



**MEMORANDUM OF UNDERSTANDING  
AMONG THE  
U.S. DEPARTMENT OF AGRICULTURE,  
U.S. DEPARTMENT OF THE INTERIOR,  
AND  
U.S. ENVIRONMENTAL PROTECTION AGENCY,  
REGARDING AIR QUALITY ANALYSES AND MITIGATION  
FOR FEDERAL OIL AND GAS DECISIONS THROUGH  
THE NATIONAL ENVIRONMENTAL POLICY ACT PROCESS**

**PREAMBLE**

Safe and responsible domestic oil and gas production is vital to America's energy security. In facilitating oil and gas development, we must ensure that public health, safety, and environmental quality standards are met efficiently, transparently, and in a well-coordinated fashion. Through this Memorandum of Understanding (MOU), the U.S. Department of Agriculture (USDA), the U.S. Department of the Interior (DOI), and the U.S. Environmental Protection Agency (EPA) (Signatories) commit to a clearly defined, efficient approach to compliance with the National Environmental Policy Act (NEPA) regarding air quality and air quality related values (AQRVs), such as visibility, in connection with oil and gas development on Federal lands. The MOU charts a path to protect air quality and AQRVs as we move forward with responsible oil and gas development on Federal lands.

The Signatories expect this standardized approach—which builds on best practices learned from recent successful collaboration—will facilitate the completion of NEPA environmental analyses for Federal land use planning and oil and gas development decisions. The Signatories also expect it to lead to improved design and implementation of mitigation measures, including best management practices, that will both protect air quality and AQRVs, and provide opportunities for future oil and gas development.

In recent years, demand for development of oil and gas resources has increased, while at the same time air quality in some areas of intensive oil and gas development has correspondingly worsened, with some areas experiencing episodes of high levels of air pollution and negative impacts to AQRVs. Effectively addressing these issues requires clear lines of communication and close coordination among the various Federal agencies that have a role in issuing the environmental analyses associated with planning and development decisions. Specific to this process, authorities and requirements of different agencies inadvertently have contributed to heightened uncertainty for oil and gas companies proposing development on Federal lands regarding the NEPA process and have undermined prospects for timely

decisionmaking. In some instances, major oil or gas development proposals have been delayed while questions about appropriate air analyses and mitigation measures were resolved. In addition, administrative protests and lawsuits have been filed challenging air quality analyses and mitigation measures and further delaying land use plans and energy development projects. Through this Administration's focused effort to improve coordination, the agencies have developed a number of best practices that have already yielded demonstrable results in both shortening the time for planning and project decisions and in increasing efficiency for companies and Federal agencies. Through this MOU, the Signatories seek to formalize such successful processes.

Through this MOU, the Signatories are demonstrating their commitment to act collaboratively in order to protect air quality and AQRVs and facilitate the responsible development of oil and gas resources on Federal lands. The MOU will accomplish these goals by providing:

- Commitments by the Signatories' respective Agencies to collaborate throughout the NEPA process, including providing the Lead Agency with input and assistance early in the process on appropriate analyses and mitigation to address air quality and AQRVs;
- Common procedures for determining which type of air quality analyses are appropriate and when air modeling is necessary;
- Specific provisions for analyzing and discussing impacts to AQRVs and for mitigating such impacts;
- A dispute resolution process to facilitate the timely resolution of differences among the Signatories or their respective Agencies; and
- Assurances that, if the EPA determines the MOU procedures have been followed, it will rate the resulting NEPA analyses of air quality or AQRVs as "adequate" (and not "inadequate" or "3") under the EPA criteria for rating draft Environmental Impact Statements (EIS).

Through the MOU, the Signatories recognize that air resources are important, and merit protection within their respective Agencies' legal authorities. The Agencies will strive to ensure that Federal oil and gas decisions do not cause or contribute to exceedances of the National Ambient Air Quality Standards (NAAQS), nor adversely impact AQRVs in Class I Areas or sensitive Class II Areas. The MOU provides a process that will foster timely, responsible decisions on the development of oil and gas resources on Federal lands. With the signing of this MOU, the Signatories reaffirm the importance of predictable, science-based processes to protect air quality and AQRVs, provide appropriate opportunities for development of Federal oil and gas resources, and eliminate unnecessary uncertainty and delay.

## **I. PURPOSE**

The USDA on behalf of the U.S. Forest Service (FS); the DOI on behalf of the Bureau of Land Management (BLM), the Fish and Wildlife Service (FWS), and the National Park Service (NPS); and the EPA enter into this MOU. The purpose of this MOU is to set forth expectations and agreements for addressing air quality analyses and mitigation measures through the NEPA process related to Federal oil and gas planning, leasing, or field development decisions.

Air quality is important to public health and the environment. Federal statutes, including the Clean Air Act (CAA) and Federal Land Policy and Management Act (FLPMA), provide authority for protecting and improving air resources. Additionally, the National Forest Management Act (NFMA) affords the FS the opportunity to consider sustainable management of National Forest System ecosystems and the interrelationships among air, plants, animals, soil, water, and other environmental factors. Further, the Agencies with Federal land management responsibilities acknowledge that air resources are important and merit protection within their respective legal authorities. Accordingly, the Agencies will strive to ensure, to the maximum extent practicable, that Federal decisions relating to oil and gas will not cause or contribute to exceedances of the NAAQS, nor adversely impact AQRVs in Class I Areas, or sensitive Class II Areas.

In recognition of the need to balance the national mandate to protect air quality and AQRVs, human health, and the environment with the Nation's ongoing demand for energy, the Signatories have come together to create a coordinated, consistent process to evaluate and mitigate adverse impacts to air quality and AQRVs from Federal decisions relating to oil and gas activities within the NEPA process. Additional goals for the MOU are to:

- Improve collaboration and respect in conducting analyses of impacts to air quality and AQRVs and mitigating those impacts;
- Provide greater certainty and transparency for the Agencies, project proponents, and the public regarding the conduct and review of analyses of impacts to air quality and AQRVs in the NEPA process, and the application of mitigation;
- Promote and support a regional perspective on air resources, and collaborative development of appropriate regional air quality assessments; and
- Encourage both integration of design features that reduce emissions and application of cost-effective mitigation measures in projects covered by this MOU.

The Signatories recognize that Federal land management agencies must consider multiple resources when authorizing activities, and, therefore, acknowledge that air quality and AQRVs are among the many resources that must be considered in the decisionmaking process.

