AQ - 1 – Air Quality Considerations for IWM

One of the purposes of the Irrigation Water Management conservation practice standard is to manage air, soil, or plant microclimate. The Atmospheric Resource Quality Management conservation practice standard helps minimize or reduce emissions of particulate matter, smoke, odors, greenhouse gases, ozone, and chemical drift, as well as maintain or increase visibility.

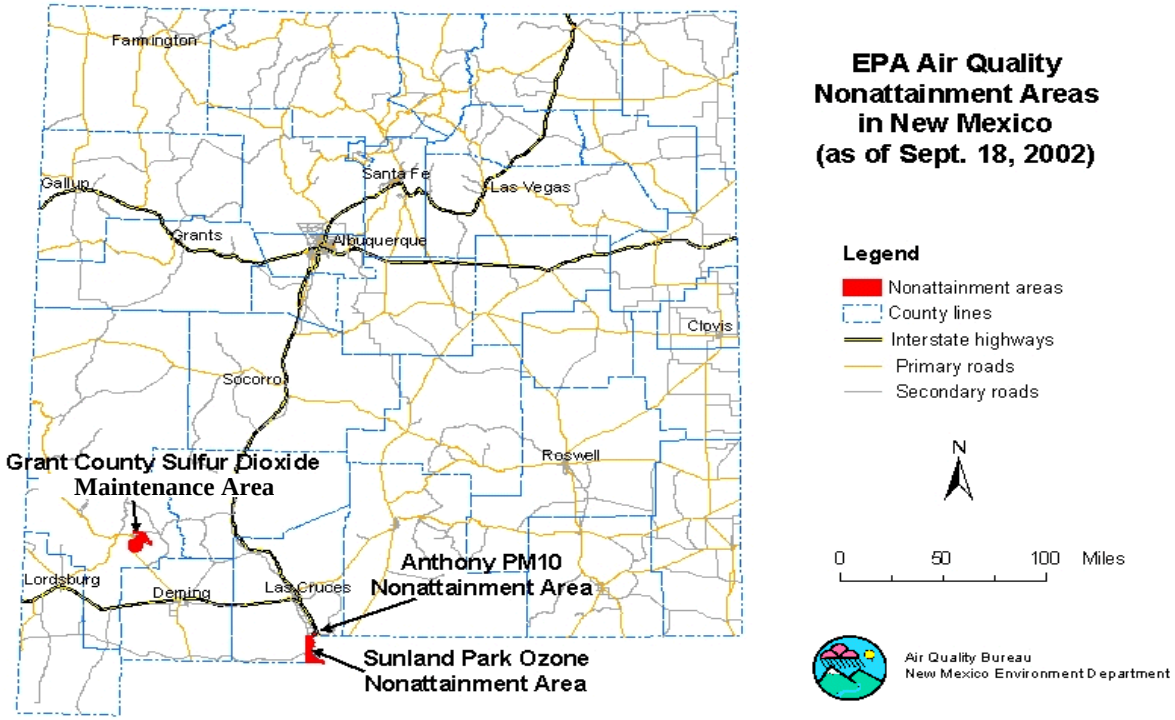
When planning a resource management system, an assessment of air quality resource concerns must be made and practices implemented to address those. The current tool being used by NRCS is the Air Quality Assessment Tool, detailed in this section, and located at: http://www.nm.nrcs.usda.gov/technical/tech-notes/envir/env-8.pdf . Some of the practices, which can be implemented on cropland, are summarized in this section.

Air Quality Assessment Tool for New Mexico

This assessment tool should help field offices determine whether or not they have air quality/atmospheric resource issues/concerns and then how to address that issue concern.

