of the model performance evaluation and comparison, we will develop a guidance document describing when and how to use CAMx and CMAQ. This guidance will describe when it is preferable to have an ensemble simulation that uses both models, when one model may be preferable over the other, and how to select the model input data and configuration. The intent of this guidance will be to help the 3SAQS cooperators select the best decision support tool to use for different applications, particularly NEPA modeling studies.

Deliverables:

- 3SAQS CMAQ version 5.0.2 2011 modeling platform, including all data, codes, and scripts, loaded onto the 3-State Data Warehouse

- Annual 2011 CMAQ modeling on the 3SAQS 36/12/4-km modeling domains; final simulation results loaded on the 3-State Data Warehouse
- CMAQ Model Performance Evaluation (MPE) and CAMx comparison report
- 3SAQS air quality modeling guidance document describing when and how to use CAMx and CMAQ

Schedule: This work would be performed during October and November 2014.

Task 2. 2011 Source Apportionment Modeling

Objective: To quantify emissions source/receptor relationships in the three-state region, particularly for oil and gas emissions

Description: We will apply the same types of source apportionment configuration used for the West-wide Jump-start Air Quality Modeling Study (WestJumpAQMS) using the 3SAQS 2011 modeling platform. These source apportionment simulations could use both the ozone (APCA) and PM (PSAT) source apportionment tools. The types of runs we envision include:

- Subtask 2a (SA Guidance Document) – CAMx source apportionment (SA) design document to provide guidance, including how we'll do these runs and coordinate SA modeling between 3SAQS cooperators.
- Subtask 2b (Geographic SA) – CAMx 2011 36/12 km state-specific geographic SA to obtain upwind state contributions to downwind state ozone and PM2.5 concentrations and visibility and deposition. Post-processing of these results can define state contributions to visibility and deposition at Class I and other sensitive areas and potential contributions to ozone and PM2.5 nonattainment under alternative NAAQS using a CSAPR-type analysis.
- Subtask 2c (Emissions Sector SA) – CAMx 2011 36/21/4 km source category-specific SA to obtain source category contributions to ozone and PM2.5 concentrations and visibility and deposition.
- Subtask 2d (Detailed 4-km SA) – CAMx 4 km detailed source regions and category source apportionment modeling. Focus on 4 km 3SAQS domain and obtain ozone and PM2.5 contributions by Basin and details by source categories.
- Subtask 2e (SA Web Tool) – Source Apportionment web tool to allow dynamic analysis of result via a 3SDW web client. Develop data formats to allow analysis of SA results via spreadsheet and 3SDW online tool.
- Subtask 2f (Additional SA Modeling) – Additional SA modeling TBD. A placeholder subtask to address any additional SA simulations for particular issues brought up by the 3SAQS technical team.

The SA results would be loaded into the 3SDW website source apportionment visualization tools as they became available.

Deliverables:

- Source apportionment design document
- Source apportionment results available through visualization tools on the 3SDW website.
- Report documenting the source apportionment modeling results and examples on how to use the source apportionment visualization tools.

Schedule: The work would begin in October 2014 and each subtask would require three months to complete overlapping by two months (i.e., October 2014 – April 2015).

Task 3. 2011 Air Quality Model Performance Improvements

Objective: To use air quality modeling sensitivities to identify and improve areas of poor model performance

Description: We will conduct up to five modeling sensitivity simulations that focus on discrete episodes (< 2 weeks) and locations where the air quality modeling performance was particularly poor in the 3SAQS base 2011 version A simulations. Potential modeling sensitivity focus areas include:

- Subtask 3a (Oil and Gas Emissions) – conduct targeted analysis of model performance for ozone, NOx, VOCs, and primary PM species in oil and gas source regions. Design 2-3 emission sensitivity simulations to address areas of weakness. Increase/decrease relevant emissions species to match the observations
- Subtask 3b (Vertical Transport/mixing) – poor model performance can arise from improper mixing of pollutants between the aloft and surface model layers. Use process analysis integrated process rates to identify a period in which model performance is degraded by vertical advection processes and explore alternative transport schemes/configurations.
- Subtask 3c (Boundary Conditions) – the source apportionment modeling in Task 2 will identify receptor areas and time periods that are strongly influenced by in-flow through the boundary of the outer modeling domain. Identify 2-3 modeling episodes in the spring/summer with high positive biases for PM and/or ozone that were driven by BCs and explore options to reduce these biases. Options for improving model performance issues related to the BCs include scaling the concentrations along the western boundary up or down to match observations, running MOZART in-house using year 2010 Representative Concentration Pathway (RCP) global inventories and evaluating the results prior to using these as inputs to the regional models, or changing from the MOZART to GEOS-Chem model for generating BCs