## II. SCOPE AND AUTHORITIES

### A. *Scope of this MOU*

1. This MOU focuses on analyzing and addressing air quality impacts (i.e., direct, indirect, and cumulative) associated with Federal decisions relating to on-shore oil and gas planning, leasing, or field development, including exploration, development, and production. This MOU is intended to refine existing Agency guidance and procedures. Specifically, the MOU establishes procedures to be followed for assessing impacts related to the NAAQS and AQRVs.
2. The MOU procedures may be used to assess emissions of hazardous air pollutants (HAPs) and greenhouse gases (GHGs), but that is not their intended purpose. However, emissions of GHGs and HAPs need to be considered, and may need to be assessed and disclosed in NEPA documents. The Agencies agree that mitigation and control measures to address the NAAQS and impacts to AQRVs often result in co-benefit reductions in GHGs and HAPs. Such reductions in GHGs and HAPs should be taken into consideration.
3. In all cases, the Agencies will follow the Council on Environmental Quality's (CEQ) NEPA regulations and guidance, as well as their own NEPA procedures.
4. The Agencies will emphasize collaboration in determining the appropriate air quality analysis under the circumstances and preparing applicable NEPA documents. Collaboration includes:
  - Informal communications among the Agencies to inform each other of issues, concerns, review schedules, etc.;
  - Timely requests for review;
  - Timely submission of review comments or the determination that providing comments is unnecessary;
  - Documentation of the results of reviews and decisions.
5. To meet the goal of promoting and supporting a regional perspective for air quality analysis, the Agencies will consider programmatic NEPA evaluations for Federal oil and gas decisions, as appropriate.
6. If disagreements arise between or among the Agencies about implementing this MOU, the affected Agencies intend to use the Dispute Resolution process in Section VII. The Agencies also are encouraged to resolve the dispute through informal discussions among higher-level decision-makers before invoking the formal Dispute Resolution process.
7. State, local, and tribal governments have authorities and responsibilities under the CAA and collaborate with Federal land management agencies and the EPA. Nothing in this MOU is intended to (a) alter or replace State, local, or tribal regulatory authorities or

responsibilities; or (b) diminish the Signatories' or the Agencies' interactions with State, local, or tribal governments.

8. The Signatories acknowledge there may be on-going efforts that address similar issues and working relationships. Those efforts are encouraged to follow the provisions of this MOU as appropriate.

#### B. Authority

The authority for the Signatories to enter into and carry out this MOU includes:

- The Clean Air Act, 42 U.S.C. 7401 *et seq.*
- The Energy Policy Act of 2005, Public Law 109-58
- The Federal Land Policy and Management Act of 1976, 43 U.S.C. 1701 *et seq.*
- The Federal Onshore Oil & Gas Leasing Reform Act of 1987, 30 U.S.C. 181 *et seq.*
- Mineral Leasing Act of 1920, as amended, 30 U.S.C. 181 *et seq.*
- National Environmental Policy Act, 42 U.S.C. 4321 *et seq.*
- National Forest Management Act, 16 U.S.C. 1600 *et seq.*
- National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd-668ee
- The National Park Service Organic Act of 1916, as amended, 16 U.S.C. 1 *et seq.*
- The Organic Administration Act of 1897, 16 U.S.C. 473-475, 477-482, 551
- Wilderness Act of 1964, 16 U.S.C. 1131 *et seq.*

### III. DEFINITIONS

Terms defined in NEPA or CEQ regulations and used in this MOU have the meaning given them in NEPA or CEQ regulations. The following terms as used in this MOU are defined as:

“Adverse impacts” is used in the NEPA context. With respect to AQRVs, it does not refer to a formal determination of “adverse AQRV impacts” under the CAA.

“Agency” or “Agencies” – the EPA or the following Agencies or Bureaus of the Signatories: the U.S. Forest Service (FS) of the USDA; and the Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service (FWS), and the National Park Service (NPS) of the DOI.

“Air quality or AQRVs analysis / analyses” consists of qualitative or quantitative methods for estimating impacts to the NAAQS, AQRVs, or resources, resulting from emissions as identified in the emissions inventory. Methods range from specific numerical air quality models to narrative description of physical, chemical, or transport processes.

“Air Quality Related Values (AQRVs)” – a resource, as identified by the Federal Land Manager for one or more Federal areas that may be adversely affected by a change in air

quality. The resource may include visibility or a specific scenic, cultural, physical, biological, ecological, or recreational resource identified by the Federal Land Manager for a particular area.

“Class I Area” – as defined in Section 162(a) of the CAA (42 USC § 7472(a)), to be national parks over 6,000 acres, national wilderness areas and national memorial parks over 5,000 acres, and international parks that existed on August 7, 1977 and as designated by States and Indian tribes pursuant to their authority in Section 164 of the CAA (42 U.S.C. § 7474).

“Emissions” – direct and precursor emissions that are regulated under the CAA and its implementing regulations to reduce concentrations of criteria pollutants (ozone (O<sub>3</sub>), carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>), particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), and lead (Pb)). For purposes of analyzing impacts to AQRVs, emissions also include secondary pollutants (such as pollutants referenced in the Federal Land Managers’ Air Quality Related Values Work Group (FLAG) guidance document). GHGs are not included.

“Emission Inventory” – an accounting of the amount of emissions (as described in Section V.E.3) discharged into the atmosphere from a proposed action that influence local and regional air quality and AQRVs.

“Federal Land Manager (FLM)” – as defined in Section 302 of the CAA (42 U.S.C. §7602) and 40 CFR §51.301. Pursuant to delegated authority, for FS lands the FLM is the Regional Forester or an individual Forest Supervisor; for FWS and NPS lands the FLM is the DOI Assistant Secretary for Fish and Wildlife and Parks.

“Greenhouse Gases (GHG) Emissions” – emissions of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and fluorinated gases (hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride).

“Lead Agency” – as defined in 40 CFR §1508.16.

“National Ambient Air Quality Standards (NAAQS)” – as defined in the CAA (42 U.S.C. § 7409) and 40 CFR Part 50.

“Prevention of Significant Deterioration (PSD) Increment” – the maximum allowable increases in ambient pollution concentrations allowed over baseline concentrations established under Sections 163 and 166 of the CAA. (See 40 CFR §51.166 (c) for increments for specific pollutants.)

“Proximity” – as determined by the Lead Agency on a case-by-case basis after conferring with the other Agencies and considering the Agencies’ applicable guidance.

“Reasonably foreseeable number of wells” – the number of oil and gas wells that could reasonably be expected to be developed during exploration, development, and production activities in a specified planning, leasing, or project area, consistent with applicable guidance including the *Interagency Reference Guide Reasonably Foreseeable Development Scenarios*

*And Cumulative Effects Analysis For Oil and Gas Activities On Federal Lands In the Greater Rocky Mountain Region*, dated June 2003.

“Sensitive Class II Area” – for purposes of this MOU is an area identified by the affected Agency on a case-by-case basis.

“Substantial Increase in Emissions” – as determined by the Lead Agency on a case-by-case basis after conferring with the other Agencies. In making its determination, the Lead Agency will consider:

- The Emissions Inventory prepared pursuant to Section V.E.3;
- Whether an increase in the emissions related to the proposed action, based on best professional judgment, may cause or contribute to exceedances of the NAAQS or adversely impact AQRVs in Class I areas or resources in sensitive Class II areas; and
- FLAG guidance or other guidance if applicable to the Lead Agency.

#### **IV. ROLES AND RESPONSIBILITIES**

##### *A. Bureau of Land Management*

The BLM administers more than 245 million surface acres in the National System of Public Lands and 700 million acres of Federal subsurface mineral estate underlying lands owned and managed by other entities, including other Federal agencies and state and private landowners. The BLM manages the public lands on the basis of the “multiple-use” and “sustained yield” mandate described in FLPMA, which directs the BLM to manage the public lands in a manner that will protect the quality of air and atmospheric values, among others. In addition, in developing land use plans, the BLM must provide for compliance with applicable state and Federal pollution control laws, including those addressing air (such as the CAA). Consistent with FLPMA, anyone using, occupying, or developing the public lands must comply with applicable state and Federal pollution control laws, including the CAA. The BLM has responsibility, under the CAA, for Class I Areas that it manages.