1. Is the Conservation Treatment Unit (CTU) in a non-attainment area?

☐ **PM10 (Anthony)** ☐ **PM2.5 (None identified)** ☐ **Ozone (Sunland Park)**
☐ **Other Do you want to consider methods to reduce PM anyway?**



PM10

Are there unpaved roads and equipment areas? If yes, consider practices/techniques that reduce or eliminate PM10 generation such as:

- **Synthetic/organic suppressants for PM control**
- **Water**
- **Speed or traffic reduction techniques (speed bumps, speed limits, gates)**
- **Mulches (hulls, wood chips)**
- **Paving or gravel surfaces (NCPS No. 560).**

Is there any surface disturbance? If yes, consider practices/techniques that reduce or eliminate PM10 generation such as: (on the fields)

- **Residue management practices (NCPS No. 329C, 344, 329B, and 329A,.)**
- **Vegetative barriers (NCPS No. 311, 327,340,332,601,386,603,393,342.)**
- **Irrigation management (NCPS No.449).**
- **Range management (NCPS No. 512 and 550)**
- **Forest management (NCPS No. 490, 460, and 380).**
- **Wildlife management (NCPS No. 422)**
- **Land reconstruction (NCPS No. 572, 543, 466, and 544).**
- **Recreation (NCPS No. 566 and 568).**

Are there any harvest operations? If yes, consider practices/techniques that reduce or eliminate PM10 generation such as:

- **Forest management (NCPS No. 666 and 660).**
- **Range Management (NCPS No. 511).**

Is there any track out on paved roads? If yes, consider practices/techniques that reduce or eliminate PM10 generation such as:

- **construction entrance**

Does wind contribute to PM generation and/or transport? If yes, consider practices/techniques that reduce or eliminate PM10 generation such as:

- **wind erosion control practices – windbreaks (NCPS No. 380, 650), vegetative barriers (NCPS No. 601), Cross Wind Ridges (589a), Cross Wind**
  Trap Strips (589c), Stripcropping (585), Herbaceous Wind Barriers (603)

Are there any feedlots/AFOs? If yes, consider practices/techniques that reduce or eliminate PM10 generation such as:

- **corral dust control (frequent manure scraping – 634)**

Is there any on-farm materials handling (grain elevator, bulk fertilizers, manure)? If yes, consider practices/techniques that reduce or eliminate PM10 generation such as:

- **waste utilization standard (NCPS No. 633)**

PM2.5

Is this an AFO? If yes, consider practices/techniques that reduce or eliminate PM2.5 generation such as:

- **Waste utilization and management (NCPS No. 313, 359, 633, and 317).**
- **Frequent manure removal/scraping (NCPS No. 634).**

- **Sprinkler irrigation**
- **Cover manure storage (NCPS No. 365).**
- **Biofilter installation (Amendments for Treatment of Ag Waste (591))**
- **Feed management (592)**

Is any agricultural or prescribed burning done? If yes, consider practices/techniques that reduce or eliminate PM2.5 generation such as:

- **Consider non-burning alternatives and emission reduction techniques and follow smoke management plan (NCPS No.338).**

Are diesel engines used in the operation? If yes, consider practices/techniques that reduce or eliminate PM2.5 generation such as:

- **Switch out to electric engines**
- **Newer certified engines – diesel, natural gas or propane**
- **Retrofit existing engine – add-on technologies**
- **Alternative fuel blends**

Is there any on-farm materials handling? If yes, consider practices/techniques that reduce or eliminate PM2.5 generation such as:

- **Waste utilization and management (NCPS No. 313, 359, 633, 365, 317, and 364).**

Ozone (Ozone precursors are both VOCs and NOx)

Is any agricultural or prescribed burning done? If yes, consider practices/techniques that reduce or eliminate both NOx and VOC generation such as:

- **Consider non-burning alternatives and emission reduction techniques and follow smoke management plan (NCPS No. 338).**

Are nitrogen fertilizers used in the operation? If yes, consider practices/techniques that reduce or eliminate VOC generation such as:

- **Consider N formulation of fertilizer (NCPS No. 590)**
- **Fertilizer incorporation (NCPS No. 590)**
- **Application rate, method and timing (NCPS No. 590)**

Is animal waste utilized on the farm? If yes, consider practices/techniques that reduce or eliminate VOC generation such as:

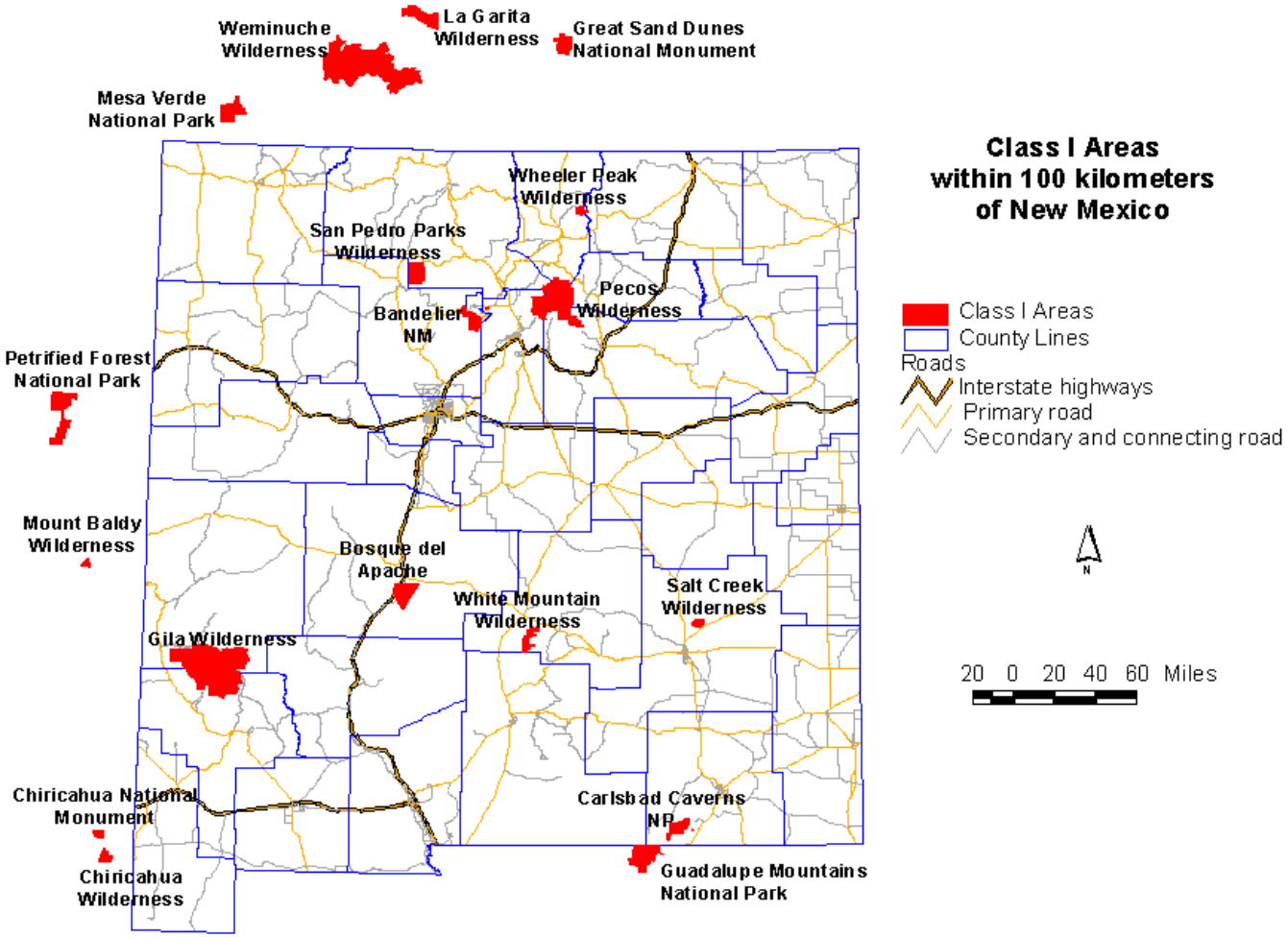
- **Waste utilization (NCPS No. 633)**
- **Composting (NCPS No. 317)**