- Subtask 3d (Winter Ozone Formation) – combine emissions sensitivities for NOx and Total Organic Gases (including methane) with a vertical diffusivity ceiling to limit mixing in regions with significant snow cover
- Subtask 3e (Ammonia) – emissions sensitivity potentially including temporal distribution and mass emissions rates.
- Subtask 3f (Additional Sensitivity Modeling) – Additional sensitivity tests based on what is learned in the model performance evaluation and what is needed to improve model performance.
- Subtask 3g (Integrated Sensitivity) – Integrated sensitivity simulation that combines multiple model/data improvements

Deliverables:

- Memo describing the sensitivity modeling, including an integrated sensitivity, with recommendations for improving the 3SAQS 2011 version B air quality modeling platform.
- Updated/new input data sets and/or model configuration options to improve 3SAQS air quality model performance

Schedule: October 2014 through March 2015.

Task 4. 2011 Deposition and Visibility Analyses

Objective: To provide a more detailed assessment of the 2011 platform visibility and depositions modeling results.

Description: We would analyze the 2011 CAMx and CMAQ visibility and deposition modeling results in more detail. This would include visibility and deposition model performance evaluation using both observed visibility based reconstructed mass, direct visibility measurements (e.g., nephelometer), and wet and dry deposition observations. The treatment of CAMx and CMAQ deposition would be analyzed, including the aqueous chemistry treatment in the two models. How the models treat liquid-phase chemistry, particularly within falling raindrops, may partly explain the differences in the model and observed differences in the split between wet ammonia and ammonium depositions.

Deliverables:

- Document describing the analysis of the CMAQ and CAMx 2011 visibility and deposition modeling results and how that will improve the application to 2014.

Schedule: Work would start in December 2014 after the 2011 CMAQ run and end in March 2015.

Task 5. 2014 Data Analysis and Modeling Plan

Objective: To describe how the 2014 data and modeling results will be analyzed.

Description: A Modeling Protocol would be prepared describing how the 2014 modeling platform will be developed, including the analysis of the 2014 data and procedures for analyzing the 2014 modeling results. A "Lessons Learned" document would also be prepared describing what has been learned from the 2008 and 2011 modeling and how these lessons would be included in the 2014 Modeling Protocol.

Deliverables:

- 2014 modeling protocol version 1
- Documentation of lessons learned from 2008 and 2011 3SAQS WRF/SMOKE/CAMx modeling

Schedule: January-February 2015.

Task 6. 2014 WRF Modeling and Evaluation

Objective: To develop and evaluate a 3SAQS 2014 WRF modeling platform

Description: We will use WRF with ICBC data for 2014 to generate annual 2014 meteorology on the 36/12/4-km 3SAQS modeling domains. This simulation will use two different configurations: (1) a wintertime configuration (January – March, December) will be based on the results found under Task 8 and will optimize the model performance in the 4-km domain for winter ozone modeling; (2) a non-winter configuration (April – December) will use the same WRF configuration as the 3SAQS 2011 WRF runs to simulate meteorology outside of the winter months.

Figure 1 shows the proposed 2014 WRF modeling domain. Tables 1 and 2 show the proposed non-winter physics options and vertical layer structure, respectively. The draft winter physics configuration is presented under Task 8.

We will conduct a full model performance evaluation on the 2014 WRF modeling runs with a focus on sites in the three-state region. The standard MPE metrics for surface temperature, winds, and mixing ratio will be augmented with performance metrics for precipitation, clouds, snow cover, vertical winds, vertical temperatures, and mixing height. We will prepare an MPE report and present the result to the 3SAQS cooperators.