##### *B. Environmental Protection Agency*

The EPA is responsible for reviewing and commenting on NEPA documents, particularly EISs, pursuant to NEPA and the EPA’s specific authorities under Section 309 of the CAA. Additionally, the EPA administers the programmatic and regulatory aspects of the CAA. The EPA sets the NAAQS, develops and promulgates CAA implementing regulations, oversees State and tribal CAA regulatory programs, and issues CAA permits, where appropriate.

##### *C. Forest Service*

The FS is responsible for the surface management of 193 million acres of National Forest System lands, portions of which are covered by Federal oil and gas leases that grant exclusive rights for exploration and development. The FS also evaluates National Forest

System lands for potential oil and gas leasing. The 1977 CAA Amendments protect visibility and other AQRVs in Class I areas from the adverse impacts of air pollution. The FS reviews permit applications and NEPA documents, for new or expanding industrial facilities and activities proposing to construct on or near FS administered lands, to determine whether air pollution from these sources would have an effect on FS administered lands.

#### *D. Fish and Wildlife Service and National Park Service*

The FWS and NPS are responsible for the surface management of 150 and 84 million acres, respectively, of National Wildlife Refuge and National Park System lands. The 1977 CAA Amendments give FWS an affirmative responsibility to protect visibility and other AQRVs of Class I wilderness areas under its jurisdiction from the adverse impacts of air pollution. Similarly, the 1977 CAA Amendments give NPS an affirmative responsibility to protect visibility and other AQRVs of Class I national parks and wilderness areas under its jurisdiction from the adverse impacts of air pollution. In addition, the National Wildlife Refuge Systems Improvement Act, the National Park Service Organic Act, and associated Management Policies require FWS and NPS to protect the AQRVs of all of their lands, including both Class I and Class II areas, for the enjoyment of future generations. The FWS and NPS meet these responsibilities by reviewing permit applications and NEPA documents for new or expanding industrial facilities and activities proposing to construct on or near NPS or FWS administered lands. As part of this review, FWS and NPS determine whether air pollution from these sources would have an adverse effect on FWS or NPS administered lands.

### **V. AIR QUALITY AND AQRVS ANALYSES**

- A. The Signatories will collaborate to implement this MOU. The analysis of impacts to air quality and AQRVs will be conducted in accordance with current technical standards, guidance, and practices and will be used to inform the decisionmaker, the Agencies, and the public. The Lead Agency should use existing analyses to the extent practicable.
- B. When preparing an EIS for a Federal oil and gas decision, a Lead Agency will follow the procedures in this MOU and the Appendix for the air quality and AQRVs analyses. When preparing an Environmental Assessment for a Federal oil and gas decision where air quality or AQRVs are issues warranting NEPA analysis, the Lead Agency will consider following the procedures established in this MOU and the Appendix.
- C. Technical work groups can facilitate communication and share expertise for conducting air quality and AQRVs analyses early in the NEPA process.
  1. When the Lead Agency determines through NEPA scoping, that air quality or AQRVs will be significantly impacted by a proposed action, the Lead Agency will convene a technical workgroup for that proposed action composed of the Agencies to provide advice about the analysis. The Agencies will assign appropriate staff, who will fully participate in the technical workgroup, which will establish a work plan, consistent with the Lead Agency's schedule, for circulating and reviewing appropriate work products.

2. If air quality or AQRVs are a concern, but will not be significantly impacted by a proposed action, the Lead Agency may convene a technical workgroup. Alternatively, an Agency may ask the Lead Agency to convene a technical workgroup in those circumstances.
  3. The Lead Agency may rely on an existing stakeholder group that complies with the Federal Advisory Committee Act (FACA), as appropriate, or include cooperating agencies in a technical workgroup, provided the technical workgroup meets the requirements established in Section V.C.1. above.
- D. Consistent with NEPA and its implementing regulations, the Lead Agency will complete and document supporting air quality and AQRVs analyses prior to Federal oil and gas planning, leasing, or field development decisions.
1. If the Lead Agency cannot complete necessary quantitative analyses (e.g., if a reasonably foreseeable number of wells cannot be determined, see V.E.1), it will include in the appropriate NEPA documents:
    - A qualitative narrative description of the air quality issues or impacts;
    - A statement of when more detailed information will likely be available; and
    - A commitment to complete the air quality and AQRVs analyses once the requisite information is available.
  2. If the Lead Agency encounters a situation involving incomplete or unavailable information as defined in 40 CFR §1502.22, it will follow that provision and its own NEPA procedures.

E. Procedures For Assessing Impacts to Air Quality and AQRVs

1. Early in the NEPA process, the Lead Agency will discuss with the Agencies:
  - a. Information about the affected environment to include in the baseline assessment;
  - b. Methodology, assumptions, and scale (e.g. local or regional) of the analyses;
  - c. Monitoring protocols and mitigation (see Section VI).

As early as possible in its planning process, the Lead Agency will identify the reasonably foreseeable number of oil or gas wells that can be expressed as a range, expected to be located within the planning area. Existing reasonably foreseeable development scenarios can be used to identify the number of wells.

2. Once the Lead Agency identifies the reasonably foreseeable number of oil or gas wells, it will prepare an Emissions Inventory of criteria pollutants and volatile organic

compounds. The Lead Agency will use the Emission Inventory to analyze whether modeling is required as provided in V.E.3 below.

3. Except as provided in V.E.4 below, the Lead Agency will conduct modeling to assess impacts to air quality and/or AQRVs if a proposed action meets at least one of the criteria in subparagraph (a) *and* at least one of the criteria in subparagraph (b) below:
  - a. *Emissions/Impacts* - the proposed action:
    - Is anticipated to cause a Substantial Increase in Emissions based on the Emissions Inventory prepared pursuant to Section V.E.2; or
    - Will materially contribute to potential adverse cumulative air quality impacts as determined under NEPA.
  - b. *Geographic Location* - the proposed action is in:
    - Proximity to a Class I or sensitive Class II Area; or
    - A Non-Attainment or Maintenance Area; or
    - An area expected to exceed the NAAQS or PSD increment based on:
      - Monitored or previously modeled values for the area;
      - Proximity to designated Non-Attainment or Maintenance Areas; or
      - Emissions for the proposed action based on the Emissions Inventory prepared pursuant to Section V.E.2.
  - c. Modeling will be conducted as described in the Appendix. If multiple approved models, or a completed regional air quality assessment, can provide equivalent information, the Lead Agency will choose the appropriate approach or approaches.
4. Modeling will not be required in the following circumstances:
  - a. If the Lead Agency demonstrates and the EPA, and the Agencies whose lands are affected, concur (in writing or by electronic transmission) that, due to mitigation or control measures or design features that will be implemented, the proposed action will not cause a Substantial Increase in Emissions. The demonstration will describe the proposed features or measures, the anticipated means of implementation, and the basis for the conclusion that the proposed action will not cause a Substantial Increase in Emissions.
  - b. If the EPA and the Agencies whose lands are affected concur (in writing or by electronic transmission) that:
    - An existing modeling analysis addresses and describes the impacts to air quality and AQRVs for an area under consideration, and

- The analysis can be used to assess the impacts of the proposed action.

5. If modeling is not required because either:

- The Section V.E.3 criteria above *have not been* met, or
- one of the circumstances in Section V.E.4 above *has been* met,

the Lead Agency will document its decision not to model and include a qualitative narrative analysis of the impacts to air quality and AQRVs in the appropriate NEPA documents.