Are pesticides used on the farm? If yes, consider practices/techniques that reduce or eliminate VOC generation such as:

- **Consider different formulations and application techniques - Pest management (NCPS No. 595).**

Are combustion engines used on the farm? If yes, consider practices/techniques that reduce or eliminate NOx generation such as:

- **Switch out to electric or cleaner burning natural gas engine**
- **Retrofit existing engine**
- **Alternative fuel blends**



2. Is the CTU within 50 km (~31 miles) of a Class I area? (Near IS<50 km) (smoke/visibility, NOx, O3, VOC, NH3)

Consider practices/techniques that reduce or eliminate smoke generation

- **Emission reduction techniques**
- **Use of non-burning alternatives (i.e., chipping, debris removal)**
- **Crop Residue Management (NCPS No. 329C, 344, 329B, and 329A,.)**
- **Smoke management plan (NCPS No. 338).**
- **No-till or Minimum Tillage (NCPS No. 329C, 344, 329B, and 329A,.)**

3. Is the CTU within X miles of a concentrated population (X people/mile) or a major transportation corridor (freeway, interstate highway, state highway, airport, vehicle miles traveled)? (nuisance, safety) If yes, Consider practices/techniques that will reduce or eliminate generation of PM or smoke.

Consider practices/techniques that will reduce or eliminate generation of odor.

- **Feed management (592)**
- **Biofilters (591)**
- **Control manure moisture**
- **Manure management (NCPS No. 590, 313, 359, 633)**
- **Slurry injection**
- **Composting (NCPS No. 317)**

4. Are pesticides applied to the CTU? (VOCs, drift) If yes, Consider practices/techniques that will reduce or eliminate drift such as:

- **Consult label directions**
- **Windbreak (NCPS No. 380, 650)**
- **Application techniques (NCPS No. 595)**

Consider practices/techniques that will reduce or eliminate generation of VOCs such as:

- **Change pesticide formulation if possible (NCPS No. 595)**
- **Integrated Pest Management (NCPS No. 595)**

5. Are greenhouse gases (ghgs) regulated? (CH4, N2O, CO2, CFCs,) Not yet in New Mexico.

Consider practices/techniques that will offset or reduce generation of CH4 such as:

- **Digesters for electricity generation (NCPS No. 365)**
- **Feed management (592)**
- **Livestock management**

Consider practices/techniques that will offset or reduce generation of N20 such as:

- **Fertilizer formulation (NCPS No. 590)**
- **Soil management**

Consider practices/techniques that will offset or reduce generation of CO2 such as:

- **Reduced tillage**
- **Use of renewable energy**
- **Reduce or Eliminate open burning**
- **C-sequestration practices to offset CO2 emissions**

6. Are plant and animal health and productivity, and human comfort adversely affected by air circulation?

- **Construction of windbreaks, herbaceous wind barriers and/or hedgerow planting will disturb air flow serving to increase/decrease air flow and reduces energy costs.**
- **Use of fans and air dams**
- **Building design**