Deliverables:

- 3SAQS WRF 2014 modeling platform, including all data, codes, and scripts, loaded onto the 3-State Data Warehouse

- Annual 2014 WRF modeling on the 3SAQS 36/12/4-km modeling domains; final simulation results loaded on the 3-State Data Warehouse
- WRF Model Performance Evaluation (MPE) report

Schedule: March – May 2015.

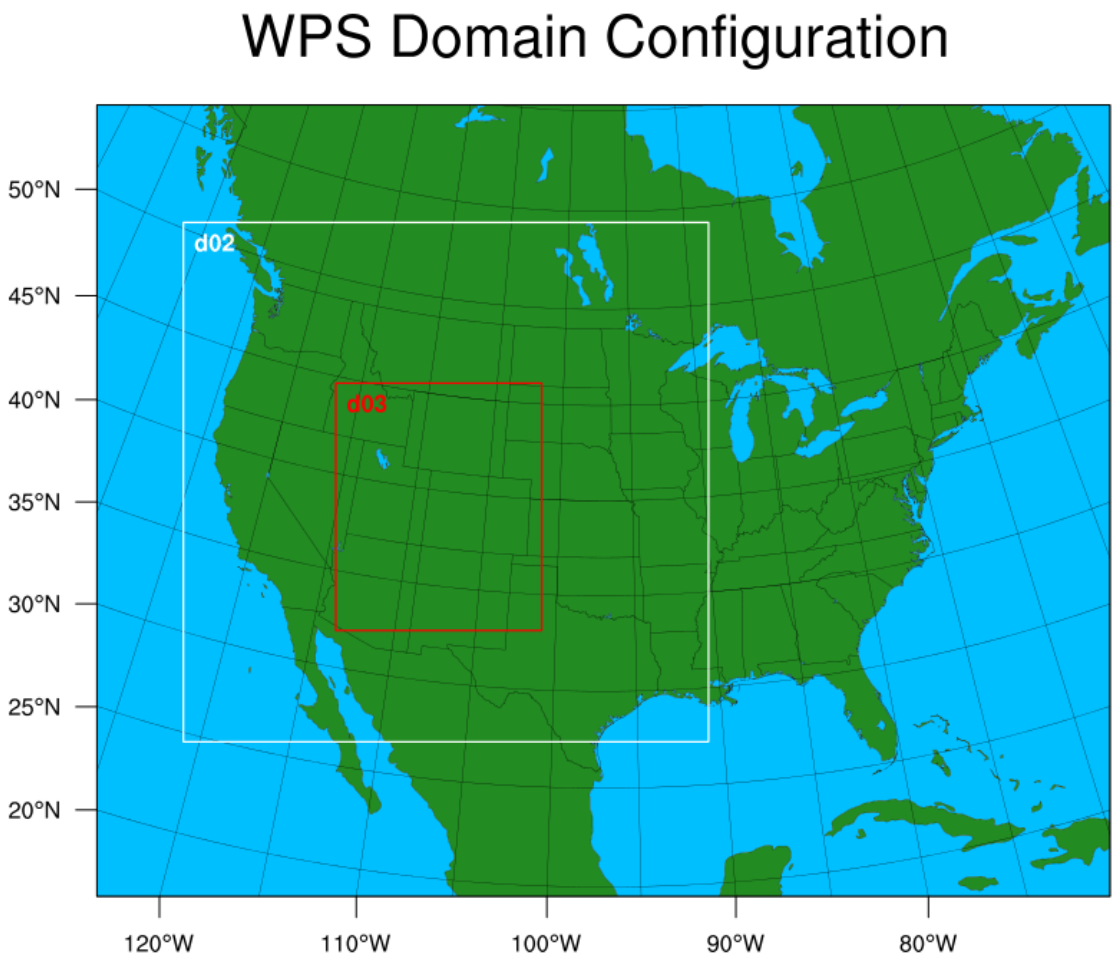

Figure 1. 3SAQS 2014 WRF modeling domains

Table 1. 3SAQS 2014 WRF physics options

WRF Treatment	Option Selected	Notes
Microphysics	Thompson	A scheme with ice, snow, and graupel processes suitable for high-resolution simulations.
Longwave Radiation	RRTMG	Rapid Radiative Transfer Model for GCMs includes random cloud overlap and improved efficiency over RRTM.
Shortwave Radiation	RRTMG	Same as above, but for shortwave radiation.
Land Surface Model (LSM)	NOAH	Two-layer scheme with vegetation and sub-grid tiling.
Planetary Boundary Layer (PBL) scheme	YSU	Yonsie University (Korea) Asymmetric Convective Model with non-local upward mixing and local downward mixing.
Cumulus parameterization	Kain-Fritsch in the 36 km and 12 km domains. None in the 4 km domain.	4 km can explicitly simulate cumulus convection so parameterization not needed.
Analysis nudging	Nudging applied to winds, temperature and moisture in the 36 km and 12 km domains	Temperature and moisture nudged above PBL only
Observation Nudging	Nudging applied to surface wind and temperature only in the 4 km domain	moisture observation nudging produces excessive rainfall
Initialization Dataset	12 km North American Model (NAM)	

Table 2. Vertical layer structure for the 3SAQS 2014 WRF simulation

WRF Meteorological Model				
WRF Layer	Sigma	Pressure (mb)	Height (m)	Thickness (m)
37	0.0000	50.00	19260	2055
36	0.0270	75.65	17205	1850
35	0.0600	107.00	15355	1725
34	0.1000	145.00	13630	1701
33	0.1500	192.50	11930	1389
32	0.2000	240.00	10541	1181
31	0.2500	287.50	9360	1032
30	0.3000	335.00	8328	920
29	0.3500	382.50	7408	832
28	0.4000	430.00	6576	760
27	0.4500	477.50	5816	701
26	0.5000	525.00	5115	652
25	0.5500	572.50	4463	609
24	0.6000	620.00	3854	461
23	0.6400	658.00	3393	440