6. Additional Procedures for AQRVs

a. When the BLM is the Lead Agency, the BLM will apply:

1. The BLM threshold values and methodologies assessing impacts to AQRVs on BLM administered lands, unless otherwise determined by the BLM; and
2. The threshold values and methodology in the FLAG guidance assessing impacts to AQRVs on FS, FWS, NPS administered lands, or other guidance accepted by FS, FWS, or NPS.

b. When FWS, NPS, or FS is the Lead Agency, the Lead Agency will apply:

1. The threshold values and methodology in the FLAG guidance assessing impacts to AQRVs on FS, FWS, NPS administered lands, or other guidance accepted by FS, FWS, or NPS; and
2. The BLM threshold values and methodologies assessing impacts to AQRVs on BLM administered lands, unless otherwise requested by BLM.

c. The Lead Agency will identify, consider, and discuss in the body of the NEPA document:

1. Analysis results for the threshold values assessed, as stated in Section V.E.6 (a) and (b) above, to facilitate comparison of the results;
2. The Agencies' views about: (a) the nature of impacts to AQRVs on the affected Agencies' land and (b) potential mitigation measures.

F. The Agencies will comply with the General Conformity requirements under CAA Section 176 (42 U.S.C. § 7506) and the corresponding regulations at 40 CFR § 93.150, *et seq.*, where applicable.

G. For informational purposes, the Lead Agency will calculate, and disclose in the NEPA document, PSD increment consumption from the proposed action at Class I Areas.

Further evaluation may need to be performed under applicable statutory or regulatory requirements if an affected Class I Area has known increment violations.

- H. The procedures in Section V of this MOU are designed to ensure that adequate air quality and AQRVs analyses will be prepared for NEPA documents. For purposes of this Section H, the term air quality relates solely to Emissions associated with achieving the NAAQS and impacting AQRVs (as those terms are defined in Section III). Emissions of HAPs and GHGs are not included within the scope of this Section H, and the term air quality as used in this Section H.

If the EPA determines that the MOU procedures have been followed for an EIS, it will find that the air quality or AQRVs analysis is adequate. However, any future laws, regulations or policies may require additional analyses beyond those contemplated by this MOU. In addition, the EPA may determine that an EIS presents inadequate discussions of proposed mitigation or control measures or design features to address adverse impacts to air quality or AQRVs, or inadequate analysis of impacts to resources other than air. Further, because adequate analyses do not mean that the impacts will be environmentally satisfactory, the EPA will continue to convey its views on the environmental soundness of respective actions in the comment letters it issues pursuant to NEPA and Section 309 of the CAA. Moreover, as required by Section 309 of the CAA, if EPA determines that the effects of a Federal oil or gas action are unsatisfactory from the standpoint of public health or welfare or environmental quality, it will refer the action to the CEQ.

## **VI. MITIGATION AND EMISSIONS REDUCTIONS**

- A. The Lead Agency, in collaboration with the other Agencies as provided in Section V.E.1, will identify reasonable mitigation and control measures and design features to address adverse impacts to air quality or AQRVs on all affected lands in the NEPA process. Mitigation and control measures can include: best management practices, control technologies, and pace of development.
- B. The Lead Agency will evaluate the reasonable mitigation and control measures and design features to eliminate or reduce adverse impacts to air quality or AQRVs identified in the NEPA process.
- C. The Lead Agency will determine the appropriate mitigation and control measures and design features to (1) eliminate or reduce adverse impacts to air quality or (2) eliminate or reduce adverse impacts to AQRVs (including on other Agencies' lands), and describe them in the NEPA decision document.
- D. As provided for by law and consistent with lease rights and obligations, the Lead Agency will:
- Ensure implementation of reasonable mitigation and control measures and design features through appropriate mechanisms, including lease stipulations and conditions of approval, notices to lessees, and permit terms and conditions;

- Take appropriate steps to retain the flexibility to implement additional reasonable mitigation and control measures and design features for permitted operations;
  - Work to implement additional reasonable mitigation and control measures and design features to reduce future emissions from permitted operations.
- E. The Lead Agency will consider adopting a monitoring and enforcement program to verify that mitigation and control measures and design features are achieving their intended purposes. Monitoring should be conducted in cooperation with stakeholders.
- F. If the Lead Agency determines that mitigation and control measures and design features are not achieving their intended purposes, it will take appropriate action, consistent with applicable law and lease rights and obligations.

## **VII. DISPUTE RESOLUTION**

- A. The Signatories will resolve expeditiously all disputes related to this MOU. Disputes will be raised and resolved in a timely manner with due consideration to the projects or other activities impacted by the dispute.
- B. The Signatories encourage communication and joint problem solving to recognize and deal with disputes as they arise and to maintain constructive interagency relationships.
- C. Decisionmaking will occur at the lowest level possible by staff with specific knowledge and relevant experience. Unresolved issues will be elevated quickly to higher-level decisionmakers to apply a broader policy perspective as needed.
- D. The Agencies agree to the following dispute resolution process if a dispute arises between or among any of them relating to implementation of this MOU.
1. Level One: The Agency that seeks resolution will provide a written statement of the dispute to the involved Agencies' Level One contacts identified in Section IX. The written statement will include the following: a brief summary of the dispute, a brief statement of each issue that needs to be resolved or decided, up to three proposed solutions including the reasons these solutions are important, and supporting documentation. The Agencies involved in the dispute will engage in discussions and attempt to arrive at a consensus resolution of the dispute.
  2. Level Two: If resolution is not reached within 15 working days of receipt of the statement of dispute, the dispute may be elevated by written notice to the involved Agencies' Level Two contacts identified in Section IX. The written notice will include: a brief summary of the dispute, a brief statement of each issue that needs to be resolved or decided, a brief description of the Level One efforts to resolve the issue(s) and the reasons those efforts were unsuccessful, and the perspectives of the other Agencies on the dispute, outstanding issues, and previous efforts to reach a resolution. Each Agency involved in the dispute will prepare a brief paper describing the issue, background information, needs and concerns, and options from their perspective. The Level Two decision-makers will meet, discuss the issue(s), and seek

consensus resolution. The Agency that seeks resolution also may schedule a joint briefing of all relevant Agencies.

3. Level Three: If consensus is not reached by the Level Two officials within 30 working days of receipt of the written notice of dispute, the Agencies involved in the dispute will elevate the matter to the principal policymakers at headquarters for the respective Signatories (Level Three contacts identified in Section IX), who will endeavor to resolve the issue(s) within 30 working days.
4. The Agencies involved in the dispute will include appropriate agency expertise, including NEPA experts, in the discussions and use a discussion format that provides for orderly and direct communication and consideration of the range of agency perspectives.
5. The above time limits may be extended by written agreement of the parties to the dispute. The Agencies involved in the dispute may employ agency dispute resolution services to assist in the resolution of the dispute. States or tribal governments may participate in discussions to resolve the matter with the consent of all the parties to the dispute.

#### **VIII. ADMINISTRATIVE PROVISIONS**

- A. Nothing in this MOU is intended or will be construed to limit, expand, or affect in any way the authority or legal responsibilities of the Agencies.
- B. Nothing in this MOU may be construed to obligate the Agencies or the United States to any current or future expenditure of resources in advance of the availability of appropriations from Congress. Nor does this Agreement obligate the Agencies, or the United States, to spend funds on any particular project or purpose, even if funds are available.
- C. The mission requirements, funding, and staffing of the Agencies may affect their ability to fully implement all of the provisions of this MOU.
- D. Specific activities that involve the transfer of money, services, or property between or among the Agencies (1) will require execution of separate agreements or contracts, (2) will be contingent upon the availability of funds, and (3) must be independently authorized by appropriate statutory authority. This MOU does not provide such authority. Negotiation, execution, and administration of each such agreement must comply with all applicable statutes and regulations.
- E. The Signatories and their respective Agencies and offices will handle their own activities and utilize their own resources, including the expenditure of their own funds, in pursuing these objectives. Each Agency will carry out its separate activities in a coordinated and mutually beneficial manner.