Cropland Air Quality Practices

Cropland Practices to Reduce Dust/Particulate Matter Emissions	Cropland Practices to Reduce Smoke Emissions	Cropland Practices to Reduce Odor	Cropland Practices to Reduce Greenhouse Gas Emissions	Cropland Practices to Reduce Ammonia Loss	Cropland Practices to Reduce Ozone Precursors
Components of PM_{10} include finely divided solids or liquids such as dust, fly ash, soot, smoke, aerosols, fumes, mists and condensing vapors that can be suspended in the air for extended periods of time. Particles originate from a variety of stationary and mobile sources and may be directly emitted (primary emissions) or formed in the atmosphere (secondary emissions) by transformation of gaseous emissions. $PM_{2.5,}$ secondary particulate matter can be derived form precursor gases reacting in the atmosphere. Ammonium, sulfur oxides (SOx), nitrogen oxides (NOx), and certain volatile organic compounds (VOC) are major precursors of fine secondary particulate matter. Emissions of ammonia, nitrates (fertilizers, animal emissions, and animal waste emissions), volatile organic products, sulfates, and chemical drift and pesticide re-entrainment are possible agricultural contributors.	In impacted air sheds, reduce or eliminate burning of agricultural residues unless required for disease control. In air sheds that impact Class 1 regional haze areas, burn or smoke management plans shall be followed. Burns initiated for management shall meet Prescribed Burning Conservation Practice Standard. When burning, all procedures specified in New Mexico Burn Permit shall be followed.	The major agricultural odor source is livestock. Complete a manure management plan or comprehensive nutrient management plan for the entire facility and implement recommendations	To reduce the amount of greenhouse gases reaching the atmosphere, the reduction and/or capture of greenhouse gases is necessary. Agricultural activities contribute carbon dioxide emissions through combustion of fossil fuels, burning, and decomposition of soil organic matter. Economic benefits to grower include less time and fuel required. Nitrous oxide emissions are principally derived from soils, the application of organic and inorganic fertilizers, biomass burning, and livestock waste management. Burning of agricultural residues creates emissions of carbon dioxide and nitrous oxide. Methane emissions from agricultural sources are from animal waste storage, treatment, and application.	Ammonia as a gaseous emission can undergo a series of atmospheric reactions and eventually combine with NOx (emissions from engines) to form ammonium nitrate, a very fine particulate. Major sources of ammonia from agricultural activities include: raising of animals, applications of organic and inorganic fertilizers, and composting	Ozone is harmful to both human health and vegetation. Ozone in the lower atmosphere is formed when volatile organic compounds (VOC) and oxides of nitrogen (NOx) react in the presence of sunlight. Agricultural practices such as burning of agricultural wastes, application of pesticides, livestock and livestock waste contribute to VOC. Agricultural practices such as burning, farm equipment, and use of stationary and portable agricultural engines contribute to NOx.

Cropland Practices to Reduce Dust/Particulate Matter Emissions	Cropland Practices to Reduce Smoke Emissions	Cropland Practices to Reduce Odor	Cropland Practices to Reduce Greenhouse Gas Emissions	Cropland Practices to Reduce Ammonia Loss	Cropland Practices to Reduce Ozone Precursors
Reduce or modify operations that create dust, provide crop residues, or cover crop during critical air periods to protect exposed fields. **After land leveling or re-leveling, the field should be irrigated or bedded up as soon as possible and not left in a smooth dry condition.**	**When pruning orchards or removing orchards and vineyards, activities in lieu of burning shall be considered.** **Options include chipping/shredding, soil amendment with chips/shredding, use as biofuel, composting, or placing chips on unpaved roads for dust control**	**Proper corral management and manure storage practices will be followed, including scraping corrals at least twice per year, store manure under roof, divert rainfall and runoff, provide adequate storage area, mix wet material quickly with drier material, compost.**	**To reduce carbon dioxide emissions:** **Reduce tillage operations; utilize newer EPA certified engines or electric motors and utilize the least engine horsepower required to get the job done.** **Decrease carbon emissions by:** **minimizing losses of organic matter, including select cropping sequences with a Soil Conditioning Index of "0" or greater, plant cover crops that sequester carbon, convert from annually cropped to perennial non-tilled crops.**	**To reduce ammonia losses from confined animal operations:** **Corral should be designed with a 3-5% slope whereby water does not pond and keep manure wet.** **Scrape manure from corrals two to three times per year.** **Do not stockpile manure for long periods of time.**	**To reduce VOC:** **Reduce agricultural burning (see Smoke column).** **Utilize integrated pest management (IPM) to reduce the amount of pesticides used. Utilizing IPM practices will utilize the least amount of pesticides while maintaining control of pests. Utilize lower pesticide application rates. Utilize pest control advisors and new application equipment to reduce VOC emissions. Utilize pesticides with a lower VOC emission factor.** **Utilize proper livestock waste management, storage, and application procedures.**