22	0.6800	696.00	2954	421
21	0.7200	734.00	2533	403
20	0.7600	772.00	2130	388
19	0.8000	810.00	1742	373
18	0.8400	848.00	1369	271
17	0.8700	876.50	1098	177
16	0.8900	895.50	921	174
15	0.9100	914.50	747	171
14	0.9300	933.50	577	84
13	0.9400	943.00	492	84
12	0.9500	952.50	409	83
11	0.9600	962.00	326	82
10	0.9700	971.50	243	82
9	0.9800	981.00	162	41
8	0.9850	985.75	121	24
7	0.9880	988.60	97	24
6	0.9910	991.45	72	16
5	0.9930	993.35	56	16
4	0.9950	995.25	40	16
3	0.9970	997.15	24	12
2	0.9985	998.58	12	12
1	1.0000	1000	0	

Task 7. 2014 Emissions Platform Development and Testing

Objective: To develop a preliminary 3SAQS 2014 emission modeling platform

Description: We will start this task by preparing a 2014 emission inventory development plan for review by the 3SAQS cooperators. This plan will detail an approach for developing year 2014 emission inputs by the spring of 2015. It will also include a plan for 2014 emissions beyond the preliminary platform, including the integration of the NEI 2014, 2014 oil and gas inventories, and other emissions improvements. The initial 2014 platform will likely use the latest version of the 2011 NEI for most of the anthropogenic sources. We will supplement the NEI 2011 with the following datasets to create 2014 emissions:

- O&G – Use Task 10 preliminary 2014 O&G emissions
- MOVES - use 2014 meteorology data developed under Task 6 and fleet information collected from Colorado, Utah, and Wyoming to run MOVES in emission factor mode for 2014.
- EGUs and large point sources - collect year 2014 Continuous Emission Monitor (CEM) data from CAMD for large point sources
- Biogenic – run MEGAN with 2014 meteorology
- Agricultural ammonia – collect 2014 CAFO locations, animal population data, and county emissions factors from the states and run the Carnegie Mellon University NH3 model
- Agricultural methane – add methane emissions factors to the CMU NH3 model to estimate methane from animal waste and enteric fermentation
- Dust – Review available approaches and select one for generating windblown dust emissions.
- Fires – Use best available source at time of modeling (e.g., FINN, Bluesky, etc.).