- F. Nothing in this MOU is intended or will be construed to restrict the Signatories or the Agencies from participating in similar activities or arrangements with other public or private agencies, organizations, or individuals.
- G. This MOU is not intended to, and does not, create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity by any party against the United States, its departments, agencies, or entities, its officers, employees, or agents, or any other person.
- H. Any information furnished between the Agencies under this MOU may be subject to the Freedom of Information Act, 5 U.S.C. § 552, *et seq.*, including provisions for interagency consultation with the originating agency before making a direct FOIA response.
- I. All press releases and public statements issued by the Signatories concerning or characterizing this MOU will be jointly reviewed and agreed to by delegated staff representing each of the undersigned Signatories.
- J. This MOU may be amended or modified only through written agreement among all of the Agencies, signed by the Secretaries and Administrator or their respective delegees. Other Federal and state agencies may become signatories to this MOU with the written consent of all the Agencies.
- K. In addition to the annual review in Section X.B, the Signatories will review this MOU at least every five (5) years for adequacy, effectiveness, and continuing need.
- L. The Agencies will comply with FACA (5 U.S.C. Appendix 2) to the extent it applies.

**IX. PRINCIPAL CONTACTS**

Each Signatory hereby designates the following Federal employees as the principal contacts regarding this MOU. The contacts may be changed through written notice to each Signatory.

	<b>Level One</b>	<b>Level Two</b>	<b>Level Three</b>
<b>BLM</b>	State Director	Bureau Director	Assistant Secretary
<b>EPA</b>	Regional Division Director	Regional Administrator	Assistant Administrator
<b>FS</b>	Regional Forester	Chief	Under Secretary
<b>FWS</b>	Associate Director	Bureau Director	Assistant Secretary
<b>NPS</b>	Associate Director	Bureau Director	Assistant Secretary

**X. MOU TERM, IMPLEMENTATION, AND APPLICABILITY**

- A. *Effective Date and Term.* This MOU is effective on the date of the last approving Signatory's signature. This MOU will remain in effect unless amended or terminated.
- B. *Implementation.* Within 90 days of the effective date, BLM, EPA, FS, FWS, and NPS will coordinate to:

- Develop Agency and joint plans for implementing and disseminating this MOU,
- Develop appropriate joint training efforts and materials, and
- Designate national senior level managers to oversee implementation of this MOU.

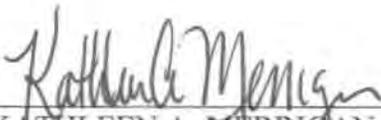
The designated senior level managers will approve the MOU implementation plans. They will meet annually to confirm the effectiveness of the MOU and discuss and document any challenges, concerns, or opportunities for improvement.

*C. Applicability.*

1. This MOU applies to all NEPA analyses commencing after the effective date, as provided in Section V.B.
2. This MOU applies to on-going NEPA analyses for which a draft NEPA document (e.g., draft EIS, completed EA / unsigned FONSI) will not be issued for public review within 90 days following the effective date of the MOU. However, the provisions of Section V.H. are not available to NEPA analyses if the MOU procedures have not been followed.
3. The Agencies also will consider applying the MOU to on-going NEPA analyses where comments on the draft have questioned the adequacy of the air quality or AQRVs analysis, if such analysis can be accomplished in a cost-effective and timely manner.

*D. Termination.* This MOU will be terminated when it is no longer required. In addition, a Signatory may terminate participation in this MOU 90 days after providing written notice to the other Signatories.

**XI. SIGNATURES**

By:   
KATHLEEN A. MERRIGAN  
DEPUTY SECRETARY  
DEPARTMENT OF AGRICULTURE

JUN 23 2011  
Date: \_\_\_\_\_

By:   
DAVID J. HAYES  
DEPUTY SECRETARY  
DEPARTMENT OF THE INTERIOR

JUN 23 2011  
Date: \_\_\_\_\_

By:   
BOB PERCIASEPE  
DEPUTY ADMINISTRATOR  
ENVIRONMENTAL PROTECTION  
AGENCY

JUN 23 2011  
Date: \_\_\_\_\_

**Attachments:**

Appendix:

- Modeling Approaches to Evaluate Air Quality for NEPA Decisions Regarding Federal Oil & Gas
- Modeling Approach Tables for Oil & Gas Development through the NEPA Process
- Overview Matrix Of Air Quality Model Characteristics

Concept Paper – Overview and Example Design of a Reusable Modeling Framework for Air Quality Modeling

**APPENDIX TO MEMORANDUM OF UNDERSTANDING  
AMONG THE U.S. DEPARTMENT OF AGRICULTURE, U.S. DEPARTMENT OF THE INTERIOR, AND  
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGARDING AIR QUALITY ANALYSES AND  
MITIGATION FOR FEDERAL OIL AND GAS DECISIONS THROUGH THE NEPA PROCESS  
(06/20/11)**

**MODELING APPROACHES TO EVALUATE AIR QUALITY FOR  
NEPA DECISIONS REGARDING FEDERAL OIL & GAS**

The purpose of this Appendix is to provide information when modeling is required by Section V.E.3.c of the Memorandum of Understanding (MOU). Section V.A of the MOU says “The analysis of impacts to air quality and AQRVs will be conducted in accordance with current technical standards, guidance, and practices and will be used to inform the decision-maker, Agencies [BLM, EPA, Forest Service, FWS, and NPS], and the public.” Section V.D. of the MOU says “[c]onsistent with NEPA and its implementing regulations, the Lead Agency will complete and document supporting air quality and AQRVs analyses prior to Federal oil and gas planning, leasing, or field development decisions.”

Modeling is required when criteria described in MOU Section V.E.3 are met. This appendix provides general direction on approaches, models, and underlying principles to accomplish technical tasks while encouraging and optimizing resource efficiencies. Initially some of the modeling efforts may require additional investments. However, the outlined approaches encourage, to the maximum extent practicable, the reuse of pre-existing major modeling components and data to reduce overall resource commitments over time.

The Appendix is comprised of this introduction, and these two additional components:

- Two tables (A and B) of general air quality analysis approaches for a variety of conditions (e.g., planning phase, data quantity/quality, and potential air quality impacts); and
- A matrix summarizing characteristics of currently available air quality models, applicability, and references (Overview Matrix Of Air Quality Model Characteristics).

Also attached is a concept paper describing a Reusable Modeling Framework, which provides an example of a complex air quality modeling system designed for multiple uses.

Consistent with the provisions of Section V. of the MOU, the Lead Agency selects the appropriate air quality models and technical approaches. Nevertheless, the Lead Agency must collaborate and engage the Agencies and technical workgroups, if convened, in selecting air quality models and technical approaches (see MOU Sections V.A., V.C. and V.E.1.). Early use of the approaches outlined in this Appendix will assist in making air quality modeling more efficient, effective, and save time and expense.