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Nut orchards shall be irrigated 10 to 20 days before harvest unless otherwise recommended. Cover crops in orchards and vineyards improve soil structure and tilth, and reduce dust generated during cultural and harvest operations **Floating and leveling row middles after orchard crop has been harvested reduces dust generation during following harvest**	**Crop residue treatment after harvest options include crop residue incorporation, removal, shredding, fall flooding or a combination of the above.**	**Reduce the odor during manure spreading operations.** **Disk solid manure into soil within 24 to 48 hours after application; not recommended when plant canopy exceeds 4 foot in height and exceeds 75%.** **Also follow proper liquid manure management practices, including use of adequate flush volumes, use solids separator, inject or incorporate into soil, irrigate according to crop schedule.**	**To reduce nitrous oxide emissions:** **When tillage is done, surface applications of manure and fertilizer nitrogen, which are subject to volatilize, e.g. urea, should be incorporated into soil within 24 hours after application.** **When tillage is not done, the rate, form and timing of application(s) shall be managed to minimize volatilization losses.** **When liquid forms of manure are applied with irrigation equipment, modifying the equipment can reduce the potential for volatilization of nitrogen from the time the manure leaves the application equipment until it reaches the soil surface (e.g. reduced pressure, drop down tubes for center pivots). N volatilization from manure in a surface irrigation system will be reduced when applied under a crop canopy.**	**To reduce ammonia emissions from fertilizer application:** **Implement a comprehensive nutrient management plan for an animal feeding operation.** **Implement a nutrient management plan for cropland.** **These specify timing, application methods, materials, storage and water management for site-specific field conditions. Immediate incorporation of manure into soil greatly reduces emissions.** **Methods for reducing ammonia application from inorganic fertilizer include: injection into moist soil, injection into dry soil, top dress and incorporate immediately, water in through irrigation; water applied within 24 hours of fertilizer application; top dress without mechanical or irrigation incorporation.**	**To reduce NOx:** **Reduce agricultural burning (see Smoke column).** **Replace older engines or retrofit old engines with newer certified cleaner burning, more fuel-efficient components.** **On stationary and portable engines such as irrigation pumps, evaluate the feasibility of participating in a retrofit program.** **Utilize cleaner burning fuels such as natural gas, biodiesel, electricity, and reformulated low sulfur diesel fuel.** **Reduce tillage operations.** **Utilize the least engine horsepower required to get the job done.**

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Wetting the soil surface before mowing will reduce dust particulate matter emissions into the air. Use of newer equipment designed for dust reductions is recommended.	Acceptable alternative disposal methods of combustible materials such as trays, bags, and sacks will be pursued.	Avoid applying manure and organic byproducts upwind of occupied structures when residents are likely to be home	To reduce carbon dioxide and nitrous oxide: reduce or eliminate burning of agricultural residues (refer to smoke column). Biomass collection of agricultural residues to be used as feed stocks for energy production and using them to offset fossil carbon energy sources can reduce the need for burning. Sufficient biomass should be left on the surface to maintain soil quality.		
Utilization of newer certified diesel engines, electric, and alternative fueled engines will produce less particulates.	When there are no options available except burning, activities will comply with Prescribed Burning, Standard 338, and comply with approved written burn plan. In this case, steps must be taken to minimize emissions, including proper vegetative management (stacking and/or drying), proper timing of the burn, proper preparation prior to ignition	Windbreaks or herbaceous wind barriers may be a viable option in modifying wind speed and direction. Tree varieties and placement for the windbreak should be managed to maximize odor interception and dilution of air, and reduce odor leaving the source.	To reduce methane emissions: Capture, utilize, or reduce methane emissions from animal waste storage, including manage to reduce methane emissions, such as composting, convert to aerobic systems, convert to anaerobic digester technology with methane capture		.

Linda Scheffe, 2008