We will process the 3SAQS preliminary 2014 emissions through SMOKE (3SAQS_SMOKE_2014prelim) for the 3SAQS 36 and 12 km domains and create reports for comparing the data to the 2008 and 2011 3SAQS emissions platforms.

Deliverables:

- 3SAQS SMOKE 2014 modeling platform, including all data, codes, and scripts, loaded onto the 3-State Data Warehouse
- Annual 2014 SMOKE modeling on the 3SAQS 36/12 modeling domains; final simulation results loaded on the 3-State Data Warehouse
- 3SAQS emission trends report comparing 2008, 2011, and 2014 emissions data
- Memo describing the lessons learned in building the final 2011 and preliminary 2014 emissions modeling platforms and the next steps for future 2014 emissions data and modeling

Schedule: March through June 2015.

Task 8. Preliminary 2014 Air Quality Modeling

Objective: To perform a preliminary 3SAQS 2014 photochemical grid model simulation and model performance evaluation

Description: We will use the preliminary 2014 emissions developed under Task 7, the meteorology data developed under Task 6, and potential model improvements gleaned from Task 3 to create a preliminary 2014 air quality modeling platform for the 3SAQS. The intent of this simulation is to develop and evaluate an initial air quality modeling configuration using both CAMx and CMAQ. We will conduct an annual 2014 simulation on the 3SAQS 36 and 12-km modeling grids using both models and evaluate the results against available observations.

We will use AMET to conduct a model performance evaluation of the modeling results, focusing on monitors in the three-state region. . Our focus will be on the model performance for ozone, primary and secondary PM, visibility, and deposition. In addition to the model-to-observations comparisons, we will use AMET to compare the 3SAQS 2014 CAMx and CMAQ results.

Following completion of the model performance evaluation and comparison, we will develop a trends report for 2008, 2011, and 2014. The report will compare observed air quality trends in the three-state region and the evolution of model performance through the triennial simulations conducted for the 3SAQS.

Deliverables:

- 3SAQS CAMx and CMAQ preliminary 2014 modeling platforms, including all data, codes, and scripts, loaded onto the 3-State Data Warehouse
- Annual 2014 CAMx and CMAQ modeling on the 3SAQS preliminary 36/12-km modeling domains; final simulation results loaded on the 3-State Data Warehouse
- 3SAQS air quality trends report comparing modeled 2008, 2011, and 2014 ozone, PM, visibility and deposition trends in the three-state region

Schedule: May through July 2015.

Task 9. WRF Winter Ozone Modeling Platform

Objective: To develop an operational winter modeling configuration for WRF that optimizes model performance for winter ozone events across the three-state region.

Description: The University of Utah (U of U) and the Utah Department of Air Quality have developed a WRF modeling configuration to improve model performance in

simulating cold air pooling in the Uintah Basin. While the configuration has shown promising results for reproducing the dynamical and radiative drivers of particular high ozone events, it has not been tested outside of a few limited time periods in the Uintah Basin.

- Subtask 9a (Prepare WRF wintertime model) – We will adapt this configuration into an operational wintertime WRF modeling platform and conduct detailed model performance evaluation for high ozone events in other time periods/locations in the three-state region. The details of the prototype operational 3SAQS wintertime WRF configuration are shown in Table 3. This configuration differs from the U of U WRF runs in that it's using interpolated snow cover and snow depth rather than idealized values based on local observations. The idealized snow values used in the U of U configuration do not lend to operational WRF runs as they use local observations of snow parameters that are not widely available. The SNODAS/CMC data processors recently developed by ENVIRON provide a viable alternative to the idealized snow values.