NOTES: (1) If the Lead Agency cannot complete necessary quantitative analyses (e.g. if a reasonably foreseeable number of wells cannot be determined, see MOU Section V.E.1), the Lead Agency should follow the procedures in MOU Section V.D. (2) This Appendix supports implementation of the MOU and does not supersede the provisions and process established in the MOU. (3) If disputes arise about application of the Appendix, follow the MOU dispute resolution provisions (Section VII). (4) This Appendix may be updated to reflect current knowledge and science as provided in the MOU.

The following tables describe various analysis approaches:

- Table A is used when the Lead Agency has determined a reasonably foreseeable number of wells utilizing limited or general information. The number of wells or associated emissions can be expressed as a range (e.g., low, medium, high).
- Table B is used when the Lead Agency has determined a reasonably foreseeable number of wells (e.g., specific number and location).

<b>Table A. Consult this table when:</b>		
<b>A reasonably foreseeable number of oil or gas wells and associated emission inventory has been developed, utilizing limited or general information; the reasonably foreseeable number of wells and associated emissions are expressed as a range (e.g., low, medium, high).</b>		
<b>Long Range Transport Assessment Approach</b>	<b>'Add-on' Photochemical Approach</b>	<b>Local Assessment Approach</b>
<p><b>When:</b> Actions that contain single (or small group) source scenarios. Conducive to providing regional assessments of cumulative and incremental impacts. Transport distances greater than 50km.</p>	<p><b>When:</b> Actions that contain large scale source scenarios. Conducive to providing regional assessments of cumulative and incremental impacts.</p>	<p><b>When:</b> Actions likely to result in local air quality impacts. Transport distances less than 50km.</p>
<p><b>Description:</b> Conduct modeling with estimates of emissions and estimated meteorological and geographic information for single or small groups of sources.</p> <p>This analysis may be used for new projects or proposals that lack specific development information but contain source scenarios that warrant additional review.</p> <p>This approach utilizes EPA guideline approved models for near (local) and far-field analysis. Models tend to be specific to an AQ pollutant, approved purpose, and regulatory application. Impact estimates are generated for ambient concentration, atmospheric deposition, and AQRVs.</p> <p><b>Note:</b> Additional narrative may be necessary to describe how uncertainties affect air quality impact estimates.</p>	<p><b>Description:</b> Conduct regional scale modeling with estimates of emissions and estimated meteorological and geographic information with complex photochemical processes.</p> <p>This analysis may be used for new projects or proposals that lack specific development information but contain large scale or complex photochemical source scenarios that warrant additional review.</p> <p>For this approach, reasonable estimates of incremental emissions are reentered into an existing photochemical modeling system to fully assess impacts based on reasonably foreseeable scenarios.</p> <p><b>Note:</b> Additional narrative may be necessary to describe how uncertainties affect air quality impact estimates.</p>	<p><b>Description:</b> Conduct local scale modeling analysis with emission estimates, meteorological, and geographic information for single sources.</p> <p>May be used when local AQ impact potential is great.</p> <p>Must consider the uncertainties associated with running near-field models with limited or general information.</p> <p><b>Note:</b> Additional narrative is likely to be needed to describe air quality issues, emission uncertainties, and their affects on estimated impacts. Commitment to complete additional analysis may be necessary when requisite information becomes available.</p>
<p><b>Models*:</b> Long range transport models such as CALPUFF, SCIPUFF</p>	<p><b>Models*:</b> Photochemical models such as CMAQ, CAMX</p>	<p><b>Models*:</b> AERMOD / AERSCREEN, VISCREEN, PLUVUE II, CALPUFF</p>
<p><b>Maximizing resources, time, and costs:</b> Lead Agencies are encouraged to develop and utilize modeling methods that promote optimal resource efficiencies. Early planning often can result in datasets (meteorology, emissions, etc...), modeling systems, and analysis outputs that can be applied to a broad range of agency actions requiring air quality models. Reusing aspects of air quality modeling results in substantial time and cost savings, especially with repetitive similar applications. Early modeling considerations substantially reduce modeling development requirements in all subsequent project development phases. Modeling systems that evaluate varied growth patterns (expressed in the form of low, medium, and high) offers reuse potential for both results and modeling systems. An example of a Reusable Modeling Framework (RMF) with emphasis on growth patterns using a complex photochemical model is found in the RMF example attached to this Appendix. The RMF concept could be applied to additional models, domains, and agency actions. MOU Section V.E.4.b describes criteria to eliminate air quality modeling requirements based on availability of existing modeling.</p>		

\*An overview of model characteristics can be found in the following Matrix of Air Quality Modeling Characteristics.

<b>Table B: Consult this Table When</b>	
<b>A reasonably foreseeable number of oil or gas wells (e.g., specific number and location) and associated emission inventory has been developed.</b>	
<b>Dispersion Model Approach</b>	<b>'Add on' Photochemical Approach</b>
<b>When:</b> For criteria pollutants, toxics/HAPs, AQRVs (FLAG), small-medium scale & number of sources, EPA guideline (regulatory), screening & refined modeling options.	<b>When:</b> Projects or plans with large geographic extent, large number of sources, or present complex issues with ozone and secondary particulate impacts.
<p><b>Description:</b> Conduct modeling with project specific emission, meteorological, and geographic information.</p> <p>This approach recommends EPA guideline models, or alternative models that meet Appendix W guidelines on model applications for near (local) and far-field analysis. Models tend to be specific to an AQ pollutant, approved purpose, and regulatory application. Impact estimates are generated for ambient concentration, atmospheric deposition, and AQRVs.</p> <p>Although these models make up the primary air quality modeling tool chest, most do not handle complex scenarios, advanced chemical reactivity, or large numbers of sources commonly associated with regional scale oil &amp; gas development.</p> <p>This modeling approach is the current state-of-practice and is likely for most project specific AQ impact assessments. Re-use of domains, meteorology, and file configuration minimizes resources and costs.</p>	<p><b>Description:</b> Conduct regional scale modeling with project specific emission, meteorological, and geographic information with complex photochemical processes.</p> <p>This approach utilizes a regional scale 'one atmosphere' simulation of a wide variety of AQ pollutants with a large geographic extent. Emissions are gridded, allow for chemical transformation, and offer a variety of transportation mechanisms to address near and far-field transport. Impact estimates are generated for ambient concentration, atmospheric deposition, and AQRVs.</p> <p>'Add on' means to insert project specific incremental emission estimates into an existing regional scale modeling system. Re-use of existing baseline inventories, meteorology, and model setup greatly reduce resources necessary for model application.</p> <p>The 'Add on' photochemical approach is anticipated to become the state-of-practice in coming years.</p>
<b>Models*:</b> AERMOD / AERSCREEN, VISCREEN, PLUVUE II, CALPUFF, SCIPUFF	<b>Models*:</b> CMAQ, CAMX
<p><b>Maximizing resources, time, and costs:</b> Lead Agencies are encouraged to develop and utilize modeling methods that promote optimal resource efficiencies. Early planning often can result in datasets (meteorology, emissions, etc...), modeling systems, and analysis outputs that can be applied to a broad range of agency actions requiring air quality models. Reusing aspects of air quality modeling results in substantial time and cost savings, especially with repetitive similar applications. Early modeling considerations substantially reduce modeling development requirements in all subsequent project development phases. Modeling systems that evaluate varied growth patterns (expressed in the form of low, medium, and high) offers reuse potential for both results and modeling systems. An example of a Reusable Modeling Framework (RMF) with emphasis on growth patterns using a complex photochemical model is found in the RMF example attached to this Appendix. The RMF concept could be applied to additional models, domains, and agency actions. MOU Section V.E.4.b describes criteria to eliminate air quality modeling requirements based on availability of existing modeling.</p>	

\*An overview of model characteristics can be found in the following Matrix of Air Quality Modeling Characteristics.

**OVERVIEW MATRIX OF AIR QUALITY MODEL CHARACTERISTICS**

	Near Field (<50km)			Long Range Transport (>50km) & Photochemical Models		
	AERSCREEN	VISCREEN/PLUVUE II	AERMOD	CALPUFF	SCIPUFF**	CMAQ/CAMX
<b>Description</b>	A conservative single-source <i>screening</i> model based on AERMOD for NAAQS and PSD permitting.	Plume blight models for AQRVs and PSD permitting. Visual impacts are estimated by detailing change in color and contrast along a specific view.	<i>Refined</i> single/cumulative regulatory model for NAAQS, toxics, and PSD. Used for non-reactive criteria pollutants.	<i>Refined</i> long range transport model for AQRVs, NAAQS, and PSD Increment. Contains simplified chemical processes.	<i>Refined</i> (alternative) long range model for NAAQS and PSD Increment. Contains more advanced chemical processes.	<i>Refined</i> photochemical model with full chemistry. Urban to regional scale model capable of single source or cumulative impact assessments.
<b>Advantages</b>	Quick, easy to setup, and simple operation.	VISCREEN: Quick, easy operation and results. PLUVUE II: Complex blight analysis.	Most widely accepted regulatory model. Extensive documentation/guidance for appropriate use.	Ability to simulate pollutant transport that varies in time and space. Addition of simple chemistry and deposition.	Ability to simulate pollutant transport that varies in time and space. Addition of advanced chemistry.	Primary models for ozone and secondary particulate matter impact. Includes most realistic chemistry.
<b>Disadvantages</b>	Conservative modeling assumptions and results.	Single purpose models with lack of robust guidance.	Not suitable for ozone or AQRV impact analyses.	Numerous model control options, difficult validation, and long run times.	Not widely available and not extensively documented.	Complex setup and operation. Advanced computing requirements.
<b>Required computer resources</b>	Light (laptop)	Light (laptop)	Light/Moderate (PC)	Moderate (robust PC)	Moderate (robust PC)	Heavy (UNIX, cluster)
<b>Required model input data</b>	Pre-set meteorology.	Pre-set meteorology or National Weather Service observations.	National Weather Service or on-site observations.	3-Dimension meteorology	3-Dimensional meteorology	3D meteorology, heavy emissions processing.
<b>Range of costs*</b>	In-house to minimal	In-house / \$10K - \$75K	\$10K – \$30K	\$10K - \$50K	\$10K - \$75K	\$50K - \$100K
<b>Factors affecting costs</b>	None	None/Multiple runs	runtime	Meteorology, runtime	Meteorology, runtime	Multiple inputs, runtime
<b>Time to set up, run model</b>	Minutes	Minutes / 1-2 weeks	1-2 Weeks	Days to weeks	Weeks	Weeks to months
<b>Model Developer</b>	EPA	EPA/EPA	EPA	TRC	Lakes Environmental	EPA/Environ
<b>Background, references</b>	40CFR51AppxW	FLAG, 40CFR51AppxW	40CFR51AppxW	FLAG, 40CFR51AppxW	Private	EPA SIP guidance

\* Does not include development of baseline emissions (present or future), meteorological inputs, or contract management. Initial development costs may be more.  
 \*\* SCIPUFF is considered an alternative model under 40 CFR 51 Appx. W but may be considered for long range transport use on a case-by-case basis.

## OVERVIEW AND EXAMPLE DESIGN OF A REUSABLE MODELING FRAMEWORK FOR AIR QUALITY MODELING

**Note to Readers:** *This example of an ‘Add-on’ air quality modeling approach is intended to highlight a strategy for the development of air quality modeling products that can be used at the various stages in National Environmental Policy Act (NEPA) documents (refer to Modeling Approach Tables (Tables A and B) in the MOU Appendix). This framework is not intended to be prescriptive, but an example that could be adapted to reflect project specific information.*

*This framework is intended to promote the development of air quality modeling analysis in a manner that reduces overall resource expenditures through reuse of data, modeling systems, or results. With early consideration, modeling systems can generate input datasets or become the foundation of future applications with simple modification. In some situations, an existing modeling analysis may fulfill the requirements of the MOU that states: ‘Modeling will not be required...[i]f EPA and the Agencies whose lands are affected concur (in writing or by electronic transmission) that: an existing modeling analysis addresses and describes the impacts to air quality and AQRVs for an area under consideration, and the analysis can be used to assess the impacts of the proposed action.’ (Section V.E.4.b).*

### **Conceptual Description**

For the purposes of this document, a Reusable Modeling Framework (RMF) refers to an existing air quality modeling analysis with underlying emission inventories, regional meteorology, and appropriate growth factors (oil/gas emissions) that are considered applicable to a new or modified project proposal. It may be possible to infer potential impact(s) for a new or modified project without the need for additional air quality analyses, as described in the following example.

In this example, an RMF is designed to work in conjunction with a regional scale photochemical model to evaluate potential impacts for criteria pollutant National Ambient Air Quality Standards (NAAQS) of concern (focused primarily upon a cumulative regional assessment of ozone and secondary particulate) and air quality related values (AQRV’s). This RMF is most appropriate when specific numbers, size, and location of development are not well known for a proposed project, typically at the resource management plan (RMP), forest plan (FP), or leasing stage. These proposals often include large scale planning and leasing decisions that have potential to affect distant air quality values. However, a RMF can be adapted for additional models, approaches, and scale.

This RMF uses emissions sensitivities analyses to bracket potential impacts from future growth scenarios. If the emission projections for a stage of a new or modified project falls within the range of emissions growth used in prior sensitivity analyses, then existing modeling potentially satisfies analysis needs without having to perform additional air quality modeling.

**Example Design:**

This RMF suggests that regional air quality assessments for both base year and future years be conducted at predetermined intervals. These intervals usually occur, at a minimum, every three (3) years corresponding to the cycle of the development by EPA's national emission inventory (NEI). To maximize quality and representativeness, this RMF could leverage existing national, regional, and state/local emission databases. New base and future year modeling may be necessary prior to the next 3 year interval if regional development exceeds emissions growth projections for that planning period.

The regional air quality assessments may be conducted on a multistate basis to encompass nearby states to ensure complete airshed coverage. Grid resolution should adequately represent the geophysical characteristics of the domain and anticipated development.

For future year emissions, projections should be made from the base year to 10-15 years forward to examine the potential for maximum growth in the planning area. Emissions projections for non-oil and -gas emission sectors potentially can be leveraged from existing inventory databases. Examples may include: regional planning organizations (RPO's), States, or EPA databases. For the oil and gas sector (O&G), emission growth estimates over the future year baseline should be estimated to characterize the potential range in growth. Future year growth estimates should examine the potential for low, medium, and high development based on the anticipated regional growth.