Table 3. WRF wintertime configuration options

WRF Treatment	Option Selected	Notes
Microphysics	Modified Thompson	Turn off cloud ice sedimentation and turn cloud ice auto-conversion to snow to force the formation of ice clouds rather than liquid clouds
Longwave Radiation	RRTMG	Rapid Radiative Transfer Model for GCMs includes random cloud overlap and improved efficiency over RRTM.
Shortwave Radiation	RRTMG	Same as above, but for shortwave radiation.
Land Surface Model (LSM)	NOAH	Two-layer scheme with vegetation and sub-grid tiling.
Planetary Boundary Layer (PBL) scheme	MYJ	
Cumulus parameterization	Kain-Fritsch in the 36 km and 12 km domains. None in the 4 km domain.	4 km can explicitly simulate cumulus convection so parameterization not needed.
Analysis nudging	None	
Observation Nudging	None	
Spectral Nudging	None	
Upper Level Damping	1	diffusive damping
Vertical Velocity Damping	None	
Turbulence and Mixing	1	Kvidf for vertical diffusion
Eddy Coefficient	4	horizontal Smagorinsky first order closure
Initialization Dataset	12 km North American Model (NAM)	Updates to snow cover and snow depth using 6-hourly SNODAS and CMC data
LULC Dataset	30-m NLCD 2006	Update VEGPARM.TBL based on U of U configuration for SNUP and albedo
Slope effects/shading	On	
Snow albedo	0.82	
Vertical levels	41	Configuration based on U of U simulation in Uintah Basin

- Subtask 9b (February 1-7, 2013 Benchmark) – We will evaluate the proposed 3SAQS configuration for the same February 1-7, 2013 Uintah Basin case presented by U of U. The reason for testing this period in 2013 is to benchmark the 3SAQS wintertime WRF configuration against the U of U results and to evaluate the impact of the different snow cover/depth parameterization.
- Subtask 9c (2011 Winter WRF Modeling/Evaluation) – We will then expand the testing of this configuration to other time periods and basins in 3-state region that experienced elevated winter ozone concentrations during 2011. Our evaluations of this WRF configuration will focus on surface temperatures, winds, mixing heights, snow cover, and radiation.
- Subtask 9d (Winter WRF Memo) – We will developed a final memo to document the testing and configuration of the 3SAQS WRF wintertime model.
- Subtask 9e (Additional Winter Modeling TBD) – There is the potential for building simulations around other measurement campaigns conducted during the winter of 2014-2015. Using the Uintah Basin and Upper Green River Basin field campaigns as examples, we are seeking meteorology measurement campaigns in other basins within the three-state region. In particular, measurements of snow cover/snow depth, vertical temperature and wind profiles, incoming and reflected radiation, mixing heights, and chemical measurements (O3, NOx, VOCs, methane) within oil and gas development basins would be useful in evaluating the performance of the 3SAQS wintertime WRF configuration. We are seeking participation with 3SAQS cooperators to provide these different measurements for the next winter season.

Deliverables:

- 3SAQS WRF 2011 wintertime modeling platform, including all data, codes, and scripts, loaded onto the 3-State Data Warehouse
- January-March, December 2011 WRF modeling on the 3SAQS 36/12/4-km modeling domains using the 3SAQS wintertime configuration; final simulation results loaded on the 3-State Data Warehouse
- Final memo documenting the testing and configuration of the 3SAQS WRF wintertime modeling platform

Schedule: October 2014 through February 2015.

Task 10. O&G Survey and Preliminary 2014 Emissions

Objective: Under this task ENVIRON will survey operators in the Piceance Basins in Colorado and the Uinta Basin in Utah for updated information on survey-based sources. The objectives are to obtain key input data from operators to generate 2014 emission inventories for these three basins, as well as whatever information is available from operators to refine projections of emissions in these basins to 2020. Also under this task we would acquire and process the 2014 permit (state and tribal) data within CO, UT and WY and process and project non-permit O&G data to 2014 to generate a SMOKE-ready preliminary 2014 O&G emissions inventory.

Description: Subtasks 10a-10c would develop surveys for the Denver-Julesburg (D-J), Piceance and Uinta Basins, respectively. For the D-J Basin ENVIRON is involved in a study headed by Garvin Heath for RPSEA/DOE that will develop O&G surveys to support generation of O&G emission inventories during the FRAPPE summer 2014 field study period. Thus, no new survey work will be performed for the D-J Basin under this study and we would rely on the O&G surveys developed under the RPSEA study. Note that the RPSEA study O&G surveys do not cover the entire D-J Basin and are just for Weld County. They are also focused on the summer 2014 FRAPPE field study period so may not have information regarding non-summer sources (e.g., heaters). The O&G surveys for the Piceance and Uinta Basins would be developed and distributed to the Operators. Note that Utah DEQ/DAQ may work with WEA to develop their own O&G survey study that would be performed in place of this one.