Emission sensitivities can be conducted using methods developed by the photochemical modeling community. The most straight forward method to address emission sensitivities uses photochemical modeling runs to examine incremental growth in the O&G sector. This approach is often referred to as the "brute force method" which examines the impact of emission growth through successive model runs showing impacts from alternative growth scenarios (e.g., High, Medium, and Low). Other probing techniques, which are more sophisticated, allow for the development of area specific source-receptor relationships. Examples include the Response Surface Methods (RSM), as developed from iterative model runs, and the Direct Decoupled Method (DDM), as developed within a particular photochemical model. RSM provides model sensitivity estimates across a wide range of emission changes, but is costly due to need for numerous iterations of the photochemical model. DDM allows for model sensitivity estimates for small emission changes (e.g., 10% - 20%) without having to rerun the model for each scenario, but is costly due to large upfront development.

**Table 1 - Reusable Data Products**

Category	BASE YEAR	FUTURE YEAR
Meteorology	Base Year (corresponds to 3-YR NEI baseline)	Base Year
Emissions Modeling	3-YR NEI	10 – 15 year projection
Basecase Analysis	Base Year Performance	NA
Emissions Sensitivity Analyses (Photochemical)	NA	O&G Growth Scenario (Low, Medium, and High)

## EXAMPLE SCOPE OF WORK

### **Task 1. Preparation of Work Plan**

A work plan shall be prepared that provides details of the modeling effort and approach.

### **Task 2. Development of Comprehensive Modeling Protocol**

In this subtask, the Contractor will develop a modeling protocol which addresses the development of meteorological, emissions, and air quality modeling for this project. The Contractor will prepare a draft protocol for review by participating agencies. Upon receipt of comments, the Contractor will coordinate with the responsible organization to incorporate comments as warranted and submit a final modeling protocol to all study participants.

The modeling protocol will describe in detail how the air quality modeling inputs will be developed. The protocol shall address, at a minimum, the following:

1. Numerical meteorological model configuration including the following:
  - Horizontal and vertical model domain configuration
  - Physics options selection
  - Data sources for initial and boundary condition development
  - Four dimensional data assimilation (FDDA) strategy
2. Numerical meteorological performance evaluation methods
3. Emissions database development including:
  - Data sources for inventory development
  - Growth factor development
  - Oil and Gas Sector Development Scenarios
4. Base Year Air Quality Modeling Simulations
  - Processing of numerical meteorological fields
  - Initial and boundary condition development
  - Photolysis rate development
  - Photochemical model configuration and option selection
5. Base Year Air Quality Model Performance Evaluation
6. Emissions Sensitivity Scenarios for Future Oil and Gas Development Scenarios
  - Air quality model methods (“brute force” or model probing tools.)

The deliverables for this task will include a draft and final modeling protocol submitted to the responsible organization and participants.

### **Task 3a. Annual Meteorological Modeling Simulation**

For this subtask, the Contractor will develop a numerical meteorological model fields necessary to support regional scale air quality modeling recommended under the MOU. Meteorological fields will be developed in accordance with details outlined in the protocol developed under Task 2 of this project.

Deliverables under this subtask will include hourly numerical meteorological model fields for specified domains that can be used for development of meteorological inputs for photochemical modeling.

### **Task 3b. Meteorological Model Performance Evaluation**

For this subtask, the Contractor will conduct a statistical performance evaluation of the numerical meteorological fields using methods and metrics described in Emery et al. (2001) and Tesche et al. (2002). The statistical performance evaluation will be conducted in accordance with details outlined in the protocol developed under Task 2 of this project.

The deliverable under this subtask will include a report documenting the evaluation of performance of the numerical weather model.

### **Task 3c. Process Numerical Meteorological Fields for Input into Photochemical Model**

The purpose of this subtask is to provide meteorological inputs for the photochemical modeling platform and period(s) delineated in the protocol under Task 2 of this project. The Contractor will (1) process the numerical meteorological model data through the appropriate meteorological preprocessor for input into the photochemical, including subdomains identified in the protocol under Task 2; (2) quality assure (QA) meteorological inputs and results of vertical layer aggregation; and (3) document methods and QA results, and instructions for future processing of meteorological data.

The deliverables of this subtask are (1) the processed meteorological fields; (2) preprocessor run scripts; (3) the results of QA measures and log files from meteorological preprocessor; and (4) a report describing the approach and instructions for reproducing the preprocessing and analysis of meteorological fields for preparation as input to photochemical models.

### **Task 4. Development of Emissions**

The purpose of this task is to create emissions inputs for use in the photochemical model identified under Task 2 of this project. Emissions will be developed for the modeling domain(s) determined under Task 2 for at least a 12-month consecutive period corresponding to the most current national emission inventory (NEI) baseline period.

For this task, the Contractor will (1) create speciation input files, emissions surrogate data, and landuse data appropriate for the photochemical model; (2) run SMOKE processors needed for photochemical platform specific emissions; (3) quality assure SMOKE outputs, correct and rerun as needed; and (4) document all processing steps, processing and data decisions, and provide an interim report on photochemical model emission inputs.

Emissions will be developed for the following:

1. Actual baseyear emissions (corresponding to most current NEI baseline year) for purposes of air quality model performance evaluation
2. "Typical" baseyear emissions for development of future year emissions projections

3. Future year emissions
4. Future year emissions with Oil and Gas Sector emissions growth scenarios

### **Task 5a. Base Year Air Quality Model Simulations**

The purpose of this subtask is to create a suitable baseyear modeling analysis that can serve as a platform to assess potential air quality impacts from future development scenarios. The Contractor will (1) use meteorological and emissions inputs created under Subtasks 3c and 4; (2) create initial and boundary condition (IC/BC) and photolysis rates data for input.

Deliverables for this subtask will include (1) all input data files (meteorology, emissions, IC/BC, photolysis); (2) all base base model output data files; and (3) model run scripts and log files created for completion of this task.

### **Task 5b. Base Year Performance Evaluation**

The purpose of this subtask is to evaluate photochemical model performance for ozone and its precursor data (where available) and speciated fine particulate matter in order to achieve reasonable baseyear model performance for development of future year emissions. The Contractor will (1) acquire all observational data sets (IMPROVE, STN, CASTNET, and SLAMS/NAMS ozone) to conduct performance analysis; (2) conduct a phenomenological and statistical performance evaluation of base year simulations; and (3) document results of performance analysis.

Deliverables for this subtask include (1) an interim report documenting final model configuration, outstanding issues not resolved from subtask 5b; (2) further recommendations for baseyear model performance improvement; (3) model performance analyses and results; (4) final datasets and software used to conduct model performance evaluation; and (5) documentation on how to perform analyses.

### **Task 6. Future Year Emissions Sensitivity Scenarios**

The purpose of this task is to complete emissions sensitivity analyses for future development scenarios for the oil and gas sector consistent with the goals of MOU to provide a basis for describing future development projects within the airshed. Emissions sensitivity analyses will use model techniques and probing tools described in the protocol developed under task 2 of this project. The Contractor will (1) develop model ready emissions inputs from the future year inventory developed under Task 4 of this project; (2) develop model emission ready emission based upon projections for oil and gas growth scenarios to conduct sensitivities of future oil and gas development; (3) conduct air quality simulations for oil and gas emissions sensitivities using methods described in the protocol developed under Task 2 of the project; and (4) develop final documentation suitable for use as a technical support document for future resource development plans with emissions projections consistent with the emission ranges assumed for future year development scenarios.

Deliverables for this task include (1) a final report documenting future year emissions sensitivities; (2) documentation of methods for all model inputs and run scripts; and (3) all model output from emissions sensitivity scenarios.