Subtasks 10d through 10f are to perform outreach to the O&G Operators in the three Basins to make sure the surveys are completed. For the D-J Basin we have not allocated any resources for outreach since that will be performed under the RPSEA study. For the Uinta Basin we are assuming that Utah DEQ/DAQ will perform the outreach effort. For the Piceance Basin we have allocated $20,000 for Lee Gribovicz to perform outreach.

ENVIRON will follow the WRAP Phase III model for a survey outreach to O&G companies operating in these three basins. Survey instruments will be developed to request data from operators on basin average equipment, processes, activities, and gas compositions. Surveys will be developed using the latest methodologies and lessons learned from recent past projects since the original WRAP Phase III surveys were created; specifically this will include adding additional source categories including produced water ponds, fracing engines, and pipeline data. Surveys will target those sources that are unlikely to be permitted, separately for Colorado and Utah (as the list of these sources is expected to differ between the two states). Once surveys are developed, Airstar Consulting would conduct outreach to companies operating in these basins. Companies would be identified and targeted as those representing the top 70% of ownership of wells, gas production and liquid hydrocarbon (oil and condensate) production. This data would be obtained from processing oil and gas production and well statistics from the IHS Global Powertools database. **ENVIRON assumes that access to the IHS database would be made**

available and costs for doing so are not included in this scope. Once companies are identified, Airstar Consulting would conduct phone and email outreach to the companies to encourage participation, including but not limited to setting up teleconferences to introduce the project and generating outreach materials to describe the goals and importance of the project. Surveys would be distributed to the companies, and ENVIRON and Airstar Consulting would work together to address comments or questions from operators. Once surveys have been received, ENVIRON will aggregate survey data in a surrogate ownership weighted-average methodology similar to that used in the WRAP Phase III project.

Under Subtask 10g, ENVIRON would acquire the 2014 "permitted" O&G emissions data for Colorado, Utah and Wyoming. For Colorado the 2014 APEN data for O&G would be acquired. For Utah most of the O&G is located on Tribal lands. Wyoming DEQ has a complete O&G inventory for all sources. These data would be reviewed and any questions raised discussed with the appropriate agency and either resolved or documented. The resulted "permitted" 2014 O&G emissions would be reformatted for SMOKE (Subtask 10i).

We are assuming that the survey data would not be available in time for Task 10 so that under Subtask 10h ENVIRON would generate a preliminary 2014 O&G inventory for the "unpermitted" O&G data by extrapolating the WRAP 2011 inventory to 2014. The results would be reformatted for SMOKE emission modeling (Subtask 10i).

Also under this task we would prepare a Technical Memorandum that describes how to implement new NEPA future year Project emissions within a future year projected O&G inventory. Various issues that need to be considered (e.g., are the Project emissions on top of or replace existing O&G emissions) will be discussed. The Technical Memorandum will also discuss the design of an on-line tool where a user can input their Project emissions and locations and the tool will output comparisons with current estimate of future year emissions in the region so that an assessment of potential significance can be made (Subtask 10j).

Deliverables: The deliverables from this task would be:

- Basin-aggregated survey data on activity, equipment, processes and gas compositions for the source categories for the D-J, Piceance and Uinta Basins.
- Preliminary 2014 O&G emissions formatted for SMOKE.

Schedule: October 2014 through June 2015.

Task 11. Project Management

Objective: To attend conference calls, travel to project meetings, prepare documents, and manage technical staff for the 3SAQS during October 2014 through June 2015.

Description: Under this task we would:

- Prepare for and participate in conference calls with the project participants.
- Travel to and present project results at technical meetings
- Review contracts and prepare subcontracts.
- Prepare monthly progress reports and invoices.
- Perform project management.

Deliverables:

- Signed contracts with WESTAR.
- Subcontract with UNC
- Monthly progress report and invoices.
- Attend conference calls and meetings as needed.
- Prepare additional scope of work and other documents as needed.

Schedule: October 2014 through June 2015.